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Niagara Mohawk Power Corporation Syracuse, N. Y. 13202 T. J. Brosnan	10-10-72	10-12-72	X			

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Mr. Muller	1			SENT AEC PDR X SENT LOCAL PDR X

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DESCRIPTION:

Ltr re our 9-18-72 ltr, trans the following:

ENCLOSURES:

Basic Data for a Source Term Calculation and for a Gaseous and Liquid analysis, submitted in response to our 9-18-72 ltr.

(45 cys of encl rec'd)

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ACKNOWLEDGED

PLANT NAMES: Nine Mile Point Unit No. 1

FOR ACTION/INFORMATION 10-13-72 AB

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NIAGARA MOHAWK POWER CORPORATION

NIAGARA MOHAWK

300 ERIE BOULEVARD WEST
SYRACUSE, N.Y. 13202

October 10, 1972

RECEIVED OCT 12 1972 U.S. ATOMIC ENERGY COMMISSION Regulatory Mail Section

Mr. Daniel R. Muller, Assistant Director
for Environmental Projects
Directorate of Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Muller:

Re: Nine Mile Point Unit No. 1
Docket 50-220

Transmitted herewith are 45 copies of the information requested in your letter of September 18, 1972.

Arrangements have been finalized to meet with representatives of Oak Ridge National Laboratory on October 20, 1972, to discuss this material.

Sincerely,

T. J. Brosnan
Vice President and Chief Engineer

TJB/vk

Enclosures

DOCKETED USAEC OCT 12 1972 REGULATORY MAIL SECTION DOCKET CLERK AB

5523

QUESTION 1

Reactor power (MWt) and plant capacity factor (%) at which impact is to be analyzed.

ANSWER

The licensed reactor power at which impact is to be analyzed is 1850 MWt. The capacity factor for the unit is 85 percent. (Environmental Report Section 9)

QUESTION 2

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

ANSWER

The initial core contained 227,577 lbs. of uranium. The equilibrium cycle will depend on the annual capacity factor, and the then current design practices. It is anticipated that the uranium loading for equilibrium cores will not differ significantly from that of the initial core.

QUESTION 3

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

ANSWER

The initial core contained an average of 2.1% U-235 (as measured) as compared with the 2.12% design value reported in the FSAR (Volume I, Section IV, Page 4). Equilibrium reload fuel is expected to contain an isotopic ratio in the range of 2.58 w/o U-235.

QUESTION 4

Expected offgas rate after 30 minutes delay.

ANSWER

The expected offgas rate after 30 minutes delay is less than 50,000 μCi/sec. (Ref. Environmental Report Table 3.6-1, Sec. 3.6.3.3, 3.6.3.5.1)

QUESTION 5

Escape rate coefficients used (or reference).

ANSWER

Noble Gas Release Rate

$$(1)\quad R_i = 2.6\text{x}10^7 y_i \lambda_i^{\,0.4} (1-e^{-\lambda_i T}) \; (e^{-\lambda_i t})$$

Halogen Release Rate

$$(2)\quad R_i = 2.4\text{x}10^7 y_i \lambda_i^{\,0.5} (1-e^{-\lambda_i T}) \; (e^{-\lambda_i t})$$

Halogen Reactor Water Concentration

$$(3)\quad C_i = \frac{R_i}{V \; (\lambda_i + \beta + \gamma)\rho}$$

Where:

R_i = Release rate of isotope (μCi/sec)

Y_i = Fission yield of isotope i (atoms/fission)

λ_i = Decay constant of isotope i (sec^{-1})

T = Fuel irradiation time (sec)

t = Decay time following release from fuel (sec)

C_i = Concentration of isotope i in reactor water (μCi/g)

V = Volume of water in operating reactor (cc)

β = Cleanup system removal constant (sec^{-1})

$$\beta = \frac{\text{Cleanup system flow rate (g/sec)}}{\text{Quantity of water in operating reactor (g)}}$$

γ = Steam carryover removal constant (sec^{-1}) for halogens

$$\gamma = \frac{\text{(0.01) (steam flow - g/sec)}}{\text{Quantity of water in operating reactor (g)}}$$

ρ = Density of water in an operating reactor = 0.74g/cc

Noble Gas Release Rates

The release rate of noble gases can be expressed by the simplified form of Equation (1):

$$R_g = K_g y \lambda^m$$

The observed experimental data have shown a variation in individual noble gas isotopes with respect to each other that can be expressed in terms of variation in m, the exponent of the decay constant term (λ). The average measured value of m was 0.4 with a standard deviation of ± 0.07. With the ΣR_g at 30 min set at 50,000 μCi/sec, the value of K_g is calculated after selecting the value of m.

Halogen Release Rates

The release rate of halogens can be expressed by the simplified form of Equation (2):

$$R_n = K_n Y \lambda^n$$

The observed experimental data have shown a variation in individual halogen isotopes with respect to each other that can be expressed in terms of variations in n, the exponent of the decay constant term (λ). The average measured value of n was 0.5 with a standard deviation of ± 0.19. With I-131 release rate set at 700 μCi/sec, the value of K_n is calculated after selecting the value of n.

QUESTION 6

Mass of primary coolant in system (lb).

a. Mass of primary coolant in reactor; mass water; mass steam (lb).
b. Mass of primary coolant in recirculating system (lb).
c. Fraction of primary coolant in main condenser (lb).

ANSWER

a.	Mass of water in reactor	379,400 lbs.
	Mass of steam in reactor	11,600 lbs.
b.	Mass of primary coolant in recirculating system	90,500 lbs.
c.	Mass of primary coolant in the main condenser is 918,000 lbs. This is approximately 5/8 of the total primary coolant inventory excluding the condensate system, the feedwater system upstream of the isolation valve, the main steam system downstream of the second isolation valve, the turbine and the condenser steam space.	

QUESTION 7

Steam conditions at turbine (temp F, press psi, flow lb/hr).

ANSWER

flow, lb/hr*	7.25×10^6
pressure, psia	965
temperature, F	538

*Includes 5,000 lbs/hr air ejector motive steam and 410,000 lbs/hr steam flow to reheat.

QUESTION 8

Normal recirculation flow rate (lb/hr).

ANSWER

Normal recirculation flow through the core at the design rating is 67.5×10^6 lbs/hr. This figure includes both circulation and feedwater flow.

QUESTION 9

Normal clean-up system flow rate (lb/hr). What type of resins are used? What decontamination factors are expected for each principal nuclide? What is the frequency of regeneration and volume of regenerants?

ANSWER

The normal flow through the reactor water clean-up system is 300,000 lbs/hr. The design flow is 380,000 lbs/hr. The ion exchange resin is a mixture of cation and anion resins (amberlite 200 and IRA 900). The resins are 2 to 1 by volume, cation to anion. While the individual radionuclide decontamination factors have not been determined, the overall decontamination factor is expected to be at least 10. Operationally, experience has demonstrated that regeneration of the clean-up demineralizer resins is not practical. Therefore, these resins are removed after a service life of about six months.

QUESTION 10

Describe and provide the expected performance of the expanded gaseous radwaste treatment system from the main condenser air ejector? Give the expected air in leakage. Is the condenser ejector one stage or two stage? Where is it discharged? How many condenser shells? (If applicable - pounds of charcoal and operating temperature F)

ANSWER

The hold-up portion of the offgas system will be a charcoal base system designed to provide hold-up times of 20 days for xenon isotopes and 33 hours for krypton isotopes based on an air (condenser air inleakage) flow rate of 22 cfm. Since the air inleakage is expected to be approximately 10 cfm maximum, the expected offgas system hold-up times would be approximately twice the design values given above. The condenser air ejection system is a two-stage design that discharges to the offgas system. There is one condenser shell. The calculated quantity of charcoal required is 85,000 lb. at 77 F.

QUESTION 11

What is the expected leak rate of primary coolant to the drywell (lb/hr)? How frequently is the drywell purged? What treatment is given to this purge and where is it released?

ANSWER

The leak rate of primary coolant to the drywell is estimated to be 5.5 gpm (2750 lb/hr) (FSAR, Fifth Supplement, P-18). This leakage is from the recirculation pump seals and from valve stem packing.

It is not expected that the drywell need be vented and purged on a routine basis during normal operation. The containment will be purged during each startup with pure nitrogen until the atmosphere contains less than five percent oxygen. The containment will be deinerted during reactor shutdown for maintenance and/or refueling (i.e. approximately once per year). Gases from the containment are normally exhausted directly to the stack by a fan rated at 10,000 cfm. However, the gases can be routed through the reactor building emergency ventilation system if necessary.

QUESTION 12

What is the expected leak rate of primary coolant (lb/hr) to the reactor building? What is the ventilation air flow through the reactor building (cfm)? Where is it discharged? Is the air filtered or otherwise treated before discharge? If so, provide expected performance.

ANSWER

The expected leak rate of primary coolant to the reactor building is negligible. Most leakage is identified (such as pump seal, valve packing, etc.) and goes to closed equipment drains. Very little, if any, of these find their way into the reactor building atmosphere.

Floor drain leakage has been averaging on the order of 1.0 gpm. However, the amount of primary coolant in this water is very small (about $1x10^{-3}$ gpm based on activity analysis).

The normal ventilation air flow through the reactor building is 35,000 cfm which is discharged to the stack. The exhaust is not treated, but radiation monitoring is provided. A maximum flow of 70,000 cfm can be reached with high speed purging.

QUESTION 13

What is the expected leak rate of steam (lb/hr) to the turbine building? What is the ventilation air flow through the turbine building (cfm)? Where is it discharged? Is the air filtered or treated before discharge? If so, provide expected performance.

ANSWER

The leak rate of steam to the turbine building is not expected to exceed 7 gpm or 2,610 lb/hr. (Environmental Report, Sec. 5.2.5.2)

The ventilation exhaust system has two fans. The fans are interlocked so that only one can operate at a time. The normal ventilation air flow through the turbine building is 170,000 cfm, which is discharged to the stack. The normal exhaust is not filtered or otherwise treated before being discharged.

QUESTION 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.?)

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

c. Indicate how often the mechanical vacuum pump will be operated and the expected range of activity released.

ANSWER

a. The origin of the steam used for the turbine gland seals is primary reactor steam.

b. The steam from the packing exhausters is condensed and the air and gases that remain are sent through a 1.75 min holdup pipe. The holdup pipe discharges to the stack where it is diluted with ventilation air.

c. The mechanical vacuum pump system is provided for hogging air from the condenser prior to starting the turbine. The system is employed after each refueling and maintenance outage, which are annual events, and at such other extended shutdowns which may be necessitated in the interim. Over the life of the unit, these additional shutdowns should not average more than one per year. The amount of activity released depends to a large degree upon the preshutdown offgas release rate, the type of fission product mixture, the duration of the shutdown, and the length of time required to evacuate the condenser. Further, the activity release tends to peak within the first few minutes of hogging operation and decays substantially thereafter. Considering these factors, the release rate over several hours of hogging operation might average out to be in the same range as the preshutdown offgas releases.

QUESTION 15

Provide average gallons/day and μCi/cc prior to treatment 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-purity wastes (for example, "clean" or low conductivity waste and equipment drains). Give range of activity expected.
b. "Dirty wastes (for example, floor drain wastes, high-conductivity wastes, and laboratory wastes). Give range of activity expected.
c. Chemical wastes. Give range of activity expected.
d. Laundry, decontamination, and wash-down wastes. Give range of activity expected.

For these wastes (a-d), provide:

a. Number and capacity of collector tanks.
b. Fraction of water to be recycled or factors controlling decision.
c. Treatment steps-include number, capacity, and process D. F. for each principal nuclide for each step. If step is optional, state factors controlling decision.
d. Decay time for primary loop to discharge.

ANSWER

This response is based on information contained in the Environmental Report.

	Gallons/ day	Activity μCi/cc Max.
a. High-purity Wastes		
Equipment drains	63,000	0.11
Condensate demin. rinse	2,500	0.025
URC Wash water	1,500	0.045
Waste concentrator distillate	4,000	0.0058
Drywell floor drains	1,000	2×10^{-5}
b. Dirty Waste		
Floor drains	4,000	0.0026
Centrifuge Effluent	1,300	0.0001
Laboratory Drains	500	0.001
Concentrator Rinse	50	0.1

	Gallons/ day	Activity $\mu Ci/cc$ Max.
c. Chemical Wastes		
Regenerant Chemicals	1,000	3.0
d. Laundry, Decontamination, and Wash-Down Wastes		
Laundry wastes	300	$<1 \times 10^{-5}$
Decontamination drains	50	1.0

For these wastes (a-d), provide:

a. Number and capacity of collector tanks.

	No.	Size Gallons
1. High purity wastes - collector tanks	1	25,000
2. Dirty wastes - collector tanks	1	10,000
3. Chemical wastes - neutralizing tanks	1	15,000
4. Both 1 & 2 above can overflow to waste surge tank	1	50,000
5. Laundry drain tanks	2	10,000

b. Under normal operating conditions, approximately 96 percent of the waste liquid is expected to be recycled for reuse within the unit. The fractions which will be recycled are as follows:

1. Equipment drains, condensate demineralizer rinse, URC wash water, waste concentrator destillate, drywell floor drains - 97% of this water is expected to be recycled.

2. Floor drains and centrifuge effluent - about 50% of this waste will be recycled.

3. Regenerant chemicals, laboratory drains, concentrator rinse, decontamination drains - all of this waste water is expected to be recycled.

4. Laundry wastes - 100% discharge.

c. Treatment Steps

1. High purity waste
   a) Waste Collector Filter - 1
      capacity - 300 gpm
      decontamination factor - 5
   b) Demineralizer - 1
      capacity - 300 gpm
      decontamination factor - 1000

2. Dirty waste
   a) Floor drain filter - 1
      capacity - 300 gpm
      decontamination factor - 5
   b) Traveling belt filter - 1
      capacity - 40 gpm
      decontamination factor - 5
   c) Waste evaporators - 2
      capacity - #1-12 gpm, #2-20 gpm*
      decontamination factor - #1-500, #2-300,000*

   The floor drain filter, traveling belt filter and waste evaporators for handling the dirty waste will be at the option of the operator. The evaporators may also be used for chemical wastes below.

3. Chemical wastes
   Waste evaporators - described above

d. Decay time from primary loop to discharge is 24 hours, minimum.

* Upgraded System as described in Environmental Report, Sec. 3.6.3

QUESTION 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.

ANSWER

The design flow rate for the condensate demineralizer system is 7.25×10^6 lb/hr. Since five demineralizers are in service, (and one standby) each one is expected to pass 1.45×10^6 lb/hr. The resins are of the mixed bed type (amberlite 200 and IRA 900) and consist of 2 to 1, by volume, cation to anion. Each demineralizer is regenerated on a frequency of approximately every six weeks. An ultrasonic resin cleaner will be installed at the station. It is expected that this equipment will decrease the frequency of regeneration so that each demineralizer will be regenerated approximately every six months. Backwashing is not presently employed since it has proven to be of little value. Although the expected decontamination factor for each nuclide is not available, the design basis for the condensate demineralizer system is such that essentially 100 percent removal efficiency for all principal fission and corrosion/activation products may be assumed.

QUESTION 17

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

ANSWER

The normal dilution flow rate is 268,000 gpm. The minimum flow is approximately 18,000 gpm (service water flow). Assuming an 85 percent capacity factor for the unit, the total dilution flow per year would approach 120 billion gallons.

QUESTION 18

How is waste concentrate (filter cake, demineralizer resin, evaporator bottoms) handled? Give total volume or weight and curies per day or year. Include the expected annual volume of dry waste and curie content of each drum.

ANSWER

Filter sludge is dewatered, transferred into containers, and shipped offsite for disposal. Filter cake from the traveling belt filter is discharged into drums, stored, and shipped offsite for disposal. Spent resins are flushed to processing facilities, dewatered, loaded into containers, stored, and shipped offsite for disposal. Concentrates (evaporator bottoms) are cooled prior to transfer to the packaging facilities, mixed with an absorbent, loaded in containers, stored, and shipped offsite for disposal. (Ref. Environmental Report, Sec. 3.6.4.2)

Solid Radwaste

	No. of Shipments	Volume Shipped	Total curies Shipped	No. of Drums	Ci per Drum
Based on input from Jan. 1, 1971, to Dec. 31, 1971	44	12,910 $ft.^3$	201.21	1,756	0.115