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WRITER'S DIRECT DIAL NUMBER

(202) 663-8090

April 13, 1988

Ms. Frances Skolnick
2079 New Danville Pike
Lancaster, Pennsylvania 17603

In the Matter of
GPU Nuclear Corporation
(Three Mile Island Nuclear Station, Unit 2)
Docket No. 50-320-OLA
(Disposal of Accident-Generated Water)

Dear Ms. Skolnick:

In its Memorandum and Order (Granting Joint Intervenors' Motion to Compel), April 6, 1988, the Atomic Safety and Licensing Board ordered Licensee to "produce for the Joint Intervenors' inspection and copying the pertinent portions of any contract entered into with a disposal systems vendor which details the technical specifications for the disposal of the accident-generated water."

I remain uncertain that I am adequately communicating Licensee's position on your document request. In its Memorandum and Order, the Board describes our position (reflected in

DS03

Licensee's Answer to Intervenors' Motion to Compel Discovery, April 1, 1988) as hinging upon the circumstance that technical specifications for accident-generated water disposal have not yet been approved by NRC and included in the TMI-2 operating license. The Board stated:

> We do not understand the Licensee to argue that there are no extant technical specifications which, even if they are not deemed to be included in and thus currently do not form a part of the operating license, address the proposed method for the disposal of the accident-generated water.

Memorandum and Order at 3. To the contrary, Licensee does not have draft or proposed technical specifications which, if approved, will become a part of the TMI-2 license. As stated in answer to your motion to compel, we have a procurement specification which was issued to potential bidders for the disposal system contract.

So that there is no further misunderstanding on this score, I am enclosing for the entire Service List a copy of the pertinent contract provisions which incorporate the procurement technical specifications, and the procurement document itself. This complies with the Board's Order. To repeat, these are commercial contract documents prepared for private parties. They do not represent regulatory requirements, draft proposed technical specifications, or eventual license conditions. They have nothing whatsoever to do with license technical specifications, now or in the future.

Sincerely,

Thomas A. Baxter

Thomas A. Baxter
Counsel for Licensee

TAB:jah
cc: Service List attached

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
GPU NUCLEAR CORPORATION	)	Docket No. 50-320-OLA
	)	(Disposal of Accident-
(Three Mile Island Nuclear Station, Unit 2)	)	Generated Water)
	)	

SERVICE LIST

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Ms. Vera L. Stuchinski
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Harrisburg, Pennsylvania 17102

Dr. William D. Travers
Director, Three Mile Island
Cleanup Project Directorate
P.O. Box 311
Middletown, Pennsylvania 17057

Adjudicatory File
Atomic Safety and Licensing Board
Panel Docket
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

GPU Nuclear

GPU NUCLEAR CORPORATION
ATTN: Contracts Office
P.O. Box 480
Middletown, PA 17057
(717) 948-8184

ISSUED TO:

Pacific Nuclear Systems, Inc.
1010 South 336th Street
Federal Way, Washington 98003
Attn: Mr. Roger Shingleton
Vice President

CONTRACT NO: TC-055068
DATE: June 15, 1987
REQUISITION NO: 4240-86-0128
QA REQUIRED: YES
QA APPROVAL: J. Marsden per telecon 7/8/87
QC RECEIPT INSPECTION REQ: YES
QA CLASSIFICATION: ITS
CERTIFICATE OF INS. REQ'D: YES

EVAPORATION OF RADIOACTIVE WATER AND PACKAGING OF WASTE

BY D W Demerse
Authorized Representative of
GPUNC Materials Management Dept.

1293U

This Contract is between the GPU Nuclear Corporation, hereinafter referred to as "OWNER", acting on behalf of Metropolitan Edison Company, Jersey Central Power & Light Company, and Pennsylvania Electric Company, Owners of the Three Mile Island Nuclear Generating Station and Pacific Nuclear Systems, Inc., with an office and place of business at 1010 South 336th Street, Federal Way, Washington, hereinafter referred to as "CONTRACTOR".

ARTICLE I - SCOPE OF WORK

This Contract covers the evaporation of 2.1 million gallons of radioactive water and subsequent dry packaging and/or compaction of the resulting waste in accordance with the "Technical Specification for Processed Water Disposal for GPU Nuclear Corporation Three Mile Island, Unit-2 Nuclear Power Plant, Rev. 0, dated 12/4/86". For administration purposes, the work and its components are segregated into seperate Line Items as follows:

A. Line Item No. 1 - Mobilization

CONTRACTOR shall mobilize all equipment and personnel required for performance of the work to Three Mile Island. Mobilization shall include set-up of all equipment including the 100 foot stack with a sound dampener.

B. Line Item No. 2 - Evaporation of Water

CONTRACTOR shall provide all required properly trained labor, supervision, tools and equipment, including a Licon Dual Evaporation System, to evaporate 2.1 million gallons of radioactive water at the TMI-2 Nuclear Generating Station. CONTRACTOR'S evaporation system shall have the capability to automatically shut down emission release and alarm upon high distillate conductivity.

C. Line Item No. 3 - Packaging of Wastes

CONTRACTOR shall process all waste through its Blender/Dryer system and compact all resulting waste using either a pelletizer or a GE Super Compactor. CONTRACTOR shall provide all labor, supervision, materials, tools, equipment and drums to package all waste acceptable for shipment to an approved disposal site. CONTRACTOR warrants that the waste will be acceptable for commercial burial, under current burial regulations.

D. Line Item No. 4 - Training and Psychological Screening

1. CONTRACTOR personnel shall undergo all required site training and psychological screening requirements (Ref. Article 60 of the General Terms and Conditions).

2. All time spent during on-site training shall be recorded on a GPUNC Services Received Document (SRD) and submitted to OWNER'S Technical Representative for approval. These SRDs shall serve as the basis for Time and Material compensation to CONTRACTOR.

GPU Nuclear

TECHNICAL SPECIFICATION

FOR

PROCESSED WATER DISPOSAL

FOR

GPU NUCLEAR CORPORATION

THREE MILE ISLAND—UNIT 2

NUCLEAR POWER PLANT

NO.	DATE	REVISIONS	APPROVALS			
			RECOVERY ENG'G.	WASTE MNGMT.	QUAL. ASSUR.	SITE OPS.
0	12/4/86	Issue for Bids	D.F.B. n/a	U.A.R. 12/4/86	[illegible] 12-4-86	[illegible] 12/4/86

SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV	SHEET	LATEST REV.	SHEET	LATEST REV
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REVISION STATUS SHEET

DOCUMENT TITLE: Processed Water Disposal

JOB TMI-2 | REV

SPEC. NO.

PAGE 1

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ARTICLE 1 SCOPE

1.1 This specification details the requirements for procurement of services for (1) a radwaste evaporator for processed water disposal, and (2) for solidification and/or packaging of concentrates generated as a result of the evaporator operation. The solidification and/or packaging is designed to provide immobilization of the evaporator concentrates for waste disposal at a commercial, low level waste disposal facility.

1.2 This specification is divided into two sections, one for evaporator services and one for solidification or dry packaging services. Prospective contractors may bid on either or both sections; however, those bidding on the entire package shall break their bids down into two parts consistent with this specification. The solidification or dry packaging section is also divided into two sections, one for packaging the waste in a dry form containing less than 1/2 of 1% free standing water and the other for solidification of the waste form using an approved binding agent.

1.3 Article 7 of this specification is provided for the prospective contractors use to prepare a responsive proposal consistent with the volume, chemistry and radionuclide concentration of the processed water to be disposed of in accordance with this specification.

ARTICLE 2 CODES AND STANDARDS

All work provided under this specification shall be in strict conformance with the latest edition, unless otherwise stated, of the applicable codes, standards, specification regulations, procedures and tests of the following:

2.1 American National Standards Institute
B31.1. Power Piping

2.2 American Society for Testing and Materials

2.3 ANSI/ASME N45.2.6 (1978) Qualification of Inspection, Examination and Testing Personnel for Nuclear Power Plants

2.4 American Society of Mechanical Engineers
Boiler and Pressure Vessel Code, Section VIII - Division 1

2.5 Institute of Electrical and Electronic Engineers

2.6 American Institute of Steel Construction

2.7 American Welding Society

2.8 Uniform Building Code, International Conference of Building Officials

2.9 National Electrical Code

2.10 National Electric Manufacturers Association

2.11 Commonwealth of Pennsylvania Fire & Panic Code and Regulations

2.12 Unfired Pressure Vessels Special Requirements for Pennsylvania

2.13 Standards of Hydraulic Institute

2.14 Standards of Tubular Exchangers Manufacturing Association

2.15 Instrument Society of America

2.16 Title 49 Code of Federal Regulations, Part 173
General Requirements for Shipping and Packaging

2.17 Title 10 Code of Federal Regulations

2.2.1 Part 20 - Standards for Protection Against Radiation

2.2.2 Part 50 - Appendix I and Part 50.59

2.2.3 Part 61 - Licensing Requirements for Land Disposal of Radioactive Waste

2.2.4 Part 71 - Packaging and Transportation of Radioactive Material

2.18 The NRC Low-Level Waste Licensing Branch, Branch Technical Position on Radioactive Waste Classification, dated April 11, 1983

2.19 The NRC Low-Level Waste Licensing Branch, Branch Technical Position on Waste Form, dated March 3, 1983

2.20 The State of Washington Radioactive Materials License WN-I019-2 issued to US Ecology, Inc.

2.21 GPUNC Recovery Quality Assurance Plan for Three Mile Island Unit-2, dated November 1, 1985

2.22 Control of Lifting and Handling Program, Administrative Procedure Number 4000-ADM-3890.02

2.23 GPUNC Radiation Protection Plan for Three Mile Island Unit 2

2.24 ANSI/ASME N45.2.11 (1974) QA Requirements for the Design of Nuclear Power Plants

2.25 ANSI/ASME N45.2.13 (1976) QA Requirements for the Control of Procurement of Items and Services for Nuclear Power Plants

ARTICLE 3 GENERAL REQUIREMENTS

3.1 EVAPORATOR

3.1.1 Work To Be Provided/Performed

Contractor shall be responsible for:

3.1.1.1 Designing, furnishing, installing, operating and maintaining a transportable evaporator system complete with facility hook up points (i.e., electrical, ventilation, etc.), instrumentation and controls, software and other accessories as specified herein.

3.1.1.2 Shop and field testing of equipment as specified herein.

3.1.1.3 Installation of all wiring on evaporator unit to single terminal locations for connection of external wiring by GPUNC.

3.1.1.4 Delivery of the equipment to the site.

3.1.1.5 Listing of equipment service tie-ins to existing plant including, as a minimum, mechanical and electrical termination points and anticipated capacities, flows and

qualities. Also includes space requirements for equipment set-up, all as described in Article 6.

3.1.1.6 Furnishing of all documentation specified herein including, the submission of drawings, qualification documents, test procedures and results and equipment performance data, all as described in Article 6.

3.1.1.7 Nothing in this specification shall diminish the contractor's responsibility to perform, in addition to the requirements of this specification and the applicable sections of Article 2 such analysis, test, inspections and other activities which he considers necessary to insure that the design, materials and workmanship are satisfactory for the intended service. Approval of the contractor's drawings, specifications, calculations, procedures, or tests by GPUNC does not relieve the contractor of the responsibilities described herein.

3.1.1.8 It is the intent of this specification to have all electrical, instrumentation and equipment associated with the evaporator unit installed in place on the unit prior to delivery to the site. If certain instrumentation or equipment cannot be installed and shipped integral with the evaporator unit housing, then contractor shall

provide all required labor for installation of said equipment after installation of the evaporator unit in the field.

3.1.1.9 Prior to delivery, contractor, using GPUNC approved procedures will run mock-up tests for proof-of-principle demonstration, evaporator process and characterization/ quantification of evaporator bottoms using a surrogate waste solution as specified by GPUNC. These tests will be performed at the contractor facility.

3.1.1.10 The contractor shall provide estimated volume reduction factors for TMI-2 processed water (see Section 7) and estimated secondary radwaste volume generation.

3.1.1.11 The contractor shall provide estimated offgas releases (see Section 7) at the evaporator exhaust duct in µCi/cc for each isotope in µCi/hour for each isotope for all anticipated operating ranges. Operating or test data for release fractions shall be included.

3.1.1.12 Equipment will be operated and maintained by contractor personnel with GPUNC support as herein noted.

3.1.1.13 Unless GPUNC dictates otherwise, the system shall be operated seven (7) days per week. The number of shifts and operating hours per day will be scheduled by the contractor to maximize the processing effort.

3.1.1.14 Systems shall be operated in an open cycle mode to allow the vapors and aerosols to discharge to the atmosphere.

3.1.1.15 Based on contractor's estimate of exhaust characteristics, the contractor shall provide electric powered exhaust duct heaters to prevent the condensation of distillates in the exhaust duct. The exhaust duct will be approximately 100 ft. in height and provided with suitable exhaust blowers.

3.1.1.16 Evaporator system shall be electric powered or powered by contractor's self contained unit. GPUNC will not provide steam to power the system.

3.1.1.17 The evaporator system shall be designed to operate outdoors in the climatic conditions anticipated at the job site.

3.1.1.18 The contractor shall provide a description of the evaporator operation with the bid which shall include the safety features and devices designed to prevent

potentially hazardous situations and protect equipment and the environment.

3.1.1.19 Contractor shall submit written procedures covering the evaporator process operation. These procedures are required to be approved by GPUNC prior to the start of work covered by this specification. These procedures shall be submitted for approval two months prior to scheduled on-site work. Response to alarm procedures and emergency shut down procedures shall also be included.

3.1.1.20 The contractor shall provide all chemical usage data in accordance with GPUNC procedures.

3.1.1.21 The contractor shall provide all sampling capabilities necessary to operate and control the system.

3.1.1.22 All equipment provided by the contractor will be in proper working order at all times. The exterior accessible surfaces of all equipment shipped to or departing TMI will be in compliance with Article 2, Section 2.23.

3.1.2 Work By Others

3.1.2.1 GPUNC will assist contractor in the receiving, unpacking, checking and storing of equipment at the job site.

3.1.2.2 Provide the necessary plant tie-ins with station utility services. These include a supply of water, instrument air and electric power. In addition, telecommunications, additional shielding, and crane service will be provided if required. These requirements are to be provided through formal submittal by the vendor as a part of the proposal.

3.1.2.3 If required, a concrete pad will be provided to accept the evaporator unit. System(s) should be either skid or trailer mounted. The contractor shall specify in the bid package the space requirements for the evaporator system.

3.1.2.4 Storage space for chemicals, tools and spare parts. Contractor to specify types of chemical and space requirements.

3.1.2.5 Personal training on TMI site procedures and security badging of contractor personnel (as required).

3.1.2.6 Health physics, security, offgas radiological monitoring and environmental monitoring personnel, both off-site and on-site to support the contractor's operation activities.

3.1.2.7 Chemical analyses will be provided by GPUNC. The specific type and number of analyses will be specified in the contractor's bid proposal.

3.1.2.8 Upon completion of project, the system will be decontaminated using GPUNC approved methods, by the contractor and released to contractor for removal from site, per Article 2, Section 2.23. The waste will be accepted by GPUNC for disposal.

3.1.2.9 GPUNC will provide the necessary plant tie-in points to the evaporator interface.

3.2 SOLIDIFICATION/PACKAGING

3.2.1 Work To Be Provided/Performed

3.2.1.1 Contractor will provide containers, equipment, supplies and trained qualified personnel to perform solidification and/or the dry packaging of Class "A" waste which will meet the immobilization requirements as outlined in the applicable codes and standards, Article 2.

3.2.1.2 For solidification processes, the contractor will submit a topical report or test data that demonstrates the compatibility of their binder with the waste type.

3.2.1.3 For the solidification or packaging processes, contractor will develop and conduct a Process Control Program that will ensure the consistent production of a waste form in compliance with applicable sections of Article 2 for Class "A" waste. This Process Control Program shall be submitted to GPUNC for review two months prior to the start of the solidification or packaging program.

3.2.2 If required, only the following solidification media will be used as part of the contractor's solidification process.

3.2.2.1 Cement (including Envirostone)

3.2.2.2 Delaware Custom Media

3.2.2.3 Other solidification media and processes which have been reviewed and approved by the NRC and the Hanford low-level waste disposal facility, with the exception of bitumen which is not acceptable to GPUNC.

3.2.3 All equipment provided by the vendor will be in proper working order at all times. The exterior accessible surfaces of all equipment shipped to or departing TMI will be in compliance with Article 2, Section 2.23.

3.2.4 After solidification and/or dry packaging, all containers shall be in full compliance with all requirements of the Hanford commercial low-level waste facility and the applicable codes and standards per Article 2.

3.2.5 After solidification, all solidified containers will be of a size and weight that based on their total activity are transportable in accordance with the applicable codes and standards per Article 2.

3.2.6 Work By Others

GPU Nuclear Corporation shall be responsible:

3.2.6.1 To provide characterization of the waste type to be solidified or packaged. Should the contractor require additional characterization, details will be requested from GPUNC in writing.

3.2.6.2 To provide personnel training on TMI site procedures and security badging of contractor personnel, (as required).

3.2.6.3 To provide space for the contractor to set up and lay down equipment as required. This space allowance shall be requested in the contractor's bid submittal.

3.2.6.4 To provide electrical power, service air, demineralized or potable water, crane support and other services as required by the contractor. Contractor will state these requirements in the bid proposal.

3.2.6.5 To provide radiation protection support and plant support personnel for the unloading, storing and positioning of equipment and materials for solidification or packaging services.

3.2.6.6 To provide adequate shielding of waste containers prior to and during solidification to minimize radiation exposure to contractor personnel. Shielding requirements shall be discussed with contractor.

3.2.6.7 To analyze waste samples of the evaporator concentrate which has been collected by the contractor and to provide required chemical and radiological verification in support of the contractor's Process Control Program.

3.2.6.8 To provide for the movement, temporary storage, transportation and disposal of solidified containers or packages.

ARTICLE 4 DETAILED REQUIREMENTS

4.1 EVAPORATOR

4.1.1 Description of Intended Use

4.1.1.1 The evaporation unit is to be used for the disposal of processed water through a monitored discharge of vapor to the atmosphere via forced evaporation. This will be accomplished by the use of a contractor provided evaporator system. Operation of the evaporator in an open cycle will allow the vapors and aerosols to be discharged. This discharge will be from the evaporator exhaust system.

4.1.1.2 The use of an evaporator for processing and disposal of the processed water is intended to provide the maximum volume reduction factor possible. The contaminants in the liquid influent to the evaporator will be concentrated in the evaporator bottoms, which will ultimately be disposed of at a commercial, low-level waste burial facility.

4.1.1.3 The evaporator will normally be operational seven (7) days per week. The number of shifts and actual processing per shift is intended to have an operational availability of 75 percent. The evaporator system shall be sized so that it will handle a feed rate of 3 gpm, minimum.

4.1.1.4 Electrical equipment associated with the evaporator unit will interface with the plant's electrical distribution system.

4.1.1.5 Immobilization of the evaporator bottoms will be accomplished using vendor services.

4.1.2 Performance Requirements

4.1.2.1 The concentrating evaporator system shall be designed for the conditions of service and meet the performance requirements, as follows:

4.1.2.1.1 The combined evaporator equipment shall be capable of handling a continuous feedwater rate of 3 gpm minimum and shall be designed to provide the maximum volume reduction thats possible, consistent with the input flow rates. These flow rates, volume reduction factors and space requirements will be submitted as a part of the bid proposal, for engineering evaluation.

4.1.2.1.2 The evaporator system shall be capable of transferring the concentrated evaporator bottoms to a disposal point up to one hundred (100) feet from the evaporator system with a fluid velocity in the turbulent range. This 100 feet of transport piping will be provided by GPUNC.

4.1.2.1.3 The evaporator shall have instrumentation capable of determining the volume reduction specified and the capability of sampling the evaporator bottoms for analysis to characterize the bottoms.

4.1.2.1.4 The 100 feet exhaust ductwork from the evaporator shall have electric powered duct heaters and exhaust blowers capable of preventing condensation in the exhaust ductwork. Any condensation in the exhaust ductwork will be collected for controlled disposal.

4.1.2.1.5 The evaporator system shall have provisions for detection, collection and control of any leakage or upset condition from the system for the entire inventory of liquids in the system.

4.1.2.2 All equipment shall be capable of being operated outdoors in the climatic conditions anticipated at the job site including a temperature range of -5° to 100°F.

Contractor shall provide appropriate weather enclosures and/or heat trace protection for exposed equipment and/or piping.

4.1.2.3 The system shall be designed to operate for the time period dictated by the designed flow rate of the evaporator with consideration for corrosion, erosion, and material fatigue. Scheduled maintenance of the unit should not be required at intervals of less than 1 year.

4.1.2.4 The system shall be capable of being periodically cleaned without disassembly.

4.1.2.5 The equipment shall possess safety features and devices which shall prevent potentially hazardous situations and to protect personnel, materials and components.

4.1.2.6 The layout and dimensions of the equipment package shall be selected to allow ease of installation, removal of components and ease of maintenance within the confines of the allocated space. Consideration should be given to allow maintenance of components contaminated with radioactive residues.

4.1.2.7 The evaporator and associated piping shall be arranged and designed so that complete draining and collection of systems can be accomplished.

4.1.2.8 Provision shall be made to permit remote manual backwash of the evaporator internals following shutdown draining.

4.1.2.9 Provision shall be made to protect against vessel failure due to a vacuum condition caused by cooling of the vessel with all valves closed.

4.1.2.10 The evaporator system shall be capable of remote operation as required to reduce personnel radiation exposure consistent with ALARA principles.

4.1.2.11 The evaporator operations performed under this specification will be accomplished using controlled procedures for the system operations. These procedures will be developed by the contractor and submitted to GPUNC for review. Once submitted no changes will be made to them without GPUNC approval. These procedures are required to be reviewed by GPUNC prior to the start of work governed by this specification. Contractor procedures will be placed into GPUNC format by contractor and approved via the GPUNC procedure system. Procedures

will be submitted to the Supervisor Waste Disposal, TMI Unit-2, GPU Nuclear Corporation, P.O. Box Box 480, Middletown, PA 17057.

4.1.3 Design Requirements and Construction Features

4.1.3.1 General

4.1.3.1.1 The evaporator and pressure vessels handling evaporator feed or concentrate shall be designed, constructed, inspected, tested and stamped in accordance with the ASME Code Section VIII and TEMA. Additionally, Commonwealth of Pennsylvania Codes and Regulations and Unfired Pressure Vessels Special Requirements for Pennsylvania shall be met.

4.1.3.1.2 Piping on the skid shall be in accordance with ANSI B31.1.

4.1.3.1.3 The system shall fail in a "safe" condition on loss of power, air, feed flow, etc.

4.1.3.1.4 The evaporator system shall be constructed so that it can be readily opened for inspection and maintenance.

4.1.3.1.5 Evaporator and internals shall be designed to permit complete draining and collecting of fluids/debris.

4.1.3.1.6 Internal devices shall be incorporated to permit externally operated remote-manual flushing to clean the unit.

4.1.3.1.7 e evaporator body shall be designed for a maximum pressure of 15 psig. Effluent from pressure relief devices shall be collected.

4.1.4 Valves and Controls

4.1.4.1 Valves, controls and protective devices shall be supplied as required to assure a safe, efficient operating evaporator system allowing for remote operations as required to meet ALARA concepts. Remote operating features shall be incorporated into all valves as necessary to provide operation as described above.

4.1.5 Instrumentation and Control

4.1.5.1 Instrumentation and control wiring and tubing shall be combined at terminal boards and manifolds on the skid to facilitate hook up of interface connections during field installation. Choice of materials, location, mounting, piping and wiring in the installation of instruments, control and panelboards shall be such that the possible adverse effects of water, chemicals, mechanical damage and weather are minimized.

4.1.6 Testing

4.1.6.1 General: All hydrostatic testing on piping shall be performed at 150% of operating pressure for 30 minutes.

4.1.6.2 Vendor Shop Tests

4.1.6.2.1 The following shop tests and/or inspections shall be performed by the contractor:

4.1.6.2.2 Final cleaning and inspection prior to shipment.

4.1.6.2.3 All pumps, pipes and valves within the package shall be inspected prior to assembly and tested following assembly for leak tightness and operability.

4.1.6.2.4 A performance test shall be carried out to demonstrate the ability of the proposed system to meet its performance requirements. Simulated waste solutions specified by GPUNC, less radioactivity, will be used and concentrated to specification requirements. Samples of feed and distillate will be taken and analyzed by vendor. Test report shall be submitted. In the procedure, contractor must clearly state what tests will be performed and how the results will be indicative of satisfactory performance. Unsatisfactory performance

during this demonstration phase will be cause to reject the contractor's proposed system.

4.1.6.2.5 Contractor shall assure the leak tight capability of the assembled evaporator package, for both liquids and gases, and shall outline in the proposal the intended procedures for accomplishing this objective, including gas tests to be performed and the acceptance standards for these tests.

4.1.6.2.6 A qualification test shall be performed to demonstrate the procedure to be used for cleaning of the evaporator package.

4.1.6.2.7 Operational Check - Operate all electrical and/or pneumatic components in correct sequence in accordance with contractor's approved procedures. Apply dummy signals where required for loop checks. Leak test all pneumatic lines and operational check for correct setting of pressure switches, alarms, instrumentation and other control devices to verify system performance.

4.1.6.2.8 System Test - A complete system checkout will be made by the contractor's system engineer, qualified per Article 2, Section 2.3.

4.1.6.2.9 Calibration - Check calibration traceable to ar applicable standard of all instruments and fully document all inspection and tests. Affix Calibration labels to the calibrated instruments.

4.1.6.2.10 All testing, inspection and/or requisite repairs required shall be subject to the approval of GPUNC or its agents. Certified test certificates and/or test reports shall be submitted for all individual items of equipment tested in addition to the complete package.

4.1.6.3 Field Tests

After installation at TMI, a complete system performance test will be conducted by contractor to demonstrate installed equipment will meet its performance requirements. Waste solutions specified by GPUNC will be provided for this demonstration. Unsatisfactory performance during this test phase will be cause to reject the contractors equipment.

4.1.7 Installation

4.1.7.1 The evaporator equipment shall be shipped completely assembled ready for installation as modified by para. 3.1.1.8.

4.1.7.2 The evaporator system is to be installed by the vendor at the desired location and by making piping and wiring connections to the site provided interface points.

4.1.8 Field Operations

It is the intent of this specification for the evaporator contractor to provide equipment, materials and labor to operate and maintain the equipment for the duration of the program. However, GPUNC reserves the option to provide labor and field supervision for the system operations if deemed appropriate by GPUNC. Accordingly, contractor's proposal will identify, as a separate item, the monthly labor costs for the anticipated period of system operations.

4.2 SOLIDIFICATION/PACKAGING

4.2.1 Based on the evaporation of an anticipated 2.1 million gallons of water included in the scope of this technical bid specification, is the stabilization of an estimated 150-200 tons of waste chemicals. These chemicals are currently in solution in various tanks, sumps and other isolated areas throughout the TMI-2 Reactor, Fuel Handling and Auxiliary Buildings (See Article 7). The chemicals will be collected as evaporator bottoms and

transferred to a collection point. Evaporator bottoms will be concentrated to the maximum extent possible to provide a maximum volume reduction factor.

4.2.1.1 Immobilization or packaging of the evaporator bottoms will be accomplished using contractor services. This process may or may not use an immobilization binder. If a binder is required, it is not necessary for the binder to meet the stability requirements of the NRC Branch Technical Position on Waste Form since the binder is merely to immobilize the free-standing liquids and create a free-standing monolith. The solidification binder, however, will have to be one that is approved for use per the burial ground license. It will be noted here that the bituminization processes, included with some transportable evaporator systems, is not acceptable for immobilization of the evaporator bottoms because of regulatory uncertainties regarding the use of asphalt as a solidification binder.

4.2.2 Upon award of contract the contractor will provide to GPUNC the following information:

4.2.2.1 Written procedures covering their solidification and operation program

4.2.2.2 Written Process Control Programs and Test Data that covers the type of waste to be processed

4.2.2.3 If items are not available at contract award, contractor will provide a date by which each non-available item will be provided.

4.2.3 The evaporator bottoms may be ready for solidification as early as July 1987, although the exact time period cannot, as yet, be determined. GPUNC will provide 30 days notice as a minimum prior to the start of solidification. Contractor will supply the following:

4.2.3.1 Containers for transfer of the waste to be solidified or packaged, in the quantities specified by the contractor and agreed to by GPUNC. At GPUNC's option, all evaporator bottoms may be transferred in batches to containers and solidification may be accomplished as each container is filled.

4.2.3.2 Mobile equipment required to solidify or package the waste.

4.2.3.3 Contractor personnel to operate the equipment, conduct the Process Control Program, which may require the use of radioactive samples, and provide the solidification or packaging services.

4.2.3.4 Supplies and other material which are required in the solidification and control process.

4.2.4 All containers provided by the contractor in which the waste will be solidified or packaged will be so constructed and designed and its contents so limited, that under conditions normally incident to transportation there will be no significant release of radioactive materials to the environment; the effectiveness of the packaging will not be substantially reduced; and there will be no mixture of gases or vapors in the package that could through any credible spontaneous increase of heat or pressure, or through an explosion, significantly reduce the effectiveness of the packaging. Each container will be certified by the Contractor as being a strong tight container meeting the requirements of 49 CFR 173.24.

4.2.5 Contractor will submit liner or packaging design with proposal to ensure compatibility with the requirements of this specification. This design will require GPUNC approval prior to fabrication or procurement by vendor. Compatability of the final waste product with the packaging materials of construction will be certified by the contractor.

4.2.6 If any container, solidified or packaged by the contractor, is refused burial at a disposal site, and the reason for refusal is due to the contractor's action, or improper service, then the contractor shall bear the full cost of transporting the container back to the GPUNC site or other GPUNC approved locations, all labor and materials associated with repackaging to correct the problem, and all costs associated with transporting the container back to the disposal site. If GPUNC is prevented from disposing of radioactive material at a disposal site and if the reason for site closure is due to the negligence of the contractor, then in addition to the above, the contractor shall also pay any additional costs resulting from site closure to GPUNC.

4.2.7 If any container, solidified or packaged by the contractor is not transportable in a standard commercially available shipping container in full compliance with the regulations of the Department of Transportation and the Nuclear Regulatory Commission, and this non-transportability is due to the contractor's actions or improper service, then the contractor shall be responsible for transporting the container in a legal manner to the disposal site and bearing all excess cost associated with such transportation. GPUNC will be

responsible only up to the costs it would have incurred had it been able to ship the container in a routine manner.

4.2.8 All filter systems used by the contractor for airborne activity control shall be DOP tested and have the capability for DOP testing while on site.

4.2.9 The solidification performed under this specification will be using an approved Process Control Program. The Process Control Program will be developed by the contractor and submitted to GPUNC for review. Once submitted no changes will be made to the program without GPUNC approval. Process Operating procedures are required to be reviewed by GPUNC prior to the start of work governed by this specification. Contractor procedure will be placed into GPUNC format by contractor and approved via the GPUNC procedure system. Procedures will be submitted to the Supervisor Waste Disposal, TMI Unit-2, GPU Nuclear Corporation, P.O. Box 480, Middletown, PA 17057.

ARTICLE 5 QUALITY ASSURANCE

5.1 PROGRAM

5.1.1 Each contractor shall submit with his proposal a copy of his Quality Assurance Program for approval. This program shall be in compliance with 10 CFR 50 Appendix B as applicable to the scope of this specification.

5.1.2 An acceptable QA Program shall be a prerequisite for a contractor being chosen.

5.1.3 If the QA Program was previously submitted, vendor shall identify the submittal in his proposal.

5.1.4 On site work will be controlled under the GPUNC Recovery Quality Assurance Plan for Three Mile Island Unit-2 dated November 1, 1985.

5.2 QA/QC REQUIREMENTS

5.2.1 Right of Access

GPUNC reserves the right to inspect fully all phases of testing and audit with inspection of the equipment at the contractor's facility and/or vendor's suppliers'

facilities. Any item found to be unsatisfactory shall be rejected or repaired at no cost to GPUNC. Any inspection by GPUNC will not relieve the contractor of any responsibility for conformance with stated conditions and shall not be considered as a waiver of warranty or other rights.

5.2.2 For work performed by the contractor or his subcontractors on GPUNC property, GPUNC reserves the right to stop work whenever continued work would result in a significant incident, or further work could lead to or conceal a problem or when dictated by plant conditions elsewhere.

5.2.3 All work performed by the contractor or his subcontractors under this specification will be accomplished under the requirements of the Recovery Quality Assurance Plan for Three Mile Island Nuclear Station Unit-2 or a similar plan that has been approved by the Quality Assurance Department.

5.2.4 The contractor shall report to GPUNC supervision any incident or condition relating to contractor or subcontractor work affecting GPUNC activities.

5.2.5 The contractor will comply with all applicable GPUNC site requirements and procedures to include, but not limited to, security, radiation protection, handling, storage, shipping and cleanliness.

5.2.6 All contractor personnel working at the site must satisfy site qualification requirements as applicable.

5.2.7 The contractor shall maintain documentation and records sufficient to provide documenting evidence that a task was performed in accordance with pre-established requirements and this specification. All documentation shall be made available to GPUNC upon request.

5.2.8 The contractor will provide qualified personnel who have been indoctrinated and trained for performing activities affecting quality as necessary to assure that suitable proficiency is achieved and maintained.

5.2.9 The materials/supplies provided by the contractor as part of this specification shall be shipped in accordance with standard "good" commercial practice.

5.2.10 GPUNC will provide inspection, surveillance and audit of the contractor's activities as appropriate or necessary to establish contractor or subcontractor's compliance with the requirements of this specification.

5.2.11 The contractor shall forward all required final documentation, noted in Section 6.2, as follows:

(1) One (1) copy enclosed with the material when shipped.

(2) One (1) copy to GPUNC QC Manager, TMI Nuclear Station, P.O. Box 480, Middletown, PA 17057.

5.2.12 The contractor will provide a certificate of conformance for each container provided under this specification. The certificate will verify that the container meets the requirements of a strong tight container as outlined in 49 CFR 173.24 and give the maximum authorized gross weight. The certificate will also certify that the specific specification requirements have been met, such as codes, standards and other requirements. Also, the certificate will identify the GPUNC Purchase Order Number and any procurement requirements that have not been met, together with an explanation and the means for resolving the non-conformances. It shall be signed by a person who is responsible for this quality assurance function. The contractor shall forward the certificate as follows:

One (1) copy enclosed with the container when shipped;

One (1) copy to GPUNC QC Manager, TMI Nuclear Station, P.O. Box 480, Middletown, PA 17057.

ARTICLE 6 INFORMATION TO BE SUBMITTED

6.1 INFORMATION TO BE SUBMITTED IN PROPOSAL

6.1.1 The Contractor shall submit a comprehensive written proposal with the bid, listing all materials and services to be furnished. Included with the proposal shall be Contractor's Quality Assurance Program.

6.1.2 Sufficient information and detail shall be submitted with the bid to permit full understanding and evaluation of the equipment and services offered including equipment performance history and specification.

6.1.3 The contractor shall list any exceptions taken to the specifications and provide a detailed basis for each exception.

6.1.4 The contractor shall specify foundation requirements with bolt hole locations for all equipment, if required.

6.1.5 The contractor shall submit a delivery schedule with his bid including site mobilization plans.

6.1.6 Contractor shall complete Attachment 6.1.6.1 Evaporator Service Tie-In Requirements and Attachment 6.1.6.2

Solidification/Packaging Service Tie-In Requirements, describing the necessary site services to be provided by GPUNC, per Section 3.1.1.5.

6.1.7 Contractor shall provide a description of the Evaporator operation which shall include the safety features and devices proposed to prevent hazardous situations from developing and protect equipment and the environment per Section 3.1.1.18.

6.1.8 Contractor shall provide the system flow rates, volume reduction factors estimated secondary waste generation and space requirements to demonstrate the Evaporator capability per Section 3.1.1.10 and 4.1.2.1.1.

6.1.9 Contractor shall provide an outline of the intended procedures to assure leak tight capability of the assembled Evaporator package.

6.1.10 Contractor shall provide the proposed liner or packaging design to ensure compatability with the requirements of this specification per Section 4.2.5.

6.1.11 Contractor shall provide an estimate of offgas release per Section 3.1.1.11.

ATTACHMENT 6.1.6.1

EVAPORATOR SERVICE TIE-IN REQUIREMENTS

Service	Quantity (GPM)	Quality (PSIG)	Quality (TEMP°F)	Tie-in Connection Size/Type
A. Mechanical				
1. Demineralized Water				/
2. Service Water				/
3. Process Water (Borated)				/
4. Feed Tie-In				/
5. Bottom Discharge				/
6. System Flush				/
7. Drain Connection	N/A	N/A	N/A	/
8. Sample Connection				/

	Quantity (SCFM)	Quality (PSIG)	Quality (TEMP°F)	Tie-in Connection Size/Type
8. Instrument Air				/
9. Service Air				/
10. Evaporator Vent				/

	Quantity (KW/AMPS)	Quality V/Ø/Hz
B. Electrical		
1. Primary Heating Power	KW	
2. System Power, Inst. & Control	AMPS	
3. Heat Tracing Power (If Required)	KW	

	Length (FT)	Width (FT)	Height (FT)
C. Space Requirements			
1. Evaporator Pad			
2. Chemical Storage			
3. Neutralizing Tank			
4. Concentrate Storage Tank			

ATTACHMENT 6.1.6.1

EVAPORATOR SERVICE TIE-IN REQUIREMENTS

Service

D. Other Service Requirements

List as required.

General Notes:

- Fill in all blanks
- If not required enter N/R
- If not applicable enter N/A
- It is GPUNC's intention to provide single point tie-ins for services and contractor to provide headers for distribution.

ATTACHMENT 6.1.6.2

SOLIDIFICATION/PACKAGING SERVICE TIE-IN REQUIREMENTS

Service

	Quantity (GPM)	Quality (PSIG)	Quality (TEMP°F)	Tie-in Connection Size/Type
A. Mechanical				
1. Demineralized Water				/
2. Service Water				/
3. Processed Water (Borated)				/
4. Feed Tie-In				/
5. Discharge Tie-in				/
6. Dewatering Tie-in				/
7. Sampling Connection				/
8. Drain Connection	N/A	N/A	N/A	/

	Quantity (SCFM)	Quality (PSIG)	Quality (TEMP°F)	Tie-in Connection Size/Type
8. Instrument Air				/
9. Service Air				/
10. Solidification Vent				/

	Quantity (KW/AMPS)	Quality V/Ø/Hz
B. Electrical		
1. System Power, Inst. & Control		

	Length (FT)	Width (FT)	Height (FT)
C. Space Requirements			
1. Solidification/Packaging Unit			
2. Cement/Binder Unit			

D. Other Service Requirements

List as required.

6.2 DOCUMENTS TO BE SUBMITTED AFTER AWARD

The documents outlined in the following paragraphs shall be submitted for review/approval.

6.2.1 Schedules

A detailed Schedule of Submissions showing the date for submittal and schedule for preparation of drawings, procedures, and technical documents required by the Contract Documents.

6.2.1.1 A detailed shop test schedule. GPUNC may identify mandatory hold points on the test schedule which will be witnessed by GPUNC representatives or its agents.

6.2.1.2 A schedule showing the time and delivery of all pieces of equipment to jobsite.

6.2.1.3 A detailed jobsite installation schedule including start-up and acceptance testing of equipment.

6.2.2 Drawings and Data

6.2.2.1 Drawings showing the outline of the evaporator unit and other accessory mounted equipment including clearance requirements, materials of construction, shipping and

operating weights, overall dimensions, location of components, and the location of all external mechanical and electrical service connections. Also P&IDs and electrical one line drawings shall be provided.

6.2.2.2 Performance test procedures per Section 4.1.6 (Shop and Field).

6.2.2.3 Characterization/quantification P.O.P. tests and process demonstration procedures per Section 3.1.1.9.

6.2.2.4 Chemical usage data per Section 3.1.1.20.

6.2.2.5 Response to alarms and emergency shut down procedures per Section 3.1.1.19.

6.2.2.6 Process operating procedures per Sections 3.1.1.19, 4.1.2.11, 3.2.1.3, 4.1 and 4.2.9.

6.2.2.7 Certified test results for all tests (shop and field) herein specified.

6.2.2.8 Material Certificates of Conformance as herein specified.

6.2.2.9 Instrument Calibration Certification as herein specified.

6.2.2.10 Code data reports with material or equipment shipments.

ARTICLE 7 WATER CHEMISTRY AND VOLUMES

7.1 The plant currently has approximately 400,000 gallons of processed water ready for disposal. However, it is expected that the evaporator will process an approximate total of 2,100,000 gallons of water over a period of approx. 2 years. Much of this water will be effluent water from the plants ion exchange water processing systems. (This water is known as "Processed Water").

7.2 Estimates of water volumes by source locations, radionuclide analyses and chemical concentrations of this processed water are provided as Tables to this Article. This data must be recognized as typical information only and is subject to change depending on plant conditions. However, the estimated 150-200 tons of sediments resulting as a product of the evaporation process, noted in Section 4.2, is accurate within the scope of this specification. The use of these Tables is qualified as follows:

7.2.1 The radionuclide analyses presented in Tables 7-1 and 7-2 are the actual source term calculations performed on each given sample during the dates noted for each of the source locations. Measured concentration values for all radionuclides with positive (i.e., greater than LLD) values are presented in Table 7-1, while Table 7-2 presents the total activity present in each source volume. The data in these two tables represents the actual liquid source terms present at TMI-2 in March 1986.

7.2.2 The radionuclide analyses presented in Tables 7-3 and 7-4 are the projected source terms as estimated after approximately 40% of the source water is processed by plant systems prior to evaporation. The water sources requiring processing prior to evaporation are identified with an asterisk in Table 7-3. Tables 7-3 and 7-4 present the radionuclide concentrations and total activity, respectively, projected to exist on 10/01/86 after processing approximately 40% of the processed water.

7.2.3 The water chemistry data presented in Table 7-5 is from the actual chemistry analyses performed on each given sample on the data noted for each source location.

7.3 A typical water chemistry for processed water is as follows:

(Based on PWST-2 sample of 10-27-86)

Boron (B)	1946 ppm (From H_3BO_3 addition to water)
Conductivity	8.5 µmho (From NaOH addition to water)
Sodium (Na)	1.5 ppm
pH	5.29
Ag 110m	<3.3 E-7 µCi/ml
Ce 144	<1.4 E-6 µCi/ml
Co 58	<2.3 E-7 µCi/ml
Co 60	<4.3 E-7 µCi/ml
Cs 134	<3.2 E-7 µCi/ml
Cs 137	<9.7 E-6 µCi/ml
Ru 106	<1.9 E-6 µCi/ml
Sb 125	<1.0 E-6 µCi/ml
Chloride (Cl)	.04 ppm
Oxalate (C_2O_4)	<.05 ppm
Nitrate (NO_3)	.03 ppm
Phosphate (PO_4)	.09 ppm
Sulfate (SO_4)	.2 ppm
Tritium (H^3)	2.1 µCi/ml (as of 11-21-86)

Total volume of this water is 413,000 gallons (as of 11-07-86)

7.4 Other water to be disposed of is higher in boron and sodium in content. For example, the Borated Water Storage Tank is typical of these waters: (Based on BWST Sample of 11-04-86)

Boron (B)	5100 ppm (From H_3O_3 addition to water)
Chloride (Cl)	1.95 ppm
Fluoride (F)	.02 ppm
Iron (Fe)	2.10 ppm
Oxalate (C_2O_4)	20 ppm
Sodium (Na)	1360 ppm (From NaOH addition to water)
pH	7.77
RedOx	468 mV
TOC	2.6 ppm
Turbidity	6.8 NTU
Tritium (H^3)	1.0 E-1 µCi/ml
Co 60	2.6 E-6 µCi/ml
Cs 134	5.7 E-6 µCi/ml
Cs 137	1.2 E-4 µCi/ml
Sb 125	6.0 E-6 µCi/ml
Sr	7.5 E-5 µCi/ml

Total volume of this water is 421,000 gallons (as of 11-07-86)

7.5 As prior stated, the total volume to be evaporated will be approximately 2,100,000 gallons. The average boron concentration for this water is approximately 3000 ppm, and the average sodium concentration is 700 ppm.

TABLE 7-1

TMI-2 PROCESSED WATER SOURCE TERMS

*** ACTUAL SOURCE TERMS ***

STORAGE	DESCRIPTION	VOLUME GALLONS	SAMPLE DATE	RADIONUCLIDE CONCENTRATION H-3 µCi/ml	Sr-90 µCi/ml	Cs-137 µCi/ml	Cs-134 µCi/ml	Sb-125 µCi/ml	Co-60 µCi/ml
RCS	Reactor Coolant System	67,286	03/07/86	1.20E-01	1.80E+00	2.60E-01	7.40E-03	3.60E-02	9.40E-03
PWST-1	Processed Water Storage	109,081	02/22/86	3.00E-01	1.60E-05	6.80E-05			
PWST-2	Processed Water Storage	480,134	02/24/86	2.80E-01	5.30E-05	4.40E-06			
CO-T-1A	Condensate Storage	101,518	03/03/86	5.60E-02	1.80E-04	4.40E-06			
WDL-T-9A	Evap. Cond. Test Tank	5,610	04/12/83	1.30E-01	2.58E-05	9.40E-06	9.40E-07		9.00E-07
WDL-T-9B	Evap. Cond. Test Tank	2,231	04/17/83	1.30E-01	8.80E-05	5.00E-06	3.50E-07		
CC-T-1	Epicor II Off-Spec	20,500	03/05/86	1.30E-01	5.80E-04	1.80E-04	5.00E-06	4.90E-05	
CC-T-2	Epicor II Clean	16,887	11/15/85	8.80E-02	3.00E-04	1.50E-04		1.10E-04	6.50E-06
SFP-B	Spent Fuel Pool "B"	241,698	03/02/86	4.50E-02	3.30E-05	3.60E-06			
SDS-T-1A	SDS Monitor	373	03/14/86	7.60E-02	5.30E-03	9.80E-04		6.6E-04	
SDS-T-1B	SDS Monitor	497	03/08/86	7.30E-02	9.70E-04	1.00E-03		9.40E-04	6.90E-05
WDL-T-1A	RC Bleed Holdup	3,810	02/24/86	8.50E-02	3.30E-02	9.30E-03	2.70E-05	4.60E-04	9.00E-05
WDL-T-1B	RC Bleed Holdup	4,420	03/07/86	1.30E-01	1.70E+00	2.00E-01	5.60E-03	3.40E-02	6.60E-03
WDL-T-1C	RC Bleed Holdup	57,116	10/31/85	1.70E-01	2.50E+00	1.70E-01		8.10E-02	6.50E-03
BWST	Borated Water Storage	458,915	03/04/86	6.60E-02	3.80E+04	1.30E-04	8.90E-06		2.70E-06
WDL-T-8A	Neutralizer	8,675	02/28/86	9.00E-02	1.40E-01	1.90E-01	5.30E-03		
WDL-T-8B	Neutralizer	8,605	03/01/86	6.80E-02	7.70E-02	1.80E-01	5.30E-03		
WDL-T-2	Miscellaneous Waste Holdup	3,712	02/28/86	6.90E-02	7.80E-02	1.70E-01	4.90E-03		
WDL-T-11A	Contaminated Drains	1,931	03/01/86	2.10E-05	2.70E-05	4.20E-05	9.30E-07		
WDL-T-11B	Contaminated Drains	820	03/01/86	1.40E-05		1.10E-05			
	Chem Cleaning Bldg Sump	1,680	03/02/86	4.50E-02	1.10E-03	8.80E-04		3.40E-03	7.90E-06
	Auxiliary Bldg Sump	5,917	10/04/85	1.30E-01	1.20E-01	2.30E-02			
	Reactor Bldg Basement	43,082	04/26/86	2.60E-02	1.60E+00	4.90E+00			
SFP-A	Spent Fuel Pool "A"	205234	02/27/86	2.60E-01	3.20E-02	8.80E-03	2.40E-04	2.60E-03	2.50E-04
	Deep End of Transfer Canal	58,685	03/12/86	3.00E-01	2.60E-02	8.60E-03	2.20E-04	2.90E-03	2.50E-04
	Total as of 01/01/86	1,908,417							
	Average Concentrations		µCi/ml =	1.64E-01	1.84E-01	1.29E-01			

(Blanks indicate LLD values or data not available)

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TABLE 7-2

TMI-2 PROCESSED WATER SOURCE TERMS

*** ACTUAL SOURCE TERMS ***

TANK	DESCRIPTION	VOLUME GALLONS	DATE	TOTAL RADIOACTIVITY (In Curies) H-3 Ci	Sr-90 Ci	Cs-137 Ci	Cs-134 Ci	Sb-125 Ci	Co-60 Ci
RCS	Reactor Coolant System	67,286	03/07/86	3.06E+01	4.58E+02	6.62E+01	1.88E+00	9.17E+00	2.39E+00
PWST-1	Processed Water Storage	109,081	02/22/86	1.24E+02	6.61E-03	2.81E-03			
PWST-2	Processed Water Storage	480,134	02/24/86	5.09E+02	9.63E-02	8.00E-03			
CO-T-1A	Condensate Storage	101,518	03/03/86	2.15E+01	6.92E-02	1.69E-03			
WDL-T-9A	Evap. Cond. Test Tank	5,610	04/12/83	2.76E+00	5.48E-04	2.00E-04	2.00E-05		1.91E-05
WDL-T-9B	Evap. Cond. Test Tank	2,231	04/17/83	1.10E+00	7.43E-04	4.22E-05	2.96E-06		
CC-T-1	Epicor II Off-Spec	20,500	03/05/86	1.01E+01	4.50E-02	1.40E-02	3.88E-04	3.80E-03	
CC-T-2	Epicor II Clean	16,887	11/15/85	5.62E+00	1.92E-02	9.59E-03		7.03E-03	4.15E-04
SFP-B	Spent Fuel Pool "B"	241,698	03/02/86	4.12E+01	3.02E-02	3.29E-03			
SDS-T-1A	SDS Monitor	373	03/07/86	1.07E-01	7.48E-03	1.38E-03		9.32E-04	
SDS-T-1B	SDS Monitor	497	10/10/85	1.37E-01	1.82E-03	1.88E-03		1.77E-03	1.30E-04
WDL-T-1A	RC Bleed Holdup	3,810	02/24/86	1.23E+00	4.76E-01	1.34E-01	3.89E-04	6.63E-03	1.30E-03
WDL-T-1B	RC Bleed Holdup	4,420	03/07/86	2.17E+00	2.84E+01	3.35E+00	9.37E-02	5.69E-01	1.10E-01
WDL-T-1C	RC Bleed Holdup	57,116	10/31/85	3.68E+01	5.40E+02	3.68E+01		1.75E+01	1.41E+00
BWST	Borated Water Storage	458,915	03/04/86	1.15E+02	6.60E-01	2.26E-01	1.55E-02		4.69E-03
WDL-T-8A	Neutralizer	8,675	02/28/86	2.96E+00	4.60E+00	6.24E+00	1.74E-01		
WDL-T-8B	Neutralizer	8,605	03/01/86	2.21E+00	2.51E+00	5.86E+00	1.73E-01		
WDL-T-2	Miscellaneous Waste Holdup	3,712	02/28/86	9.69E-01	1.10E+00	2.39E+00	6.88E-02		
WDL-T-11A	Contaminated Drains	1,931	03/01/86	1.53E-04	1.97E-04	3.07E-04	6.80E-06		
WDL-T-11B	Contaminated Drains	820	03/01/86	4.35E-05		3.41E-05			
	Chem Cleaning Bldg Sump	1,660	03/02/86	2.86E-01	6.99E-03	5.60E-03		2.16E-02	5.02E-05
	Auxiliary Bldg Sump	5,917	10/04/85	2.91E+00	2.69E+00	5.15E-01			
	Reactor Bldg Basement	43,082	04/26/86	4.24E+00	2.61E+02	7.99E+02			
SFP-A	Spent Fuel Pool "A"	205234	02/27/86	2.02E+02	2.49E+01	6.84E+00	1.86E-01	2.02E+00	1.94E-01
	Deep End of Transfer Canal	58,685	03/12/86	6.66E+00	5.78E+00	1.91E+00	4.89E-02	6.44E-01	5.55E-02
	Total as of 01/01/86	1,908,417		1182.75	1331.17	929.49			

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7.6 Reprocessing Considerations

Prior to evaporation it is likely that a considerable percentage of the processed water at TMI-2 will require further processing by plant systems to minimize radioactive contaminants. The major purpose for this processing (reprocessing for some of the water) is to further reduce the radionuclide levels, thereby minimizing the total release of activity to the environment. Of particular concern is the need to reduce the total quantity of Sr-90 present in processed water.

7.6.1 The volume of water requiring processing prior to ultimate disposition is dependent upon the final method selected by GPUN for disposal of processed water. Because of the concentrating effects of the evaporation process, it is estimated that 40% of the total water volume will require plant radwaste processing to reduce the activity levels influent to the evaporator. Additional water processing will be performed as needed.

TABLE 7-3

TMI-2 PROCESSED WATER SOURCE TERMS

*** PROJECTED SOURCE TERMS ***
APPROXIMATE 40% PROCESSING

TANK	DESCRIPTION	VOLUME GALLONS	REPROCESS 10/01/88	RADIONUCLIDE CONCENTRATION H-3 µCi/ml	Sr-90 µCi/ml	Cs-137 µCi/ml	Cs-134 µCi/ml	Sb-125 µCi/ml	Co-60 µCi/ml
RCS	Reactor Coolant System	67,286	*	1.04E-01	1.00E-05	4.00E-06			
PWST-1	Processed Water Storage	109,081		2.59E-01	1.50E-05	6.40E-06			
PWST-2	Processed Water Storage	480,134		2.42E-01	4.98E-05	4.14E-06			
CO-T-1A	Condensate Storage	101,518		4.84E-02	1.69E-04	4.15E-06			
WDL-T-9A	Evap. Cond. Test Tank	5,610		9.55E-02	2.26E-05	8.29E-06	1.54E-07		4.38E-07
WDL-T-9B	Evap. Cond. Test Tank	2,231		9.56E-02	7.72E-05	4.41E-06	5.78E-08		
CC-T-1	Epicor II Off-Spec	20,500		1.12E-01	5.45E-04	1.70E-04	2.14E-06	2.57E-05	
CC-T-2	Epicor II Clean	16,887		7.48E-02	2.80E-04	1.40E-04		5.34E-05	4.45E-06
SFP-B	Spent Fuel Pool "B"	241,698	*	3.89E-02	1.00E-05	4.00E-06			
SDS-T-1A	SDS Monitor	373		6.58E-02	4.99E-03	9.24E-04		3.48E-04	
SDS-T-1B	SDS Monitor	497		6.32E-02	9.12E-04	9.43E-04		4.93E-04	4.92E-05
WDL-T-1A	RC Bleed Holdup	3,810	*	7.34E-02	1.00E-05	4.00E-06			
WDL-T-1B	RC Bleed Holdup	4,420	*	1.12E-01	1.00E-05	4.00E-06			
WDL-T-1C	RC Bleed Holdup	57,116	*	1.44E-01	1.00E-05	4.00E-06			
BWST	Borated Water Storage	458,915	*	5.71E-02	3.57E-04	1.23E-04	3.80E-06		1.92E-06
WDL-T-8A	Neutralizer	8,675	*	7.78E-02	1.00E-05	4.00E-06			
WDL-T-8B	Neutralizer	8,605	*	5.88E-02	1.00E-05	4.00E-06			
WDL-T-2	Miscellaneous Waste Holdup	3,712	*	5.96E-02	1.00E-05	4.00E-06			
WDL-T-11A	Contaminated Drains	1,931		1.82E-05	2.54E-05	3.96E-05	3.96E-07		
WDL-T-11B	Contaminated Drains	820		1.21E-05		1.04E-05			
	Chem Cleaning Bldg Sump	1,680		3.89E-02	1.03E-03	8.29E-04		1.78E-03	5.62E-06
	Auxiliary Bldg Sump	5,917	*	1.10E-01	1.00E-05	4.00E-06			
	Reactor Bldg Basement	43,082	*	2.14E-02	1.00E-05	4.00E-06			
SFP-A	Spent Fuel Pool "A"	205234	*	2.25E-01	1.00E-05	4.00E-06	2.40E-04	2.60E-03	2.50E-04
	Deep End of Transfer Canal	58,685	*	2.60E-01	1.00E-05	4.00E-06	2.20E-04	2.90E-03	2.50E-04
	Subtotal	1,908,417	37%	(Percent for initial or reprocessing before disposition)					
	Additional Water to 10/88	153,848		1.82E-05	2.54E-05	3.96E-05	3.96E-07		
	Total for Disposition	2,062,265		(Activities Decayed to 10/01/88)					

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TABLE 7-4

TMI-2 PROCESSED WATER SOURCE TERMS

*** PROJECTED SOURCE TERMS ***
APPROXIMATE 40% PROCESSING

TANK	DESCRIPTION	VOLUME GALLONS		TOTAL RADIOACTIVITY H-3 Ci	Sr-90 Ci	Cs-137 Ci	Cs-134 Ci	Sb-125 Ci	Co-60 Ci
RCS	Reactor Coolant System	67,286		2.64E+01	2.55E-03	1.02E-03			
PWST-1	Processed Water Storage	109,081		1.07E+02	6.21E-03	2.64E-03			
PWST-2	Processed Water Storage	480,134		4.39E+02	9.05E-02	7.53E-03			
CO-T-1A	Condensate Storage	101,518		1.86E+01	6.50E-02	1.59E-03			
WDL-T-9A	Evap. Cond. Test Tank	5,610		2.03E+00	4.81E-04	1.76E-04	3.28E-06		9.30E-06
WDL-T-9B	Evap. Cond. Test Tank	2,231		8.07E-01	6.52E-04	3.72E-05	4.88E-07		
CC-T-1	Epicor II Off-Spec	20,500		8.72E+00	4.23E-02	1.32E-02	1.66E-04	1.99E-03	
CC-T-2	Epicor II Clean	16,887		4.78E+00	1.79E-02	8.97E-03		3.41E-03	2.85E-04
SFP-B	Spent Fuel Pool "B"	241,698		3.56E+01	9.15E-03	3.66E-03			
SDS-T-1A	SDS Monitor	373		9.29E-02	7.04E-03	1.30E-03		4.91E-04	
SDS-T-1B	SDS Monitor	497		1.19E-01	1.72E-03	1.77E-03		9.28E-04	9.26E-05
WDL-T-1A	RC Bleed Holdup	3,810		1.06E+00	1.44E-04	5.77E-05			
WDL-T-1B	RC Bleed Holdup	4,420		1.88E+00	1.67E-04	6.69E-05			
WDL-T-1C	RC Bleed Holdup	57,116		3.12E+01	2.16E-03	8.65E-04			
BWST	Borated Water Storage	458,915		9.91E+01	6.21E-01	2.13E-01	6.60E-03		3.34E-03
WDL-T-8A	Neutralizer	8,675		2.55E+00	3.28E-04	1.31E-04			
WDL-T-8B	Neutralizer	8,605		1.91E+00	3.26E-04	1.30E-04			
WDL-T-2	Miscellaneous Waste Holdup	3,712		8.38E-01	1.40E-04	5.62E-05			
WDL-T-11A	Contaminated Drains	1,931		1.33E-04	1.86E-04	2.89E-04	2.89E-06		
WDL-T-11B	Contaminated Drains	820		3.76E-05		3.22E-05			
	Chem Cleaning Bldg Sump	1,680		2.47E-01	6.58E-03	5.27E-03		1.13E-02	3.58E-05
	Auxiliary Bldg Sump	5,917		2.46E+00	2.24E-04	8.96E-05			
	Reactor Bldg Basement	43,082		3.49E+00	1.63E-03	6.52E-04			
SFP-A	Spent Fuel Pool "A"	205234		1.75E+02	7.77E-03	3.11E-03			
	Deep End of Transfer Canal	58,685		5.77E+01	2.22E-03	8.88E-04			
	Additional Water to 10/88	2,062,265		1.06E-02	1.48E-02	2.30E-02	2.31-04		
	Total for Disposition	2,062,265	Ci =	1020.61	0.90	0.29			
	Average Concentrations		µCi/ml =	1.31E-01	1.15E-04	3.71E-05	8.97E-07	2.32E-06	4.82E-07

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7.7 Chemical Concentrations

7.7.1 For each of the sources of processed water, chemical analyses were performed to characterize the non-radioactive nature of the water. Of particular interest is the boron concentration in each source since boron will directly influence any concentrates from evaporation requiring solidification, or the necessity to add stabilizing agents to ensure proper solidification.

7.7.2 The results of the characterization are presented in Table 7-5. It has been assumed that the chemical nature of sources requiring processing before evaporation will not change during processing, and that additional water added to the inventory will not contain appreciable quantities of boron. Several tanks reflect assumed chemistry parameters, which are based on the best current information available.

7.7.3 From Table 7-5, it can be seen that most of the processed water has a near-neutral pH, with varying levels of conductivity and sodium. Boron ranges from less than 100 ppm for contaminated drains and new water, to over 5,000 ppm for RCS and BWST water. The average concentration is approximately 3,050 ppm, and is equivalent to approximately 150 tons of boric acid which will be the primary constituents of the concentrates to be solidified or packaged for disposal.

TABLE 7-5

TMI-2 PROCESSED WATER SOURCE TERMS

*** ACTUAL SOURCE TERMS ***
CHEMICAL CONCENTRATIONS

TANK	DESCRIPTION	VOLUME GALLONS (01/01/86)	SAMPLE DATE	pH	WATER CHEMISTRY COND µmho	BORON ppm	Cl ppm	TOC	PO4	SO4	Na
RCS	Reactor Coolant System	67,286	03/07/86	7.61	3610	5309	1.7	43			1375
PWST-1	Processed Water Storage	109,081	02/22/86	7.76	3180	4625		11.2			1480
PWST-2	Processed Water Storage	480,134	02/24/86	7.67	6.65	1620	0.11	2.1			0.35
CO-T-1A	Condensate Storage	101,518	03/03/86	5.77	24.7	1845		1.1			0.02
WDL-T-9A	Evap. Cond. Test Tank	5,610	04/12/83	5.5		842					
WDL-T-9B	Evap. Cond. Test Tank	2,231	04/17/83	5.5		842					
CC-T-1	Epicor II Off-Spec	20,500	03/05/86	5.07	6.2	1430		15.3			
CC-T-2	Epicor II Clean	16,887	11/15/85	4.85	6.9	1840	0.23				
SFP-B	Spent Fuel Pool "B"	241,698	03/02/86	8.67	1805	886		0.99			500
SDS-T-1A	SDS Monitor	373	03/14/86	7.66	1300	1650	41	32	25	28	400
SDS-T-1B	SDS Monitor	497	10/10/85	7.86	1090	1680	43.5		32	245	360
WDL-T-1A	RC Bleed Holdup	3,810	02/24/86	7.59	3230	5040	1.38				1320
WDL-T-1B	RC Bleed Holdup	4,420	03/07/86	7.55	3800	5360	1.33		2.1		1220
WDL-T-1C	RC Bleed Holdup	57,116	10/31/85	7.61	3704	5274	2	2.3			1480
BWST	Borated Water Storage	458,915	03/04/86	7.56	3505	5090	1.6	3			1350
WDL-T-8A	Neutralizer	8,675	02/28/86	7.77	17	1500		49			280
WDL-T-8B	Neutralizer	8,605	03/01/86	7.8	1330	1635		46			280
WDL-T-2	Miscellaneous Waste Holdup	3,712	02/28/86	7.65	2375	1624	42.5				310
WDL-T-11A	Contaminated Drains	1,931	03/01/86	7.65		65		8.7			140
WDL-T-11B	Contaminated Drains	820	03/01/06	7.25	538	40		28			48
	Chem Cleaning Bldg Sump	1,680	03/02/86	6.79	238	2023		84			50
	Auxiliary Bldg Sump	5,917	10/04/85	7.65	2375	1624	42.5				310
	Reactor Bldg Basement	43,082	04/26/85			3500					
SFP-A	Spent Fuel Pool "A"	205234	02/27/86	7.71	8645	4915	0.82	47			1480
	Deep End of Transfer Canal	58,685	03/21/86	7.62	8645	4925	0.43				1500
	Additional Water to 10/88	153,848				0					0
	[illegible]										
	Total for Disposition										
	Average Concentrations					17	ppm				722.4
	Total Tons Solids					0	tons BA				10