Experience From The Development Of Point Lepreau's Training Program For Technical Support Staff

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Abstract

The Training Department at the Point Lepreau GS has been developing and improving its training for technical support staff. A generic set of objectives are being used as the basis for a systematic approach to training. The program covers general and job specific knowledge and skills using a mix of classroom instruction, mentoring and continuing training seminars. This paper describes experience, success and the challenges in the development, delivery and evaluation of the training program.

1. Introduction

The Technical Staff (TS) Training and Qualification Program is a key component of PLGS strategy to provide engineering and technical expertise to:

- protect the station's design and safety basis
- prevent equipment failure
- ensure safe and reliable operation.

The Program is designed to provide initial, position specific and continuing training. The TS Training and Qualification Program is based on guidelines established in INPO ACAD 98-004, *Guidelines for Training and Qualification of Engineering Personnel*. The elements of the Program are described in a Training and Qualification station document and in individual Qualification Guides.

The goal of initial training is to ensure that TS gain an appreciation of the knowledge and skill requirements needed in their jobs. The TS initial training provides employees with knowledge of the following:

- how to communicate effectively with and understand the functions of other departments and personnel in the organization
- the need to conduct work activities according to applicable regulations, processes and procedures
- an overview of basic sciences and equipment system principles and how they apply to the operation of the plant (Examples: electrical theory, thermodynamics, reactor theory)
- the basic operation of the plant
- the need for high standards and a commitment to professionalism.
- the demands of the technology and the need for commitment to reactor safety and plant reliability.

Meeting the technology demands and the need to foster a professional respect for reactor safety, lead to the development of a set of generic courses designed to enable TS to understand the station's licensing basis, and to help ensure safe and reliable operation.

2. Development of generic courses

Three courses Design Basis, Safety Assessment, Operational Safety have been developed to cover generic knowledge and skills training for maintaining the station's licensing basis. These courses cover generic training objectives from the ACAD catalogue.

Examples of the training objectives include knowledge of the following:

- selected licensing documents (Safety Report, Operating Policies and Principles, Reactor Operating LIcence, S-99, etc.);
- fundamental safety principles (defence in depth, control/cool/contain, ALARA);
- safety design provisions, and design basis accidents;
- safety assessment (deterministic and probabilistic);
- core protection and beyond design basis events;
- operational safety provisions and safe operating envelope;
- topics in configuration management and plant modification processes;
- risk management and operational decision making;
- topics important to the procurement and replacement of parts and equipment.

The purpose of the three courses is to provide Technical Support (TS) staff with the knowledge and skills to meet performance expectations in support of safe and reliable operation. The courses were developed from similar courses that had been developed for certification of Shift Supervisor (SS) candidates. The purpose of those courses was to prepare an SS for decision making when plant conditions are not covered by operating procedures and practices.

An analysis of the generic knowledge requirements for technical staff is summarized in Figures 1-3. Each of the figures highlights a specific performance focus for technical staff together with

- the operational safety program requirements; and,
- the enabling knowledge needed for implementing the safety programs.

The courses combine classroom instruction on the knowledge objectives with group exercises to apply the knowledge. The courses and their delivery are designed so that trainees acquire 'tools' to improve their performance. Links are made to the WANO Performance Objectives and Criteria. The class exercises are based on station and industry OPEX. The trainees are challenged to identify deficiencies that lead to the events and link them to the course objectives.

2.1 Protect the design basis

For technical staff to "protect the design basis", they need to understand the safety design provisions, their basis and their significance. The Design Basis course is developed from the safety design objective.

The objective of safety design provisions is to keep the risk from the operation of the plant as low as reasonably achievable (ALARA). This includes:

- *taking all reasonably practical measures to prevent accidents and to mitigate their consequences should they happen;*
- *ensuring that, for all possible accidents taken into account in the design, any radiological consequences would be below prescribed limits; and,*
- *to ensure the likelihood of accidents with serious radiological consequences is extremely low.*

The Design Basis course covers the fundamental safety principles and licensing requirements that are the basis for the design. It includes the hazard analysis that leads to the design basis events. Particular attention is given to the means and practices for prevention, detection and mitigation.

As shown in Figure 1 the Design Basis course is enabling knowledge for the safety management programs that are covered in the Operational Safety course. It describes the plant status and configuration control programs. Particular emphasis is given to the design modification process and the tracking of changes. It also describes the role of technical staff in supporting operations staff exercise the primary responsibility for plant status control.

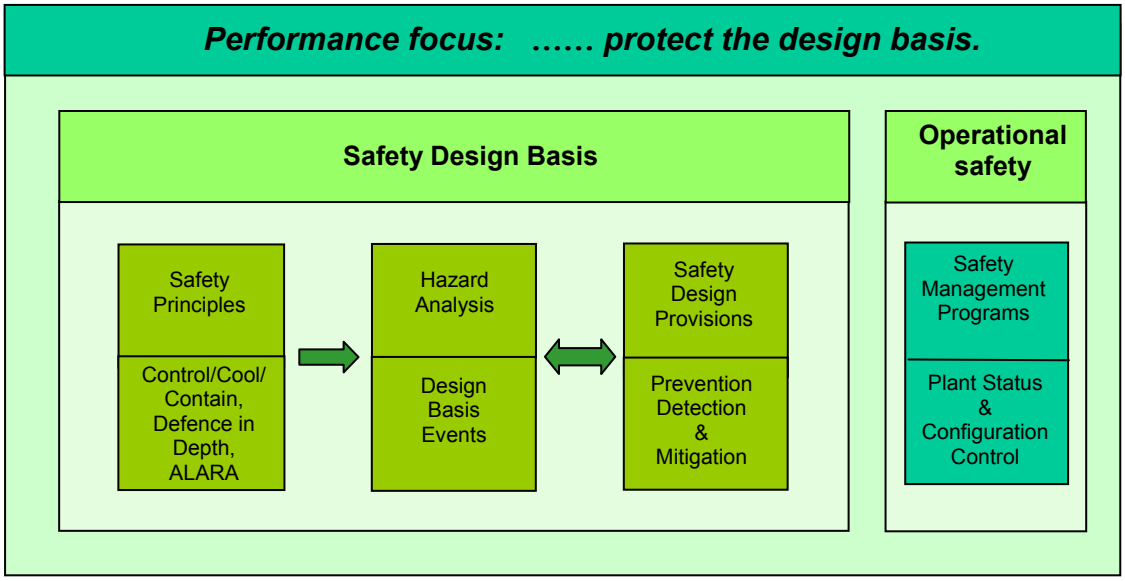

Figure 1. Knowledge requirements to enable technical staff to *'protect the design basis'.*

2.2 Ensure the design performance of the SSC.

For technical staff to "ensure the design performance of the SSC", they need to understand the minimum acceptable performance capability for the structures, systems and components (SSC). The Safety Assessment course describes analysis methods and acceptance criteria for validating

the safety design provisions. This course is an essential link between the safety design provisions and the operational safety objective.

The objectives of operational safety provisions are

- *to maintain the safety level of the plant as provided for by its design; and,*
- *when possible, to reduce the risk to the public in accordance with the ALARA principle and regulatory requirements.*

The Safety Assessment course covers both the deterministic safety analysis for design basis accidents and the risk assessment for beyond design basis accidents as shown in Figures 2 and 3. The operating limits and conditions that result from the safety assessment are critical input to the station's safety management programs.

Particular attention is given the safe operating envelope (SOE) which is the primary tool used by operations staff to meet the operational safety objective. The operating limits and conditions are the primary reference for technical staff in monitoring and maintaining the SSC and implementing the SOE.

As shown in Figure 2 knowledge of the safety assessment is enabling knowledge for safety programs covered in the Operational Safety course. It covers the plant monitoring and maintenance programs.

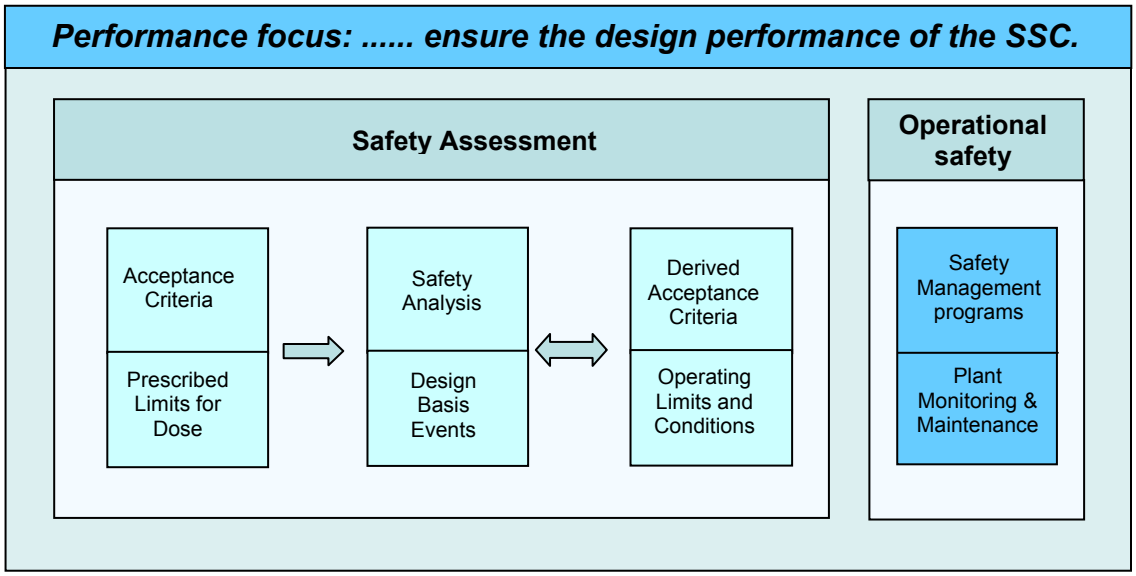

Figure 2. Knowledge requirements to enable technical staff to *'ensure design performance of SSC'.*

2.3 Respect the core and manage the risk

For technical staff to 'manage the risk', they need to understand the concept of risk, risk assessment and the design and operating provisions for managing risk. The Operational Safety course is developed from the objective of the safety management programs.

The objective of safety management provisions is to implement a management system that achieves the business goal for nuclear safety as well as the goals for power production and cost control through risk management. This includes

- *fostering a strong safety culture*
- *assessment, bench-marking, correction of deficiencies and the use of operating experience to continuously improve the safety performance,*
- *controlling change and the ageing of the plant to maintain the level of safety; and,*
- *periodic assessments of the station's design and operation against current safety standards and practices.*

The Operational Safety course describes the management system and role Operating Policies and Principles (OP&P) document in implementing operational safety provisions. The content of the OP&P is presented from the perspective of the application of safety principles and the implementation of operating limits and conditions. The course emphasizes the importance of 'respect for the core' in managing risk because the station is vulnerable to an accident at any time. Risk assessment, which is covered in the Safety Assessment course, is enabling knowledge for the Operational Safety course as shown in Figure 3. The course describes the importance of assessing risk correctly in the operational decision making process.

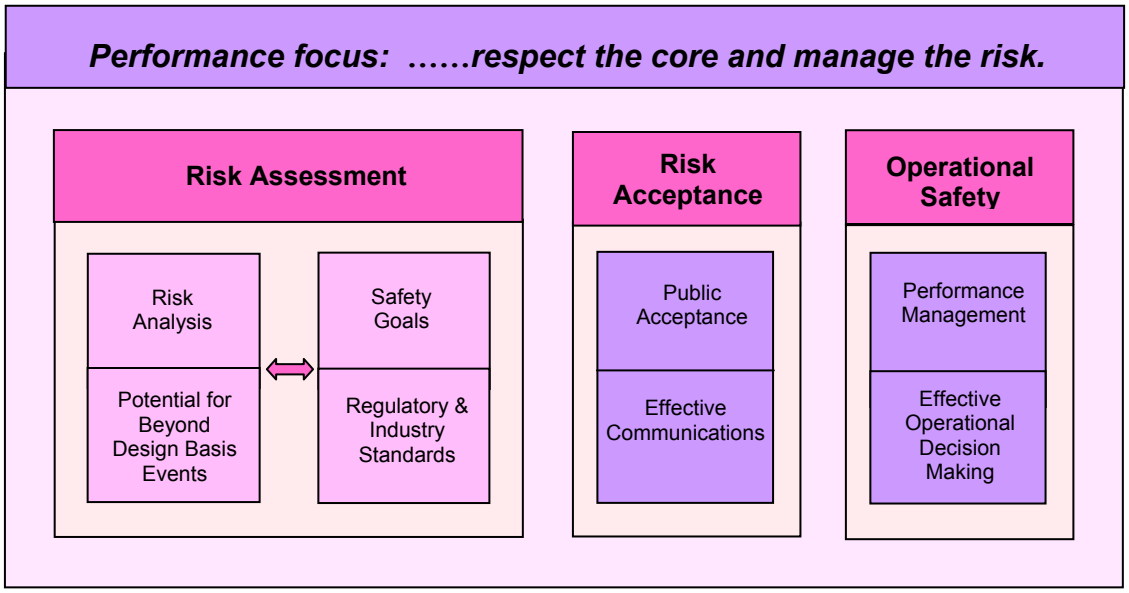

Figure 3. Knowledge requirements to enable technical staff to '*manage the risk*' of potential core damage.

3. Course Delivery

Each of the courses are presented as classroom instruction over three days. Each day is structured to accommodate the three levels of training objectives: knowledge, comprehension and application. The delivery plan for a typical day is as follows:

8:00-9:00 am Review of objectives from the previous day
9:00-10:00 am Self study of objectives for a module
10:00-11:00 am Classroom instruction for the objectives
11:00-12:00 am Group exercises for comprehension and application of the objectives

1:00-2:00 pm Self-study of objectives for a module
2:00-3:00 pm Classroom instruction for the objectives
3:00-4:00 pm Group exercises for comprehension and application of the objectives.

Each session is opened by either the Engineering Director, or Technical Manager, or Nuclear Safety Manager. Their presence and opening remarks emphasizes the importance of reactor safety, and the role and responsibilities that TS take on in ensuring safe and reliable operation.

The objectives are covered in five modules for each course. The last half-day is used for performance evaluation, self-study and/or topical sessions by a guest instructor. The delivery plan has evolved over successive presentations of the courses.

The classroom group exercises are structured around industry experience that is related to the objectives for the module just covered. The class groups apply the knowledge from the module to an assessment of an assigned event. They then present it to the class and discuss it following guidelines linked to the course material. Each group consists of three/four people so each has an opportunity to be the group spokesperson.

4. Performance evaluation

The evaluation of student performance in the training program includes the following elements:

a) Acquisition of knowledge which is assessed from written answers to objectives;
b) Comprehension of concepts and approach objectives and classroom presentations; and
c) Application of knowledge to events and abnormal plant conditions which is assessed by performance in classroom exercises.

Recent courses have adopted a workshop format for the final afternoon that has the class groups apply their knowledge to review and comment on industry events. Events are selected that reveal deficiencies in technical support activities. An example would be the Davis-Besse event. The trainees are given a series of questions to relate the event to their plant and their activities. The questions are developed to cover several of the course objectives.

The class groups present their findings to the rest of the class as a work group briefing. Work group supervisors are invited to the presentations to assess the effectiveness of the training.

5. Experience from development of the program

The three-day format for each course provides constraints with trade-offs having to be made in the course design and delivery. A second constraint is the need to cover as many as possible of the objectives from the ACAD catalogue for generic technical staff training. We have not had

reason to modify the three-day format. It is accepted by supervisors and the trainees find it acceptable. However, the course materials have been revised extensively to incorporate the instructor's experience, trainee feedback, supervisor's feedback and the performance evaluations.

The training objectives have been revised to minimize the amount of commit-to-memory knowledge. This is necessary because of the limited instructional time and the amount of material to be covered. The scope of the course content is set by including the ACAD generic training objectives related to the station's licensing basis.

The delivery plan has been modified to that described in Section 2. The current plan gives roughly equal weight to self-study, classroom instruction and group exercises. The trainees prefer group exercises to self-study and instruction. However, it is effective only if there is a mix of experience levels in the class. The instructor makes group assignments and exercise assignments based on the trainees work areas and experience.

Because of the compressed schedule for the courses including evaluation, we have moved away from a written checkout at the end of the course. Now the trainees prepare written 'answers' for the objectives during self-study and class exercises. These are reviewed and the trainee's performance during group exercises is assessed for the final judgment of a pass/fail mark.

Considerable effort has been invested in improvements to the quality of the instructional materials. It is a challenge to achieve the desired level of comprehension in a few days. The following are some examples of topics where we have found the need to be careful in presenting the concepts to avoid confusion.

1) Design Basis vs Design Modification Process

   Although the purpose of the training is to provide knowledge of the station's design basis, the basis for the station's design modification process is the design basis and the design requirements. Change control starts with the 'as-built' design configurations as the reference for approving and tracking changes.

2) Defence-in-depth

   The training emphasizes the importance of defence in depth in design and operation for managing risk. We adopted the IAEA description of defence in depth as five 'levels' of defence. Because of the use of 'level' to denote safety significance in classifying impairments and other procedures, the trainees found levels of defence to be confusing. We have adopted the description 'lines' of defence and find it conveys the concept more effectively. Moreover, it helps in making the point that the lines of defence are not redundant and all must be available.

3) Operational Safety

To develop understanding of the objective for operational safety provisions we make use of everyday experience. For example, a car is not safe because it has safety systems (brakes, air-bags) but it is safe because we drive it as intended by the designer. This is used to emphasize the importance of understanding the design basis, the importance of maintenance and the management of risk.

4) Risk Acceptance

The classroom instruction part of course includes discussion of acceptance criteria for risk. Particular effort is given to separating the trainee's personal tolerance for risk from their professional obligation to ensure public is not exposed to undue risk.

6. Conclusions

Feedback from Technical Staff is positive with respect to the knowledge gained, and it's applicability to the engineering and technical work performed.

Future development will build on acquired knowledge. Continuing training will be provided to Technical Staff through the implementation of workshops that are based on station specific case studies and industry OPEX.