FROM:
Northern States Power Company
Minneapolis, Minnesota 55401
E. C. Ward

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TO:
~~Roger S. Boyd~~

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Ltr re our 3-7-72 ltr regarding Basic Data for a Source Term Calculation & Liquid Effluent Analysis trans the following:

ENCLOSURES:
Monticello Nuclear Generating Plant - Answers to Questions Forwarded with 3-7-72 Letter from Roges S. Boyd

(45 cys encl rec'd)

REMARKS:
1 - Local PDR - Minneapolis, Minn.
16- Holding for ACRS
5 - ORNL - Sent 4-10-72

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NORTHERN STATES POWER COMPANY

April 5, 1972

50-263

Mr Roger S Boyd
Assistant Director
for Boiling Water Reactors
Division of Reactor Licensing
Atomic Energy Commission
Washington, DC 20545

Dear Mr Boyd:

MONTICELLO NUCLEAR GENERATING PLANT E-5979
NEPA Review - Gaseous and Liquid Effluent Analysis

Your letter of March 7 requested certain basic data required for a source term calculation for a gaseous and liquid effluent analysis being performed for the Monticello plant as a part of the NEPA review. We discussed this information with your representatives and personnel from the Oak Ridge National Laboratory during a visit here on March 28 and 29.

To confirm the information conveyed at the recent meeting, we are enclosing 45 copies of a tabulation listing the data together with the source reference. As you requested, the data is submitted for (1) the facility as presently designed, and (2) any projected design changes.

Yours very truly,

E C Ward

E C Ward, Director
Engineering Vice Presidential Staff

1905

MONTICELLO NUCLEAR GENERATING PLANT

Answer to Questions Forwarded with 3/7/72
Letter from Roger S. Boyd

1. Operating power (Mwt) at which impact is to be analyzed.

   *(1) 1970 Mwt (p. 1-1.1, FSAR)
   *(2) same as (1) (no projected design changes)

2. Weight of U loaded (first loading and equilibrium cycle).

   (1) first loading 206,074 lbs.
   (1) equilibrium cycle 204,074 lbs.

   (2) same as (1) (no projected design changes)

3. Isotopic ratio in fresh fuel (first loading and equilibrium cycle).

   (1) first loading 2.25 wt. % (p. 1-6.6, FSAR)
   (1) equilibrium cycle 2.55 wt. %

   (2) same as (1) (no projected design changes)

4. Expected offgas rate after 30 minutes delay.

   (1) 25,000 μCi/sec (p. II-21 Monticello Environmental Report)
   (2) 1,300 μCi/sec (for projected 50 hour hold-up system, based on 25,000 μCi/sec at 30 min). (Based on answers to DRL Questions of June 3, 1971 in report dated October, 1971 and submitted as Request for Change No. 2, Docket No. 50-263)

5. Escape rate coefficients used (or reference).

   (1) 700 μCi/sec for I^{131} to the primary coolant based on offgas rate of 100,000 μCi/sec after 30 minute holdup.

   (2) same as (1)

6. Mass of primary coolant in system (lb.).

   (1) a. in reactor:
   340,700 lbs water
   10,600 lbs steam

   b. in recirculating system:
   46,697 lbs water

   c. in condensate return system:
   755,000 lbs water

   d. total:
   1,142,397 lbs water

   (2) same as (1)

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*(1) The facility as designed.

*(2) The facility with indicated projected design changes or revised operational procedures.

7. Steam conditions at turbine.

(1) temperature 540°F (Fig. 1-3-3B, FSAR)
pressure 965 psia
flow rate 6,770,092 lb/hr

(2) same as (1) (no projected design changes)

8. Normal recirculation flow rate (lb/hr).

(1) 57.6×10^6 lb/hr total core flow (Fig. 1-3-2B, FSAR)

(2) same as (1) (no projected design changes)

9. Normal clean-up system flow rate (lb/hr).

(1) 80,000 lb/hr total of two loops (Fig. 1-3-2B, FSAR)

(2) same as (1)

What type of resins are used?

(1) Not available

(2) Solka floc BW 100 & Powdex
combined precoat/demineralizer

What decontamination factors are expected for each principal nuclide?

(1) Not available

(2) Preliminary measurements at Monticello based on a limited sample run have shown the following;

	D.F.
particulate (gross crud activity)	76-99
gross filtrate activity	43
gross (I^{131})	149-483
Cation Cu^{64}	11-41
Anion Cu^{64}	27-32
I^{131}	85-90

10. What is the expected performance of the expanded gaseous radwaste system from the main condenser air ejector?

(1) nonexistent in design basis system

(2) design basis for the modified offgas system is to provide 50 hour holdup (minimum) to offgases from the main condenser air ejector. Estimated gaseous release rates will be reduced to 0.012 Ci/sec based on air ejector discharge rate of 0.27 Ci/sec at 30 min. delay with a condenser inleakage rate of 28 scfm.
(p. 8 Gaseous Radwaste System Modification Report, Revision C, October 13, 1971)

Give the design air in-leakage.

(1) 28 scfm maximum (p. 5 Answers to DRL Questions of June 3, 1971 on Monticello off-gas modification)

(2) The design maximum air in-leakage is 28 scfm, however the present system experience is about 7 scfm. The expected long term average value is about 20 scfm. The anticipated number of shutdowns per year is 6 with 3 of these expected to be of long enough duration to necessitate complete breaking of the condenser vacuum. For restarting from no vacuum conditions it is expected that the vacuum pump will operate for an average of 2 hours and a maximum of 4 hours.

Is the condenser ejector one stage or two stage?

(1) The condenser ejectors are two one-half capacity two stage steam jet air ejector units with inter- and after-condensers. (p. 11-3.1, FSAR)

(2) same as (1) (no projected design change)

Where is it discharged?

(1) to the air ejector subsystem which consists of a 30 minute holdup line, high efficiency filters, dilution fans and the plant main stack. The inter-condenser condensate returns to the condenser and the after-condenser condensate goes into the liquid rad waste system. (p. 9-3.2, FSAR)

(2) to the recombiner subsystem of the modified offgas system via an eductor nozzle on the air-ejector after-condenser. (p. 9 Gaseous Radwaste System Modification Report, Revision C)

How many condenser shells?

(1) The main condenser consists of two shells operated as a single pass dual-pressure, dearerating type with divided water boxes. (p. 11-3.1, FSAR)

(2) same as (1) (no projected design changes)

11. What is the expected leak rate of primary coolant to the dry well? (lb/hr)

(1) Estimated background drainage to equipment drain sump from dry well is 1250 lb/hr liquid. (p. 4-3.10, FSAR)

(2) same as (1) (no projected design changes)

How frequently is the dry well purged?

(1) & (2) It is expected that it will be required to completely purge this system about 2 times per year. In addition it will be necessary to partially purge the system about 3 times every 2 weeks with approximately 100,000 cubic feet of nitrogen to control oxygen build-up and it will be necessary to bleed the system pressure down from about 15 psia to atmospheric pressure about 1 time per week. The entire system volume is approximately 240,000 cubic feet.

What treatment is given to this purge?

(1) The purge gas goes through the standby gas treatment system which consists of a demister, a particulate filter, a charcoal filter and a second particulate filter.
(Fig. 5-3-1, FSAR)

(2) same as (1) (no projected design changes)

12. What is the expected leak rate of primary coolant to the reactor building?

(1) Design basis is zero, however 250 lb/hr assumed for radiation dose calculation in Answers to DRL Questions on Gaseous Radwaste System Modification Report, Revision C.
(p. 33 Answers to DRL Questions on Gaseous Radwaste System Modification Report, Revision C, October 1971)

(2) Experience to date at Monticello with a several month period of zero liquid rad waste release is that the plant make up water rate is about 350 to 500 gallons per day. This water is being lost from the plant through a combination of evaporative losses, additive to the solid waste solidification system and possible steam leaks in the turbine building. About 50 percent of the loss is assumed to go up the stack with the air ejector off gas. Based on this indirect analysis it is expected that evaporative losses to the reactor building will be about 56 lbs/hour. All liquid leaks are reclaimed through the various drain sumps.

What is the ventilation air flow through the reactor building? (CFM)

(1) $0.9\text{-}1.8 \times 10^5$ cfm (1 to 3 fans)

(2) same as (1)

Where is it discharged?

(1) to the reactor building roof vent.
(p. 9-3.5, FSAR)

(2) same as (1)

Is the air filtered or otherwise treated before discharge?

(1) not filtered, but monitored to alarm such that dose will not exceed 5% of 500 mRem/yr at off-site location and set to isolate reactor building vent and automatically direct all flow through the standby gas treatment system based on not exceeding 2 mRem/hour off-site.

(p. 9-3.5, FSAR)

(2) same as (1)

13. What is the expected leak rate of steam to the turbine building? (CFM)

(1) design basis is zero, operator corrective action would be taken if the leak rate were ≥ 10,000 lb/hr.

(p. 9-3.6, FSAR)

(2) The expected steam leak rate is 10 lb/hr based on the indirect water balance analysis presented in the above answer to Question 12.

What is the ventilation air flow through the turbine building? (CFM)

(1) Upper turbine building flow is variable;

100,000 cfm in summer
0 cfm in winter (Fig. 10-3-1, FSAR)

Lower turbine building;
64,000 cfm

(2) Same as (1) except experience dictates an annual average for the upper turbine level of 59,000 cfm.

Where is it discharged?

(1) Lower turbine building vents to the reactor building and upper turbine building vents to the turbine building roof vent.

(2) same as (1)

14. Describe the treatment of the exhaust stream from the turbine seal glands.

a. What is the origin of the steam used in the gland seals? (i.e., is it primary steam, condensate, or demineralized water from a separate source, etc?)

(1) primary steam (p. 9-3.3, FSAR)
(2) same as (1) (no projected design changes)

b. How is the effluent stream from the gland seals treated and disposed of?

(1) 1.75 minute hold-up, mixed with air ejector offgases and dilution air at the base of the stack.
(p. 9-3.3, FSAR)

(2) same as (1) (no projected design changes)

15. Provide average gallons/day and μCi/cc for the following categories of liquid waste. Use currently observed data in the industry where different from the SAR or Environmental Report (indicate which is used).

a. High-level wastes (for example, "clean" or low conductivity waste and equipment drains);

(1) Flow: 21,000 gal/day (low river flow)
14,000 gal/day (normal river flow)

Activity: <3 x 10^{-3} μCi/cc (design value in waste collector tank)
2 x 10^{-5} μCi/cc (effluent from waste collector demineralizer at low river flow)
3 x 10^{-5} μCi/cc (effluent from waste collector demineralizer at normal river flow)

(Figs. 9-2-1, 9-2-2, FSAR)

(2) Flow: 20,000 gal/day (categories a, b, c and d combined)
Activity: 10^{-4} μCi/cc (in waste collector tank operated on continuous recycle through filter)

(Under present operating procedures wastes in categories a, b, c and d are combined and not treated separately).

1.(1) Number and Capacity of collector tanks; (p. 9-2.7, FSAR)

No.	Name	Capacity (gals.)
1	Waste Surge Tank	35,000
2	Waste Sample Tanks	10,000 each
1	Condensate Backwash Receiving Tank	8,500
1	Waste Collector Tank	10,000
2	Condensate Phase Separator Tanks	12,000 each
2	Clean-Up Phase Separator Tanks	3,000 each
2	Condensate Storage Tanks	220,000 each
1	Waste Sludge Tank	7,500

(2) same as (1) plus the following (p. 9-2.7, FSAR)

No.	Name	Capacity (gals.)
1	Floor Drain Collector Tank	10,000
1	Floor Drain Sample Tank	10,000

2. Fraction of water to be recycled or factors controlling decision.

(1) Recycle 100% to condensate storage tanks after treatment. (p. 9-2.1, FSAR)

(2) same as (1)

3. Treatment steps--include number, capacity and process D.F. for each principal nuclide for each step.

(1) Process through waste collector filter and deep bed demineralizer to waste sample tank, measure and transfer to condensate storage tank if activity $<10^{-3}$ μCi/cc. If activity $>10^{-3}$ μCi/cc recycle through filters. (p. 9-2.1, FSAR)

The design basis decontamination factors were extracted from Fig. 9-2.2 by calculating the ratio of the inlet stream activity to the effluent stream activity for all filters. The resulting decontamination factors are presented below;

Waste collector filter	6.7	total activity
Waste demineralizer	100	total activity
Floor drain filter	5.7	total activity
Laundry drain filter	1	total activity

(2) Preliminary measurements have been performed at the Monticello plant based on a very limited sample run. Decontamination factors for the waste collector filter using solka floc with resin overlay were measured at the plant as follows:

		D.F.
particulate	Co^{60}	698
	Co^{58}	1062
	Cu^{64}	32
Cation	Cu^{64}	0
Anion	I^{133}	82
	Mo^{99}	3.6

Decontamination factors for the deep bed demineralizer were measured at the plant as follows: (This test was made with very clean water to begin with as the waste collector tank is operated on continuous recycle)

		D.F.
particulate	Co^{60}	∿0 (essentially no activity to measure)
	Co^{58}	1.3
	Cu^{64}	13.5
Cation	Cu^{64}	2.1
Anion	I^{133}	1.2

Capacity of each step:
- Waste collector filter - 110 gpm
- Deep bed demineralizer - 110 gpm
- Floor drain filter - 50 gpm
- Laundry drain filter - 25 gpm

Modified operating procedure is such that all category a, b, c and d wastes are currently processed through the waste collector filter and deep bed demineralizer to the waste sample tanks. If measured activity is $<10^{-3}$ μCi/cc, they are passed to the condensate storage tanks for system recycle. If measured activity in the waste sample tanks is $>10^{-3}$ μCi/cc the liquid is recycled back through the waste collector filter and deep bed demineralizer.

4. Decay time from primary loop to discharge.

(1) minimum 24 hours.

(2) 100% recycle, if release occurs it will be from tank of lowest activity prior to refueling and average decay time is conservatively estimated to be 6 months such that concentration in discharge canal will not exceed 10^{-7} μCi/cc.

5. How is waste concentrate handled? (filter cake, demineralizer resin, evaporator bottoms)

(1) Drummed, sealed and shipped to an approved AEC burial site. (p. 9-4.1, FSAR)

(2) Solidified by mixing with cement, drummed in 55 gallon drums and shipped to AEC approved off site disposal area.

Give total volume or weight and curies per day or year.

(1) normal river flow (Fig. 9-2-2, FSAR)

	Item	Flow (55 gal drums/year)	Activity Normal	(Ci/year) Maximum
1.	clean-up system sludge	26.2	2410.	2620.
2.	condensate system sludge	107.	107.	139.
3.	waste collector, floor drain and fuel pool sludges	97.	359.	388.
4.	waste demineralizer spent resins	42.	4.2	601.

(1) low river flow (Fig. 9-2-1, FSAR)

	Item	Flow (55 gal drums/year)	Activity Normal	(Ci/year) Maximum
1.	clean-up system sludge	26.2	2418.	2541.
2.	condensate system sludge	107.	107.	139.
3.	waste collector, floor drain and fuel pool sludges	116.	232.	418.
4.	waste demineralizer spent resins	64.	6.4	1376.

(2) Total solid wastes shipped for categories a, b, c and d for first 12 months operation scaled up to 1 year @ 80% load;
Flow: 32,851 ft^3/year
Activity: 53.0 Ci/year
(6 month operating reports for January, 1971 to June, 1971 and July, 1971 to December, 1971, from Monticello plant)

Estimated breakdown for categories a, b, c and d are:
Category a: 70% of total
Category b: 10% of total
Category c: 10% of total
Category d: 10% of total

b. "Dirty" wastes (for example, floor drain wastes, high-conductivity wastes, andlaboratory wastes).

(1) Flow: 7,200 gal/day (low river flow) (Fig. 9-2-1, FSAR)
8,200 gal/day (normal river flow) (Fig. 9-2-2, FSAR)
Activity:
4×10^{-5} μCi/cc (normal activity level in floor drain collector tank)
6×10^{-6} μCi/cc (effluent from floor collector filter - low river flow)
7×10^{-6} μCi/cc (effluent from floor collector filter - normal river flow)

(Figs. 9-2.2 & 9-2.1, FSAR)

(2) combined with category a, see previous answer.

1. Number and capacity of collector tanks.

(1)

No.	Name	Capacity (gals.)
1	Floor Drain Collector Tank	10,000
1	Floor Drain Sample Tank	10,000

(p. 9-2.7, FSAR)

(2) combined with category a, see previous answer

2. Fraction of water to be recycled or factors controlling decision.

(1) variable recycle. See next item.
(2) (Same answer as 15.a.2.)

3. Treatment steps--include numbers, capacity and process D.F. for each principal nuclide.

(1) Normal river flow: process through the floor drain filter to the floor drain sample tank, measure activity and release such that concentration in discharge canal will not exceed 10^{-7} μCi/cc.
(Fig. 9-2-1, FSAR)

Low river flow: the filtrate from the floor drain filter is routed to the waste collector tank.
(Fig. 9-2-2, FSAR)

Decontamination factors and capacity - see answer to 15.a.3.(1).

(2) Same answer as 15.a.3.(2)

4. Decay time from primary loop to discharge.

(1) same answer as 15.a.4.(1)

(2) same answer as 15.a.4.(2)

5. How is waste concentrate handled? (filter cake, demineralizer resin, evaporator bottoms)

(1) Same answer as 15.a.5.(1)

(2) Same answer as 15.a.5.(2)

Give total volume or weight and curies per day or year.

(1) same answer as 15.a.5.(1)

(2) same answer as 15.a.5.(2)

c. Chemical wastes

(1) Flow: 500 gal/day (Fig. 9-2-2, FSAR)
Activity: 8×10^{-3} μCi/cc (Table 9-2.2., FSAR)

(2) Flow: 300 gal/day
Activity: 10^{-5} μCi/cc

1. Number and capacity of collector tanks. (Fig. 9-2-1, FSAR)

(1) & (2) 1 Chemical Waste tank @ 4,000 gals.

2. Fraction of water to be recycled or factors controlling decision.

(1) Same answer as 15.a.1.(1)

(2) 100% solidification or recycle, no release.

3. Treatment steps--include number capacity and process D.F. for each principal nuclide.

(1) same answer as 15.a.3.(1)

Decontamination factors:
not available

Capacity - 25 gpm.

(2) complete solidification by using as moisture additive to cement for solid waste disposal or recycle.

4. Decay time from primary loop to discharge.

(1) same answer as 15.a.4.(1)

(2) same answer as 15.a.4.(2)

5. How is waste concentrate handled? (filter cake, demineralizer resin, evaporator bottoms).

(1) drummed and shipped to AEC approved offsite disposal area.

(2) same as (1)

Give total volume or weight and curies per day or year.

(1) same answer as 15.a.5.(1)
(2) same answer as 15.a.5.(2)

d. Laundry, decontamination, and wash-down wastes.

1. Number and capacity of collector tanks.

(1) & (2) Laundry Drain Tanks @ 1000 gals.
(p. 9-2.7, FSAR)

2. Fraction of water to be recycled or factors controlling decision.

(1) 0% recycle (Figs. 9-2-1, 9-2-2, FSAR)

(2) same answer as 15.a.2.(2) (these wastes are combined with those of category a, b and c and are not treated separately)

3. Treatment steps--include number, capacity, and process D.F. for principal nuclide for each step.

(1) process through laundry drain filter monitor and release such that activity in discharge canal will not exceed 10^{-7} μCi/cc.

(Figs. 9-2-1, 9-2-2, FSAR)

(2) same answer as 15.a.3.(2)

4. Decay time from primary loop to discharge.

(1) same answer as 15.a.4.(1)

(2) same answer as 15.a.4.(2)

5. How is waste concentrate handled? (filter cake, demineralizer resin, evaporator (bottoms).

(1) same answer as 15.a.5.(1)

(2) same answer as 15.a.5.(2)

Give total volume or weight and curies per day or year.

(1) same answer as 15.a.5.(1)
(2) same answer as 15.a.5.(2)

16. For the condensate demineralizers provide the flow rate lb/hr, type of resin used, expected backwash and regeneration frequency, and expected D.F. for each principal nuclide.

(1) a. flow rate 6,770,000 lb/hr (Fig. 1-3-3B, FSAR)

b. type of resin used: Powdex

c. expected backwash and regeneration frequency:
backwash every 10 to 20 days, no regeneration

d. expected D.F. for each principal nuclide.
not available

(2) same as (1)

17. Dilution flow rate for liquid effluents, normal gpm and total gallons per year.

(1) a. normal open cycle & helper 280,000gpm
closed cycle 16,000gpm
(p. 9-2.3, FSAR)
(p. 9-2.4, FSAR)

b. 1.5×10^{11} per year based on 100% normal cycle or helper tower operation

(2) a. same as (1)

b. 1.3×10^{11} gallons per year based on 85% of normal cycle operation.

Additional Information

$\frac{X}{Q}$ Values

a. stack release 4.37×10^{-8} sec/m^3

(Off-gas Modification Report October 1971 Page 24 ff)

b. ground level release 2.6×10^{-6} sec/m^3