


United States Nuclear Regulatory Commission Official Hearing Exhibit	
In the Matter of:	Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3)
	ASLBP #: 07-858-03-LR-BD01
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Submitted: March 29, 2012



*Entergy*

**Indian Point NPP**

Feb 13, 2012

IPEC-CHM-12-005

MEMORANDUM TO: D. GRAY – CHEMISTRY ENVIRONMENTAL SUPERVISOR

FROM: S. SANDIKE - CHEMISTRY SPECIALIST

SUBJECT: IPEC ODCM Liquid Effluent Pathway Bases



This memo summarizes the information leading to the original ODCM liquid effluent pathway determinations. Bases are provided in existing ODCM references, but this memo was constructed to simplify and encapsulate the specific data leading to the decision to use only ingestion of fresh water fish and salt water invertebrates.

Attachment 1 includes specific pathway analyses from the 10CFR50 Appendix I Evaluation performed in 1977 (ODCM Ref. 4). Within this reference is another ODCM Reference (Ref. 2), from NY University Medical Center (M. Wrenn and J. Lentsch) in 1974. Several liquid effluent pathways were evaluated and proven to be less than 1% of the total for Indian Point Units 2 or 3.

NUREG 0133, the basis for this section of the ODCM, states that pathway parameters for the required calculations are found in Reg Guide 1.109. In Section C of this Guide, 'significant' pathways are defined as those making up at least 10% of the total dose.

As shown in Attachment 1, all pathways other than ingestion totaled less than 0.3% of the total dose. Therefore, from the details in the original 10CFR50 Appendix I evaluation, the lack of a potable water pathway, guidance from NUREG 0133, the original Technical Specifications/ODCM submittals through the Franklin Research Center, and data supplied from NY University Medical Center, the only applicable pathways at IPEC are Fresh Water Fish and Salt Water Invertebrates.

Bioaccumulation and dose factor tables were therefore compiled for these pathways and implemented into the sites' ODCMs in the early 1980s.

SS/ss

cc: D. Wilson                      D. Mayer                      J. Doroski

## Attachment 1 - Indian Point Liquid Effluent Pathway Determination - Historical Bases

**Primary Source:**

PD-77-024, "An Evaluation to Determine the Compliance of the Indian Point Reactor with the Design Objectives of 10CFR50, Appendix I", Feb 1977, authored by Consolidated Edison and Power Authority of the State of New York. A study by NY University of Environmental Medicine is a quoted reference, below. Regarding this original Appendix I evaluation:

Page 20 identifies the Hudson's primary usage as industrial and as a major transportation artery for freighter and barge traffic to upstate New York and the St. Lawrence Seaway. "Agricultural utilization of the Hudson River (ie, for irrigation purposes or animal watering) are precluded in the Indian Point area because of the general unsuitability of the river for these purposes".

Salinity, sewage, oil, and other pollutants are listed as justification for the lack of a potable water pathway at the Indian Point area, citing Chelsea pumping station as the last potable pathway on the Hudson (approximately 22 miles upriver). Despite these pollutants, dose calculations were conservatively measured for applicable pathways, assuming 1% of the people in a 50 mile radius swimming one hour per day for three months of the year. The 1968 commercial catch of 340,000 pounds of fish (plus 200,000 pounds of sport fish) were applied to the ingestion calculations. The Appendix I evaluation also includes other parameters applied for these original calculations.

In all, on pages 21 and 22 of the Appendix I evaluation, the pathways originally considered were:

- Ingestion of aquatic foods (fish and invertebrates)
- Exposure at shoreline from sediment
- Immersion by swimming in the Hudson River
- Recreational boating on the Hudson River

Table XV of the evaluation includes doses to the Maximum Individual, calculated from PWR-GALE and LADTAP codes, as well as Volume 2 of Wash 1258 "Final Environmental Statement Concerning Proposed Rule Making Action". The resulting dose values from applicable pathways are listed as follows:

Pathway	Max Organ Dose, Adult Liver, mrem	Max Total Body Dose, Adult, mrem
<i>Fish</i>	<i>8.49E-01</i>	<i>6.40E-01</i>
<i>Invertebrates</i>	<i>1.75E-02</i>	<i>1.23E-02</i>
<i>Shoreline</i>	<i>1.90E-03</i>	<i>1.90E-03</i>
<i>Swimming</i>	<i>3.98E-05</i>	<i>3.98E-05</i>
<i>Boating</i>	<i>3.98E-05</i>	<i>3.98E-05</i>
<i>Total</i>	<i>8.68E-01</i>	<i>6.54E-01</i>
Fish & Inv % of total dose	<b>99.8%</b>	<b>99.7%</b>

**Other References:**

NUREG 0133, Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants, October 1978 (W. Burke and F. Congel). This listed ODCM source document inherently applied the 90% requirement imbedded in Reg Guide 1.109 (page 2), stipulating that known pathways need to be evaluated before they can be dismissed. Authors of NUREG 0133 were aware that this would result in application of ingestion and potable water pathways only, in all but the most rare cases. Nonetheless, it was incumbent upon the licensee to demonstrate that these other pathways were indeed insignificant, simplifying the detail provided in Reg Guide 1.109 and other guides. The App I evaluation referenced above accomplishes this objective, along with the conservative nature of dose assessment from ingestion alone.

NY University of Environmental Medicine, Progress Report, Vol II, "The fate of gamma-emitting radionuclides released to the Hudson River estuary and an evaluation of their environmental significance", M.E. Wrenn and J.W. Lentsch, 1974

Review of IP #3 Radiological Effluent Technical Specifications and the Offsite Dose Calculation Manual, by the Franklin Research Center, July 1982, (C. Willis and F. Congel, NRC), where NUREG 0133 was adopted as the source for ODCM, Rev 0.