

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR REACTOR REGULATION  
WASHINGTON, DC 20555-0001

February 5, 2007

NRC INFORMATION NOTICE 2007-04: CONSTRUCTION EXPERIENCE RELATED TO  
THE ASSURANCE OF QUALITY IN THE  
CONSTRUCTION OF NUCLEAR FACILITIES

## **ADDRESSEES**

All current and potential applicants for an early site permit (ESP), combined operating license (COL), or standard design certification (DC) for a nuclear power plant under the provisions of Title 10 Code of Federal Regulations (10 CFR) Part 52, all current holders of and potential applicants for construction permits under 10 CFR Part 50, and all licensees and potential applicants for new fuel cycle facilities under 10 CFR Part 70.

## **PURPOSE**

The U.S. Nuclear Regulatory Commission (NRC) is issuing this Information Notice (IN) to alert addressees to the importance of considering lessons learned from construction experience when planning for and constructing new nuclear power plants or fuel cycle facilities. Recipients are expected to review the information for applicability to their planned activities and to consider actions, as appropriate, to avoid similar problems. However, the suggestions contained in this IN are not NRC requirements; therefore, no specific action or written response is required.

## **DESCRIPTION OF CIRCUMSTANCES**

Interest in constructing new nuclear power plants is increasing in the United States. Fifteen utilities have officially notified the NRC of their intent to submit applications to construct more than 24 new nuclear power plants. One major fuel cycle facility is currently under construction in the United States with more expected. These events follow a hiatus of more than 20 years in the construction of new reactors in the United States. Lessons learned during the last period of plant construction in the United States and during recent international construction offer the industry the opportunity to understand the causal factors that have led to construction problems. Developing an appreciation for these factors will decrease the likelihood of repeating past mistakes and will promote quality in nuclear power plant design and construction. While the experiences referred to in this IN come from the construction of a new nuclear power plant, the NRC believes it is also appropriate for consideration in the construction of new fuel cycle fabrication facilities.

## **BACKGROUND**

In the late 1970s and early 1980s, several nuclear power plant construction projects experienced major problems related to design and construction quality. The Congress directed the NRC to conduct a study to improve quality in the construction of future nuclear power

plants. The NRC published the results of the 1984 study as NUREG-1055, "Improving Quality and the Assurance of Quality in the Design and Construction of Nuclear Power Plants" (ADAMS Accession No. ML063000293).

NUREG-1055 focused on what had happened in the past to derive lessons to apply in the future. The report stated:

"The increased industry and NRC experience and the lessons learned, if applied properly, should decrease the probability of major quality problems in future generations of nuclear plants. However, there are several conditions under which major quality problems might recur. These include the following:

- A first-time utility with staffs or an architect/engineer, construction manager, or constructors (vendors and fabricators) that have inadequate nuclear design or construction experience;
- A very large growth in the number of nuclear power plants being constructed that can overwhelm the industry's and NRC's capabilities;
- A long delay before nuclear plant construction activities start again, resulting in a dearth of experience in the industry;
- Regulatory actions at federal and state levels that undercut quality.

The NRC and the nuclear industry need to be aware of the implications for quality that these possibilities hold."

Several of the conditions identified in NUREG-1055 under which major quality problems might recur currently exist in the U.S. This fact emphasizes the importance of understanding the causal factors associated with historical construction problems in order to chart a future course for assuring quality in new nuclear power plant construction.

## **DISCUSSION**

The nuclear industry is responsible for designing, constructing, and operating reactors and fuel cycle facilities in a manner consistent with NRC regulations and other applicable federal laws. Each licensee is responsible for achieving and assuring the quality of a nuclear power plant, beginning with its design and construction. NUREG-1055 identified several causes of significant quality-related problems that have occurred during the construction of nuclear power plants:

- An inability of utility management to adequately control all aspects of the construction project, including planning, scheduling, procurement, and oversight of contractors;
- Inexperience with nuclear plant construction, resulting in utilities and their contractors not fully appreciating the complexity and difficulty associated with building a nuclear power plant and therefore the importance of nuclear-related standards;

- A false sense of security growing out of prior successes;
- A failure to establish an atmosphere that encourages problem reporting and resolution at all levels of the organization;
- A failure to delegate authority commensurate with responsibility; and
- A failure to have clear communication pathways across all project interfaces.

NUREG-1055 noted that “quality craftsmanship is an absolute necessity” for achieving quality in nuclear construction. Further, it also noted that the failure of management to control certain conditions, such as the amount of rework because of excessive design changes, the failure to complete designs sufficiently ahead of construction, uninformed supervision, and a project environment that emphasizes production to the detriment of quality, can defeat quality craftsmanship.

Improvements in the performance of operating reactors over the last decade may suggest that these historical issues will no longer pose a problem. However, recent construction experiences in Finland indicate that the causal factors identified in 1984 continue to exist in the current international construction arena. In Investigation Report 1/06, “Management of Safety Requirements in Subcontracting During the Olkiluoto 3 Nuclear Power Plant Construction Phase,” dated July 10, 2006, the Finnish Radiation and Nuclear Safety Authority (STUK) identified the following causal factors related to construction problems at the Olkiluoto 3 construction site:

- Poor communication between design and construction organizations and within organizations participating in construction;
- Overconfidence in personnel with little nuclear industry experience and inadequate oversight and training;
- Ineffective problem identification, reporting, and inadequate corrective actions;
- Unrealistic and aggressive schedules to complete designs sufficiently ahead of construction;
- Inadequate assignment of responsibilities and authority to control assigned work,
- Inadequate communication of nuclear power plant specific requirements on quality and quality control from the plant vendor to subcontractors in the tendering stage and in purchase agreements;
- Inadequate understanding by vendors and contractors of the special work practices required for performing work in the nuclear field,
- Inadequate training of the subcontractors at the site and the staff of the manufacturers about the importance to safety of the work and about the special requirements of constructing for nuclear power plants; and

- Over reliance on subcontractors by the owner.

STUK has posted the complete report at [http://www.stuk.fi/stuk/tiedotteet/en\\_GB/news\\_419/](http://www.stuk.fi/stuk/tiedotteet/en_GB/news_419/).

In both Finland and the United States, interest in new reactor and fuel cycle facility construction is resuming after many years. However, the problems currently being identified in Finland are very similar to those that occurred in the United States more than 20 years ago. Regardless of the licensing process and the type of construction, a commitment to quality, instilled early in a nuclear construction project, is important to ensure that the facility is constructed and will operate in conformance with its license and the NRC's regulations.

## **CONTACT**

This IN requires no specific action or written response. Please direct any questions about this matter to the Office of New Reactors contact listed below.

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and Operational Programs  
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Note: NRC generic communications may be found on the NRC public Web site, <http://www.nrc.gov>, under Electronic Reading Room/Document Collections.