

RAS 15077

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

DOCKETED
USNRC

February 12, 2008 (8:30am)

Before Administrative Judges:

Lawrence G. McDade, Chair

Dr. Richard E. Wardwell

Dr. Kaye D. Lathrop

OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

In the Matter of

: Docket Nos.

50-247-LR and 50-286-LR

ENTERGY NUCLEAR OPERATIONS, INC.

: ASLBP No. 07-858-03-LR-BD01

(Indian Point Nuclear Generating Units 2 and 3): FEBRUARY 8, 2008

CONNECTICUT RESIDENTS OPPOSED TO RELICENSING OF INDIAN POINT
(CRORIP) AND NANCY BURTON'S REPLY TO ANSWERS OF NRC STAFF AND
ENTERGY NUCLEAR OPERATIONS, INC. OPPOSING REQUEST FOR HEARING,
PETITION TO INTERVENE AND PETITION FOR WAIVER

I. INTRODUCTION

Petitioners Connecticut Residents Opposed to Relicensing of Indian Point and Nancy Burton (collectively referred to herein as "CRORIP") reply herewith to the Answers and Objections of the applicant, Entergy Nuclear Operations, Inc. ("Entergy") and the NRC Staff to CRORIP's Petition to Intervene, Request for Hearing and Petition for Waiver, all dated December 10, 2007,¹ pursuant to the scheduling orders of the

¹ On January 22, 2008, Entergy filed its "Answer of Entergy Nuclear Operations, Inc. Opposing Request for Hearing, Petition to Intervene and Petition for Waiver of Connecticut Residents Opposed to Relicensing of Indian Point"; on January 22, 2008, NRC Staff filed its Answer to the Petition to Intervene titled "NRC Staff's Response to Petitions for Leave to Intervene Filed By (1) Connecticut Attorney General Richard Blumenthal, (2) Connecticut Residents Opposed to Relicensing of Indian Point and Nancy Burton, (3) Hudson River Sloop Clearwater, Inc., (4) the State of New York, (5) Riverkeeper, Inc., (6) the Town of Cortlandt and (7) Westchester County, as well as its "NRC Staff's Response to the Petition for Waiver of Commission Regulations Filed by Connecticut Residents Opposed to Relicensing of Indian Point (CRORIP)."

TEMPLATE = SECY-037

SECY-02

Atomic Safety and Licensing Board Panel.

CRORIP's Petition to Intervene sets forth a single contention, as follows:

Health risks from the cumulative effects of radiation exposure traceable to Indian Point routine and accidental releases during the projected relicensing term are substantial, have not been adequately accounted for in the RLA and constitute new information which must be but which has not been analyzed under 10 CFR Part 51.

In support of the Petition to Intervene, CRORIP submitted *inter alia* expert declarations setting forth compelling facts which establish a clear correlation between high levels of strontium-90 recently found in baby teeth of children living near the Indian Point Nuclear Power Station ("Indian Point") and heightened cancer incidences among children aged 0-9 living near Indian Point, as well as enormously increased levels of airborne radiation released by Indian Point since the U.S. Nuclear Regulatory Commission ("NRC") adopted the Generic Environmental Impact Statement ("the GEIS")(published in May 1996), which facts contributes to other information submitted by CRORIP to illustrate how Indian Point airborne releases of radiation are markedly increasing beyond levels assumed by the GEIS and human health is being significantly affected as a result.

CRORIP further argues herein that Entergy's Environmental Report ("ER") fails to take into account new and significant information regarding this issue, as required under the National Environmental Policy Act ("NEPA").

CRORIP further argues, in the alternative, that its Petition for Waiver of Commission Regulations should be granted so that the critical issues raised in its contention can be

fully examined in these adversarial proceedings

Finally, CRORIP argues that the NRC is dedicated to protection of the public from radiation releases emitted by the Indian Point Nuclear Power Plant; that the NRC intended that the GEIS be reviewed and updated as new information became available in relicensing proceedings; that the NRC has not had a full opportunity to date to review and update the GEIS to adequately take into account such new information in the twelve (12) years since its promulgation and, therefore, the NRC is inclined to grant CRORIP's waiver so that CRORIP's contention will be thoroughly considered in these relicensing proceedings and not disregarded by default in the NRC's neglect to review and update the GEIS to reflect new facts and circumstances, including a more sophisticated understanding of the health effects of exposure to radiation released by Indian Point, upward trending of strontium-90 levels in baby teeth near Indian Point and its correlation with childhood cancer, and enormous increases in Indian Point radiation releases to the environment.

Finally, CRORIP argues that the NRC should be held to the same standard of "reasonableness" as determined by the U.S. Court of Appeals for the 9th Circuit in its recent decision in San Luis Obispo Mothers for Peace v. Nuclear Regulatory Commission, 449 F.3d 1016, 1031 (9th Cir. 2006), cert. den. 127 S.Ct. 1124 (2007)("Under the NRC's own formulation of the rule of reasonableness, it is required to make determinations that are consistent with its policy statements and procedures.")

I. Petition to Intervene

A. Standing

Entergy "does not contest CRORIP's standing to represent the interests of its three

named members [Nancy Burton, Gail Merrill, Lally Codriansky] based on geographic proximity.² Judged against the previously discussed criteria, CRORIP, through Ms. Burton, Ms. Merrill and Ms. Codriansky, has made a showing sufficient to satisfy the requirements of 10 C.F.R. §2.309 with respect to standing.” (Footnotes omitted.)³

Entergy does not address Ms. Burton’s standing to intervene in these proceedings as an individual, apart from her role as designated representative of CRORIP. Absent Entergy objection, Ms. Burton’s standing to intervene as an individual should be accepted by the Panel.

NRC Staff does not contest CRORIP’s representational standing nor Ms. Burton’s⁴

² With regard to Entergy’s assertion that the Secretary of the NRC denied CRORIP’s December 31, 2007 Motion for Reconsideration (Entergy Answer at 10, footnote 39), Entergy omits to note that the Secretary noted timely emailing of the motion but untimely filing of hard copies as the basis for her refusal to accept the filing. When Ms. Burton went to mail the hard copies on or about 4:30 P.M. on December 31, 2007, she discovered that her local post office had closed at 12 noon in observance of the impending New Year’s Eve. She later learned that other post offices in the area also closed early that day. Ms. Burton mailed hard copies of the motion on the day the post office reopened. Ms. Burton also emailed an explanatory note to the Office of the Secretary and all participants to these proceedings, with apologies, on December 31, 2007, the deadline for the motion to be filed.

³ With regard to Entergy’s discussion at page 10, footnote 41 of its Answer, CRORIP’s designated representative, Nancy Burton is fully prepared to provide any additional information the Panel may wish to have to satisfy any concern that CRORIP has authorized Ms. Burton to be its designated representative in these proceedings.

⁴ NRC Staff’s Response to Petitions to Intervene states: “An online search revealed that a Nancy Burton resides at the given address, albeit in a neighboring town - Redding CT 06896.” Actually, “Redding Ridge” - Ms. Burton’s home and the location where NRC Staff has sent mail to her - is a neighborhood within the Town of Redding. It has its own post office with the zip code 06876. “West Redding” is another neighborhood within the Town of Redding with the zip code 06896. “Redding” is a neighborhood within the Town of Redding with its own post office and zip code 06875. Altogether, the Town of Redding has four post offices and four zip codes. With regard to NRC Staff’s statement that the address given - 147 Cross Highway in Redding - is approximately 40 miles from Indian Point, whereas Ms. Burton gave the distance as “approximately 25 miles” in her Petition to Intervene, Ms. Burton made her calculation

individual standing to intervene in this proceeding.⁵

B. CRORIP's Contention

CRORIP has submitted the following contention pursuant to NEPA:

Health risks from the cumulative effects of radiation exposure traceable to Indian Point routine and accidental releases during the projected relicensing term are substantial, have not been adequately accounted for in the RLA and constitute new information which must be but which has not been analyzed under 10 CFR Part 51.

CRORIP's Petition to Intervene provides the requisite factual and legal foundation to meet the requirements of 10 C.F.R. § 2.309(f) as follows:

(i) Provide a specific statement of the issue of law or fact to be raised or controverted.

Health risks from the cumulative effects of radiation exposure traceable to Indian Point routine and accidental releases during the projected relicensing term are substantial, have not been adequately accounted for in the RLA and constitute new information which should be but which has not been analyzed. The RLA dismisses these potential effects as being of only inconsequential ("small") concern, where they are of paramount concern to CRORIP membership and indeed all the communities in the environs of Indian Point and require consideration in these proceedings as a matter of law.

from a map showing concentric circles from Indian Point. The map was possibly inaccurate. Nevertheless, Ms. Burton certainly resides within the range of 25-40 miles from Indian Point.

⁵ NRC Staff's Response to Petitions to Intervene at 13.

(ii) Provide a brief explanation of the basis of the contention.

Indian Point released 17.50 Curies of radiation to the atmosphere between 1970 and 1993, making it the fifth highest of 72 nuclear power stations then operating in the U.S., behind Dresden, Oyster Creek, Millstone and Quad Cities. (Tichler J. et al. Radioactive Materials Released from Nuclear Power Plants, annual reports. Brookhaven National Laboratory, Upton NY, NUREG/CR-2907) More recent data collected by the NRC demonstrates a six-fold increase in release of fission gases from fourth-quarter 2001 to 1st quarter 2002, about 100 times higher than 1st quarter 2001, including a 15-fold increase for Xenon-133. These facts provide a basis for concern about the potential releases of radiation during the projected relicensing period as the facility ages and cracks and leaks which have been detected currently inevitably worsen over time. Indeed, these facts also suggest an upward trending of radiological releases, contrary to the RLA, which asserts that radiological releases will continue at “current” levels. See Applicant’s Environmental Report, Operating License Renewal Stage, Section 4.23.3 (“Cumulative Radiological Impacts”)(“With respect to the future, the REMP sampling locations identified in the IP2 and IP3 ODCMs have not identified increasing levels or the accumulation of radioactivity in the environment over time.”)

(iii) Demonstrate that the issue raised in the contention is within the scope of the proceeding.

The issue of the environmental and health consequences of radiation releases to the environment is clearly within the scope of this proceeding. In its Environmental Report, Appendix E, Entergy makes reference to the issue of its release of radiological materials to the environment in Sections 2.11.2 (“Radiological Environmental Monitoring

Program Air Sampling Program”), 3.2.3 (“Radioactive Waste Treatment Processes (Gaseous, Liquid and Solid)”) and in 4.23.3 (“Cumulative Radiological Impacts”). 10 CFR Part 51 requires an analysis of the environmental impact of these releases during the projected relicensing term.

(iv) Demonstrate that the issue raised in the contention is material to the findings the NRC must make to support the action that is involved in the proceeding.

Ultimately, the NRC must decide whether Indian Point can operate safely through the projected relicensing term without causing harm to the health and safety of the public. The petitioner submits that continued Indian Point operations beyond the current licensing period will subject the public to undue health and safety risks which have not been adequately analyzed.

The NRC's NUREG-1555, Supplement 1 is very specific about what the licensee is required to analyze with regard to radiological impacts of normal operations. See Section 4.3. Nevertheless, the RLA entirely omits data and information which is required regarding “new information on the radiological impacts of operation during the renewal term known to the applicant” as well as “new and potentially significant information on the impacts of renewal-term operations on radiological issues identified by the public.” (Emphasis added.)

CRORIP contends that information regarding the credible statistical link between elevated levels of strontium-90 detected in baby teeth of children living in the region surrounding Indian Point and heightened cancer and associated disease incidence in the same region has been public and brought to the attention of Entergy for a sufficient period of time to require its presentation in the application pursuant to the

NUREG 1555, Supplement 1 passage quoted above, *inter alia*. This information is further developed in the Declaration of Joseph J. Mangano and his related report, "Public Health Risks to Fairfield County CT of Keeping the Indian Point Nuclear Reactors Open" (September 12, 2007), attachments hereto. Entergy's deliberate omission of this information requires admission of this contention.

(v) Provide a concise statement of the alleged facts or expert opinions which support the requestor/petitioner's position on the issue and on which the petitioner intends to rely at hearing, together with references to the specific sources and documents on which the requestor/petitioner intends to rely to support its position on the issue.

CRORIP presents facts supporting its contention through the Declaration of Joseph J. Mangano, MPH, MBA, Executive Director, Radiation and Public Health Project (attached) and his report titled "Public Health Risks to Fairfield County CT of Keeping the Indian Point Nuclear Reactors Open" (September 12, 2007)(attached), together with the sources cited by Mr. Mangano. The Declaration of Helen M. Caldicott, M.D. addressed to medical hazards of nuclear power generation is also attached hereto and incorporated herein.

In brief, a statistical link has been established between elevated levels of the fission product strontium-90 in baby teeth of children living near Indian Point and heightened incidences of cancer and related diseases in the same population. Heightened health risks from exposure to Indian Point-generated radiological releases – which are cumulative in effect in the human body - coupled with the inevitable progression of cracking and leaking as the facility ages lead to the conclusion that continued operation

of Indian Point in the projected relicensing term cannot occur without undue and therefore unacceptable risk to the public health and safety.

(vi) Provide sufficient information to show that a genuine dispute exists with the applicant/licensee on a material issue of law or fact. This information must contain references to specific portions of the application (including the applicant's environmental report and safety report) that the petitioner disputes and the supporting reasons for each dispute, or, if the petitioner believes that the application fails to contain information on a relevant matter as required by law, the identification of each failure and the supporting reasons for the petitioner's belief.

Entergy's Environmental Report, Operating License Renewal Stage. Section 4.23.3 ("Cumulative Radiological Impacts") states in pertinent part:

On the basis of an evaluation of REMP [Radiological Environmental Monitoring Operating Reports] results, Entergy concludes that impacts of radiation exposure on the public and workers (occupational) from operation if IP2 and IP3 during the renewal term would be SMALL. . . . and therefore mitigation measures are not warranted.

CRORIP contends that Entergy failed to adequately evaluate the impact of its radiological releases on the public health during the projected relicensing term. In fact, the application is totally missing any analysis of the environmental impact of its radiation releases during the relicensing term on human health and on its own workforce.

C. CRORIP's Contention fully complies with the requirements of 10 CFR § 309(f)(1) and is admissible for these proceedings.

“To trigger a full adjudicatory hearing, petitioners must be able to ‘proffer at least some minimal factual and legal foundation in support of their contentions.’”In the Matter of Florida Light & Power Company (Turkey Point Nuclear Power Plant), 54 NRC 3, (2001), citing Duke Energy Corp. (Oconee Nuclear Stations, Units 1, 2 and 3), 49 NRC 328, 334 (1999). “Hearings should serve the purpose for which they are intended: ‘to adjudicate genuine, substantive safety and environmental issues placed in contention by qualified intervenors.’ Id. (Citing H.R. Rep. No. 97-177, at 151 (1981). “While intervenors need not be technical experts, they must knowledgeably provide some threshold-level factual basis for their contention.”

CRORIP has submitted a substantial factual and legal foundation in support of its contention, including expert declarations of Joseph Mangano and Dr. Helen M. Caldicott and the September 7, 2007 Mangano report entitled “Public Health Risks to Fairfield County CT of Keeping the Indian Point Nuclear Reactors Open” (“Mangano Indian Point Public Health Risks Report”).

These submissions establish evidence of heightened risk of serious health effects to the community, including its most vulnerable population, its children, due to continued and recently enormously increased releases of radioactive materials into the air.

D. NEPA Requires the NRC to Consider New and Significant Information

NEPA, codified in 10 CFR §51.53(c)(3)(iv), requires license renewal applicants to address new and significant information or changed circumstances in their Environmental Reports (“Ers”), even if a matter would otherwise be considered a Category I issue.

NRC regulatory guidance defines “new and significant information” as follows:

(1) information that identifies a significant environmental issue that was not considered in NUREG-1437 [the GEIS] and, consequently, not codified in Appendix B to Subpart A of 10 C.F.R. Part 51 or (2) information that was not considered in the analyses summarized in NUREG 1437 and that leads to an impact finding different from that codified in 10 C.F.R. Part 51.⁶

Oddly, Entergy argues that the NRC is barred from applying its own Regulatory Guidance.⁷

CRORIP submits that the NRC should accept its “new and significant information” for analysis by admitting its contention.

II. CRORIP’S Petition for Waiver of Commission Regulations

A. The Waiver Petition

On December 10, 2007, simultaneously with filing its Petition to Intervene and Request for Hearing, CRORIP petitioned the NRC for a waiver pursuant to 10 C.F.R. §2.335(b), for purposes of the pending relicensing proceedings, of the NRC’s Generic Environmental Impact Statement for License Renewal of Nuclear Plants (“GEIS”)⁸ with regard to (a) its exclusion of radiation exposures to the public and occupational radiation exposures during the license renewal term as Category 1 excluded issues which do not require site-specific analysis and (b) its use of the “Reference Man” dose

⁶ RG 4.2, Supp. 1, “Preparation of Supplemental Environmental Reports for Applications to Renew Nuclear Power Plant Operating Licenses, 4.2-S-4 (Sept. 2000), available at ADAMS Accession No. ML003710495.

⁷ Entergy Answer at 26-28.

⁸ See NUREG 1437.

models from 1980.⁹

In an accompanying affidavit, Ms. Burton respectfully submitted that special circumstances with respect to the subject matter of the instant proceeding are such that the application of the categorical exclusion rule would not serve the purposes for which it was adopted.

In its most pertinent passages, the affidavit states as follows:

12. In the application at hand, the GEIS relegates the important topic of “Human Health” vis-a-vis radiation exposures to the public and occupational radiation exposures during the relicensing term to Category I exclusion.

13. Thereby, the GEIS excludes consideration of site-specific conditions involving human health impacts from radiological exposures to workers and the public during the public license renewal proceedings.

14. With regard to conditions at the Indian Point Nuclear Power Station, this is clearly an mistaken course to follow. Factors which demonstrate that the exclusion of Human Health as a Category I issue in these proceedings would not serve the purposes for which the rule was adopted include the following:

A. It entirely removes from the proceedings arguably the most critical issue involved in continuation of operations during the license renewal term: the very health of the plant’s workers and the public surrounding the plant. Thus, rather than effectuate the purposes underlying enactment of the GEIS - to assist the NRC and the applicant in complying with NEPA in an efficient way - it simply buries the issue so that the true

⁹ The applicable rules for which waiver is sought is 10 CFR §51.53©, which provides in pertinent part as follows: “The environmental report for the license renewal stage is not required to contain analyses of the environmental impacts of the license renewal issues identified as Category 1 issues in Appendix B to subpart A of this part.”

environmental impacts cannot and will not be probed nor evaluated in the public proceedings.

B. The Petitioners respectfully represent that Indian Point's radiological emissions cannot be completely disregarded as a possible factor in the high levels of strontium-90 found in baby teeth near the plant and the correlation found between high strontium-90 levels and elevated cancer incidences in the communities closest to the plant. (See Declaration of Joseph J. Mangano, November 30, 2007, and attachments thereto, filed by Petitioners in support of their December 10, 2007 intervention petition and incorporated by reference herein.)

C. It is a fact that even the applicant recognizes that substantial leaks of radioactive material have occurred at the plant since GEIS was enacted in 1996: the occurrence of such leakages and the prospect for continued and/or worsening leakages in the relicensing term are issues which need be considered for their environmental impact to human health.

15. The Petitioners also seek a waiver of the NRC's use of "Reference Man" - a healthy white male - in its dose calculations.

16. In 2005, the Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation (National Research Council of the National Academies) issued a report that concluded that women have a 52 per cent greater chance than men of getting cancer from radiation exposure. Seven years ago the Environmental Protection Agency had reached similar conclusions. Yet, radiation protection regulations applicable to U.S. nuclear power plants is still stuck in the past - their "reference" person is a man.

17. Thus, a central principle of environmental health protection - protecting those most at risk - women, children and fetuses - is missing from the regulatory framework.

18. As a consequence, the true health effects of Indian Point on the community and workers and their children from exposure to plant-generated radiation to date and in the projected relicensing period has been under-assessed.

19. Children and fetuses are at the highest risk: they suffer far higher doses from the same exposures adults receive. See “Science for the Vulnerable: Setting Radiation and Multiple Exposure Environmental Health Standards to Protect Those Most at Risk” at 35-37, 78 (“... current dose limits, unchanged since the late 1980s and early 1990s ... need to be re-evaluated in light of today’s knowledge regarding radiation risks and the recognition that the most vulnerable populations should be the focus of protective actions.” (<http://www.ieer.org/campaign/report.pdf>) (October 19, 2006)(Arjun Makhijani, Ph.D. et al.)

20. Radiation releases - planned and unplanned, monitored and unmonitored are likely to increase as Indian Point’s physical plant ages. See Declaration of Helen M. Caldicott, M.D. (filed by Petitioners on December 10, 2007 in support of their intervention petition and incorporated by reference herein).

21. Correspondingly, the true environmental impact of radiation exposures on human health - to the public and plant workers - in the projected relicensing period should be examined on a site-specific basis as a Category II issue.

B. CRORIP’s Waiver Petition Satisfies the Requirements of 10 CFR §2.335(b).

A petitioner for waiver under 10 C.F.R. §2.335 must demonstrate that it meets each of the following factors for a waiver to be granted:

1. The rule's strict application would not serve the purpose for which it was adopted;
 2. The movant has alleged "special circumstances" that were "not considered, either explicitly or by necessary implication, in the rulemaking proceeding leading to the rule sought to be waived";
 3. Those circumstances are "unique" to the facility rather than "common to a large class of facilities"; and
 4. A waiver of the regulation is necessary to reach a "significant safety problem."¹⁰
- A §2.335 petition can be granted "only in unusual and compelling circumstances."¹¹
- CRORIP's waiver petition satisfies all requirements of 10 C.F.R. §2.335.

The petition sets forth compelling facts which establish *inter alia* a scientific correlation between high levels of strontium-90 recently found in baby teeth of children living near the Indian Point and heightened cancer incidences among children aged 0-9 living near Indian Point, as well as enormously increased levels of airborne radiation released by Indian Point since the NRC adopted the Generic Environmental Impact Statement ("the GEIS")(published in May 1996), which facts contributes to other information submitted by CRORIP to illustrate how Indian Point airborne releases of radiation are markedly increasing beyond levels assumed by the GEIS and human health is being significantly affected as a result.

Sections 1, 2, 3 and 4 below address the second, third and fourth factors which must be met to satisfy 10 C.F.R. §2.335.

Section C below addresses the GEIS in more detail and why the rule's strict

¹⁰ Public Service Co. of New Hampshire (Seabrook Station, Units 1 and 2), CLI-89-20, 30 NRC 231, 235 (1989).

¹¹ Id.

application- - deeming public health effects in the relicensing term as a Category 1 issue - would not serve the purpose for which it was adopted.

1. Strontium-90 in Baby Teeth of Children Living Near Indian Point

A study of 500 baby teeth collected from children living near Indian Point shows markedly higher levels the closer the child resided to Indian Point.

What Entergy calls “speculation”¹² is actually sound science that has its origins in U.S. Government-funded studies that measured tooth and bone samples for strontium-90 concentrations in the 1950s.

As the Mangano report, “Public Health Risks to Fairfield County CT of Keeping the Indian Point Nuclear Reactors Open”¹³ states:

Radioactivity Levels in Bodies Near Indian Point. The question of how much man-made radioactivity enters human bodies was first considered in the 1950s, when the U.S. Government sponsored studies that measured bone and teeth samples for strontium-90, one of the 100-plus chemicals found in nuclear weapons explosions and nuclear reactor operations. A landmark study of baby teeth in St. Louis found that the average sr-90 level for children born in 1964 (just as atomic bomb testing was stopped) was about 50 times greater than for children born in 1950. Furthermore, sr-90 studies found that average concentrations in bodies plunged by about half from 1964 to 1969, after large-scale weapons testing in the atmosphere was banned. Similar studies of sr-90 in bone and teeth in Europe found similar patterns. (Sources: Rosenthal HR.

¹² See Entergy’s Answer at 37.

¹³ This report is incorporated by reference in Mr. Mangano’s Declaration, which is incorporated by reference in Ms. Burton’s affidavit.

Accumulation of environmental strontium-90 in teeth of children. In: Proceedings of the Ninth Annual Hanford Biology Symposium, Richland WA, May 5-8, 1969. Washington DC: U.S. Atomic Energy Commission, 1969. Health and Safety Laboratory, U.S. Atomic Energy Commission. Strontium-90 in Human Vertebrae. In: Radiation Data and Reports, monthly volumes, 1964-1969).

Government officials dropped their in-body radiation monitoring programs in 1970, 1971, and 1982. No studies measuring in-body levels near U.S. nuclear plants existed until 1996, when the independent research group Radiation and Public Health Project initiated an effort measuring Sr-90 in baby teeth. RPHP used a machine designed to measure low-dose radioactivity levels and selected the REMS radiochemistry lab of Canada to establish protocols and test teeth. The lab calculated the ratio of Sr-90 to calcium, and RPHP converted it to a ratio at birth, using the Sr-90 half life of 28.7 years. Most Sr-90 in a baby tooth is taken up during the last six months of pregnancy and the first few months of life. A tooth from a person age 28.7 years with a current ratio of 4.30 would have an at-birth ratio of 8.60. Teeth were classified according to where the mother lived during pregnancy and the first year of life, not the current residence.

RPHP has tested nearly 5,000 baby teeth, and published five medical journal articles on results. Average Sr-90 in baby teeth was 30-50% higher in counties closest to six U.S. nuclear plants, and rose about 50% from the late 1980s to the late 1990s (reversing a prior decline), as reactors aged and were in operation more frequently. Results were statistically significant, suggesting strongly that reactor emissions were entering human bodies. (Source: Mangano JJ et al. An

unexpected rise in Strontium-90 in US deciduous teeth in the 1990s. The Science of the Total Environment 2003;317:37-51).

Over 500 teeth were collected and tested from the New York metropolitan area partly supported by a \$25,000 grant from the Westchester County legislature.

The average local Sr-90 level was highest in the four New York counties closest to Indian Point – Westchester, Rockland, Orange, and Putnam (3.78 picocuries per gram of calcium), followed closely by Fairfield County CT (3.45). The average in Fairfield exceeded both New York City and Long Island (Table 6).

Table 6

Average Strontium-90 in Baby Teeth, New York Metropolitan Area

<u>Region</u>	<u>Teeth</u>	<u>Average Sr-90</u>
4 NY Cos. Near Indian Point	279	3.78
Fairfield County	32	3.45
New York City	161	3.10
Long Island	94	2.75

Average = picocuries of Sr-90 per gram of calcium at birth. Only births after 1979 included.

Source: Radiation and Public Health Project

While the tooth study provided some unique and important data, it is difficult to demonstrate exactly how the Sr-90 entered children's bodies. (Some is from the mother's bone stores, some through the mother's diet during pregnancy, and some through the baby's diet during infancy). Sr-90 enters bodies through milk, water, vegetation, and breathing. These limits do not, however, negate the importance of consistent and significant findings of high and rising levels of radioactivity closest to Indian Point.

Moreover, according to the Mangano Declaration (§ 7), the average levels of strontium-90 in baby teeth in children living near Indian Point are higher than the levels found in baby teeth collected from children at five other nuclear power plants and these levels have risen sharply since the late 1980s.

The highest average Sr-90 is in the New York counties that flank Indian Point (Orange, Putnam, Rockland and Westchester (at 3.78 picocuries of Sr-90 per gram of calcium at birth (279 teeth). The next highest area in the region was Fairfield County CT, which had an average of 3.45 (32 teeth), followed by the more distant New York City (3.10, 161 teeth) and Long Island (2.75, 94 teeth).

2. Correlation Between Elevated Strontium-90 Concentrations in Baby Teeth of Children and Others Living Near Indian Point and Childhood and Other Cancers

Joseph Mangano's expert declaration states as follows:

"RPHP has documented a statistical link between trends in average levels of Sr-90 in baby teeth and trends in cancer incidence in children age 0-9 in Westchester, Rockland and Putnam counties. Trends in Sr-90 were followed by similar trends in child cancer incidence four years later." (Mangano Declaration §12).

"It is my opinion that the statistical link between trends in average Sr-90 levels in baby teeth and trends in cancer incidence in children age 0-9 in Westchester, Rockland and Putnam counties referenced above in paragraph 12 provides scientific support for belief that radiation releases from Indian Point are responsible in part for both trends and that such trends will continue during the proposed relicensing period should Indian Point be allowed to continue to operate and release radiation to the environment at current levels. (Mangano Declaration §14.)

Moreover, just as baby teeth of children living in Fairfield County closest to Indian Point have tested high for strontium-90, so, too, are cancer and childhood mortality rates in Fairfield County at heightened levels.

Cancer incidence for all Fairfield County residents for the period 1998-2002 was 8.2% and 6.7% higher than the U.S. rate for males and females, respectively, based on a total of 33,975 cases in the county. The elevated rates are statistically significant. The portion of Fairfield County with the highest cancer incidence rate are the towns in the southwest part of the county, directly downwind and closest to Indian Point. (Mangano Declaration ¶11.

Mortality in Fairfield County from 1987-2004 was 5.6% below the U.S. for cancer (31,740), but 15.7% lower for all other causes (84,535 deaths), a statistically significant difference. **For children age 0-9, the gap was even greater: cancer mortality was 10.7% above the U.S. (79 deaths), while mortality for other causes was 25.8% lower (1691 deaths).** The recent rate of babies born underweight in Fairfield County exceeds U.S. rates by 3%, 12%, 3% and 32% for whites, blacks, Asians and Hispanics, respectively. (Mangano Declaration, ¶ 11). [Emphasis added.]

The Mangano Indian Point Public Health Risks Report further states:

Cancer Incidence. The Connecticut Tumor Registry began in 1935, making it the oldest in the United States. Table 9 compares recent (1998-2002) incidence of all cancers combined in Fairfield County with the U.S. The county rate is 8% and 7% above the U.S. for males and females, respectively. A total of 33,975 cancer cases were diagnosed among county residents during the five-year period.

Table 9

Cancer Incidence, Fairfield County vs. U.S., 1998-2002

Fairfield County

<u>Area</u>	<u>Cases</u>	<u>Cases/100000</u>	<u>U.S. Cases/100000</u>	<u>% Co. vs. U.S.</u>
Males	12222	613.4	567.0	+8.2%
Females	11753	450.2	421.9	+6.7%

Cancer Mortality. The type of cancer most extensively studied for risks of radiation exposure is childhood cancer. In the past two decades, the rate of Fairfield County children under ten who died of cancer was 10.7% above the U.S. rate. This compares to a local rate 25.8% below the U.S. for all other causes for children under ten (Table 11).

Table 11

Childhood Mortality Rates, Cancer/Other Causes, Age 0-9, Fairfield County vs. U.S., 1987-2004

<u>Area</u>	<u>Deaths</u>	<u>Ann Pop</u>	<u>Rate</u>	<u>% Co. vs. U.S.</u>
Cancer				
Fairfield County	79	120903	3.63	+10.7%
United States	22760	38563621	3.28	
All Other Causes				
Fairfield County	1691	120903	77.70	- 25.8%
United States	726815	38563621	104.71	

3. Airborne Radiation Releases from Indian Point have been increasing enormously since the NRC promulgated the GEIS in 1996.

Historically, airborne radiation releases from Indian Point have been among the

highest in the nation.¹⁴

Radiation releases at Indian Point are trending upward - in contrast with the GEIS - which states the airborne releases are trending downward. [cite section]

For example, fission gases rose about six-fold from 4th quarter 2001 to the 1st quarter 2002, about 100 times higher than 1st quarter 2001. In the case of Xenon-133, the rise was a 15-fold increase. Second-quarter 2004 airborne fission gases were much higher than typical 2003 releases.

Table 4

Airborne Radioactivity Released from Indian Point 3, in Millicuries by Quarter, 2001-

<u>04Quarter</u>	<u>Xenon-133</u>	<u>Tot. Fission Gases</u>	<u>Tritium</u>
1 st Q 01	59	91	360
2 nd Q 01	218	251	457
3 rd Q 01	321	1040	1120
4 th Q 01	378	1400	1430
1 st Q 02	5580	8180	1310
2 nd Q 02	1820	3790	1670
3 rd Q 02	166	202	1540
4 th Q 02	33	55	679
1 st Q 03	141	181	495
2 nd Q 03	190	229	828
3 rd Q 03	371	525	951

¹⁴ See Declaration of Joseph Mangano filed on December 10, 2007 (¶4); Declaration of Joseph Mangano (filed on February 8, 2008, annexed hereto and incorporated by reference herein)(¶ 6); and Mangano Indian Point Public Health Risks Report at pages 6-9).

4 th Q 03	523	1590	830
1 st Q 04	144	204	1420
2 nd Q 04	1290	1450	1340
3 rd Q 04	29	58	1140
4 th Q 04	36	121	1570

(Mangano Indian Point Public Health Risks Report at pages 7-8)

Moreover, the capacity factor of Indian Point Units 2 and 3 has risen steeply since the mid-1990s, when the GEIS was being formulated.

The capacity factor of Indian Point Units 2 and 3 from 2001-2004 was 94.6% and 95.6% (average 95%), an increase from the pre-1995 factors of 64.7% and 50.4% (average 58%). (Mangano Indian Point Public Health Risks Report, page 6).

When the GEIS was being promulgated, the Indian Point capacity factor was approximately 58% - and the GEIS was presuming unchanging patterns in radiation releases.

The GEIS prediction for Indian Point was simply wrong, since the Indian Point capacity factor rose by nearly 40 per cent in six years!

Moreover, the NRC approved a 3.26% stretch power uprate for Indian Point 2 in 2004 and a stretch power uprate for Indian Point Unit 3 in 2005; more uprates may be planned.

Increased capacity with uprates brings about corresponding releases of airborne radiation.¹⁵ These increases were not contemplated in the GEIS. Indian Point's

¹⁵ See, e.g., pending application to the NRC by Dominion Nuclear Connecticut, Inc., for a 7 per cent uprate at its Unit 3 nuclear reactor. If the application is granted, Millstone Unit 3 will release an estimated (by Dominion) 7-9% more airborne radiation. The application is available in ADAMS, ML 072000281. Dominion's plans for the uprate

enormous increases in radiation releases have enormous potential to bring about significant health effects during the relicensing term which have not been analyzed by Entergy in its ER.

4. Accidents, leaks and record unplanned shutdowns at Indian Point since the GEIS was promulgated have heightened risks of excess radiation releases and correspondingly significant health effects.

Indian Point's operational life since 1996, when the GEIS was promulgated, has been plagued by operational problems marked by unplanned releases of radiation to the environment, including the following:

Accidental releases to the environment can include releases due to leaking equipment, which can include the cladding and welds or fuel rods in the reactor core, cracks and breaks in fuel that damages cladding, corroding pipes, and cracked steam generator tubes. (Mangano Indian Point Public Health Risks, page 6)

For example, the steam generator tube rupture at Indian Point Unit 2 on February 15, 2000, which resulted in unmonitored and unknown quantities of releases of radioactive steam to the air and hundreds of gallons of radioactive water to the Hudson River and kept Indian Point Unit 2 shut down until December 2000 obviously had public health consequences. (See Declaration of Dr. Helen M. Caldicott, ¶¶ 24-25)

The same year, the NRC rated Indian Point Unit 2 the most trouble-plagued nuclear power plant in the nation.¹⁶

and associated refurbishment were not disclosed during the recent Millstone relicensing proceedings.

¹⁶ Three years later, on August 12, 2003, the NRC opened an investigation into the cause of nine (9) unplanned shutdowns at Indian Point during the previous 18 months - eight (8) more than the national average of one unplanned shutdown per

More recently, Entergy notified the NRC on October 5, 2005 that a sample from a monitoring well located in the Indian Point transformer yard showed levels of tritium contamination ten times higher than the EPA drinking water standard. By December, the level had increased to 30 times the EPA limit. Tritium leakage is a continuing significant public-health problem at Indian Point with implications for radiation exposure by the public.

Moreover, Entergy's dedication to complying with NRC standards of operation and for public health and safety is drawn into question with reference to the NRC's posting of its "Escalated Enforcement Actions" to Indian Point Units 1, 2 and 3 on its website at <http://www.nrc.gov/reading-rm/doc-collections/enforcement/actions/reactors/i.html>.¹⁷

C. The GEIS and Indian Point

The GEIS is the underpinning of the determination that radiation exposure is a Category I issue.¹⁸

The GEIS reflects the NRC's awareness that "[H]ealth impacts on individual humans are the focus of NRC regulations limiting radiological doses and its dedication to adequately protecting the public from radiological doses." (the GEIS at 4.6)

The GEIS was published in 1996, following a rulemaking proceeding that gathered information on past operational experience of the nation's nuclear power plants, including Indian Point.

reactor per year. Unplanned shutdowns also result in unplanned releases to radiation to the air.

¹⁷ The most recent action - taken on January 24, 2008 for a Level III Severity - proposed imposition of a \$650,000 civil penalty on Entergy for continuing violation of NRC orders.

¹⁸ Entergy Answer at 36, footnote 173.

The GEIS states:

Public Radiation Doses to the public during the license renewal term were estimated using current (baseline) levels and trends. [4.6.2]

(Accompanying Table 4.6 shows Indian Point but not Millstone releases, although Millstone had even higher airborne and liquid emissions than Indian Point.)

The GEIS further states:

Projections into the future can be made on the basis of current trends. The first objective of the analysis was to determine to what extent known information about all sites could be used to predict what the dose commitment values for each site were for the years 1979-1987. [4.6.2.2]

Much of the information regarding operational experience thus is from the 1970s and 1980s¹⁹ - during the first and second decades of Indian Point operations when the plant was in its infancy. At 32 and 35 years of age, Indian Point is now at an advanced age.

(Since Indian Point Unit 2 went online in 1973, that means the GEIS was issued only two-thirds into Unit 2's current operating life, necessarily not taking into account the operational history which has evolved in the 12 years since the GEIS was published and not including any new or significant information developed in the intervening twelve (12) years of operating experience.)

¹⁹ Obviously the GEIS is oblivious of BEIR V, which superseded BEIR IV to which it has reference, and which calls for heightened radiation standards in light of its conclusion that there is no safe exposure to radiation which does not risk cancer incidence; similarly, the GEIS is unaware of the recent study for the German Government finding much-heightened risk of childhood leukemia among children living within 3 miles of German nuclear power plants, as well as the brilliant study by the Institute for Energy and Environmental research titled "Science for the Vulnerable: Setting Radiation and Multiple Exposure Environmental Health Standards to Protect Those Most at Risk" (October 19, 2006).

(Similarly, since Unit 3 went online in 1976, that means the GEIS was issued less than two-thirds of the way into Unit 3's operating life, necessarily not taking into account the operational history which has evolved in the 12 years since the GEIS was published and thus including any new or significant information developed in the intervening twelve (12) years of operating experience.)

The major conclusions drawn by the GEIS which are pertinent to these proceedings appear in Section 4.6.2.3 and 4.6.2.4:

4.6.2.3 Projected Doses for License Renewal

Similarly, radiation exposure to the average individual and collective dose to the population around a nuclear power plant are not anticipated to increase from present levels in the period after license renewal. Analysis of all available pertinent information suggests that, if anything, radiation doses to the public are decreasing.

4.6.2.4: No changes in the operation of power plants under license renewal are expected to increase radiation doses to the public compared with current operation.

Indeed, the GEIS concluded that future release from all nuclear power plants in the United States would be so inconsequential that of the 150,000,000 people living within 50 miles of a nuclear power plant, there would only be 5 (five) fatalities attributable to exposure to nuclear power plant radiation during the relicensing periods of all.

The facts brought forth herein by CRORIP illustrate overwhelmingly why application of the rule excluding considerations of health effects of Indian Point radiation releases during the relicensing term would not serve the purpose for which the rule was adopted,

namely, to aid the NRC to implement its “dedication to adequately protecting the public from radiological doses” in a relicensing proceeding. (The GEIS 4.6)

CRORIP has asserted in its filings that radiation releases from Indian Point have risen steeply since the GEIS was promulgated and that Indian Point has had a large and measurable effect on the health of its community that corresponds with such releases.

Obviously, the conclusions drawn by the GEIS in Sections 4.6.2.3 and 4.6.2.4 do not apply to Indian Point.

CRORIP has presented “special circumstances” indeed which were clearly “not considered, either explicitly or by necessary implication, in the rulemaking proceeding leading to the rule sought to be waived.”²⁰ Such “special circumstances are demonstrably “unique” to Indian Point, as has been shown herein.²¹

As a practical matter, the NRC will not be able to address this discrepancy, now that it has been brought to its attention through these proceedings, in a revised GEIS applicable to these proceedings.

Clearly, a waiver of the regulation is necessary to address a significant safety problem, one involving to a significant degree the health of the children - and their families - living near Indian Point. Under these unusual and compelling circumstances, the only reasonable course is for the NRC to grant CRORIP’s waiver petition.

III. CRORIP’S RESPONSE TO ENTERGY’S ANSWER

The arguments presented in Entergy’s Answer are not adequate to bar admissibility of CRORIP’s Petition to Intervene nor its Petition for Waiver.

²⁰ Public Service Co. of New Hampshire, supra.

²¹ If the NRC finds these special circumstances to be “common to a large class of facilities,” drastic remedies need be taken without delay.

Entergy's Answer states:

"Consideration of health effects of radiation in individual license renewal proceedings is contrary to 10 CFR §51.53(c)(3)."²²

Petitioners' Response: It is precisely *because* consideration of health effects of radiation in the Indian Point license renewal proceedings is expressly excluded as a Category I issue pursuant to 10 CFR §51.53(c)(3) that petitioners seek a waiver of the rule.

Entergy's objections to the Petition for Waiver are without merit. Entergy's comments will be addressed *ad seriatim*:

1. Entergy states that the Burton affidavit "incorrectly suggests that 'the process that produced the GEIS does not include components such as public input and operational conditions occurring post-adoption of the GEIS . . . nor progress in the evolution of standards to better protect the public health and safety from radiological exposures to workers and the public off-site.'"

Response: Entergy misreads the affidavit. The affidavit does not state that the rulemaking which resulted in the GEIS did not accept public input. It asserts instead that the rule itself precludes consideration of public input and receipt of new and significant information such as regarding evolving standards of radiation protection because it is a Category 1 issue.

2. Entergy's Answer states:

The [Burton] affidavit speculates, relying on Mr. Mangano's declaration, that "Indian

²² 10 CFR §51.53(c) provides in pertinent part as follows: "The environmental report for the license renewal stage is not required to contain analyses of the environmental impacts of the license renewal issues identified as Category 1 issues in Appendix B to subpart A of this part."

Point's radiological emissions cannot be completely disregarded as a possible factor in the high levels of strontium-90 found in baby teeth near the plant and the correlation found between high strontium-90 levels and elevated cancer incidences in the communities closest to the plant."²³

It is noted that Mr. Mangano does not speculate: his Declaration draws a scientific correlation between high levels of strontium-90 in baby teeth of children near Indian Point elevated cancer incidences in the communities closest to the plant.

3. Entergy's Answer argues that the issue which the petitioners seek to raise in their contention is "generic in nature and that there is nothing unique to this license renewal proceeding that warrants waiver of the categorization of this issue as Category I."

Contrary to this assertion, the Petition for Waiver and its attachments present a clear set of circumstances which are unique to Indian Point and therefore qualify for waiver of the Category 1 rule.

For example, the petition and its attachments provide the following:

(a) Scientific analysis of 500 baby teeth collected from families living at varying distances from Indian Point, with results showing higher levels of strontium-90 correlating with propinquity to the nuclear power plant (See Table 6 in Mangano "Public Health Risks" report);

(b) Scientific correlation documenting a statistical link between trends in average sr-90 levels in baby teeth and trends in cancer incidence in children age 0-9 in Westchester, Rockland and Putnam counties, followed by similar trends in child cancer incidence four years later;

²³ Entergy Answer at 37-38.

(c) Expert opinion that “the statistical link between trends in average sr-90 levels in baby teeth and trends in cancer incidence in children age 0-9 in Westchester, Rockland and Putnam counties . . . provides scientific support for belief that radiation releases from Indian point are responsible in part for both trends and that such trends will continue during the proposed relicensing period should Indian Point be allowed to continue to operate and release radiation to the environment at current levels.”

(Mangano Declaration at ¶14.)

The Petition and its attachments also provide clear evidence of a sharply escalating upward trend in Indian Point's airborne radiation releases, leaks and disturbing unplanned shutdowns which have potential to gravely impact the health of the community.

4. Entergy's Answer asserts that CRORIP has failed to make the *prima facie* showing required by 10 C.F.R. §2.335 (c), (d).

By submission of the Petition, Affidavit and its attachments, CRORIP counters that it did, indeed, make the requisite *prima facie* showing that special circumstances are presented such that application of the Category 1 rule would not serve the purposes for which the rule was adopted.

5. Entergy suggests that the contention raises an operational rather than license renewal issue.²⁴

The flaw in this argument is that the NRC's own GEIS specifically identifies radiological effects on public health as a Category 1 issue for reactor relicensing.

6. Entergy seeks to discredit and denigrate CRORIP's declarants, Joseph Mangano

²⁴ Entergy Answer at 39.

and Dr. Helen M. Caldicott.²⁵

However, their *curriculum vitae* speak for themselves.

Moreover, far from presenting dated information, as Entergy asserts, Mr. Mangano's Indian Point Public Health Risks Report, attached to his December 10, 2007 Declaration, citing the latest baby teeth results and cancer mortality incidences near Indian Point, is most timely and fresh.

Indeed, Entergy's dismissal of Mr. Mangano's Indian Point work based on other work he has performed not involving Indian Point is off the mark.

7. Entergy asserts CRORIP's contention should be ruled inadmissible because it lacks "the requisite specificity with respect to the subject matter of this proceeding."²⁶

Here again Entergy is wide of the mark.

The contention is absolutely specific to the subject, which involves the issue of the unanalyzed health **effects** of continued operations of Indian Point in the proposed relicensing term, not a challenge to the Commission's permissible doses.

8. Entergy argues that CRORIP should not be permitted to adopt contentions of other petitioners.²⁷

The rule Entergy cites - 10 C.F.R. §2.309(f)(3) allows a petitioner to agree that the sponsoring requestor/petitioner shall act as the representative with respect to that contention - does not require an affirmative statement on the part of the requestor/petitioner.

²⁵ Entergy Answer at 39-41.

²⁶ Entergy Answer at 43.

²⁷ Entergy Answer at 43.

Because CRORIP has standing and has filed an admissible contention, the rule allows it to “adopt” any and all contentions of other petitioners.

IV. CRORIP’S RESPONSE TO NRC STAFF’S RESPONSES

NRC Staff opposes admission of CRORIP’s contention and its Petition for Waiver. The arguments presented in NRC Staff’s responses are not adequate to bar admissibility of CRORIP’s Petition to Intervene nor its Petition for Waiver.

NRC Staff’s comments regarding CRORIP’s Petition to Intervene and the admissibility of its contention reiterate those asserted by Entergy. Therefore, CRORIP incorporates herein its comments to Entergy’s Answer, hereinabove in Section III.

With regard to NRC Staff’s Response to CRORIP’s Petition for Waiver, CRORIP responds to the following points:

1. NRC Staff asserts at page 1, footnote 1, that CRORIP’s Petition to Intervene rests upon a grant of its Petition for Waiver. This is not entirely accurate. As set forth hereinabove, should the NRC permit consideration of the “new and significant information” which CROCRP has submitted and thereby admit CRORIP’s contention, the NRC need not even consider CRORIP’s Petition for Waiver.

2. NRC Staff utilizes confusing and inaccurate terminology in responding to CRORIP’s Petition for Waiver. NRC Staff refers to the Category I exclusion of “radiological doses.”²⁸

However, it is important to note that the actual issue is one of “Human Health” as appears in Table B-1 to Appendix B to 10 C.F.R. Part 51. Thus, the issue is clearly not one of radiological doses themselves and whether or not they exceed “permissible” levels, but rather the effects of such doses on human health itself.

²⁸ NRC Staff Response to CRORIP Petition for Waiver at 5.

3. NRC Staff urges upon the Commission an incorrect burden: to determine whether “Mr. Mangano’s findings [with regard to strontium-90 in baby teeth] . . . fail to establish a *prima facie* showing that strontium-90 found in infants’ teeth near Indian Point in fact resulted from the operation of Units 2 and 3.”

NRC Staff misconstrues 10 C.F. R. §2.335: the rule posits the *prima facie* burden on the petitioner to show that “**special circumstances exist**” such that the application of the rule or regulation would not serve the purposes for which the rule or regulation was adopted. (Emphasis added.)

4. NRC Staff incorrectly asserted errors in Mr. Mangano’s December 10, 2007 Declaration; Mr. Mangano has corrected NRC Staff in his February 8, 2008 Declaration, which is incorporated by reference herein.

5. While NRC Staff assert - astonishingly - that CRORIP’s assertions regarding unplanned releases of radiation and the prospect for worsening leakages “could be made for numerous facilities which have experienced unplanned radiological releases in their operating history,” such unsupported statement hardly diminishes the unique characteristics of Indian Point.

6. NRC Staff argue that the issues set forth in CRORIP’s Petitions are common to the industry and not unique to Indian Point. However, to be persuasive on this point, NRC Staff should provide its basis for factual comparison. In the absence of substantiation, NRC Staff’s argument is rhetorical.

7. Other assertions of NRC Staff repeat those of Entergy. Therefore, CRORIP incorporates herein its comments to Entergy’s Answer, hereinabove in Section III.

Conclusion

CRORIP has submitted an admissible contention which is compelling and significant to these proceedings. Clearly, a waiver of the regulation at issue is necessary to address a significant safety problem, one involving to a significant degree the health of the children - and their families - living near Indian Point. Under these unusual and compelling circumstances, the only reasonable course²⁹ is for the NRC to grant CRORIP's waiver petition. In the alternative, the NRC should admit CRORIP's contention without a waiver on the basis that it qualifies as "new and significant information" under NEPA.

Respectfully Submitted,

**CONNECTICUT RESIDENTS OPPOSED TO
RELICENSING OF INDIAN POINT and
NANCY BURTON**



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²⁹ See San Luis Obispo Mothers for Peace, supra.

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
ATOMIC SAFETY AND LICENSING BOARD**

**Before Administrative Judges:
Lawrence G. McDade, Chair
Dr. Richard E. Wardwell
Dr. Kaye D. Lathrop**

In the Matter of

: Docket Nos.

50-247-LR and 50-286-LR

ENTERGY NUCLEAR OPERATIONS, INC.

: ASLBP No. 07-858-03-LR-BD01

(Indian Point Nuclear Generating Units 2 and 3): FEBRUARY 8, 2008

DECLARATION OF JOSEPH MANGANO

Joseph Mangano hereby declares under penalty of perjury that the following is true and correct:

1. I submit the following comments in support of the Connecticut Residents Opposed to Relicensing of Indian Point ("CRORIP") and Nancy Burton's Reply to Answers of NRC Staff and Entergy Nuclear Operations, Inc. Opposing Request for Hearing, Petition to Intervene and Petition for Waiver.

2. I am a health researcher and have worked with the Radiation and Public Health Project (RPHP) since 1989. I currently serve RPHP as Executive Director.

3. My work with RPHP has involved conducting research on the risk of cancer and other disease from fission products emitted from nuclear reactors. To that end, I am the author or co-author of 23 medical journal articles that have been peer-reviewed by experts (unknown to me) and deemed appropriate for publication. I also am the author

of *Low Level Radiation and Immune Damage: An Atomic Era Legacy* (Lewis 1998), and co-author of *The Enemy Within: The High Cost of Living Near Nuclear Reactors* (Four Walls Eight Windows, 1996).

4. For over a decade, our group has studied levels of radioactive Strontium-90 in baby teeth, based on prior studies in the 1960s in the U.S. and abroad. We have tested nearly 5,000 teeth in a laboratory, and five of the journal articles I mentioned address results of the tooth study. The effort is the only attempt to examine radioactivity levels in bodies of Americans living near nuclear reactors of which I am aware.

5. I submit the following comments in response to the January 22, 2008 U.S. Nuclear Regulatory Commission document *NRC Staff's Response to the Petition for Waiver of Commission Regulations Filed by Connecticut Residents Opposed to Relicensing of Indian Point*, part of In the Matter of Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3, Docket Nos. 50-247/286LR).

6. Footnote 8 of the NRC response states that I failed to identify any specific portion of the NRC contractor report by Tichler J. et al. *Radioactive Materials Released from Nuclear Power Plants* in support of my claims. The response goes further to state that data in the Tichler report show "that Indian Point releases were on a par with – and often lower than – releases from other pressurized water reactors."

The following represents a more detailed presentation of the information I used to support my statement. It is based on the Tichler report, which lists emission levels of various types of radioactivity from reactors, including airborne Iodine-131 and effluents for each U.S. reactor, each year from 1970 to 1993, when the annual publication ceased.

There are various types of radionuclides that are emitted into the environment from nuclear reactors. Of these, the category airborne Iodine-131 and effluents may be one of the more meaningful ones in terms of assessing potential health risk. Many radioisotopes produced in nuclear reactors have very short half lives, and do not typically enter the food chain. However, any radioisotope with a longer half life (8 days or more) remains in the environment is more likely to be ingested by humans through drinking water, milk, and other food products.

The following lists annual amounts (in curies) of airborne Iodine-131 and effluents from the Indian Point plant.

<u>Year</u>	<u>Curies (1986 Report)</u>		<u>Curies (1993 Report)</u>	
	<u>IP1/2</u>	<u>IP3</u>	<u>IP1/2</u>	<u>IP3</u>
1973	<1.00 ⁻²		<1.00 ⁻²	
1974	4.30 ⁻¹		4.30 ⁻¹	
1975	1.62 ⁺⁰		1.62 ⁺⁰	
1976	2.42 ⁻¹		2.42 ⁻¹	
1977	5.59 ⁻²		5.59 ⁻²	
1978	2.05 ⁻¹	1.29 ⁻²	2.05 ⁻¹	1.29 ⁻²
1979	4.50 ⁻¹	3.89 ⁻³	4.50 ⁻¹	3.89 ⁻³
1980	6.42 ⁻²	2.53 ⁻²	6.42 ⁻²	2.53 ⁻²
1981	4.42 ⁻²	3.63 ⁻³	4.42 ⁻²	3.63 ⁻³
1982	4.17 ⁻²	<4.28 ⁻³	4.17 ⁻²	<4.28 ⁻³
1983	2.06 ⁻²	<1.53 ⁻⁴	2.06 ⁻²	<1.53 ⁻⁴
1984	<1.51 ⁻¹	3.43 ⁻²	<1.51 ⁻¹	2.04⁻²

1985	5.67 ⁺⁰	1.90 ⁻³	1.44⁺⁰	1.90 ⁻³
1986	8.36 ⁺⁰	4.01 ⁻³	4.59⁻¹	4.01 ⁻³
1987			1.57 ⁻²	2.07 ⁻³
1988			9.18 ⁻³	3.42 ⁻³
1989			3.88 ⁻³	1.36 ⁻³
1990			5.36 ⁻³	1.81 ⁻⁴
1991			2.10 ⁻³	2.44 ⁻⁵
1992			1.32 ⁻²	8.26 ⁻⁵
1993			5.76 ⁻³	1.55 ⁻⁴
TOTAL 1973-93 (if 1986 report figures used)		5.29 ⁺⁰		8.03 ⁻²
TOTAL 1973-93 (if 1993 report figures used)	17.42 ⁺⁰		8.02 ⁻²	

Notes: In 1976 and 1977, Indian Point 3 releases included with Indian Point 1/2.

Indian Point 1 was shut down October 31, 1974.

Indian Point 2 achieved criticality May 22, 1973 at partial power and went commercial August 1, 1974 at full power.

Indian Point 3 achieved criticality April 6, 1976 at partial power and went commercial August 30, 1976 at full power. Source: U.S. Nuclear Regulatory Commission.

Figures provided in the 1986 and 1993 reports are identical, with a few exceptions. There is a small discrepancy in the Indian Point unit 2 levels in 1984 (3.43⁻² vs. 2.04⁻² curies). The other two discrepancies are much larger, however. The 1986 report originally reported the 1985-86 releases from Indian Point 2 as 14.03 curies (5.67 plus 8.36); but the 1993 report had reduced this total to 1.90 curies (1.44 plus 0.46). NRC staff attributed this alteration to a "typographical error."

Indian Point's emissions, using airborne Iodine-131 and effluents as a marker, are well above those of most other U.S. nuclear plants – regardless of which set of figures for Indian Point 2 in 1985-86 are used. The table below lists emission totals for all U.S. nuclear plants that operated from 1970-87, calculated by Gould JM in *The Enemy Within* (1996) using releases reported in Tichler et al. Indian Point would have either the 5th or 13th highest total of 70 plants. (After 1987, reported releases of I-131 and effluents were small, so rankings from 1970-1987 is a good estimate of lifetime rankings).

<u>Plant</u>	<u>Curies 1970-87</u>	<u>Plant</u>	<u>Curies 1970-87</u>
1. Dresden	95.58	36. Kewaunee	0.74
2. Oyster Creek	76.80	37. Zion	0.70
3. Millstone	32.64	38. H.B. Robinson	0.56
4. Quad Cities	26.79	39. R.E. Ginna	0.44
*5. Indian Point	17.50	40. Haddam Neck	0.27
6. Nine Mile Point	14.61	41. Ft. St. Vrain	0.26
7. Three Mile Island	14.42	42. Trojan	0.26
8. Brunswick	14.19	43. McGuire	0.24
9. Monticello	12.13	44. Beaver Valley	0.18
10. Turkey Point	6.67	45. LaSalle	0.18
11. Pilgrim	6.56	46. Sequoyah	0.17
12. Big Rock Point	6.20	47. Rancho Seco	0.14
13. San Onofre	4.16	48. Ft. Calhoun	0.11
14. St. Lucie	3.59	49. Prairie Island	0.10

15. Salem	3.55	50. Palo Verde	0.09
16. Humboldt Bay 3	3.41	51. Davis Besse	0.08
17. Calvert Cliffs	3.40	52. Byron	0.07
18. James A. Fitzpatrick	3.34	53. Crystal River	0.06
19. Oconee	2.43	54. Susquehanna	0.05
20. Peach Bottoms	2.06	55. Catawba	0.02
21. Browns Ferry	1.62	56. Fermi	0.01
22. Edwin I. Hatch	1.56	57. Grand Gulf	0.01
23. LaCrosse	1.48	58. Limerick	0.01
24. Vermont Yankee	1.36	59. Waterford	0.01
25. Donald C. Cook	1.17	60. Braidwood	0.00
26. North Anna	1.16	61. Callaway	0.00
27. Point Beach	1.13	62. Clinton	0.00
28. Surry	1.13	63. Diablo Canyon	0.00
29. Maine Yankee	1.12	64. Harris	0.00
30. Arkansas One	1.09	65. Perry	0.00
31. Palisades	1.02	66. River Bend	0.00
32. Cooper	0.95	67. Shoreham	0.00
33. Joseph M. Farley	0.85	68. Virgil Summer	0.00
34. Yankee Rowe	0.78	69. Vogtle	0.00
35. WNP-2	0.77	70. Wolf Creek	0.00

* Indian Point would rank 12th using revised 1985-86 releases for Indian Point 2 (5.37)

Another measure of environmental emissions of radioactivity is Liquid Effluents: Mixed Fission and Activation Products. This represents a mixture of radionuclides with both short and long half lives, but it is also a general marker for relative levels of releases by reactor, in liquid form. Gould also used Tichler et al. to calculate releases by U.S. plant; Indian Point ranks 12th highest of 70 U.S. nuclear plants. Again, because the largest releases occurred in the 1970s and early 1980s, the 1970-87 data are a good approximation of lifetime rankings. Of the 61.03 curies emitted from Indian Point, 50.77, or 83%, are from Indian Point 2, a similar proportion for airborne emissions.

<u>Plant</u>	<u>Curies 1970-87</u>	<u>Plant</u>	<u>Curies 1970-87</u>
1. Millstone	580.97	36. LaSalle	14.41
2. Joseph M. Farley	576.03	37. R. E. Ginna	14.40
3. LaCrosse	196.00	38. Maine Yankee	14.19
4. Nine Mile Point	193.20	39. Trojan	12.40
5. Surry	180.87	40. H.B. Robinson	11.94
6. San Onofre	161.10	41. Fort Calhoun	9.05
7. Dresden	150.12	42. Virgil Summer	7.53
8. Quad Cities	110.33	43. Waterford	5.59
9. Arkansas One	102.64	44. Susquehanna	4.57
10. Oconee	78.73	45. Crystal River	4.50
11. Cooper	70.79	46. Three Mile Island	3.99
12. Indian Point	61.03	47. Catawba	3.34
13. Salem	60.09	48. Wolf Creek	3.19

14. Peach Bottom	56.59	49. Beaver Valley	2.77
15. Point Beach	47.81	50. Davis Besse	2.42
16. Oyster Creek	47.00	51. Hope Creek	2.38
17. Calvert Cliffs	45.74	52. Rancho Seco	1.75
18. Palisades	45.28	53. Prairie Island	1.55
19. St. Lucie	38.10	54. Harris	0.91
20. Pilgrim	36.60	55. Yankee Rowe	0.77
21. Turkey Point	32.23	56. Callaway	0.54
22. Edwin I. Hatch	31.62	57. Vogtle	0.54
23. Zion	30.55	58. Duane Arnold	0.30
24. Haddam Neck	30.08	59. Vermont Yankee	0.29
25. Brunswick	28.36	60. Monticello	0.20
26. Byron	22.83	61. River Bend	0.19
27. Sequoyah	22.50	62. Limerick	0.10
28. North Anna	21.63	63. WNP-2	0.07
29. James A. Fitzpatrick	20.26	64. Braidwood	0.05
30. Big Rock Point	19.62	65. Clinton	0.02
31. Humboldt Bay 3	19.47	66. Fermi	0.02
32. Donald C. Cook	19.31	67. Fort St. Vrain	0.02
33. Diablo Canyon	17.17	68. Perry	0.02
34. McGuire	14.83	69. Shoreham	0.01
35. Kewaunee	14.48	70. Palo Verde	0.00

7. Footnote 8 of the response also states that effluent release reports documented in

the NRC data base, found at www.reirs.com/effluent, “show that radiological releases at Indian Point Units 2 and 3 in 1999 and 2003 (the only years reported for these reactors) were within the range of releases reported by all licensees – and these were liquid releases, rather than airborne releases as claimed by Mr. Mangano.”

This statement is not supported by the data in REIRS (Radiation Exposure Information and Reporting System). The System includes emissions data from various U.S. nuclear reactors for the years 1998 to 2004 (see below). Lack of support is demonstrated by the following facts concerning Indian Point 2:

- data are only reported for one (1999) of the seven years in the data base
- 1999 data included 13 of 104 U.S. reactors, limiting comparisons to other reactors (Indian Point 2 data are missing from 2001-2004, when over 90 U.S. reactors report data)
- 1999 data only included actual measurements of airborne releases for each quarter for Argon-41, Carbon-14, Tritium (H-3), and Xenon-135, which is only a small proportion of all fission and activation products in reactors.

Emissions data for Indian Point 3 are included for each year from 2001 to 2004, but since Indian Point 3 has historically emitted a much smaller amount of radioactivity than Indian Point 2, these data cannot be assumed to be a valid indicator for the entire plant

8. The NRC comment of January 22 also notes that the Tichler data on emissions “present a combined total for all three reactors at the site; if the Unit 2 and 3 releases were considered alone, without contribution from the Unit 1 facility, the tabulated releases might well be lower.”

Tichler reports include data from 1973 to 1993. The Indian Point 1 reactor closed

permanently on October 31, 1974. Thus, aside from a portion of the 1973 and 1974 emissions (years in which emission levels were relatively low compared to later), the Tichler data represent only emissions from Indian Point Units 2 and 3.

9. Results of a recent study measuring concentrations of radioactive Strontium-90 in baby teeth provide additional information supporting my contention that environmental study, which is the only one to date that examined radioactivity levels in bodies of Americans living near nuclear reactors, analyzed Strontium-90 levels using protocols from other similar studies, most notably the 1958-1970 effort by Washington University in St. Louis that measured buildup of atomic bomb test fallout in bodies.

Results of the most current study of Strontium-90, which is a fission product produced only in nuclear weapons and reactors, finds that average levels near Indian Point are the highest of areas near all but one of six U.S. nuclear plants. The table below is taken from one of five medical journal articles published on the tooth study, specifically Mangano JJ et al. An unexpected rise in Strontium-90 in US deciduous teeth in the 1990s. The Science of the Total Environment 2003;317:37-51. It only includes areas near nuclear plants in which more than 100 baby teeth were collected and tested.

<u>Plant</u>	<u>Proximate Counties</u>	<u>Teeth</u>	<u>Avg. Sr-90*</u>
Limerick	Berks, Chester, Montgomery PA	98	168
Indian Point	Putnam, Rockland, Westchester NY	217	164
St. Lucie	Indian River, Martin, St. Lucie FL	97	153
Turkey Point	Broward, Dade, Palm Beach FL	350	129
Oyster Creek	Monmouth, Ocean NJ	169	128
Diablo Canyon	San Luis Obispo, Santa Barbara CA	50	127

* Average millibecquerels of Strontium-90 per gram of calcium in baby teeth at birth.

Includes only births after 1979.

10. The above data provide the basis for my contention that radioactive environmental emissions from the two currently operating Indian Point nuclear reactors have been greater than that of most U.S. nuclear plants. These data suggest that emissions may have had an adverse consequence on the health of local humans, especially in light of unexpectedly elevated rates of cancer in the New York counties closest to Indian Point and Fairfield County CT, which is also close to the plant.

REFERENCES

1. Tichler J., Doty K, Lucadamo K. Radioactive Materials Released from Nuclear Power Plants, 1986 and 1993 annual reports. NUREG/CR-2907. Upton NY: Brookhaven National Laboratory.

Pursuant to 28 U.S.C. §1746, I declare on this 8th day of February, 2008 under penalty of perjury that the foregoing is true and correct.

Joseph Mangano

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:
Lawrence G. McDade, Chairman
Dr. Richard E. Wardwell
Dr. Kaye D. Lathrop

In the Matter of
ENTERGY NUCLEAR OPERATIONS, INC.
(Indian Point Nuclear Generating Units
2 and 3)

Docket Nos.
50-247-LR and 50-286-LR

FEBRUARY 8, 2008

CERTIFICATE OF SERVICE

I hereby certify that copies of the "CONNECTICUT RESIDENTS OPPOSED TO RELICENSING OF INDIAN POINT (CRORIP) AND NANCY BURTON'S REPLY TO ANSWERS OF NRC STAFF AND ENTERGY NUCLEAR OPERATIONS, INC. OPPOSING REQUEST FOR HEARING, PETITION TO INTERVENE AND PETITION FOR WAIVER and attached DECLARATION OF JOSEPH MANGANO were served on this 8th day of February, 2008 upon the persons listed below, by first class mail and by email as shown below.

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