SAFETY EVALUATION
TRANSFIX™ SERVICE

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I. INTRODUCTION

Installation of the NUS Process Services TRANSFIX™ System constitutes a change in the waste processing practices at a nuclear power station. The requirements of 10 CFR Part 50.59 permit a licensee to make changes in the facility design and operating procedures, as described in the Safety Analysis Report without NRC approval, provided the change does not involve modifications to the station technical specifications and that a safety evaluation is performed. No modifications to the station technical specifications will be required as a result of TRANSFIX™ installation and operation. This report describes the design features of the TRANSFIX™ System with regard to safety questions to assist the licensee in performing a safety evaluation.

II. SYSTEM CRITERIA

General guidelines for radioactive waste management systems are presented in U.S. NRC Regulatory Guide 1.143 (Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water Cooled Nuclear Power Plants). This document is only a guide and does not set forth any specific requirements, however, this document does provide the basis for TRANSFIX™ System design and operation.

A. Design Criteria

1. Process Piping - All TRANSFIX™ process piping is designed, fabricated and tested in accordance with ANSI B31.1. All stainless materials are used in system piping and, where practical, in the selection of piping components, such as valves, gauges, pumps, etc. Thus corrosion which could affect the system integrity is minimized. The waste processing lines are nominally 1 1/2 inches in diameter and are designed such that radioactive material will not collect in low points or crevices.

2. Welding - Welding of piping is performed by welders and procedures qualified to ASME Section IX. System piping is designed for an operating pressure of 150 psig and is hydrotested at 225 psig (1.5 times the operating pressure) for a minimum of 30 minutes in accordance with ANSI B31.1.

3. Vessels - All TRANSFIX™ filtration and ion exchange vessels are pressure vessels which are designed, fabricated and tested in accordance with ASME Section VIII. The vessels have a design pressure of 150 psig and are hydrotested to 225 psig. A pressure relief is provided on the Control & Sample Panel as required by Section VIII to protect the system in the event an overpressure condition occurs.

   A filter housing which uses replaceable cartridge filters may be provided with the system for removal of suspended solids. This vessel is also

designed and fabricated for a design pressure of 150 psig and hydrotested to 225 psig. The material of construction is stainless steel for corrosion resistance.

4. Resin Liners - Liners used to dewater or solidify, transport and dispose of contaminated resins are designed for compatibility with all these operations. For dewatering, the liners are provided with a low-point drain for maximum water removal. For transport to the disposal site, the liner is designed to fit the transport cask and does not have features which could damage the cask during loading or shipping. All liners are fabricated by welders using procedures qualified to ASME Section IX. Lifting slings are designed with a safety factor of 5.

5. Hoses - Hoses with quick-connect couplings are used to connect system piping units and vessels. All hoses are compatible with the radwaste water environment and have a minimum operating pressure equal to that of the system pressure (150 psig). The hoses are hydrotested after fabrication to assure the integrity of the end-fitting and the absence of defects in the hose materials. The hoses are selected to be resistant to the effects of abrasion and abuse during operations.

6. Electrical System - All system electrical components are selected and installed in accordance with the National Electric Code (NEC). Motors are TEFC totally enclosed types suitable for both indoor and outdoor applications. Motor and process controls are mounted in NEMA Type 4 enclosures, designed for indoor or outdoor use.

NEMA 4 enclosures are designed to meet hosedown, dust, external icing and rust-resistance tests.

B. System Quality Assurance

The TRANSFIX™ System equipment falls within the general envelope of NUS Quality Assurance Level 2, since rad-waste systems are not considered "safety related" and compliance with the full extent of 10 CFR 50, Appendix B is not required. Due to its impact on plant operations and the nature of its function, however, systematic and documented control of design, procurement and fabrication activities is necessary. The NUS Process Services Quality Assurance Program complies with the quality provisions specified in ANSI N199-1976/ANS-55.2 as directed in Regulatory Guide 1.143.

1. Design and Procurement Control - Design and procurement documents are independently reviewed for compliance with the system QA requirements. Each TRANSFIX™ System has a complete set of as-built drawings prior to release for field use. Changes to these documents are verified and controlled in accordance with NUS Process Services procedures to maintain conformance with QA requirements.

2. Purchasing - Suppliers of major equipment items, such as vessels, skids, shields, etc., are surveyed to verify that the supplier has the capability to meet quality requirements specified in procurement documents. Suppliers of equipment or materials to be used in fabrication of the process piping must provide C of C's certifying conformance with purchase order requirements.

3. Testing and Inspection - Each TRANSFIX™ System undergoes thorough functional and hydrostatic testing prior to release. Documentation and procedures provide for the identification of items which pass required inspections and tests. Items of nonconformance and the corrective actions required are identified and documented during QA inspection of supplied items.

4. Maintenance - TRANSFIX™ System Equipment maintenance is performed regularly by the technician in accordance with established schedules and procedures. Regular maintenance contributes to long equipment life, trouble-free operation and effective performance in decontaminating radioactive wastes.

III. SAFETY CONSIDERATIONS

The TRANSFIX™ System is designed and operated to ensure the safety of operating personnel and the general public. Specificly, system design and operation have been developed to minimize the following:

- Radiation exposure to operating personnel (ALARA)
- Potential for uncontrolled releases of radioactive material

The features of the TRANSFIX™ System which contribute to safety are presented in the following sections.

A. ALARA

The TRANSFIX™ System is designed and operated to maintain radiation exposures to operating personnel as low as reasonably achievable (ALARA) in accordance with NRC Regulatory Guide 8.10. Time-shielding-distance principles are applied to minimize radiation exposures by the following methods:

- o Minimizing the time technicians are exposed to vessels containing radioactive materials.
- o Use of process and storage shields to shield pressure vessels and resin liners.
- o Remote control of system operations.

The following sections present the specific methods by which ALARA principles are applied.

1. Minimizing Exposure Time - In operating the TRANSFIX™ System, the technician is exposed to contaminated vessels only when making connections and capping for transport and disposal. All connections are quick-connect couplings and can be made and broken quickly (< 5 seconds). Since the vessels are shielded, most exposure occurs only to the hands and arms. Quick-connect hose couplings also assist in minimizing exposure during system maintenance and repair activities.

2. Process Shields - The filtration and ion exchange vessels in which radioactive material is concentrated are placed in lead shields to attentuate gamma radiation. The shields have a wall-thickness equivalent to two inches of lead,

approximately the same as the shipping cask in which the radioactive, exhausted vessels will be loaded for transport to the burial site. The shields undergo testing by gamma scan at the time of manufacture to verify the absence of voids which could be formed as a result of improper pouring of the lead.

3. Storage Shields - The concrete storage shields provided by NUS are fabricated of high-density concrete and carbon steel. The eight-inch wall thickness of concrete, with a density of approximately 225 pounds, provides effective gamma attenuation and, as with the lead shield, the concrete shields are gamma-scanned to ensure uniform density throughout the shield. Waste reading 25 Rad/hour on contact can be stored without excessive radiation levels external to the shield. Topside shielding is provided with an optional two-inch, carbon-steel lid.

4. Remote Operation - All waste processing, resin transfer, dewatering and solidification operations are controlled remotely from the Plant Connection Skid, the Control & Sample Panel, Dewatering Skid or the Vessel Solidification System. It is unnecessary to approach the radioactive vessels in the process shields until vessel or resin replacement is required.

B. Uncontrolled Releases

The TRANSFIX™ System has been designed to minimize the potential for uncontrolled release of radioactive material in the power station and off-site to the general public. The following sections present the methods by which the potential for releases are minimized.

1. System Design - As stated in Section III, all pressure-retaining components, such as vessels, piping and hoses, are designed and fabricated in accordance with applicable codes and manufacturer's specifications. Thus, release of radioactive material resulting from the loss of system integrity is minimized through proper design.

2. Hydrostatic Testing - At the completion of fabrication, all pressure-retaining components are hydrotested to 1.5 times the system design pressure in accordance with ASNI B31.1. Whenever the system pressure boundary is broken (for example: a hose coupling is disconnected), the system is leak tested with noncontaminated water prior to reinitiating waste processing operations. Procedures require the operating technician to secure the "ears" of quick-connect fittings with tie-wraps or clips to prevent inadvertent disconnection while processing.

3. Dewatering Skid - The dewatering skid incorporates several features to prevent the release of radioactive material during normal dewatering operations or during an upset when a break in the system integrity occurs. Air is pulled through the vessel being dewatered and filtered through a coalescer and a high-efficiency filter. Essentially, all particulates are removed in the process. For added conservatism, the process area can be vented to the plant off-gas system. At power stations where the dewater skid is currently installed, numerous dewatering operations were monitored to verify that radioactive material was not released to the process area atmosphere. No activity was detected.

Vacuum is used in the dewatering process to prevent leakage of radioactive material from the dewatering system. If a line break occurs, inleakage of air to the system will occur and contamination will not be released. In contrast, a line break in a compressed air system would result in leakage of contaminated air and entrained water into the process area.

4. Processing Area - The process area provided for the TRANSFIX™ System must be suitable for waste processing operations. Access to the area must be controlled. The area should be vented to the facility off-gas system and the drains must be controlled and directed to the facility waste collection system. Curbs or other means to contain waste or resin spills are also required, especially where radioactive material could flow out of the process area to uncontrolled areas. With these precautions, the possibility of an uncontrolled off-site release is minimal.

IV. PROCESS CONTROL

Process controls ensure that waste processing, dewatering and solidification operations comply with regulatory requirements. During waste processing, the operating technician obtains periodic grab samples for pH, conductivity and isotopic analysis and records the results in data records. Due to the TRANSFIX™ System design in which vessels are installed in series, it is not critical to the system performance to identify the exact time of vessel exhaustion. When upstream vessels become exhausted, the downstream vessels begin loading with radioactive material with no decrease in decontamination factors. The grab sample analyses indicate

when the upstream vessels should be removed from service. Cumulative curie loadings are calculated and updated with each isotopic analysis.

The Dewatering System is controlled with a Process Control Program (PCP) designed to provide reasonable assurance that all free water is removed from the vessel prior to disposal. The volume of water removed from a vessel is monitored to determine when all free water is removed. When no water is removed on successive days, the vessel is fully dewatered and the procedure is terminated. Documentation providing results of dewatering tests can be submitted upon request for customer review prior to use.

The Vessel Solidification System is controlled with a Process Control Progam (PCP). The PCP, as defined by NUREG 0800, has been developed to provide a reasonable assurance of complete stablization of the expended resin and to satisfy free-standing water criteria established by the disposal sites.

V. ADMINISTRATIVE CONTROLS

The TRANSFIX™ waste processing, dewatering, solidification, maintenance procedures and PCP's are controlled in accordance with the NUSPSC Quality Assurance Program. These procedures are approved by NUS Process Services Corporation management and then submitted to the customer for review. Customer review helps ensure that plant-specific safety concerns are adequately addressed in the procedures.

All work performed at the customer's site will be conducted in accordance with the site Radiation Control Program. Site Health Physics personnel will monitor and approve the conduct of work to ensure compliance with site requirements.

VI. PERSONNEL TRAINING

Technicians assigned to field projects are trained and qualified in accordance with the procedure entitled "Technician Qualification" which is available for review upon request. Only technicians with previous nuclear experience are hired to operate NUSPSC TRANSFIX™ equipment. Following satisfactory completion of formal and on-the-job training, technicians are certified by the Division Director. Technician certifications will be submitted to the utility if required for review prior to the technician's assignment.

VII. REFERENCES

1. USNRC Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants".

2. USNRC Regulatory Guide 8.8, "Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will Be As-Low-As-Reasonably Achievable" (ALARA)

3. IE Circular No. 80-18, "10 CFR 50.59 Safety Evaluations for Changes to Radioactive Waste Treatment Systems".

4. IE Information Notice No. 79-09, "Spill of Radioactively Contaminated Resin".

5. NUREG/CR-2731, "An Evaluation of the Safety Aspects of Temporary/Mobile Radioactive Waste Solidification Systems".

6. NUS Process Services Quality Assurance Program.

NUS PROCESS SERVICES CORPORATION

Affidavit Submitted to the Nuclear Regulatory Commission Concerning Confidential Information and Trade Secrets Contained in Procedures Prepared by NUS Process Services Corporation

State of South Carolina
County of Richland

Regan E. Voit states as follows on behalf of NUS Process Services Corporation:

1. I am the Director of Waste Management Services for NUS Process Services Corporation.

2. I have prepared and am familiar with the following documents prepared by NUS Process Services Corporation:

   - P&ID Drawing No. 8911-M-2000, Rev. 3

   - P&ID Drawing No. 8911-M-2001, Rev. 2

3. NUS Process Services Corporation, hereinafter "NUSPSC" has granted permission for Detroit Edison Company to submit copies of the above to the Nuclear Regulatory Commission. The copies of the above contains proprietary information which should be withheld from public disclosure.

4. NUSPSC's Radwaste Solidification and TRANSFIX™ systems are major components of its waste processing business. These systems for processing radioactive liquid wastes are unique to NUSPSC. Design and fabrication details for these systems are held in strictest confidence by all employees.

All employees of NUSPSC complete an agreement with NUSPSC regarding protection and non-disclosure of trade secret information at the commencement of their employment. The information included in the procedures contains the type of information covered under the non-disclosure agreement. NUSPSC routinely stresses that such information is not to be discussed outside the company either during or after employment.

NUSPSC is in the process of making its initial entry into the radwaste processing service market. The Radwaste Solidification and TRANSFIX™ systems and associated chemical control information represent a substantial commitment of personnel and financial resources for research, development, design and procedural controls. This commitment has resulted in systems currently superior to that provided by competitors and this superiority is the basis on which system details are withheld from public disclosure.

The information included in the aforementioned documents is not available through public sources. Release through public channels of the procedures will substantially harm the competitive position of NUSPSC.

NUSPSC has expended over $750,000 in salaries and capital equipment during the last year and is engaged in a capital building project to make these systems available. Duplication of this effort by competitors would require both similar capital expenditures and the assembly of a team of experts similar to the design team employed by NUSPSC.

Regan E. Voit

Regan E. Voit
Director
Waste Management Services

Sworn and subscribed before me this 15th day of February, 1985.

Patricia L. Jewell
Notary Public

My commission expires: November 12, 1993