

**ANNUAL REPORT
ON
THE EFFECTIVENESS OF TRAINING
IN THE NUCLEAR INDUSTRY
FOR
CALENDAR YEAR 2005**

August 2006

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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, 10 CFR 55 was revised 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. 10 CFR 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 requiring a rule on training rather than a policy statement to satisfy the NWPA, 10 CFR 50.120, "Training and Qualification of Nuclear Power Plant Workers," was issued in April 1993. 10 CFR 50.120 had an effective date of November 1993. 10 CFR 50.120 acknowledges that the safety of nuclear power plant operations and the assurance of general public health and safety depends on personnel performing at adequate levels of competence. 10 CFR 50.120 requires that training programs be established, implemented, and maintained 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 enhance public confidence in the ability of workers to perform successfully. 10 CFR 50.120 complements the requirement for SAT-based training of licensed operators contained in 10 CFR 55.

The Operator Licensing and Human Performance Branch of the Division of Inspection and Regional Support under the Associate Director for Operating Reactor Oversight and Licensing of the Office of Nuclear Reactor Regulation has programmatic responsibility for ensuring that utilities implement training requirements addressed by 10 CFR 50.120 and 10 CFR 55 in an acceptable manner.

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 assesses the effectiveness of the 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 data obtained is analyzed the Operator Licensing and Human Performance Branch (IOLB), using the Human Factors Information System (HFIS), to identify the training-related performance issues. The NRC obtains additional data during the conduct of for cause inspections of training programs; 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 and has done so when appropriate using Inspection Procedure 41500, "Training and Qualification Effectiveness," which references the guidance in NUREG-1220, "Training Review Criteria and Procedures."

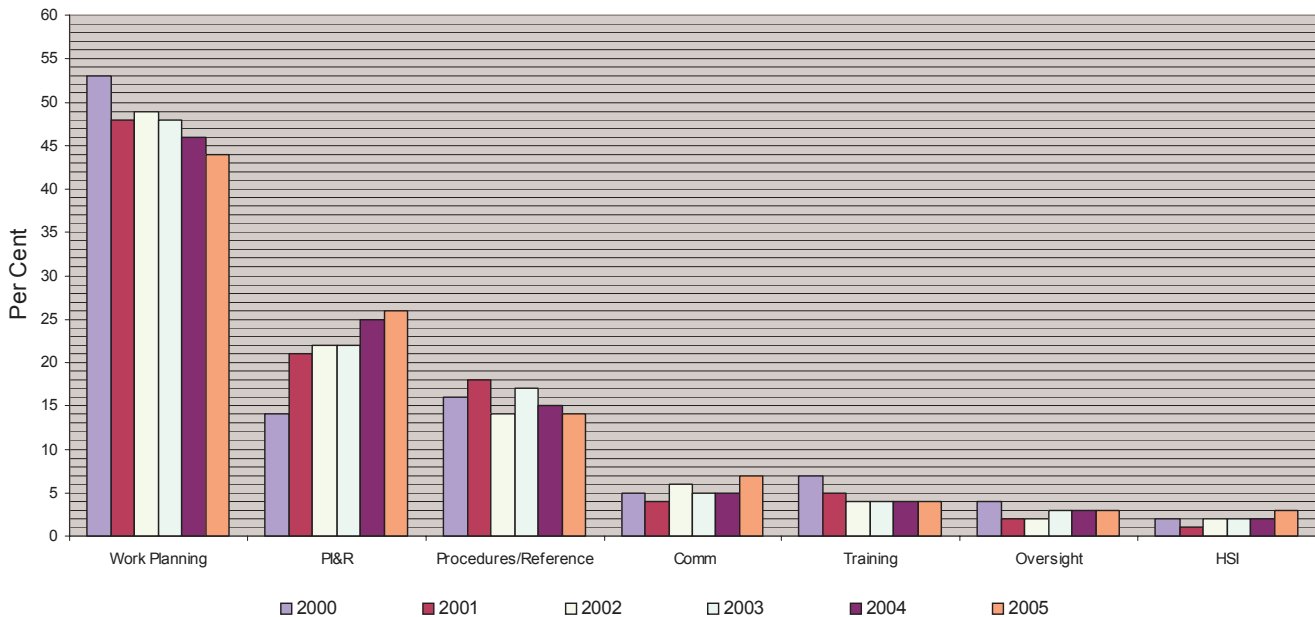
The NRC also monitors the effects on the industry as new regulations and associated guidance documents are implemented by participating in meetings with regional training organizations and industry focus groups. NRC participates in meetings and workshops sponsored by the Mid-Atlantic Nuclear Training 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.

NRC MONITORING OF HUMAN PERFORMANCE

Issues in LERs, Inspection Reports and Examination Reports

Several aspects of worker performance are continually monitored and documented in HFIS by IOLB during its ongoing reviews of LERs, inspection reports, and operator licensing examination reports. Figure 1, *HFIS 6-Year Trend*, shows the relative contribution (in percent) of various categories of human performance issues to the overall industry total. A total of 5,856 human performance items were identified in LERs, inspection reports and examination reports during 2005. Of that total, 208 items were attributed to training. The contribution to overall human performance attributable to training, for the industry as a whole, decreased from 7.65 percent in 1999 to 3.55 percent in 2005. The 2005 data shows that the number of items attributable to training for most licensees is clustered near the industry mean of 2.00 items.

Figure 1 - HFIS 6-Year Trend



As shown in Figure 1, *Work Planning* continues to be the single largest contributor to overall human performance errors. *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 exceeding two times the national average for the industry as a whole. For 2005, eight plants² have been identified as having outlying overall human performance. Four of the eight human performance outliers (Palo Verde 1, Perry, Point Beach 1 and 2) are in column 3 or higher in the ROP Action Matrix.

Figure 2, *2005 HFIS 6-Year Work Practices Data*, shows the breakdown of the 1,944 *Work Practices* items identified in 2005. “Work practice or skill of the craft less than adequate” increased from 25 percent in 2000 to more than 53 percent in 2005 of the total *Work Practices* deficiencies. It is not possible to determine that portion of skill of the craft items attributable solely to training. When the deficiencies attributed to “work practices or skill of the craft less than adequate” are combined with the deficiencies attributed to training, the resultant total accounts for 21 percent of the total human performance deficiencies for 2005. Of the ten plants³ with the highest number of combined skill of the craft and training deficiencies, five were among those plants identified as having outlying combined skill of the craft and training performance.

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 2005 are Cooper, Fort Calhoun, Hope Creek, Palo Verde 1, Perry, Point Beach 1, Point Beach 2, River Bend

³ Plants with the highest combined skill of the craft and training deficiencies for 2005 are Comanche Peak 2, Cooper, Diablo Canyon 1, Diablo Canyon 2, Fermi, Hope Creek, Oconee 3, Palo Verde 1, Perry, River Bend

Figure 2 - HFIS 6-Year Work Practices Data

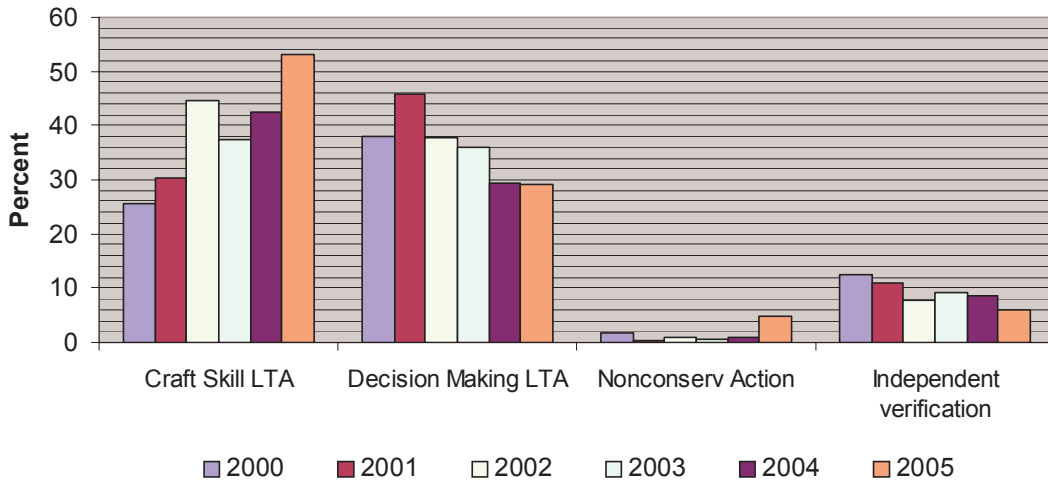
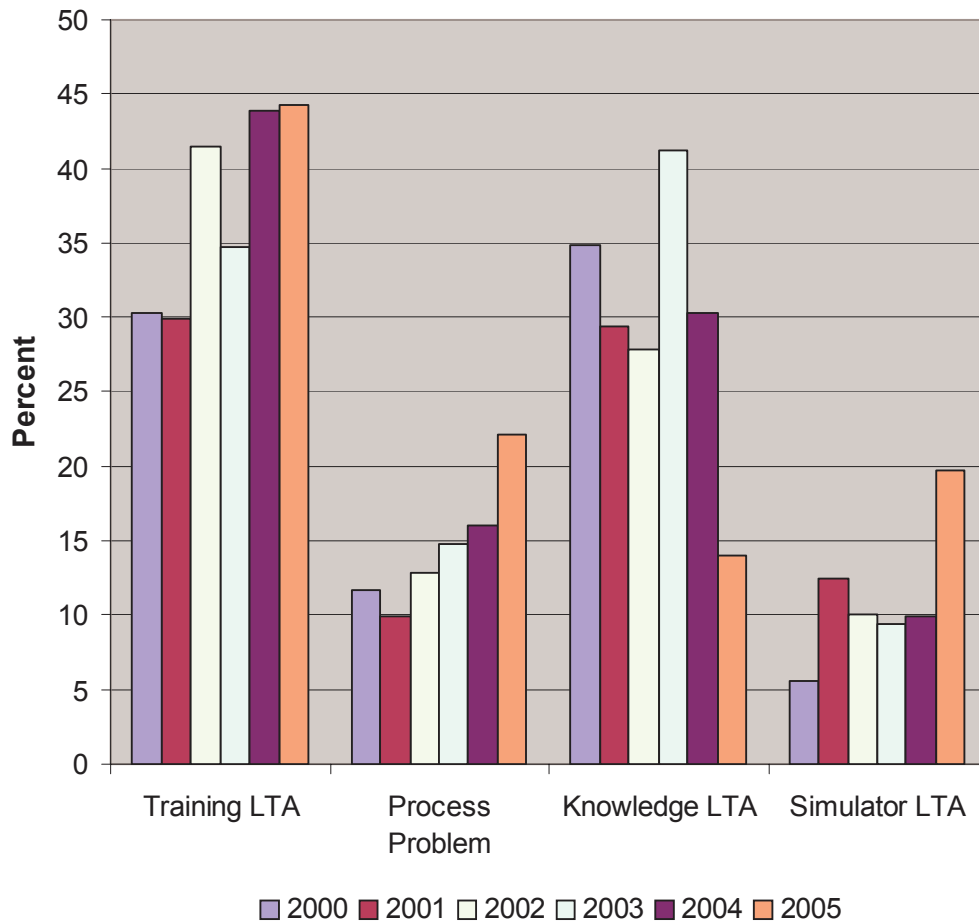


Figure 3, *HFIS 6-Year Training Data*, shows the breakdown of the items attributable to training into their specific causes. Figure 2 shows that the causes of the 208 training-related issues identified in 2005 continue to be concentrated in two distinct areas: “Training less than adequate (LTA)”⁴ and “Individual knowledge less than adequate (LTA)”⁵. The individual knowledge deficiencies are split approximately equally between continuing training and on-the-job training.

⁴ 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.

⁵ The worker has received the appropriate training but fails to apply or inadequately applies the relevant knowledge.

Figure 3 - HFIS 6-Year Training Trend



The number of training items at seven plants⁶ identified them as having outlying performance in the area of training. Of the eight human performance outliers, four were among those plants identified as having outlying overall training performance.

⁶ Plants with outlying performance in the area of training for 2005 are Perry, Cooper, Hope Creek, Millstone 3, Brunswick 1, Brunswick 2, Point Beach 2

NRC MONITORING OF LICENSEE TRAINING PROGRAMS

The NRC can inspect facility training programs at any time to verify implementation of the training requirements contained in 10 CFR 50 and 10 CFR 55. 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 requirements to have 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, inspections of training programs are conducted whenever the causes of declining performance suggest training-related deficiencies outside the licensee response band. There were no training inspections conducted during calendar year 2005.

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 calendar 2005, 50 licensed operator requalification program inspections were conducted using IP 71111.11 and 54 initial licensing examinations were administered. Issues identified during these examinations and inspections include:

- Three severity level III violations resulting from the failure to accurately report completion of corrective actions from a previous severity level III violation, failure to provide complete and accurate information about operators' health status, and failure to report a change in operator medical status. (D. C. Cook)
- One green finding resulting from a failure to conduct simulator testing in accordance with the ANSI/ANS standard. (San Onofre)
- One green finding related to exam integrity. (Columbia Generating Station)
- One green finding resulting from a failure to remove abandoned. (Davis Besse)

- One NCV resulting from the performance of licensed duties while medically unqualified (Oconee)
- One NCV resulting from greater than 25% of licensed crews failing the annual operating test (Kewaunee)
- One NCV resulting from a failure to protect the integrity of the annual reactor operator requalification examination as described in 10 CFR 55.49 (Comanche Peak)
- Two NCVs involving procedural inadequacies (River Bend, San Onofre)

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. Licensee evaluations continue 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.

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 systems approach to training. 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 2005. The staff observed the presentation of training programs from 19 sites to the NNAB for accreditation renewal. During the sessions observed by the NRC, the NNAB reviewed technical programs from 10 sites and operator training programs from 11 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:

- The accrediting process is rigorous and thorough.
- The knowledge of the Accreditation Team Visit managers and the level of detail discussed during the meetings is impressive.
- The NNAB did not accept anecdotal stories of success, they asked for more in-depth responses and results.
- Members of the NNAB were very familiar with the materials and demonstrated the ability to integrate information into probing questions.
- The NNAB looked for strong links between training and performance.
- Excellent followup related to previous accreditation.

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, 2005, 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 calendar year 2005 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 to INPO-led Accreditation Team Visits and to the NNAB.

The 2005 meeting was held at INPO Headquarters, in Atlanta, GA, on June 17, 2005. 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. The minutes for the 2005 INPO/NRC meeting and its enclosures (accession number ML052060232) 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> (the Public Electronic Reading Room).

CONCLUSIONS

During calendar year 2005, the NRC identified eight facilities as outliers in the area of human performance. Of the eight human performance outliers, four were also identified as having outlying overall training performance and 6 were identified as having outlying combined skill of the craft and training performance. In addition, two green findings, six non-cited violations, and five severity level III violations were issued in the area of licensed operator training.

While the monitoring of industry performance in the area of training during 2005 provided some indications of 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.