

April 24, 2006

Mr. James E. Zelko
Executive Director
Will County Health Department &
Community Health Center
501 Ella Avenue
Joliet, IL 60433

Dear Mr. Zelko:

I am responding to your letter of March 15, 2006, seeking information related to events involving the handling and storage of tritiated water at Exelon Generation Company, LLC's (Exelon's) Braidwood Station. The Nuclear Regulatory Commission (NRC) shares your concerns regarding these issues at Braidwood. Although Exelon has recently identified the migration of tritiated water to offsite locations, our current assessment does not indicate any hazard to the public or to the environment. However, we are concerned that radioactive material was released in a manner that was not intended.

In your letter, you expressed a concern that tritium is potentially linked to excess cancer mortality. The NRC staff shares your concern with potential effects of radioactive material on the health and safety of the public. As with all ionizing radiation, the NRC assumes as a prudent precaution for the purposes of radiation protection that the risk of developing cancer from tritium exposure increases as exposure increases. That is why the NRC has set strict limits on the amount of radiation that the general public can be exposed to from nuclear power plant operations. Our assessment indicates that the migration of tritium off-site at Braidwood remains well below our dose limits.

The NRC takes very seriously its mission to protect the public's health and safety from radioactive effluent discharges from nuclear power plants. I would like to briefly summarize our regulatory requirements to describe our regulatory framework and inspection process in place to routinely review radiological effluents. I will also address the information you requested on Exelon's handling, storage, disposal plans, sampling methodology, and the NRC's plans related to Braidwood tritium issues.

1. NRC Regulatory Framework for Radiological Effluents

The most notable NRC regulations in place to ensure that licensees maintain adequate control over radioactive effluents are Title 10 of the *Code of Federal Regulations* (CFR), "Standards for Protection Against Radiation," and 10 CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low As Is Reasonably Achievable" for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents." These regulations establish requirements for the control of radioactive material to limit radiation exposure to workers and members of the public and the impact on the environment. These regulations require the licensee to maintain exposures as low as is reasonably achievable. Nuclear power reactors are required to maintain radioactive effluent releases to levels that will not cause the annual dose to a member of the public to exceed 1000 μ Sv (100 mrem). The design objective is 30 μ Sv (3 mrem) from liquid releases.

The regulations also require licensees to operate monitoring programs to assess release levels, and potential doses to people who may be exposed.

Section IV.B of Appendix I to 10 CFR Part 50 states:

The licensee shall establish an appropriate surveillance and monitoring program to:

1. Provide data on quantities of radioactive material released in liquid and gaseous effluents...
2. Provide data on measurable levels of radiation and radioactive materials in the environment to evaluate the relationship between quantities of radioactive material released in effluents and resultant radiation doses to individuals from principal pathways of exposure; and,
3. Identify changes in the use of unrestricted areas (e.g., for agricultural purposes) to permit modifications in monitoring programs for evaluating doses to individuals from principal pathways of exposure.

Radiological environmental monitoring and effluent monitoring at nuclear power plants are required by the NRC regulations contained in General Design Criteria 60, 61, and 64 of Appendix A to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50. Such monitoring is important for plant operations. During operations, environmental monitoring verifies the effectiveness of in-plant measures for controlling the release of radioactive materials, and ensures that the levels of radioactive materials in the environment do not exceed the levels anticipated before the plant was licensed.

Licensees are also required to submit to the NRC (1) annual radiological environmental and effluent monitoring reports on radiological effluent releases from the plant and their impact on the environment, and (2) a special report within 30 days of discovery of an event if predetermined levels of radioactivity are exceeded. In addition, the NRC requires that the licensee participate in an Interlaboratory Comparison Program to ensure the accuracy of the licensee's data. The results of the licensee's radiological environmental monitoring and effluent release programs are available to the public.

2. NRC Response to Recent Concerns about Environmental Contamination

In response to recent concerns about environmental contamination at nuclear power plant sites, the NRC has assessed the significance of this contamination and confirmed adequate protection of the public. This has included additional inspections at the sites, including observation of licensee monitoring and collection of independent samples to conform the representation and accuracy of licensee samples. The NRC has also participated in public fora and increased stakeholder outreach to explain our regulatory program and answer questions and hear comments. In addition, the NRC has added a page on the NRC Web site to give the public the latest available information on tritium issues. This information can be accessed by going to www.NRC.gov, then using the link "Groundwater Contamination (Tritium)." We are considering whether additional actions are necessary as part of our ongoing oversight of licensee performance.

As a separate complimentary action, the NRC has formed a task force to examine the agency's regulations for radiological effluent and environmental monitoring programs and the associated inspection program.

The task force is addressing several topics, including:

- A general assessment of the potential public health impact from inadvertent releases
- How the issues were communicated to the public, State and local officials, other Federal agencies, Congress, and other interested groups
- A review of other inadvertent releases at nuclear power plants, including decommissioning sites, from 1996 to the present
- Industry actions in response to the releases, including the timing of remediation efforts
- NRC oversight of inadvertent releases, both under the Reactor Oversight Process (ROP) and the process in place prior to the ROP

The task force will be completing its review by August 31, 2006. A written report summarizing the task force's findings will be issued late this year. The task force's charter is available on the NRC's Web site by going to www.NRC.gov, then using the link to "Groundwater Contamination (Tritium)," and then "NRC Actions."

On February 7, 2006, Exelon made a written commitment (Agencywide Documents Access and Management System (ADAMS) ML060670040) to the NRC to suspend liquid effluent releases through the blowdown line. Exelon also committed to communicate with the NRC before any future radioactive releases through the blowdown line and before disposition of the stored liquids onsite by any method other than recycling back into the plant. The NRC confirmed these commitments in a letter dated February 17, 2006 (ADAMS ML060660590). In addition, to ensure that the licensee operates in a manner that continues to ensure the protection of the public and in accordance with Federal regulations and the plant's license, the NRC continuously assesses the licensee's performance in accordance with the NRC oversight process.

As part of the NRC's oversight process, inspectors evaluate the licensee's performance through inspection. Specifically, for the issues related to tritium at Braidwood, the inspectors initially used Inspection Procedure 71153, "Event Followup." After gaining a preliminary understanding of the situation, the inspectors utilized other inspection procedures such as Inspection Procedures 71122.01, "Radioactive Gaseous and Liquid Effluent Treatment and Monitoring Systems," and 71122.03, "Radiological Environmental Monitoring Program (REMP) and Radioactive Material Control Program." These procedures are available on the NRC's public Web site at www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html.

The NRC will continue to verify the licensee's activities related to the blowdown line by inspecting the adequacy of Exelon's ability to prevent, detect, respond to, and radiologically assess any leakage from the blowdown line.

The results of the NRC inspection activities are documented in publically available inspection reports. The initial inspection activities were documented in NRC Inspection Reports 05000456/20050010 and 05000457/20050010, issued on February 6, 2006. The current inspection activities will be documented in NRC Inspection Reports 05000456/2006008 and 05000457/2006008. Issued inspection reports are available on the

NRC's public Web site at

http://www.nrc.gov/NRR/OVERSIGHT/ASSESS/listofrpts_body.html#brai.

3. Exelon's Handling of Tritium, Storage, and Disposal Plans at Braidwood

The Braidwood Station discontinued the normal release of water containing tritium on November 23, 2005. Since that time the plant has installed temporary tanks to store the water contaminated with tritium that normally would have been released to the Kankakee River. These tanks are fixed-rear-axle container tanks used for storage only (they are not used for transport). Currently, there are 21 of these 21,000 gallon temporary storage tanks on the Braidwood site, and the licensee plans to add additional tanks as necessary. The temporary tanks are located in two areas within the plant's security fence. One of the areas is outdoors and contains 14 tanks surrounded by a 12-inch-high berm wall. The other area is in an on site storage building which currently contains seven tanks that are surrounded by a similar berm. The licensee may install additional tanks inside this building. The licensee is also making preparations to potentially utilize other permanent tanks available on site to store the water.

Exelon is in the process of determining a permanent solution for tritium disposal, and is working with State agencies and the NRC. The options include, but are not limited to (1) recycling the tritiated water for nuclear plant makeup water, (2) recommencing liquid releases through the blowdown line (after upgrading the blowdown line and related equipment and installing leak-monitoring devices), and (3) evaporating the tritiated water. Any alternative selected by the licensee will have to meet NRC requirements in 10 CFR Part 20.

NRC's resident and regional inspectors are performing an analysis of the storage tanks and associated compensatory measures. The inspectors' review of the temporary storage tanks and compensatory measures found them to be in accordance with the licensee's Technical Requirements Manual and not to pose a threat to public health. Furthermore, the inspectors continue monitoring the licensee's handling of tritium.

4. Groundwater Sampling and Results

The Braidwood Station has installed monitoring wells both on site and off site. Since discovering the presence of tritium off site, Exelon has installed approximately 140 new wells and taken other water samples as follows:

- Alongside the vaults of the vacuum breakers for the circulating water blowdown line
- At sufficient locations to characterize and identify the perimeter of the tritium plumes of past leaks
- At shallow depths of approximately 13 feet
- At deeper depths of approximately 30 feet to determine levels in the shallow

- aquifer and clay till level
At resident drinking wells in the vicinity of the plant and the blowdown line

The NRC has collected independent samples and has obtained split samples from these wells for independent analysis of tritium levels. A split sample is a sample drawn by the licensee and a portion is provided to the NRC for independent analysis. To date, the NRC's analytical results have been consistent with the licensee's. The enclosure lists the sample results. Also enclosed is a map showing the tritium plume that is 2,400 to 2,800 feet north of the plant's property line.

The NRC has also analyzed a number of samples for other radioactive material besides tritium, including gamma-emitting radioactivity, strontium-90, and technitium-99. Based on our own analysis, no licensed radioactive material other than tritium was identified above detection limits.

5. Conclusion

As I stated earlier, I share your concern about tritium contamination at Braidwood and other sites. In particular, I am concerned that the licensee may not have adequately identified the significance of these historical events when they occurred and evaluated the dose consequences and the impact to the environment caused by these spills. However, based on currently available information, we believe that the contamination at Braidwood does not pose any threat to public health and safety. In closing, I assure you that the NRC is and will continue to be a strong regulatory authority and will ensure that corrective actions for these issues are effective.

Sincerely,

J. E. Dyer, Director */RA/*
Office of Nuclear Reactor Regulation

Enclosures:

1. Tritium Sample Results
2. NRC Groundwater Measurement Results

- At deeper depths of approximately 30 feet to determine levels in the shallow aquifer and clay till level
- At resident drinking wells in the vicinity of the plant and the blowdown line

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J. E. Dyer, Director
Office of Nuclear Reactor Regulation

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NAME	PKleene	ABoland*	CHaney	JDyer
DATE	04/10/06	04/7/06	04/19/06	04/24/06

Tritium Sample Results

Tritium concentrations are reported in the units of picocuries per liter. A picocuries is a very small amount of radioactivity equal to 0.000000000001 curie. As a result of natural and manmade causes, tritium is generally found in surface water in concentrations in the 200 to 300 pci/L range. Additional information useful in reading this table is found in the footnotes.

Braidwood Tritium Sample Results			NRC Split Sample Results		
Licensee Sample Designation ¹	Collection Date	pCi/L ²	pCi/L ^{2,3}	NRC Sample ID	Ratio Licensee to NRC ⁴
P-1	12-01-05	2484	2930	NRC-1-R3	0.848
P-4	12-01-05	33041	33630	NRC-2-R3	0.982
P-5	12-01-05	6621	6820	NRC-3-R3	0.971
P-6	12-01-05	450	190	NRC-4-R3	Statistically Insignificant
P-7	12-01-05	1210	1200	NRC-5-R3	1.008
P-8	12-01-05	2998	2720	NRC-6-R3	1.102
RW-1	12-01-05	2050	2650	NRC-7-R3	0.774
RW-2	12-01-05	33736	34760	NRC-8-R3	0.971
BL-17	12-01-05	25	240	NRC-9-R3	Statistically Insignificant
BL-18	12-01-05	108	150	NRC-10-R3	Statistically Insignificant
BL-19	12-01-05	37	300	NRC-11-R3	Statistically Insignificant
PW-9	12-05-05	142	-340	NRC-12-R3	Statistically Insignificant
PW-11	12-05-05	99	100	NRC-13-R3	Statistically Insignificant
PW-4	12-02-05	43	200	NRC-14-R3	Statistically Insignificant
SW-4	12-02-05	83	210	NRC-15-R3	Statistically Insignificant
PW-8	12-03-05	1151	1490	NRC-16-R3	0.772
D-3	12-02-05	137	-60	NRC-17-R3	Statistically Insignificant
RW-3	12-02-05	197	140	NRC-18-R3	Statistically Insignificant
RW-4	12-02-05	380	420	NRC-19-R3	0.905
P-2	12-02-05	4344	2750	NRC-20-R3	1.580
P-3	12-02-05	3258	2470	NRC-21-R3	1.319
VB3-7	12-02-05	169	-90	NRC-22-R3	Statistically Insignificant

Braidwood Tritium Sample Results			NRC Split Sample Results		
Licensee Sample Designation ¹	Collection Date	pCi/L ²	pCi/L ^{2,3}	NRC Sample ID	Ratio Licensee to NRC ⁴
VB3-8	12-02-05	171	110	NRC-23-R3	Statistically Insignificant
PW-1	11-30-05	-26	200	NRC-24-R3	Statistically Insignificant
PW-2	11-30-05	48	180	NRC-25-R3	Statistically Insignificant
PW-3	11-30-05	25	-250	NRC-26-R3	Statistically Insignificant
PW-8	12-06-05	1524	1020	NRC-27-R3	1.494
SW-1	11-30-05	2464	2480	NRC-28-R3	0.994
SW-2	11-30-05	2347	2490	NRC-29-R3	0.943
G-1	12-06-05	133	290	NRC-30-R3	Statistically Insignificant
G-2	12-06-05	87	230	NRC-31-R3	Statistically Insignificant
G-3	12-06-05	81	140	NRC-32-R3	Statistically Insignificant
P-9	12-05-05	1346	-40	NRC-33-R3	Statistically Insignificant
P-10	12-05-05	1934	2120	NRC-34-R3	0.912
P-11	12-05-05	1681	1770	NRC-35-R3	0.950
P-12	12-05-05	1535	1400	NRC-36-R3	1.096
S-1	12-05-05	-21	-70	NRC-37-R3	Statistically Insignificant
S-2	12-05-05	95	110	NRC-38-R3	Statistically Insignificant
S-3	12-05-05	145	140	NRC-39-R3	Statistically Insignificant
S-4	12-05-05	1280	1230	NRC-40-R3	1.041
S-5	12-05-05	2023	2190	NRC-41-R3	0.924
S-6	12-05-05	679	490	NRC-42-R3	1.386
D-4	12-06-05	91	-30	NRC-43-R3	Statistically Insignificant
D-2	12-05-05	125	-40	NRC-44-R3	Statistically Insignificant
P-4	12-06-05	25311	30020	NRC-45-R3	0.843
P-8	12-06-05	2212	2500	NRC-46-R3	0.885
VB2-6	12-05-05	2348	1640	NRC-47-R3	1.432

Braidwood Tritium Sample Results			NRC Split Sample Results		
Licensee Sample Designation ¹	Collection Date	pCi/L ²	pCi/L ^{2,3}	NRC Sample ID	Ratio Licensee to NRC ⁴
VB3-4	12-05-05	43708	42580	NRC-48-R3	1.026
MW-113	12-05-05	3598	3840	NRC-49-R3	0.937
NRC Sample (VB 3-4)	11-30-05		39400	NRC-50-R3	
D-5	12-02-05	73	280	NRC-51-R3	Statistically Insignificant
NRC Sample (PW-3)	12-07-05		280	NRC-52-R3	
NRC Sample (PW-2)	12-08-05		210	NRC-53-R3	
NRC Sample (PW-1)	12-08-05		150	NRC-54-R3	
PW-5	12-07-05	9	310	NRC-55-R3	Statistically Insignificant
PW-10	12-07-05	72	210	NRC-56-R3	Statistically Insignificant
PW-12	12-07-05	44	190	NRC-57-R3	Statistically Insignificant
PW-7	12-07-05	-58	170	NRC-58-R3	Statistically Insignificant
VB3-9D	12-13-05	21715	21720	NRC-61-R3	1.000
MW-113D	12-14-05	4835	4810	NRC-62-R3	1.005
P-2D	12-12-05	2599	2480	NRC-63-R3	1.048
RW-2@10'	12-13-05	54111	55920	NRC-64-R3	0.968
RW-2@20'	12-13-05	171166	160400	NRC-65-R3	1.067
RW-2@25'	12-13-05	246442	281800	NRC-66-R3	0.875
NRC Sample (PW-8)	12-27-05		1310	NRC-67-R3	
NRC Sample (SW)	12-08-05		-30	NRC-68-R3	
NRC Sample	12-08-05		1360	NRC-69-R3	

¹The Licensee Sample Designation code provides some indication of the location:

BL	Blowdown Line	PW	Private Well
D	near the on-site Ditch	RW	Remediation Well
G	Private Well	S	Private Well
MW	Monitoring Well	SW	Surface Water
P	Pond	VB	Vacuum Breaker

²The negative numbers indicated radioactivity statistically indistinguishable from background radiation or from the laboratory's Lower Limit of Detection (LLD).

³The NRC's contract laboratory's LLDs:

- (1) drinking water wells 200 picocuries per liter
- (2) non-drinking water wells 500 picocuries per liter

⁴The term Statistically Insignificant applied when sample results are near the LLD.