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August 6, 1982

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

Subject: Byron Station Units 1 and 2
Braidwood Station Units 1 and 2
Volume Reduction System
NRC Docket Nos. 50-454, 50-455,
50-456 and 50-457

Dear Mr. Denton:

This is to provide advance copies of responses to Byron/Braidwood FSAR questions regarding the volume reduction system. NRC review of this information should close Outstanding Item 15 of the Byron SER.

Attachment A to this letter lists the information being provided. Please direct questions regarding this matter to this office.

One signed original and fifteen copies of this letter and the attachment are provided for your review.

Very truly yours,

T. R. Tramm

T. R. Tramm
Nuclear Licensing Adminstrator

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ATTACHMENT A

List of Enclosed Information

I. FSAR Question Responses

NEW:	321.44	REVISED:	321.15
	321.45		321.25
	321.46		
	321.47		
	321.48		
	321.49		
	321.50		
	321.51		
	321.52		

QUESTION 321.15

"Describe and justify all Byron/Braidwood VR System design details which differ from those described in AECC-2-P."

RESPONSE

There are four major design changes incorporated into the Byron/Braidwood system that were not described in the AECC-2-P Topical Report. They are: (1) incorporation of a second venturi scrubber; (2) incorporation of a recycle gas filter for the dryer fluidizing air; (3) deletion of the product storage hopper; and (4) modification to the charcoal adsorber.

(1) The system, utilizing a single venturi scrubber, provided a DF of greater than 10^4 for particulates for a dryer-alone system. With the incorporation of the dry waste processor, the DF decreased to less than 10^4. The result was a HEPA filter life of only 30 days. The second venturi scrubber was added to the system to increase the life of the filter. Tests performed on the AECC system have demonstrated DFs in excess of 10^4 and a projected filter life of 6 months. The secondary scrubber uses condensate as the scrubbing liquid. Formerly, the concentration of total solids in the condensate was 150 ppm; it has now been increased to 250 ppm.

(2) Extensive tests performed by AECC, which used recirculated exhaust gas as fluidizing air for the dryer, have shown that a potential problem involving an increasing pressure drop across the air distribution plate in the dryer exists. Eventually, this pressure drop will inhibit the efficient operation of the system. The incorporation of the HEPA filter in this line extends the operation time of the dryer to more than 1 year between maintenance periods. Normally, the system is decontaminated yearly for maintenance and inspection, and the air distribution plate is flushed clean by the standard decontamination procedure which does not increase in decontamination solution quantities.

(3) Due to height limitations in the building, the interface with the packaging system has been modified so that the product storage hopper is included as part of the volume reduction product packaging system, instead of as part of the volume reduction system.

(4) The depth of the charcoal adsorber has been increased from 6 inches to 11-1/2 inches to provide longer operating life for the adsorber and a better DF for iodine. One minor change has also been incorporated into the system.

QUESTION 321.25

"Describe where the decontamination solution from the following equipment is routed:

(1) Scrubber Preconcentrator

(2) Condenser

(3) Waste Liquor Storage Tanks."

RESPONSE

The decontamination procedures for the scrubber preconcentrator, the secondary scrubber, and the condenser are as follows:

(1) Transfer liquid (28% solids) from scrubber preconcentrator to waste liquor storage tank.

(2) Transfer condensate (250 ppm solids) from the secondary scrubber/condenser to the scrubber preconcentrator.

(3) Recirculate condensate in preconcentrator and add fresh water (about 50 gallons) to condenser.

(4) Recirculate fresh water in secondary scrubber/condenser and transfer scrubber preconcentrator first flush to waste liquor storage tank.

(5) Repeat steps (2), (3), and (4) three times.

In all cases the liquid from the three units is transferred to the waste liquor storage tanks. The final concentration of this fluid is about 12.6% weight solids. The decontamination solution is drained from the waste liquor storage tanks by using the drain connection on the recirculation pump which is the lowest point in the system and discharging it to the radwaste building's floor drains system.

QUESTION 321.44

"In one part of your response to Question 321.15 dated March 16, 1982, you state that the product storage hopper has been deleted and in another part you state that the product storage hopper has been included as a part of the packaging system. Please clarify."

RESPONSE

Question 321.15 requested information regarding the differences in design details between the Byron/Braidwood volume reduction (VR) system and the system described in AECC-2-P. One of the differences was that the product storage hopper had been deleted from the scope of the Byron/Braidwood VR system. However, the product storage hopper was added to the scope of the VR system product solidification system to compensate for the deletion of this hopper from the VR system.

In addition to the above response, the response to Question 321.15 has also been clarified.

QUESTION 321.45

"In your response to Question 321.21 you indicate that the values presented in the FSAR are the actual values for the system and that the AECC-2-P topical report will be modified to agree with these values. Drawing 1190500 should be corrected so that the waste recirculation pump shows 10 gph rather than 24403 gph, the scrubber preconcentration recirculation pump rate should show 1680 gph rather than 896 gph."

RESPONSE

The response to Question 321.21 stated that Table 11.4-1 had been modified to indicate the actual values. The design capacity of the waste recirculation pump as shown by this revised table is 500 gpm. This results in a capacity of 30,000 gph. The table was also modified to indicate that the scrubber preconcentrator recirculation pump has a design capacity of 20 gpm. This corresponds with a capacity of 1200 gph.

QUESTION 321.46

"Is the waste feed tank in response to Question 321.25 the same tank as the liquid waste storage? If not, specify where this tank is located."

RESPONSE

The waste feed tanks and the waste liquor storage tanks are the same tanks. The response to Question 321.25 has been modified to eliminate confusion regarding the names of these tanks.

QUESTION 321.47

"The response to Question 321.39 does not address process and effluent sampling and monitoring of gaseous streams. This should be addressed."

RESPONSE

A process radiation monitor with particulate, iodine, and gas channels continuously samples the volume reduction system areas and cubicles ventilation exhaust. Grab samples can be taken at the monitor. Additional information for the process radiation monitor can be found in Subsection 11.5.2.2.15 and Table 11.5-1. Additional information for the radwaste building HVAC system can be found in Subsection 9.4.3.3 and Figure 9.4-4.

Exhaust from the volume reduction system process itself is routed to the auxiliary building equipment vents (filtered) system as described in Subsections 11.4.3 and 9.4.7.2. A process radiation monitor with particulate iodine and gas channels monitors the auxiliary building filtered tanks vents exhaust system before entering the auxiliary building vent stack. Grab samples can also be taken at this monitor. Additional information for the process radiation monitor can be found in Subsection 11.5.2.2.1 and Table 11.5-1.

QUESTION 321.48

"The response to Question 321.41 does not address the methods to be utilized to limit the amount of PVC to be incinerated. Please address this. Based upon the concentration of HCl and H_2SO_4 in the offgas stream, what will the impact be on the ability of the plant's vent stack to accept these corrosive concentrations? In other words, what will the concentrations of H_2SO_4, HCl, and other acids be in the offgas and will the plant vent stack and the associated ductwork be able to accept these concentrations without a deleterious impact?"

RESPONSE

Administrative controls will minimize the amount of PVC used in plant areas that are contaminated or could be contaminated. Alternate types of materials, such as polyethylene, will be substituted for halogenated materials whenever possible. Station procurement procedures will require that the Maintenance Department review and approve all station purchases of halogenated plastics for use in contaminated areas.

With these controls, the concentrations of sulfur and chlorides in the incoming dry active waste are expected to be less than 1000 ppm and 5000 ppm, respectively. The corresponding gaseous concentrations at the incinerator exit are 120 ppm SO_2 and 300 ppm HCl. These concentrations are further diluted by combining this exhaust with the fluid bed dryer exhaust. The equilibrium concentrations in the gaseous stream prior to preconcentrator are 50 ppm SO_2 and 125 HCl. The scrubbing efficiency for the acid gases has been measured to be greater than 99.7%, and the equilibrium concentration of the acid gases before the charcoal adsorber will be less than 0.5 ppm. At these low concentrations, the plant vent stack and the associated ductwork will not be impacted.

QUESTION 321.49

"In your response to Question 321.15, it is stated that the HEPA filter will be flushed clean by a standard decontamination procedure. It is our position that flushing a HEPA filter is unacceptable and that the filter should not be flushed and then utilized again for filtration purposes in the offgas system."

RESPONSE

The HEPA filter is not flushed clean by a standard decontamination procedure. The air distribution plate is cleaned in this manner. The response to Question 321.15 has been modified to eliminate this discrepancy.

QUESTION 321.50

"In your response to Question 321.17, it is indicated that a feed solution with a solids concentration of less than 7% weight would have to be processed manually rather than automatically. Explain why this is the case."

RESPONSE

The incoming evaporator concentrates are preconcentrated in the scrubber/preconcentrator by utilizing the waste heat from the exhaust gas. The available energy is sufficient to preconcentrate 7% solutions to 28% at the normal feed rate to the fluid bed dryer (24 gph). If the incoming concentration is less than 7%, the concentration of the scrubbing liquid (dryer feed) will also be less than 28% at the same feed rate. The following shows this effect:

Incoming Feed Concentration	Dryer Feed (Scrubbing Liquid) Concentration at 24 gph
Above 7%	28%
7%	28%
6%	14.3%
5%	9.7%

The dryer is designed to operate at a minimum feed concentration of 20% befo: e automatic alarm and shutdown occurs. At concentrations below 20%, the fluid bed dryer loses bed material because its natural attrition rate is greater than the salt agglomeration rate. The system will not function efficiently in this mode due to the lack of bed media. However, if the operator reduces the dryer feed rate to below 24 gph by manually adjusting the output of the bed heaters, lower concentrations of feed can be processed as follows:

Incoming Feed Concentration	Dryer Feed Rate and Concentration 24 gph	20 gph	15 gph	10 gph
7%	28%	28%	28%	28%
6%	14.3%	20.1%	28%	28%
5%	--	12.3%	25.7%	28%
4%	--	--	11.2%	28%
3%	--	--	--	11.5%

Ten gph feed is the minimum feed rate allowable due to the same type of problem as low feed concentration (loss of bed media). By manually adjusting the bed heater output, concentrations as low as 4% can be fed to the scrubber/preconcentrator at the rate of approximately 84 gph.

QUESTION 321.51

"Provide a commitment that information on the polymer binder system will be provided later."

RESPONSE

New Subsection 11.4.4 provides a system description and process control program for the volume reduction system product solidification system.

QUESTION 321.52

"In your response to Question 321.41, it is stated that the chloride ion is neutralized. How is it known that the scrub solution will always have a chemical composition such that the Cl^- ion will be neutralized? Provide data that shows how effectively the Cl^- ion is neutralized by the evaporator bottoms scrub solution with its variable chemical composition."

RESPONSE

The liquid waste stream which is used to scrub the off-gas stream is adjusted to a pH of 11 in the waste liquor storage tank regardless of its chemical composition. Since the liquid waste stream is continuously processed, there is always an excess quantity of sodium ions available to combine with the chloride ions.

During Run Number 412 in the full scale prototype test, the scrubber efficiency for neutralizing chlorides was determined by measuring the distribution of chlorides in the various process streams during the test. The results are as follows:

PROCESS STREAM	CHLORIDE (wt %)
dry waste processor bed	0.01
dry product derived from scrubber liquid	99.99

In a similar test performed on a 12-inch fluidized bed dry waste processor, the scrubber efficiency for the removal of chloride was determined to be as follows:

PROCESS STREAM	CHLORIDE (wt %)
dry waste processor bed	0.0
gas/solid separator product	0.18
scrubber liquid	99.8

The results from the two separate tests indicate that the scrubber efficiency for the removal of chloride is at least 99.8%.

TABLE 11.4-1

SOLID WASTE MANAGEMENT SYSTEM EQUIPMENT

AND STORAGE DESIGN CAPACITIES

PROCESSING EQUIPMENT	QUANTITY	DESIGN CAPACITY	MATERIALS
Decanting tank	2	500 gallons	304L SS
Decanting pump	2	18 gpm	304L SS
Metering pump	4	15 gpm	304L SS
Cement storage tank	1	1000 ft^3	CS
Drum processing unit	2	1 Drum	304L SS
Packaging container	-	55 gallons	CS
Dry waste compactor	1	1 Drum	CS
Travelling bridge crane[1]	1	7.5 tons	CS
Fixed bridge crane[1]	2	1.0 ton	CS
Drum transfer car[2]	2	2 drums	CS
Cartridge filter transfer vehicle[3]	1	1 drum	CS/Pb
Filter servicing machine	1	1 filter	CS
Startup heater	1	395 scfm	304SS/316L-SS/347SS
Air heater	1	320 scfm	304SS/316L-SS
Gas heater	1	786 scfm	304SS/316L-SS
Fluid bed dryer air blower	1	317 scfm	CS
Dry waste processor air blower	1	300 scfm	CS
Waste feed filter	1	30 gpm	316L-SS
FBD inlet air filter	1	320 scfm	CS
DWP inlet air filter	1	300 scfm	CS
Gas filter assembly	2	466 scfm	CS
Recirculating gas filter	1	320 scfm	CS

TABLE 11.4-1 (Cont'd)

PROCESSING EQUIPMENT	QUANTITY	DESIGN CAPACITY	MATERIALS
Caustic tank	1	1000 gal	304SS
Decon tank	1	650 gal	304SS
Contaminated oil tank	1	150 gal	CS
Bed storage and tranfer hopper	2	2900 lb	304SS
Trash hopper	2	1500 lb	CS/Fe
Waste liquor storage tank	2	3500 gal	316L-SS
Fluid bed dryer	1	0.41 gpm	347SS/Inconel 625
Drywaste processor	1	83 lb/hr	347SS
Trash conveyor	1	---	Rubber/CS
Trash elevator	1	20 lb/min	CS
Waste feed pump	1	120 gph	316L-SS
Waste recirc. pump	2	500 gpm	316L-SS
Decon. pump	1	50 gpm	304SS
Dryer feed pump	1	30 gph	316L-SS
Condensate pump	1	22 gpm	316SS
Contaminated oil pump	1	14 gpm	CS
Scrubber preconcentrator recirc. pump	1	20 gpm	316L-SS
Caustic additive pump	2	15 gpm	304SS
Scrubber preconcentrator	1	16.8 gpm	316L-SS/Inconel 625
Secondary scrubber	1	1142 scfm	316L-SS

TABLE 11.4-1 (Cont'd)

PROCESSING EQUIPMENT	QUANTITY	DESIGN CAPACITY	MATERIALS
Condenser	1	22 gpm	316SS
Metal detector	1	1 Trash Bag	Al,Cu
Volume reduction system gas/solids separator	1	911 scfm	347SS
Trash shredder	1	20 lb/min	Fe/CS/CrMo Steel
Polymer storage tank	2	2000 gal	
Polymer additive storage tank	1	6 gal	
Surge hopper	1	-----	304L
Storage hopper	1	-----	304L
Drum processing enclosure	1	1 drum	304L
Flame arrester	2	-----	-----
Volume reduction system solidification system gas/solid separator	1	250 scfm	304L
Volume reduction product blower	1	250 scfm	304L
Polymer circulating pump	1	-----	-----
Promoter metering pump	1	-----	-----
Roller conveyor	1	-----	CS
Polymer filter	1	-----	-----
Polymer station vent filter	1	-----	-----
Volume reduction product blower filter	1	-----	-----
Roller conveyor lift inlet filter	1	-----	-----

TABLE 11.4-1 (Cont'd)

STORAGE AREA	NUMBER OF STORAGE AREAS	DESIGN CAPACITY PER STORAGE AREA
Low level	1	570 drums
Intermediate level	1	640 drums
Dry compacted waste	1	70 drums
Dry uncompacted waste	1	90 ft^3
Empty drum	2	100 drums (total)

TABLE 11.4-1 (Cont'd)

NOTES

1. Overhead Crane Operating Speeds

	High-Speed	Low-Speed
Bridge	125 fpm	2.5 fpm
Trolley	125 fpm	2.5 fpm
Drum Grab Hoist	30 fpm	7.5 fpm

2. Drum Transfer Car Operating Speeds

High-Speed	Low-Speed
100 fpm	10 fpm

3. Cartridge Filter Transfer Vehicle Operating Speeds

High-Speed	Low-Speed
400 fpm	158.4 fpm