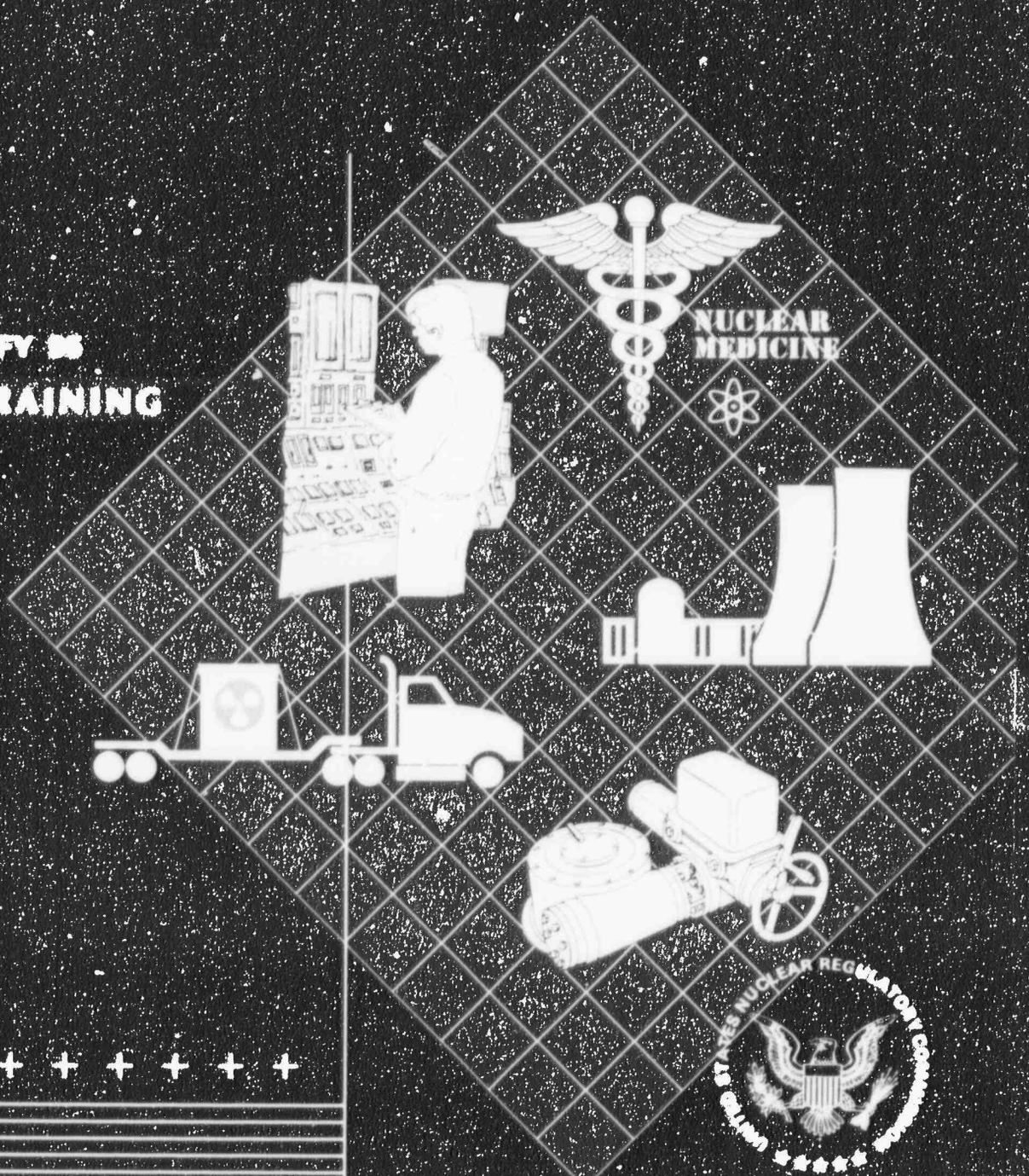
NUREG – 1272
VOL. 9, NO. 3

OFFICE FOR

ANALYSIS and EVALUATION of OPERATIONAL DATA

ANNUAL REPORT, FY 96

TECHNICAL TRAINING



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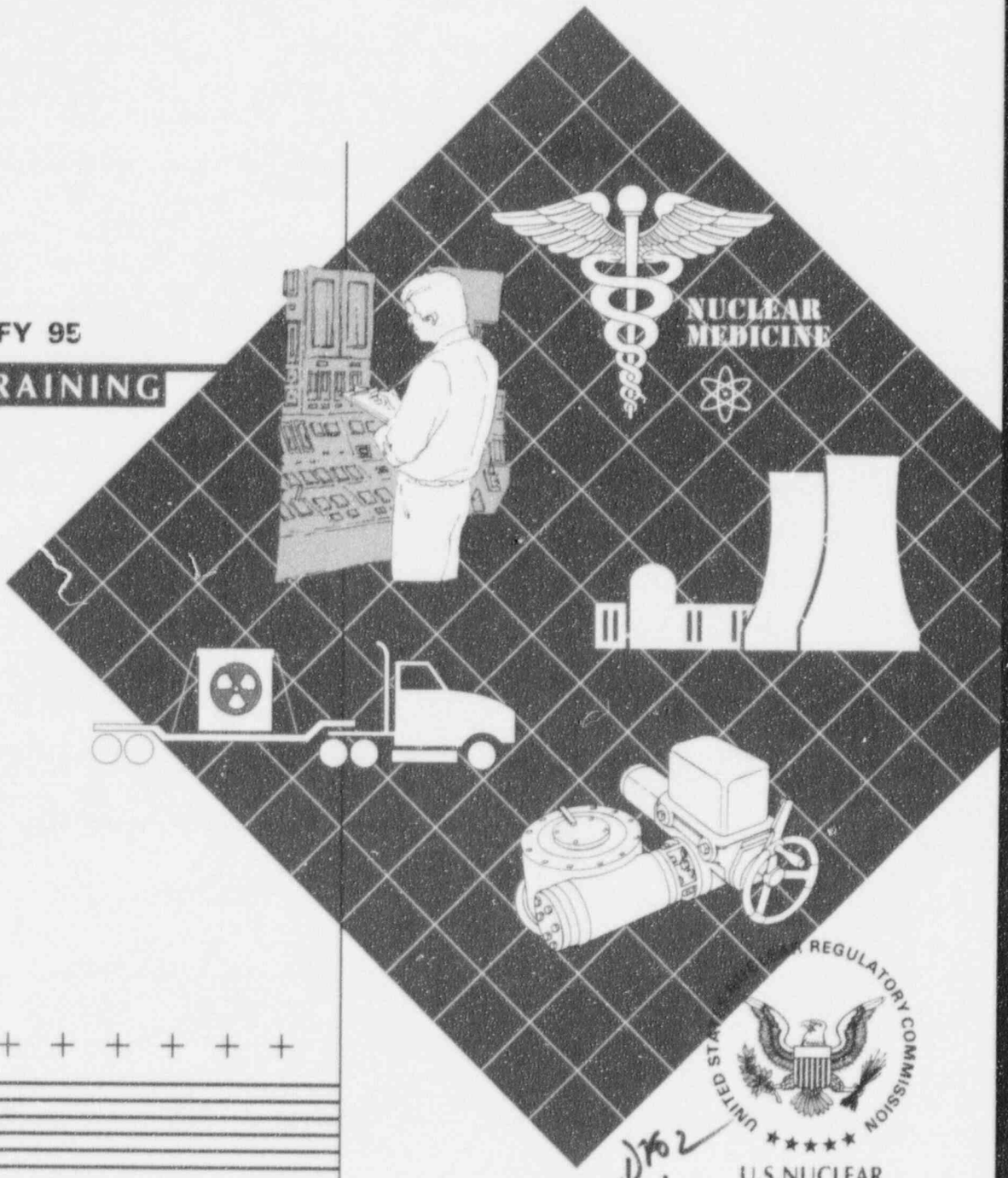

ANNUAL REPORT, FY 95

TECHNICAL TRAINING

SEPTEMBER 1996

U.S.NUCLEAR
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Previous Reports in Series

The following semiannual or annual reports have been prepared by the Office for Analysis and Evaluation of Operational Data (AEOD).

- Semiannual Report, January - June 1984, AEOD S/405, September 1984
- Semiannual Report, July - December 1984, AEOD/S502, April 1985
- Annual Report 1985, AEOD/S601, April 1986
- *Report to the U.S. Nuclear Regulatory Commission on Analysis and Evaluation of Operational Data* 1986, NUREG-1272, AEOD/S701, May 1987
- *Report to the U.S. Nuclear Regulatory Commission on Analysis and Evaluation of Operational Data* 1987, Power Reactors, NUREG-1272, AEOD/S804, Vol. 2, No. 1, October 1988
- *Report to the U.S. Nuclear Regulatory Commission on Analysis and Evaluation of Operational Data* 1987, Nonreactors, NUREG-1272, AEOD/S804, Vol. 2, No. 2, October 1988
- *Office for Analysis and Evaluation of Operational Data 1988 Annual Report, Power Reactors,* NUREG-1272, Vol. 3, No. 1, June 1989
- *Office for Analysis and Evaluation of Operational Data 1988 Annual Report, Nonreactors,* NUREG-1272, Vol. 3, No. 2, June 1989
- *Office for Analysis and Evaluation of Operational Data 1989 Annual Report*, NUREG-1272, Vol. 4, No. 1, July 1990
- *Office for Analysis and Evaluation of Operational Data 1989 Annual Report*, NUREG-1272, Vol 4, No. 2, July 1990
- *Office for Analysis and Evaluation of Operational Data 1990 Annual Report,* NUREG-1272, Vol. 5, No. 1, July 1991
- *Office for Analysis and Evaluation of Operational Data 1990 Annual Report,* NUREG-1272, Vol. 5, No. 2, July 1991
- *Office for Analysis and Evaluation of Operational Data 1991 Annual Report*, NUREG-1272, Vol. 6, No. 1, July 1992
- *Office for Analysis and Evaluation of Operational Data 1991 Annual Report,* NUREG-1272, Vol. 6, No. 2, August 1992
- *Office for Analysis and Evaluation of Operational Data 1992 Annual Report,* NUREG-1272, Vol. 7, No. 1, July 1993
- *Office for Analysis and Evaluation of Operational Data 1992 Annual Report,* NUREG-1272, Vol. 7, No. 2, October 1993
- *Office for Analysis and Evaluation of Operational Data 1993 Annual Report,* NUREG-1272, Vol. 8, No. 1, November 1994
- *Office for Analysis and Evaluation of Operational Data 1993 Annual Report,* NUREG-1272, Vol. 8, No. 2, May 1995
- *Office for Analysis and Evaluation of Operational Data 1994-FY 95 Annual Report,* NUREG-1272, Vol. 9, No. 1, July 1996

Abstract

The United States (U.S.) Nuclear Regulatory Commission's Office for Analysis and Evaluation of Operational Data (AEOD) has published reports of its activities since 1984. The first report covered January through June of 1984, and the second report covered July through December of 1984. Since those first two semiannual reports, AEOD has published annual reports of its activities from 1985 through 1993. Beginning with the report for 1986, AEOD Annual Reports have been published as NUREG-1272. Beginning with the report for 1987, NUREG-1272 has been published in two volumes, No. 1 covering power reactors and No. 2 covering nonreactors (changed to "nuclear materials" with the 1993 report). The 1993 AEOD Annual Report was NUREG-1272, Volume 8.

AEOD has changed its annual report from a calendar year to a fiscal year report to be consistent with the NRC Annual Report and to conserve staff resources. NUREG-1272, Volume 9, Nos. 1 and 2, therefore, are combined calendar year 1994 (1994) and fiscal year 1995 (FY 95) reports which describe activities conducted between January 1, 1994, and September 30, 1995. Certain data which have historically been reported on a calendar year basis, however, are complete through calendar year 1995. Throughout this report, whenever information is presented for fiscal year 1995, it is designated as FY 95 data. Calendar year information is always designated by the four digits of the calendar year.

NUREG-1272, Volume 9, No. 1, covers power reactors and presents an overview of the operating experience of the nuclear power industry from the NRC perspective. NUREG-1272, Vol. 9, No. 2, covers nuclear materials and presents a review of the events and concerns associated with the use of licensed material in non-power reactor applications. This report, NUREG-1272, Volume 9, No. 3, is a new part which covers technical training and presents the activities of the Technical Training Center in FY 95 in support of the NRC's mission.

Contents

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Abbreviations

AEOD	Analysis and Evaluation of Operational Data (NRC Office for)
ANS	American Nuclear Society
ANSI	American National Standards Institute
B&W	Babcock and Wilcox Company
BPR	business process re-engineering
BWR	boiling-water reactor
CE	Combustion Engineering Company
CFR	Code of Federal Regulations
CPU	central processing unit
DEC	Digital Equipment Corporation
EOP	emergency operating procedure
ERIS	Emergency Response Information System
FY	fiscal year
GAN	Gosatomnadzor of Russia
GE	General Electric Company
GEM	Graphical Evaluation Module
HRP	Halden Reactor Project
I&C	instrumentation and control
IMC	inspection manual chapter
I/O	input/output
JTA	job task analysis
MEPNS	Ministry for Environmental Protection and Nuclear Safety of Ukraine
MERIT	management evaluation and risk identification tree
NDE	nondestructive examination
NFWS	Nuclear Engineering Workstation Simulator
NMSS	Nuclear Material Safety and Safeguards (NRC Office of)
NRC	U.S. Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation (NRC Office of)
OIG	Office of the Inspector General (NRC)
ORISE	Oak Ridge Institute for Science and Education
PIP	PRA Implementation Plan
PRA	probabilistic risk assessment
PTFG	PRA Training Focus Group
PWR	pressurized-water reactor
RES	Nuclear Regulatory Research (NRC Office of)
SAT	site access training
SART	site access refresher training
SPDS	Safety Parameter Display System
TTC	Technical Training Center
TTD	Technical Training Division

Executive Summary

The Office for Analysis and Evaluation of Operational Data (AEOD) was created in 1979 to provide a strong, independent capability to analyze and evaluate operational safety data associated with activities licensed by the U. S. Nuclear Regulatory Commission (NRC). This role was strengthened and expanded in 1987 to include responsibility for the Incident Response Program, the Diagnostic Evaluation Program, the Incident Investigation Program, and the Technical Training Center.

The Technical Training Center provides initial and continuing technical training for NRC staff and contractors to satisfy training needs defined by formal NRC staff qualification and training programs. Technical training includes reactor technology programs and specialized technical programs. Reactor technology programs include a spectrum of courses, including classroom and simulator instruction, in each of the four Nuclear Steam Supply System vendor designs—General Electric (GE), Westinghouse, Combustion Engineering (CE), and Babcock and Wilcox (B&W). Specialized technical training includes courses in engineering support, probabilistic risk assessment, radiation protection, fuel cycle technology, safeguards, and regulatory skills.

During FY 95, AEOD presented 66 reactor technology courses and 90 specialized technical training courses. This training was accomplished in 63,759 instructional-hours, where an instructional-hour is a 1 hour period of training per student. Most of this technical training was provided in support of qualification programs for NRC technical staff.

The number of reactor technology courses, course-weeks, and instructional-hours peaked in FY 92, primarily as a result of an increase in reactor engineer intern training. Since then they have dropped to their lowest levels since FY 87. Specialized technical training instructional-hours peaked in FY 94 due to extensive training on the revised 10 CFR Part 20. They are significantly higher than in the past, primarily due to the addition of new curriculum areas such as probabilistic risk assessment and Fuel Cycle Technology and the development of new courses in these areas.

Reactor Technology Training

The core program in reactor technology training continues to be the 7 week series consisting of a 3 week systems course, a 2 week advanced course, and 2 weeks of reactor simulator training (1 week of which concentrates on emergency operating procedures (EOPs)). New courses developed include a boiling-water reactor (BWR)/4 course to support integration of the BWR/4 simulator (formerly the Shoreham plant simulator), and cross-training courses in CE and B&W technologies. The Westinghouse course was revised to support the incorporation of the newly purchased and installed Trojan simulator. Interactive plant system diagrams using the Nuclear Engineering Workstation Simulator were completed in the Westinghouse, GE, and B&W technologies. The addition of PRA information continued for the advanced technology course manuals using event briefings, generic letters, and NUREGs, including information from NUREG-4674, "Precursors to Potential Severe Core Damage."

Engineering Support Training

A new Welding and Nondestructive Examination course was developed and taught in July 1995. Also, a number of new commercial instrumentation and control courses were added. The Power Plant Engineering course continues to be needed for initial training of new personnel.

Probabilistic Risk Assessment Training

A PRA Training Focus Group was established in early March 1995 to provide guidance to ensure that agency PRA training supports the PRA Implementation Plan. PTFG recommendations resulted in the deletion of the 1 day PRA Overview course and the use of the PRA Fundamentals course as the first course in the PRA curriculum. The PRA Basics for Inspection Applications and the PRA Basics for Licensing Project Managers courses have been consolidated into a single course entitled PRA Basics for Regulatory Applications. During FY 95, four new courses were added to the PRA training curriculum—the Advanced Integrated Reliability and Risk Analysis System course, the PRA Insights into an IPE course, the Systems Modeling

Techniques course, and the Risk Assessment in Event Evaluation course.

Radiation Protection Training

Three new courses were developed and offered in FY 95. The Health Physics Technology Overview course was presented for the first time in February 1995, the new Introductory Health Physics course was presented in June 1995. and, at the request of NMSS, the TTC staff coordinated the development of a new Radiological Surveys in Support of Decommissioning course. In addition to the three new courses, a second version of the Health Physics Topical Review course was developed and presented.

Fuel Cycle Training

Work continued on a major new training initiative in the area of fuel cycle technology requested by the Division of Fuel Cycle Safety and Safeguards within NMSS. The planned curriculum currently consists of eight courses: Fuel Cycle Technology, Hazards of Chemical and Mechanical Fuel Cycle Processes, General Health Physics Practices for Fuel Cycle Facilities, Management Systems and Structures For Regulators, Integrated Safety Analyses, Mechanics of Sampling and Measurement for Fuel Cycle Facilities, Nuclear Criticality Safety, and Fire Protection for Fuel Cycle Facilities. Four of the eight courses identified have been developed, and a pilot presentation of the Hazards of Chemical and Mechanical Fuel Cycle Processes course was conducted during August 1995.

Regulatory Skills Training

At the request of the Office of the Inspector General (OIG), TTC staff developed and conducted two courses for OIG and Office of Investigations personnel at the TTC. In addition, a reactor and a nuclear materials version of the Inspecting for Performance course are now available, and AEOD has developed and made available a Root Cause/Incident Investigation Refresher Workshop.

Digital Instrumentation and Control Training

Training in the area of digital instrumentation and control (I&C) is evolving through the Digital I&C Work Group. The work group concluded that training is most urgently needed for region-based inspectors and headquarters personnel responsible for addressing instrumentation and control issues. The work group has developed a recommended curriculum for NRC personnel to obtain the necessary skills to conduct effective inspections. To provide regulatory insights, the work group is developing a Regulatory Perspectives Workshop through a cooperative effort among AEOD, NRR, and the regions.

Simulator Projects

GE BWR/4 Simulator Project

Because the original computer system for the BWR/4 simulator was obsolete and difficult to maintain, a replacement computer system was procured and installed during FY 95. In May 1995, a project was begun to replace the antiquated BWR/4 simulator Safety Parameter Display System (SPDS).

Westinghouse Simulator Project

The project to upgrade the capabilities of the Westinghouse simulator began in 1990. When the Trojan simulator became available for purchase, TTC staff members evaluated the Trojan simulator and determined that it would provide many significant improvements to the Westinghouse training curriculum at significantly less cost and risk. In 1994, the NRC submitted the successful bid to purchase the Trojan simulator, and the simulator was installed at the TTC in November 1995.

Combustion Engineering Simulator Project

The project to upgrade the capabilities of the Combustion Engineering Simulator instructor station by replacing it with a Macintosh-based system was begun in 1995. The project is being performed in three phases, with additional functionality added in the different phases. Phase one was completed in 1995, and phase two will be completed in FY 96. The schedule for phase three has not yet been determined.

Nuclear Engineering Workstation Simulator

Development of the Nuclear Engineering Workstation Simulator (NEWS) continued during FY 95. The software to support the connection of the NEWS to the CE simulator was completed and tested in January 1995. Completion of the CE simulator connection is scheduled for early 1996. The BWR/4 simulator connection will then be developed.

Other Technical Training Activities

Revision of Inspection Manual Chapters 1245 and 1246

Extensive revisions to Inspection Manual Chapters (IMCs) 1245 and 1246 are underway. NMSS program elements will be removed from IMC 1245 and placed in IMC 1246. This will align the manual chapters with the regional organizations, and will allow each program office to function independently and to have direct control over their qualification programs. The revisions also address some comments in recent OIG audits. NRR is reviewing the draft of the revision to IMC 1245, and NMSS and the regions are reviewing IMC 1246 and the accompanying qualification journals. The revised documents are expected to be issued in late FY 96 or early FY 97.

Lisbon Initiative Technical Assistance

AEOD is assisting Gosatomnadzor of Russia (GAN) in the establishment of a comprehensive system for training and qualification of GAN technical personnel and a functional training center for GAN personnel. Delivery of office equipment, training equipment, computer hardware and software, and consumables to the GAN training center was completed in December 1995. AEOD is also assisting the Ministry of Environmental Protection and Nuclear Safety (MEPNS) of Ukraine in the establishment of a comprehensive system for training and qualification of MEPNS technical personnel. In addition to these two Lisbon Initiative technical assistance projects mentioned above, two others have evolved. AEOD will be providing analytical simulators to both GAN and MEPNS for training of regulatory personnel; AEOD will also train designated GAN staff in the use and maintenance of the simulators.

1 Introduction

AEOD provides technical training for NRC personnel to satisfy integrated training needs defined by formal NRC staff qualification and training programs. New courses are developed and existing courses are modified to meet new or changing requirements identified by headquarters and regional offices. Principles of the systems approach to training are routinely used throughout the life cycle of the technical training courses.

Technical training includes reactor technology programs and specialized technical programs. Reactor technology training courses are implemented, maintained, and improved in each of the four reactor vendor designs – General Electric (GE), Westinghouse, Combustion Engineering (CE), and Babcock and Wilcox (B&W). The curriculum includes a spectrum of courses involving both classroom and simulator training. Reactor technology courses are typically presented by AEOD staff, who also manage the operation, maintenance, and upgrade of each full-scope reactor simulator and associated computer equipment.

Specialized technical training courses are implemented, maintained, and improved in engineering support, probabilistic risk assessment, radiation protection, fuel cycle technology, safeguards, and regulatory skills. Specialized technical training is provided through customized courses developed by the staff, customized courses by contractors, coordination of slots (training opportunities) in courses that are presented by other Government agencies, and the identification and promotion of appropriate commercially available courses that NRC personnel may attend as individual training opportunities. For many of the contracted courses, NRC perspectives are provided by designated individuals from within the NRC staff.

AEOD manages the Technical Training Center (TTC) and associated capital assets in Chattanooga, Tennessee, where most of the technical training is conducted. TTC staff also provide technical assistance in areas of expertise to other NRC offices as well as to foreign regulatory counterparts.

2 Technical Training Programs

During FY 95, AEOD presented 66 reactor technology courses providing 81 course-weeks of instruction, and 90 specialized technical training courses providing 97 course-weeks of instruction. These 178 course-weeks include all courses listed in the Technical Training Division (TTD) Course Catalog. Course-weeks can be correlated to staff effort or contract dollars required to conduct training. This training was accomplished in 63,759 instructional-hours, of which 20,002 were associated with reactor technology training and 43,757 with specialized technical training. Most of this technical training was provided in support of qualification programs for NRC technical staff.

An instructional-hour is a 1 hour period of training per student devoted to any of the following activities: lectures, seminars, discussions, problem solving sessions, quizzes, examinations, on-the-job training, laboratory exercises, programmed learning, and simulation exercises. For example, a course of 16 hours for 10 students would constitute 160 instructional-hours. Instructional-hours can be correlated to the time spent by the NRC staff in technical training classroom work, not including study time outside of class.

Statistical trends in technical training are shown in Figures 2.1 through 2.3. The data include all courses presented by, coordinated by, or arranged by the TTC staff. The graphs show the trends for both reactor technology and specialized technical training for FY 87 through FY 95. Reactor technology courses, course-weeks, and instructional-hours peaked in FY 92, primarily as a result of an increase in reactor engineer intern training. Since then they have dropped to their lowest levels since FY 87. The principal contributors to these decreases are reduced NRC hiring of new personnel, staff reductions within the AEOD technical training staff, and internal reprogramming of reactor technology resources to address other pressing needs in the specialized technical training area. The number of full course series in the Westinghouse and GE technologies have been reduced from three per year to two per year in each technology. Full course series were eliminated entirely for the CE and B&W technologies and were replaced with three week cross training courses in these two technologies. In addition, there has been lower student registration for some of the courses that have been scheduled. Specialized technical training instructional-hours peaked in FY 94 due to extensive training on the revised 10 CFR Part 20. They are significantly higher than in the past, primarily due to the addition of new curriculum areas such as probabilistic risk assessment (PRA) and Fuel Cycle Technology and the development of new courses in these areas.

Data on instructional-hours and students taught for both reactor technology training and specialized technical training are presented in Appendices A and B.

2.1 Reactor Technology Training

The core of the reactor technology training provided in support of initial qualification programs for NRC staff continued to be an integrated series of courses consisting of a 3 week systems course, a 2 week advanced course, and 2 weeks of reactor simulator training (1 week of which concentrates on emergency operating procedures (EOPs)). This integrated reactor technology training was available several times throughout the year. A variety of other stand-alone reactor technology courses have been made available to support other parts of NRC staff qualification programs. Simulator refresher training was increased in all reactor technology areas to maintain staff qualification and to bring staff identified as overdue for refresher training into compliance with NRC policy and procedures. Reactor technology course students included a significant number of foreign regulatory personnel.

Curriculum development involved preparation of new course materials to support new curriculum areas as well as the upgrade, enhancement, and maintenance of current course materials. New development included boiling-water reactor (BWR)/4 course materials to support integration of the BWR/4 simulator (formerly the Shoreham plant simulator). This development work involved creation of course manuals, graphics, lesson plans and other training materials for use in the BWR technology classroom and simulator courses.

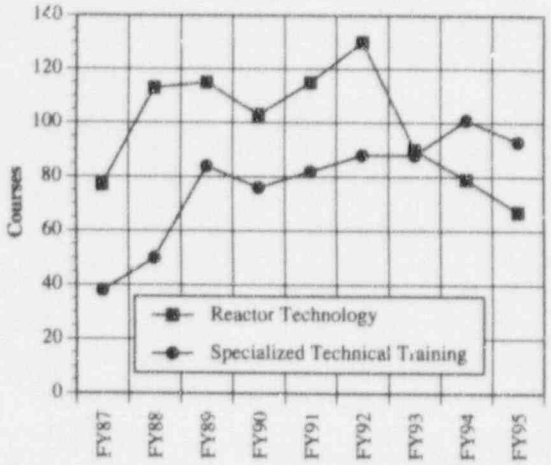

Figure 2.1 Technical Training Course Trends

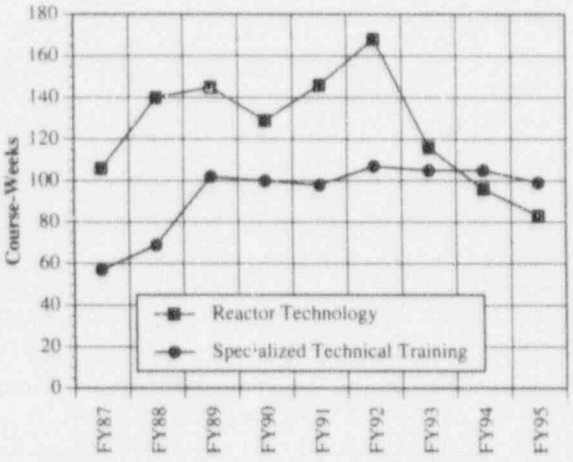

Figure 2.2 Technical Training Course-Week Trends

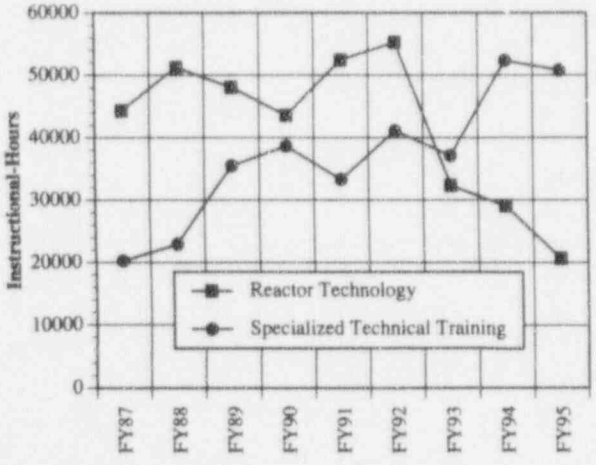

Figure 2.3 Technical Training Instructional-Hour Trends

Development of simulator scenarios and procedures was completed to support simulator courses. A new technical issues chapter on core shroud cracking was added to the curriculum.

Revision of Westinghouse course materials to support the incorporation of the newly purchased and installed Trojan simulator into the Westinghouse curriculum is in progress. In addition to course manuals and graphic illustrations, development is continuing on supporting instructor lesson plans, transient curves, and exam bank questions. Development of simulator test and operating procedures, scenarios, and instructor lesson plans are in progress to support simulator courses.

Program reviews for systems and advanced courses were completed for the purpose of attaining and maintaining a current (i.e. up-to-date and meeting agency needs) and consistent curriculum across the technologies. Significant changes that have resulted from the reviews are (1) reformatting of advanced course manuals, (2) revision of the technical specification teaching methodology to incorporate more performance-based examples and exercises, (3) revision of the advanced course examination methodology including elimination of systems questions, (4) incorporation of open book technical specification questions, (5) addition of a question category for technical issues, (6) reduction in the systems course length by 1 day due to a decrease in the morning review and scheduling 7 hours of presentation per day, and (7) development of CE and B&W cross-training courses.

New cross-training courses in CE and B&W technologies were developed and presented. The majority of the attendees were resident inspectors assigned to CE or B&W plants. These courses were designed to meet the needs of experienced personnel who have already completed a pressurized-water reactor (PWR) full course series and only need training in the differences between PWR vendor technologies. The cross-training courses are 3 weeks in length, include material that is different or unique to the CE or B&W designs, and integrate systems, advanced, and simulator course materials from the full course series into a single course. These courses are relatively fast paced with a high degree of reliance on existing knowledge and experience. They meet the training requirements of NRC Inspection Manual Chapter (IMC) 1245 and will be offered once per year.

Considerable development of interactive plant system diagrams using the Nuclear Engineering Workstation Simulator (NEWS) were completed in the Westinghouse, GE, and B&W technologies. These interactive system diagrams are used in reactor technology courses to enhance student understanding of system dynamics and interfaces.

Addition of PRA information continued for the advanced technology course manuals using event briefings, generic letters, and NUREGs, including information from NUREG-4674, "Precursors to Potential Severe Core Damage." In addition, questions were added to the exam bank to cover new PRA information as the manuals were revised. A risk-management module is being developed and will be added to the technical issues section of the advanced technology courses. In addition, the use of the Graphical Evaluation Model (GEM) program and a database for a plant design representative of each of the full scope training simulators has been added to simulator courses for instructor demonstration and student use. PRA information is provided in the reactor technology full course series to complement that obtained in the PRA curriculum and to give NRC staff insights, practical discussions, and exercises regarding PRA use by licensees in managing risk at the plants.

2.2 Engineering Support Training

Development of the new Welding and Nondestructive Examination (NDE) Overview course (E-901) was completed and the first course was conducted in July 1995. This course assists NRC technical managers and other technical personnel in developing a general familiarity with metallurgy, welding, and NDE technologies, including welding fabrication, welding processes, welding inspection, ultrasonic testing, radiographic testing, eddy current testing, liquid penetrant testing, and magnetic particle testing.

A number of new commercially available courses have been added to the Engineering Support Curriculum to support staff training in the area of digital instrumentation and controls. Course topics include instrumentation and control fundamentals, process controls, industrial measurement

and control, microprocessor fundamentals, software engineering, software verification and validation, and programmable controllers.

The Power Plant Engineering course continued to be needed for initial training of inexperienced technical personnel such as interns and non-nuclear-trained specialists. Other engineering support courses presented included Emergency Diesel Generators, Motorized Valve Actuators, Fire Protection for Power Plants, Nondestructive Examination Technology and Codes, and Eddy Current Testing.

2.3 Probabilistic Risk Assessment Training

A PRA Training Focus Group (PTFG) was established in early March 1995 to provide guidance to ensure that agency PRA training supports the PRA Implementation Plan (PIP). PTFG meetings are attended by the TTD Director, cognizant branch chiefs from AEOD and the Offices of Nuclear Reactor Regulation (NRR), Nuclear Regulatory Research (RES), and Nuclear Material Safety and Safeguards (NMSS), and other principal staff from NRR and AEOD.

The PTFG mission is to provide recommendations and guidance on (1) converging the PRA training program to support the PIP; (2) the level of PRA expertise needed for the various categories of NRC technical positions; (3) knowledge, skills and abilities needed by NRC staff to carry out the PIP; (4) developmental programs deemed necessary to achieve each PRA expertise category; (5) the relative importance and priority of PRA training initiatives; (6) the needs for job task analyses (JTAs) for different categories of NRC staff; (7) agency PRA policy issues related to training; and (8) monitoring implementation of PRA training program changes and implementation of PTFG recommendations.

To assist NRC line management in developing qualification and training programs for their staff, AEOD is preparing a NUREG/BR entitled "Guidance for Professional Development of NRC Staff in Regulatory Risk Analysis." The document will address the three general groups of skill levels (basic user, advanced user, and expert practitioner) required by NRC staff in the area of risk-informed regulation and will provide line management with recommendations on the needed training, the recommended course sequences, and the education and experience that agency employees will need to use PRA in their jobs.

The PTFG recommended several changes to the PRA curriculum. As a result, the 1 day PRA Overview course has been deleted from the curriculum and the PRA Fundamentals course, which provides more information, is now the first course in the PRA curriculum. The PRA Basics for Inspection Applications and the PRA Basics for Licensing Project Managers courses, which differed primarily in the workshop, have been consolidated into a single course entitled PRA Basics for Regulatory Applications. Two new modules, Risk Implications of Configuration Management and Implications of Uncertainty, have been recommended for development and inclusion in applicable courses. Testing in appropriate PRA courses will also begin in FY 96.

During FY 95, four new courses were added to the PRA training curriculum. The Advanced Integrated Reliability and Risk Analysis System (IRRAS) course was developed as a result of student feedback and covers advanced features of the IRRAS software. The PRA Insights into an IPE course was developed as a result of instructor feedback. Two additional courses, the Systems Modeling Techniques course and the Risk Assessment in Event Evaluation course were developed as a result of NRR and RES JTAs. A special seminar on Poisson and Binomial Failure data was developed to satisfy an AEOD need and presented in December 1994. Material from this seminar is being added to other courses.

Development of the Accident Consequence and Accident Progression Analysis course has been delayed until FY 96. In addition, the PTFG recommended creation of two additional courses: a PRA for Technical Managers course and an External Events course. The PRA for Technical Managers course will provide NRC technical managers an overview of PRA techniques and applications. It will include modules that discuss the status of the PIP, PRA techniques, PRA calculations, PRA software, and PRA applications. The External Events course will familiarize students with the risk associated with external events. It will combine portions of the existing Seismic Margins course with additional

material dealing with fires, floods, tornadoes, hurricanes, transportation accidents, etc.

The final report on a JTA for the Performance Assessment and Hydrology Branch of NMSS was due in October 1995. It is the last PRA JTA currently planned. Future course development will likely be required in response to actions identified in the NRC PRA Implementation Plan and if additional JTAs are completed.

2.4 Radiation Protection Training

Three new courses were developed and offered in FY 95. The Health Physics Technology Overview course was presented for the first time in February 1995 at the TTC. The course familiarizes NRC technical managers and supervisors with important radiation protection issues and hazards encountered in various areas within the nuclear industry. The course covers radiation terms, nomenclature, hazards, fundamental concepts, rules of thumb, types of radiation and sources used, and commonly occurring events and significant historical incidents. Applicable regulations are summarized, including reporting requirements to the NRC. Radiation protection areas addressed include power and non-power reactors, industrial radiography, medical facilities, fuel cycle facilities, gamma irradiators, moisture density gauges, well logging, radwaste, and transportation. Two special, condensed versions of the Health Physics Technology Overview course were presented to Headquarters Operations Officers in January and March 1995.

The new Introductory Health Physics course was presented in June 1995 at NRC headquarters. This course provides a basic understanding of health physics and radiation protection principles. Topics included are elementary radiation physics and health physics concepts; types of radiation; interaction of radiation with matter; radiation units; biological effects of radiation; environmental radiological monitoring; overview of radiation protection standards including the new 10 CFR Part 20; operational aspects of health physics, such as personnel monitoring, surveys, and health physics instruments (emphasis is on selection and actual use of portable survey instruments); and radiation protection plans and procedures. Rules of thumb, along with the caveats of their limitations, are also provided.

At the request of NMSS, TTC staff coordinated the development of a new Radiological Surveys in Support of Decommissioning (H-120) course. The first presentation of this course was planned for November 1995. TTC staff also arranged for a presentation of the Oak Ridge Institute for Science and Education (ORISE) Air Sampling for Radioactive Materials course exclusively for NRC personnel.

In addition to the three new courses, a second version of the Health Physics Topical Review course was developed and presented at headquarters in July 1995. The course was also presented in Region II in September 1995 with presentations planned for the other regions and the Walnut Creek Field Office in early FY 96. The course emphasizes new modalities in teletherapy and brachytherapy.

AEOD staff updated and reprinted the manual used for Site Access Training (SAT), Site Access Refresher Training (SART), and NMSS Radiation Worker Training. In response to regional requests, the SAT and SART examination question bank was reviewed by headquarters and regional personnel and new hardcopy examinations were generated. The computer-based examination bank has been updated in headquarters and in Region II, with the other regions to follow in FY 96.

Contracted presentations of the SAT, SART, and NMSS Radiation Worker Training courses at headquarters were continued. In addition, special contracted SART presentations were held in Region I, and AEOD staff conducted special SART sessions at the TTC, headquarters, and Region II.

A new 5 year contract for presentation of the Diagnostic and Therapeutic Nuclear Medicine and Teletherapy and Brachytherapy courses was awarded to Advanced Health Education Center in Houston, Texas. The first courses under the new contract are planned for June 1996. Because many students attend both courses, the two courses will be held on consecutive weeks in the future to better utilize travel funds.

2.5 Fuel Cycle Training

Work continued on a major new training initiative in the area of fuel cycle technology requested by the Division of Fuel Cycle Safety and Safeguards

within NMSS. NRC staff targeted for this training include fuel facility inspectors, license reviewers, headquarters staff, and other personnel who have regulatory oversight over fuel cycle facilities.

The planned curriculum currently consists of eight courses: Fuel Cycle Technology, Hazards of Chemical and Mechanical Fuel Cycle Processes, General Health Physics Practices for Fuel Cycle Facilities, Management Systems and Structures For Regulators, Integrated Safety Analyses, Mechanics of Sampling and Measurement for Fuel Cycle Facilities, Nuclear Criticality Safety, and Fire Protection for Fuel Cycle Facilities.

Four of the eight courses identified have been developed. A pilot presentation of the Hazards of Chemical and Mechanical Fuel Cycle Processes course was conducted during August 1995. The Mechanics of Sampling and Measurement for Fuel Cycle Facilities course is being reviewed by NRC staff and will be piloted in FY 96. Development and pilot presentation of the General Health Physics Practices for Fuel Cycle Facilities course and the Fire Protection for Fuel Cycle Facilities course are scheduled for FY 96. Work on the Integrated Safety Analyses and Management Systems and Structures for Regulators courses continued. The courses are being developed by various contractors. Instructors include contractor personnel, subject matter experts within the DOE community, and NRC experts from the various regions and headquarters staffs. IMC 1246 is being revised to incorporate these new courses into the fuel facility inspector qualification program.

2.6 Safeguards Training

TTC staff continued to work closely with DOE and other government agencies to provide training for security and safeguards personnel. AEOD instituted an interagency agreement with the Central Intelligence Agency to support training of security personnel. A Safeguards Technology Refresher course (S-402) was presented in August 1995.

2.7 Regulatory Skills Training

At the request of the Office of the Inspector General (OIG), TTC staff developed and conducted two courses for OIG and Office of Investigations personnel at the TTC in May and September 1995. Course topics included training of NRC inspectors, sources and location of regulations, an overview of boiling water and pressurized water reactors, regulatory environment, professionalism, reactor and materials inspection and licensing programs, radiation protection issues for reactors, high and low level waste, industrial radiography, medical uses of byproduct material, fuel cycle issues, transportation of radioactive materials, gamma irradiators, moisture density gauges, and well logging. Classroom lectures were supplemented by simulator tours and demonstrations and videos of various activities. AEOD is exploring the applicability of the course to a wider NRC audience.

The Fundamentals of Inspection course was held at NRC headquarters in February 1995. Due to the wider availability of NRC managers to support the course, all future presentations of the course will likely be in headquarters. A Fundamentals of Inspection Refresher course was also held in headquarters in March 1995.

AEOD assumed coordination responsibility for the Inspection Procedures and Licensing Practices and Procedures courses during FY 95. Each course was presented twice. During FY 96 work will continue on the consolidation of the Inspection Procedures and the Fundamentals of Inspection courses. The Inspecting for Performance (materials version) and the Effective Communications for NRC Inspectors courses are also being reviewed for consolidation with the Inspection Procedures and the Fundamentals of Inspection courses. A working group meeting is planned for late January 1996 at the TTC.

A reactor and a nuclear materials version of the Inspecting for Performance course are now available. Presentations of the new nuclear materials version were held in Region III in December 1994 and in Region I in September 1995. AEOD has also developed and made available a Root Cause/Incident Investigation Refresher Workshop.

2.8 Agreement State Training

AEOD has now assumed responsibility for training of Agreement State Personnel. The Office

of State Programs is working with the Agreement States to define a core of required courses for Agreement State personnel that will be compatible with NRC inspector qualification requirements.

Integration of Agreement State personnel into selected NRC courses continued. The Health Physics Technology, Safety Aspects of Industrial Radiography, Transportation of Radioactive Materials and Safety Aspects of Well Logging courses have been fully integrated. Similarly, NRC personnel have been fully integrated into the Inspection Procedures and Licensing Practices and Procedures courses.

During FY 95 AEOD continued presentation of the 5 week Applied Health Physics course and the Agreement State Nuclear Medicine and the Health Physics Engineering courses through an interagency agreement with ORISE. Two presentations of the 5 week Applied Health Physics course and one presentation of the Health Physics Engineering course are planned for FY 96. Starting in FY 96, Agreement State personnel will attend the NRC Diagnostic and Therapeutic Nuclear Medicine and the Teletherapy and Brachytherapy courses. The Health Physics Topical Review course will likely replace the Health Physics Engineering course in the future. Agreement State personnel also attend other NRC courses, such as the Environmental Monitoring for Radioactivity course, on an individual training opportunity basis.

2.9 Digital Instrumentation and Control Training

Training in the area of digital instrumentation and control (I&C) is evolving through the Digital I&C Work Group. The work group was established in 1994 to determine training needs in digital instrumentation and controls and related areas, define target audiences for training, identify courses to be developed and/or recommend commercially available courses, review course materials, and recommend changes to the curriculum. The work group consists of personnel from AEOD, NRR, and each region.

The work group reviewed the technical positions that might need training and concluded that training is most urgently needed for region-based inspectors and headquarters personnel responsible for addressing instrumentation and control issues. In light of the limited number of personnel who need in-depth training and the diversity in their backgrounds and training, the work group concluded that development of customized courses would not be cost effective. The work group proposed a group of commercially available courses that will provide the average regional inspector with the technical bases to address digital instrumentation and control issues. These courses will be part of the Engineering Support Curriculum.

To provide regulatory insights, the work group is developing a Regulatory Perspectives Workshop through a cooperative effort among AEOD, NRR, and the regions. The workshop will give inspectors, reviewers, and project engineers a better understanding of the digital upgrade process and will address methods for doing an effective inspection of digital instrumentation and control systems. Industry personnel who have been involved with digital upgrades will also share their perspectives. The first workshop was held December 5–7, 1995, at the TTC. The workshop is likely to become an annual event.

The work group has developed a recommended curriculum for NRC personnel to obtain the necessary skills to conduct effective inspections in the digital instrumentation and control area. AEOD is preparing a NUREG/BR entitled "Guidance for Professional Development of NRC Staff in Digital Instrumentation and Controls." The purpose of the document is to provide NRC line management with recommendations on training, course sequences, education, and experience such that agency employees can better perform their jobs. Line organizations will be able to modify the formal and informal qualification, training, and development programs to assure the NRC staff has the needed knowledge, skills and abilities to implement the goals of the developing NRC policy on digital instrumentation and control.

The work group is also planning development of a seminar for resident inspectors. This short seminar is intended to acquaint resident inspectors with digital instrumentation and control issues and would be conducted as part of regional resident inspector meetings.

3 Simulator Projects

3.1 GE BWR/4 Simulator Project

Because the original computer system for the BWR/4 simulator was obsolete and difficult to maintain, a replacement computer system was procured and installed during FY 95. The replacement system consists of two proprietary super-minicomputers similar in architecture to the original equipment, and a high performance Unix-based system, linked together with a reflective memory system. The components that comprise the replacement system use the current state-of-the-art in high performance simulation computers.

The simulation models were reused without modification. Executive software that controls the sequence and execution of the models was significantly modified and enhanced by TTC simulator engineers to be compatible with the current version of the operating system.

One element remains to be completed. The vector processor used to execute the reactor core model in the original system is still in use. However, the means for eliminating it has been identified and will be implemented in FY 96.

In May 1995, a project was begun to upgrade the antiquated BWR/4 simulator Safety Parameter Display System (SPDS). The hardware for the SPDS supplied with the simulator began malfunctioning shortly after simulator delivery. The manpower and monetary investment required to return the existing SPDS to service was estimated to be far greater than that required to develop a new SPDS and may not have successfully returned the hardware to a reliable condition. Therefore, it was decided to develop a new system using TTC resources.

Development time for the new system was significantly reduced by using the BWR/6 Emergency Response Information System (ERIS) algorithms and the Nuclear Engineering Workstation System (NEWS—see Section 3.7) software as the bases for the SPDS software. The main displays have been completed, as has the initial version of the communications task (which transfers the data from the ERIS algorithms to the SPDS displays). The algorithms are partially completed.

3.2 Westinghouse Simulator Project

The project to upgrade the capabilities of the Westinghouse SNUPPS Simulator to better support the training of NRC technical personnel began in 1990. The initial plan involved upgrading the hardware and the modeling of the present Westinghouse 4-loop nuclear power plant simulator to meet the existing and projected performance requirements of technical training programs for NRC personnel. During the analysis to identify viable alternatives for upgrading the modeling, the Trojan simulator became available for purchase as part of the shutdown and decommissioning of the Trojan Nuclear Plant. This alternative proved to be the lowest cost and lowest risk means for achieving the project goal.

TTC staff members evaluated the Trojan simulator and determined that it would provide many significant improvements to the Westinghouse training curriculum at significantly less cost and risk. The combination of more robust modeling, improved fidelity, and improved reliability associated with more modern hardware made procurement of the Trojan Simulator the best alternative for addressing the continuing Westinghouse SNUPPS Simulator performance problems. The Trojan simulator was delivered to Trojan in 1989, has been certified in accordance with ANSI/ANS 3.5, and has been utilized for utility operator training.

In 1994, the NRC submitted the successful bid to purchase the Trojan simulator with an agreement to store the simulator at its present location until July 1, 1995. Arrangements were made and the simulator was installed at the TTC in November 1995, with the first scheduled classes using the simulator in February of 1996.

3.3 Combustion Engineering Simulator Project

The project to upgrade the capabilities of the Combustion Engineering Simulator instructor station by replacing it with a Macintosh-based system was begun in 1995. The new system is visually and functionally equivalent to the instructor stations used with the Babcock & Wilcox and General Electric BWR/6 simulators

and offers a more user friendly interface than the existing system with most functions being executed by simply pointing and clicking a mouse. Typing is completely eliminated with the exception of certain functions associated with initial conditions and manual modification of data base variables. When fully completed, the Macintosh-based instructor station will offer several features that are not available on the existing system. These include ramping of malfunction severities, event triggering of malfunctions, non-volatile backtrack initial conditions, multiple and automatically updated monitored parameters, an integrated data acquisition system, and an integrated daily operational readiness testing system. Moreover, similarity to instructor stations on other simulators reduces time required by instructors to learn to operate the Combustion Engineering simulator.

The project is being performed in phases, with additional functionality added in the different phases. Functions included in phase one are basic control functions (i.e. start, stop, run, and freeze), initial condition reset and snapshot, control of all simulator malfunctions and remote functions, manual modification of simulation data base variables, and non-volatile backtrack control. All of these functions were completed in FY 95 with the exception of the non-volatile backtrack control, which will be completed by the end of 1995. Monitored parameters, input/output (I/O) overrides, data acquisition, and daily operational readiness testing will be added in phase two and will be completed in FY 96. Phase three is scheduled to add piping and instrumentation diagrams. The timing for phase three has not yet been determined.

In addition to creation of the Macintosh-based system, software for the existing instructor station was modified to allow it to run in tandem with the new one. This allows continued use of parameter trend plots and other functions, such as I/O override, which were not included in phase one of the project. It also provides a backup in the event of a problem with the new system.

The new Macintosh-based instructor station was used in tandem with the existing instructor station during the first two CE training classes taught in FY 96 and was well received by simulator instructors.

NUREG–1527, "NRC's Object-Oriented Simulator Instructor Station", was published in June 1995. This NUREG describes the Macintosh-based instructor station developed by AEOD.

3.4 Babock and Wilcox Simulator Project

The project to upgrade the performance of the B&W simulator was completed in 1993. This upgrade brought the B&W simulator core, thermal hydraulic, and containment models to the current state-of-the-art simulation and provided additional capabilities in the simulation of various accidents and plant operations, including mid-loop operations.

The upgrade substantially increased the computational capacity required to execute the simulation models. Indeed, there is very little spare time on the Encore 32/9780 computer system that serves as the computer platform. It has been observed that, on rare occasions, the models have insufficient CPU time to complete in a given cycle, which results in a halt of the models.

Current plans are to use the Encore 32/9780 that presently runs the Westinghouse SNUPPS simulator as an additional computer for the B&W simulator. The CPU load will be split among the four processors for optimal performance. It is anticipated that this will improve simulator performance and repeatability.

A project is also underway to replace the graphic display generators that are used for process computer video displays. When this project is complete, the remaining Encore 32/55 system (the oldest of the Encore computer family) will be retired.

3.5 Simulator Hardware Maintenance

There were two significant simulator hardware failures during FY 95. The first affected the Westinghouse SNUPPS simulator and resulted in delaying a scheduled class. The simulator I/O system developed multiple failures that required eight days and vendor assistance to resolve. The second failure was a computer fault on the B&W simulator. A CPU backplane (the bus into which

all CPU cards are plugged) developed a fault that required replacement.

Several peripheral devices, such as magnetic tape and disk drives, were replaced on three simulators with newer SCSI devices. This has resulted in improved performance and has eased the process of performing software backups.

A contract is in place for simulator hardware maintenance. The contract was modified during FY 95 to provide an additional technician, bringing the level of contract support to four technicians. Use of a contractor for these services has greatly reduced TTC simulator engineer involvement in routine hardware maintenance, allowing more time for challenging engineering projects.

3.6 Simulator Software Maintenance

The contract providing two full-time software engineers to perform software maintenance, modifications, and support services for the TTC full-scope simulators continued during 1995. Option 1 to extend the contract for an additional year (through April 1996) was exercised.

During FY 95, contractor personnel devoted the majority of their time to addressing discrepancy reports on the BWR/4 and B&W Simulators. In addition, the contractor also performed routine backups of the software on all simulators except the CE simulator. Use of a contractor for these services has reduced TTC simulator engineer involvement in routine software maintenance, allowing more time for challenging simulator engineering projects.

Because of budget reductions, the contract is being modified to reduce the scope of work and the level of effort to one full-time software engineer. This modification became effective on October 1, 1995. Additionally, the option to extend the contract beyond April 1996 will not be exercised.

3.7 Nuclear Engineering Workstation Simulator

Development of the Nuclear Engineering Workstation Simulator (NEWS) continued during FY 95. Graphical display development for the different technologies continued to be performed primarily by the Reactor Technology Instructors who are members of the NEWS Work Group. The rate of picture development is dependent upon the instructors work schedule and teaching load and the complexity of each picture. Because of the large effort devoted to development of Trojan training materials, there were very few new displays developed during the year for the PWR technologies. However, during the last half of the year, development of displays for the BWR/4 began in earnest.

The software to support the connection of the NEWS to the CE simulator was completed and tested in January 1995. Because of other software development activities, the work on identifying the data to be transferred was suspended. Completion of the CE simulator connection is scheduled for early 1996. The BWR/4 simulator connection will then be developed, as the software developed for the communication between the BWR/4 simulator computers and the new SPDS can be used as the basis, thus making development time fairly short.

TTC staff actively participated in the Enlarged Halden Program Group Meeting on Man-Machine Systems Research in November, 1994. One of the TTC simulator engineers presented a paper entitled "The Evolution of the Nuclear Engineering Workstation Simulator at the USNRC Technical Training Center".

4 Other Technical Training Activities

4.1 Revision of Inspection Manual Chapters 1245 and 1246

Extensive revisions to Inspection manual chapters (IMCs) 1245 and 1246 are underway. IMC 1245 has historically addressed the qualification requirements of all inspectors, from the regions as well as from NRR and NMSS. Its last major revision was in 1991. IMC 1246 was established in 1994 to define qualification requirements for Materials License Reviewers.

NMSS program elements will be removed from IMC 1245 and placed in IMC 1246. This will allow each program office to function independently and to have direct control over their qualification programs. It will also align the manual chapters with the regional organizations.

NRR is reviewing the draft of the revision to IMC 1245. It is anticipated that this revision will unify the standards for regional and NRR inspection personnel and that qualification requirements will be established for some additional headquarters positions.

NMSS and the regions are reviewing IMC 1246 and the accompanying qualification journals. A working group met at the TTC to revise the document and several iterations have been through peer review. The requirements for Fuel Facility Specialist Inspectors have been significantly expanded to include more process oriented courses in recognition of our added responsibilities under 10 CFR Part 76. NMSS has also added sections to include NMSS's Transportation Packaging and Dry Storage Supplier Safety Inspectors, Fuel Cycle License Reviewers, and Division of Waste Management Inspectors and License Reviewers.

The revisions also address some comments in recent OIG audits. The current category of "training required within two years of certification" has been removed and the layout improved to be more compatible with the revised Automated Training System. Required initial training will be divided into three areas: self-study and on-the-job training (the bulk of the qualification journal activities), core training (formal training required of all inspectors in a particular field), and specialized training (courses required for personnel who will inspect in specialized areas).

The revised documents are expected to be issued in late FY 96 or early FY 97.

4.2 High Performance Computing

AEOD efforts in high performance computing and open systems continued to evolve. The twelve Sun SPARCStations have been upgraded to SPARCStation 20 processors, and the operating system has been upgraded to Solaris 2.3. The SPARCStations are used for the NEWS project and for access to the Internet.

The CE Simulator continues to run on a Silicon Graphics 4D/240 dual-processor platform, with three upgraded Indigo workstations for display and control. During FY 95, the operating system was upgraded to IRIX 5.3.

Two 8-processor Silicon Graphics Challenge-L computer systems, also running the IRIX operating system, have seen extensive use. During FY 95, licenses were obtained for the DataViews graphics application, enabling the use of the TOPMERET simulation-generation package. The BWR/4 Simulator SPDS system is being developed using a Challenge server, and the Challenge systems serve as the primary Network File System, Network Information System, and Domain Name Service servers for the TTC simulation network.

New acquisitions in FY 95 included several X-terminals to support the BWR/4 Simulator SPDS system, and a DEC Alpha AXP system that is part of the BWR/4 upgraded computer system. The DEC system runs the OSF/1 operating system, recently renamed Digital Unix.

The TTC Senior Simulator Engineer serves as system administrator for all TTC Unix-based equipment as well as the Encore equipment.

A "mini-seminar" was conducted by Halden Reactor Project (HRP) personnel for TTC staff members to demonstrate and discuss a computer-based alarm system toolbox developed by the HRP called COAST. This system may have

possible application on the CE Simulator. In addition, another of these "mini-seminars" is scheduled for early FY 96 on the SCORPIO system, a core surveillance system developed by the HRP which may have classroom application.

4.3 Technical Assistance to Others

Technical assistance was provided by TTC staff in a number of diverse areas throughout the year. In support of the Operator Licensing Branch of NRR, both GE and Westinghouse instructors played the role of license candidates, provided assistance in establishing the exam scenarios, and validated the simulator scenarios of the examiners-in-training during examination techniques courses.

AEOD used its interagency agreement with the Central Intelligence Agency to respond to an urgent NRR request for assistance for its vehicle barrier testing program.

AEOD staff have assisted NMSS in its business process re-engineering (BPR) project associated with implementation of a redesigned materials licensing process. AEOD arranged for special training on the Management Evaluation and Risk Identification Tree (MERIT) process and assisted contractors in the use of MERIT to evaluate the BPR effort to date. AEOD will provide additional support in FY 96 as Phase II of the BRP project proceeds.

4.4 Lisbon Initiative Technical Assistance

Active pursuit of Lisbon Initiative technical assistance projects continued. Under the framework of Russian Priority 5, AEOD is assisting Gosatomnadzor of Russia (GAN) in the establishment of a comprehensive system for training and qualification of GAN technical personnel and a functional training center for GAN personnel in the Don Region. The scope of this technical assistance includes the normal activities associated with the application of the principles of the systems approach to training and will result in the establishment of a training curriculum. Methodologies used by the NRC are being made available to GAN training managers and instructors. In addition, a contract was awarded in September 1995 to supply office equipment, training equipment, computer hardware and software, and consumables to the GAN training center. Equipment delivery was completed in December 1995. This equipment is needed for training program and course development, training presentations, methodological support, and management of the training system.

Under the framework of Ukrainian Priority 2, AEOD is assisting the Ministry of Environmental Protection and Nuclear Safety (MEPNS) of Ukraine in the establishment of a comprehensive system for training and qualification of MEPNS technical personnel. The scope of this technical assistance includes transfer of the methodology and practical application of activities associated with the principles of the systems approach to training, transfer knowledge of contemporary information and technology to MEPNS specialists to supplement and enhance their knowledge and skills in several scientific and engineering specialties, and delivery of specialized equipment to MEPNS training locations necessary in support of development and implementation of the regulatory training program. Two contracts were awarded in September 1995 to supply office and training equipment and interactive laser videodisc workstations in support of development and implementation of the regulatory training program. Equipment delivery should be completed as of February 1996.

In addition to the two Lisbon Initiative technical assistance projects mentioned above, two others have evolved. Under the framework of Russian Priority 5.1, AEOD will be providing analytical simulators to GAN for training of regulatory personnel. The scope of this technical assistance includes development of a statement of work, establishment of a contract, contractor development of specialized simulation software, and delivery of equipment. The work in this priority also involves assisting GAN in assuring that the analytical simulators are functional and adequately represent the intended reactor designs and it includes training of designated GAN staff who will use and maintain the analytical simulator(s). It also includes the prioritized development of additional analytical simulator software loads and establishment of analytical simulator hardware at different GAN locations.

Under the framework of Ukraine Priority 2.1, AEOD will provide analytical simulator(s) to MEPNS for training of regulatory personnel. The scope of work in this area includes development of a statement of work, establishment of a contract, contractor development of specialized simulation software, and delivery of equipment. The work in this priority also involves assisting MEPNS in assuring that the analytical simulator(s) are functional and adequately represent the intended reactor designs and it includes training of designated MEPNS staff who will use and maintain the analytical simulator(s). It also includes the prioritized development and implementation of additional analytical simulator software loads.

In support of these four Lisbon Initiative technical assistance priorities, a number of planning meetings have taken place in Russia, Ukraine, and the U.S.

Appendix A

Instructional-Hour Totals

Contents

Tables

Key

QTY = Quantity of Courses
C–W = Quantity of Course-Weeks
IH = Instructional-Hours
# S = Number of Students
R1 = Region I
R2 = Region II
R3 = Region III
R4 = Region IV
NRR = Office of Nuclear Reactor Regulation
AEOD = Office for Analysis and Evaluation of Operational Data
NMSS = Office of Nuclear Material Safety and Safeguards
RES = Office of Nuclear Regulatory Research
CTR = NRC Contractors
IP = International Programs Personnel (Foreign National)
SP = State Programs
OTH = Other NRC Offices or Other Agencies
TOT = Total

Table A–1 Reactor Technology Instructional-Hour Totals by Course Group

Course	QTY	C–W	R1 IH	R2 IH	R3 IH	R4 IH	NRR IH	AEOD IH	NMSS IH	RES IH	CTR IH	IP IH	SP IH	OTH IH	TOT IH
Technology (100 Level)	3	3	56	150	127	165	323	56	28	318	0	0	0	229	1452
Technology (200 Level)	1	4	0	0	0	105	630	0	0	0	0	0	0	0	735
Technology (300 Level)	4	12	618	721	1030	412	1133	0	0	0	0	309	0	0	4223
Adv. Technology (500 Level)	4	8	388	342	480	344	274	0	0	0	68	412	0	272	2602
Simulator (Series)	11	11	245	175	385	175	420	35	0	0	35	175	0	105	1750
EOP Simulator	8	8	136	170	408	102	374	68	0	0	34	136	0	0	1428
Sim. Refresher (Examiners)	2	2	35	70	172	0	68	0	0	0	35	0	0	0	380
Sim. Refresher (Inspectors)	24	24	791	872	1419	488	311	382	0	0	69	35	0	0	4367
Technical Managers	3	3	70	175	105	210	105	35	0	0	0	105	0	35	840
GE Nuclear Engineering	1	2	140	70	70	0	420	70	0	0	0	0	0	0	770
Westinghouse Maintenance Overview	3	3	170	170	272	68	238	272	0	0	0	0	0	0	1190
Reactor Concepts	1	1	0	0	28	0	14	0	0	42	0	28	0	140	252
NRC News Media Seminar	1	1	16	16	16	0	0	0	0	0	0	0	0	160	208
Reactor Safety	1	1	0	0	70	0	245	140	0	0	0	0	0	0	455
TOTALS	67	83	2687	2931	4582	2069	4555	1058	28	360	241	1200	0	941	20652

Table A–2 Reactor Technology Instructional-Hour Totals by Course

Course	QTY	C–W	R1 IH	R2 IH	R3 IH	R4 IH	NRR IH	AEOD IH	NMSS IH	RES IH	CTR IH	IP IH	SP IH	OTH IH	TOT IH
General Electric Technology															
GE BWR/4 Technology (R–101B)	1	1	56	28	0	0	140	28	28	140	0	0	0	56	476
GE BWR/6 Technology (R–106B)	1	1	0	66	99	165	99	0	0	66	0	0	0	33	528
GE BWR/4 Technology (R–200B)	1	4	0	0	0	105	630	0	0	0	0	0	0	0	735
GE BWR/4 Technology (R–304B)	2	6	412	412	824	103	927	0	0	0	0	0	0	0	2678
GE BWR/4 Advanced Technology	1	2	136	136	68	68	68	0	0	0	0	0	0	0	476
GE BWR/4 Simulator	5	5	105	105	210	35	315	0	0	0	0	0	0	0	770
GE BWR/4 EOP Simulator	4	4	34	102	238	0	306	0	0	0	0	0	0	0	680
GE BWR/4 Sim. Ref. (Examiners)	1	1	35	70	70	0	0	0	0	0	35	0	0	0	210
GE BWR/4 Sim. Ref. (Inspectors)	8	8	476	102	544	68	136	102	0	0	34	0	0	0	1462
GE BWR/6 Sim. Ref. (Inspectors)	1	1	0	35	105	0	0	35	0	0	0	0	0	0	175
GE Nuclear Engineering	1	2	140	70	70	0	420	70	0	0	0	0	0	0	770
GE BWR/4 Technical Managers	1	1	70	0	0	105	70	0	0	0	0	70	0	0	315
GE Subtotals	**27**	**36**	**1464**	**1126**	**2228**	**649**	**3111**	**235**	**28**	**206**	**69**	**70**	**0**	**89**	**9275**
Westinghouse Technology															
Westinghouse Technology (R101P)	1	1	0	56	28	0	84	28	0	112	0	0	0	140	448
Westinghouse Technology (R–304P)	1	3	103	103	0	103	103	0	0	0	0	103	0	0	515
Westinghouse Advanced Technology	2	4	204	136	272	136	136	0	0	0	68	272	0	272	1496
Westinghouse Simulator	4	4	105	35	140	70	70	0	0	0	35	105	0	105	665
Westinghouse EOP Simulator	2	2	68	34	136	34	34	0	0	0	34	68	0	0	408
Westinghouse Sim. Ref. (Examiners)	1	1	0	0	102	0	68	0	0	0	0	0	0	0	170
Westinghouse Sim. Ref. (Inspectors)	14	14	280	735	735	350	175	245	0	0	35	35	0	0	2590
Westinghouse Maintenance Overview	3	3	170	170	272	68	238	272	0	0	0	0	0	0	1190
Westinghouse Technical Managers	1	1	0	35	70	70	35	35	0	0	0	35	0	0	280
Westinghouse Subtotals	**29**	**33**	**930**	**1304**	**1755**	**831**	**943**	**580**	**0**	**112**	**172**	**618**	**0**	**517**	**7762**

Table A–2 Reactor Technology Instructional-Hour Totals by Course (cont.)

Course	QTY	C–W	R1 IH	R2 IH	R3 IH	R4 IH	NRR IH	AEOD IH	NMSS IH	RES IH	CTR IH	IP IH	SP IH	OTH IH	TOT IH
Combustion Engineering Technology															
CE Technology (R–305P)	1	3	103	206	206	206	103	0	0	0	0	206	0	0	1030
CE Advanced Technology	1	2	70	70	140	140	70	0	0	0	0	140	0	0	630
CE Simulator	2	2	35	35	35	70	35	35	0	0	0	70	0	0	315
CE EOP Simulator	2	2	34	34	34	68	34	68	0	0	0	68	0	0	340
CE Sim. Ref. (Inspectors)	1	1	35	0	35	70	0	0	0	0	0	0	0	0	140
CE Subtotals	**7**	**10**	**277**	**345**	**450**	**554**	**242**	**103**	**0**	**0**	**0**	**484**	**0**	**0**	**2455**
Babcock & Wilcox Technology															
B&W Technical Managers	1	1	0	140	35	35	0	0	0	0	0	0	0	35	245
B&W Subtotals	**1**	**1**	**0**	**140**	**35**	**35**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35**	**245**
Generic Reactor Technology															
Reactor Concepts	1	1	0	0	28	0	14	0	0	42	0	28	0	140	252
NRC News Media Seminar	1	1	16	16	16	0	0	0	0	0	0	0	0	160	208
Reactor Safety	1	1	0	0	70	0	245	140	0	0	0	0	0	0	455
Generic RT Subtotals	**3**	**3**	**16**	**16**	**114**	**0**	**259**	**140**	**0**	**42**	**0**	**28**	**0**	**300**	**915**
Reactor Technology Totals	**67**	**83**	**2687**	**2931**	**4582**	**2069**	**4555**	**1058**	**28**	**360**	**241**	**1200**	**0**	**941**	**20652**

Table A–3 Specialized Technical Training Instructional-Hour Totals by Course

Course	QTY	C–W	R1 IH	R2 IH	R3 IH	R4 IH	NRR IH	AEOD IH	NMSS IH	RES IH	CTR IH	IP IH	SP IH	OTH IH	TOT IH
Probabilistic Risk Assessment Courses															
Fundamentals of PRA	1	1	0	42	0	0	210	63	42	105	0	21	0	21	504
Probability & Statistics for PRA	2	2	0	35	0	0	455	105	35	210	0	35	0	70	945
PRA Basics for LPMs	1	1	0	0	0	0	126	63	0	21	0	0	0	84	294
PRA Basics for Inspection Appl.	4	4	252	273	420	315	84	0	0	21	0	0	0	21	1386
PRA Insights into an IPE	9	9	532	308	364	0	826	224	0	98	0	56	0	14	2422
System Modeling Techniques	1	1	0	0	0	0	315	42	0	210	0	0	0	0	567
Advanced IRRAS	2	2	28	0	0	0	140	56	0	84	0	0	0	28	336
Human Reliability Analysis	1	1	0	0	0	18	90	18	18	144	0	18	0	18	324
Data Analysis Workshop	1	1	0	70	0	0	315	35	0	210	0	0	0	0	630
Risk Assessment in Event Evaluation	1	1	0	0	0	0	210	42	0	147	0	0	0	21	420
PRA Subtotals	**23**	**23**	**812**	**728**	**784**	**333**	**2771**	**648**	**95**	**1250**	**0**	**130**	**0**	**277**	**7828**
Engineering Support Courses															
Power Plant Engineering	1	2	102	102	0	0	918	0	0	0	0	0	0	0	1122
Emergency Diesel Course	2	2	160	96	192	256	288	160	0	0	0	0	0	0	1152
Motorized Valve Actuators	4	4	288	64	256	128	160	32	0	0	0	160	0	0	1088
Eddy Current Testing	1	1	0	0	64	64	0	0	0	0	0	0	0	0	128
Heat Exchanger Predictive Analysis	1	1	70	175	140	245	210	0	0	0	0	0	0	0	840
Engineering Support Subtotals	**9**	**10**	**620**	**437**	**652**	**693**	**1576**	**192**	**0**	**0**	**0**	**160**	**0**	**0**	**4330**
Radiation Protection Courses															
Site Access	4	4	0	0	0	28	602	0	140	14	0	0	0	84	868
Site Access Refresher	9	9	245	168	0	0	812	42	98	14	0	0	0	21	1400
Radiation Worker Training	2	2	0	0	0	0	0	0	36	0	0	0	0	0	36
HP Overview	2	2	0	1	0	0	0	10	8	0	0	0	0	2	21
Applied Health Physics	2	5	0	172	0	0	0	172	172	0	0	0	7740	0	8256
Air Sampling for Radioactive Mtls.	1	1	210	245	105	105	0	0	0	0	0	0	0	0	665

Table A–3 Specialized Technical Training Instructional-Hour Totals by Course (cont.)

Course	QTY	C–W	R1 IH	R2 IH	R3 IH	R4 IH	NRR IH	AEOD IH	NMSS IH	RES IH	CTR IH	IP IH	SP IH	OTH IH	TOT IH
Health Physics Technology	2	3	134	536	536	201	0	67	134	67	0	0	1139	0	2814
Radwaste Management	1	1	64	96	96	64	32	0	32	0	0	0	0	0	384
RERO	2	2	0	32	32	32	0	0	0	0	0	0	0	0	96
Safety Aspects of Indust. Radiography	3	3	144	36	72	72	0	36	0	0	0	252	1368	72	2052
Radio Emer Preparedness Planning	1	1	0	0	0	0	96	0	0	0	0	0	0	0	96
Transportation of Radioactive Materials	1	1	64	64	256	128	0	64	96	0	0	0	1056	128	1856
HP in Radiation Accidents	1	1	0	0	0	32	0	0	0	32	0	0	0	0	64
Environmental Sample Analysis	1	1	20	120	40	20	0	0	40	0	0	0	0	0	240
Respiratory Protection	2	2	0	0	70	35	0	0	0	35	0	0	0	0	140
Internal Dosimetry & Whole Body	1	1	315	175	210	210	0	0	0	35	0	0	0	0	945
Teletherapy & Brachytherapy	1	1	320	80	240	240	0	40	0	0	0	0	0	0	920
Pool–Type Irradiator	1	1	0	144	72	36	0	0	72	0	0	0	72	0	396
HP Topical Review	1	1	0	378	0	0	0	0	0	0	0	0	0	0	378
Environmental Monitoring for Radioact.	1	1	105	105	105	0	0	0	0	0	0	0	350	0	665
Health Physics Engineering	1	1	0	0	0	0	0	0	0	0	0	0	840	0	840
Radiation Protection Subtotals	**40**	**44**	**1621**	**2352**	**1834**	**1203**	**1542**	**431**	**828**	**197**	**0**	**252**	**12565**	**307**	**23132**
Fuel Cycle Courses															
Nuclear Criticality Safety	1	1	0	175	105	105	0	140	280	0	0	0	0	0	805
Fuel Cycle Technology	1	1	0	84	56	28	0	28	364	0	0	0	0	28	588
OSHA Orientation	3	3	0	231	987	0	0	0	0	0	0	0	0	0	1218
Hazards of Chem. & Mech. Fuel Cycle	1	1	0	175	70	0	0	0	980	0	0	0	0	0	1225
Fuel Cycle Subtotals	**6**	**6**	**0**	**665**	**1218**	**133**	**0**	**168**	**1624**	**0**	**0**	**0**	**0**	**28**	**3836**

Table A-3 Specialized Technical Training Instructional-Hour Totals by Course (cont.)

Course	QTY	C-W	R1 IH	R2 IH	R3 IH	R4 IH	NRR IH	AEOD IH	NMSS IH	RES IH	CTR IH	IP IH	SP IH	OTH IH	TOT IH
Safeguards Courses	1	1	105	35	70	105	245	35	70	0	245	0	0	0	910
Safeguards Subtotals	**1**	**1**	**105**	**35**	**70**	**105**	**245**	**35**	**70**	**0**	**245**	**0**	**0**	**0**	**910**
Regulatory Skills Courses															
Non Power Reactor	1	1	64	0	0	32	192	32	0	0	0	0	0	0	320
Inspection Procedures	2	2	0	72	0	36	0	0	0	36	0	36	1296	252	1728
Licensing Practices & Procedures	2	2	324	72	72	180	0	0	0	0	0	0	1404	252	2304
Root Cause Incident Investigation Workshop	2	2	35	455	560	70	35	0	0	0	0	0	0	315	1470
Human Performance Investigation Process	2	2	0	84	140	0	0	0	0	0	0	0	0	0	224
Inspecting for Performance	3	3	234	324	108	162	252	0	36	0	0	0	0	0	1116
IIT Training	1	2	246	164	164	410	492	246	164	164	0	0	0	0	2050
OIG Staff Training	2	2	70	140	35	70	0	0	0	0	0	0	0	1225	1540
Regulatory Skills Subtotals	**15**	**16**	**973**	**1311**	**1079**	**960**	**971**	**278**	**200**	**200**	**0**	**36**	**2664**	**2044**	**10752**
Specialized Technical Training Totals	**94**	**100**	**4131**	**5528**	**5637**	**3427**	**7105**	**1752**	**2817**	**1647**	**245**	**578**	**15229**	**2656**	**50788**

Appendix B

Student Totals by Course

Contents

Tables

Key

QTY	=	Quantity of-Courses
C–W	=	Quantity of Course-Weeks
IH	=	Instructional-Hours
# S	=	Number of Students
R1	=	Region I
R2	=	Region II
R3	=	Region III
R4	=	Region IV
NRR	=	Office of Nuclear Reactor Regulation
AEOD	=	Office for Analysis and Evaluation of Operational Data
NMSS	=	Office of Nuclear Material Safety and Safeguards
RES	=	Office of Nuclear Regulatory Research
CTR	=	NRC Contractors
IP	=	International Programs Personnel (Foreign National)
SP	=	State Programs
OTH	=	Other NRC Offices or Other Agencies
TOT	=	Total

Table B–1 Reactor Technology Student Totals by Course

Course	QTY	C–W	R1 #S	R2 #S	R3 #S	R4 #S	NRR #S	AEOD #S	NMSS #S	RES #S	CTR #S	IP #S	SPOTH #S		TOT #S
General Electric Technology															
GE BWR/4 Technology (R–101B)	1	1	2	1	0	0	5	1	1	5	0	0	0	2	17
GE BWR/6 Technology (R–106B)	1	1	0	2	3	5	3	0	0	2	0	0	0	1	16
GE BWR/4 Technology (R–200B)	1	4	0	0	0	1	6	0	0	0	0	0	0	0	7
GE BWR/4 Technology (R–304B)	2	6	4	4	8	1	9	0	0	0	0	0	0	0	26
GE BWR/4 Advanced Technology	1	2	2	2	1	1	1	0	0	0	0	0	0	0	7
GE BWR/4 Simulator	5	5	3	3	6	1	9	0	0	0	0	0	0	0	22
GE BWR/4 EOP Simulator	4	4	1	3	7	0	9	0	0	0	0	0	0	0	20
GE BWR/4 Sim. Ref. (Examiners)	1	1	1	2	2	0	0	0	0	0	1	0	0	0	6
GE BWR/4 Sim. Ref. (Inspectors)	8	8	14	3	16	2	4	3	0	0	1	0	0	0	43
GE BWR/6 Sim. Ref. (Inspectors)	1	1	0	1	3	0	0	1	0	0	0	0	0	0	5
GE Nuclear Engineering	1	2	2	1	1	0	6	1	0	0	0	0	0	0	11
GE BWR/4 Technical Managers	1	1	2	0	0	3	2	0	0	0	0	2	0	0	9
GE Subtotals	**27**	**36**	**31**	**22**	**47**	**14**	**54**	**6**	**1**	**7**	**2**	**2**	**0**	**3**	**189**
Westinghouse Technology															
Westinghouse Technology (R101P)	1	1	0	2	1	0	3	1	0	4	0	0	0	5	16
Westinghouse Technology (R–304P)	1	3	1	1	0	1	1	0	0	0	0	1	0	0	5
Westinghouse Advanced Technology	2	4	3	2	4	2	2	0	0	0	1	4	0	4	22
Westinghouse Simulator	4	4	3	1	4	2	2	0	0	0	1	3	0	3	19
Westinghouse EOP Simulator	2	2	2	1	4	1	1	0	0	0	1	2	0	0	12

Table B-1 Reactor Technology Student Totals by Course (cont.)

Course	QTY	C-W	R1 #S	R2 #S	R3 #S	R4 #S	NRR #S	AEOD #S	NMSS #S	RES #S	CTR #S	IP #S	SPOTH #S		TOT #S
Westinghouse Sim. Ref. (Examiners)	1	1	0	0	3	0	2	0	0	0	0	0	0	0	5
Westinghouse Sim. Ref. (Inspectors)	14	14	8	21	21	10	5	7	0	0	1	1	0	0	74
Westinghouse Maintenance Overview	3	3	5	5	8	2	7	8	0	0	0	0	0	0	35
Westinghouse Technical Managers	1	1	0	1	2	2	1	1	0	0	0	1	0	0	8
Westinghouse Subtotals	**29**	**33**	**22**	**34**	**47**	**20**	**24**	**17**	**0**	**4**	**4**	**12**	**0**	**12**	**196**
Combustion Engineering Technology															
CE Technology (R-305P)	1	3	1	2	2	2	1	0	0	0	0	2	0	0	10
CE Advanced Technology	1	2	1	1	2	2	1	0	0	0	0	2	0	0	9
CE Simulator	2	2	1	1	1	2	1	1	0	0	0	2	0	0	9
CE EOP Simulator	2	2	1	1	1	2	1	2	0	0	0	2	0	0	10
CE Sim. Ref. (Inspectors)	1	1	1	0	1	2	0	0	0	0	0	0	0	0	4
CE Subtotals	**7**	**10**	**5**	**5**	**7**	**10**	**4**	**3**	**0**	**0**	**0**	**8**	**0**	**0**	**42**
Babcock & Wilcox Technology															
B&W Technical Managers	1	1	0	4	1	1	0	0	0	0	0	0	0	1	7
B&W Subtotals	**1**	**1**	**0**	**4**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**7**
Generic Reactor Technology															
Reactor Concepts	1	1	0	0	2	0	1	0	0	3	0	2	0	10	18
NRC News Media Seminar	1	1	1	1	1	0	0	0	0	0	0	0	0	10	13
Reactor Safety	1	1	0	0	2	0	7	4	0	0	0	0	0	0	13
Generic RT Subtotals	**3**	**3**	**1**	**1**	**5**	**0**	**8**	**4**	**0**	**3**	**0**	**2**	**0**	**20**	**44**
Reactor Technology Totals	**67**	**83**	**59**	**66**	**107**	**45**	**90**	**30**	**1**	**14**	**6**	**24**	**0**	**36**	**487**

Table B–2 Specialized Technical Training Student Totals by Course

Course	QTY	C–W	R1 #S	R2 #S	R3 #S	R4 #S	NRR #S	AEOD #S	NMSS #S	RES #S	CTR #S	IP #S	SPOTH #S	TOT #S
Probabilistic Risk Assessment														
Fundamentals of PRA	1	1	0	2	0	0	10	3	2	5	0	1	0	1	24
Probability & Statistics for PRA	2	2	0	1	0	0	13	3	1	6	0	1	0	2	27
PRA Basics for LPMs	1	1	0	0	0	0	6	3	0	1	0	0	0	4	14
PRA Basics for Inspection Appl.	4	4	12	13	20	15	4	0	0	1	0	0	0	1	66
PRA Insights into an IPE	9	9	38	22	26	0	59	16	0	7	0	4	0	1	173
System Modeling Techniques	1	1	0	0	0	0	15	2	0	10	0	0	0	0	27
Advanced IRRAS	2	2	1	0	0	0	5	2	0	3	0	0	0	1	12
Human Reliability Analysis	1	1	0	0	0	1	5	1	1	8	0	1	0	1	18
Data Analysis Workshop	1	1	0	2	0	0	9	1	0	6	0	0	0	0	18
Risk Assessment in Event Evaluation	1	1	0	0	0	0	10	2	0	7	0	0	0	1	20
PRA Subtotals	**23**	**23**	**51**	**40**	**46**	**16**	**136**	**33**	**4**	**54**	**0**	**7**	**0**	**12**	**399**
Engineering Support														
Power Plant Engineering	1	2	1	1	0	0	9	0	0	0	0	0	0	0	11
Emergency Diesel Course	2	2	5	3	6	8	9	5	0	0	0	0	0	0	36
Motorized Valve Actuators	4	4	9	2	8	4	5	1	0	0	0	5	0	0	34
Eddy Current Testing	1	1	0	0	2	2	0	0	0	0	0	0	0	0	4
Heat Exchanger Predictive Analysis	1	1	2	5	4	7	6	0	0	0	0	0	0	0	24
Engineering Support Subtotals	**9**	**10**	**17**	**11**	**20**	**21**	**29**	**6**	**0**	**0**	**0**	**5**	**0**	**0**	**109**
Radiation Protection														
Site Access	4	4	0	0	0	2	43	0	10	1	0	0	0	6	62
Site Access Refresher	9	9	35	24	0	0	116	6	14	2	0	0	0	3	200
Radiation Worker Training	2	2	0	0	0	0	0	0	9	0	0	0	0	0	9
HP Overview	2	2	0	1	0	0	0	10	8	0	0	0	0	2	21
Applied HealthPhysics	2	5	0	1	0	0	0	1	1	0	0	0	45	0	48

Table B–2 Specialized Technical Training Student Totals by Course (cont.)

Course	QTY	C–W	R1 #S	R2 #S	R3 #S	R4 #S	NRR #S	AEOD #S	NMSS #S	RES #S	CTR #S	IP #S	SPOTH #S		TOT #S
Air Sampling for Radioactive Mtls.	1	1	6	7	3	3	0	0	0	0	0	0	0	0	19
Health Physics Technology	2	3	2	8	8	3	0	1	2	1	0	0	17	0	42
Radwaste Management	1	1	2	3	3	2	1	0	1	0	0	0	0	0	12
RERO	2	2	0	1	1	1	0	0	0	0	0	0	0	0	3
Safety Aspects of Indust. Radiography	3	3	4	1	2	2	0	1	0	0	0	7	38	2	57
Radio Emer Preparedness Planning	1	1	0	0	0	0	3	0	0	0	0	0	0	0	3
Transportation of Radioactive Materials	2	2	2	2	8	4	0	2	3	0	0	0	33	4	58
HP in Radiation Accidents	1	1	0	0	0	1	0	0	0	1	0	0	0	0	2
Environmental Sample Analysis	1	1	1	6	2	1	0	0	2	0	0	0	0	0	12
Respiratory Protection	2	2	0	0	2	1	0	0	0	1	0	0	0	0	4
Internal Dosimetry & Whole Body	1	1	9	5	6	6	0	0	0	1	0	0	0	0	27
Teletherapy & Brachytherapy	1	1	8	2	6	6	0	1	0	0	0	0	0	0	23
Pool-Type Irradiator	1	1	0	4	2	1	0	0	2	0	0	0	2	0	11
HP Topical Review	1	1	0	18	0	0	0	0	0	0	0	0	0	0	18
Environmental Monitoring for Radioact.	1	1	3	3	3	0	0	0	0	0	0	0	10	0	19
Health Physics Engineering	1	1	0	0	0	0	0	0	0	0	0	0	24	0	24
Radiation Protection Subtotals	**39**	**43**	**69**	**83**	**43**	**33**	**163**	**22**	**52**	**7**	**0**	**7**	**135**	**18**	**632**
Fuel Cycle															
Nuclear Criticality Safety	1	1	0	5	3	3	0	4	8	0	0	0	0	0	23
Fuel Cycle Technology	1	1	0	3	2	1	0	1	13	0	0	0	0	1	21
OSHA Orientation	3	3	0	11	47	0	0	0	0	0	0	0	0	0	58
Hazards of Chem. & Mech. Fuel Cycle	1	1	0	5	2	0	0	0	28	0	0	0	0	0	35
Fuel Cycle Subtotals	**6**	**6**	**0**	**24**	**54**	**4**	**0**	**5**	**49**	**0**	**0**	**0**	**0**	**1**	**137**

Table B–2 Specialized Technical Training Student Totals by Course (cont.)

Course	QTY	C–W	R1 #S	R2 #S	R3 #S	R4 #S	NRR #S	AEOD #S	NMSS #S	RES #S	CTR #S	IP #S	SPOTH #S		TOT #S
Safeguards	1	1	3	1	2	3	7	1	2	0	7	0	0	0	26
Safeguards Subtotals	**1**	**1**	**3**	**1**	**2**	**3**	**7**	**1**	**2**	**0**	**7**	**0**	**0**	**0**	**26**
Regulatory Skills															
Non Power Reactor	1	1	2	0	0	1	6	1	0	0	0	0	0	0	10
Inspection Procedures	2	2	0	2	0	1	0	0	0	1	0	1	36	7	48
Licensing Practices & Procedures	2	2	9	2	2	5	0	0	0	0	0	0	39	7	64
Root Cause Incident Invest. Wkshp.	2	2	1	13	16	2	1	0	0	0	0	0	0	9	42
Human Performance Investigation Proc.	2	2	0	12	20	0	0	0	0	0	0	0	0	0	32
Inspecting for Performance	3	3	13	18	6	9	14	0	2	0	0	0	0	0	62
IIT Training	1	2	3	2	2	5	6	3	2	2	0	0	0	0	25
OIG Staff Training	2	2	2	4	1	2	0	0	0	0	0	0	0	35	44
Regulatory Skills Subtotals	**15**	**16**	**30**	**53**	**47**	**25**	**27**	**4**	**4**	**3**	**0**	**1**	**75**	**58**	**327**
Specialized Technical Training Totals	**93**	**99**	**169**	**212**	**212**	**102**	**362**	**71**	**111**	**64**	**7**	**20**	**210**	**89**	**1629**

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11. ABSTRACT (200 words or less)

This annual report of the U.S. Nuclear Regulatory Commission's Office for Analysis and Evaluation of Operational Data (AEOD) describes activities conducted during CY 1994 and FY 1995. The report is published in three parts. NUREG-1272, Vol. 9, No. 1, covers power reactors and presents an overview of the operating experience of the nuclear power industry from the NRC perspective, including comments about the trends of some key performance measures. The report also includes the principal findings and issues identified in AEOD studies over the past year and summarizes information from such sources as licensee event reports, diagnostic evaluations, and reports to the NRC's Operations Center. NUREG-1272, Vol. 9, No. 2, covers nuclear materials and presents a review of the events and concerns during 1993 associated with the use of licensed material in nonreactor applications, such as personnel overexposures and medical misadministrations. Both reports also contain a discussion of the Incident Investigation Team program and summarize both the Incident Investigation Team and Augmented Inspection Team reports. Each volume contains a list of the AEOD reports issued from 1980 through 1993. NUREG-1272, Vol. 9, No. 3, covers technical training and presents the activities of the Technical Training Center in support of the NRC's mission in FY 1995.

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digital instrumentation and control training
Westinghouse simulator
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engineering support training
radiation protection training
safeguards training
Agreement State training
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Combustion Engineering simulator
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