



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 16, 2013

Ms. Deborah Brancato, Esq.
Riverkeeper, Inc.
20 Secor Rd.
Ossining, NY 10562

Dear Ms. Brancato:

In an email dated November 14, 2012, addressed to Mr. R. William Borchardt, Executive Director for Operations of the Nuclear Regulatory Commission (NRC), you submitted a petition pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 2.206, "Requests for action under this subpart," asking that the NRC take enforcement action by ordering the permanent shutdown of Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point). Your petition has been referred to a Petition Review Board (PRB) within the Office of Nuclear Reactor Regulation for action. The NRC has made your petition publicly available in the Agencywide Documents Access and Management System (ADAMS) under Accession No. ML12321A317.

In your petition, you state that there is no assurance that Entergy Nuclear Operations, Inc., the licensee for Indian Point, could control the total quantity of hydrogen generated following a severe reactor accident. You also state that following such an accident, it is highly likely that there would be hydrogen combustion in the containment either in the form of a deflagration or a detonation. You note that NRC's resolution of combustible gas control issues for large, dry containments, similar to Indian Point, is predicated on static loading and does not consider the potential effects of hydrogen fast deflagrations, detonations, or deflagration to detonation transition (DDT). You assert that using these assumptions would result in dynamic loadings which, in turn, would result in more severe results than static loads. You request that the NRC revoke the operating licenses of the Indian Point reactors because hydrogen fast deflagrations, detonations, or DDT could breach the Indian Point containments following a severe reactor accident and expose the public to a large radiological release.

In your petition, you state that an unintended ignition following a severe reactor accident could cause a hydrogen detonation. You also state that the passive autocatalytic recombiners (PARs) at Indian Point Unit No. 2 can be overwhelmed by the generation of hydrogen following a severe reactor accident and can act as igniters in environments containing elevated concentrations of hydrogen. You quote a 2011 International Atomic Energy Agency report stating that electrically powered thermal recombiners, similar to those used at Indian Point Unit No. 3, can act as igniters in environments containing hydrogen concentrations greater than 4 percent.

In your petition, you reference NRC documents that estimated the peak calculated containment pressures following postulated severe reactor accidents at the Oconee, Three Mile Island, and Turkey Point nuclear facilities. These calculations, which assumed 75 and 100 percent zirconium metal-water reactions along the active fuel length, predicted pressures that approached the estimated containment ultimate failure pressures. You state that the NRC calculations are non-conservative because they assume static loads and do not consider the effects of dynamic loads that would occur if fast deflagrations, detonations, or DDT were assumed. Furthermore, you assert that the estimated ultimate containment failure pressures may be non-conservative due to the lack of data.

In your petition, you state that the NRC's design basis analyses do not consider internally generated missiles that may be the result of hydrogen deflagrations or detonations. Such missiles may damage safety-related mitigation systems inside containment. You state that the Indian Point severe accident management guidelines do not address internally generated missiles resulting from hydrogen combustion.

Finally, you stated that the Riverkeeper petition is plant-specific for Indian Point due to the following considerations:

- The Indian Point site is located within one or two miles of the Ramapo seismic zone. The petition asserts that the site is susceptible to a 7.0 magnitude earthquake on the Richter scale and Indian Point is only designed for a 6.1 magnitude earthquake. An earthquake, in addition to human error, can lead to a severe reactor accident.
- The population within a 50-mile radius of the site is approximately 17 million which is significantly greater than any other plant in the country.
- A large radiological release over the New York City area would have a significant financial impact on the country.

On December 20, 2012, a telephone conference call was held between you and the PRB in which you provided further explanation and support for your petition. A transcript of that conference call, which supplements your petition, is publicly available at ADAMS Accession No. ML13030A486.

On January 17 and February 5, 2013, the PRB met internally to discuss your petition and make its initial recommendation in accordance with Management Directive 8.11 (ADAMS Accession No. ML041770328). The PRB noted that the 2003 revisions to 10 CFR 50.44, "Combustible gas control for nuclear power reactors," removed combustible gas control requirements for large, dry pressurized-water reactor (PWR) containments. The NRC staff concluded that even with a 75 percent zirconium metal-water reaction, large, dry PWR containments would be expected to withstand a deflagration resulting from hydrogen combustion. The staff believes that hydrogen deflagrations are the most likely mode of combustion in degraded core accidents. Multiple ignition sources would be present inside containment to initiate combustion at lower flammability limits which would generally be expected to keep hydrogen concentrations below detonable levels. Detonations of sufficient magnitude to fail containment are considered to have an extremely low probability of occurrence. The PRB also noted that both Indian Point Unit Nos. 2 and 3 currently meet the NRC's licensing design basis with respect to hydrogen control.

The PRB further noted that your petition takes issue with the existing regulations in 10 CFR 50.44 regarding NRC's assumptions and methodology for handling combustible gases. Specifically, you state in your petition that (1) one or two recombiners are insufficient for a severe reactor accident and recommended that PWR containments include 30-60 recombiners distributed throughout containment, (2) NRC assumptions for hydrogen production are non-conservative because the total quantity of hydrogen produced in a severe reactor accident could exceed the total quantity of hydrogen produced from the oxidation of 100 percent of the active fuel length, and (3) NRC calculations of peak containment pressures are non-conservative because the NRC assumes static loads whereas the petitioner believes that dynamic loads associated with fast deflagrations, detonations and DDT are more appropriate modeling techniques.

As a result, the PRB concluded that the petition implicitly implies that deficiencies exist within the Commission's regulations at 10 CFR 50.44. Therefore, the initial recommendation of the PRB was to reject the Riverkeeper petition for review as it met the criterion for rejection pursuant to Management Directive 8.11. On March 29, 2013, you were informed of the PRB's initial recommendation and provided with a detailed discussion that included the basis of our findings (ADAMS Accession No. ML13088A224).

On May 29, 2013, a second telephone conference call was held with you and the PRB in which you provided further explanation and support for your petition. The transcript of that conference call, which supplements your petition, is enclosed and is publicly available at ADAMS Accession No. ML13176A429.

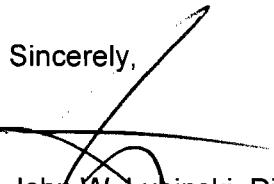
On June 17, 2013, the PRB met internally to discuss the second telephone conference call and determine whether any changes to the initial recommendation were necessary. The PRB concluded that the additional information was not sufficiently persuasive to change its initial recommendation.

In summary, the PRB concludes that the NRC staff has extensively studied the issue of post-accident combustible gas control at operating facilities and that the PRB's final recommendation is to reject this petition for review under 10 CFR 2.206 because you have asserted deficiencies within the Commission's regulations.

The PRB notes that the October 14, 2011, petition for rulemaking (PRM) submitted under 10 CFR 2.802 by the Natural Resources Defense Council, proposes extensive revisions to 10 CFR 50.44 on hydrogen control (ADAMS Accession No. ML11301A094). This petition is being tracked by the NRC staff as PRM-50-103. The PRB is placing the information from your petition on the PRM-50-103 docket so that your concerns can be further evaluated in conjunction with that petition for rulemaking. You can monitor the docket for PRM-50-103 on the Federal rulemaking Web site, <http://www.regulations.gov>, by searching on Docket ID NRC-2011-0189.

Thank you for your interest in these matters.

Sincerely,


John W. Lubinski, Director
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

Enclosure:

Transcript of May 29, 2013, Conference Call

cc w/encl: Distribution via Listserv

Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: 10 CFR 2.206 Petition Review Board
Riverkeeper
Indian Point Nuclear Generating Unit Nos. 2 and 3

Docket Numbers: (50-247, 50-286)

Location: Rockville, MD

Date: Wednesday, May 29, 2013

Edited by: Douglas Pickett

Work Order No.: NRC-4235 Pages 1-26
ML13176A429

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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

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4 10 CFR 2.206 PETITION REVIEW BOARD (PRB)

5 CONFERENCE CALL

6 RE

7 INDIAN POINT ENERGY CENTER

8 + + + + +

9 WEDNESDAY

10 MAY 29, 2012

11 + + + + +

12 The conference call was held, John
13 Lubinski, Chairperson of the Petition Review Board,
14 presiding.

15
16 PETITIONER: RIVERKEEPER

17 PETITION REVIEW BOARD MEMBERS

18 JOHN LUBINSKI, Office of Nuclear Reactor
19 Regulation, Division of License Renewal

20 DOUGLAS PICKETT, PRB Petition Manager, Office of
21 Nuclear Reactor Regulation, Division of Operating
22 Reactor Licensing

23 ANDREA RUSSELL, PRB Coordinator, Office of
24 Nuclear Reactor Regulation, Generic Communications
25 Branch

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Regulation, Rulemaking BranchFARHAD FARZAM, Office of Nuclear Reactor
Regulation, Mechanical and Civil Engineering Branch

CHRISTOPHER HAIR, Office of General Counsel

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Materials and Environmental Management Programs

ALLEN NOTAFRANCESCO, Office of Research

AHSAN SALLMAN, Office of Nuclear Reactor
Regulation, Containment and Ventilation Branch

NRC REGIONAL STAFF

BRICE BICKETT, Region 1 Division of Reactor
Projects

PAUL KROHN, Region 1 Division of Reactor Safety

REPRESENTATIVES OF PETITIONER

DEBRA BRANCATO

MARK LEYSE

ALSO PRESENT

STEVEN PRUSSMAN, ENTERGY

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1 P-R-O-C-E-E-D-I-N-G-S

2 10:04 a.m.

3 MR. PICKETT: Welcome and good morning. I
4 would like to thank everybody for attending this meeting.
5 My name is Douglas Pickett and I am the Indian Point
6 project manager for the Office of Nuclear Reactor
7 Regulation.

8 We are here today to allow the petitioner,
9 Riverkeeper, assisted by Mr. Mark Leyse, to address the
10 Petition Review Board, known as the PRB, regarding
11 Riverkeeper's 2.206 petition dated November 14, 2012
12 concerning Indian Point Nuclear Generating Units 2 and
13 3. I am the petition manager for the petition. The
14 Petition Review Board Chairman is Mr. John Lubinski.

15 As part of the PRB's review of this petition
16 Riverkeeper has requested this opportunity to address
17 the PRB. Today's meeting is scheduled for one hour from
18 10:00 to 11:00 a.m. Eastern Time. The meeting is being
19 recorded by the NRC Operations Center and will be
20 transcribed by a court reporter. The transcript will
21 become a supplement to the petition. The transcript
22 will also be made publicly available.

23 I would like to open this meeting with
24 introductions. As we go around the room, please be sure
25 to clearly state your name, your position, and the office

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1 that you work for within the NRC for the record.

2 I'll start with myself. I'm Douglas
3 Pickett.

4 MR. SALLMAN: My name is Ahsan Sallman. I
5 work in the Containment and Ventilation Branch of NRR.

6 MR. AULUCK: I'm Rajendar Auluck. I'm in
7 the Japan Lessons Learned Directorate within the Office
8 of Nuclear Reactor Regulation.

9 MR. FARZAM: Farhad Farzam, Mechanical
10 Civil Engineering Branch, Office of Nuclear Reactor
11 Regulations.

12 MR. DUDLEY: Richard Dudley, Rulemaking
13 Project Manager in the Rulemaking Branch in the Office
14 of Nuclear Reactor Regulation.

15 MR. NOTAFRANCESCO: Allen Notafrancesco,
16 Office of Research involved in a number of hydrogen
17 related issues.

18 CHAIR LUBINSKI: John Lubinski. I'm the
19 Director of the Division of License Renewal in NRR and
20 I'm the Petition Review Board Chairman.

21 MR. PICKETT: We have completed
22 introductions at NRC headquarters. At this time are
23 there any NRC participants from headquarters on the
24 phone?

25 MS. RUSSELL: Yes. This is Andrea

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1 Russell, the PRB Coordinator in the Office of Nuclear
2 Reactor Regulation.

3 MR. PICKETT: Are there any NRC
4 participants from the regional office on the phone?

5 Are there any representatives for the
6 licensee on the phone?

7 MR. PRUSSMAN: Steven Prussman, Entergy.

8 MR. PICKETT: Ms. Brancato, would you
9 please introduce yourself for the record.

10 MS. BRANCATO: Yes. This is Debra
11 Brancato. I'm a staff attorney with Riverkeeper.

12 MR. PICKETT: And Mr. Mark Leyse, would you
13 please introduce yourself for the record?

14 MR. M. LEYSE: Sure. Mark Leyse.

15 MR. PICKETT: Mr. Robert Leyse, would you
16 introduce yourself for the record?

17 MR. R. LEYSE: No.

18 MR. PICKETT: It is not required for
19 members of the public to introduce themselves for this
20 call. However, if there are any members of the public
21 on the phone that wish to do so at this time, please state
22 your name for the record.

23 I would like to emphasize that we each need
24 to speak clearly and loudly to make sure that the court
25 reporter can accurately transcribe this meeting. If you

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1 do have something that you would like to say, please first
2 state your name for the record.

3 For those dialing into the meeting, please
4 remember to mute your phones to minimize any background
5 noise or distractions. If you do not have a mute button,
6 this can be done by pressing the keys * 6. To unmute
7 press the * 6 key again.

8 At this time I'll turn it over to the PRB
9 chairman John Lubinski.

10 CHAIR LUBINSKI: Good morning. Welcome to
11 this meeting regarding the 2.206 petition submitted by
12 Riverkeeper. I would like to first share some
13 background on our process.

14 Section 2.206 of Title 10 of the Code of
15 Federal Regulations describes the petition process, the
16 primary mechanism for the public to request enforcement
17 action by the NRC in a public process. This process
18 permits anyone to petition NRC to take enforcement type
19 action related to NRC licensees or licensed activities.

20 Depending on the results of this
21 evaluation, NRC could modify, suspend, or revoke an
22 NRC-issued license or take any other appropriate
23 enforcement actions to resolve a problem.

24 The NRC staff's guidance for the
25 disposition of 2.206 petition request is in Management

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1 Directive 8.11 which is publicly available. The purpose
2 of today's meeting is to provide the petitioner an
3 opportunity to comment on the initial recommendation of
4 the PRB to reject the Riverkeeper petition because it
5 asserts deficiencies within the Commission's
6 regulations on combustible gas control.

7 The PRB also recommends referring
8 Riverkeeper petition for rulemaking with regard to the
9 October 14, 2011 petition for rulemaking submitted by
10 NRDC. This meeting is not a hearing. Nor is it an
11 opportunity for the petitioner to question or examine the
12 PRB on the merits or the issues presented in the petition
13 request. No decision regarding the merits of the
14 petition will be made at this meeting.

15 Following this meeting the Petition Review
16 Board will conduct its internal deliberations. The
17 outcome of this internal meeting will be discussed with
18 the petitioner.

19 The Petition Review Board typically
20 consists of the Chairman, usually a manager at the senior
21 executive level at the NRC. It has a petition manager
22 and a PRB coordinator. Other members of the Board are
23 determined by the NRC staff based on the content of the
24 information in the petition request.

25 At this time I would like to introduce the

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1 Board. I am John Lubinski, the Petition Review Board
2 chairman. Doug Pickett is the petition manager for the
3 petition under discussion today. Andrea Russell is the
4 office's PRB coordinator.

5 Our technical staff includes Ahsan
6 Sallman of the Office of Nuclear Reactor Regulation,
7 Containment and Ventilation Branch; Farhad Farzam from
8 the Office of Nuclear Reactor Regulation, Mechanical and
9 Civil Engineering Branch; Asimios Malliakos, Office of
10 Federal and State Materials and Environmental Management
11 Programs; Brice Bickett from NRC's Region I Division of
12 Reactor Projects; and Paul Krohn from NRC's Region 1
13 Division of Reactor Safety.

14 We also obtain advice from our Office of General Counsel
15 represented by Christopher Hair.

16 As described in our process, the NRC may ask
17 clarifying questions in order to better understand the
18 petitioner's presentation and to reach a reasoned
19 decision whether to modify the PRB's initial
20 recommendation.

21 I would like to summarize the scope of the
22 petition under consideration and the NRC activities to
23 date. On November 14, 2012 Riverkeeper submitted to the
24 NRC a 2.206 petition regarding Indian Point Units 2 and
25 3.

1 The petition was prepared by Mr. Mark Leyse.

2 The petitioner requested the permanent shutdown of
3 Indian Point Units 2 and 3 because fast hydrogen
4 deflagrations or detonations could breech the
5 containment following a severe accident exposing the
6 public to a large radiological release.

7 The petitioner states that there is no
8 assurance that Entergy, the licensee, could control the
9 total quantity of hydrogen that would be generated in the
10 event of a severe reactor accident at Indian Point. It
11 is highly likely that there would be hydrogen combustion
12 in the containment either in the form of a deflagration
13 or detonation.

14 As the basis for this request, the petition
15 states the following:

16 The Indian Point site is located within one
17 or two miles of the Ramapo seismic zone. Research
18 suggests the site is susceptible to an earthquake of 7.0
19 magnitude on the Richter scale and the petitioner
20 indicates the site was only designed for a 6.0 magnitude
21 earthquake. As a result, the sites are susceptible to
22 a severe reactor accident.

23 A population of nearly 17 million people
24 reside within a 50-mile radius of the site and they would
25 be adversely impacted by a large radiological release.

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1 The NRC's resolution of combustible gas control issues
2 for large dry containment such as Indian Point did not
3 assume hydrogen deflagrations or detonations.

4 Indian Point 2 has passive autocatalytic
5 recombines, or PARs, which could be overwhelmed by the
6 production of hydrogen during a severe reactor accident.
7 PARs have been observed to have unintended ignitions
8 during experiments with high initial concentrations of
9 hydrogen. These ignitions could lead to a deflagration
10 or detonation.

11 Indian Point 3 has electrically powered
12 thermal hydrogen recombines that, according to the
13 petitioner, could also have unintended ignitions
14 following a severe reactor accident. While the Indian
15 Point containment design pressure is 47 psi, the
16 petitioner acknowledges that the ultimate containment
17 failure is estimated to be approximately 126 psi.

18 The petitioner notes that due to an overall
19 lack of data, estimated containment failure pressures
20 are questionable. It states that the Indian Point
21 containments could fail from the maximum possible
22 combustion load.

23 Finally, the petitioner states that the
24 containment integrity and essential system could be
25 compromised by internally generated missiles caused by

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1 flame acceleration or DDT. The petitioner notes that
2 the licensee's severe accident mitigation alternatives,
3 known as SAMA, do not address internally generated
4 missiles resulting from hydrogen combustion.

5 Allow me to discuss the NRC activities to
6 date. On November 16, 2012, the petitioner manager
7 contacted the petitioner to discuss the NRC 2.206 process
8 and to offer the petitioner an opportunity to address the
9 PRB by phone or in person. On December 20, 2012 the
10 petition assisted by Mr. Mark Leyse addressed the PRB in
11 advance of the PRB's initial deliberations on the
12 petition. On January --

13 COURT REPORTER: This is the court
14 reporter. Can non-speakers please mute their phones at
15 this time.

16 CHAIR LUBINSKI: Thank you. On January 17
17 and February 20, 2013, the PRB met internally to discuss
18 the Riverkeeper petition and to make its initial
19 recommendation. The PRB concluded that the petitioner
20 asserted deficiencies in the Commission's regulations
21 regarding post-accident generation of hydrogen and the
22 subsequent modeling of combustion.

23 In accordance with NRC Management Directive
24 8.11 this finding supports rejecting the petition from
25 review under 10 CFR 2.206. The PRB also noted that Mr.

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1 Mark Leyse, who prepared the Riverkeeper petition, also
2 prepared the October 2011 NRDC 2.802 petition for
3 rulemaking proposing rulemaking to revise the
4 Commission's regulations on combustible gas control.
5 The PRB also recommended that the Riverkeeper 2.206
6 petition be referred to the NRDC rulemaking petition.

7 On March 27, 2013 the PRB's initial
8 recommendation was submitted to senior NRR management
9 for approval. This approval was provided on March 29,
10 2013. On March 29, 2013 the petitioner was informed that
11 the PRB's initial recommendation was to reject the
12 petition because the petitioner asserted deficiencies
13 within existing NRC rules.

14 In addition, the PRB recommended referring
15 the Riverkeeper 2.206 petition to rulemaking under the
16 NRDC petition noted previously. At the time Riverkeeper
17 was offered an opportunity to address the PRB regarding
18 its initial recommendation. Finally, on April 23, 2013
19 Riverkeeper and NRC agreed upon today May 29th, for their
20 second petition before the PRB. As a reminder
21 for the phone participants, please identify yourself if
22 you make any remarks as this will help us in the
23 preparation of the meeting transcript that will be made
24 publicly available. Thank you. Also, as a reminder,
25 when you're not talking please mute your phone so that

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1 other people can hear the conversations.

2 Ms. Brancato, I will turn over to you to
3 allow you to provide any information you believe the PRB
4 should consider as part of this petition.

5 MS. BRANCATO: Thank you. This is Debra
6 Brancato. I'm a staff attorney with Riverkeeper.
7 First, I just wanted to thank you for the opportunity to
8 address the PRB in this follow-up conference call.
9 Riverkeeper disagrees with the PRB's initial
10 recommendation to reject Riverkeeper's 2.206 petition.

11 As Mr. Leyse will discuss in further detail,
12 the petition does present site-specific concerns for
13 which generic consideration and another form of
14 rulemaking proceeding is not appropriate and which
15 warrants the PRB's acceptance of the petition for further
16 review and consideration.

17 To the extent the PRB ultimately decides to
18 uphold this initial recommendation to reject
19 Riverkeeper's petition, then in the alternative only
20 does Riverkeeper support any recommendation that the
21 issues and concerns raised in our 2.206 petition be fully
22 considered in the context of petition for rulemaking
23 PRM-50-103.

24 With that very short introductory remark,
25 I'll turn it over to Mr. Leyse to discuss in further

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1 detail why we disagree with the PRB's initial
2 recommendation. Thank you.

3 MR. M. LEYSE: Mark Leyse speaking. Thank
4 you. First, I would like to thank the Petition Review
5 Board, PRB, for this second meeting. In this second PRB
6 meeting I will respond to the PRB's initial decision to
7 not consider Riverkeeper's 2.206 petition.

8 In an email dated March 29, 2013, that Doug
9 Pickett, the PRB manager sent to Debra Brancato of
10 Riverkeeper, there is an explanation of the PRB's initial
11 decision. The email states that, "The PRB's initial
12 recommendation is to reject the petition because the
13 petitioner asserts deficiencies within existing NRC
14 rules.

15 In addition, the PRB recommends referring
16 the Riverkeeper petition to rulemaking under PRM-50-103.
17 I guess PRM-50-103 was just covered. That's the NRDC
18 rulemaking petition that is requesting revisions to the
19 NRC's regulations on combustible gas control.

20 First, I would like to say that I think that
21 Riverkeeper's 2.206 petition does raise a number of
22 issues that are plant specific. For one thing, Indian
23 Point Unit 2 is the only unit licensed by the NRC that
24 has passive autocatalytic recombiners, PARs.

25 In the event of a severe accident, there is the

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1 possibility that a PAR will malfunction by having an
2 ignition. Such an ignition could cause a detonation
3 that could potentially jeopardize Unit 2 containment.
4 That would most likely be in the form of a deflagration
5 that would transition to a detonation. Then on
6 page 6 through 8 of the petition we cover plant specific
7 characteristics regarding the location of Indian Point.
8 On pages 8 and 9 of the petition we cover plant specific
9 characteristics regarding the particular volume of
10 Indian Point's containments as well as the particular
11 distribution of steel and concrete masses in the
12 containments.

13 Then, finally, the NRC itself in its
14 resolution of Generic Safety Issue 121 stated, "It was
15 believed that plant specific vulnerabilities may exist
16 mainly due to the effects of local hydrogen detonation
17 activities for estimating the likelihood of local
18 hydrogen detonation and accessing the consequences would
19 require plant specific information."

20 The second problem with the PRB's initial
21 recommendation to reject the petition and referring it
22 to the rulemaking branch is that the rulemaking process
23 take years, decades in some cases. It could take more
24 than 10 years for the NRC to correct the deficiencies in
25 its current regulations on combustible gas control.

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1 Unfortunately the NRC has decided to
2 relegate combustible gas control safety issues to the
3 lowest priority of its response to the Fukushima Dai-ichi
4 accident. There is a very important reason that the PRB
5 should accept Riverkeeper's petition. I think there are
6 plenty of plant specific issues to justify the PRB
7 accepting the petition.

8 As discussed in the petition, Indian Plant
9 was built within a couple miles of the Ramapo seismic
10 zone. Research suggests that Indian Point is
11 susceptible to an earthquake of 7.0 in magnitude on the
12 Richter scale.

13 Hence, if there were a large earthquake,
14 there could be a severe accident at Indian Point. Severe
15 accidents can also occur without being caused by natural
16 disasters. Three Mile Island Unit 2 accident was not
17 caused by a natural disaster.

18 Or there could be perhaps a fire at Indian
19 Point that could cause a severe accident. Incidentally,
20 the NRC has allowed Indian Point to have lower fire
21 protection standards than are permitted at other
22 commercial buildings in New York.

23 Now I will discuss information that
24 indicates that Indian Point's large dry PWR containments
25 could be vulnerable to hydrogen combustion. The

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1 Fukushima Dai-ichi accident demonstrated that the NRC's
2 hydrogen experiments, many of which were conducted at
3 Sandia National Laboratories, SNL, just did not
4 replicate what could occur in a severe accident.

5 In the September 8, 2011 ACRS meeting Dana
6 Powers of SNL said that, "It's extraordinarily hard to
7 get" detonations in experiments because of ignition
8 problems. He pointed out that there were detonations in
9 the Fukushima Dai-ichi accident. It seems to me that the
10 experiments that have been conducted just were not
11 realistic enough so conclusions from such experiments
12 could be non-conservative.

13 I want to point out that the NRC's
14 SECY-00-0198 states that, "A detonation would impose a
15 dynamic pressure on the containment structure that could
16 be more severe than the static load from an equivalent
17 deflagration." The point is that a dynamic pressure
18 load on the containment could be more severe than the
19 static load.

20 In a July 2011 IAEA report, Mitigation of
21 Hydrogen Hazards in Severe Accidents in Nuclear Power
22 Plants states, "Hydrogen deflagration can pose various
23 risks to the containment and other plant systems.

24 Combustion can give large pressure spikes varying
25 from relatively low pressure loads bound by AICC loads,

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1 adiabatic isochoric complete combustion loads, up to
2 large loads from accelerated flames and detonations.
3 Such acceleration can already occur above 8 percent
4 hydrogen volume so that above that value the AICC load
5 may not always be the bounding value."

6 The NRC may have determined that Generic
7 Safety Issue 121, hydrogen control for large dry PWR
8 containments, has been resolved. However, there are
9 calculations that indicate that hydrogen combustion
10 could cause a large dry PWR containment to fail.

11 Such calculations were done in 1982 in the
12 Indian Point probabilistic safety study by the power
13 authority of the State of New York and Con Edison. This
14 is covered in the petition on pages 23 and 24. Some of
15 the calculations found that the peak pressure could reach
16 160, 169, about 157, and 180 pounds per square inch.
17

18 Absolutes were greater. Such results
19 indicate that hydrogen combustion could, in fact, cause
20 Indian Point's containments to fail because the
21 estimated failure pressure of Indian Point's
22 containments is about 141 pounds per square inch
23 absolute.

24 Since these calculations were done back in
25 1982, it's very doubtful that these calculations modeled

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1 loads from flame acceleration. Hence, they would have
2 been for static loads and not for dynamic loads so they
3 could be actually non-conservative in some ways.

4 Riverkeeper's petition does discuss the
5 fact that in a severe accident more hydrogen could be
6 produced than not produced from a reaction, a metal water
7 reaction of 100 percent of the active fuel cladding
8 length.

9 Despite that fact, the NRC does not seem to
10 be too worried about large concentrations of hydrogen
11 building up and exploding in a severe accident if it
12 occurs -- if it were to occur at a PWR with a large dry
13 containment.

14 In a recent proposed decision the NRC made
15 regarding 2.206 petition that NRDC, Natural Resources
16 Defense Council, submitted regarding Indian Point Unit
17 2, the NRC stated, "Hydrogen deflagrations are the most
18 likely mode of combustion in degraded core accidents.
19 The likelihood in nature of deflagrations inside
20 containments are influenced by gas mixture composition
21 and availability of ignition sources.

22 Due to the small amounts of energy needed
23 to ignite combustible mixtures, there are numerous
24 potential ignition sources such as sparks from
25 electrical equipment, electrostatic discharges, hot

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1 jets, gases, hot surfaces including PARs, core-melt
2 particles, etc."

3 In that same decision the NRC concluded
4 that, "Multiple ignition sources would be present in the
5 containment to initiate combustion at lower flammability
6 limits which would be expected to maintain hydrogen
7 concentrations below detonable levels."

8 It is clear that the NRC has overlooked the
9 fact that a hydrogen deflagration could transition into
10 a detonation in a severe accident at a PWR with a large
11 dry containment. Of course, the NRC is correct that in
12 a severe accident hydrogen could randomly deflagrate
13 when its concentrations were low because only a small
14 quantity of energy is required for igniting hydrogen.

15 However, other scenarios could also occur.
16 In a severe accident the average hydrogen concentration
17 in the containment could reach 16 volume percent or
18 higher. Local concentrations could be much higher.
19 Hermit Karwat, K-A-R-W-A-T, a safety expert, in a paper
20 he wrote entitled, "Igniters to Mitigate the Risk of
21 Hydrogen Explosion: A Critical Review" he concluded,
22 "Within the large geometries of PWR containments, a slow
23 laminar deflagration would be very unlikely. In most
24 cases highly efficient combustion modes must be
25 expected."

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1 Scenarios in which large quantities of
2 steam were present in the containment, the hydrogen gas
3 could reach high concentrations because of the inerting
4 effect of steam. That would prevent the hydrogen from
5 igniting at lower concentrations.

6 After the steam condensed, which is
7 inevitable at some point, a deflagration could
8 transition into a detonation. A detonation could cause
9 the containment to fail. It could also in particular
10 cause the containment to fail at containment
11 penetrations. PWRs typically have about 90 containment
12 penetrations.

13 To conclude, I think this is a very serious
14 safety issue regarding Indian Point. As discussed,
15 Riverkeeper's 2.206 petition raises issues that are
16 plant specific. I would be happy to answer any questions
17 that you may have regarding what I discovered. Thank
18 you.

19 CHAIR LUBINSKI: Thank you, Mr. Leyse and
20 Ms. Brancato. We appreciate the additional
21 information.

22 At this time does the staff here at
23 headquarters have any questions for either Mr. Leyse or
24 Ms. Brancato? Okay. We have no questions here at
25 headquarters.

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1 Did anyone from our Region I office join us?

2 MR. KROHN: Yes. Paul Krohn. I joined
3 about five minutes ago. I have no other questions.

4 CHAIR LUBINSKI: Thank you, Paul.
5 Appreciate it.

6 Does the licensee have any questions at this
7 time?

8 MR. PRUSSMAN: No, we do not.

9 CHAIR LUBINSKI: Okay. Before I conclude
10 the meeting, members of the public may provide comments
11 regarding the petition and ask questions about the 2.206
12 petition process.

13 However, as stated at the beginning of the
14 meeting, the purpose of this meeting is not to provide
15 an opportunity for the petitioner or the public to
16 question or examine the PRB regarding the merits of the
17 petition request. Are there any members of the public at
18 this time who have any comments or questions? Okay.

19 Hearing none, Ms. Brancato and Mr. Leyse,
20 thank you for taking the time to provide the NRC staff
21 with clarifying information on the petition you've
22 submitted.

23 Before we close, does the court reporter
24 need any additional information for the meeting
25 transcript?

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1 COURT REPORTER: I'm all right. Thank
2 you, sir.

3 CHAIR LUBINSKI: Okay. With that this
4 meeting is concluded and --

5 MR. M. LEYSE: Actually, I'm sorry. This
6 is Mark Leyse speaking. May I just ask one question and
7 if the PRB does not want to answer it, would you please
8 consider the question?

9 CHAIR LUBINSKI: Yes.

10 MR. M. LEYSE: Sorry. It's just something
11 I thought of after I concluded. Senator Edward J.
12 Markey's office asked the NRC some questions regarding
13 statements that were made by the NRC on this petition.
14 The NRC responded on March 7, 2013.

15 In the attachment it said that the NRC said
16 that in a severe accident management in the SAMGs, severe
17 accident management guidelines, they provide advice, and
18 I quote, "Indian Point operators with multiple options
19 to control hydrogen including controlled burns in
20 containment by starting motors and initiating sparks."
21 Now, do you really think of turning motors on in the
22 containment? Do you really consider that a controlled
23 burn? It seems like a very random thing.

24 CHAIR LUBINSKI: Mr. Leyse, thank you for
25 that additional piece of information. If you requested

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1 it, we weren't going to respond to that today. We would
2 consider that in our deliberation and we will consider
3 that question as well as the information that is in
4 response to Congressman Markey.

5 MR. M. LEYSE: Sure, sure. I just want to
6 add there is an IAEA report which I know I've referred
7 to it in Riverkeeper 2.206 petition. It was published
8 in 2011 and the title is Mitigation of Hydrogen Hazards
9 and Severe Accidents in Nuclear Power Plants. They
10 talked about that. Also about switching components on
11 and off. They qualify it. They say, "The operator may
12 try to generate sparks by switching components on an
13 off."

14 You know, they -- just like I say -- I
15 appreciate the fact that you will consider this. It just
16 really doesn't seem to me to really be a controlled burn.
17 If that's what we have up at Indian Point to save the day
18 in the event of a meltdown accident, I think that is not
19 going to really save the day. I think that is a real
20 problem.

21 Then there is also the option of containment
22 venting but that would not really solve the problem
23 because there would be no way you could vent a large PWR
24 dry containment in a timely fashion such that you would
25 be able to prevent hydrogen combustion.

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1 Anyway, that is the last comment I have.

2 Thank you.

3 CHAIR LUBINSKI: Thank you, Mr. Leyse. We
4 will consider that information in making our final
5 deliberation.

6 MR. M. LEYSE: Okay. Thank you.

7 CHAIR LUBINSKI: Okay. Thank you for that
8 additional information. At this point we will conclude
9 the meeting and terminate the phone connection. Thank
10 you, everyone.

11 (Whereupon, at 10:41 a.m. the conference
12 call was adjourned.)

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ADAMS Package: ML13176A398

Response to Petitioner: ML13176A417

Transcript of May 29, 2013 ML13176A429

Incoming Petition: ML12321A317

Transcript of Dec 20, 2013: ML13030A486

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