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RE Indian Point Unit 2, G20120253

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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10 CFR 2.206 PETITION REVIEW BOARD (PRB)

CONFERENCE CALL

RE

INDIAN POINT UNIT 2

+ + + + +

WEDNESDAY

SEPTEMBER 12, 2012

+ + + + +

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

PETITIONER: NATURAL RESOURCES DEFENSE COUNCIL

PETITION REVIEW BOARD MEMBERS

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P R O C E E D I N G S

(1:09:35 p.m.)

1
2
3 Mr. Pickett: Good afternoon. I'd like to
4 thank everybody for attending this meeting. My name is
5 Doug Pickett and I am the Indian Point Project Manager.
6 We are here today to allow the petitioner, Mr. Jordan
7 Weaver of the Natural Resources Defense Council,
8 assisted by Mr. Mark Leyse, to address the Petition
9 Review Board, also referred to as the PRB, regarding
10 their 2.206 petition dated April 16, 2012. This is the
11 second presentation by the NRDC before the PRB. I am
12 the Petition Manager for this petition. The PRB
13 Chairman is Mr. John Lubinski.

14
15 As part of the PRB's review of this petition,
16 Jordan Weaver, has requested this opportunity to
17 address the PRB.

18
19 This meeting is scheduled from 1:00 to 3:00 p.m.
20 eastern time. The meeting is being recorded by the NRC
21 Operations Center and will be transcribed by a court
22 reporter. The transcript will become a supplement to
23 the petition. The transcript will also be made
24 publicly available.

25
26 I'd like to open this meeting with introductions.
27 As we go around the room, please be sure to clearly state
28 your name, your position, and the office that you work

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1 for within the NRC for the record. I'll start off with²
2 myself, Douglas Pickett. I am the Petition Manager.

3 CHAIRMAN LUBINSKI: This is John Lubinski. I'm
4 Director of the Division of License Renewal and I'm the
5 Chair of the Petition Review Board.

6 Ms. Russell: This is Andrea Russell and I'm
7 the Petition Review Board Coordinator.

8 Mr. Farzam: This is Farhad Farzam from the
9 Mechanical and Civil Engineering Branch

10
11 Mr. Sallman: This is Ahsan Sallman from
12 the Containment and Ventilation Branch

13 Mr. Dudley: This is Dick Dudley from the
14 Rulemaking Branch

15 Mr. Pickett: We've completed introductions at the
16 NRC headquarters. At this time, are there any NRC
17 participants from Headquarters on the phone? Are there
18 any NRC participants from the Regional Office on the
19 phone?

20 MR. DOERFLEIN: This is Larry Doerflein. I'm
21 Chief Engineering Branch II, Division of Reactor Safety,
22 Region I.

23 MR. BICKETT: This is Brice Bickett, Senior
24 Project Engineer, NRC Region I, Division of Reactor
25 Projects.

26 MR. PICKETT: Are there any representatives
27 for the licensee on the phone? Mr. Weaver, would you

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1 please introduce yourself and anyone assisting you for
2 the record.

3 MR. WEAVER: Yes, this is Jordan Weaver. I'm
4 a Project Scientist on the Nuclear Program with the
5 Natural Resources Defense Council, and I am -- no one is
6 here with me at the office, but I am assisted on the phone
7 by Mr. Leyse who is a consultant for the Nuclear Program.

8 MR. PICKETT: Thank you. It is not required
9 for members of the public to introduce themselves for
10 this call. However, if there are any members of the public
11 on the phone that wish to do so at this time, please state
12 your name for the record.

13 I'd like to emphasize that we each need to
14 speak clearly and loudly to make sure that the court
15 reporter can accurately transcribe this meeting. If you
16 do have something that you would like to say, please first
17 state your name for the record. For those dialing into
18 the meeting, please remember to mute your phones to
19 minimize any background noise or distractions. If you do
20 not have a mute button, this can be done by pressing the
21 keys *6. To unmute press *6 keys again. Thank you.

22 At this time, I'll turn it over to the PRB
23 Chairman, John Lubinski.

24 CHAIRMAN LUBINSKI: Thank you, Doug, and
25 good afternoon, everyone. Welcome to this meeting

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1 regarding the 2.206 Petition submitted by Mr. Weaver of
2 the Natural Resources Defense Council.

3 I'd like to first share some background on
4 our process. Section 2.206 of Title 10 of Code of Federal
5 Regulations describes the Petition process, the primary
6 mechanism for the public to request enforcement action
7 by the NRC in a public process. This process permits
8 anyone to petition NRC to take enforcement-type action
9 related to NRC licensees or licensed activities.

10 Depending on the results of its evaluation,
11 NRC could modify, suspend, or revoke an NRC-issued
12 license, or take any other appropriate enforcement
13 action to resolve a problem. The NRC staff's guidance for
14 disposition of a 2.206 Petition Request is in Management
15 Directive 8.11 which is publicly available.

16 The purpose of today's meeting is to give
17 the Petitioner an opportunity to comment on the Petition
18 Review Board's initial recommendation to reject the
19 petition, and a second opportunity to provide any
20 additional explanation or support for the petition.

21 This meeting is not a hearing, nor is it an
22 opportunity for the Petitioner to question or examine the
23 Petition Review Board on the merits or the issues
24 presented in the Petition Request. No decision regarding
25 the merits of this position will be made at this meeting.

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1 The Petition Review Board typically
2 consists of a Chair, usually a Manager at the Senior
3 Executive level at the NRC. It has a Petition Manager,
4 and a Petition Review Board Coordinator. Other members
5 of the Board are determined by the NRC staff based on the
6 content of the information in the Petition Request.

7 At this time, I would like to introduce the
8 Board. As I already stated, I am John Lubinski, the
9 Petition Review Board Chairman. Doug Pickett is the
10 Petition Manager for the Petition under discussion
11 today. Andrea Russell is the office's Petition Review
12 Board Coordinator. Technical staff participating in this
13 Review Board are Ahsan Sallman of the Office of Nuclear
14 Reactor Regulation's Containment and Ventilation
15 Branch. Farhad Farzam from the Office of Nuclear Reactor
16 Regulation's Mechanical and Civil Engineering Branch.
17 And Brice Bickett and Larry Doerflein from the NRC's
18 Region I office.

19 We also obtain advice from our Office of
20 General Counsel who is represented by Mr. Chris Hair, who
21 is not here today.

22 As described in our process, the NRC staff
23 may ask clarifying questions in order to better
24 understand the Petitioner's presentation.

25 I would like to summarize the scope of the

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1 petition under consideration and the NRC activities to
2 date. On April 16th, 2012, Mr. Weaver submitted a petition
3 prepared by Mr. Leyse acting as a consultant to the
4 Natural Resources Defense Council under 10 CFR 2.206
5 regarding the use of passive autocatalytic recombiners,
6 hereafter referred to as PARs, at the Indian Point
7 Nuclear Generating Unit 2.

8 In this petition, Mr. Leyse requested the
9 NRC order the licensee of Indian Point Unit 2 to remove
10 the PAR system from the reactor containment because the
11 PAR system could have unintended ignitions in the event
12 of a severe accident, which in turn could cause the
13 hydrogen detonation and ultimate failure of the reactor
14 containment system.

15 As the basis for this request, the
16 Petitioner describes the PAR system as simple devices
17 consisting of catalyst surfaces arranged in an
18 open-ended enclosure. In the presence of hydrogen, a
19 catalytic reaction occurs spontaneously with oxygen at
20 the catalyst surface. PARs do not need external power nor
21 operator action to function, and once installed they
22 cannot be stopped or turned off by control room
23 operators following an accident.

24 The Petitioner does not question the use of
25 the PAR system during the design basis accident. However,

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1 the Petitioner believes that the nearby Ramapo seismic
2 zone could create a seismic event that exceeds the Indian
3 Point design basis, thus inducing a severe reactor
4 accident.

5 Once a severe reactor accident occurs, the
6 Petitioner believes that the PAR system will be
7 overwhelmed by local concentrations of hydrogen gas and
8 effectively become ignition sources leading to a
9 hydrogen detonation as described above.

10 On April 17th, 2012, the Petition Manager
11 contacted the Petitioner to discuss the 2.206 process and
12 to offer the Petitioner an opportunity to address the PRB
13 by phone or in person. The Petitioner requested to
14 address the PRB by phone prior to its initial meeting to
15 make the initial recommendation to accept or reject the
16 petition for review.

17 On June 14th, 2012, the Natural Resources
18 Defense Council assisted by Mr. Mark Leyse made a
19 presentation via teleconference call before the Petition
20 Review Board. The Petitioner provided additional
21 clarification that their concerns focus on severe
22 reactor accidents and not on NRC's design basis accident
23 at Indian Point 2.

24 On June 22nd, 2012, the Petition Review Board
25 held an internal meeting to discuss the merits of the

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1 petition. The Petition Review Board's initial
2 recommendation, which has been endorsed by senior NRC
3 management is to reject the petition from the 2.206
4 process because, one, the petition raises issues that
5 have already been the subject of NRC staff review and
6 evaluation, and a technical resolution which is
7 applicable at Indian Point 2 has been achieved. And, two,
8 the petition addresses deficiencies within existing NRC
9 regulations.

10 On July 30th, 2012, the Petitioner was
11 informed of the PRB's initial recommendation to reject
12 the petition. At that time, the Petitioner was offered
13 a second opportunity to address the Petition Review
14 Board.

15 The purpose of a second presentation, which
16 is today's call, would be for the Petitioner to comment
17 on the Petition Review Board's initial recommendation
18 and to provide additional supporting information to the
19 original petition.

20 On August 10th, the Petitioner accepted a
21 second presentation before the Petition Review Board,
22 and requested that two hours be allotted for the
23 presentation. On August 13th, 2012, the Petition Review
24 Board agreed to a two-hour meeting, and requested that
25 the presentation be limited to approximately one hour and

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1 45 minutes.

2 For this meeting today which is a second
3 presentation, the Petition Review Board will meet -- I'm
4 sorry. Following this meeting today, the Petition Review
5 Board will meet internally to determine whether a
6 modification or change to its initial recommendation is
7 warranted. The outcome of this internal meeting will be
8 discussed with the Petitioner.

9 As a reminder for the phone participants,
10 please identify yourself if you make any remarks as this
11 will help us in preparation of the meeting transcript
12 that will be made publicly available.

13 At this time, Mr. Weaver, I would like to
14 turn over the conference to you and Mr. Leyse to provide
15 any additional information you believe the Petition
16 Review Board should consider as part of this petition.
17 And I would ask all the NRC staff to hold all their
18 questions until the end of the presentation. Mr. Weaver.

19 MR. WEAVER: Thank you. Yes, I want to thank
20 the PRB for allowing us to take an opportunity to further
21 support our petition. But at this time, I'm going to go
22 ahead and just turn it over to Mr. Leyse because he has
23 prepared a written presentation for today. So, with
24 that, I'll go ahead and turn it over to Mark. Thank you.

25 MR. LEYSE: Hello, this is Mark Leyse

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1 speaking. Yes, I would like to thank the Petition Review
2 Board for this second meeting, especially for giving us
3 extra time to present information pertinent to Natural
4 Resources Defense Council's 2.206 petition. I'll now
5 refer to Natural Resources Defense Council as NRDC,
6 regarding Indian Point Unit 2. And I will refer to Indian
7 Point Unit as IP2 , regarding the two passive
8 autocatalytic recombiner units, and I will refer to
9 passive autocatalytic recombiners as PARs.

10 And I'm sorry, as it turns out this
11 presentation should not be as long as I had initially
12 anticipated; however, I do thank you for allotting the
13 extra time.

14 I just want to review a couple of things.
15 In our first meeting with the PRB we mostly focused on
16 suggesting that Entergy replace IP2's two PARs with two
17 electrically powered thermal hydrogen recombiners. Our
18 point was that if Entergy wants to have two hydrogen
19 recombiner units at IP2 to handle the quantity of
20 hydrogen that would be produced in the design basis
21 accident, Entergy could replace IP2's two PARs with two
22 electrically powered thermal hydrogen recombiners. That
23 would be safer in the event of a severe accident, because
24 operators would be able to terminate the operation of
25 electrically powered recombiners in a severe accident,

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1 where in such an accident operators would not be able to
2 terminate the operation of PARs, and thereby prevent the
3 PARs from having ignitions which could in turn cause a
4 detonation.

5 One thing, in the petition we did refer to
6 the Ramapo Fault line. And, obviously, Indian Point is
7 vulnerable to earthquakes. However, a severe accident
8 could occur for other reasons. For example, Three Mile
9 Island was not caused by a natural disaster, just wanted
10 to point that out.

11 Anyway, in the second PRB meeting I will
12 respond to the PRB's initial decision to not consider
13 NRDC's 2.206 petition regarding IP2's PARs. And I will
14 divide my presentation into two parts, and there's also
15 a conclusion.

16 In the first part, I will explain that the
17 PRB really has not addressed the fact that in the event
18 of a severe accident the PARs in IP2 could have ignitions
19 that could in turn cause a detonation. That was the point
20 of NRDC's petition.

21 In the second part, I will discuss
22 information which indicates that IP2's large dry PWR
23 containment could be vulnerable to failure from hydrogen
24 combustion. That is not the subject of NRDC's petition;
25 however, in my opinion, the PRB introduced this issue

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1 with its explanation of its initial decision which was
2 covered in an email that Mr. Pickett sent on July 30,
3 2012.

4 So, I think it would make sense to
5 supplement this petition with information about
6 calculations indicating the IP2's containment could be
7 vulnerable to failure from hydrogen combustion.

8 Now, for the first part to address the PRB's
9 initial decision. I do not believe that the PRB addressed
10 the issue that NRDC raised in its 2.206 petition. NRDC,
11 as you have pointed out in your introduction, we
12 requested that the two PARs be removed from IP2 because
13 in the event of a severe accident, the PARs could have
14 ignitions. That's not what they are designed to have.
15 That is a malfunction. If a PAR has an ignition, it
16 starts to behave like a hydrogen igniter, and to use a
17 hydrogen igniter is described in NRDC's petition, it
18 involves a lot of preliminary calculations. One has to
19 really know what they're doing, it's activated at the
20 correct time.

21 Anyway, a PAR could start behaving like an
22 igniter. There's no way to predict if it will, or if it
23 will not, or when it will and that in an elevated hydrogen
24 concentration such as one would have in a severe accident
25 that could cause a detonation.

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1 In different experimental programs, PARs
2 have malfunctioned by having ignitions in elevated
3 hydrogen concentrations, and that is documented in
4 NRDC's petition. The petition also has information
5 regarding the fact that a PAR's ignitions could cause a
6 direct detonation in IP2's containment.

7 In an email dated July 30, 2012 that Doug
8 Pickett, the PRB Manager sent to Jordan Weaver of NRDC,
9 there's an explanation of the PRB's initial decision.
10 This email discussing Regulatory Guide 1.7, Control of
11 Combustible Gas Concentrations in Containment, pointed
12 out that this Regulation Guide states, "The staff
13 considers that the combustible gas control systems
14 installed and approved by the NRC as of October 3, 2003
15 are acceptable without modification."

16 That was cited as one of the PRB's
17 justifications for rejecting NRDC's petition. But I ask,
18 is really true that after October 2003, if any defects
19 are discovered in any of the combustible gas control
20 systems installed and approved by the NRC, that the NRC
21 will not do anything about it, even after Fukushima? Is
22 it true that the NRC would ignore experimental data
23 indicating that PARs have malfunctioned by having
24 ignitions in elevated concentrations?

25 The email regarding the PRB's initial

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1 decision says that NRDC raised "issues that have already
2 been the subject of NRC staff review and evaluation
3 either on that facility, other similar facilities, or on
4 a generic basis for which a resolution has been achieved.
5 The issues have been resolved, and the resolution is
6 applicable to the facility in question."

7 And the email states that the NRC had
8 evaluated and resolved these issues in NRC's resolution
9 of Generic Safety Issue 121-SECY-00-0198. I will refer
10 to that document from now on as SECY 198. And in the
11 revision to Section 10 CFR 50.44, the email also points
12 out that "the revision" -- forget the quote. Anyway
13 -- sorry.

14 The email also points out that the revision
15 to Section 10 CFR 50.44, Combustible Gas Control for
16 Nuclear Power Reactors, led to the removal of technical
17 specification requirements for hydrogen recombiners in
18 large dry PWR containments.

19 That's all fine; however, that's not
20 -- that doesn't mean -- the fact that the NRC has revised
21 Section 10 CFR 50.44 and done other evaluations, it does
22 not mean that the NRC has evaluated and resolved the
23 issues of NRDC's 2.206 petition.

24 In different experimental programs, PARs
25 have malfunctioned by having ignitions in elevated

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1 hydrogen concentrations, and the PARs ignitions could
2 cause a direct detonation in IP2's containment. Those are
3 the issues of NRDC's petition.

4 In the email referring to the PRB's initial
5 decision, there is not a reference to any document that
6 states that the NRC has resolved the safety issue of PARs
7 malfunctioning by having ignitions in elevated hydrogen
8 concentrations.

9 In fact, in NRDC's petition, on page 17
10 there are two quotes from a 2011 IAEA report stating that
11 as of 2011, the PAR ignition problem has not been
12 resolved.

13 I would like to ask the PRB to please
14 consider the fact that the NRC has not resolved the PAR
15 ignition problem. It just seems to me that the NRC has
16 not evaluated and resolved the issues raised in the
17 petition, so I would ask the PRB to accept the petition
18 for consideration.

19 And I want to specify that in the petition,
20 NRDC did not provide much information indicating that a
21 detonation could compromise IP2's containment. The
22 petition is not whether or not large dry PWR containment
23 would withstand a detonation, or not. It's about the fact
24 that PARs could have an ignition which could lead to a
25 detonation in the elevated concentrations of hydrogen

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1 that would occur in a severe accident.

2 So, I just want to ask the PRB does either
3 the NRC or Entergy want a detonation to occur in IP2's
4 containment during a severe accident? Would someone in
5 the PRB please answer this question?

6 CHAIRMAN LUBINSKI: This is the PRB Chair,
7 John Lubinski. The purpose of the PRB meeting today is
8 to -- for the Petitioner to provide additional
9 information, not to have the NRC make decisions or defend
10 the positions it took in its initial review, so we will
11 not be responding to any questions today.

12 MR. LEYSE: Okay, I understand that, but when
13 you are making your final decision on this would you
14 please consider that question, because that is a
15 fundamental question that we are raising with this
16 petition. Like I said, we could have detailed a lot of
17 information regarding the affects of hydrogen
18 combustion, and I'm going to actually give a rundown on
19 some calculations regarding that in the second part.

20 We're merely pointing out that this is a
21 safety device, a PAR, and it can malfunction. It's been
22 shown to do such, and it just seems to me that the NRC
23 or Entergy, who would want a detonation to occur in
24 containment building during a severe accident? So, I
25 really think that the fact that you have done resolution

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1 of the Generic Safety Issue, what is I believe 121, that's
2 really not the point. Apart from the fact that even if
3 the containment were not breached, a lot of safety
4 equipment could be destroyed. It just wouldn't be a very
5 positive effect to have occurring during a severe
6 accident. So, anyway, if you would please consider that
7 question, I would appreciate it.

8 CHAIRMAN LUBINSKI: Mr. Leyse, this is John
9 Lubinski, again. Yes, as I said earlier, we will be
10 considering all the information you provide us today, and
11 we will consider that question. Can I just ask for the
12 record that you specifically repeat the question that you
13 would like us to consider when looking at our initial
14 recommendation?

15 MR. LEYSE: Oh, sure. The question is does
16 either the NRC or Entergy want a detonation to occur in
17 IP2's containment during a severe accident? And that's
18 all in the context of the fact that the PAR has been shown
19 to malfunction in elevated hydrogen concentrations, and
20 such a ignition could lead to a detonation.

21 CHAIRMAN LUBINSKI: Thank you, Mr. Leyse. We
22 will consider that as we're looking at our initial
23 recommendation. Thank you.

24 MR. LEYSE: Thank you. I appreciate that. I
25 will continue.

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1 The PRB's explanation of its initial
2 decision ignored the fact that PARs have had ignitions
3 in elevated hydrogen concentrations in different
4 experimental programs. The PRB did not address that. In
5 fact, the PRB avoided the very issue that NRDC raised,
6 which is an issue, a safety issue that is still
7 unresolved.

8 I would urge the PRB to study the data
9 regarding the ignitions of PARs that have -- the PARs
10 have occurred in elevated concentrations in different
11 experimental programs, and I would suggest that if there
12 is no way to guarantee that PARs at IP2 would not have
13 ignitions in elevated concentrations in the event of a
14 severe accident, then the PRB should accept NRDC's
15 petition for review as a step toward ordering Entergy to
16 remove the two PARs from IP2.

17 In the PRB's explanation of its initial
18 decision it refers to SECY 198. And on page 5-18 of
19 Attachment 2, SECY 198 states that "a number of
20 combustible gas control systems along with their pros and
21 cons are discussed in NUREG/CR-2726. More recently, an
22 experimental program was conducted at the Surtsey
23 Facility at Sandia National Laboratories to evaluate a
24 PAR design developed by the NIS, that's a company. It
25 actually has a very long name, which I'll avoid trying

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1 to pronounce, but I'll call it NIS of Hanau, Germany."
2 And this statement is referenced, and the reference is
3 NUREG/CR-6580, and that's Sandia National Laboratories
4 report, and the title is "Performance Testing of Passive
5 Autocatalytic Recombiners."

6 NRDC's 2.206 petition refers to the same
7 Surtsey facility that SECY 198 refers to. In the Surtsey
8 facility, PARs were experimented. They were --- well,
9 the experiments were conducted with the very same design,
10 the NIS PARs, and that is the type of PAR that is in IP2.
11 And on page 15 of NRDC's petition, there is a quote that
12 states that in the Surtsey facility's PAR experiments,
13 "unexpected ignitions from a NIS recombiner were
14 observed in three out of 12 experiments." So, it just
15 seems to me that the PRB should discuss this data in its
16 review of NRDC's petition, and look into data, look into
17 reports on that data beyond what we've cited. But I think
18 we have cited plenty of data because we've also cited
19 other experimental programs in which PARs have had these
20 unintended ignitions.

21 And this is more a rhetorical question, I
22 guess. Does the PRB really think that it's fine for IP2
23 to operate with equipment that has been proven to
24 malfunction in elevated hydrogen concentrations, and in
25 a severe accident that it's fine that a PAR's ignition

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1 could cause a detonation in IP2's containment?

2 The NRC is a regulator with a duty to protect
3 the public, and I would hope that it would pay attention
4 to experimental data from an experimental program
5 mentioned in SECY 198, indicating that the PARs in IP2's
6 containment could have ignitions in the event of a severe
7 accident. And, furthermore, this is an unresolved safety
8 issue.

9 Now, I'd like to move to the second part of
10 my presentation. And in this part, I will discuss
11 information that indicates that IP2's large dry PWR
12 containment could be vulnerable to hydrogen combustion.

13 Fukushima demonstrated that the NRC's
14 hydrogen experiments, many of which were conducted at
15 Sandia National Laboratories, just did not replicate
16 what would occur in a severe accident.

17 In a September 8, 2011 ACRS meeting, Dana
18 Powers of Sandia National Laboratories said that it's
19 "extraordinarily hard to get detonations" in experiments
20 because of ignition problems. And he pointed out that
21 there were detonations in the Fukushima accident.

22 It seems to me that the experiments that
23 have been conducted were just not realistic enough, so
24 perhaps the conclusions from such experiments could be
25 non-conservative. And I want to point out that SECY 198,

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1 one of the documents cited in the email regarding the
2 PRB's initial decision states that "a detonation would
3 impose a dynamic pressure load on the containment
4 structure that could be more severe than the static load
5 from an equivalent deflagration." That's on page 4-2 of
6 Attachment 2 of SECY 198.

7 The point is that a dynamic pressure load
8 on the containment structure could be more severe than
9 a static load. This is significant because the
10 calculations discussed in NRDC's petition on page 13 for
11 hydrogen combustion at Turkey Point, that's for Units 3
12 and 4, which are PWRs with large dry containments, those
13 calculations were for pressure from an adiabatic and
14 complete hydrogen burn. The NRC's Turkey Point
15 calculations do not take into consideration flame
16 acceleration which would result in dynamic loads on the
17 containment walls and dome of the containment. And the
18 calculations are for adiabatic isochoric complete
19 combustion, which I will refer to as I -- I'm sorry, I
20 will refer to as AICC, which is sometimes termed Constant
21 Volume Explosion Pressure.

22 A July 2011 IAEA report titled, "Mitigation
23 of Hydrogen Hazards in Severe Accidents in Nuclear Power
24 Plants, on page 58 states, "Hydrogen deflagration can
25 pose various risks to the containment and other plant

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1 systems. Combustion can give large pressure spikes
2 varying from relatively low pressure loads bound by the
3 AICC loads up to large loads from accelerated flames and
4 detonations. Such acceleration can already occur above
5 about 8 percent of hydrogen in the containment, so that
6 above that value the AICC load may not always be the
7 bounding value."

8 And on pages 105 and 106 of the same IAEA
9 report there is a quote which I begin, "In the USA the
10 hydrogen risk during a severe accident is not considered
11 an area for which further research is warranted. It has
12 been analyzed. The containments in the U.S. plants can
13 either withstand the induced hydrogen combustion loads
14 with enough safety margins for the large dry containment
15 PWR containments, for example." It says, "The USA
16 analyses do not include advanced methods such as the use
17 of computational fluid dynamics codes to find a more
18 refined hydrogen containment distribution or loads from
19 flame acceleration as it has been assessed that the
20 safety margins were large enough to cover such
21 uncertainties."

22 So, the NRC may have determined that Generic
23 Safety Issue 121 hydrogen control for large dry PWR
24 containments has been resolved; however, there are
25 calculations besides the ones for hydrogen combustion at

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1 Turkey Point which I have just referred to that indicate
2 that hydrogen combustion could cause a large dry PWR
3 containment to fail.

4 For example, in 1982 there were some
5 calculations that were done in a document, Indian Point
6 Probabilistic Safety Study that was by the Power
7 Authority of the State of New York and also by Con Edison.
8 This is in ADAMS. It's at Accession Number ML 102520201.

9 On pages 4.3-22 and 4.3-23, is a table that
10 has the results of calculations in which the peak
11 pressure resulting from combustion exceeds the estimated
12 failure pressure of Indian Point's containments, which
13 is about 141 pounds per square inch absolute, so that's
14 141 psi absolute. In the table there are calculations for
15 certain scenarios in which the peak pressure was found
16 to be 160, 169, about 157, and 180 psi absolute or
17 greater. So, those were at least four examples in which
18 there were results of calculations. They were done with
19 a code and the results came up with pressures that
20 exceeded the estimated failure pressure of the Indian
21 Point containments. Those calculations were reported in
22 1982, so that's just one example, but that's -- the
23 results indicate that hydrogen combustion could cause
24 IP2's containment to fail. And another -- I would highly
25 doubt that these calculations modeled dynamic loads that

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1 would result from flame acceleration or detonation.

2 And regarding different types of
3 containment failure, the 2011 IAEA report states, "The
4 failure mechanism can be of a different nature as the
5 containment exists of a main structure plus a number of
6 penetrations, hatches, pipe, and cable penetrations.
7 Failure may either be a gross failure of the containment
8 or failure of one or more of the penetrations. Concrete
9 containments often show initiation of cracks as the first
10 indication of failure. If the cracks are large enough
11 they will prevent gross containment failure."

12 Interestingly, the 1982 Indian Point
13 Probabilistic Safety Study discusses one case in which
14 there would be a total of more than 6,000 pounds of
15 hydrogen generated, and that occurs in a case in which
16 there would be molten core concrete interaction. That's
17 on page 4.3-10.

18 And there's information in SECY 198 that
19 relates to this. It's on page 6-6 of Appendix 2. It
20 states, "Analyses performed since the Three Mile Island
21 accident have shown that accidents in which the core
22 melts through the reactor pressure vessel can pose a more
23 severe threat to containment integrity, and thus are more
24 risk significant than if the damaged core is retained
25 within the vessel. This implies that the proposed option

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1 should address full core melt down accidents in which
2 significantly more hydrogen, perhaps more than that
3 which would occur from a metal water reaction of 100
4 percent," what they mean is 100 percent of the active
5 cladding length of the fuel rods, "and also carbon
6 monoxide may be generated. In addition, the combustible
7 gases and steam flow rates to containment have to reflect
8 the rapid blow down rates associated with reactor
9 pressure vessel failure if it occurs at high pressure."
10 So, SECY 198 states that more hydrogen could be produced
11 than that of 100 percent of the active fuel cladding
12 length if that were to react with steam.

13 So, that concludes what I have to say about
14 hydrogen combustion and large dry PWR containments.
15 However, NRDC's petition is not about -- as I said
16 before, is not really about whether or not a large dry
17 PWR containment could withstand a detonation or not. It's
18 about the fact that PARs could have ignitions and the
19 elevated hydrogen concentrations of a severe accident
20 which could in turn cause a detonation. And that's quite
21 simply why we requested that the two PARs be removed from
22 IP2's containment.

23 And now to conclude, I just want to
24 reiterate that this, as I said in the last meeting, this
25 2.206 Petition is plant-specific. To the best of my

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1 knowledge, Indian Point is the only plant that is
2 licensed by the NRC that has PARs, so IP2 is the only unit
3 that in the event of a severe accident has a possibility
4 of a PAR malfunctioning by having an ignition which in
5 turn could cause detonation.

6 Furthermore, it's significant that
7 resolution of GSI-121 states that, "It was believed that
8 plant-specific vulnerabilities may exist mainly due to
9 the effects of a local hydrogen detonation. Activities
10 for estimating the likelihood of local hydrogen
11 detonations and assessing the consequences would require
12 plant-specific information." And, also, please keep in
13 mind that NRDC's petition discusses information from
14 documents that were published after the NRC published its
15 resolution of Generic Safety Issue 121, SECY 198, and
16 after the NRC revised Section 10 CFR 50.44 in 2003.

17 As I mentioned earlier, a 2011 IAEA report
18 quoted on page 17 of NRDC's petition states that the
19 safety issues of PARs incurring ignitions in elevated
20 hydrogen concentrations has not been resolved.
21 Furthermore, as Dana Powers pointed out in the ACRS
22 meeting, I referred to that earlier, "detonations are
23 extraordinarily hard to get in experiments because of
24 ignition problems. However, there were detonations in
25 the Fukushima accident."

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1 Thank you. And I wanted to add just one more
2 thing, that I can email a lot of the information that I
3 cited that I've just discussed, I can email that to the
4 PRB along with references. And now I would be happy to
5 answer any questions that you may have.

6 CHAIR LUBINSKI: Mr. Leyse, and Mr. Weaver,
7 thank you. We would, Mr. Leyse, like to take you up on
8 your offer to mail those references. If you could please
9 mail them to the Petition Manager, Doug Pickett. You've
10 referenced email he has sent to you so you have his email
11 address.

12 MR. LEYSE: Yes.

13 CHAIR LUBINSKI: Okay.

14 MR. LEYSE: I will certainly do that.

15 CHAIR LUBINSKI: Thank you. Appreciate it.
16 What I'd like to do now is ask if we have any questions
17 of either Mr. Weaver or Mr. Leyse. I'll start here at our
18 Headquarters office, are there any questions you have?

19 MR. PICKETT: Yes, this is Doug Pickett. I
20 do have one comment. You talked a number of times about
21 the PARs serving as a source of ignition and high
22 concentrations of hydrogen under a severe reactor
23 accident.

24 Going back to the Three Mile Island
25 accident, there was hydrogen detonation. I thought that

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1 was attributed to something other than a PAR, and I was
2 wondering if you could possibly comment on other sources
3 of ignitions for high concentrations of hydrogen. I would
4 think there would be a number of ignition sources in
5 containment post accident other than PARs.

6 MR. LEYSE: Mark Leyse speaking. Most
7 certainly Three -- like I said before, PARs, I believe
8 the only units licensed by the NRC that has PARs is IP2,
9 and I believe those were installed around 1998. So, most
10 definitely a PAR did not cause the explosion that
11 occurred in the containment during the Three Mile Island
12 accident.

13 I would like to point out that as far as I
14 know, the explosion that occurred in the containment
15 during the Three Mile Island accident has been
16 characterized as a deflagration. And I believe that the
17 concentration of hydrogen they estimate was around 8
18 percent when that occurred. So, I mean, there -- I think
19 they theorized that that was initiated by a spark. So,
20 surely you could have an accident and you have a spark
21 which occurs that would initiate a deflagration. Most
22 likely, I highly doubt that a spark would have the energy
23 source necessary for a detonation; however, if you have
24 a hydrogen igniter, that actually has enough of an energy
25 source to cause a direct detonation.

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1 So, the point of this is that a PAR is
2 supposed to recombine hydrogen with oxygen on its
3 catalyst surface and form steam, but in these
4 experimental programs the PARs have malfunctioned and
5 they start behaving like igniters. And there are a lot
6 of -- we have quotes on it in the 2.206 Petition, there
7 are a lot of studies regarding the use of hydrogen
8 igniters. The Europeans at one point I believe were
9 considering to install them in PWRs, not ICE condensor
10 PWRs, just regular PWRs. I think that was something they
11 were thinking about in the early '90s. They did a lot of
12 calculations and debates over it. I don't know the
13 details but, basically, they decided that it was too
14 risky to install igniters in their containment buildings
15 for PWRs. So, some of their statements are in this
16 petition, but they say that you really have to have fully
17 analyzed the use of an igniter to really know what's going
18 to go. Others emphasize that it's an issue of timing, that
19 you have a window of opportunity to use the igniter, but
20 after the hydrogen concentration builds up too high, that
21 the use of the igniter could be very risky because it
22 could cause a direct detonation. Those are quotes in this
23 petition referring to those issues.

24 So, basically, the PAR could start behaving
25 like an igniter, and it's something that's entirely

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1 unpredictable, at least from what I've read and the
2 studies. So, that becomes the issue that it's -- it would
3 be that concentration of energy that in an elevated
4 hydrogen concentration could cause a direct detonation.

5 Now, to answer your question more, I'm sure
6 there could be other causes for this, but I think that
7 most likely combustion would result in a deflagration
8 unless you had a higher energy source. But I think this
9 is something that is very complex. Mark Leyse, just sort
10 of ending the answer to your question, thank you.

11 MR. WEAVER: And this is Jordan Weaver, NRDC.
12 I just wanted to kind of follow-up on that a little bit,
13 which is regardless of any additional sources that would
14 carry the necessary ignition energy for a direct
15 detonation, those would -- obviously, that was
16 -- although it was highlighted, we hoped that NRC would
17 then act on removing that. And what we're proposing here
18 is that these PAR systems actually represent such a
19 vulnerability. So, regardless of other unintended
20 ignition sources or discoveries that could lead you to
21 believe that would occur, we're highlighting that this
22 is one that has been shown to, indeed, provide that exact
23 behavior; so, hence, the large motivation of this
24 petition.

25 MR. PICKETT: Okay, thank you.

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1 CHAIR LUBINSKI: Any other questions here
2 from Headquarters? Okay. What I'd like to do now is turn
3 to our regional office, Larry Doerflein and Brice
4 Bickett, did you have any questions?

5 MR. DOERFLEIN: No questions here in Region
6 I.

7 CHAIR LUBINSKI: Okay. Did the licensee join
8 the bridge? Okay. I'm assuming hearing no response they
9 did not join the bridge.

10 At the beginning of the meeting Doug asked
11 if there are members of the public. Before I conclude this
12 meeting we'd like to give members of the public an
13 opportunity to provide comments regarding the petition,
14 or ask questions about the process. Did any members of
15 the public join the call?

16 Okay, hearing none, Mr. Weaver, Mr. Leyse
17 we appreciate this afternoon you taking time to provide
18 the NRC staff with clarifying information on your
19 petition, including clarifying information in response
20 to the email sent to you by Mr. Doug Pickett.

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

24 COURT REPORTER: Sir, the only additional
25 information I would need would be a list of the attendees

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1 for the meeting.

2 CHAIR LUBINSKI: Okay. Mr. Doug Pickett will
3 provide you an email with that, as well as I believe you
4 may have missed a few minutes of the beginning of the
5 meeting. We do have a recording of this and we'll work
6 with you to make sure that that additional information
7 is recorded, as well.

8 COURT REPORTER: That's fine. I would only
9 ask Mr. Pickett to remain on the line after the conclusion
10 of the Petition Review Board's meeting.

11 CHAIR LUBINSKI: Okay, that would be fine.
12 We could do that.

13 Okay. With that, this meeting is concluded,
14 and we will ask everyone to please drop off the bridge
15 line so Mr. Pickett and the court reporter can talk. Thank
16 you all. Have a good afternoon.

17 (Whereupon, the proceedings went off the
18 record at 2:05 p.m.)

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