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Integrated Regulatory Review Service Mission to the United States

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MODULE 11B: FEEDBACK OF OPERATING EXPERIENCE

Overview

Following the accident at Three Mile Island Unit 2 in March 1979, and again after the discovery of reactor vessel head degradation at Davis-Besse in February 2002, the operating experience (OpE) program at the U.S. Nuclear Regulatory Commission (NRC) received close examination to determine how it could be improved to reduce the likelihood that these types of events would recur. The purpose of the program that evolved is to collect, evaluate, communicate, and apply operating experience to help prevent significant events and inform NRC decisionmaking. By keeping track not just of daily events but also of lower level occurrences that do not rise to the level of reportability at power reactors around the country and around the world, and by performing trending and analysis of available data for signs of developing adverse trends, the OpE program supports the NRC goal of protecting the health and safety of the public and the environment.

NRC Policy/Program

Background/History

As one of the responses to the reactor accident and partial core melt at Three Mile Island in March 1979, NRC established the Office for Analysis and Evaluation of Operational Data, dedicated to the collection and analysis of operating experience. In 1998, the office was disbanded. The core functions, including analysis and trending of data, were distributed to other NRC offices, but there was no longer a single, centralized group responsible for operating experience.

Following the February 2002 discovery at Davis-Besse of reactor vessel head degradation caused by control rod drive mechanism leakage, a lessons-learned task force recommended reestablishment of a program dedicated to the review of operating experience, and the current OpE program was created. The foundation provided by existing data analysis efforts provided a base on which to build a group that would serve as the focal point for all agency operating experience. Starting with an agency-wide management directive clearly delineating roles and responsibilities, and an Office of Nuclear Reactor Regulation (NRR) office instruction giving further details as to how the program would function, the Operating Experience Branch in NRR took on the centralized role of coordinating all NRC reactor operating experience functions.

Among the first steps, the creation of a centralized, internal Web site, the Reactor OpE Information Gateway, provided one Web page with links to the available searchable databases. A clearinghouse team was established, which met daily to review events and create a daily summary of occurrences. Formal processes were established for further review of issues that the group determined to be safety significant and generically applicable and also to ensure that less significant issues that still warranted interest were brought to the attention of the relevant technical groups. The centralized process provided a way to ensure dissemination of operating experience throughout the NRC on a regular basis and provided a systematic means for finding additional information and assigning potentially significant issues to the appropriate technical staff members.

Current Policy/Program

The agency's OpE program for reactors ensures that operating experience is processed effectively and efficiently in a risk-informed and timely manner. It ensures that the NRC's rulemaking, licensing, oversight, and incident response programs are able to continuously learn from operating experience and effectively apply the lessons learned.

The OpE program ensures that operating experience information is systematically collected, stored for future use, screened for followup, and effectively communicated to or made available to internal and external stakeholders. The OpE program provides coordination to ensure that timely decisions are made with respect to the application of operating experience. The program analyzes operating experience to identify trends and recurring issues of safety significance for short and longer term agency actions.

An important part of the program resides in the Office of Nuclear Regulatory Research (RES), which develops and manages programs to take a longer term and broader evaluation of U.S. operational safety data and reliability information for determining risk-significant trends and for use in probabilistic risk assessments. RES also performs risk and reliability analyses and evaluations based on operating experience to assess industry and plant performance and to identify plant outliers.

Reporting of Events

Reactor events of potential safety and regulatory significance are reported to the NRC in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.72, "Immediate Notification Requirements," and 10 CFR 50.73, "Licensee Event Reporting System." Reports involving radioactive exposure and contamination events are made in accordance with 10 CFR Part 20, "Standards for Protection against Radiation." Time requirements vary depending on the urgency and severity of the situation, and range from an hour for events requiring an emergency declaration, to 60 days for licensee event reports (LERs). The details of the reports also vary depending on the timeframe involved. Event notifications made under the regulations of 10 CFR 50.72 require as much information as is available at the time, with the emphasis on notification rather than detail. LERs provide more detailed information, including a summary of the event details, safety significance, cause analysis, corrective actions, and a review of previous similar events at the plant.

Screening of Events

The OpE Clearinghouse meets daily to discuss reactor event notifications submitted in accordance with 10 CFR 50.72 and 50.73; inspection findings; reports submitted to the International Nuclear and Radiological Event Scale Web site; reports of manufacturing defects submitted in accordance with 10 CFR Part 21, "Reporting of Defects and Noncompliance"; international reports from the Web-based International Reporting System for Operating Experience (IRS); and other "lower level" plant issues, which are discussed during the regional morning phone calls. The team uses a screening process defined in the OpE office instruction to determine whether issues rise to the level of safety significance and generic applicability that would benefit from more indepth analysis as an issue for resolution (IFR). Criteria considered in the screening process include quantitative assessments of risk significance, the safety significance of the event, complications involved, potential failure modes not previously considered, or heightened public or governmental interest.

Investigation of Events

It is the NRC's policy to ensure that significant operational events are investigated in a timely, objective, systematic, and technically sound manner; that the factual information pertaining to each event is documented; and that the cause or causes of each event are ascertained. Following an event determined to be of increased significance whether caused by unforeseen complications, significant equipment failures, or human performance deficiencies, the regional offices perform an evaluation in accordance with Management Directive 8.3, "NRC Incident Investigation Program," to determine if a reactive inspection is appropriate.

The decision regarding an "investigatory response" for a significant operational event is defined by its risk significance, complexity, and generic safety implications. Significant events are evaluated on the basis of both deterministic criteria and risk significance, such as conditional core damage probability, to define the level of investigatory response. NRC responses could range from a followup inspection by the resident inspector or inspections led by a special inspection team, an augmented inspection team, or an incident investigation team.

Indepth Analysis of Safety-Significant Events

Events that are screened at the OpE Clearinghouse as IFRs are examined in more detail both by the OpE group and by the staff of the relevant technical branches. Analysis involves developing a complete understanding of what occurred during the event, including what went wrong, the safety significance of each failure, cause analysis, and a review of operating experience. The review incorporates reports from the licensee regarding immediate causes and root causes, safety analysis, and lessons learned, as well as reports from NRC inspectors. Input from the technical branch staff helps to clarify engineering and other issues experienced during the event and aids in the determination of the safety significance of the event and its generic applicability to other plants. The technical branch also provides a means to verify the licensee's analysis of the situation. A review of operating experience examines whether the problem has been noted before, whether action has already been taken, and if so, whether that action should have been sufficient to prevent a recurrence. If the review by the technical staff and the OpE group concludes that more agency action is necessary to prevent a repeat of the event at another plant, a variety of possible actions is available.

Events resulting from licensee performance deficiencies are also evaluated using the significance determination process as part of the Reactor Oversight Process (ROP). Inspection results are examined on a quarterly basis along with performance indicators submitted by the licensee to evaluate the level of regulatory oversight needed for each reactor site. More formal assessments are performed by the Regions on a semi-annual basis to determine upcoming inspection schedules.

Longer term evaluation of events and other operating experience is conducted through the use of technical review groups (TRGs) on an annual basis. TRGs produce multiple, independent comprehensive assessments and recommendations for additional actions or applications in the various technical areas of interest.

The Accident Sequence Precursor (ASP) Program also evaluates significant events. This program reviews U.S. nuclear power plant operating experience to identify, document, and rank the operating events that are most likely to lead to inadequate core cooling and severe core damage (accident precursors). The ASP Program has the following objectives: provide a

comprehensive, risk-based view of nuclear power plant operating experience and a measure for trending nuclear power plant core damage risk; provide a partial check on dominant core damage scenarios predicted by probabilistic risk assessments; and provide feedback to regulatory activities. The NRC also uses the ASP Program to monitor industrywide safety performance against the safety goal established in the agency's Strategic Plan.

Consideration of Trends

For consideration of long-term trends, various OpE databases capture all events, including those that do not meet the criteria for screen-in. The OpE group analyzes events that have occurred to determine common features, such as failures of similar components or systems, similar operational events at multiple plants, or similar failure causes across systems. Trend analysis is used to determine if a possible adverse trend is developing and the actions that might be necessary to prevent low-level problems from becoming a safety-significant event. The results of trending analysis are presented for screening consideration at the OpE Clearinghouse meeting, and demonstration of a developing adverse trend is one of the screening criteria.

The NRC also has an Industry Trends Program (ITP), which is described in Inspection Manual Chapter 0313. Using the ITP, the staff monitors industry safety performance to identify and address adverse industry trends. In addition to evaluating the long-term trends and indicators, the ITP uses a statistical approach based on prediction limits to identify potential short-term, year-to-year emergent issues before they become long-term trends. The ITP complements the ROP in that the ITP monitors industry-level performance, while the ROP provides oversight of individual plant conditions and events. Another important output of the ITP is the annual agency performance measures reported to Congress on the number of statistically significant adverse industry trends in safety performance. In addition, NRC senior managers review the results of the ITP and any actions taken or planned during the annual Agency Action Review Meeting. The NRC staff reports the findings of this review to the Commissioners.

Recommended Actions

The final result of the IFR process is a recommendation as to whether the NRC needs to act to help prevent the same type of event from happening again, and if so, what action(s) would be most appropriate. The most common application of the OpE process is the issuance of a generic communication, usually in the form of an information notice (IN), to inform the industry and the public of the event. INs may either give an indepth account of a single, safety-significant event, or they may summarize several events that are linked by a common theme (e.g., the mode of failure, the equipment that failed, or the root cause). These INs document information that can be used to prevent reoccurrence of the event in question.

In addition to generic communication, some events may require further actions. One possibility is a revision to NRC inspection procedures to ensure that plant procedures and equipment with the ability to affect safety receive the appropriate attention during the inspection process. An OpE Smart Sample may be developed, which provides inspectors with an in-depth guide for inspecting systems, equipment, or procedures shown by operating experience to be a source of potentially safety-significant events. The OpE Smart Sample is designed as an additional tool to be used by agency staff within the baseline inspection program for operating experience issues the NRC considers to have potential generic safety implications. Complex technical issues that

cannot be resolved within the few months allocated to the IFR process may be transferred to the generic issues program or to RES for more indepth analysis. If it is determined that the NRC's regulations are insufficient to address an issue, the rulemaking process may be initiated.

Dissemination of Information

One focus of the OpE program is to make relevant information available to those who can use it. As such, a summary with a brief description of the events considered at each OpE Clearinghouse meeting is e-mailed daily to affected and interested staff. Events of interest that do not rise to the level of the screening criteria are e-mailed to the relevant TRGs to ensure their awareness of all relevant issues. The TRGs submit an annual report to the OpE group, summarizing their review of the information they received and noting any evidence of a potential adverse trend or a need for further action. This report is available on the OpE Gateway where it may be accessed by all staff in the agency.

Many issues, even those that do not rise to the level of an IFR, are sufficiently complex or involve a more detailed description that they warrant more description than can be provided in the daily summary. In this case, an agency internal Web-based OpE communication is written, allowing a complete description of the event, analysis of the issues, and links to relevant supporting information. The OpE communications are maintained in a database accessible from the OpE Gateway, and notification is sent to interested groups within the agency when new information is posted.

Results from the ITP and the ASP Program are documented in annual papers to the Commission and are available on the NRC's public Web site.

Events rated Level 2 or higher on the International Nuclear and Radiological Event Scale, or events whose rating is requested by a member nation of the International Atomic Energy Agency, are posted to the Nuclear Events Web-Based System within 2 working days. All reactor-related generic communications are submitted to the IRS. NRC participation in these programs ensures worldwide dissemination of information and operating experience. In addition, the OpE group actively participates in the Committee on Nuclear Regulatory Activities Working Group on Operating Experience, exchanging information on both significant issues from the past year and emerging issues of regulatory interest.

Generic communications provide the widest distribution of information. Though mailed directly to licensees, they are available from the NRC public Web site for the general public and the international audience to ensure the broadest possible dissemination of information. Performance reports summarizing licensee performance over the previous year are discussed at annual public meetings, and are also made available on the public Web site, as are event notifications and LERs submitted in accordance with 10 CFR 50.72 and 10 CFR 50.73.

Continuous Monitoring of Programs

The NRC performs a formal assessment of various aspects of its OpE program every 3 years. However, constant feedback from within the program and from the program's customers throughout the agency is considered on a regular basis and incorporated into the program as necessary. To provide a relevant and timely product, the OpE program continuously adapts to the changing needs of technical reviewers and the inspectors at the regions and at reactor plant sites.

The Institute of Nuclear Power Operations (INPO), an industry organization, and the individual licensees jointly conduct licensee operating experience programs. While INPO is responsible for the collection and analysis of industry operating experience as described in Generic Letter 82-04, "Use of INPO See-in Program," dated March 9, 1982, each plant is responsible for maintaining and reviewing plant-specific operating experience and ensuring that appropriate corrective actions are taken. NRC Inspection Procedure 71152, "Problem Identification and Resolution," provides for the resident inspector to take quarterly, semiannual, and annual inspection samples to ensure that licensee review of plant-specific, industry, and NRC-generated operating experience is effective. Additionally, the procedure implements a biennial inspection of the licensee's inspection program by a team of inspectors, which reviews records as far back as 5 years to verify the effectiveness of the licensee operating experience program. In addition, the problem identification and resolution (PI&R) crosscutting area is used to identify inspection findings characterized by a failure to adequately implement operating experience and provides a path for increased oversight if a pattern of PI&R issues develops.

Storage, Retrieval, and Documentation of Information

One of the key initiatives of the OpE program is the creation of a single page on the internal NRC Web site, which offers agency personnel access to various databases and search engines to allow for more efficient and effective retrieval of operating experience. The databases allow for searches of, among other things, event notifications, LERs, inspection findings, international reports, IFRs, INPO documents, and generic communications. This Reactor OpE Information Gateway also provides links to OpE communications, IFR analyses, and TRG reports.

A more restricted database available within the OpE group contains detailed information on each event notification, including its screening disposition and INES rating, along with information from 10 CFR Part 21 reports and each IFR. The OpE group is currently developing a searchable database for lower level OpE data that do not meet any reporting thresholds, but which may provide valuable trending information before significant events occur.

Strengths of Current Program

The current OpE program harnesses available information technology and the broad spectrum of technical experience at the agency to provide a comprehensive review of issues of potential safety significance to power reactors. This program provides current information to those who are most able to use it and makes past information available in an easily searchable and retrievable format.

The OpE Clearinghouse meeting ensures that issues of potential safety significance receive the appropriate agency attention in a timely manner.

Dissemination of information via the Clearinghouse Daily Summary, e-mails to TRGs, and OpE communications keeps all potentially interested personnel within the agency informed of current safety issues and events.

The TRG program and use of technical branch staff to assist in evaluations of operating experience ensure that technical issues requiring indepth expertise can be examined at the appropriate level to address developing safety issues.

The ROP provides for increased oversight of licensees who repeatedly demonstrate a failure to properly implement lessons from operating experience, as noted by the PI&R crosscutting area.

A single, internal Web page provides access to searchable databases for both current issues of interest and past events, serving as a valuable knowledge management tool for OpE.

In summary, the NRC has an OpE program that is effective and that covers all of the elements listed in International Atomic Energy Agency Safety Guide NS-G-2.11.

Considerations for the Future

While there have been major adjustments to the OpE program from lessons-learned reviews following the Three Mile Island accident and the Davis-Besse incident, OpE is a continuously evolving program. Current projects aimed at enhancing the accessibility and effectiveness of the program are the development of a searchable database for lower level operating experience data, which often provide valuable trending information, and a more comprehensive and better delineated process for the analysis and trending of the information that is received. The NRC will continue to use domestic and international operating experience to inform decisionmaking, to improve regulatory programs, and to apply safety-focused operating experience research to anticipate and resolve safety issues to aid in protecting the public health and safety and the environment.