

January 14, 1985

Mr. Walter H. Dardenne
Principal Licensing Engineer
Safety and Licensing Operation
General Electric Company
175 Curtner Avenue
San Jose, California 95125

Dear Mr. Dardenne:

SUBJECT: AMENDMENTS TO SER ACCOMPANYING ACCEPTANCE LETTER DATED
DECEMBER 27, 1985 FOR TOPICAL REPORT NEDE-30878 "TRANSPORTABLE
MODULAR AZTECH PLANT"

Enclosed are revised pages to the SER for the subject Topical Report which include some previously omitted statements, previously omitted Appendix A and typographical corrections. Please include Appendix A and substitute the corrected SER pages for the respective pages in the SER that accompanied the December 27, 1985 letter. Corrections are noted with vertical lines in the margins opposite the corrections that were made. All other aspects of the December 27, 1985 letter remain.

If you have any questions, please contact Harold Bernard at 301-492-9794.

Sincerely,

Original signed by
Herbert Berkow, Director
Standardization and Special
Projects Directorate
Division of PWR Licensing-B

Enclosures:
As stated

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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Sincerely,

A handwritten signature in dark ink, reading "Herbert N. Berkow". The signature is fluid and cursive, with the first name "Herbert" and last name "Berkow" clearly visible.

Herbert Berkow, Director
Standardization and Special
Projects Directorate
Division of PWR Licensing-B

Enclosures:
As stated

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

Report Number: NEDE-30878

Report Title: Transportable Modular Aztech Plant

Originating Organization: General Electric Company, San Jose, Ca.

Reviewed by: (1) EG&G Idaho, Inc. Idaho Falls, Id.
(2) Plant Systems Branch, Division of BWR
Licensing, NRR
(3) Waste Management and Engineering Branch,
Division of Waste Management, NMSS
(4) Waste Management Branch, Division of
Health, Siting & Waste Management, RES

1.0 INTRODUCTION

In October 1981, the U. S. Nuclear Regulatory Commission (NRC) established a policy regarding the volume reduction of low-level radioactive waste. The policy statement addressed the need for volume reduction and the need for waste generators to minimize the quantity of waste produced. The General Electric Aztech process is one of a number of means available in the nuclear industry by which licensees can achieve volume reduction of radioactive waste.

In February 1985, General Electric Company submitted for NRC review and approval their Licensing Topical Report (LTR) NEDE-30878, "Transportable Modular Aztech Plant (Aztech System)," supplemented by (1) Revision No. 1 to the LTR dated April 15, 1985, (2) Revision No. 2 to the LTR dated June 28, 1985, and (3) responses to the NRC licensing review questions dated August 9, September 6, November 6 and December 9,

The waste streams covered by the test data include the following non-radioactive solutions or slurries simulating typical nuclear power plant low-level wastes:

- Sodium sulfate, up to 60 weight percent
- Boric acid, up to 50 weight percent
- Mixed bed bead resins, up to 40 weight percent
- Mixed bed powdered resins, up to 40 weight percent
- Decontamination solution up to 40 weight percent
- Combination of bead resins, and 4 weight percent sodium sulfate,
up to 40 weight percent total solids
- Oxidized powdered resins, up to 60 weight percent

2.4.1 Minimum Requirements of 10 CFR Section 61.56(a)

2.4.1.1 Packaging

The waste form is contained in a steel 55-gallon drum and thus satisfies the requirement.

2.4.1.2 Liquid waste

Liquid wastes are completely solidified in solidification operations. This satisfies the requirements of no more than 1 percent by volume of free standing liquid in unstabilized waste.

2.4.1.3 Free liquid

Water is completely removed by the Aztech process. Liquids fed to the process are completely polymerized, so that no free standing liquid remains. Each drum of product is to be checked for free standing liquid. The PCP also provides corrective measures to be used in the

event of failure to polymerize. This also satisfies the requirement that

the volume of free standing water be no more than 1 percent.

2.4.1.4 Reactivity of product

On the basis of the information provided by GE, the waste form produced from normal power plant wastes does not contain any substances capable of explosive decomposition or reactions at pressures and temperatures anticipated during processing, transportation and disposal.

2.4.1.5 Gas generation

On the basis of the information provided by GE, the waste form also does not contain, nor is capable of generating, quantities of toxic gases, vapors or fumes harmful to persons transporting, handling or disposing the waste form.

2.4.1.6 Pyrophoricity

The waste form does not contain materials which are pyrophoric as defined in 20 CFR Section 61.2.

2.4.1.7 Gaseous wastes

This provision is not applicable to the Aztech waste form. The Aztech products are not in a gaseous form.

2.4.1.8 Hazardous wastes

The waste form does not contain biological, pathogenic or infectious material. Wastes are hazardous if so designated in 40 CFR Part 261 by the Environmental Protection Agency (EPA). The designation may result from (a) having the characteristics of ignitability, corrosivity,

The polymerization reaction does not involve formation of gaseous byproducts which might create gas-filled voids within the solidified waste form.

2.4.3 Branch Technical Position on Waste Form

2.4.3.1 Compressive strength

The specimens tested were nominally 1 inch in diameter by 2 inches long and were prepared by casting in plastic containers. The test compression used was ASTM C 39 as provided in the TPWF. The minimum required compressive strength is 50 psi.

In all cases, the compressive strength of the laboratory specimens ranged from 1,700 psi to 10,550 psi. While there was significant variability between the compressive strengths of duplicate specimens, all the data were considerably in excess of the 50 psi strength requirement. The Aztech process, therefore, satisfies the guidelines provided in the TPWF; namely, that the waste form exhibit more than the minimum acceptable compressive strength of 50 psi.

2.4.3.2 Radiation resistance

The data for compressive strength, after irradiation for all waste types tested, fall in the range of 3,700 to 11,000 psi. The specimens were exposed to 100 megarad (Mrd) cumulative dosage from a gamma irradiator, |

2.4.3.4 Leachability index

The TPWF guideline is that leach indices obtained in accordance with ANS 16.1 should be greater than 6 and that the leach testing should include 90-day results.

Data are presented representing tests with deionized water and synthesized sea water using three non-radioactive tracers - cesium, strontium, and cobalt. All samples satisfied the TPWF guideline. All leach indices exceeded 7.1, with many test leach indices in the range of 10.0 to 15.2.

2.4.3.5 Immersion resistance

The TPWF states that test specimens of the solidified waste form shall retain compressive strengths of at least 50 psi following immersion for 90 days in water. Specimens from leach testing may be used. The data presented include results from immersion in deionized water and in sea water.

The data indicate that the compressive strength generally decreases with increased waste loading, sometimes sharply. Because of the large relative standard deviations found in many cases, attention was focused on the minimum values. In all but three cases, the minima were well over 1,000 psi, far in excess of the 50 psi required. In two of these exceptions, the minimum of 50 psi was satisfied. The remaining exception involved bead resins with 4 weight percent sodium sulfate loaded to the 40% total solid level in the waste form. In this case,

correlation tests were performed on Aztech samples from the 60 weight percent sodium sulfate waste stream. Correlation means that results obtained for samples cut from full-scale specimens are comparable to results from laboratory samples.

Correlation was demonstrated to the extent that all of the compressive strength values are well above the 50 psi minimum.

With respect to the leach index data, the data for the cut samples are in agreement with the laboratory scale data in that all leach indices are greater than 6.0. Therefore, the TPWF guideline is satisfied.

2.4.3.9 Homogeneity

Data for twelve cut samples from the full scale specimen showed compressive strengths within a range of 2,900 to 8,700 psi. After a 90-day immersion in deionized water, the range of strengths was from 1,880 to 8,800 psi; for sea water immersion, the range was from 800 to 7,550 psi. Homogeneity, therefore, was achieved in that all compressive strengths were well above the 50 psi minimum.

2.5 Fire Protection

The entire Aztech plant (three transportable modules) is provided with a system that contains smoke and heat sensors and alarms. Sprinkler systems are provided in the chemical handling, chemical storage, and sludge operating areas and in each operating cell. All working areas

the GE reported compressive strength was less than 50 psi after immersion in deionized water. This waste stream showed a compressive strength of 2,600 psi at a 30 weight percent loading. The staff concludes, therefore, that the Aztech product meets the immersion resistance guideline in the TPWF for up to 30 weight percent loading of the bead resin, and 4 weight percent sodium sulfate waste.

2.4.3.6 Thermal cycling resistance

The TPWF states that solidified waste forms should retain a minimum compressive strength greater than 50 psi after 30 thermal cycles between 60°C and -40°C, as per ASTM B 553.

GE data show compressive strengths after thermal cycling to be in the range of 2,000 to 11,500 psi. Therefore, the TPWF guideline is satisfied.

2.4.3.7 Free liquid

Water is completely removed from the waste before encapsulation and all liquid reactants are believed to be completely polymerized before exiting the process. The requirement that free liquids be no more than 0.5 volume percent of the stabilized waste is satisfied. Free liquids were not observed in the qualification testing.

2.4.3.8 Full-scale results

The TPWF states that test data from sections or cores of the full-scale products be correlated with test data from laboratory specimens. The full-scale Aztech waste form is a 55-gallon size product. These