TVA

Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381

JUL 2 1 1995

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of the Application of	)	Docket Nos. 50-390
Tennessee Valley Authority	)	50-391

WATTS BAR NUCLEAR PLANT (WBN) - RESPONSE TO NRC COMMENTS ON RADWASTE MANAGEMENT SYSTEMS - FINAL SAFETY ANALYSIS REPORT (FSAR) CHAPTER 11 (TAC NOS. M84429, M87197, M90253, and M91523)

This letter provides TVA's response to the NRC's comments discussed in a meeting on June 23, 1995 in Rockville, MD, with the NRC staff. Enclosure 1 provides the responses to the questions and Enclosure 2 provides the draft FSAR pages that will be amended by Amendment 90. Enclosure 3 list the commitment being tracked by this letter.

If you should have any questions concerning this matter, please contact John Vorees at (615) 365-8819.

Sincerely,

Paul Baron

~~R. R. Baron~~
Nuclear Assurance
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Enclosures
cc: See page 2

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JUL 21 1995

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ENCLOSURE 1

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
RADWASTE MANAGEMENT SYSTEM
FINAL SAFETY ANALYSIS REPORT (FSAR)
CHAPTER 11 QUESTIONS

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
RADWASTE MANAGEMENT SYSTEM
FSAR CHAPTER 11 QUESTIONS

The following comments completed the NRC's review of the WBN FSAR Chapter 11, regarding radwaste management systems, up to and including Amendment 89, TVA's submittals to date and handouts provided during meetings on January 10, 1995 (meeting summary dated January 19, 1995) and June 23, 1995 (meeting summary dated July 3, 1995). To reflect the agreed upon resolution of these issues from the June 23, 1995 meeting, TVA is providing responses to the comments and the draft Amendment 90 FSAR revisions.

Liquid Radwaste Management System (LWMS)

1. Both Page 11.2-16 and Section 11.4.2.1.1 of the Watts Bar FSAR do not list the chemical drain tank as a tank from where liquid waste discharge to the environs can occur. However, Page 11.2-5 lists the above tank as one of the tanks from where discharge to the environs can occur.

RESPONSE

As stated in FSAR Section 11.2.3.1, page 11.2-5 and FSAR Section 11.2.4, page 11.2-16 (Amendment 89), the chemical drain tank can discharge directly to the cooling tower blowdown line. FSAR Section 11.4.2.1.1 is being revised as indicated in Enclosure 2 of this letter to add the chemical drain tank which can discharge directly to the environs.

2. Section 11.2.4.1.1 includes the floor drain collector tank as one of the tanks from where the liquid waste discharge is continuously monitored. However, other FSAR sections do not list the above tank as one of the tanks from where discharge to the environs can occur.

RESPONSE

FSAR Section 11.4.2.1.1 is being revised as indicated in Enclosure 2 of this letter to delete the floor drain collector tank since it cannot discharge directly to the environs. Discharge from this tank is first routed to another tank identified in Section 11.4.2.1.1 before discharging to the cooling tower blowdown line.

Gaseous radwaste management system (GWMS)

1. Section 11.3.2 does not explicitly state that operator actions will be performed both at 2% and 4% oxygen concentration levels when either the sequential or the continuous analyzer reaches either of the above concentration levels for oxygen. Also, the section does not identify the actions. The staff notes that TVA's February 17, 1995 submittal identifies the actions. However, the staff considers that it is appropriate to include the information in the FSAR section, since the Watts Bar design of the analyzers deviates from SRP 11.3 criteria for design of analyzers. Also the FSAR section should spell out the corrective actions the operator will have to perform in the event one or more analyzers become

inoperable. These additional surveillances are given in the handout on explosive gas storage tank radioactivity monitoring program. The staff recognizes that the program need not be spelled out in detail in the Watts Bar TS. However, the staff's acceptance of the analyzers for Watts Bar is partially based on grab sampling and analysis provisions and reporting requirements (see SSER 8, Page 11-1). Since the Watts Bar design of the analyzers deviates from SRP acceptance criteria, it is necessary to describe the equivalent level of protection for the gaseous radwaste processing system.

RESPONSE

Operator actions and corrective actions for programs required by the Technical Specification Administrative Controls Section 5.7.2.15 are described in more detail in the February 17, 1995 letter and implemented by licensee controlled documents. The level of detail in the controlled documents are inappropriate for inclusion in the FSAR. The FSAR Section 11.3.2 was amended by Amendment 89, as indicated in the draft FSAR pages provided in the letter dated February 17, 1995. Draft FSAR changes are enclosed in Enclosure 2 of this letter to provide additional detail of that program. This program will meet the NRC's bases of acceptance in SSER 8 in that grab samples are collected at least once every 4 hours and analyzed within the following 4 hours when a hydrogen or oxygen monitor is inoperable. The following clarification to the SSER 8 is necessary: SSER 8 implies that a special report will be submitted to the staff when either monitor is inoperable for more than 7 days or both monitors are inoperable. The WBN program will have provisions for providing a special report if a monitor can not be restored to operable status within 30 days. This is consistent with other nuclear plant technical specifications.

Solid radwaste management system

1. TVA has faxed (April 19, 1995) information on waste packaging area for Watts Bar. The faxed information should be adequately supplemented and incorporated in FSAR Section 11.5.

RESPONSE

Details of the fax are being incorporated as appropriate, in the FSAR to provide more detail on the waste packaging area. FSAR Section 11.5 is being revised to include information from Questions 2, 3, 4, and 5 below. Draft FSAR revisions are provided in Enclosure 2 of this letter to indicate the additional detail and will be included in Amendment 90.

2. TVA has not indicated where the processed primary spent resins placed in liners and HICs will be stored.

RESPONSE

Watts Bar does not plan to store processed primary resins. With the disposal site at Barnwell, SC remaining open, there is no need to store resins. However, if short term storage is necessary, the Auxiliary Building truck bay is available for short term storage. Additionally, the yard storage area is available for storage of primary resins.

3. TVA has not provided information on the processing of secondary spent resins from the condensate polishing demineralizer.

RESPONSE

Secondary spent resins may be dewatered as referenced in the Processed Control Program (PCP), and shipped directly for disposal. Additionally, the spent resins may be sluiced into a liner located in the Turbine Building railroad bay and shipped offsite to a licensed facility for volume reduction.

4. TVA has not provided information on available storage space for wet wastes other than primary spent resins (i.e., spent resins from mobile demineralizer system and secondary regenerant demineralizers; spent filter elements).

RESPONSE

Filter wastes are to be processed and stored in the Auxiliary Building truck bay. The filters are stored/processed in a high integrity container (HIC). The HIC is located inside a radvault. Based on current Sequoyah Nuclear Plant (SQN) production rates, this provides 90-180 days of storage. In addition, storage capacity of 22.5 ft^3 is available using 55-gallon drum pigs. These pigs can be stored in the waste packaging area.

Spent resins from the mobile demineralizer system are sluiced to holding tanks which are located in the waste packaging area. These tanks provide 267 ft^3 of storage capacity. This provides 80-day generation storage capacity.

Secondary resins are stored in a 441 ft^3 storage tank. This tank is located in the Turbine Building. This tank provides greater than 30-day storage as required in the referenced Branch Technical Position (BTP) 11.3, Position III.2. This also responds to Item 6 below.

5. TVA has not provided information on available storage space for packaged dry active wastes and contaminated equipment. In this context TVA should explain what it means by the words "stored outside."

RESPONSE

Watts Bar has sufficient storage space inside the Auxiliary Building truck bay to support one full shipment of stored waste (2000 ft^3). Normally, the loaded sealand containers will be stored outside the Auxiliary Building in a storage yard ("stored outside") adjacent to and east of the truck bay. This yard provides sufficient storage for dry active waste (DAW) shipments as well as storage for incoming outage equipment. This also responds to Item 7 below.

6. TVA has not demonstrated that storage area for wet wastes other than primary spent resins is sufficient to accommodate at least 30 days of the subject wet waste generation at normal generation rate in accordance with Position III.2 of BTP ETSB 11-3. TVA has not clarified whether the storage area will be located indoors as required by the above BTP position.

RESPONSE

This is the same question as Item 4 above. See the Response for Item 4 above.

7. TVA has not demonstrated that the storage area for DAW and packaged contaminated equipment is sufficient to accommodate one full offsite shipment in accordance with BTP Position B.III.3.

RESPONSE

This is the same question as Item 5 above. See the Response for Item 5 above.

8. TVA should clarify whether DAW that can be compacted will be compacted onsite. This question arises since the handout "Solid Waste Disposal" (N3-77B-4001) refers to such possibility. Also, clarify whether the exhaust from the subject area will be HEPA filtered.

RESPONSE

Watts Bar does not plan to use DAW compaction onsite at the present time. DAW will be shipped offsite for vendor volume reduction. This agrees with FSAR Section 11.5.3.2.

The exhaust air from the waste packaging area is not processed through a HEPA filter. FSAR Figure 9.4-8 shows the air flow arrangement for the waste packaging area. HEPA filters are not shown in the exhaust flow path.

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
RADWASTE MANAGEMENT SYSTEM
FSAR CHAPTER 11 QUESTIONS

Process and effluent radiological monitoring and sampling system

1. Page 11.3-8 refers to two exhaust vents for the service building. However, Section 11.4 and Tables 11.4-2 and -3 refer to only one effluent monitor. Explain how this single monitor monitors the exhausts from both the vents. Clarify whether both the exhausts will be filtered.

RESPONSE

The Service Building radiochemical laboratory, the titration rooms, and the protective clothing decontamination facility and ventilation room are radiologically monitored and are exhausted through a HEPA filter. Other areas pose insignificant radioactive release potential; however, HEPA filtration is provided for the machine shop. Exhaust systems from the various building areas discharge to a common exhaust housing, which is vented at separate locations to the outside. Draft FSAR Section 11.3.8, Service Building Vent is enclosed to clarify this design.

2. Section 11.4 does not explicitly state that the system will meet the guidelines of RG 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operation) - Effluent Streams and the Environment".

RESPONSE

Watts Bar is not committed to RG 4.15, Revision 1, however, the radiation monitoring program generally agrees with and satisfies the intent of RG 4.15, Revision 1 except for specific calibration techniques and frequencies. Discussions concerning calibration and testing frequencies of the monitors are in the draft FSAR changes for Sections 11.4.4, 12.3.4.1.3, and 12.3.4.2.6 provided in TVA's letter to the NRC dated July 18, 1995. Radiological monitoring is controlled in accordance with established site procedures and instructions, and is implemented by personnel qualified to perform the required functions. Process controls, including laboratory analysis and techniques, materials control, sampling methodology, performance monitoring and corrective actions are implemented within program requirements.

ENCLOSURE 2

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
FINAL SAFETY ANALYSIS REPORT (FSAR) CHAPTER 11
DRAFT FSAR CHANGES

The blowdown from the steam generators is routed to the condensate demineralizer or the hotwell (refer to Subsection 10.4.8) or discharged directly to the cooling tower blowdown line.

Spent regenerant waste from the condensate polishing demineralizers is processed through the neutralization and non-reclaimable waste tanks or the high crud tanks. From any of these tanks it is either released to the river via the cooling tower blowdown line, processed by a vendor, or concentrated by the condensate demineralizer waste evaporator (not required for unit 1 operation). The CDWE evaporator bottoms are solidified by a vendor located in the railroad access bay. Following solidification, the material is prepared for shipment to a burial site. The distillate is routed to the respective distillate test tanks. When one tank is filled, it is isolated and sampled for radionuclide analysis while the other tank(s) are in service. Analysis confirms that the activity level in the distillate is suitable for discharge. If unsuitable, the liquid is returned to the floor drain collector tank for processing or to the condensate demineralizer waste evaporator.

Mobile Demineralizer System Processing of Tritiated and Non-Tritiated Waste

Flow from both the tritiated and nontritiated tanks is routed to a Mobile Demineralizer System by use of the floor drain collector tank and tritiated drain collector tank pumps.

Processed water from the system is routed to either the CVCS monitor tank or the cask decontamination collector tank. The contents of these tanks are discharged as described in the two previous sections or processed further, as necessary, to meet ODCM limits. The Mobile Demineralizer System removes most soluble and suspended radioactive materials from the waste stream via ion exchange and filtration. Once the resin and filter media is expended, the resin is sluiced to a vendor supplied container to accumulate enough resin for off-site disposal. The filters are stored in an appropriate container. The spent resin is then sluiced to the railroad bay where it is dewatered to meet the disposal site criteria for spent resins.

Laboratory Sample Processing

The chemical drain tank receives inputs from the laboratory and the decontamination room. ~~However,~~ If the radioactivity level is low and the chemical content is suitable for release, the tank contents are discharged to the cooling tower blowdown line for release to the environment. In the event that the radioactivity level is high and analysis shows that there are no chemicals present which would be harmful to the demineralizer, the liquid is sent to the floor drain collector tank for processing. The tank contents may also be sent directly to the mobile demineralizer if required.

Processing of Waste from Regeneration of Condensate Polishing Demineralizer

Wastes produced in the regeneration of the condensate polishing demineralizers are processed for discharge or reuse. High crud, low conductivity waste (contains no regenerative chemicals) is filtered and discharged when the radioactive level does not exceed discharge limits. When limits are exceeded, the high crud waste is processed by a vendor or in the condensate demineralizer waste evaporator (CDWE) (not required for Unit 1 operation). Low crud, high conductivity waste is neutralized. If it contains radioactive material above discharge limits, it is processed by a vendor or in the CDWE. Distillate is discharged or recycled to the condensate system. Evaporator bottoms are solidified.

Tritiated Drain Collector Tank (TDCT) and Floor Drain Collector Tank (FDCT) Discharge Filters

Filters are provided to remove particulate matter from the discharge of the TDCT and FDCT. Each filter vessel is constructed of austenitic stainless steel.

Laundry Tank Basket Strainer

The laundry tank basket strainer is a perforated stainless steel sheet within a stainless steel casing. It is designed to prevent large particles from entering the waste collection system.

Condensate Demineralizer Waste Evaporator Package (Not required for Unit 1 operation)

A 30 gpm evaporator package is provided for concentrating radioactive spent regenerant solutions from the condensate demineralizer system. It is also capable of concentrating wastes from the liquid radwaste system. The evaporator package consists of a vapor body, entrainment separator, heater, recirculation pump, condenser, subcooler, vent gas cooler, condensate pumps, distillate pumps, concentrate pumps, chemical pumps optional, slurry holdup tank, chemical mixing tank, two distillate test tanks, and associated piping, valving, and instrumentation. Portions of the evaporator that are wetted with concentrate are constructed of Inconel 625, except the circulating pump, which is cast alloy 20. Portions wetted by feed and by distillate are constructed of 316L stainless steel. Portions wetted by steam, condensate, or cooling water may be carbon steel.

Cask Decontamination Collector Tank

The cask decontamination collector tank (CDCT) is used as a release tank for liquid disposal. The CDCT receives processed liquid from either the floor drain collector tank or the tritiated drain collector tank via the mobile demineralizer or directly from ~~or~~ the laundry and hot shower tanks.

The cask decontamination collector tank also receives water used in the decontamination of the spent fuel shipping cask. The contents are pumped to the cooling tower discharge line via the radwaste line if the activity is sufficiently low, and to the floor drain collector tank or returned to the mobile demineralizer for processing if the activity is ~~if~~ too high for discharge.

Cask Decontamination Pump

Two 100 gpm pumps are provided to recirculate and pump liquid from the cask decontamination collector tank through the cask decontamination filter to the waste discharge line. Normally, only one pump is used.

Cask Decontamination Filter

Two filters are provided to remove particulate matter larger than ~~25~~ 5 microns from the cask decontamination waste. The vessels are constructed of stainless steel and the replaceable filter elements are nylon. Normally, only one filter is used.

Waste Condensate Tanks

The waste condensate tanks are available for additional capacity to process effluent liquid. Each of three tanks have a capacity of 1500 gallons and discharge to the waste condensate pumps.

from the laundry and hot shower drain tanks and the chemical drain tank

Waste Condensate Pumps

Two waste condensate pumps are available to receive liquid from the waste condensate tanks. Each pump has a 20 gpm capacity and discharges to the CVCS monitor tank pump discharge header. The discharge can be recirculated back to the waste condensate tanks, to the CVCS monitor tank, the cask decontamination collector tank, or to the mobile demineralizer for processing.

Condensate Polishing Demineralizer Waste Processing Equipment High Crud (HC) Tanks

These tanks collect high crud, low conductivity waste produced during the backwash phase of condensate polishing demineralizer regeneration. The waste is filtered and is normally discharged to the cooling tower blowdown, processed to the Turbine Building sump or waste disposal, by a vendor, or through the condensate demineralizer waste evaporator (not required for Unit 1 operation). The discharge (after filtration) is very near condensate quality and is discharged only if permissible discharge concentrations are not exceeded.

High Crud Pumps

Two 150 gpm pumps are provided to circulate the contents of the high crud tanks for sampling, and to pump the tank contents through the high crud pre-filter and high crud filters. Normally, only one pump is used.

High Crud Pre-Filters

Three bag filters are arranged in parallel upstream of the high crud filter to filter the discharge stream, thus reducing the loading and clogging of the high crud filters. The vessels are constructed of stainless steel with replaceable filter elements. During normal operation two filters ~~will be~~ are in service. The third filter which is on standby and isolated may be placed in service while changing out the clogged filters. Each vessel has pressure gauges upstream and downstream of the filters.

High Crud Filters

A filter is provided to remove particulate matter from the high crud waste resulting from condensate polishing demineralizer regeneration. The filter is constructed of stainless steel.

Neutralization Tank

This tank collects spent regenerant chemicals and rinses from condensate polishing demineralizer regeneration (low crud, high conductivity waste), miscellaneous waste from the condensate polishing demineralizer sump and has the capability to receive and neutralize waste from the cation and anion regeneration tanks. Sulfuric acid or sodium hydroxide is added to adjust the pH to a value between 6.0 and 9.0. The tank contents are circulated during pH adjustment. After neutralization, the tank contents are pumped to the non-reclaimable waste tank or discharged to the environment.

Mobile Waste Demineralization System

The mobile waste demineralization system (MWDS), which can process 140gpm consists of several vessels with an associated pumping skid and level control system. The vessel headers have influent and effluent isolation valves and all piping is welded with long radius bends. Demineralizer vessels are operated inside shielding in the waste packaging area with a remote control panel to insure that the dose to personnel is within acceptable limits. The system is designed to the applicable portions of Regulatory Guide 1.143, Revision 1, 1979.

The MWDS provides in-line processing of liquid radwaste through filtration and demineralization. The MWDS receives both tritiated liquid (the tritiated drain collector tank, non-reclaimable waste tanks, high crud filter discharge, and CVCS holdup tank) and nontritiated liquids (the floor drain collector tank). Processed water from the MWDS is sent to either the CVCS monitor tank or the cask decontamination tank for release to the river. The waste condensate tanks are available for additional capacity if necessary to process effluent liquid; however, these tanks are not normally used for Unit 1 operation.

The liquid radwaste is processed through ion exchange and filtration which remove soluble and suspended radioactive materials from the waste streams. The first vessel is normally loaded with a filter media, such as activated carbon, to provide initial filtration of the radwaste. This filter medium removes solids, cobalt isotopes, existing in the form of colloidal-sized suspended solids and cleaning agents, and other chemicals that can be removed by absorption of the activated carbon. A mechanical filter loaded with filter cartridges can be used for filtration. This conditions the radwaste for treatment in the subsequent tanks.

The subsequent demineralizer tanks contain beds (anions and cations) of ion-exchange resins, which remove the soluble constituents of the waste stream. Once the resin and filter media is expended, the resin is removed from the MWDS vessels to a vendor supplied spent resin storage container to accumulate enough resin for off-site disposal, and the filters are placed in a shielded container for transport and storage prior to off-site disposal.

Since the equipment for the MWDS is supplied by a vendor and the selected vendor may change from time to time, a detailed description of the system is not possible. The specific treatment steps and equipment used ~~will~~ CAN also vary somewhat from vendor to vendor.

11.2.3.2 Instrumentation Design

The system instrumentation is depicted in Table 11.2-5.

The instrumentation readout is located mainly on the Waste Processing System panel in the Auxiliary Building. Some instruments are read where the equipment is located.

Alarms are shown separately on the WPS panel and/or waste disposal recycle control and CRT panel.

Most pumps are protected against loss of suction pressure by a control setpoint on the level instrumentation for the respective vessels feeding the pumps.

Pressure indicators upstream and downstream of filters provide local indications of pressure drops across each component. Radioactive releases to the environment are monitored for radioactivity by effluent radiation monitors. This instrumentation is further described in Section 11.4.

same as normal except for the increased load on the system. Abnormal liquid volumes of reactor coolant resulting from excessive reactor coolant or auxiliary building equipment leakage (1 gpm) can also be accommodated by the floor drain collector tank and processed by the non-tritiated system. Valve and pump leakoffs are all processed through the tritiated drain collector tank and non-reusable reactor coolant entering the floor drain collector tank is processed for release to the river.

3. Excessive Leakage in Auxiliary System Equipment

Leakage of this type could include water from steam side leaks inside the containment which are collected in the Reactor Building floor and equipment drain sump. Although the sump pump discharge is normally routed to the tritiated drain collector tank, the flow can be diverted to the floor drain collector tank upon discovery of a leak that is low in tritium. Other sources could be component cooling water leaks, service water leaks, and secondary side leaks. This water ~~will~~ enters the floor drain collector tank and will be processed and discharged as during normal operation.

4. Steam Generator Tube Leaks

During periods of operation with fuel defects, coincident with steam generator tube leaks, radioactive liquid is discharged via the steam generator blowdown system. The releases from the secondary side will be within the ODCM limits.

Releases of Waste

If the activity is not below ODCM limits, the liquid waste streams are returned to the waste disposal system for further processing by the mobile demineralizer.

Release of radioactive liquid out of the Liquid Waste Processing System is from the waste condensate tanks, cask decontamination collector tank, CVCS monitor tank, chemical drain tank, and laundry and hot shower tank to the blowdown line from the cooling towers. The cooling tower blowdown line discharges into the river through the diffuser pipes. Liquid wastes from the condensate polishing demineralizer system are released from the high-crud tanks, the non-reclaimable waste tank, and condensate demineralizer waste evaporator distillate tanks (not required for Unit 1 operation).

The condenser circulating water system operates in the closed cycle mode. Water is recirculated between the cooling towers and the condenser. The cooling towers blowdown flows to the diffuser in order to maintain the solids in the water at an acceptable level.

Release of the radioactive liquids from the liquid waste system is made only after laboratory analysis of the tank contents. Once the fluids are sampled, they are pumped to the discharge pipe through a normally locked closed manual valve and a remotely operated control valve, interlocked with a radiation monitor and a flow element in the cooling tower blowdown line. This assures that sufficient dilution flow is available for the discharge of radioactive liquids. The minimum dilution flow required for discharge of radioactivity into the cooling tower blowdown lines (CTBL) is 20,000 gpm.

Similar arrangement is provided for wastes discharged from the condensate polishing demineralizer waste system. A radiation monitor on this system and a flow element on the cooling tower blowdown are interlocked with a flow control valve in the system discharge line. Release of wastes is

4. All sampling points are available for sampling.

During reactor operation, the system is used at all times and hence is under continuous surveillance. Data is taken periodically for use in determining decontamination factors of demineralizers and evaporators.

11.2.6 ESTIMATED RELEASES

11.2.6.1 NRC Requirements

The following documents have been issued by the NRC to provide regulations and guidelines for release of radioactive liquids:

1. 10 CFR 20, Standards for Protection Against Radiation.

2. 10 CFR 50, Licensing of Production and Utilization Facilities.

11.2.6.2 Westinghouse PWR Release Experience

The liquid releases are highly dependent upon administrative activities which control the use of water for decontamination, equipment and floor rinsing and other uses in the controlled areas.

Operating plants have reported liquid discharges as shown in Table 11.2-6.

11.2.6.3 Expected Liquid Waste Processing System Releases

The quantities and isotopic concentration in liquids are assumed discharged to the liquid waste processing system, and hence the releases to the environment, are highly dependent upon the operation of the plant. The radionuclide concentrations and calculated doses ~~will be~~ the principal focus of treatment activities. Volume released is a secondary focus. The analysis for Watts Bar is based on engineering judgement, with respect to the operation of the plant and the liquid waste processing system, and realistic estimation of the potential input sources. Hence, the results are representative of typical releases from the Watts Bar liquid waste processing system.

The input sources, the computational data and assumptions are summarized in Table 11.2-1. The isotopic composition of reactor coolant (RC) is based on .12% failed fuel, as outlined in ANS N237. The associated releases in curies per year per nuclide are given in Table 11.2-7.

The liquid waste processing system is assumed to operate as described in Subsection 11.2.4.

11.2.6.4 Turbine Building (TB) Drains

11.2.6.4.1 Purpose

The TB drainage system is designed to remove all liquid drainage in the Turbine Building.

11.2.6.4.2 Description

The TB drains are not normally radioactive.

Auxiliary Services

The auxiliary services portion of the GWPS consists of two automatic gas analyzers and its instrumentation, valves, and tubing, a nitrogen and a hydrogen supply manifold and the necessary instrumentation, valves, and piping.

One automatic sequential gas analyzer determines the quantity of oxygen and hydrogen in the gas space of the volume control tank, pressurizer relief tank, holdup tanks, evaporators, gas decay tanks, reactor coolant drain tank, and spent resin storage tank and provides a local and main control room alarm on 2% oxygen concentration (hi-alarm), and 4% concentration (hi-hi alarm). ~~Operator action is relied upon to prevent the formation of a combustible gas mixture.~~

A second oxygen monitor is installed to continuously sample the discharge of the operating gas compressor. This monitor ~~will~~ sounds an alarm at 2% oxygen (hi-alarm) and 4% oxygen (hi-hi alarm) in the main control room. Operator action is relied upon to prevent the formation of a combustible gas mixture. Insert 1

The nitrogen and hydrogen supply packages are designed to provide a supply of gas to the Nuclear Steam Supply System. Two headers are provided for each package: one for operation and one for backup. The pressure regulator in the backup header is set slightly lower than that in the operating header. When the operating header is exhausted, its discharge pressure falls below the set pressure of the backup header, which comes into service automatically to ensure a continuous supply of gas. An alarm alerts the operator that one header is exhausted.

Nitrogen is supplied for the following: spent resin storage tank, reactor coolant drain tank, pressurizer relief tank, volume control tank, gas stripper (not required for Unit 1 operation), boric acid evaporator (not required for Unit 1 operation), waste gas decay tanks, and holdup tanks. In addition, there is a truck fill connection in the nitrogen supply header for the direct filling of the safety injection system accumulators. Makeup nitrogen for the accumulators is supplied from the package. Hydrogen is supplied for the volume control tank.

The design and material of valves and manifolds are the same as for the main gaseous waste processing system (GWPS).

11.3.3 SYSTEM DESIGN

11.3.3.1 Component Design

The GWPS equipment parameters are given in Table 11.3-1. For further information on design codes and safety classes see Section 3.2.

Waste Gas Compressors

The two waste gas compressors are provided for continuous removal of gases discharging to the vent header. One unit is supplied for normal operation and is capable of handling the gas from a holdup tank which is receiving letdown flow at the maximum rate. The second unit is provided for backup during peak load conditions, such as when degassing the reactor coolant or for service when the first unit is down for maintenance. Operation of the backup unit can be controlled manually or automatically by vent header pressure. Each unit is sized for 40 CFM.

ENCLOSURE 2

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
FINAL SAFETY ANALYSIS REPORT (FSAR)
DRAFT FSAR CHAPTER 11 CHANGES

INSERT 1 PAGE 11.3-2, PARAGRAPH 3

In the waste gas holdup system, this is accomplished by reducing oxygen concentrations on a high alarm and suspending additions to the waste gas system and reducing oxygen concentrations on a high-high alarm. For the sequential analyzer on a hi alarm, the operator determines the source of the high oxygen and reduces the oxygen concentration. For a sequential analyzer hi-hi alarm, the operator minimizes an increase in vent header pressure, suspends additions to the waste gas system, and reduces oxygen concentration.

As protection against an uncontrolled release of radioactive materials from the GWPS, grab sampling and analysis is performed when either the WDS waste gas hydrogen or oxygen analyzer is inoperable.

755-foot level will not exceed 23,000 cfm and the flow rates through typical vent at the 824-foot level will not exceed 36,000 cfm. The general arrangement of vents on the turbine building is shown on Figure 1.2-1. The turbine building is shown on the main plant general plan, Figure 2.1-5.

Condenser Vacuum Exhaust Vent

Gaseous wastes from the condenser are discharged through the condenser vacuum exhaust vent. The vent, which is a 12-inch diameter pipe, is located on the turbine building roof and discharges approximately 32 feet above grade. Under normal operating conditions the discharge flow rate will typically be less than 45 cfm.

Service Building Vent INSERT 2

~~Potentially radioactive waste gases from the radiochemical laboratory, the titration room, and the decontamination facility are exhausted to a common duct which inputs to the service building roof exhaust vent from the north mechanical and electrical equipment room. Other potentially radioactive waste gases from the machine shop, decontamination area, and the general area exhaust to a common duct which inputs to the service building roof exhaust vent from the south mechanical and electrical equipment room. Both vents discharge to atmosphere approximately 24 feet above grade. All air is exhausted through HEPA filters. The service building is shown on the site plot plan, Figure 2.1-5.~~

11.3.9 Atmospheric Dilution

Calculations of atmospheric transport, dispersion, and ground deposition are based on the straight-line airflow model discussed in NRC Regulatory Guide 1.111 (Revision 1, July 1977). All releases are assumed to be continuous. Releases known to be periodic, e.g., those during containment purging and waste gas decay tank venting, are treated as continuous releases.

Releases from the Shield Building, Turbine Building (TB), and Auxiliary Building (AB) vents are treated as ground level. The ground level joint frequency distribution (JFD) is given in Section 2.3. Air concentrations and deposition rates were calculated considering radioactive decay and buildup during transit. Plume depletion was calculated using the figures provided in Regulatory Guide 1.111.

Estimates of normalized concentrations (X/Q) and normalized deposition rates (D/Q) for gaseous releases at points where potential dose pathways exist are listed in Table 11.3-10.

11.3.10 Estimated Doses from Radionuclides in Gaseous Effluents

Individuals are exposed to gaseous effluents via the following pathways: (1) external radiation from radioactivity in the air and on the ground; (2) inhalation; and (3) ingestion of beef, vegetables, and milk. No other additional exposure pathway has been identified which would contribute 10 percent or more to either individual or population doses.

ENCLOSURE 2

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
FINAL SAFETY ANALYSIS REPORT (FSAR)
DRAFT FSAR CHAPTER 11 CHANGES

INSERT 2 PAGE 11.3-8, REPLACE PARAGRAPH

Service Building Vent

Radiologically monitored potentially radioactive waste gases from the radiochemical laboratory, the titration room, and the protective clothing decontamination facility and ventilation room are exhausted through HEPA filters via a common duct which discharges to the common Service Building roof exhaust plenum. Exhaust air from the machine shop, which is HEPA filtered, the small tool and equipment decontamination area, and the general area, discharges to the common Service Building roof exhaust plenum. Separate vents from the common roof exhaust plenum discharge to atmosphere approximately 24-feet above grade. The Service Building is shown on the site plot plan, Figure 2.1-5.

11.4.2.1 Liquid Monitors

All process liquid monitors, except steam generator blowdown liquid sample monitors (not used for Unit 1 operation) and Turbine Building sump discharge monitors, indicate and record activity on MCR Panel 0-M-12. All monitors initiate visual (annunciator window) and audible alarms on high radiation and instrument malfunction in the MCR. All monitors have individual power supplies compatible with detector voltage requirements. The steam generator blowdown liquid sample monitors (not used for Unit 1 operation) and the Turbine Building sump discharge monitor have local indication of activity. The detector location and type, monitor sensitivity and range, etc., of each off-line liquid process monitor are listed in Table 11.4-1.

11.4.2.1.1 Waste Disposal System Liquid Effluent Monitor

Chemical drain tank

This monitor continuously monitors batch releases from the waste disposal liquid released from the plant from the three waste condensate tanks, cask decontamination collection tank, two laundry tanks, ~~floor drains collector tank,~~ CVCS monitor tank, two distillate tanks, and condensate demineralizer waste evaporator (not required for Unit 1 operation) blowdown tank. This effluent line is not in continuous service. The monitor assembly consists of a gamma scintillation detector and preamplifier; a sample pump; and appropriate flow instrumentation. In the event of a high-radiation or instrument malfunction signal, automatic closure of the effluent discharge valve is initiated to prevent release to the environment.

(not required for Unit 1 operation),

The waste disposal system liquid effluent monitor setpoints are established using the methodology provided in the Offsite Dose Calculation Manual (ODCM).

11.4.2.1.2 Essential Raw Cooling Water Effluent Monitors

Essential raw cooling water effluent is continuously monitored to ensure radioactivity is not released to the cooling tower basin. These monitors serve as accident monitors to detect leakage from either the component cooling heat exchangers or containment spray heat exchangers (during accident). Each monitor assembly consists of a sample pump, two gamma scintillation detectors and preamplifiers measuring the same range, and appropriate flow instrumentation. Significant activity in the ERCW is indicated by an alarm in the MCR, at which time the operator will determine appropriate action. The setpoint is based on background levels, identified leakage, and maximum limits. Each monitor assembly is supplied from separate trained Class 1E power supply.

Setpoints are established using the methodology provided in the ODCM.

11.4.2.1.3 Component Cooling System Liquid Effluent Monitors

Each monitor continuously monitors downstream of its respective component cooling heat exchanger for activity levels indicative of a reactor coolant leak from either the RCS or RHR systems. Each monitor assembly consists of a gamma scintillation detector and preamplifier, and appropriate flow instrumentation. In the event of a high radiation signal, automatic closure of the component cooling surge tank vent line from each surge tank is initiated to prevent gaseous activity release. Significant activity in the component cooling water is indicated by an alarm in the MCR. The setpoint is based on background levels and maximum limits.

11.5 SOLID WASTE MANAGEMENT SYSTEM

11.5.1 Design Objectives

The ~~estimated 65,820 ft^3 of~~ slurries and solid radwaste[1] produced ~~annually~~ by Watts Bar Nuclear Plant Units 1 and 2 is prepared for shipment or for temporary onsite storage in compliance with the requirements in 10 CFR 61, 10 CFR 71, and 49 CFR 171, 172, 173, 177, and 178. Solid wastes ~~will be~~ are processed by the Solid Waste System (SWS) which is located in a seismic Category I structure. The waste packaging area, divided into three sections by thick concrete walls is composed of the mobile demineralizer (MD) area, an area for high level storage and the MD storage container, and an area for low level dry active wastes (DAW). Radiological monitoring is provided for the waste packaging area as described in Chapter 12. For further information on design codes and safety classes, see Section 3.2.

11.5.2 System Inputs

Waste inputs are divided ~~in~~to two categories: (1) Dry Active Waste (DAW) and (2) Wet Active Waste (WAW). DAW and WAW are products of the plant operation and maintenance. Dry Active Wastes are further subdivided into compactible and noncompactible wastes. Solid compactible wastes include paper, clothing, rags, mop heads, rubber boots, and plastic. Non compactible wastes include tools, mop handles, lumber, glassware, pumps, motors, valves, and piping.

Wet active wastes are primarily composed of spent resins. The sources for spent resins are the spent resin storage tank, the mobile demineralizer, and Condensate Polisher Demineralizer System (CPDS).

A list of inputs and expected yearly volumes of solid wastes are provided in Table 11.5-1. Table 11.5-2 provides a list of major nuclides activity to be shipped on a yearly basis.

11.5.3 Systems Description

11.5.3.1 Wet Active Waste Handling

Bulk Resin Processing

A system for packaging and dewatering bulk quantities of spent resin for shipment is shown in Figure 11.5-1. The shipping container consists of an inner disposable steel liner with an outer returnable shield. Filter elements are mounted inside the liner near the bottom and are connected to a hose connection outside the shield to facilitate dewatering spent resins. The container also has fill and vent connections.

Several types of shipping casks may be used. Most of these are vertical cylinders, having capacities of 128 ft^3 to 215 ft^3. All casks have been licensed pursuant to the general license provisions of paragraph 71.12(b) of 10 CFR Part 71. Other licensed casks are available to TVA on a rental basis.

Loading is accomplished with the cask mounted on a truck or trailer bed. The truck or trailer is located in the Auxiliary Building railroad bay. The cask with disposable liner is filled from the spent resin tank. Resin slurry is sluiced to the liner using water from the Primary Makeup Water (PMW) System. Water is removed from the liner through the internal filters, and is collected in the tritiated drain collector tank. A pump is used as required to aid the dewatering process. Additional slurry is added to the container, and the

The spent resin storage tank is pressurized with nitrogen, and the

[1] Include resin waste.

INSERT 3

fill-and-dewatering process is repeated until the level indicator shows that the desired amount of resin has been transferred. ~~The waste is dewatered to meet the free-standing water limitations at licensed disposal facilities. Flush connections are provided from the PMW System to flush the resin slurry lines.~~

In the event that the container were to overflow during the filling process, the overflow would take place through the vent line and the liquid would drain to the tritiated drain collector tank. The strainer in the vent line would prevent overflow of resin.

In certain cases spent resins will be stabilized or packaged in a ~~high integrity container (~~HIC~~)~~. Resins can also be transferred to a commercial portable solidification unit for solidification (see Section 11.5.4.2).

Spent Resin Inventory

The level indicating system in the spent resin storage tank is a thermal disposition type level probe which measures resin and water level independently. Since the level probe indicates the resin/water interface, the inventory of spent resins in the tank can be determined.

Mobile Demineralizer Resin Processing

Spent resins from the mobile demineralizer ~~system~~ are stored in ~~a~~ vendor-supplied containers to accumulate sufficient ~~enough~~ spent resins for disposal off-site. ~~The spent resins are dewatered to meet the disposal facilities' free-standing water limitations. The dewatered resins and disposable metal liners or HICs are prepared for shipment or temporary onsite storage.~~

INSERT 4

INSERT 5

11.5.3.2 Dry Active Waste Handling

Dry active waste (DAW) is separated into two types of waste. The two types of waste are those that can be incinerated (incinerable), and those that cannot be incinerated (non-incinerable). DAW is collected throughout the plant and is brought to the waste packaging area. Here DAW is sorted and temporary stored prior to shipment offsite.

Incinerable Waste

Incinerable waste like paper, clothing, rags, plastic, mop handles, lumber, etc., are collected and then transferred to a Sealand type container for processing by offsite vendor and disposal.

Non-incinerable Waste

Non-incinerable waste such as tools, valves, motors, etc., are collected and packaged in containers, and are temporary stored. ~~in the waste package area.~~ This waste is then sent for processing by an offsite vendor for volume reduction, and disposal or recycle.

ENCLOSURE 2

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
FINAL SAFETY ANALYSIS REPORT (FSAR)
DRAFT FSAR CHAPTER 11 CHANGES

INSERT 3 PAGE 11.5-2

The waste is dewatered to meet the free-standing water limitations at licensed disposal facilities, and the liquid effluent is discharged to the tritiated drain collector tank. Flush connections are provided from the primary makeup water (PMW) system to flush the resin slurry lines back to the spent resin storage tank.

The resins are sampled for waste characterization per 10 CFR 61. The high integrity containers (HIC) are capped and may be temporarily stored at the site prior to shipment. Temporary onsite storage is provided in the yard east of the CDWE Building and in the Auxiliary Building railroad bay. Primary spent resins are stored only in a shielded container if stored in the yard.

INSERT 4 PAGE 11.5-2

Loading is accomplished with the cask mounted on a truck or trailer bed located in the Auxiliary Building railroad bay. The cask with the disposable liner/HIC is filled from the vendor furnished storage containers. Resin slurry is sluiced to the liner using service water. Water removed from the liner through the internal filters is discharged to the tritiated drain collector tank, and a pump is used as necessary to aid the dewatering process. Additional slurry is added to the container and the fill-and-dewatering process is repeated until the level indicator shows that the desired amount of resin has been transferred. The waste is dewatered to meet the free-standing water limitations at licensed disposal facilities.

The resins are sampled for waste characterization per 10 CFR 61. The liners/HICs are capped and may be temporarily stored at the site prior to shipment. Temporary onsite storage is provided in the yard east of the CDWE Building and in the Auxiliary Building railroad bay. Spent mobile demineralizer resins are stored only in a shielded container if stored in the yard.

ENCLOSURE 2

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
FINAL SAFETY ANALYSIS REPORT (FSAR)
DRAFT FSAR CHAPTER 11 CHANGES

INSERT 5 PAGE 11.5-2

Condensate Polishing Demineralizer Resin Processing

Contaminated spent resins from the condensate polishing demineralizer system are transferred directly from the storage tank to a disposal liner located on a trailer in the Turbine Building railroad bay. The resin storage tank is pressurized with air, and the resin slurry is sluiced to the liner using water from the condensate system. Water is removed from the liner through internal filters, and is collected in the high crud tanks. Additional slurry is added to the container, and the fill-and-dewatering process is repeated until the level indicator shows that the desired amount of resin has been transferred. The waste is dewatered to meet the free-standing water limitations at licensed disposal facilities or licensed waste processors. The resins are sampled for waste characterization per 10 CFR 61. The liner is capped and may be temporarily stored at the site prior to shipment. Temporary onsite storage is provided in the yard east of the CDWE Building and in the Auxiliary Building railroad bay. Yard storage is permitted provided the resins are in the final disposal/shipping containers.

11.5.3.3 Miscellaneous Waste Handling

Air and gas filter and prefilter elements and glassware are placed in appropriate containers. Wet radioactive plant filters are packaged, when necessary, in high integrity containers.

If radiation levels of containers are high enough to require shielding, they are loaded into and transported in shielded truck trailers or a cask similar to those used to transport liners containing bulk quantities of dewatered resins.

11.5.4 Equipment Operation

11.5.4.1 Deleted

11.5.4.2 Mobile Solidification System (MSS)

The MSS is a portable solidification unit provided by a vendor service contract. The MSS combines and mixes radioactive wastes (resins, concentrates and liquid wastes) with solidification agents and needed additives to solidify the waste. The solidification is done in accordance with a Process Control Program to ensure that each batch of waste is properly solidified. Only solidification agents (such as cement) which have been approved by licensed disposal facilities are used. The waste is solidified in a disposable liner and prepared for shipment or temporary onsite storage. The disposable liners are equipped with internal mixers to provide uniform mixing. The mobile solidification system is located in the Auxiliary Building railroad bay. Necessary connections have been provided in the railroad bay to support the mobile solidification system as shown by Figure 11.5-1.

11.5.5 Storage Facilities

Insert 6

~~The Waste Packaging Area is a temporary storage area for DAW.~~

11.5.6 Shipment

Insert 7

~~Low-level radioactive waste (LLRW) is shipped to a commercial disposal site according to federal regulations and disposal site criteria. Drums and boxes containing radwaste are transported to the disposal facility in a sole-use van-type or flatbed truck trailer. Dewatered resins and solidified resins are packaged in liners or high integrity containers and transported in a transportation cask when required. All radioactive waste is packaged and transported in accordance with federal, state and TVA regulations.~~

ENCLOSURE 2

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
FINAL SAFETY ANALYSIS REPORT (FSAR)
DRAFT FSAR CHAPTER 11 CHANGES

INSERT 6 PAGE 11.5-3

11.5.5 Storage Facilities

Inplant Storage Area

Packaged wastes and unpackaged dry active wastes are stored in designated storage areas until shipment. Designated inplant storage areas include the waste packaging area and the Auxiliary Building railroad bay. The indoor storage for processed wastes and unprocessed DAW provides greater than 30 day storage at expected generation rates. The annual DAW volume for compactible and non-compactible trash as shown in Table 11.5-1 is expected to have a 11.4 curie content. For unprocessed wet wastes the following storage containers are provided:

Spent Resin Storage Tank	300 ft^3
Mobile Demineralizer Storage Tanks	267 ft^3
CPDS Storage Tank	441 ft^3
Filter HIC/shielding	96 ft^3

The above unprocessed storage capacities provide greater than 30 days storage at expected generation rates.

Outside Radwaste Storage

Operational considerations make it necessary to temporarily store containers of radioactive materials and radioactive wastes in designated areas such as the east yard outside of the CDWE. Liners of dewatered resin are stored the same as other containers such as drums or boxes. Drums, boxes, and liners of radioactive materials or wastes may be stored in outside storage areas after being packaged for shipment or storage. The outside storage yard provides sufficient storage to accommodate one full shipment of DAW or radioactive materials. The contact dose for containers stored outside is in accordance with 49 CFR 173.441.

INSERT 7 PAGE 11.5-3

11.5.6 Shipment

Waste is shipped to a commercial disposal site according to federal regulations and disposal criteria. Waste may also be shipped to a broker/processor to meet federal regulations and disposal site criteria. Drums and boxes containing radwaste are transported to the disposal facility in a sole-use van-type or flatbed truck-trailer. Dewatered resins and solidified resins are packaged in liners or HICs and transported in a transport cask when required. Radioactive waste is packaged and transported in accordance with federal, state, and TVA regulations.

ENCLOSURE 3

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
CHAPTER 11
COMMITMENT LIST

The FSAR will be amended by Amendment 90 to include the draft FSAR pages in Chapter 11.