EXPERIENCE DURING NRC INSPECTION OF LOW-LEVEL WASTE GENERATOR REQUIREMENTS OF 10 CFR PART 61

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ABSTRACT

The final NRC regulation governing disposal of low-level radioactive waste was published on December 27, 1982[1]. Requirements therein which apply to licensed waste disposal site operators were effective one month later on January 26, 1983. Also included in Section 10 CFR 61 were certain new requirements applicable to generators of low-level waste to be disposed of at licensed low-level shallow land burial sites. These waste generator requirements became effective one year after publication; i.e., on December 27, 1983. The new regulations provide for classification and characterization of waste, waste form and stability, shipment manifest preparation and tracking, and certain record keeping. Since early 1984, NRC regional inspectors have been including inspection of compliance with these new waste generator requirements in their routine inspections of radwaste/transportation programs of licensees who generate low-level waste for disposal at licensed burial sites. This paper describes the principal elements of this inspection program and provides observations and general conclusions by the writer thus far, based on his reviews of reports of those inspections.

BACKGROUND

Regional Training Prior to Inspections of New Rule

During 1983 and early in 1984, a series of two regional training sessions and briefings were provided by the NRC Office of Nuclear Materials Safety and Safeguards (NMSS) to the regional inspection staffs. These sessions included general orientation on the new rules, as well as discussions of the two Branch Technical Position Papers[2] which were issued by NMSS, pertaining to waste classification and waste form.

Inspection Procedures

Concurrent with the effectiveness of the waste generator requirements of Section 10 CFR 61, the relevant NRC inspection procedure (IE Procedure No. 84850)[3], was issued to the NRC regional offices by NRC Headquarters. This procedure is titled, "Radioactive Waste Management-Inspection of Waste Generator Requirements of 10 CFR 20 and 10 CFR 61." The stated objective contained within this procedure is ... "To determine whether the licensee has established and is maintaining adequate management-controlled procedures and quality assurance which reasonably assure compliance with the requirements of 10 CFR 20 and 10 CFR 61 applicable to low-level waste radwaste form, classification, stablization and shipment manifests/tracking." In using this inspection procedure, inspectors are expected to verify the adequacy of the:

1. Management Control Program
2. Quality Control Program
3. Waste Manifest Preparation and Procedure for Tracking of Shipments
4. Waste Classification Procedures and Methodology
5. Waste Form and Characterization
6. Waste Shipment Labeling
7. Procedures for Meeting Disposal Site License Conditions

During any inspection of a licensees 10 CFR 61 compliance program, the major amount of inspector's time and effort can generally be expected to be devoted to items 2, 4, and 5.

In the general guidance contained in the inspection procedure, inspectors were advised that "flexibility" should be exercised in judging the adequacy of a licensee's program for waste classification and characterization/waste form. This philosophy of "flexibility" was emphasized particularly during the first year of effectiveness of Section 10 CFR 61 requirements. As a result, during the first year, deficiencies observed were usually categorized as "open items" to be specifically reinspected during the next inspection to determine the nature and extent of corrective action taken. More recently, however, Section 10 CFR 61 deficiencies have been more typically classed as violations, and included in a written notice-of-violation to the licensee.

The inspections of Section 10 CFR 61 activities are normally carried out by health physicist inspectors assigned to either the Facilities (Reactor) Radiation Protection Section or the Materials Inspection Section in each NRC regional office. Such reactor inspectors routinely inspect such aspects as radiation protection, instrumentation, ALARA, liquid and gaseous effluents, post-accident sampling, and transportation and low-level waste, including Section 10 CFR 61 requirements. The transportation/Section 10 CFR 61 aspects may either be included in a 5-day inspection covering a number of the other aspects, or in a separate inspection. In general, the transportation/Section 10 CFR 61 portion of the inspection requires from 2-3 days per inspection and for reactors it is generally done annually. For materials licensees, the frequency of inspection will vary depending on the type of licensee.

Concurrently with the issuance of the Branch Technical Position Papers[2], written inspection implementation guidelines were provided to the inspectors. These are summarized below:

IMPLEMENTATION GUIDANCE TO INSPECTORS

General

- o A formally revised process control program (PCP) to incorporate Section 10 CFR 61 need not be in place as of December 27, 1983.
- o Written procedures and controls must be in place for classifying waste and ensuring that Class B and C wastes are in stable form.
- o Section 10 CFR 61 implementation activities need not necessarily be included in licensee's corporate level Q/A program for nuclear "safety related" items pertaining to safe operation of a nuclear power plant.

Waste Classification

1. Generic PWR, BWR or facility scaling factors are acceptable if actual sample analysis data correlate with the generic data base;
2. If generic scaling factors are not appropriate for an individual waste stream, scaling factors should be based on data from the specific waste stream;
3. For Class B and C wastes, it is acceptable to base correlation factors on a single set of analyses, repeated annually (every 2 years for Class A) to confirm the continued validity of scaling factors;
4. If the waste stream sample analyses have not been completed, calculated scaling factors are acceptable while sample analyses are in progress ("in progress" means that samples must have actually have been shipped off-site to a laboratory at the time of inspection). Following receipt of sample analysis, calculational methods may continue to be used provided that there is good correlation with the actual sample analyses;
5. NRC-approved topical reports for waste classification are acceptable for demonstrating compliance with the requirements of Section 10 CFR 61.55;
6. The four methods for classifying waste as described in the BTP are acceptable. Different methods are acceptable provided they result in a realistic representation of the waste class and correlate to actual measurements.

Waste Form and Characterization

1. Class B and C solidified waste programs should contain test data addressing compressive strength, leachability, irradiation stability, biodegradation and thermal stability. The test report results or a schedule for completion of such testing should be available for inspection. Several solidification media classically in use; e.g., cement, vinyl-ester-styrene, and asphalt are acceptable, provided that qualification testing is in progress and procedures are in use to assure consistent production of waste capable of existing as a free-standing monolith. (The acceptability of asphalt is being reevaluated by the States of SC and Wn.)
2. The waste generator solidification process control program should incorporate the testing information from the solidification agent stability qualification.
3. NRC-approved topical reports[4] on high-integrity containers (HIC's) and solidification agents are acceptable for demonstrating compliance with Section 10 CFR 61.56(b).
4. State-issued Certificates of Compliance (COC) for HIC's are acceptable for demonstrating compliance for waste shipped to that state.

Prior to Effectiveness of Rule

During 1983, prior to the effective date of Section 10 CFR 61 for waste generators, NRC inspectors routinely made inquiries of licensees regarding the status of their preparations for compliance with the new rules to become effective later that year on December 27, 1983. In accordance with an interim inspection procedure[5], these inquiries were made during routine health physics/radwaste inspections, and included determining whether:

a. the licensee was aware of the new regulations. If he were not, a copy of the new regulation was to be furnished to him, with the strong recommendation that he become familiar with it, and begin his preparations for compliance, and

b. if the licensee was aware of the rule, the inspector was then to determine whether the necessary procedures for compliance had been or were being developed, or were planned; and

c. if available, the inspector was then to seek specific information on:

   1. the waste classification methodology to be used;
   3. the process control program for waste classification, stabilization and use of high-integrity containers (HIC);
   3. the waste manifest system description and tracking procedures.

No attempts were necessarily required of inspectors to analyze the above information. In general, it was found that all operating reactor licensees were well aware of the forthcoming new regulations and were in the process of developing new procedures for compliance. A great many licensees had already taken their initial series of waste stream samples and had sent them off to analytical laboratories. In the non-fuel cycle area; e.g., byproduct material licensees, a majority of licensees were determined not to be waste generators. However, some that were waste generators were actually found to be unaware of Section 10 CFR 61. In this regard, the inspectors inquiry and furnishing of a copy of the rule turned out to be a fruitful endeavor.

Observations Since Rule Effectiveness

During the past two years, inspection of Section 10 CFR 61 compliance has been included as a routine part of inspections of operating reactors, as well as

inspections of fuel cycle licensees and byproduct materials licensees which generate waste for shipment to low-level waste burial sites. The observations presented herein are the results of the writer's routine review of several hundred relevant inspection reports, as well as accompaniments with regional inspectors on eight occasions to operating reactors during 1984-1985.

In general, a fairly high degree of compliance with Section 10 CFR 61 requirements has been found to exist. Based on those observations, it appears that reasonable efforts have been made and are continuing to be made by waste generators, particularly those in the power reactor fuel-cycle, to classify and characterize their waste streams, stabilize their material in the proper form, as well as to prepare shipment manifests and follow manifest tracking procedures.

There have been, however, some difficulties, problems and noncompliances noted, although these have neither been of extreme severity nor high in frequency. A discussion of the nature of those items should be of benefit to all licensees subject to Section 10 CFR 61.

Each of the items discussed below is presented in relation to the applicable paragraphs of Section 10 CFR 61:

o Section 20.311(d)(3) Quality Control Program

Under this section, licensees are required to conduct a quality control program to assure compliance with the waste classification requirements of Section 61.55 and the waste form requirements of Section 61.56. Such a program must include management evaluation of audits. Deficiencies relating to such a quality control program were amongst the most frequently noted, and include, typically:

- o a lack of or incomplete written procedures for the Q/A program
- o failure to perform Q/A audits
- o use of insufficiently trained auditors for such audits
- o specific failures to limit liquid contents in some waste shipments to less than 0.5% or 1.0% (also a violation of Section 61.56(a)(3) and the burial site license condition).

o Section 61.55(a)(8) Inappropriate Application of Waste Stream Scaling Factors

In recognition that some radionuclides may be difficult to analyze routinely, the regulations allow the use of indirect methods of measurement, such as scaling factors, which relate the inferred concentration of a difficult-to-measure nuclide to another which is easier to measure; i.e., a surrogate. There must, however, be reasonable assurance that the indirect method can be correlated with the actual measurements. During the early stages of the effectiveness of Section 10 CFR 61, many licensees used generic scaling factors; i.e., based on data from similar waste streams from other facilities, later combined with actual plant waste stream data to further refine the accuracy of the scaling factors. Difficulties have been observed when the scaling factors derived from a mix of generic and facility-specific data are under-conservative and differ substantially from actual facility samples. The NRC Branch Technical Position Paper recommends a guideline that inferred concentrations should generally be in agreement with actual waste stream analyses to within a factor of ten. In a number of cases, inspectors have observed some differences as high as a factor of 1,000. When such discrepancies exist, licensees should reevaluate scaling factors each time that waste stream sample results are obtained. In recognition of difficulties being experienced by some licensees in the application of scaling factors, the NRC has developed and will issue shortly, an information notice titled: "Low-level Radioactive Waste Scaling Factors - 10 CFR Part 61."

o Section 10 CFR 20.311(d)(1) and Section 61.55(4)(i) Misclassification of Waste

One rather widely publicized event[6] involving misclassification has been observed. It was the result of calculational errors in the beta-spectrometry calibration for Sr-90 in solid DAW type wastes. The violation occurred as a result of Sr-90 measurements being in error (low) by a factor of two, due to failure to consider the total equilibrium beta disintegration rate from the Sr-90 plus the Y-90 in calculations. Although this calculational error was repetitive for a number of shipments, only several drums had been incorrectly classified as Class A rather than Class B.

o Section 20.311(d)(1) Failure to Analyze and Characterize a Waste Stream

- o In the case of a non-fuel cycle licensee, it was found that actions had not been taken to sample and analyze the waste stream. In this case, the licensee did have available the results of an NRC-sponsored, contract R&D study done prior to effectiveness of Section 10 CFR 61. That study assessed and characterized the specific waste package then in use by the licensee. The licensees had apparently been relying on this study as his complete waste stream characterization and analysis. The study, however, had concluded that the package then in use would meet the then-proposed Section 10 CFR 61 criteria, except for its inability to meet the long-term degradability characteristics due to corrosion. Additional waste stream sampling for analysis of certain constituents was also recommended. The matter was left as an unresolved item, pending a licensee commitment to perform a waste stream analysis.
- o In another case, a byproduct material licensee (waste broker) who receives and repackages waste had failed to perform stability testing on a Class B/C waste form. This form consisted of DOT special form sealed sources and/or density gauges containing such sources, encased in concrete-filled drums. The specific concrete matrix, which appeared to be adequate, had not, however, actually been specifically evaluated for stability, nor was it a concrete method which had been addressed by a state or NRC-approved topical report.

CONCLUSIONS

Over two years have now passed since the Section 10 CFR 61 requirements applicable to waste generators have been effective. This period has been one of learning for both the regulators as well as the

regulated. Prior to January 1984, many expressions of concern over the rules were apparent over the predicted economic impacts, as well as over the possible method in which the regulations would be enforced by inspectors. A number of papers have been given by others at the last several Waste Management meetings regarding economic aspects.

Based on the NRC experience in inspecting the Section 10 CFR 61 requirements in the last several years, the transition to the new rules appears in general to have taken place in an orderly fashion. In general, reasonable and diligent efforts appear to be in progress to properly classify and characterize waste stream and to prepare appropriate waste shipment manifests. No significant observations of gross noncompliance or total ignorance of the new rules have been evident. Although some problems and dificiencies have been observed, they have been relatively few in number as well as severity.

REFERENCES

1. U.S. Nuclear Regulatory Commission, "Licensing Requirements Land Disposal of Radioactive Waste," Federal Register (47 FR 57446) December 27, 1982.

2. U.S. Nuclear Regulatory Commission, "Final Waste Classification and Waste Form Technical Position Papers," mailed to all NRC licensees on May 11, 1983, by the Division of Waste Management.

3. U.S. Nuclear Regulatory Commission, Office of Inspection and Enforcement, Inspection and Enforcement Manual, Inspection Procedure No.84850, "Radioactive Waste Management - Inspection of Waste Generator Requirements of 10 CFR 20 and 10 CFR 61," issued February 21, 1984.

4. U.S. Nuclear Regulatory Commission, "Topical Reports in Support of the Implementation of Waste Classification and Waste Form Requirements," Federal Register (48 FR 40512), September 8, 1983.

5. U.S. Nuclear Regulatory Commission, Office of Inspection and Enforcement, Temporary Instruction No. 84850/1, "Radioactive Waste Management - Licensee Preparation for Compliance with 10 CFR 61," issued June 6, 1983.

6. Nuclear News, article "Some Cleanup Waste Seen as Misclassified," page 119, November 1985.