Regulatory File Cy.

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March 27, 1972

Re: Consolidated Edison Company
of New York, Inc.
Indian Point No. 3
AEC Docket No. 50-286

RECEIVED MAR 27 1972 U.S. ATOMIC ENERGY COMMISSION Regulatory Mail Section

Mr. R. C. DeYoung
Assistant Director for
Pressurized Water Reactors
Division of Reactor Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. DeYoung:

Enclosed please find 45 copies of the information you requested in your letter of March 15, 1972. The information presented is for the facility as presently planned, which includes modifications such as the installation of charcoal filters in the plant vent and a blowdown intertie to the Indian Point Unit No. 1 blowdown purification system.

This information is submitted solely for the purpose of responding to your request for data to enable you to compute an estimate of actual releases from the plant. It is Con Edison's position that it is not possible to predict actual emissions. The nature of a nuclear reactor is such that emissions will necessarily fluctuate, and emission regulations have therefore always been in terms of limits.

We have responded to your questions by making several estimates and assumptions which we believe to be within a reasonable range. For example, we have stated for purposes of the calculation that containment is expected to be purged four times per year. The necessity for containment purge is determined by operational occurrences. Although four is a reasonable number, it should not be interpreted as four regularly scheduled events.

The actual emissions from the reactor will be larger or smaller than estimated dependent upon how close the actual performance

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complies with the assumptions contained herein. Until the plant is placed into operation, it is impossible to know how close actual performance will be to these estimates.

Two representatives of Con Edison will attend the meeting scheduled for March 29 and 30, 1972, in Oak Ridge.

Very truly yours,

LeBOEUF, LAMB, LEIBY & MacRAE
Attorneys for Applicant

By ______________________
Arvin E. Upton
Partner

Enclosure

Regulatory File Cy.
Received w/Ltr Dated 3-27-72

INDIAN POINT UNIT NO. 3

ER - Environmental Report
FSAR - Final Safety Analysis Report

1. Operating Power (Mw(t)) at Which Impact is to be Analyzed (FSAR Page 1.1-2)

   3216 Mw(t)

2. Weight of U Loaded (kg)

1st Loading			Equilibrium Cycle
Region 1	Region 2	Region 3	
29,600	28,400	28,100	28,100

   Uncertainties pending final design (±600 kg)

3. Isotopic Ratio in Fresh Fuel (FSAR Table 3.2.1-1)

1st Loading			Equilibrium Cycle
Region 1	Region 2	Region 3	
2.25	2.80	3.30	3.20

   Uncertainties pending final design (±0.05)

4. Expected Percentage of Leaking Fuel (ER Page 14-14, Page 23-25)

   Based on current operating experience, it is expected that the average percentage of leaking fuel would be approximately 0.1%. Release estimates in the ER were based on the highest amount of leaking fuel (0.5%) observed in any pressurized water reactor.

5. Escape Rate Coefficients (FSAR Table 9.2-4)

   Fission product escape rate coefficients:

a. Noble gas isotopes, sec^{-1}	6.5×10^{-8}
b. Br, I and Cs isotopes, sec^{-1}	1.3×10^{-8}
c. Te isotopes, sec^{-1}	1.0×10^{-9}

d. Mo isotopes, sec^{-1} 2.0×10^{-9}

e. Sr and Ba isotopes, sec^{-1} 1.0×10^{-11}

f. Y, La, Ce and Pr isotopes, sec^{-1} 1.6×10^{-12}

6. Plant Factor (ER Page 14-14, Supplement 1)

0.8

7. Number of Steam Generators (FSAR Table 4.1-4)

4

8. Type of Steam Generators (FSAR Page 4.2-5)

Vertical U-Tube with integral moisture separators (recirculation type).

9. Mass of Primary Coolant (lbs)

Primary System Total - 522,225 lbs

Reactor - 210,951 lbs

10. Primary Coolant Flow Rate (lb/hr) (FSAR Table 3.2.2-1)

136.2×10^6

11. Mass of Steam and Mass of Liquid in Each Generator (lbs)

Mass of Steam - 4,780

Mass of Liquid - 82,115

12. Total Mass of Secondary Coolant (lbs)

$\sim 3.7 \times 10^6$

13. Turbine Operating Conditions (FSAR Figure 10-4)

Pressure - 730 psi

Temperature - 507.8°F

Throttle Flow - 12,529,696 lb/hr

14. Total Flow Rate in the Condensate Demineralizer (FSAR Table 9.2-3)

Two 12.5 gpm demineralizers at the discharge of boric acid evaporator (one normally in operation). There is no demineralizer at the condenser discharge.

15. Containment Free Volume (ft^3) (FSAR Table 14.3.6-1)

2.61×10^6

16. Expected Leak Rate of Primary Coolant to the Containment (ER Page 14-14, Supplement 1)

0.01 gals/min

17. a) How often is containment purged? (ER Page 14-14, Supplement 1)

Containment is expected to be purged four times per year.

b) Is it filtered prior to release? (ER Page 14-1, Supplement 1)

Yes.

c) Are iodine absorbers provided? (ER Page 14-1, Supplement 1)

Yes.

d) What decontamination factor is expected? (ER Page 14-14, Supplement 1)

The iodine removal efficiency is expected to be greater than 99%.

18. a) Is there a continuous air clean-up for iodine in the containment? If so, what volume per unit time is circulated throughout? What decontamination factor is expected?

Two 8000 CFM charcoal units normally not in service can be operated prior to purging if needed (FSAR Table 5.3.1-1). The iodine removal efficiency of these units is expected to be greater than 99% (ER Page 14-14, Supplement 1).

b) At what concentration will purging be initiated?

Purging will be initiated only when necessary for access to containment at which time the limits in the proposed Technical Specifications will be met. The proposed Technical Specifications limit the concentration in the plant vent to 3×10^{-10} μc/cc. The containment iodine concentration at which purging can be initiated is expected to be approximately 3×10^{-8} μc/cc based on an expected charcoal filter efficiency of 99%.

19. Total expected continuous letdown rate (FSAR Table 9.2-2)

The normal letdown flow rate is 75 gpm.

a) What is the fraction returned through the demineralizer to the primary system? What is the expected demineralizer efficiency for removal of principle isotopes?

The entire letdown flow is returned to the primary system (FSAR Page 9.2-6).

The expected demineralizer efficiency for various isotopes is listed below: (FSAR Table 9.2-4)

1. Noble gases and Cs-134, 136, 137, Y-90, Y-91 and Mo-99	1.0
2. All other isotopes	10.0

b) What fraction of this letdown flow goes to the boron control system? How is it treated?

Based on the following:

1. 60 reactor coolant volumes processed in Boron Recovery System per cycle.

2. 75 gpm continuous letdown rate for 90% of the time for load follow calculation - for base load 75 gpm can be assumed 100% of the time.

3. 120 gpm letdown rate for 10% of the time (for the load follow case).

4. 50 week equilibrium cycle.

5. Reactor coolant volume of 11,504 ft^3.

The fraction of letdown going through boron recycle is as follows:

Base Load - 0.137

Load Following - 0.129

Flow is treated by demineraliztion, filtration and evaporation.

c) Is there a separate cation demineralizer to control Li and Cs? (FSAR Page 9.2-19)

Yes.

20. a) What fraction of the noble gases and iodines are stripped from that portion of the letdown stream which is demineralized to the primary return system?

The DF for iodine in the demineralizer is expected to be 10. Volume control tank noble gas stripping fractions are: (FSAR Table 9.2-4)

Isotope	Stripping Fraction
Kr-85	2.3×10^{-5}
Kr-85m	2.7×10^{-1}
Kr-87	6.0×10^{-1}
Kr-88	4.3×10^{-1}
Xe-133	1.6×10^{-2}
Xe-133m	3.7×10^{-2}
Xe-135	1.8×10^{-1}
Xe-135m	8.0×10^{-1}
Xe-138	1.0

Since this is a closed system no gases are released during operation. Prior to refueling, the primary system is stripped by purging the volume control tank.

b) How are these gases collected? What decay do they receive prior to release?

The noble gases are collected in six small gas decay tanks in the Waste Gas System which has been designed to provide 45 days hold-up (FSAR Page 11.1-18).

21. a) What fraction of the noble gases and iodines are stripped from that portion of the letdown stream which is sent to the boron control system?

The gas stripping package in the boron control system is expected to reduce the concentration of noble gases in the influent by a factor of 10^5 (FSAR Page 9.2-28). Iodines are removed by two demineralizers, one in front of the gas stripper and one behind the evaporator in the boron control system.

b) How are these gases collected? What decay do they receive prior to release? (FSAR Page 11-1-18)

The stripped gases are continuously collected in the four large gas decay tanks in the Waste Gas System which have been designed to provide 45 days hold-up.

22. Are the releases from the decay tanks passed through a charcoal absorber? What decontamination factor is expected?

No.

23. a) How frequently is the system shutdown and degassed? How many volumes of the primary coolant system are degassed in this way each year?

It is possible to degas the system any time the reactor is in cold shutdown. However, usual practice is to degas only prior to refueling.

b) What fraction of the gases present are removed? What fraction of other principle nuclides are removed, and by what means? What decay time is provided?

Essentially, 100% of the gas that has collected in equipment is removed to the waste gas decay tanks where it is held up for 45 days and subsequently released. No credit is taken for the removal of non-gaseous nuclides.

24. Are there any other methods of degassing (i.e., through pressurizer, etc.)? If so, describe.

No.

25. If the gas is removed through the pressurizer or by other means, how is it treated?

Not applicable.

26. Expected leak rate of primary coolant to the secondary system (ER Page 14-14, Supplement 1)

20 gallons per day.

27. a) Normal rate of steam generator blowdown (ER Page 14-14, Supplement 1)

20,000 lb/hr to occur 2% of the time.

b) Where are gases from blowdown vent discharged? (ER Figure -33-A
c) Supplement 1)
d) Are there charcoal absorbers on blowdown tank vent? If so, what is DF?

The radioactive gases from the blowdown pass to the Indian Point Unit No. 1 condenser. The Indian Point

Unit No. 1 air ejector releases (unfiltered) from the 113 meter high superheater stack. Indian Point Unit No. 1 has two air ejectors with a combined capacity of 40 SCFM.

28. a) Expected leak rate of steam to the turbine building.

7 gallons per minute.

b) Ventilation air flow through the turbine building. Where
c) discharged?

10 wall exhaust fans (51,000 CFM each).

11 roof ventilators (61,000 CFM each).

d) Is it filtered or treated?

No.

29. a) Flow rate of gaseous effluent from main condenser ejector.

Three condensers each having an air ejector rated at 20 SCFM for a total of 60 SCFM design rating.

b) What treatment is provided? (FSAR Page 6.7-10)

The air ejector releases are monitored; if the concentration of gaseous effluent reaches 1.4×10^{-3} μc/cc, an alarm is sounded to the operator. The effluent flow is automatically diverted to the containment.

c) Where is it released?

Released on turbine hall roof.

30. a) Origin of steam used in gland seals (FSAR Page 10.2-4)

Main steam.

b) How is effluent steam from gland seals treated and disposed?

The effluent steam is condensed in the gland steam condenser. The distillate is routed to the main condenser and the non-condensible gases are exhausted from the gland steam condenser by its air exhauster and discharged untreated.

31. a) Expected leak rate of primary coolant to auxiliary building.

20 gallons per day.

b) Ventilation air flow through PAB (FSAR Figure 6.4-2)

70,000 CFM.

c) Where discharged? (FSAR Figure 6.4-2)

discharged through plant vent.

d) Is air filtered or treated before discharged? (ER Page 14-14, Supplement 1)

Yes, it is filtered by roughing, HEPA and charcoal filters.

e) Expected performance of treatment (ER Page 14-14, Supplement 1)

HEPA filters will remove submicron particles 0.3 microns and larger with an efficiency of not less than 99.97%. The iodine removal efficiency of the charcoal filters is expected to be greater than 99%.

32. Provide average gallons/day and µci/cc for following categories of liquid effluents. Use currently observed data in the industry where different from SAR or ER (indicate which is used).

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

b. "Dirty" wastes (for example, floor drain wastes, high-conductivity wastes, aerated wastes, and laboratory wastes);

c. Laundry, decontamination, and wash-down wastes;

d. Steam generator blowdown - give average flow rate and maximum short-term flows and their duration;

e. Drains from turbine building.

For these wastes (a-e) provide:

1. Number of capacity of collector tanks.

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

3. Treatment steps - include number, capacity, and process DF for each principle nuclide for each step. If step is optional, state factors controlling decision.

4. Cooling time from primary loop to discharge.

5. How is waste concentrate (filter cake, demineralizer resin, evaporator bottoms) handled? Give total volume or weight and curies per day or year.

Letdown from the primary coolant system is not released from the system but recycled for use as reactor coolant or seal water for the reactor coolant pump seals.

Other liquid waste is collected in the 3300 ft^3 waste hold-up tank. The maximum activity (peak reactor coolant activity with 0.1% failed fuel) of all these sources is estimated to be 1.6 μci/cc (excluding tritium). The volumes of these sources are estimated to be:

1. Laboratory samples and wash water - 300 gal/week
2. Decontamination at power - 200 " "
3. Decontamination during refueling (once a year) - 700 " "
4. Spent fuel cask wash (7 weeks only) - 600 " "
5. Demineralizer regeneration (21 weeks only) -1380 " "
6. Leaks and drains
    a. pumps - 600 " "
    b. heat exchangers - 205 " "
    c. valves - 400 " "
    d. tanks - 300 " "
    e. demineralizer flush - 45 " "
    f. miscellaneous - 550 " "

From the waste hold-up tank, these liquids are processed in 1000 gallon batches through a 2 gpm waste evaporator. A process DF of 10^4 is expected.

Evaporator bottoms are concentrated to a maximum activity of 40 μci/cc and it is expected that 30-50 gallon drums of these mixed with cement will be shipped to a burial site each year. Spent resin, mixed with cement, is shipped in shielded 55 gallon drums (again about 30-50 drums per year). Each of these drums contain a maximum of 240 curies.

The steam generator blowdown occurs at a rate 0f 20,000 lbs/hr. The average blowdown rate is expected to be 400 lbs/hr since blowdown is not continuous. With a 20 gpd steam generator leak and 0.1% leaking fuel, the concentration in the liquid fraction of blowdown (260 lbs/hr) is estimated to be 10^{-4} μc/cc (excluding tritium) prior to treatment by the Indian Point Unit No. 1 purification system which consists of a demineralizer with an expected DF of 10.

The flow from the turbine hall drains is expected to be approximately 14,400 gallons per day. With a 20 gpd steam generator leak and 0.1% leaking fuel, the concentration in this effluent is estimated to be 3.4×10^{-5} μc/cc (excluding tritium). This effluent is released untreated.

Release estimates for steam generator blowdown and effluents from turbine building drains were not considered in the ER.

33. Dilution flow rate for liquid effluents (FSAR Page 9.6.1-1)

6 circulating water pumps @ 140,000 gpm each = 840,000 gpm

6 service water pumps @ 5,000 gpm each = 30,000 gpm

FROM:
LeBoeuf, Lamb, Leiby & MacRae
Washington, D. C. 20036
Arvin E. Upton

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ENCLOSURES:
Report - Indian Point Unit No. 3

(45 cys encl rec'd)

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