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May 24, 1982

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Virgil C. Summer Nuclear Station
Docket No. 50/395
Radwaste System FSAR Changes

Dear Mr. Denton:

South Carolina Electric and Gas Company (SCE&G) hereby provides marked-up FSAR pages showing changes that will be incorporated into Chapter 11 in Amendment 32. The majority of these changes do not impact previous commitments and result from our utilization of the Chem-Nuclear Cement Solidification System as opposed to our previous urea-formaldehyde system or from printing errors. However, there are two changes which warrant further discussion to preclude any confusion.

First, the FSAR previously stated that liquid radwastes would be allowed to decay in storage tanks on site for at least 30 days prior to shipping. Because we can find no basis, either regulatory or technical to delay shipment of wastes that may meet acceptable radioactivity limits, we will modify this commitment. SCE&G will store liquid radwastes on site as required prior to shipping. This storage period may be less than or greater than 30 days. The capability exists to accommodate stored wastes for at least 30 day waste generation in accordance with Standard Review Plan Section 11.4.

Another change involves the sealing of radwaste liners. SCE&G had previously stated in the FSAR that the final closure of all radwaste liners would be done by remote handling equipment. Although this equipment is available, it will not be utilized when radiation levels permit hand installation of a barrel top for sealing. The remote handling equipment will be used for closure of radwaste liners if required by radiation levels.

As mentioned earlier, the other changes shown in the attached pages do not represent changes to prior commitments. However, if you have any questions, please let us know.

Very truly yours,

T. C. Nichols, Jr.

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Senior Vice President
Power Operations

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11.5 SOLID WASTE SYSTEM

11.5.1 DESIGN OBJECTIVES

The solid waste system is designed to package and/or solidify radioactive wastes for shipment to an approved offsite burial facility in accordance with applicable Department of Transportation (DOT), NRC and State regulations. The system conforms to 10 CFR 20 and 10 CFR 50 requirements by providing shielding so that radiation exposure of operating personnel and the public is within acceptable limits. Solid waste packaging is accomplished in an area located on the ground floor (elevation 436') and in the upper mezzanine area (elevation 447') of the auxiliary building, a Seismic Category I structure. 29

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Design, fabrication and test of solid waste system components and piping is in accordance with ANSI B31.1 and other accepted standards referenced by ANSI B31.1. Additional onsite system tests will be performed using nonradioactive materials prior to commercial operation. ~~The shipping containers are DOT Type A. Overpacks for highly radioactive materials satisfy DOT regulations.~~ Packaging and shipping conform to 49 CFR 171 through 49 CFR 178. 15 32

Individual container shields and casks are used, when required, to maintain radiation levels within applicable radioactive materials regulations. ~~200 mR/hr at surface contact and 10 mR/hr at 3 feet.~~ 32 ~~29~~

11.5.2 SYSTEM INPUTS

Radioactive waste packaged includes:

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11.5.3.2.4 Instrumentation and Controls

The system uses temperature, flow, pressure, and level instruments to monitor and/or control the process located throughout the system.

The inplant control panel, power panel and radiation monitor are located in the drumming station control room. The CNSI control panel is also located in this same area.

1. Inplant Control Panel

   The inplant control panel is a standard enclosure of NEMA 12 construction. The inplant control panel provides full operational control for resin and liquid waste transfer operations to the vendor's equipment. It is also used to interface with vendor equipment
   29 for dewater return and for flushing operations. This panel contains switches and lights for valves and pumps which facilitate these
   32 operations. ~~This panel contains switches and lights for valves and pumps which facilitate these operations.~~

4. Radiation Monitoring

Radiation monitoring is provided by the vendor's equipment in the following areas:

1. Waste isolation valve of the piping process skid
2. Liner fill head
3. Drumming station control room

Radmonitor RM-7662 is portable for use in either the solidification area or truck bay. This radmonitor will alarm and terminate a fill operation by closing valves MOV-2 and MOV-5 if its setpoint is exceeded. 29

The radiation monitors are in addition to those discussed in Sections 11.4, 12.1.4 and 12.2.4. 14

11.5.3.2.5 Waste Containers and Shielding

All wastes are packaged in DOT approved containers. The containers used for cement solidification and resin dewatering accomodate a fillhead for processing. ~~Compacted wastes are packaged in standard 55 gallon drums. Other wastes are packaged in DOT Type A containers.~~ Quick disconnect fittings are located in ~~full head~~ the fillhead top for the following: 32

1. Dewater through a filter, provided in the container, back to the Excess Liquid Waste Holdup Tank or Spent Resin Storage Tank.
2. Cement - Calcium hydroxide fill connection
3. Conditioning chemical supply 29
4. Vent to filters and plant vent
5. Radwaste supply flush

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The processing of most of the liquid waste volume will be in the solidification area. This area is enclosed on three sides by walls for shielding and includes a curb to contain spills. A movable shield may be brought in if additional shielding is required. Higher activity wastes will be processed with the liner already in the transport cask located in the truck access area. A double lid cask top will be used to limit exposure in this area. The main part of the lid shields the entire top of the cask except the immediate area required for the fill head. After the process is complete, the fill head is removed and the secondary cask lid is installed. 32 29

Final closure of all radwaste liners ~~is by~~ can be accomplished by remote handling equipment, if required. Carbon steel liners are remotely sealed by a hydraulic barrel top crimper. High integrity containers are remotely sealed by a hand manipulated device which screws the closure cap into the liner. 32

11.5.3.2.6 Contamination Control Facilities

An adjacent decontamination area is provided for cleanup of contaminated containers. Exposed surfaces of filled containers or casks are surveyed by the health physics group to identify the presence of removable radioactive contamination prior to transfer to storage or shipment. Containers are decontaminated in the adjacent decontamination area, if required.

11.5.3.2.7 Handling Equipment

Equipment used for handling waste containers and equipment within the radwaste area and for truck loading includes the following: 29

1. One ton jib crane.
2. Three ton jib crane.
3. Ten ton bridge crane.
4. Twenty ton hoist and monorail.
5. Three ton bridge crane.
6. Ten ton bridge crane.

The one ton jib crane is located on a wall above the truck access floor at
32 elevation ~~435'~~ 455'. It is used for hoisting chemicals and equipment from the truck access area to the mezzanine floor. It has a lift of 23 feet at a speed of 22 ft/min. 32

The three ton jib crane is located on a wall above the solidification area. It is used to handle the vendor's fill head and other equipment. It has a 23 foot lift at a speed of 11 ft/min.

The ten ton bridge crane is used for transporting compactible and non-compactible waste, in the low radiation level storage area at floor elevation 447'. It has a lift of 14 feet at a speed of 11 ft/min and a trolley speed of 65 ft/min.

32 The twenty ton hoist and monorail is used to load the containers on a truck for transport to a burial site. It has a lift of 17 feet at a speed of 10 ft/min.

The three ton bridge crane is located over the radioactive filter area at floor elevation 463'. It is used in conjunction with a 3-1/2 inch thick lead filter transfer cask to remove spent radioactive filter
14 cartridges from the filter housings located in concrete cubicles on the floor below at elevation 452'-6". The trolley has a transfer mechanism which permits the hoist and the cask to engage a monorail which extends over the radwaste fill area. A hatch at floor elevation 463' is removed and the hoist lowers the cask to the radwaste area at floor elevation 436'. It has a lift of 47 feet at a speed of 22 ft/min and a trolley speed of 65 ft/min.

Another ten ton bridge crane is located in the hot machine shop. It is
14 chiefly used to service the machine shop. However, a portion of the floor area in the machine shop is partitioned from the rest of the shop for storage of unused containers, 55 gallon drums, pallets, etc. The
29 storage area is also serviced by this crane. The hoist has a lift of 24 feet at either 7 or 20 ft/min. The trolley has a speed of either 32-1/2 or 65 ft/min.

11.5.3.2.8 Waste Compactor

An electromechanical compactor, with a compressive force capacity of
32 ~~four~~ Nine tons, is used to compact dry wastes into 55 gallon drums. During compaction the drum is completely enclosed. A self-contained HEPA filter

and blower system filters the air released in the compaction process before it is discharged to the auxiliary building atmosphere. An electrical interlock prevents operations of the compactor if the door, which encloses the drum, is not completely closed. This prevents injury to the operator and unfiltered air from escaping to the auxiliary building atmosphere. This compactor satisfies Occupational Safety and Health Act (OSHA) requirements.

11.5.3.2.9 Truck Loading Features

A wall penetration is provided between the fill and truck access areas to to fill directly to containers on a truck. This penetration is located in the shielded cubicle of the solidification area such that exposure in the truck access is limited. 32 29

11.5.4 EXPECTED VOLUMES

The expected annual volume of solid radioactive wastes together with the associated Curie content of principal nuclides to be processed are described in Sections 11.5.4.1 through 11.5.4.4.

11.5.4.1 <u>Activity Levels</u>

The activity level of the wastes generated directly from operation of the nuclear steam supply system is based upon reactor plant operation at a base load factor of 80 percent power with reactor coolant activity levels determined on the basis of fission product diffusion through cladding defects in 0.12 percent of the fuel rods. The system is conservatively designed to accommodate solid wastes generated by plant operations with up to 1 percent fuel defects. Source term data used for system design are presented in Section 11.1.

Table 11.5-1 lists the demineralizer resin volumes and expected volumes replaced on an average yearly basis. Table 11.5-2 presents a summary of the anticipated total solid radioactive waste generated per year. The expected activity of the solid waste at time of shipment is dependent upon the decay storage time. An isotopic breakdown of spent resin and waste concentrates activities is presented in Table 11.5-3. The maximum activity of expended filter cartridges is given in Table 11.5-4. The associated Curie content and volume of waste shipped from a number of Westinghouse designed operating reactors is given in Table 11.5-6 for each year from 1971 through 1974.

11.5.4.2 Processed Wastes

The maximum Curie content of the evaporator concentrates is approximately
32 40 μCi/cc. ~~On the basis of 35 ft^3 of evaporator concentrates per container, the maximum activity is 25 Curies.~~ However, the average activity
content is expected to be on the order of 4 μCi/cc.

The Curie content of the chemical drain tank effluents totals approxi-
32 mately 2.0 Ci/yr, ~~or 0.5 Curies per container.~~ In the case of primary
spent resins, the Curie content totals approximately 1390 Ci/yr, ~~or~~
32 ~~approximately 200 Curies per container.~~ Nuclear blowdown system spent
resins are estimated, for design purposes, to account for approximately
32 4.0 Curies per year. ~~or approximately 0.3 Curies per container.~~

11.5.4.3 Filter Cartridges

The volume of expended filter cartridges processed for disposal by the solid waste system is based upon the expected filter cartridge change frequency for potentially radioactive filters. The assumption is made that filters processing reactor coolant will require cartridge renewal due to excessive radiation levels or high ΔP at minimum intervals of

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every six full power months of operation and that one of the three nuclear blowdown system filters will require cartridge renewal, normally for high ΔP, weekly. All other filters are assumed to be renewed annually. These replacement rates are approximations only since sufficient specific operational data is not yet obtainable (see Table 11.5-4).

The maximum expected activity of expended filter cartridges shipped from the site is conservatively based upon a shielding criteria of a maximum contact dose rate.

11.5.4.4 Miscellaneous Solid Wastes

The annual volume of miscellaneous solid wastes processed by the solid
waste ~~hydraulic baler~~ compactor is assumed to amount to ~~350~~ 1000, 55 gallon drums of 32
compacted refuse. The wastes consist of rags, coveralls, ventilation filter cartridges and various other potentially contaminated refuse. ~~The activity of this refuse is low level and does not present a radiation hazard (less than 1.0 Ci/yr).~~ This refuse is normally classified as low specific activity

11.5.5 PACKAGING

11.5.5.1 Evaporator Bottoms and Chemical Samples

Evaporator bottoms, concentrated to 12 percent, or less, boric acid in 14
the boron recycle or waste evaporator, are stored in the heat traced 5000 gallon waste evaporator concentrates tank. Lines from this tank to the waste line connection in the piping process skid cubicle are also heat traced. Chemical samples are stored in a 600 gallon chemical drain
tank. When a sufficient quantity has accumulated in either waste tank, 29
its contents are recirculated for at least two volume changes and a sample is taken. The sample is used by the Process Control Program for test solidification. After sampling, the waste volumes are then transferred to the vendor's equipment for processing.

The five flexible hoses and one electrical lead are disconnected by chains attached to the overhead jib crane which lifts and snaps the quick disconnects free. The fill shield assembly is removed and the lid shield is installed on the container shield cask by use of the pendant controlled jib crane. The container is automatically sealed when the disconnects are freed. The filled container is stored in a storage area until shipment. 32 29

11.5.5.2 Spent Resin

Resin in a demineralizer is considered spent when its decontamination factor falls below a permissible level or the demineralizer surface dose rate exceeds its limit. The spent resin, from demineralizers in the primary system is stored in a 350 ft^3 storage tank. The spent resin from nuclear blowdown demineralizers in the secondary system is stored in a 600 ft^3 nuclear blowdown system storage tank. The resin stored in the primary system is normally allowed to decay for a period of up to several months. ~~but not less than 30 days. The resin stored in the nuclear blowdown system storage tank is surveyed to determine the minimum decay period required. This period is expected to be less than 30 days.~~ 29 32

When a sufficient quantity of resin has accumulated and decayed, the resin is sampled, analyzed for isotopic constituents and activities, ~~for radiation level~~ and packaged. Prior to packaging, resin sluice water is recirculated in the tank to form a slurry which is transferred to the liner by nitrogen cover gas pressure. Dewatering of the resin is accomplished using the vendor's equipment with the water being returned either to the Excess Liquid Waste Holdup Tank or the Spent Resin Storage Tank. Spent resin may also be solidified. 19 ~~29~~ 32 19 29

resin storage tanks are set to relieve at 110 psig and 140 psig, respectively. The primary resin storage tank relieves to the waste holdup tank. The nuclear blowdown resin storage tank relieves to the nuclear blowdown system reservoir by way of an open drain.

11.5.5.3 Filter Disposal

Filters are of the disposable cartridge type contained in housings having hinged tops. They are replaced when surface dose rate or pressure drop exceeds established levels. Filters which are potentially radioactive are located in individual cubicles in an area close to the drumming station area. If the radiation level of the cartridge requires shielding during removal, a concrete plug in the floor above the housing is removed and another plug with a hole in it is placed in the stepped opening. A filter cask with 3 1/2" lead encased in stainless steel is placed over the hole. The filter housing is opened and the cartridge is drawn into the cask by the use of special tools having extension rods. Once the filter is in place, the cask bottom is slid closed and the tops installed. The cask is then transported by an overhead crane to a hatch at floor elevation 463' of the auxiliary building. This hatch is located above the drumming station area on the floor below. The cask is lowered into the drumming station area. Storage and disposal of all
29 filters is within either high integrity containers or DOT approved
32 55-gallon drums depending on ~~their curie content.~~ the specific activity of the filters. For filters requiring
shielding, the container is stored in a shielded cask. The filter transfer cask is positioned over a small opening in the shield cask, the bottom slide is pulled open, and the filter ~~falls down~~ is lowered into the shielded
29 container. In this manner, the handling of highly contaminated filters is kept to a minimum.

11.5.5.4 Radioactive Hardware

Radioactive hardware can consist of damaged or used equipment or instruments, which due to geometry or materials of fabrication, cannot be readily decontaminated. Such material is disposed of in much the same way as are filter cartridges or as compacted waste, depending upon radiation levels.

11.5.5.5 Compacted Waste

An electromechanical compactor provides ~~four~~ nine tons of compressive force for the compaction of compressible waste into 55 gallon drums. During compaction the drum and compacting mechanism are enclosed and the enclosure is vented to the auxiliary building atmosphere through a HEPA filter by a blower. The blower and filter are contained within the compactor. The compactor conforms to current OSHA requirements. The compactor will not operate unless the door is closed, preventing the operator from injury and preventing escape of unfiltered air to the atmosphere. | 32

11.5.6 STORAGE

Compactable waste, filled containers of compacted waste, and spent filter cartridges are stored in the shielded areas of the radwaste area. Contaminated hardware and tools may also be stored in these rooms. 29

Solidified waste, after solidification is complete, and dewatered resins, once dewatering is complete, will be shipped off-site for immediate burial at a licensed facility. No credit is taken for decay of short lived radionuclides of spent resin. Primary spent resins will normally have at least a one month decay period while being held in the spent resin storage tank. Evaporator bottoms and secondary blowdown resins do not normally require a decay period. | 32 29

If solidified waste and/or dewatered resins require storage for any reason, they will be stored in the radiation control area outside the truck access on the storage pad (see Figure 1.2-25). The storage pad is approximately 40 feet wide by 120 feet long and is sloped toward a hold-up trench. Waste stored in the storage area will be shielded as required by portable shields and/or casks used for shipment. Waste whose radiation level on contact exceeds 1 R/hr is stored on the portion of the storage pad whose access is controlled by an additional locked chain link fence. This locked access is approximately 30 feet wide by 40 feet long.

Storage areas for solidified waste, dewatered resins, and compacted waste are sufficient, based on the estimates presented in Section 11.5.4, to accomodate greater than 30 days waste generation.

There is no airborne release to the atmosphere in the fill areas. Air in the container and gas, if any, from the waste entering the container are vented to the building exhaust through a local filter. Only one line feeds waste to the container. This is flushed with water as the final phase of the fill cycle. 29

Except for the curb in the solidification area, there are no physical barriers in the immediate fill areas to contain spills. Spills from the shipping container would need to be drained to a ~~special container since spilled material could not be mixed with the contents of any other tank.~~ specific location or container as determined by the type of material spilled. 32

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The floor surfaces have a special nonporous finish to permit decontamination of the surface, if required.

11.5.8.2 Potential for Release from Storage Tanks

11.5.8.2.1 Waste Evaporator Concentrates Tank

Essentially all radioactive gases are stripped from the concentrates in the waste evaporator. A normally closed vent is ducted to the auxiliary building exhaust system. A water seal, set for 2 feet of water, vents 14 to the waste evaporator concentrates tank cubicle which is serviced by the auxiliary building exhaust system.