

**ANNUAL REPORT
ON
THE EFFECTIVENESS OF TRAINING
IN THE NUCLEAR INDUSTRY
FOR
CALENDAR YEAR 2006**

September 2007

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BACKGROUND

NRC regulation of training in the nuclear industry dates to the 1982 Nuclear Waste Policy Act (NWPA). The NWPA directed the NRC to provide guidance on the instructional requirements for workers at nuclear power plants. To meet this directive, in March 1985 the Commission published a policy statement on training that endorsed the performance-based training accreditation process of the National Academy for Nuclear Training. When issuing the policy statement, the Commission deferred rulemaking to allow the nuclear industry to continue its efforts to upgrade their training programs.

After a two-year trial period, evaluations of the accreditation process concluded that the accreditation process was generally effective in improving the training programs. Rulemaking related to the training of non-licensed personnel was not initiated. In November 1988, an amended policy statement on training was issued to reflect Commission views on training for non-licensed workers at nuclear power plants.

In May 1987, the NRC revised Title 10, Part 55, Operators' Licenses, of the Code of Federal Regulations (CFR) to incorporate several new requirements and endorsements. The 1987 changes included removing instructor certifications, endorsing Regulatory Guide 1.8 (personnel training) and 1.149 (plant-referenced simulator), requiring operating licensing examinations to be conducted on a simulator, and establishing the current licensed operator requalification training program. Part 55 requires the content of a facility licensed operator requalification program to either meet the requirements outlined in 10 CFR 55.59 (c)(1) through (7) or be developed using a systems approach to training (SAT) based process.

In response to a court decision that a rule on training, rather than a policy statement, was necessary to satisfy the NWPA, the NRC issued 10 CFR 50.120, "Training and Qualification of Nuclear Power Plant Workers." The NRC issued 10 CFR 50.120 in April 1993 with an effective date of November 1993. Section 50.120 requires that nuclear power plant licensees establish, implement, and maintain training programs using a SAT-based process for nine categories of non-licensed workers at nuclear power plants. SAT-based training provides for the systematic determination of job performance qualification requirements and for periodic retraining of personnel, which enhances both regulatory and public confidence in the ability of workers to perform successfully. Section 50.120 complements the requirement for SAT-based training of licensed operators contained in Part 55.

NRC programmatic responsibility for ensuring acceptable utility implementation of the training requirements addressed by 10 CFR 50.120 and 10 CFR 55 resides in the Operator Licensing and Human Performance Branch (IOLB). The IOLB is in the Division of Inspection and Regional Support under the Associate Director for Operating Reactor Oversight and Licensing of the Office of Nuclear Reactor Regulation.

NRC MONITORING OF TRAINING

Public health and safety depend on proper operation, testing, and maintenance of power plant systems and components. Successful performance by nuclear power plant personnel is assured by having workers achieve and maintain job-task qualification through SAT-based training and retraining required by 10 CFR 55 and 10 CFR 50.120. The implementation of SAT-based training is monitored by the Institute of Nuclear Power Operations (INPO) during the training program accreditation reviews conducted for the National Nuclear Accrediting Board (NNAB) and is reflected in the status of accreditation throughout the industry as a whole. Accordingly, indications of favorable job performance and successful SAT implementation provide reasonable assurance that the training of nuclear power plant workers is adequate to maintain public health and safety.

This report documents the NRC assessments of the effectiveness of the licensee implementation of training from the perspective of the Reactor Oversight Process (ROP) and NRC monitoring of the Accreditation Process. To obtain the ROP perspective, the NRC reviews Licensee Event Reports (LERs), inspection reports, and operator licensing examination reports for personnel performance issues. The Operator Licensing and Human Performance Branch analyzes the data using the Human Factors Information System (HFIS) to identify the training-related performance issues. The NRC obtains additional data during inspections of training programs conducted for cause and during the administration, inspection, and review of licensed operator initial and requalification training activities.

The NRC assesses the effectiveness of the accreditation process and industry's use of the systems approach to training by observing INPO-led Accreditation Team Visits and meetings of the NNAB. These activities provide an efficient and effective assessment of industry training activities and initiatives with minimal impact on licensees. Although each activity provides plant-specific information, the information is used in the composite for this report to assess the overall effectiveness of training in the nuclear industry.

Guidance for administering examinations for licensed operator candidates and licensed operators is contained in NUREG-1021, "Operator Licensing Examination Standards for Power Reactors." Guidance for inspecting the aspects of the operator training programs unique to requalification is found in Inspection Procedure 71111, Attachment 11, "Licensed Operator Requalification Program" (IP 71111.11). In addition, the NRC, for cause, verifies compliance with the requirements for SAT-based training through its inspection program using Inspection Procedure 41500, "Training and Qualification Effectiveness." This inspection procedure references the guidance in NUREG-1220, "Training Review Criteria and Procedures."

The NRC also monitors the effects on the industry as new regulations and associated guidance documents are implemented by participating in meetings with regional training organizations and industry focus groups. NRC participates in meetings and workshops sponsored by the Mid-Atlantic Nuclear Training Group (Region I), the Southern States Nuclear Training Association (Region II), the Midwest Nuclear Training Association (Region III), and Westrain (Region IV). The industry Operator Licensing Focus Group, formed in cooperation with the Nuclear Energy Institute (NEI), provides a forum for discussing and resolving issues related to the training, examination, and development of licensed operators. This forum has assisted the staff in identifying problematic areas and developing solutions.

The following sections present data and discuss issues in three major areas: results from the analysis of HFIS data, results from licensed operator requalification program inspections (IP 71111.11), and observations of industry accreditation activities.

NRC MONITORING OF HUMAN PERFORMANCE

Training-related Items in LERs, Inspection Reports and Examination Reports

The IOLB continually monitors several aspects of worker performance through ongoing reviews of LERs, inspection reports, and operator licensing examination reports. The content of these reports is categorized and documented in HFIS. Figure 1, *HFIS 3-Year Trend*, shows the percent contribution of seven categories of human performance items to the overall industry total. A total of 4,550 human performance items were identified in LERs, inspection reports and examination reports during 2006. Of that total, 153 performance items (three percent) were attributed to training, a notable reduction from the 208 items identified in 2005. However, three plants: Diablo Canyon, Palo Verde, and Susquehanna, account for over 30 percent of the training items among all plants. The 2006 data show that the number of items attributable to training for most licensees is clustered near the industry mean of 1.50 items per plant.

As shown in Figure 1, *Work Planning* continues to be the category in HFIS with the largest percentage of human performance items. *Work Planning* is comprised of three components, *Work Planning and Coordination*, *Conduct of Work*, and *Awareness/Attention*. *Work Planning* focuses on performance deficiencies resulting from power plant workers using practices that are inconsistent with the type or difficulty of the task being performed. Training-related issues are reflected in the area of *Work Planning*, primarily in the subcategory of “work practices or skill of the craft less than adequate.”¹

Within the context of this report, outlying performance is defined as human performance items exceeding two times the national average for all U.S. nuclear power plants. For 2006, seven plants² have human performance item totals that exceed two times the national average.

¹ Craft activities are not performed consistent with management expectations, the safety significance of the activity or industry standard, or if an individual was trained but the skill or knowledge was not sufficient to ensure successful on-the-job performance.

² Human performance outliers for 2006 are: Callaway, Davis Besse, Keweenaw, Palo Verde 1, Palo Verde 2, Palo Verde 3, and River Bend 1.

Four of the seven plants (Kewaunee, Palo Verde 1, Palo Verde 2, and Palo Verde 3) are in column 3 or higher in the ROP Action Matrix.

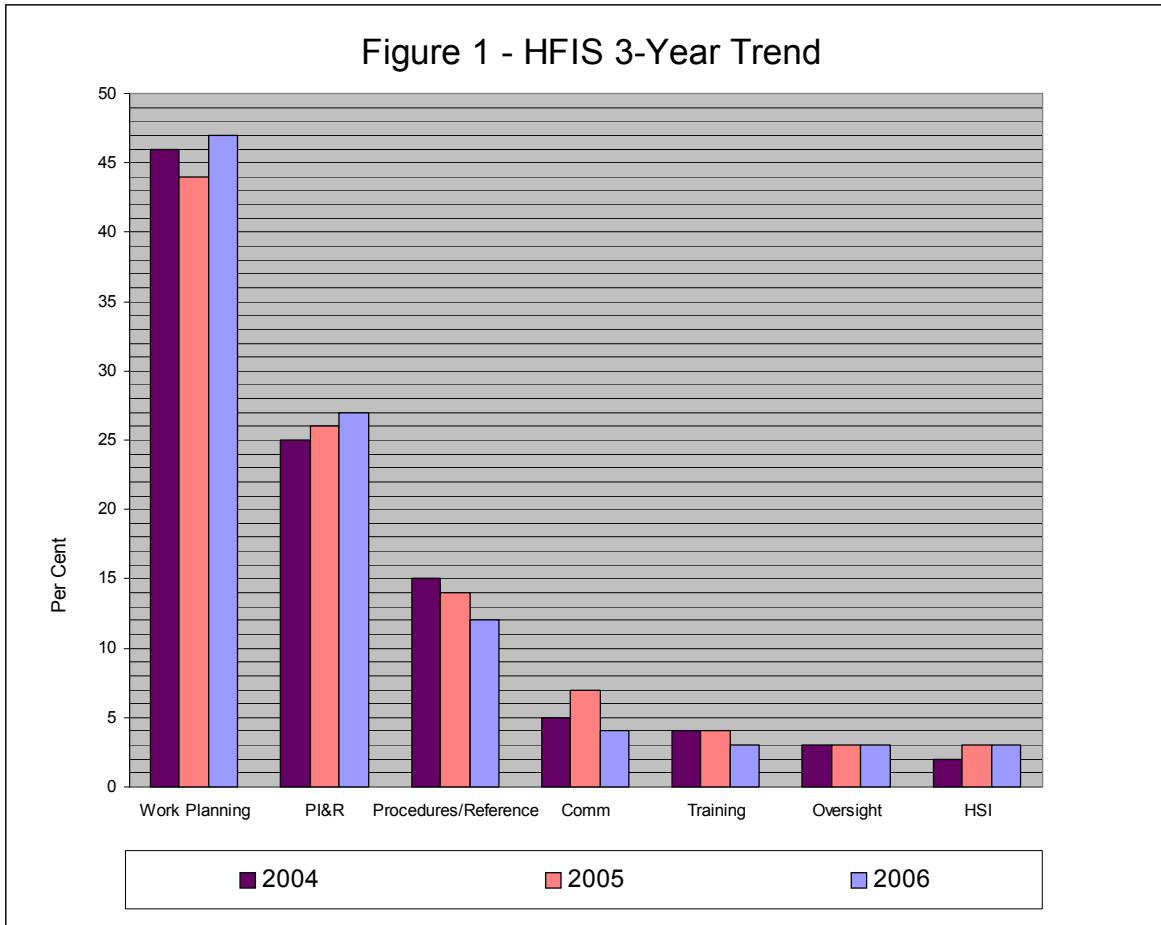
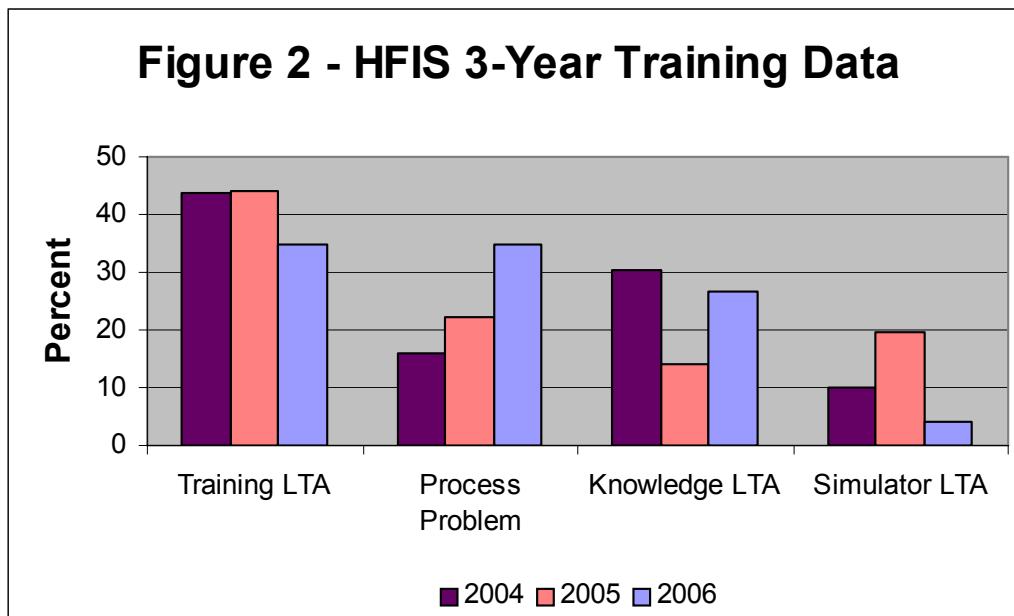


Figure 2, *HFIS 3-Year Training Data*, shows the percent contribution of 4 subcategories of training items relative to the annual totals for years 2004 through 2006. Figure 2 shows that the causes of the 153 training-related issues identified in 2006 are concentrated in three areas: “Training less than adequate (LTA)”³ “Training Process Problem,”⁴ and “Knowledge (LTA).”⁵



As shown in Figure 2, Training LTA accounted for a smaller percentage of the training items in 2006 relative to 2005. Similarly, the relative contribution of simulator-related performance errors declined. In contrast, over the past three years, *Process Problem*, accounted for an increasing percentage of HFIS training items.

³ Training was provided and was attended by the worker, but the incident/condition is due to not providing any training on a specific topic, or training is incomplete/incorrect.

⁴ Training problem is due to a break down in the SAT (examples: inadequate job or task analysis, inadequate program evaluation or feedback, failure to keep lesson materials current).

⁵ Knowledge less than adequate occurs when the worker was appropriately trained but the worker's level of knowledge was insufficient to successfully perform the task.

NRC MONITORING OF LICENSEE TRAINING PROGRAMS

Through inspections conducted prior to the implementation of 10 CFR 50.120, the NRC determined that training programs accredited and implemented consistent with National Academy for Nuclear Training (NANT) accreditation criteria and objectives would be in compliance with the NRC's requirements for SAT-based training programs. As facility training programs continue to renew accreditation, training program performance indicators are monitored in lieu of conducting routine inspections of training programs. Using the guidance of the reactor oversight process, the NRC conducts inspections of training programs whenever the causes of declining performance suggest training-related deficiencies outside the licensee response band. The NRC conducted no training program inspections during calendar year 2006.

Evaluations of licensed operator continuing training are conducted on a biennial basis by region-based operator licensing examiners and on a quarterly basis by site resident inspectors. Portions of initial licensed operator training are evaluated as part of the initial licensing process. During 2006, the NRC conducted 50 licensed operator requalification program inspections using IP 71111.11 and administered 39 initial licensing examinations. Issues identified during these examinations and inspections include:

- One green finding resulting from a failure to conduct all medical tests required by the standard (Cooper);
- One green finding resulting from a failure to conduct simulator testing in accordance with the standard (Perry);
- One green finding resulting from a failure to demonstrate simulator fidelity for steady state operations (Perry);
- One green finding resulting from unsatisfactory operating crew performance in which 2 of 10 crews failed the requalification examination (Duane Arnold);

- One green finding resulting from an inadequate annual operating test in which job performance measures failed to explore differences in task performance (Limerick);
- One green finding resulting from an inadequate SRO exam in which required immediate action steps were omitted from the test sample of job performance measures (Catawba);
- One non-cited violation (NCV) resulting from a failure to notify the NRC of a licensed operator's medical condition (Ginna); and
- One NCV resulting from a failure to certify the qualifications and status of licensed operators were current and valid (Sequoyah).

On a national basis, inspections of licensed operator requalification training programs continue to identify site-specific strengths and weaknesses. However, the results of these inspections indicate that the power reactor facilities inspected are satisfactorily maintaining their licensed operator requalification training programs. Licensees continue to demonstrate their ability to effectively develop and administer licensed operator requalification examinations and to satisfactorily identify licensed operator performance deficiencies. Licensees constructively use feedback from training for improving licensed operator training and involve management in the observation and evaluation of licensed operator performance. Resident inspector quarterly reviews of licensed operator requalification training and examinations have not revealed any areas of concern that were not being addressed by licensees in their corrective action programs.

Overall, the NRC's licensed operator requalification inspection program continues to confirm that those individuals who are licensed to operate or supervise the operation of reactor controls maintain the required level of competence to safely perform their licensed duties. In addition, the NRC's initial operator licensing examination program continues to provide reasonable assurance that only those applicants who have mastered the knowledge, skills, and abilities required to safely operate and supervise the reactor controls are being licensed to do so.

Requalification Examination Issues

The NRC staff met with the Operator Licensing Focus Group and staff at INPO to discuss improving operator requalification program examinations several times during 2006. In light of inconsistencies in requalification examination testing practices at some utilities, the industry, with assistance from NRC staff, developed guidelines entitled: "Principles and Practices for Licensed Operator Requalification Examinations" (ADAMS Accession No. ML062910317). The guideline's objectives are maintaining the quality and consistency of operator licensing requalification examinations.

INPO has distributed the guidelines to all site Vice Presidents and Training Managers and will include them in the next revision of the NANT document that provides guidance related to continuing training of licensed personnel. INPO has also noted that it expects facility licensees to assess and adjust their programs, as necessary, using the guidelines and has started reviewing examination methodology using the guideline items during accreditation team visits. It is the intention of this industry initiative to add greater integrity and quality to requalification testing programs nationwide.

NRC MONITORING OF THE ACCREDITATION PROCESS

Observing Accreditation Activities and Coordinating Activities with INPO

The NRC monitors NNAB, NANT, and INPO accreditation activities as an indicator of the overall effectiveness of the industry's use of the SAT. The NRC monitors accreditation in lieu of conducting inspections to assess the level of compliance with the SAT requirements contained in 10 CFR 50.120 and 10 CFR 55. Monitoring training program effectiveness through a review of the accreditation process increases NRC efficiency by focusing agency resources on the inspection of licensee training programs only when performance problems have been identified through routine monitoring.

Observing Accreditation Activities

The NRC uses observations of NNAB meetings to provide assurance that training programs accredited and implemented in accordance with the NANT objectives will be in compliance with the SAT requirements contained in 10 CFR 50.120 and 10 CFR 55. NRC staff attended eight meetings of the NNAB during calendar year 2006. The staff observed the presentation of training programs from 16 sites to the NNAB for accreditation renewal. During the sessions observed by the NRC, the NNAB reviewed technical programs from 6 sites and operator training programs from 10 sites. The NRC observers were drawn from various levels of the NRC staff and included representatives from headquarters and all regional offices.

NRC observers made the following observations in 2006:

- The NNAB was well-prepared.
- The questioning attitude of the board members was impressive.
- The NNAB asked for more in-depth responses and results.
- The NNAB discussed requalification programs in greater detail than past boards.
- The NNAB emphasized links between training and performance.
- The NNAB was familiar with plant materials and able to integrate information into excellent questions.

Several NRC observers favorably noted NNAB questions related to the sustainability of SAT-based training programs. SAT issues were discussed in the areas of Analysis, Design, Trainee Evaluation (including evaluation of instructors), and Program Evaluation. NRC observation of accreditation activities indicated that training programs accredited by the National Nuclear Accrediting Board continue to be effective.

As described in the Memorandum of Agreement between INPO and NRC dated November 14, 2006, NRC staff continued to review INPO plant evaluation and accreditation reports in accordance with the NRC's Field Policy No. 9, "NRC Review of INPO Documents," to ensure that significant safety issues receive appropriate follow-up. No safety-significant issues were identified in 2006 as a result of the reviews of either plant evaluation or accreditation reports.

Coordinating Activities with INPO

The IOLB staff meets with INPO's Training and Education organization at least once each year to exchange information related to training in the nuclear industry and to discuss observations made by NRC observers of INPO-led Accreditation Team Visits and of the NNAB.

The 2006 meeting was held at INPO Headquarters, in Atlanta, Georgia, on June 17, 2006. Discussion topics included changes and challenges to the accreditation and plant evaluation processes, licensed operator eligibility, simulator fidelity and testing, the licensed operator requalification program and requalification inspection results, and new reactor licensing and accreditation. A summary of the 2006 INPO/NRC meeting and its enclosures (accession number ML062050351) are available electronically from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (Electronic Reading Room).

CONCLUSIONS

While the monitoring of industry performance in the area of training during 2006 provided some indications of relatively minor training program weaknesses, overall, the industry is successfully implementing training programs in accordance with the regulations.

Monitoring the INPO managed accreditation process continued to provide confidence that accreditation is an acceptable means of ensuring the training requirements contained in 10 CFR 50 and 10 CFR 55 are being met. In addition, the NRC assessment of the accreditation process indicates that continued accreditation remains a reliable indicator of successful SAT implementation and contributes to the assurance of public health and safety by ensuring that nuclear power plant workers are being appropriately trained.