

Official Transcript of Proceedings
NUCLEAR REGULATORY COMMISSION

Title: 10 CFR 2.206 Petition Review Board
RE Indian Point Nuclear Generating Unit

Docket Number: 50-247 and 50-286

Location: (telephone conference)

Date: Monday, April 18, 2011

Work Order No.: NRC-841
Edited by John Boska, NRC Petition Manager

Pages 1-48

NEAL R. GROSS AND CO., INC.
Court Reporters and Transcribers
1323 Rhode Island Avenue, N.W.
Washington, D.C. 20005
(202) 234-4433

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

+ + + + +

10 CFR 2.206 PETITION REVIEW BOARD (PRB)

CONFERENCE CALL

RE

INDIAN POINT FUEL PEAK CLAD TEMPERATURE

DOCKET NOS. 50-247 + 50-286

+ + + + +

MONDAY

APRIL 18, 2011

+ + + + +

The conference call was held, Fred Brown,
Chairperson of the Petition Review Board, presiding.

PETITIONERS:

PHILIP MUSEGAAS AND MARK LEYSE, representing
RIVERKEEPER

PETITION REVIEW BOARD MEMBERS:

FRED BROWN, Chair, Director, Division of
Inspection and Regional Support, NRR

JOHN BOSKA, Project Manager, NRR

TANYA MENSAH, PRB Coordinator, NRR

BRICE BICKETT, Region I Division of Reactor
Projects

RICHARD DUDLEY, Rulemaking Branch, NRR

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

SHIH-LIANG WU, Nuclear Performance and Code
Review Branch, NRR

PRB ADVISORS:

CHRISTOPHER HOTT, Office of Enforcement

BRETT KLUKAN, Office of General Counsel

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

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1:01 p.m.

1
2 MR. BOSKA: Good afternoon. I'd like to
3 thank everyone for attending this meeting. My name is
4 John Boska, and I am the NRC petition manager for this
5 petition.

6 We're here today to allow the petitioners,
7 Ms. Brancato and Mr. Leyse, to address the Petition
8 Review Board on behalf of Riverkeeper concerning their
9 2.206 petition dated March 28th, 2011, on the fuel
10 peak cladding temperature at Indian Point Nuclear
11 Generating Unit Numbers 2 and 3, which are located
12 about 24 miles north of New York City on the east
13 bank of the Hudson River.

14 I am the petition manager for the
15 petition. The Petition Review Board chairman is Fred
16 Brown.

17 As part of the Petition Review Board's
18 review of this petition, Ms. Brancato and Mr. Leyse
19 have requested this opportunity to address the
20 Petition Review Board, which may also be referred to
21 as the PRB.

22 This meeting is scheduled to conclude by
23 3:00 pm. The meeting is being recorded by the NRC
24 Operations Center, and will be transcribed by a court
25 reporter. The transcript will become a supplement to

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 the petition. The transcript will also be made
2 publicly available.

3 I'd like to open this meeting with
4 introductions. As we go around the room, please be
5 sure to clearly state your name, your position, and
6 the office that you work for within the NRC for the
7 record.

8 I'm John Boska. I'm a project manager in
9 the office of Nuclear Reactor Regulation, which is
10 also referred to as NRR.

11 MS. SALGADO: This is Nancy Salgado. I'm
12 a branch chief in the division of Operating Reactor
13 Licensing, NRR.

14 MR. WU: Shih-Liang Wu, Nuclear
15 Performance and Code Review Branch, NRR.

16 MR. KLUKAN: Brett Klukan. I'm the Office
17 of General Counsel advisor to the PRB.

18 MR. BROWN: Fred Brown, Director of
19 Division of Inspection and Regional Support within the
20 Office of NRR.

21 MR. DUDLEY: Richard Dudley. I'm a
22 rulemaking project manager from the NRR rulemaking
23 branch.

24 MS. MENSAH: Tanya Mensah, 2.206
25 coordinator from the Division of Policy and Rule

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 Making, NRR.

2 MR. HOTT: Chris Hott. I'm an enforcement
3 specialist in the Office of Enforcement.

4 MR. BOSKA: We have completed
5 introductions in the room.

6 At this time, are there any other NRC
7 participants from NRC headquarters on the phone?

8 Hearing none, are there any NRC
9 participants from the Regional Office on the phone?

10 MR. BICKETT: Yes, this is Brice Bickett
11 from NRC Region 1. I'm a Senior Project Engineer.

12 MR. BOSKA: Thank you, Brice.

13 Are there any representatives for the
14 licensee on the phone?

15 MR. WALPOLE: Bob Walpole, Indian Point.

16 MR. IRANI: Adi Irani, headquarters.

17 MR. BOSKA: All right. Thank you.

18 Ms. Brancato and Mr. Musegaas, would you
19 please introduce yourself for the record?

20 MR. MUSEGAAS: Sure. This is Philip
21 Musegaas. I'm an attorney and the Hudson River
22 Program Director at Riverkeeper.

23 And John, I apologize for any confusion.
24 I will be giving our statement today on behalf of
25 Riverkeeper. And I'm joined by Mark Leyse, but I'll

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 be on this call instead of Deborah Brancato. So
2 again, sorry for any confusion there.

3 MR. BOSKA: All right. That's fine.

4 MR. MUSEGAAS: Thank you.

5 MR. BOSKA: Thank you, Mr. Musegaas.

6 Mr. Leyse, would you please introduce
7 yourself for the record?

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

9 MR. BOSKA: All right. It is not required
10 for members of the public to introduce themselves for
11 this call. However, if there are any members of the
12 public on the phone that wish to do so, please state
13 your name for the record.

14 MR. LOCHBAUM: This is David Lochbaum,
15 Director of the Nuclear Safety Project for the Union
16 of Concerned Scientists.

17 MR. SIM: Hi, I am Bob Sim (phonetic),
18 Assistant Attorney General, New York.

19 MR. BOSKA: All right. Welcome.

20 MR. R. LEYSE: Robert Leyse, citizen.

21 MR. WALD: My name is Matt Wald. I'm a
22 reporter at the New York Times. I'm not a
23 participant, I'm just listening. Thank you.

24 MR. BOSKA: All right. Thank you for the
25 introductions.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 I'd like to emphasize that we each need to
2 speak clearly and loudly to make sure that the court
3 reporter can actually transcribe this meeting. If you
4 do have something that you'd like to say, please first
5 state your name for the record.

6 For those dialing into the meeting, please
7 remember to mute your phones to minimize any
8 background noise or distractions. If you do not have
9 a mute button, this can be done by pressing the keys
10 star six. To un-mute your phone, press the star six
11 keys again.

12 Please do not place this call on hold,
13 since many phone systems play music when a call is on
14 hold, which is very annoying for the other callers.

15 Thank you.

16 Next, I'd like to share some background on
17 our process. Section 2.206 of Title 10 of the Code of
18 Federal Regulations describes the petition process,
19 the primary mechanism for the public to request
20 enforcement action by the NRC in a public process.

21 This process permits anyone to petition
22 the NRC to take enforcement-type action related to NRC
23 licensees or licensed activities. Depending on the
24 results of its evaluation, the NRC could modify,
25 suspend, or revoke an NRC-issued license or take any

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 other appropriate enforcement action to resolve a
2 problem.

3 The NRC staff's guidance for the
4 disposition of 2.206 petition requests is in
5 Management Directive 8.11, which is publicly
6 available.

7 The purpose of today's meeting is to give
8 the petitioners an opportunity to provide any
9 additional explanation or support for the petition
10 before the Petition Review Board makes an initial
11 recommendation on whether or not to accept this
12 petition for review.

13 The Petition Review Board typically
14 consists of a chairman, usually a manager at the
15 senior executive service level at the NRC. It has a
16 petition manager and a PRB coordinator.

17 Other members of the board are determined
18 by the NRC staff, based on the content of the
19 information in the petition request.

20 At this time, I would like to introduce
21 the Board. Fred Brown is the Petition Review Board
22 chairman. I am the petition manager for the petition
23 under discussion today. Tanya Mensah is the office's
24 PRB coordinator.

25 Our technical staff includes Shih Liang-Wu

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 from the NRR's Nuclear Performance and Code Review
2 Branch, Brice Bickett from the NRC's Region 1 Division
3 of Reactor Projects, and Richard Dudley, from NRR's
4 Rulemaking Branch.

5 We also have legal advice from Brett
6 Klukan from the NRC's Office of General Counsel, and
7 advice from Christopher Hott from the Office of
8 Enforcement.

9 As described in our process, the NRC staff
10 may ask clarifying questions in order to better
11 understand the petitioner's presentation and to reach
12 a reasoned decision whether to accept or reject the
13 petitioner's request for review under the 2.206
14 process.

15 I would like to summarize the scope of the
16 petition under consideration, and the NRC activities
17 to date.

18 On March 28th, 2011, Ms. Brancato
19 submitted to the NRC a petition under 10 CFR 2.206
20 regarding the fuel peak cladding temperature at Indian
21 Point Nuclear Generating Unit numbers 2 and 3, which
22 may also be called IP-2 and IP-3.

23 This petition is available from the NRC's
24 public website, www.nrc.gov, from the electronic
25 reading room under the ADAMS documents with the

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 accession number ML110890956.

2 The petitioners request that the NRC order
3 the licensee of IP-2 and IP-3 to lower the licensing
4 basis peak cladding temperatures of IP-2 and IP-3 in
5 order to provide necessary margins of safety to help
6 prevent partial or complete meltdowns in the event of
7 loss-of-coolant accidents, also called LOCAs.

8 The petitioners state that experimental
9 data demonstrates that IP-2 and IP-3's licensing basis
10 peak cladding temperatures of 1,937 degrees Fahrenheit
11 and 1,961 degrees Fahrenheit, respectively, do not
12 provide necessary margins of safety in the event of
13 LOCAs. Such data demonstrates that IP-2's and IP-
14 3's licensing basis peak cladding temperatures need to
15 be decreased to temperatures lower than 1,832 degrees
16 Fahrenheit in order to provide necessary margins of
17 safety.

18 Second, the petitioners request that the
19 NRC order the licensee of IP-2 and IP-3 to determine
20 how far below 1,832 degrees Fahrenheit the licensing
21 basis peak cladding temperature values of IP-2 and IP-
22 3 need to be lowered in order to provide necessary
23 margins of safety.

24 Third, the petitioners request that the
25 NRC order the licensee of IP-2 and IP-3 to lower both

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 of IP-2 and IP-3's licensing basis peak cladding
2 temperatures to 1,600 degrees Fahrenheit until
3 conservative values for IP-2 and IP-3 are determined.

4 Fourth, the petitioners request that the
5 NRC order the licensee of IP-2 and IP-3 to demonstrate
6 that IP-2 and IP-3 emergency core cooling systems,
7 also called ECCS, will effectively quench the fuel
8 cladding in the event of LOCAs and prevent partial or
9 complete meltdown. Experimental data indicates that
10 IP-2 and IP-3's ECCS may not effectively quench the
11 fuel cladding in the event of LOCAs, if fuel cladding
12 temperatures approached or reached IP-2 and IP-3's
13 licensing basis peak cladding temperatures of 1,937
14 degrees Fahrenheit and 1,961 degrees Fahrenheit,
15 respectively.

16 The petitioners also state that, although
17 revisions to the 10 CFR 50.46(b)(1) of 2200 degrees
18 Fahrenheit on peak cladding temperatures have been
19 proposed in a rule-making petition, PRM-50-93, this
20 petition has been filed separately under 10 CFR 2.206
21 because the concerns affect IP-2 and IP-3 and need
22 prompt resolution to protect the lives, property, and
23 environment of the people of New York. The safety
24 issues raised in this petition are of an immediate
25 nature and require prompt NRC review and action.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 Allow me to discuss the NRC activities to
2 date. On March 28th, 2011, the NRC received this
3 petition. On April 6th, the petition manager
4 contacted the petitioners to offer the opportunity to
5 address the PRB, to which the petitioners agreed.

6 That led to this teleconference.

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

11 Thank you.

12 At this time, I'll turn it over to the
13 Petition Review Board chairman, Fred Brown.

14 MR. BROWN: Good afternoon. Welcome to
15 this meeting regarding the 2.206 petition submitted by
16 Riverkeeper.

17 First, I would like to explain the purpose
18 of this meeting. This meeting is not a hearing, nor
19 is it an opportunity for the petitioners to question
20 or examine the PRB on the merits or the issues
21 presented in the petition request.

22 No decisions regarding the merits of this
23 petition will be made at this meeting. Following this
24 meeting, the Petition Review Board will conduct its
25 internal deliberations. The outcome of this internal

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 meeting will be discussed with the petitioners.

2 At this time, I'd like to turn over to
3 Riverkeeper the presentation to allow you to provide
4 any information you believe the PRB should consider as
5 part of this petition, especially reasons why this
6 petition should be considered separately from the
7 petition for rulemaking.

8 You may proceed.

9 MR. MUSEGAAS: Thank you, Mr. Brown.
10 Again, this is Phillip Musegaas, representing
11 Riverkeeper here at this PRB. I will make a brief
12 opening statement, probably no more than five or ten
13 minutes, and then I'll turn it over to Mark Leyse, who
14 will explain and give a presentation about the
15 technical basis for the petition.

16 I want to start out by thanking the NRC
17 for setting up this meeting, and giving us an
18 opportunity to present information on the petition.

19 Just as a little bit of a review,
20 Riverkeeper is a non-profit, membership-supported
21 organization. We're a 501(c)(3) environmental
22 organization. We've been working on the Hudson River,
23 protecting the Hudson River from pollution for about
24 the past 40 years in one form or another.

25 We have been involved with Indian Point

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 issues, initially with environmental concerns when the
2 plant was first licensed beginning in 1972, and then
3 subsequently, after the terrorist attacks of September
4 11th, Riverkeeper filed a 2.206 petition related to
5 safety and security issues at that time, and have been
6 involved since 2001 on a range of safety and Nuclear
7 Regulatory Commission issues related to Indian Point
8 since that time.

9 Riverkeeper also petitioned to intervene
10 in the NRC's license renewal proceeding for Indian
11 Point in 2007.

12 Riverkeeper has significant current safety
13 concerns about the operation of Indian Point at its
14 current operating level.

15 And thank you, Mr. Boska, for spelling out
16 our request for relief. I was going to do that, but I
17 appreciate you reiterating that, and so I won't repeat
18 that since you did that already.

19 And so I will discuss, as you requested,
20 why Riverkeeper believes that this petition under
21 section 2.206 should be accepted and why it's
22 distinguishable from the rulemaking petition that has
23 already been submitted.

24 The main concern here is that because
25 Indian Point is operating at the level described in

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 the petition, fuel temperatures at the levels
2 described in the petition, we have concerns that if
3 there was a loss of coolant accident and oxidation
4 occurred and a meltdown occurred, that the
5 consequences of an accident would be severe.

6 And so I'm going to focus on the location
7 of Indian Point, what we consider the enhanced risks
8 of the plant's operation, given recent information,
9 and, of course, the consequences of an accident.

10 Indian Point, as you mentioned already, is
11 located approximately 25 miles from New York City,
12 from the Bronx borough of New York City. Indian
13 Point's about 34 miles from Times Square, which is
14 roughly midtown Manhattan.

15 And within 10 miles of Indian Point, there
16 are 300,000 people. Within 50 miles of the plant,
17 there are approximately 17 to 20 million people,
18 either living, or living and working, in that area.

19 Recently we have learned, over the past
20 couple of years, new information about enhanced
21 seismic risk at Indian Point. There is a 2008
22 Columbia University study done by a Lamont-Doherty
23 Earth Institute seismologist, that concluded that in
24 addition to the Ramapo fault that was already known to
25 be near Indian Point, there was an additional fault

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 line.

2 And in addition, by looking at the history
3 of earthquakes in the area, the Columbia seismologist
4 concluded that Indian Point was, in fact, at risk of
5 an earthquake up to 7.0 on the Richter scale.

6 Entergy, the current owners of Indian
7 Point, have said publicly that they believe the two
8 reactors could withstand up to a 6.1, I believe, on
9 the Richter scale.

10 So we have significant concerns that the
11 plant may not be built or designed to withstand the
12 maximum earthquake that could be experienced in this
13 area. And that is fairly new information.

14 This information from Columbia has not
15 been considered or not been assessed to our knowledge
16 by the Nuclear Regulatory Commission. In addition to
17 the Columbia study, there is also a September 2010
18 Nuclear Regulatory Commission seismic risk study,
19 which places Indian Point 3 at an increased risk of
20 core damage under the core damage frequency
21 calculations from an earthquake. And that information
22 has not been considered in the license renewal process
23 for Indian Point or in any other formal regulatory
24 process that we are aware of. And so that is an
25 outline of the seismic risks that we are concerned

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 about.

2 In addition to this, I've spoken about
3 location, I've spoken about risk in terms of the
4 seismic damage or the potential for an earthquake
5 that's beyond the design basis of the plant.

6 I would also like to talk about the
7 consequences again. And in our petition, Riverkeeper
8 included and also cited, too, a 2004 report we
9 commissioned from the Union of Concerned Scientists,
10 Dr. Ed Lyman.

11 The report is called "Chernobyl on the
12 Hudson," and that report describes how a loss of
13 coolant accident could lead to extremely catastrophic
14 near-term and long-term fatalities and economic and
15 property damage in the area that would be affected by
16 a significant radiological release from Indian Point.

17 And so, taken together, we have the
18 location of Indian Point, we have the seismic risk, we
19 have the consequences of an accident spelled out in an
20 independent report.

21 Finally, I would just like to comment on
22 the, -- and this relates back to location,
23 Riverkeeper's ongoing concerns about the feasibility
24 of evacuating both the 10-mile area around the plant,
25 which is the designated emergency planning zone, as

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 well as the absolute lack of feasibility of evacuating
2 a larger 50-mile zone around the nuclear plant.

3 And these comments are given in light of
4 what has happened at Fukushima, Japan, and the NRC's
5 recommendations to Americans living in Japan to
6 evacuate to 50 miles from that plant.

7 And on that note, I will end my
8 preliminary comments and turn it over to Mark Leyse.
9 And I may give a few additional comments at the end of
10 our presentation. But for now, I'll turn it over to
11 Mark to give his presentation of the technical basis.

12 Thank you.

13 MR. M. LEYSE: Thank you, Phillip.

14 I first wanted to see, because I'm going
15 to probably be maybe half an hour or so, I wanted to
16 see if anyone else wanted to say anything before I
17 started.

18 Okay. In such case, I will proceed.

19 One thing, just before I begin, I want to
20 point out that the scenario we're discussing is a
21 fast-moving accident, where Fukushima, I would
22 classify as a slow-moving accident.

23 What we're talking about, you could have a
24 partial meltdown that is well underway within ten
25 minutes time after a large pipe break, but I will get

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 back to that.

2 And first, I want to start out -- that in
3 the petition, I think the Petition Review Board should
4 look at page 34, there's a statement that says that
5 the Atomic Energy Commission, in responses to
6 questions submitted by Anthony Z. Roisman, this was in
7 the original Indian Point Unit 2 licensing hearing,
8 Atomic Energy Commission stated that the calculated
9 metal water reaction is negligible below 1900 degrees
10 Fahrenheit.

11 Now, that is one of the major premises on
12 which the original Unit 2 was licensed. And I want to
13 point out that there is data from thermal hydraulic
14 experiments that demonstrates that the zirconium-steam
15 reaction is not negligible below 1900 degrees
16 Fahrenheit.

17 I will talk about a test, it's from
18 Thermal-Hydraulic Experiment 1, it's TH-1, and that's
19 test number 130.

20 TH-1 test 130 was driven by small amounts
21 of fission heat, such that it would simulate decay
22 heat that would occur during a loss of coolant
23 accident.

24 In TH-1 test number 130, the reactor shut
25 down when the peak cladding temperature was

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 approximately 1,850 degrees Fahrenheit. And after the
2 reactor shut down, cladding temperatures kept
3 increasing because of the heat that was generated from
4 the metal-water reaction.

5 And the peak measured cladding temperature
6 was 2,040 degrees Fahrenheit, so there would have been
7 a very small amount of heat that would have been added
8 from actual decay heat.

9 I just want to explain, there was
10 originally a very small amount of fission heat to
11 simulate decay heat, so they're running at very low
12 power, actually 0.37 kilowatts per foot, so there
13 would have been, say, 5 percent of that value. But
14 that wouldn't be enough to push the cladding
15 temperature up 190 degrees Fahrenheit after the
16 reactor shut down.

17 So, data from thermal-hydraulic
18 experiments demonstrates that the zirconium-steam
19 reaction is not negligible below 1900 degrees
20 Fahrenheit, and that was one of the original premises
21 on which Indian Point Unit 2 was licensed.

22 And that still holds true today, because
23 what they had back then was the Baker-Just
24 correlation. And if the Baker-Just correlation would
25 calculate that the metal-water reaction is negligible

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 below 1,900 degrees Fahrenheit, so would a best-
2 estimate metal-water correlation. What they use at
3 Indian Point now is best estimate, and that's like
4 Cathcart-Pawel.

5 So, this is a very serious problem. You
6 have experimental data -- this was from an experiment
7 that was conducted in the early 1980s, and you did
8 nothing.

9 You have not examined that. You're still
10 allowing these plants close to New York City to
11 operate, and you've done nothing to address the
12 problem that actual experimental data demonstrates
13 that the metal-water reaction is not negligible below
14 1,900 degrees Fahrenheit. It's actually very
15 substantial below 1,900 degrees Fahrenheit.

16 Another thing is, that information from
17 those tests, the TH-1 tests, in 2005, NRC stated that
18 it was actually reviewing that data from the TH-1
19 tests to determine its value for assessing the current
20 generation of codes, that would be computer models
21 such as TRAC-M, now renamed TRACE.

22 So in 2011 dollars, billions of dollars
23 have been spent on LOCA research, and I think it's
24 about time that NRC fixed the flaws in its LOCA
25 evaluation models.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 And currently, the heat transfer
2 coefficients used in LOCA evaluation models are still
3 not based on tests that were actually conducted with
4 zirconium alloy bundles.

5 What you have are tests that were
6 conducted with stainless steel bundles, and I will get
7 back to it, but it's just an observation, it seems
8 that NRC really does not like to conduct experiments
9 with zirconium alloy bundles.

10 First, you have the metal-water reaction
11 correlations. Those are based off of very tiny tube
12 specimens instead of being based off of zirconium
13 alloy bundles. And there is experimental data that
14 shows that the reaction rates are different.

15 And then, when it comes to the heat
16 transfer coefficients, it's the same thing. You don't
17 have the zirconium alloy bundle. Instead, you use a
18 stainless steel bundle, and stainless steel just does
19 not oxidize. And the oxidation just doesn't generate
20 heat like a zirconium alloy bundle does.

21 And yet, you have all this data, and
22 you've done nothing to improve your computer models,
23 and you're allowing Indian Point to operate in the
24 face of all of this data that shows that there are
25 major flaws in your models.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 Now, next, I'm going to move on to
2 something that I point out, I think this section
3 starts on page 24 of the petition. It's regarding
4 Entergy's best estimate ECCS evaluation calculations.

5 I want to point out that there is a report
6 from the Nuclear Energy Agency Group of Experts, OECD,
7 Nuclear Energy Agency, the title of the report is,
8 "In-Vessel and Ex-Vessel Hydrogen Sources." I'm
9 quoting from part one, "GAMA perspective statement on
10 in-vessel hydrogen sources." This was published in
11 2001, ten years ago.

12 And I quote from that, "Until recently,
13 the experimental data base on quenching phenomenon was
14 rather scarce. The available zircaloy-steam oxidation
15 correlations were not suitable to determine the
16 increased hydrogen production in the few available
17 tests, CORA, LOFT LP-FP-2."

18 Now, in the petition that Riverkeeper
19 submitted, there is a lengthy discussion of the CORA
20 tests and also the LOFT LP-FP-2 experiment. Now,
21 those are -- they are large, integral experiments,
22 well, especially LOFT LP-FP-2. That's a large
23 integral experiment.

24 And you just get a different metal-water
25 reaction rate than you do from your Baker-Just or

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 Cathcart-Pawel, which are based on experiments with
2 tiny tube specimens, like one inch long, very small.

3 Anyway, because there were problems with
4 these metal-water correlations for determining the
5 increased hydrogen production in experiments like LOFT
6 LP-FP-2, we argue that this indicates that the
7 available zircaloy oxidation kinetics models,
8 including best estimate models used at Indian Point
9 are non-conservative for use in analyses that
10 calculate the metal-water reaction rates that would
11 occur in the event of a LOCA.

12 So, this OECD Nuclear Energy Agency paper
13 was published in 2001. It explicitly states that
14 there are problems with these correlations when
15 they're applied to integral experiments.

16 And the NRC has done nothing, again,
17 absolutely nothing. In fact, in 2002, Robert H.
18 Leyse, submitted a petition. It was called PRM-50-76.
19 And that petition addressed the fact that the Baker-
20 Just and Cathcart-Pawel correlations are deficient
21 because they were not developed to consider how heat
22 transfer would affect zircaloy-steam reaction kinetics
23 in the event of a LOCA.

24 And NRC denied that petition in 2005, and
25 one of the reasons they used to justify -- one of

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 their statements was that there was no data available
2 to substantiate Robert H. Leyse's claims.

3 Meanwhile, you know, there was this paper
4 published in 2001, but apparently that didn't seem to
5 matter, even though it was an OECD Nuclear Energy
6 Agency paper.

7 Now, I just want to mention just to kind
8 of examine in more detail what NRC said in its denial
9 of PRM-50-76. It's -- now I'm quoting. This is NRC's
10 statement.

11 "For the development of oxidation
12 correlations, limited by oxygen diffusion into the
13 metal where well-characterized isothermal -- " (that's
14 holding the temperature of the specimen constant,) " -
15 -tests are more important than the complex thermal-
16 hydraulics suggested by Robert H. Leyse."

17 "Robert H. Leyse's suggested use of
18 complex thermal-hydraulic conditions would be counter-
19 productive in reaction kinetics studies, because
20 temperature control is required to develop a
21 consistent set of data for correlation development."

22 "Isothermal tests allow this needed
23 temperature control. It is more appropriate to apply
24 the developed correlations to more prototypic
25 transients, including complex thermal-hydraulic

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 conditions to verify that the proposed phenomena
2 embodied in the correlations are indeed limiting."

3 "This was what was done by Westinghouse in
4 WCAP 7665," (that's the FLECHT report), "and by
5 Cathcart-Pawel in NUREG-17, and by the NRC in its
6 technical safety analysis of PRM-50-76."

7 Now, I know I'm repeating myself, but
8 again, here you had an integral test, and it -- like I
9 said, published in 2001 in an OECD Nuclear Agency
10 Paper, and it explicitly stated that the available
11 zirconium alloy steam oxidation correlations were not
12 suitable to determine the increased hydrogen
13 production in the few available tests, including the
14 LOFT LP-FP-2 experiment.

15 Now, I just want to touch upon
16 Westinghouse's analysis of WCAP 7665. This would be
17 the analysis of the four zircaloy bundle runs that
18 were conducted in the FLECHT experiments. These are
19 very important experiments.

20 The Appendix K to Part 50 is still based,
21 for reflood heat transfer coefficients, that's based
22 on the test with stainless steel fuel rods from WCAP
23 7665.

24 But anyway, back to the zirconium bundle
25 runs, four of them, I point out that in the petition

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 that there was no -- well, I'm not sure if I mentioned
2 it in the petition, but I've pointed it out, there was
3 no metallurgical data from the locations of run 9573
4 that incurred runaway oxidation, because Westinghouse
5 did not obtain such data.

6 So neither Westinghouse nor the NRC
7 applied the Baker-Just correlation to metallurgical
8 data from locations of run 9573 that incurred runaway
9 oxidation.

10 And in its analyses, NRC did not apply the
11 Cathcart-Pawel oxygen uptake and zirconium dioxide
12 thickness equations to metallurgical data from those
13 locations since, as I said, those locations were not
14 measured.

15 And furthermore, it's reasonable to assume
16 that, as in the CORA-2 and CORA-3 experiments in which
17 local steam starvation conditions are postulated to
18 have occurred, during FLECHT run 9573 the violent
19 oxidation essentially consumed the available steam, so
20 that the time-limited and local steam starvation
21 conditions, those that cannot be detected in a post-
22 test investigation, those would have occurred.

23 Now, those would have occurred at the
24 locations where runaway oxidation did not occur. But
25 as I pointed out, Westinghouse didn't take

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 measurements from the parts that actually incurred the
2 runaway oxidation for that one bundle. They measured
3 the parts that would have been steam-starved, and that
4 is just not a legitimate verification of the adequacy
5 of Baker-Just and Cathcart-Pawel for use in ECCS
6 evaluation calculations.

7 And I think just the fact that NRC didn't
8 really look into what was really going on, the fact
9 that they weren't analyzing sections of that bundle
10 that did incur runaway oxidation, and they were
11 actually evaluating sections that would have most
12 likely been steam starved.

13 Now, I want to point out that here we are
14 talking about problems with metal-water reaction
15 correlations for use in analyses that would predict
16 the metal-water reaction rates that would occur in the
17 event of a LOCA. But this was actually, this very
18 same issue was raised about 40 years ago by Union of
19 Concerned Scientists during the original licensing
20 hearing for IP-2.

21 Dan Ford of UCS, for example, he pointed
22 out that the Baker-Just correlation was, and I quote,
23 "derived from experimental data that is completely
24 outside of the context of nuclear systems," end of
25 quote.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 So that means, it's derived from single-
2 rod separate effects tests, and he also pointed out
3 that this metal-water reaction correlation had not
4 been derived from integral, you know, large-scale
5 integral tests.

6 And that's in the petition, in a section
7 that starts at page 21. So that gives you some
8 history, that this has been going on for quite a
9 while, criticisms of this type of problem.

10 And I want to point out that Baker-Just,
11 again, Baker-Just is not used at Indian Point now.
12 What they presently use are best estimates, and that
13 also involves the Cathcart-Pawel correlation.

14 Now, just to point out, Cathcart-Pawel,
15 that correlation is based on data conducted with
16 experiments in two different furnaces. And in one,
17 the specimen was 18 inches long, but actually, only a
18 small segment of that tube in close proximity to the
19 thermocouple station served as the specimen. The
20 other -- the full 18-inch length, part of that was to
21 just hold it in place.

22 And then, in a different furnace, the
23 specimen was about 1.2 inches long. So, you know, is
24 it any wonder that you'd get these metal-water
25 reaction correlations derived from such small tube

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 experiments, and then when you do a larger-scale test,
2 like LOFT LP-FP-2, these correlations, -- they're not
3 suitable for analyses.

4 And the increased hydrogen production that
5 -- in a test like LOFT LP-FP-2 -- these correlations
6 fall short of predicting that.

7 So, again, LOCA model evaluations, the
8 models are flawed, and there's data out there that
9 demonstrates that they're inadequate for use in
10 analyses.

11 The metal-water reaction correlations are
12 inadequate for use in analyses that predict the
13 zircaloy oxidation rates that would occur in a LOCA,
14 and yet, the NRC still does not do anything to fix the
15 problem.

16 And now, I want to describe the type of
17 accident that we're talking about in the petition. As
18 I had mentioned before, Fukushima is what I would call
19 a slow-moving accident, as opposed to this, which is a
20 fast-moving accident.

21 Once there was a loss of coolant accident
22 at either plant, within about 60 seconds, the peak
23 cladding temperatures, they would start approaching
24 temperatures up around 1,000 degrees Celsius, around
25 1,832 degrees Fahrenheit. That would happen within

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 about 60 seconds' time.

2 And what could happen at that point is
3 that in a local area, the fuel rods could incur
4 runaway oxidation, and then, within another 60 seconds
5 or so, there would be a rapid temperature escalation,
6 and it could get up to about 3300 degrees Fahrenheit,
7 where the -- that's where zircaloy starts to melt, or
8 zirconium alloy starts to melt. I believe the Indian
9 Point plants actually have Zirlo in them, but that is
10 also a zirconium alloy.

11 And so within a couple of minutes also
12 there would be extensive core damage. And this is all
13 depicted in Appendix F of the petition. There's a
14 graph there that shows the progression of a serious
15 accident and how this is very rapid.

16 And this is all based off of data like the
17 LOFT LP-FP-2 experiment and also the CORA experiments,
18 in which there was data that recorded these rapid
19 temperature escalations, commencing at temperatures as
20 low as 1,832 degrees Fahrenheit.

21 So just what happens, again, just in a
22 little more detail, the loss of coolant accident, so
23 the fuel is uncovered, and they're trying to pump
24 water back into the core. There can be problems with
25 pressurized water reactors, there can be steam

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 binding. So we're arguing that the models used at
2 Indian Point for Unit 2 and 3, the predicted maximum
3 temperatures of the fuel rods is 1,937 degrees
4 Fahrenheit and 1,961 degrees Fahrenheit respectively.
5 That's what's predicted.

6 But we're saying that as the fuel rods
7 approach those temperatures, all taking place within
8 under a minute, it could incur runaway oxidation. And
9 then that is going to drive the temperature in the
10 local area up to around 3,300 degrees Fahrenheit.

11 Meanwhile, as they're rising up,
12 increasing rapidly in temperature, there are also
13 other assembly components, like the control rods,
14 they're going to be rapidly moving up behind them,
15 maybe around 400 degrees Fahrenheit behind them.

16 And then when the stainless steel cladding
17 or casing of the control rods, when that gets up to
18 around 2,200 or so Fahrenheit, it can have eutectic
19 reactions with Zircaloy, and that can cause
20 liquefaction at those temperatures. This was observed
21 on cameras in the CORA experiments.

22 And then you can also have a problem at
23 that temperature, the inside of the control rod, which
24 is silver, indium, and cadmium, that has melted at a
25 lower temperature. But when it gets up to around

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 2,200 Fahrenheit, that can burst, and that can spray
2 out onto zircaloy and also dissolve it rather rapidly,
3 again, observed on cameras.

4 So we're talking about a great,
5 substantial amount of damage that can occur within
6 just a couple minutes' time. Again, this is in
7 Appendix F of the petition.

8 So in under ten minutes' time, there would
9 be a substantial amount of hydrogen generation from
10 this, hydrogen from the zirconium alloy oxidation,
11 hydrogen from the oxidation of stainless steel at
12 higher temperatures, but primarily from the zirconium
13 alloy. And there would also be a substantial amount
14 of hydrogen in the containment building.

15 And now, I want to just point out and
16 refer to an article -- or, not an article, it was an
17 entry, a New York Times entry that Matt Wald wrote.
18 It was on the Green, a blog about energy and the
19 environment, and dated March 31st, 2011.

20 And there is a quote from the Indian Point
21 spokesman, James F. Steets. So I just want to read
22 from one sentence from Matt Wald's article.

23 "James F. Steets, a spokesman for Indian
24 Point, said that Units 2 and 3 there each had two
25 recombiners, and that one alone could eliminate all

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 the hydrogen in a major accident."

2 So I just want to point out that according
3 to one paper, what Steets said is just simply
4 incorrect. Now, again, this is just one paper that I
5 have, but I want to read from that. It's Nuclear
6 Engineering and Design, Number 230, published in 2004.

7 The title is, Studies on Innovative
8 Hydrogen Recombiners as Safety Devices in the
9 Containments of Light Water Reactors. And on page 49,
10 I'm going to read from the abstract.

11 "In order to prevent the containment and
12 other safety-relevant components from incurring
13 serious damage caused by the detonation of the
14 hydrogen-air mixture generated during a severe
15 accident in light-water reactors, passive
16 autocatalytic recombiners are used for hydrogen
17 removal.

18 "These devices make use of the fact that
19 hydrogen and oxygen react exothermically on catalytic
20 surfaces, generating steam and heat. "

21 "Experimental investigations at several
22 research facilities indicate that existing passive
23 autocatalytic recombiner systems bear the risk of
24 igniting the gaseous mixture due to an overheating of
25 the catalyst elements, caused by a strong reaction

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 heat generation."

2 And then, the conclusion of the paper, on
3 page 59, I want to read from that, and this more
4 addresses the issue that was addressed by Mr. Steets.
5 Actually, I'm not sure if I stated the title of Matt
6 Wald's blog entry. That's "U.S. Drops Nuclear Rule
7 Meant to Avert Hydrogen Explosions."

8 So this basically, this conclusion
9 addresses more what Mr. Steets had said. And I quote,
10 "Even if recombiners could be made safe against
11 unintended ignitions, these devices cannot solve the
12 hydrogen problem for severe accidents. Conversion
13 rates of present systems are not sufficient for
14 massive hydrogen release, and hydrogen transport to
15 the recombiners cannot be assured in a sufficient way.
16 The combination of passive autocatalytic recombiners
17 with other existing concepts for hydrogen mitigation,
18 for example, inerting or diluting, seems to be
19 advisable, even if these concepts also have
20 limitations. "

21 "One example is the reinforcement of
22 passive autocatalytic recombiners by means of
23 catalytic coated thermal insulation elements, as
24 proposed in the THINCAT project.

25 "The introduction of igniters, as

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 discussed in the past, still seems to be very
2 questionable, as the prediction of hydrogen
3 distribution and combustion in the containment is at
4 present not reliable enough to ensure safe application
5 of this measure."

6 That's the end of that quote.

7 And now, I want to move on to talking
8 about stainless steel thermal-hydraulic experiments,
9 and discuss them, because so far, I've spoken about
10 the metal-water reaction correlations, and now I want
11 to talk about heat transfer experiments that -- in the
12 petition, starting on page 104, there is a discussion
13 of a stainless steel test that's commonly included as
14 a benchmark for the validation metrics of several
15 computer codes, and this is the FLECHT-31504 test.

16 And just to briefly describe that test,
17 FLECHT-SEASET test 31504 had a rod peak power, it was
18 0.7 kilowatts per foot, a reflood rate of
19 approximately one inch per second, and the PCT at the
20 onset of reflood was about 1,585 degrees Fahrenheit,
21 and the overall peak cladding temperature was about
22 2,100 degrees Fahrenheit. So, there was an increase
23 of 516 degrees Fahrenheit in that test.

24 But, I point out, in the petition, that if
25 the FLECHT-SEASET test 31504 had been conducted with a

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 zirconium alloy instead of with a stainless steel
2 bundle, the test results would have been very
3 different, and that with high probability, the maximum
4 temperatures of the bundle, if it were a counterpart
5 test, were done with a zirconium alloy bundle, that
6 they would have exceeded the 2,200 degrees Fahrenheit
7 peak cladding temperature limit, and the bundle would
8 have, with high probability, incurred runaway
9 oxidation.

10 And it's very unfortunate that NRC has
11 actually never, never conducted a counterpart thermal-
12 hydraulic experiment with a zirconium alloy multi-rod
13 bundle.

14 This FLECHT-SEASET 31504 test is obviously
15 very important. It's used as, like I said, a
16 benchmark for computer codes. It's discussed at
17 length in a recent study -- or program description of
18 the rod bundle heat transfer facility program that's
19 being conducted right now at Penn State. But there's
20 never been a counterpart test conducted with a
21 zirconium alloy bundle.

22 And I know I'm not supposed to ask
23 questions at the meeting, but I mean, nonetheless, I
24 mean, can you tell me why NRC has never conducted such
25 a test? And if you don't want to answer that, could

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 you at least think about that question?

2 It seems pretty outrageous, frankly. Here
3 you have computer codes, and the heat transfer
4 coefficients that are used in them are based off of
5 tests conducted with stainless steel bundles, and then
6 you've never conducted counterpart tests with the same
7 test parameters with zirconium alloy bundles.

8 The TH-1 tests that were conducted in the
9 early '80s, actually, one of the parameters or
10 conditions for those tests was that they didn't want
11 the peak cladding temperatures in those tests to
12 exceed 1,900 degrees Fahrenheit, and they said that
13 was actually for safety reasons.

14 And I can sympathize with people who
15 conduct tests, but the point is, the real limit is
16 2,200 degrees Fahrenheit, so NRC needs to conduct
17 tests with zirconium alloy bundles with different
18 parameters, in which the peak cladding temperature
19 would go up to at least 2,200 degrees Fahrenheit.

20 But the real problem is, if you do tests
21 like that, you're not going to have a peak cladding
22 temperature that goes up to 2,200. You're going to
23 have runaway, and it's going to just go up to the
24 point where you have rapid oxidation, and you're going
25 to have melting of the rods, etcetera.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 So, again, I think it's time for the NRC,
2 this experiment is obviously very important, the
3 FLECHT-SEASET 31504, to conduct a counterpart test
4 with a zirconium alloy bundle.

5 And I think that could be part of the
6 technical analysis of PRM-50-93. For example, NEI has
7 pointed out that, they say, oh, 50-93, it depends too
8 much on the results of severe fuel damage experiments,
9 and the results would be entirely different if that
10 petition were based off of the results of thermal-
11 hydraulic experiments.

12 Well, the real problem I had writing that
13 is that there really is no data from thermal-hydraulic
14 experiments conducted with zirconium alloy bundles,
15 because you haven't done such experiments.

16 And in that petition, I discuss the TH-1
17 tests rather extensively. I do what I can to use that
18 very limited data to draw conclusions. I state that
19 if the initial peak cladding temperatures in those
20 tests had been higher, that they would have incurred
21 runaway oxidation.

22 But the point is, I was very limited,
23 because there's such a limited amount of data. But if
24 you really want to do an analysis of PRM-50-93, what
25 you do is you just conduct a counterpart test to

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 FLECHT-SEASET 31504, and you see what happens. You do
2 that with a zircaloy bundle.

3 And I just want to point out that here
4 I've been talking about tests, you know, TH-1 tests
5 from the early 1980s, and all of these FLECHT tests.
6 Those were done about 40 years ago.

7 Presently, as I discuss in the petition,
8 there is the test facility, it's the RBHT test
9 facility. That's at Penn State. And they're
10 conducting thermal-hydraulic experiments with Inconel
11 600 rods.

12 And I just want to read some information
13 that's also in the petition. Let me tell you what
14 page that's starting on. That's starting on page 116.
15 That's where I describe the current heat transfer
16 experiment program that uses Inconel 600 bundles.

17 And according to NRC's Advisory Committee
18 on Reactor Safeguards, this is a statement made in
19 2010, the rod bundle heat transfer facility program
20 was developed to address issues related to emergency
21 core cooling, including phenomena that would affect
22 peak cladding temperatures.

23 Now, as the test plan for the RBHT, the
24 test plan points out, it states, "oxidation is not
25 simulated in the RBHT facility tests since the

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 cladding is Inconel," and as the test plan also
2 acknowledges, "Inconel will not oxidize, while
3 zircaloy will oxidize and create a secondary heat
4 source at very high PCTs. Zircaloy reaction can be
5 significant at high temperatures."

6 So here you have ACRS, they're talking
7 about this program, and it's supposed to be addressing
8 issues relating to emergency core cooling, including
9 phenomena that would affect PCTs, and yet, ACRS can't
10 put two and two together? You know, that these tests
11 are conducted with Inconel 600, and as the test plan
12 explicitly states there will not be the additional
13 heat generated from the zirconium alloy that will
14 affect the PCTs? I don't know what to say. Actually,
15 I don't think I'll comment on that. I think it speaks
16 for itself.

17 So, currently, here we have the heat
18 transfer coefficients used in LOCA evaluation models,
19 they're still not based on data from thermal-hydraulic
20 experiments conducted with zirconium alloy bundles,
21 and there are currently no plans underway to make them
22 based on such data.

23 And I want to really point out that this
24 program, the rod bundle heat transfer facility
25 program, it's not just like these tests are worthless.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 These tests do not help public safety. It's actually,
2 these tests decrease public safety because the results
3 of these experiments conducted with stainless steel or
4 Inconel 600 multi-rod bundles, they're going to lead
5 the interpreters of tests to false conclusions.

6 For example, a test conducted with a
7 stainless steel or Inconel 600 multi-rod bundle heated
8 up to peak cladding temperatures between 1,832
9 degrees Fahrenheit and 2,200 degrees Fahrenheit, that
10 is not going to incur runaway oxidation. It's not
11 going to have much oxidation.

12 However, a zirconium alloy multi-rod
13 bundle heated up to those same temperatures, between
14 1,832 and 2,200 degrees Fahrenheit, with high
15 probability, that's going to incur runaway oxidation.

16 So what we have going on, and you can read
17 this, it's in a ACRS meeting on heat transfer from
18 last year, I believe it was dated October 18th,
19 they're discussing results from this facility, the rod
20 bundle heat transfer facility.

21 And they're saying that, well, because of
22 what we see, we can actually have more power uprates.
23 We can have more power uprates, because we see that
24 our models are overly conservative. But it's a pure
25 fantasy. There's no foundation.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 So, like I said, all you need to do, you
2 conduct a counterpart test to FLECHT-SEASET 31504.
3 You do that with a zirconium alloy bundle and you'll
4 see -- you'll find out what's wrong with your models.

5 And I think you should just stop funding
6 programs like the RBHT program where they're not using
7 zirconium alloy bundles. And I just want to point out
8 that you're a regulator, and your job is to protect
9 public and plant workers' safety. And you need to
10 have realistic experiments.

11 And this is pretty much where I want to
12 conclude. I just want to point out that what I have
13 presented are generic issues, and what Phillip
14 Musegaas focused on I think are extremely important
15 issues that demonstrate that this petition, because of
16 where Indian Point is located, that it also addresses
17 plant-specific issues.

18 And I think it's really time that NRC has
19 Entergy lower the licensing basis peak cladding
20 temperatures of Indian Point Units 2 and 3 and also
21 has Entergy demonstrate that for Indian Point Units 2
22 and 3, that the ECCS systems would effectively quench
23 the fuel cladding in the event of LOCAs.

24 Thank you.

25 MR. MUSEGAAS: Thank you, Mark.

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com

1 MR. BOSKA: This is John Boska from the
2 NRC. I did want to make one comment before we
3 continue.

4 MR. MUSEGAAS: Sure.

5 MR. BOSKA: And that is, Mr. Leyse has
6 submitted a rulemaking petition for our rule 10 CFR
7 50.46 on LOCA analysis, and his rule-making petition
8 is PRM-50-93. The NRC has accepted that petition for
9 review, and we are proceeding with the review of that
10 petition. So let me just make that one point.

11 MR. DUDLEY: On that basis, I think the
12 NRC would also like to note that we are not ignoring
13 the issues that you are raising in this phone call.
14 We are, in fact, reviewing them as part of PRM-50-93
15 and 50-95, which is actively ongoing at the present
16 time. That was Richard Dudley.

17 MR. M. LEYSE: Okay. Mark Leyse. I just
18 want to -- yes, I really appreciate that, and I am
19 aware of the fact that you're reviewing that, and I
20 appreciate that.

21 I think just more -- because it's been so
22 long that this problem has persisted, I think that's
23 more of the reason why I made some of the statements
24 that I made. But I really do appreciate that.

25 And as I had said, I really would advise

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 conducting counterpart tests to FLECHT-SEASET 31504.
2 I think you would really learn a lot of information
3 from that. But that's the last thing I want to say.
4 Thank you.

5 MR. MUSEGAAS: Thanks again, Mark. This
6 is Phillip Musegaas. I think that -- you know, I'll
7 hold any further comments. I'd like to hear what the
8 PRB has to say. Thank you.

9 MR. BOSKA: Thank you.

10 MR. R. LEYSE: Okay, this is Robert Leyse.
11 I just came back online. If I could just have a
12 second to talk about PRM-50-93 and the timing of its
13 review?

14 MR. M. LEYSE: Mark Leyse speaking. Of
15 course, you can.

16 MR. R. LEYSE: Well, I was asking
17 permission from the guys who run the meeting.

18 Anyway, the fact is going back to the ACRS
19 meeting of last October, October of 2010, it was at
20 that meeting that I found out that NRC had changed its
21 deadline for reviewing PRM-50-93. There's a number
22 that I don't have available, but that review was to be
23 completed by September of 2010.

24 So, Mark Leyse submitted an enforcement
25 action, and that was thrown in as a petition, and

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 suddenly, there was no longer any deadline. It's all
2 in the record.

3 But I never found out that the September
4 2010 deadline had gone away until Bajorek mentioned it
5 at the October 2010 ACRS meeting. And at that point,
6 I wasn't in a position to be able to talk to the ACRS.

7 So, I wouldn't want anybody to make too
8 much of the fact that PRM-50-93 is under review. I
9 mean, apparently there was review done before
10 September of 2010, but I don't see it anywhere.

11 End of comment.

12 MR. BOSKA: All right, Mr. Leyse. Thank
13 you for your comment.

14 MR. BROWN: This is Fred Brown. Our
15 thanks to Riverkeeper for making the presentation.
16 Let me now ask the staff at NRC headquarters, do we
17 have any questions for Mr. Musegaas or Mr. Leyse about
18 the 2.206 petition?

19 No questions in headquarters?

20 The region, do you have questions?

21 MR. BICKETT: This is Brice Bickett from
22 NRC Region 1. None from Region 1.

23 MR. BROWN: Very good. Thank you.

24 At this time, does the licensee's
25 representative or representatives have any questions?

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 MR. WALPOLE: No comments or questions,
2 thank you.

3 MR. BROWN: All right. Thank you all.
4 Before I conclude the meeting, members of the public
5 may ask questions about the NRC's process for 2.206
6 petitions.

7 However, as stated at the opening, the
8 purpose of this meeting is to provide an opportunity
9 for the public to question or examine -- is NOT an
10 opportunity for the public to question or examine the
11 PRB regarding the merit of the petition request.

12 Are there any questions?

13 (Pause.)

14 Hearing none, I want to thank the
15 petitioners for their time and energy to make their
16 presentation to the Petition Review Board and to
17 provide the staff with clarifying information as to
18 the petition that you have submitted.

19 Before we close -- we don't have a court
20 reporter online?

21 COURT REPORTER: Yes, we do. I'm online.
22 I do have two questions.

23 MR. BROWN: Thank you, please.

24 COURT REPORTER: The first question is if
25 the people online from Entergy could identify

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

1 themselves. I didn't catch them the first time they
2 identified themselves.

3 MR. WALPOLE: Sure, it's Bob Walpole from
4 Indian Point.

5 COURT REPORTER: W-A-L-P-O-L-E?

6 MR. WALPOLE: That is correct.

7 COURT REPORTER: And there was one other
8 person from Entergy.

9 MR. WALPOLE: His name was Adi Irani, I-R-
10 A-N-I, first name A-D-I, Alpha Delta Indigo.

11 COURT REPORTER: Thank you very much. The
12 second question is if there is someone from the NRC
13 staff who I could call if I have questions. I don't
14 anticipate any now, but as I go over my notes, I
15 might. Is there someone who can give me their phone
16 number?

17 MR. BOSKA: You should call John Boska at
18 301-415-2901.

19 COURT REPORTER: 2901. Thank you very
20 much. It will be a call within the hour or none at
21 all.

22 MR. BOSKA: Thank you.

23 MR. BROWN: Thank you all.

24 (Whereupon, the above-entitled matter was
25 concluded at 2:15 p.m.)

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

www.nealrgross.com