

**ANNUAL REPORT  
ON  
THE EFFECTIVENESS OF TRAINING  
IN THE NUCLEAR INDUSTRY  
FOR  
CALENDAR YEAR 2009**

**SEPTEMBER 2010**

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**BACKGROUND**

NRC regulation of training in the nuclear industry dates to the 1982 Nuclear Waste Policy Act (NWPA), which directed the NRC to provide guidance on the instructional requirements for workers at nuclear power plants. To meet this directive, the Commission published a policy statement on training that endorsed the performance-based training accreditation process of the National Academy for Nuclear Training in March 1985. 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, the NRC staff's evaluations of the accreditation process concluded that it was generally effective in improving the training programs, so the Commission elected not to initiate rulemaking related to the training of non-licensed personnel. In November 1988, the Commission issued an amended policy statement that reflected its 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* (10 CFR 55) to incorporate several new requirements and endorsements. The 1987 changes included removing instructor certifications, endorsing Regulatory Guides 1.8 (personnel training) and 1.149 (plant-referenced simulators), requiring operator 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, as defined in 10 CFR 55.4.

In response to a court decision requiring a rule on training rather than a policy statement to satisfy the NWPA, the NRC issued 10 CFR 50.120, "Training and Qualification of Nuclear Power Plant Workers," in April 1993. 10 CFR 50.120, which had an effective date of November 1993, acknowledges that the safety of nuclear power plant operations and the assurance of general public health and safety depend on personnel performing at adequate levels of competence. 10 CFR 50.120 requires training programs for nine categories of non-licensed workers at nuclear power plants to be established, implemented, and maintained using a SAT-based process.

SAT-based training provides for the systematic determination of job performance qualification requirements and for periodic retraining of personnel to 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 Training Branch (IOLB) of the Division of Inspection and Regional Support in the Office of Nuclear Reactor Regulation under the Deputy Director for Reactor Safety Programs 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). Therefore, the accreditation status of each licensee reflects how well the industry as a whole is implementing SAT-based training. Accordingly, indications of favorable job performance and successful NNAB accreditation 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 is analyzed by 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 implementation of the systems approach to training by observing selected 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 applicants and licensed operators is contained in NUREG-1021, "Operator Licensing Examination Standards for Power Reactors." Guidance for inspecting the aspects of the licensed 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 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. The NRC staff participates in meetings and workshops sponsored by the Mid-Atlantic Nuclear Training Group (Region I and Region III), the Southern States Nuclear Training Association (Region II), 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 NRC also monitors industry human performance activities. The following sections of the report present data and discuss issues in three major areas of plant performance: (1) selected results arising from HFIS analysis, (2) key results from the monitoring of licensee requalification training program inspections, and (3) observations of industry accreditation activities.

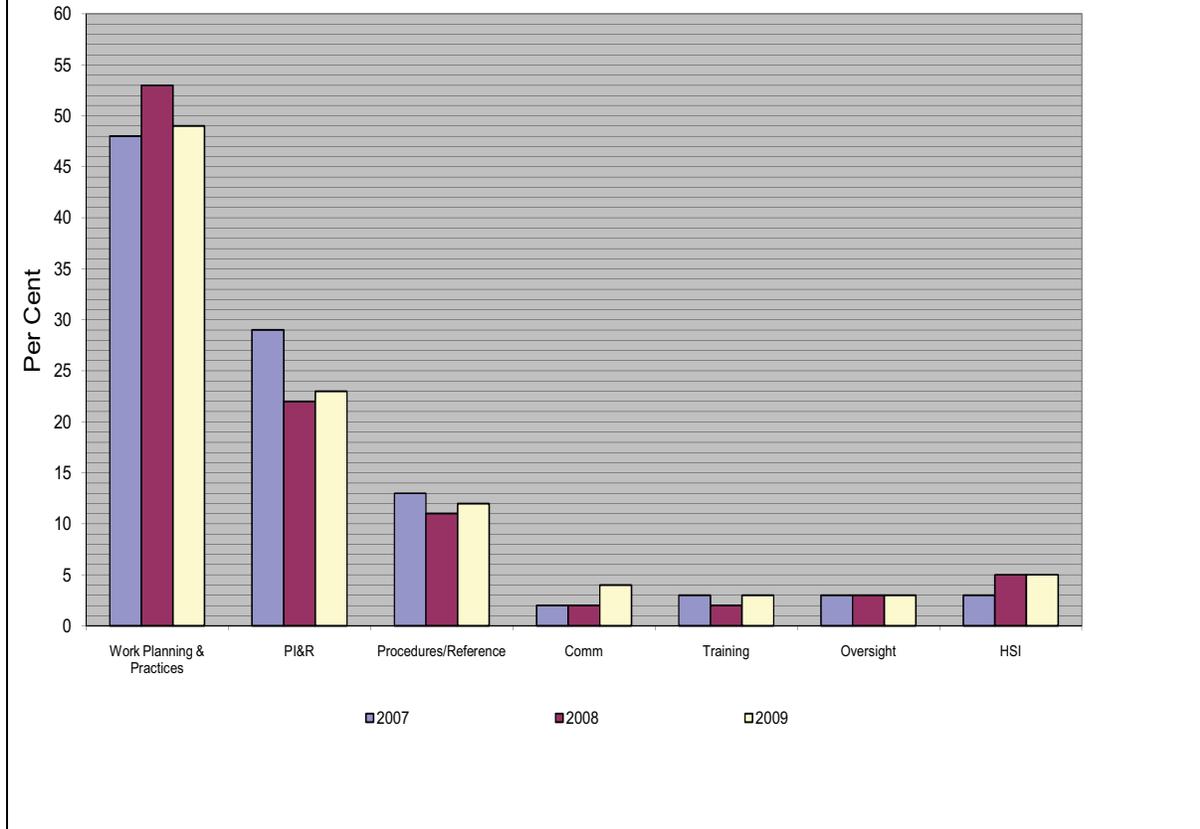
## **NRC MONITORING OF HUMAN PERFORMANCE**

### **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, *Human Performance Categories - HFIS 3-Year Trend* (next page), shows the relative contribution (in percent) of various categories of human performance issues to the overall industry total. A total of 4589 human performance issues were identified in LERs, inspection reports and examination reports, during calendar year (CY) 2009. This represents a notable increase of 788 items from 2008. However, this is in line with years 2007 and 2006. Of that total, 142 performance issues were attributed to training, indicating a clear increase from 62 items reported in 2008 and slightly greater than the 133 items reported in 2007. The fraction of overall human performance concerns attributable to training was three percent for the industry as a whole. The 2009 data shows that the number of issues attributable to training for most licensees is clustered near the industry mean of only 1.4 issues per plant. The greatest percentage of problems continues to lie in the following three categories:

Work Planning and Practices	49%
Problem Identification and Resolution	23%
Procedures and Reference Documentation	12%

Figure 1 - Human Performance Categories  
HFIS 3-Year Trend



As shown in Figure 1, *Work Planning and Practices* continues to be the single largest contributor to overall human performance errors. *Work Planning and Practices* focuses on performance deficiencies resulting from power plant workers using practices that are inconsistent with the type or difficulty of the task being performed.

Within the context of this report, outlying performance is defined as exceeding two times the National average for the industry as a whole. Given that the average number of human performance hits per plant was 44, the criterion established for identifying the more problematic plants is twice the National average, or 88.

Overall, for 2009, most plants fell substantially below this criterion. However, eight plants have been identified as having outlying overall human performance and are listed in the chart below. This is consistent with the number of outliers<sup>1</sup> identified in CY 2008.

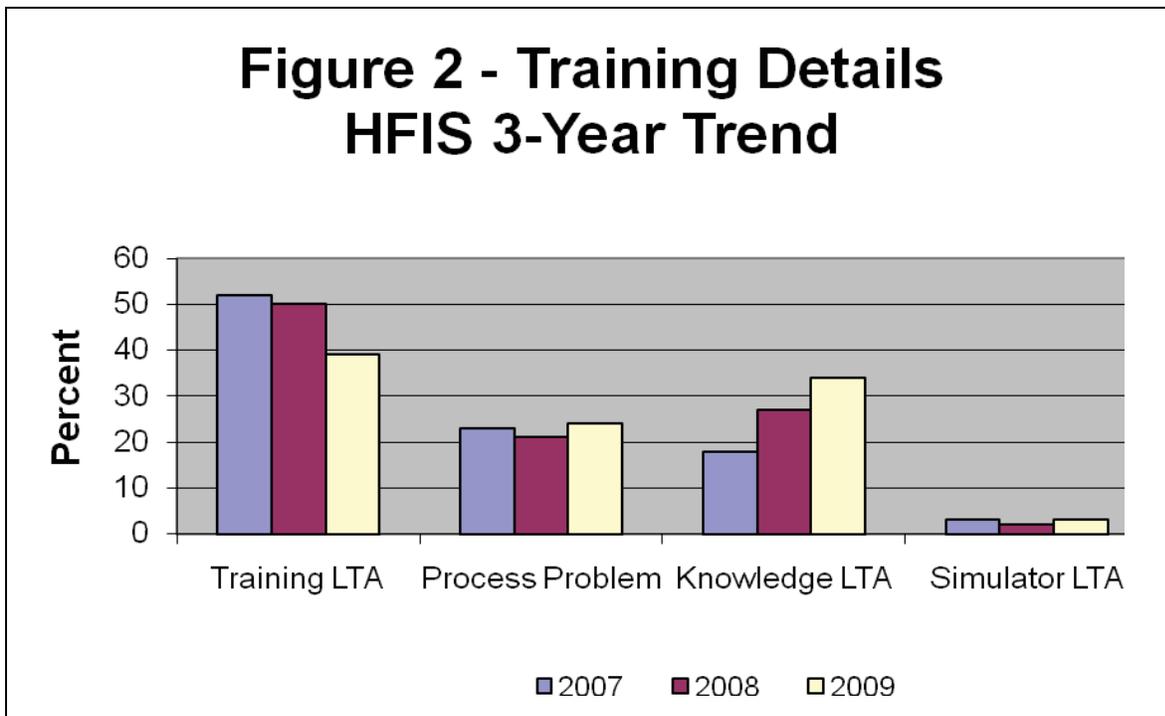
	Total Hits	<i>Work Planning and Practices %</i>
Callaway	118	52%
Columbia	105	37%
Cooper	158	52%
Diablo Canyon Unit 1	104	37%
Grand Gulf	113	48%
Prairie Island Unit 1	143	52%
Prairie Island Unit 2	154	49%
Waterford Unit 3	93	42%

Since approximately 35 - 55 percent of all hits fall into the *Work Planning and Practices* category, focused training in this area may enhance licensee performance. Although the *Training* category is a relatively small contributor to human performance errors reflected in the HFIS data shown in figure 1, there is a potential that training-related issues could influence the area of *Work Planning and Practices*. The data does not suggest any fundamental weakness in the accreditation process, but is presented to highlight an area where training could be used to address individual licensee human performance deficiencies.

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<sup>1</sup>Human performance outliers for 2008 were Grand Gulf, Palo Verde 1, Palo Verde 2, Perry, Point Beach, San Onofre 2, South Texas 2 and Wolf Creek.

Figure 2, *Training Details - HFIS 3-Year Trend*, (below) shows that the causes of the 142 training-related issues identified in CY 2009 are relatively concentrated in three distinct areas: “Training Less Than Adequate (LTA)”<sup>2</sup>, “Knowledge LTA and “Training Process Problem.”<sup>3</sup> The individual knowledge deficiencies are split approximately equally between continuing training and on-the-job training.



As illustrated in Figure 2, issues associated with “Training Less Than Adequate” showed a notable decrease in percentage of problematic human performance errors. “Process Problems” also showed a slight increase in 2009 relative to the previous year. “Knowledge Less Than Adequate” increased about 10% relative to the previous year continuing an adverse trend. Simulator related performance errors were consistent with the previous 2 years.

<sup>2</sup>Training was provided but did not address a specific topic or was incomplete/incorrect.

<sup>3</sup>Training problem is due to a breakdown in the SAT process (e.g., inadequate job or task analysis, inadequate program evaluation or feedback, failure to keep lesson materials current).

## **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 in 1993, 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 ROP, inspections of training programs are conducted whenever the causes of declining performance suggest training-related deficiencies outside the normal licensee response band (i.e., Column 1 of the ROP Action Matrix). There were no training inspections conducted during CY 2009.

Evaluations of licensed operator continuing training are conducted on a biennial basis by NRC Region-based operator licensing examiners and on a quarterly basis by site resident inspectors. During CY 2009, 65 initial licensing examinations were administered and 40 licensed operator requalification program inspections were conducted using IP 71111.11B, the baseline inspection procedure. Issues identified during these inspections included a green finding that resulted from NRC Annual Operating Exam Scenarios not meeting the total malfunction quantitative standard established by NUREG 1021 and recommended by licensee procedures at Susquehanna. Eight other findings resulted from operator medical issues. However, findings associated with medical issues are not directly related to operator training effectiveness.

On a national basis, inspections of licensed operator requalification training programs have identified a limited number of site-specific weaknesses. The results of these inspections indicate that power reactor facilities, overall, 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 mechanisms to improve licensed operator training and involve management in the observation and evaluation of licensed operator performance.

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.

## **NRC MONITORING OF THE ACCREDITATION PROCESS**

### **Observing Accreditation Activities and Coordinating Activities with INPO**

The NRC monitors NNAB, NANT, and INPO accreditation activities as indicators of the overall effectiveness of the industry's use of the SAT process. 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 the NRC's 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, drawn from various levels that included representatives from Headquarters and all Regional Offices, attended one Accreditation Team Visit and seven meetings of the NNAB during CY 2009. The staff observed representatives from 22 sites present their training programs to the NNAB for accreditation renewal. During the sessions observed by the NRC, the NNAB reviewed technical programs from 20 sites and operator training programs from 9 sites.

NRC observers who attended the accreditation reviews were favorably impressed with the Board and the level of professionalism exhibited by its members. Illustrative of that quality, several NRC observer comments follow:

- "Great push to have the station identify opportunities to measure training effectiveness and to improve training programs."
- "Board members obviously prepared on plant specific issues."
- "Overall the board meeting was great. I saw no issues of concern with how the accreditation process worked."

Several NRC observers favorably noted NNAB questions related to cross cutting issues (specifically safety culture and problem identification & resolution). NRC observation of accreditation activities indicated that training programs accredited by the NNAB continue to be effective.

As described in the Memorandum of Agreement between INPO and NRC (updated December 10, 2007), the NRC staff continued to review INPO plant evaluation and accreditation reports to ensure that significant safety issues receive appropriate follow-up. No safety-significant issues were identified in CY 2009 as a result of the reviews of plant evaluation or accreditation reports.

### **Coordinating Activities with INPO**

The NRC 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 comments made by NRC observers of INPO-led Accreditation Team Visits and the NNAB.

The most recent meeting was held at NRC Headquarters, in Rockville, MD, on May 6, 2010. Discussion topics included accreditation focus areas, new reactor accreditation, licensed operator candidate throughput, and new instructor development initiatives. The minutes for the 2010 INPO/NRC meeting and its enclosures (accession number ML1014402610) 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 CY 2009, the number of HFIS issues related to training has remained approximately 3% relative to the seven categories of assessment. The notable problematic area continues to be *Work Planning and Practices*. The NRC identified eight plants as outliers in the area of human performance of which all eight were also identified as having a substantial percentage of human performance concerns in *Work Planning and Practices*. In addition, a green finding was issued in the area of licensed operator training.

While the monitoring of industry performance in the area of training during CY 2009 provided some indications of 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's 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.