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 with Southern California Edison Company
 DVD 1/4

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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AUGMENTED INSPECTION TEAM EXIT MEETING WITH SOUTHERN

CALIFORNIA EDISON COMPANY

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MONDAY

JUNE 18, 2012

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SAN JUAN CAPISTRANO, CALIFORNIA

DVD 1/4

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The meeting convened in the Community Hall at the San Juan Capistrano Community Center at 25925 Camino Del Avion, San Juan Capistrano, California, at 6:00 p.m., Richard Daniel, presiding.

NRC STAFF PRESENT:

RICHARD DANIEL, Facilitator

THOMAS BLOUNT

ELMO COLLINS

GEORGE CRAVER

EMMETT MURPHY

JOHN REYNOSO

JOEL RIVERA-ORTIZ

GREGORY WARNICK

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PRESENT: (CONTINUED)

GREGORY WERNER

ALSO PRESENT:

PETER DIETRICH, Southern California Edison Co.

DOUGLAS BAUDER, Southern California Edison Co.

THOMAS PALMISANO, Southern California Edison Co.

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

(10:10 a.m.)

1
2
3 FACILITATOR DANIEL: (Joins during
4 progress) with you tonight. First gentleman to the
5 right -- we'll start to the right -- is regional director
6 for Region IV, the NRC, Elmo Collins.

7 Immediately to his left is Tom Blount. He
8 is the acting director for division of reactor safety.

9 The gentleman in the red shirt is Greg
10 Werner. He is the branch chief in the AIP team lead.

11 And finally the guy with the good haircut
12 there is Greg Warnick, senior resident inspector.

13 Peter Dietrich, Southern California, soon
14 I'm going to allow you to introduce your own folks.

15 MR. DIETRICH: Yes. Thank you. Good
16 evening. Pete Dietrich, the senior vice president and
17 chief nuclear officer for Southern California Edison,
18 and we are pleased to be here tonight to be able to talk
19 about the status of our steam generator situations with
20 concerned members of the public and other stakeholders.

21 MR. BAUDER: Good evening, Doug Bauder,
22 state vice president, San Onofre.

23 MR. PALMISANO: Good evening. I'm Tom
24 Palmisano, vice president of engineering, projects and
25 site support.

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1 FACILITATOR DANIEL: Okay. So without
2 further ado, I'm going to turn this over to Mr. Elmo
3 Collins. Elmo?

4 MR. COLLINS: Thank you Rick. I hope the
5 microphone is working.

6 FACILITATOR DANIEL: Hang on a second.

7 MR. COLLINS: Does that sound better? I
8 want to make sure that everyone --

9 Is this better? I hope everyone can see
10 me. I might need a stool you know, maybe. Maybe a
11 pulpit, you know, like church, but not that, I'm not
12 going to do that tonight. Thank you Rick.

13 Southern California residents, Mr.
14 Dietrich and other Edison employees, members of the
15 media, NRC representatives, good evening. I think I
16 would also like to introduce to you tonight another NRC
17 representative who is here. This is Tom Hipschman.
18 He is a technical assistant for the NRC chairman -- Tom's
19 in the back there -- the NRC Chairman Dr. Gregory Jaczko.
20 So we are glad Tom could join us tonight for the meeting.
21 Thank you, Tom, for being here.

22 I want to thank everyone for taking the time
23 to come out tonight to hear the Nuclear Regulatory
24 Commission present results of our augmented team
25 inspection.

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1 I can see we have a large crowd. I trust
2 that represents the large amount of interest that you
3 have here in the results and what's going on at San
4 Onofre.

5 I expect that many of you had to travel to
6 get here and so I appreciate the time, the effort that
7 you made to come and listen to what you have to say to
8 you tonight.

9 We all know that both units at San Onofre
10 are shut down because of what has proved to be very
11 difficult technical issues which their steam
12 generators.

13 And I'll just start tonight by saying, so
14 far these issues are not resolved to the NRC's
15 satisfaction. Understandably --

16 (Applause)

17 MR. COLLINS: Understandably, I think
18 there is a lot of concern on your part, and I think that
19 concern is warranted.

20 For tonight's meeting we are here to present
21 the team's preliminary results to Edison, licensee, and
22 to you tonight, and we are going to talk to you about
23 those results, and NRC is glad to be here to share with
24 you what we know so far at the end of this stage of our
25 review.

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1 This is a different public meeting from what
2 we normally conduct. As Rick indicated, this is an NRC
3 inspection exit meeting. This marks the end of the
4 augmented team inspection which we started several
5 months ago and what you are going to hear tonight are
6 the preliminary inspection results.

7 There's no inspection report yet. That's
8 to come, we are guessing, in about 30 days. But tonight
9 you will hear what the inspection team found.
10 Additionally, the augmented inspection teams are
11 directed to focus on fact finding and information
12 gathering.

13 We have not yet made any decisions about
14 the resumption of power operations at San Onofre. Nor
15 have we made decisions about whether violations occurred
16 as a result of that inspection.

17 Those will be indicated to you, there is
18 requiring additional follow-up -- as follow-up items
19 when the team gives its findings. So I ask you tonight
20 to keep the issues that the team describes within that
21 context, remembering that the issues are not final
22 agency conclusions.

23 Rick talked about the comment and question
24 period we are going to have after we complete the
25 business part of the meeting. I think, at the risk of

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1 stating the obvious, I know there are a lot of questions
2 out there, and so we are going to be here to answer those
3 questions.

4 We'll tell you what we know and we'll tell
5 you when we don't know, and we'll tell you when we think
6 more work is needed, and I think the questions are going
7 to fall into all three of those categories.

8 I'll also just indicate for you, tonight's
9 meeting is what NRC views as the first in a series of
10 public meetings that we are going to have to conduct
11 associated with the follow-up on these technical issues.

12 We are going to be conducting additional
13 inspection. We are going to be getting submittals from
14 Edison in writing that we'll be following up on, so as
15 they work through the issues and the NRC inspects them,
16 we will continue to conduct public meetings with you.

17 We do believe additional work by Edison is
18 needed and we do believe additional NRC inspection is
19 needed, and that will have to happen before NRC is in
20 a position to make a decision about the acceptability
21 of a resumption of power operations at San Onofre.

22 I want to thank you again for being here,
23 and we hope the meeting is informative for you, and with
24 that, I think Tom Blount will introduce the Augmented
25 Inspection Team, and we'll get into our presentation.

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1 MR. BLOUNT: Thank you, Elmo. Is this all
2 right for everyone. I kind of thought we'd go through
3 that. Sorry. I would like to offer my thanks and
4 appreciation for everyone coming out this afternoon,
5 or this evening, as well.

6 Before we get into the inspection results
7 itself, I did want to take just a couple of minutes and
8 give you some appreciation or perspective regarding the
9 team and the team's background.

10 We recognize that this is an important and
11 pretty serious issue, and the agency as a whole engaged
12 in this inspection team and provided the resources
13 necessary to support that.

14 We had support from not only Region 4, but
15 from our four other offices as well, including Research
16 and our Nuclear Reactor Regulation. Region 2 also
17 supplies some support.

18 Some of the talent that we had on this team
19 included a steam generator tube integrity engineer, a
20 thermal hydraulics specialist, steam generator material
21 engineer, quality assurance and control engineer,
22 design and evaluation engineer, all led by a Branch Chief
23 from Region 4, Greg Werner, who is going to give you
24 the AIT results here momentarily.

25 This team had over 130 years of total

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1 experience that they brought to the table on this issue,
2 not only as the team was doing their work, but we also
3 had the rest of the agency engaged in supporting our
4 efforts.

5 So I just wanted you to be aware, we took
6 this very seriously and want to get the right resources
7 to apply to this issue and will continue to do so.

8 With that, then, I'd like to ask Greg
9 Warnick if he'd give us an overview of the event and
10 the steam generators themselves.

11 MR. WARNICK: Sure, thank you very much.

12 Good evening. I'd just like to give a high level
13 overview of the steam generator tube leak event, the
14 licensee's response to that event, and what I personally
15 observed on January 31st, 2012.

16 The San Onofre plant is designed to rapidly
17 detect small amounts of radioactivity, small amounts
18 of leakage from the reactor system to the steam system
19 using sensitive radiation monitors that continuously
20 monitor and sample for radioactivity, samples of steam
21 that makes it way from the steam generator to the turbine
22 generators.

23 Procedures are in place that should, on
24 indication of steam generator tube leaks, actions are
25 prescribed to put the plant into a safe condition to

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1 protect public health and safety.

2 Finally, operators are trained on these
3 types of events such that they can quickly diagnose
4 problems, implement procedures and make the necessary
5 decisions to minimize any radioactive release to the
6 environment.

7 On the afternoon of January 31st, I had just
8 returned to my office from performing a plant tour as
9 part of an inspection. At that time, I heard a PA
10 announcement about a secondary plant system radiation
11 alarm.

12 John and I, John is a Resident Inspector,
13 we were both in the office. We went directly to the
14 control room when we heard that PA announcement. Our
15 offices are less than 100 yards from the Control Room,
16 so we were there within moments.

17 Both John and I went there and observed
18 actions to ensure that -- to assess the conditions and
19 ensure that the appropriate actions were being taken.
20 Upon arrival, I determined that the plant had
21 appropriately responded to the tube leak by identifying
22 leakage from the Reactor Coolant System and alerting
23 the operators to the abnormal condition before any
24 licensed release limits had been exceeded.

25 The operators responded in accordance with

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1 their procedures to accurately diagnose a steam
2 generator tube leak. They accurately assessed
3 conditions to determine that a rapid power reduction
4 and a plant shutdown was necessary.

5 After the plant was shut down, the operators
6 promptly isolated the affected steam generator to
7 terminate the radiation release and continued on to cool
8 down and depressurize the plant.

9 Because of the plant design, the
10 established procedures and the skill and training of
11 the operators, SONGS Unit 3 was placed into a safe
12 condition and the radioactive release that did occur
13 was minimized.

14 Our regional experts have independently
15 quantified the release and concluded that it was only
16 a very small percentage of the release limits allowed
17 by the plant license, such that the release associated
18 with this event did not represent a threat to workers
19 on site, to the public or to the environment. Next slide

20 (Question off-mic)

21 MR. WARNICK: Excuse me?

22 PARTICIPANT: What percentage?

23 (Question off-mic)

24 MR. WARNICK: It's a very small percentage
25 and that will be a -- go ahead and bring that up during

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1 the question and answer period and I'll be happy to
2 answer that.

3 MEMBER OF AUDIENCE: And what was it that
4 was released, what kind of radioactivity?

5 (Question off-mic)

6 FACILITATOR DANIEL: Folks, hang on a
7 second. We're going to have a question and answer
8 period of time, comments and everything. Let the
9 gentleman finish his presentation and we will take your
10 questions at the appropriate time, okay? Thank you.

11 MR. WARNICK: Okay, again to reiterate, I
12 work at the plant every day, went to the Control Room
13 and assessed conditions. I'd like to now just talk
14 briefly about the steam generator function and some of
15 the structural components so that you will understand
16 some of the terms as we go through the balance of this
17 presentation.

18 The function of -- or the purpose of a steam
19 generator is essentially to make steam out of water.

20 It does this by acting as a large heat exchanger that
21 transfers heat from the primary radioactive system to
22 the clean steam system where it boils water into steam.

23 Hot radioactive water enters into the
24 bottom of the tube area and travels up through the inside
25 of the tubes, around the U-bend, back down to the cold

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1 side of the bowl area and returns to the reactor to be
2 reheated.

3 The clean secondary water enters into the
4 steam generator, it flows down around the outside of
5 the tube bundle, it is then directed up around the
6 outside of the tubes of the tube bundle region, where
7 it is heated up, it boils into steam and that steam acts
8 as the top of the steam generator to go to the turbine
9 to make the electricity.

10 Now I'll point out a few other structural
11 components, just, again, to aid in understanding of
12 terms we'll be using throughout the balance of this
13 meeting.

14 A divider plate separates the hot and cold
15 bowl areas. That divider plate also helps to direct
16 flow of the primary water up through the U-tubes. It
17 also acts as a support for the divider plate and the
18 steam generator internals.

19 It is hard to see in this picture, but the
20 vertical section of the tube bundle is supported by tube
21 support plates. Those tube support plates provide
22 structural support to that vertical section.

23 In this picture, again, it's hard to see
24 but there are small holes throughout the tube support
25 plates. There are several of them that go up through

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1 that vertical section. There are also flow channels
2 throughout the middle of the tube bundle region.

3 The upper U-bend section of the tube bundle
4 is supported by a system of anti-vibration bars and
5 retainer bars. The steam generators are 65 feet tall,
6 they are 14 feet in diameter and they have a little less
7 than 10,000 tubes throughout them to perform that
8 function of transferring heat to the water.

9 It was one of these tubes in one of these
10 steam generators, one of these 10,000 tubes that
11 developed a leak, and resulted in the event that I just
12 briefly highlighted, that happened on January 31st.

13 ***time test 103406

14 FACILITATOR DANIEL: Folks, we are going
15 to take a short break here. Basically we have too many
16 people in the room, over capacity and we are going to
17 take a short break and move some folks out in the
18 courtyard on the side -- over on this side of the
19 building.

20 So, there are speakers out there and I
21 promise you I will come out and take your questions.

22 So if you could slide out the door. So you folks along
23 the back wall, if you move outside.

24 (Pause for organization of audience)

25 MR. COLLINS: I appreciate everyone's

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1 cooperation. I apologize that we have to take this pause
2 and it's a disruption to our meeting, but this is, we
3 have been informed, important for safety, and important
4 for adherence to the fire code. So thank you so very
5 much for giving us this consideration.

6 (Pause while audience organized)

7 FACILITATOR DANIEL: Gil Leone (phonetic),
8 could you come back so I can speak with you please?
9 Gil?

10 (Off mic discussion about facility director
11 and fire code)

12 FACILITATOR DANIEL: For those folks that
13 are still standing there, okay, all right. We are going
14 to continue. Sign down, please. If you want to hold
15 up your sign, you can go outside and hold it up, but
16 not while you are seated.

17 (Off-mic remarks)

18 FACILITATOR DANIEL: I understand, but I
19 asked at the beginning, I asked at the beginning, that
20 signs be held in the back, because we are afraid somebody
21 might get hit in the head. We had that happen in another
22 meeting.

23 Okay, so -- ready? All right. We are
24 going to hear from Mr. Greg Werner here.

25 MR. WERNER: Good evening. I am Greg

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1 Werner, the Augmented Inspection Team leader. I am
2 going to go ahead and briefly discuss the decision to
3 conduct the augmented inspection.

4 During the pressure testing of the 129 tubes
5 on the Unit 3 steam generator, eight of the tubes failed
6 to meet the strength requirements necessary for tube
7 integrity.

8 Because the teams failed, this resulted in
9 conducting augmented inspection. Even before we made
10 a decision to perform the augmented inspection, two
11 Region 4 inspectors were already on site, accomplishing
12 the Unit 2, in-service inspection of the steam
13 generators.

14 This was part of the normal NRC inspection
15 program. We always complete an in-service inspection
16 that looks at 100 percent of the tubes after the first
17 outage for a replacement steam generator.

18 After the tube leak on Unit 3, we also
19 brought in Emmett Murphy from headquarters to assist.
20 Emmett has over 30 years of steam generator experience.

21 SONGS inspected 100 percent of all the steam
22 generator tubes on Unit 2 and 3, almost 40,000 tubes.

23 The NRC independently reviewed and analyzed the results
24 of the tube inspections and based upon our review of
25 the type of flaws on the Unit 3 tubes and the large number

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1 of tubes with deep wear and over a long length of the
2 tube, the NRC had very good reasons to believe there
3 had been multiple failures of tubes on Unit 3.

4 So even before the first tube failed, Region
5 4 was working to put together an inspection team and
6 inspection charter. Because of this, we had inspectors
7 on site during the pressure testing.

8 The Augmented Inspection Team was initially
9 on site for two weeks. However, the team has continued
10 to review large quantities of documents, including the
11 cause evaluations, the 50.59 evaluations, draft
12 operational assessments, thermal hydraulic and
13 vibration computer simulation models, as well as
14 numerous other documents.

15 In addition, various team members,
16 including myself, have traveled back to SONGS to observe
17 expert panels on the cause evaluation, computer
18 simulation operational assessment.

19 To date, the Augmented Inspection Team has
20 expanded well over 1500 hours associated with this
21 issue. Next slide, slide 11.

22 As Tom Blount mentioned earlier,
23 individuals with specialized expertise were brought in
24 from Region 4, Region 2, Office of New Reactors, the
25 offices of nuclear reactor regulation research at

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1 headquarters in Rockville, Maryland.

2 I'm going to discuss the key items or
3 objectives that the augmented team was tasked to look
4 at. We developed an event time line to look at the
5 design, construction, shipping, installation and
6 operation of both unit steam generators, reviewed
7 information to determine the causes. We looked at the
8 operational activities on the units to see if there was
9 impacts associated with those. We compared the
10 differences in the design manufacturing between the two
11 units, reviewed quality assurance and quality control
12 associated with the design and manufacturing of both
13 units' steam generators. We also reviewed
14 implementation of the generic communications and
15 industry lessons learned, to see if they incorporated
16 lessons learned that we gathered over the last 30 or
17 so years of steam generator use, reviewed the steam
18 generator simulation models. We also collected
19 information for the NRC risk assessment. We also looked
20 at other areas such as radiological controls that Greg
21 discussed.

22 One of the key areas that we wanted to
23 understand was the differences between Units 2 and 3.
24 Why was there more wear on Unit 3 than Unit 2, because
25 essentially the designs were identical?

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1 It's important to note that for a number
2 of items we not only looked at what SONGS did, but we
3 also gathered information from Mitsubishi. We looked
4 at what the residents collected during the rapid
5 shutdown of Unit 3. We wanted to make sure that the
6 operators of the plant responded appropriately to the
7 event.

8 The team looked at hundred and hundreds of
9 documents, including design, manufacturing and
10 operational information. We did our own independent
11 comparison of the information between the units. We
12 compared manufacturing information with design
13 information to check to see if the steam generators are
14 built in accordance with the design.

15 Where there were differences, we reviewed
16 the justification or the associated change
17 authorizations. Slide 12, please.

18 Now I plan to discuss what the Augmented
19 Inspection Team found. Throughout the US nuclear
20 industry, this is the first time that more than one steam
21 generator tube failed pressure testing.

22 As I discussed earlier, because of the
23 failure of the Unit 3 tube leak, 100 percent of the tubes
24 were inspected with subsequent pressure testing of 129
25 of those tubes on Unit 3.

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1 During this pressure testing on Unit 3,
2 eight tubes failed. The pressure testing identified
3 the strength of the eight tubes was not adequate, and
4 structural integrity might not be maintained during an
5 accident.

6 It is important that both SONGS and the NRC
7 understand what occurred and why. This is a serious
8 safety issue that must be resolved to prevent further
9 failures from occurring again. This information will
10 be shared throughout the nuclear industry.

11 SONGS did use multiple independent
12 consultants and steam generator manufacturers.
13 Personally I have never seen such a vast collection of
14 experts working together. They had academia,
15 independent consultants, industry experts from
16 different utilities as well as the industry itself, and
17 they also had four different steam generator designer
18 and manufacturers looking at the issues.

19 Next slide. These next two items that I'll
20 be discussing are really the most important items that
21 the NRC identified during inspection activities. These
22 are the ones that everybody, including us, were
23 interested in.

24 Actions will have to be taken to address
25 these to prevent the vibration that leads to the

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1 tube-to-tube wear from occurring again.

2 The team identified the primary cause of
3 the unexpected tube wear was higher than expected flow
4 velocities in the steam generators.

5 Early in our inspections, we independently
6 developed a simplified mathematical thermohydraulic
7 computer simulation model of the steam generators in
8 Units 2 and 3.

9 Using this, we determined that the computer
10 simulation used by Mitsubishi during the design of the
11 steam generators had underpredicted velocities of steam
12 and of water inside the steam generators by factors of
13 three to four times.

14 San Onofre also had three other steam
15 generator vendors conduct computer simulation. The
16 results of their computer simulation also showed
17 significantly higher steam velocities and confirmed our
18 results.

19 Now the next item that I am going to discuss
20 deals with the differences between Unit 2 and 3. We
21 looked at a number of different items. However we only
22 identified one item that we could essentially determine
23 as the cause.

24 The cause of the difference in the tube wear
25 between the Units 2 and 3 is associated with the

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1 manufacturing differences of the tubes and
2 anti-vibration bars.

3 For Unit 3, the anti-vibration bars do not
4 come in contact with the tubes as tightly as they do
5 on Unit 2, along with the higher steam and water flows
6 created to the conditions necessary for the high
7 vibration.

8 So essentially the tubes are not held in
9 place securely enough so it allows them to slide or
10 vibrate. SONGS has continued to analyze and develop
11 additional actions to fix and prevent this from
12 happening again. Next slide.

13 Now what I'd like to talk about is the item
14 or the items that the team identified that require
15 additional follow up. However on this 10, we only --
16 we believe that only two are related to the tube-to-tube
17 wear. I am just going to very briefly discuss these
18 items.

19 There's a post trip and transient
20 procedure. SONGS did not conduct a formal review of
21 the reactor trip because they considered a plant trip
22 when they shut down the unit. So we are going to look
23 at the procedure as well as the operator actions to
24 assess if it was appropriate.

25 We are going to evaluate and disposition,

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1 look at the numerous Unit 3 loose part monitor alarms.

2 The NRC needs to review how these alarms were evaluated.

3 We do have concerns that the alarms were treated as
4 what we call nuisance alarms, versus being evaluated
5 in accordance with procedures.

6 The retainer bar design was not evaluated
7 for vibration impacts. Although this sounds familiar,
8 this wear is not related to the tube-to-tube wear. We
9 are reviewing the design basis of the retainer bars.

10 We are also going to look at the evaluation
11 of and control of the Unit 3 divider plate repair. This
12 by far was the most significant difference between the
13 two units and it has been discounted as a potential cause
14 for the tube-to-tube wear.

15 The bowl of the steam generator that directs
16 the reactor fluid into the tubes as well as the plate
17 that separates the hot and cold reactor coolant had to
18 be cut out, repaired, re-welded and re-tested. Again,
19 we did not identify an issue related to the tube-to-tube
20 wear for this repair.

21 Unit 3 steam generator shipping
22 requirements were changed form what was required as
23 compared to Unit 2. There's nitrogen pressure, dew
24 point, and oxygen contents were not controlled or
25 monitored. These items are supposed to be controlled

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1 to minimize corrosion of the internals of the steam
2 generators.

3 Item number 6. Lack of tube bundle support
4 for the steam generators during shipment. The shipping
5 specification did not initially have a requirement for
6 a tube bundle support, or it have a requirement for tube
7 bundle support, but it was not used during shipment.

8 So again, we are going back to look at that to see how
9 that was dispositioned.

10 We are going to look at the shipping
11 accelerometer data for Unit 3. Steam generator 88,
12 which was one of the generators for Unit 3, had all
13 accelerometers register an excessive force, which could
14 indicate mishandling during the transportation of steam
15 generators. The NRC was not able to determine if this
16 was properly reviewed.

17 We are looking at the 50.59 adequacy. The
18 NRC is continuing to review the adequacy to SONGS 50.59.

19 We did identify a concern with the potential for using
20 a different methodology than what was described in the
21 updated final safety analysis report.

22 SONGS changed their structural analysis
23 method as well as a tube-stress calculation, and we need
24 to do some additional reviews on that to determine if
25 they should have asked for an amendment.

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1 The next two follow-up items, number 9 and
2 10, are the ones that the NRC believes are related to
3 the unexpected tube wear. As I discussed previously,
4 the manufacturing differences, Mitsubishi improved the
5 manufacturing process, which sounds like it should be
6 good.

7 However, they didn't go back and look and
8 see what that would do to the original design dimensions.

9 They didn't go back and compare, should they have
10 reviewed, revised, shrunk the design dimensions. So
11 this resulted in a less rigid tube bundle, which
12 contributed to the vibration issue.

13 And as I discussed before, item number 10,
14 the computer simulation model. Again, the Mitsubishi
15 model underpredicted the behavior of the steam and water
16 in the steam generators.

17 Again, as described earlier, the
18 combination of those two, the higher than predicted
19 steam water flow and the less rigid tube bundle for Unit
20 3, they vibrated and caused the tube-to-tube wear.

21 The NRC will be conducting additional
22 inspections to review each of these issues. We have
23 been and will be requesting additional information from
24 SONGS as part of our follow-up inspection activities.

25 This completes my discussion of the

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1 augmented inspections activities. I'm going to let Tom
2 Blount, turn it back to him. He's going to summarize
3 the key points associated with this inspection. Thank
4 you.

5 MR. BLOUNT: Thank you, Greg. So what we'd
6 like you to walk away from this inspection
7 understanding, is the NRC does understand what the
8 mechanistic causes of the tube degradation are. The
9 thermal hydraulic conditions were not accurately
10 predicted during the design phase.

11 However, additional actions, as Greg has
12 pointed out, additional actions are being evaluated and
13 developed by the licensee, and these additional actions
14 will need to be inspected by us to ensure that this
15 condition will not exist in the future.

16 The NRC is not done. We have not reached
17 any conclusion. We have got more inspection to do.
18 We recognize that and we want you to understand that
19 we recognize that. We'll take as much time as necessary
20 to ensure safety, the safety of these facilities, and
21 no decision to this point has been made. Okay?

22 With that, I'd like to ask Pete Dietrich
23 if he'd like to provide his response.

24 MR. DIETRICH: Thank you, Mr. Blount. I'm
25 Pete Dietrich, the Senior Vice President and Chief

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1 Nuclear Officer for Southern California Edison.

2 In our comments tonight, we'd like to update
3 you on the actions Southern California Edison has taken
4 and will take as we work to completely understand the
5 conditions of our steam generators and the effect on
6 San Onofre.

7 I'll make some opening remarks and then Doug
8 Bauder, our site vice president, will provide some
9 comments about the current conditions of the units, the
10 planned response to the tube leak and our learnings,
11 because we are a learning organization. We learn from
12 all things that occur in our facility. But Doug will
13 discuss our learnings in the area of our response.

14 Then Tom Palmisano, the vice president of
15 engineering, will summarize our technical evaluation
16 and the conclusions that we have reached to date. Much
17 work has been done, yet we still have much work to do
18 to fully understand and address what we have learned.

19 And then I will provide some closing remarks.

20 Just to start with, Southern California
21 Edison's overriding interest is the health and safety
22 of the public and our employees. Consequently, both
23 San Onofre units are shut down and will remain shut down
24 until repairs have been made and we and the Nuclear
25 Regulatory Commission are satisfied it is safe to

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1 operate.

2 We are disappointed that the situation has
3 occurred and we recognize the impact on our
4 stakeholders, including customers of Southern
5 California Edison, San Diego Gas and Electric and the
6 City of Riverside. We are also concerned about the
7 concerns that you have, members of the public and also
8 our neighbors.

9 So Southern California Edison understands
10 the significance of the unexpected tube-to-tube wear,
11 and we agree with the facts presented tonight by the
12 Nuclear Regulatory Commission.

13 We appreciate the NRC's insights into this
14 situation and we pledge to continue to work with the
15 NRC to assure any remaining or additional questions are
16 answered promptly.

17 Early on, we recognized the seriousness of
18 the situation. As a result of the complex technical
19 nature of the wear, we recognized that we needed to
20 assemble the very best team to augment our resources
21 and the resources of the steam generator designer and
22 manufacturer, Mitsubishi Heavy Industries.

23 As a result, we have brought together
24 experts in thermal hydraulics and steam generator design
25 from around the world to help us gain an understanding

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1 of the causes of this unexpected tube-to-tube wear and
2 potential corrective actions to address it.

3 The experts include such subject matter
4 experts from companies such as AREVA, Westinghouse and
5 B&W Canada. We have used this assembled team, as well
6 as other industry experts and consultants, to review
7 the progress of our work and challenge the thoroughness
8 and adequacy of our conclusions. And we will continue
9 to do so.

10 With that, I'd like to turn it over to Doug
11 to discuss the current status of the units and our
12 response to the tube leak.

13 MR. BAUDER: Thank you, Pete. I would like
14 to cover the current status of the San Onofre units.

15 Unit 2 remains shut down since January the 9th when
16 we started our planned refueling outage, an outage that
17 included a reactor vessel head replacement and planned,
18 full-scope testing of our Unit 2 steam generator tubes.

19 On January 31st, the San Onofre operators
20 shut down Unit 3 in accordance with plant procedures
21 after detection of a very small tube leak on that unit.

22 Their actions demonstrated the right,
23 conservative decision-making and focus on protecting
24 the health and safety of plant personnel and the public.

25 I observed from the Control Room our

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1 operators' response, and I was pleased with their calm,
2 deliberate approach to properly quantifying the leak
3 and the execution of our plant procedures to safely shut
4 down the plant.

5 In fact, in my discussions with the
6 operators after the event, they told me the plant
7 response lined up with their experience and training
8 on our simulator where they frequently train --

9 (Sound system interference)

10 MR. BAUDER: I'm going to switch mics.
11 Everything okay over there? That would be a no.

12 (Off-mic discussion)

13 MR. BAUDER: Thank you. So yes, to catch
14 us back up. In my discussions with the operators
15 following the shut down on January 31st, they confirmed
16 with me the planned response matched what they were
17 trained for and evaluated for in our plant simulator.

18 And that evaluation is frequently done before our
19 operators for steam generator tube leaks.

20 As a learning operation -- organization,
21 we have reviewed our plant equipment, our procedures
22 and our operator training programs as a result of the
23 shut down on January 31st.

24 We have improved our leak detection
25 capability. We have enhanced our operator training

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1 programs and built the lessons learned from this event
2 into our plant simulator training activities.

3 We have also reviewed the post-shutdown
4 critique process and we have enhanced the procedures
5 that tied the post-shutdown critique process to any
6 plant trip.

7 Also, we have shared this information with
8 the industry. As Pete indicated, we are a learning
9 operation. We are all about learning, building things
10 back into our processes and sharing them with the
11 industry.

12 In conclusion, our operators took prompt,
13 conservative actions to shut down Unit 3, placing the
14 very highest priority on protecting the health and
15 safety of the public.

16 At this point I would like to turn the
17 presentation over to Tom Palmisano to talk through
18 insights and perspectives on open items, as well as
19 Southern California Edison's technical work so far on
20 our steam generators. Tom.

21 MR. PALMISANO: Okay. Thank you, Doug.
22 Can you hear me okay in the back? Great. Thank you.

23 What I would like to do is provide an update on the
24 technical work to date on our investigations, and talk
25 about some of the upcoming actions that we have in place.

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1 And as Pete Dietrich has said and the NRC
2 has said, we have more work to do. We realize that.

3 And we're being very deliberate and conservative in
4 our approach to our work.

5 So first, Mr. Warnick did a good job of
6 giving you an overview of the steam generator's function
7 of the plant design and the steam generator design
8 itself. I just want to point out a couple of things.

9 Tom, if you highlight the steam generator.

10 Two key functions we're talking about tonight. One
11 is the transfer heat from the radioactive primary system
12 to the secondary side to boil water to make steam that
13 ultimately turns the turbine and generates electricity.

14 The other key function, and particularly
15 from a safety standpoint, is the function of the steam
16 generator tubes to prevent radioactive primary water
17 from leaking to the secondary side. So, those are the
18 two key functions we are focused on in this discussion
19 and in our current work. Next slide please.

20 In this slide, a cutaway of the steam
21 generator, we have already explained, or the NRC has
22 already explained the flow path. Just let me reiterate
23 it.

24 The hot radioactive water comes in through
25 what's called the hot leg at the bottom, flows up through

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1 the steam generator tubes, around the U-tube bend, the
2 top of the tubes, and down through the remaining straight
3 portion and out the cold leg.

4 The heat from that water is transferred to
5 the secondary side to boil the water to make the steam
6 that exits the top of the steam generator. Of
7 particular importance tonight is what's labeled the
8 U-bend section. This is where the tube-to-tube wear
9 has occurred that caused the tube leak in one of the
10 tubes, and also caused the damage in the other tubes
11 that caused us to do the in situ pressure test and caused
12 the test failures.

13 So it's the very top of the U-bend that we're
14 going to be talking about where the tube-to-tube wear
15 has occurred. Thank you, Tom. Next slide, please.

16 So, let me kind of summarize the actions
17 to date at this point. Following the Unit 3 shutdown
18 on January 31st, we performed a comprehensive and
19 rigorous inspection of all 19,454 steam generator tubes
20 in the two Unit 3 steam generators. Each steam
21 generator has 9,727 tubes, roughly 10,000 tubes per
22 steam generator. So we did a comprehensive inspection
23 of all of them.

24 We've reviewed these inspection results
25 with industry experts and identified the cause of the

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1 tube leak as unexpected tube-to-tube wear. This wear
2 caused one tube to leak and caused the other eight
3 tubes -- there were eight tubes that we talked about
4 -- to fail the in situ pressure testing.

5 Further inspection showed wear on 326 of
6 the these 19,454 tubes. So I'd like you to have that
7 perspective with those numbers. The wear is in a very
8 localized root area of that upper tube bundle we saw
9 on the previous slide, and based on the finding of this
10 unexpected tube-to-tube wear, we elected not to restart
11 Unit 2. Unit 2 was in the process of completing a
12 refueling outage, had already had all of its tubes
13 inspected, and was in satisfactory condition to operate.

14 We elected not to restart Unit 2 at that time.

15 We wanted to make sure, given the unusual
16 nature of this tube-to-tube wear in Unit 3, that we took
17 every opportunity to inspect and test Unit 2 to help
18 us understand what was going on with the Unit 3 steam
19 generator tubes. We felt that was very important.

20 Recognizing the significance of this
21 unexpected tube-to-tube wear, we assembled a team of
22 experts to assist Southern California Edison and
23 Mitsubishi, the steam generator manufacturer.

24 You have heard this discussed by the NRC
25 and by Pete Dietrich, and in a minute, I'll talk more

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1 about that panel.

2 To date we have now completed extensive
3 tests and analysis. We have done over 60,000 tests on
4 steam generator tubes in both Units 2 and Unit 3 and
5 have performed significant analysis of the test results
6 to understand the cause of the tube-to-tube wear.

7 As has been pointed out by the NRC, it's
8 significant to note there are differences between the
9 two units. Unit 3, which experienced the tube leak,
10 had 326 tubes damaged by this tube-to-tube wear. Unit
11 2 had only two tubes which showed minor indications of
12 tube-to-tube wear, so small it was almost undetectable.

13 It was our rigorous re-testing that identified two
14 tubes that had minor indications.

15 So Unit 2 is in much better condition than
16 Unit 3. The comments that Mr. Werner had about the
17 differences in the manufacturing tolerances between the
18 units explains partially why Unit 2 is in much better
19 condition than Unit 3 is with respect to tube-to-tube
20 wear.

21 Next slide. The expert panel. This is
22 significant. You know, in any outage, we start with
23 our own expertise. We start with the manufacturer,
24 Mitsubishi Heavy Industries.

25 And as we realized the significance and

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1 usual nature of this tube-to-tube wear, we stopped and
2 we formed a group of experts to assist us both onsite
3 and off-site and in expert panels.

4 We have brought in Areva, Westinghouse and
5 B&W Canada. All of those firms design, manufacture and
6 test steam generators. They are competitors to
7 Mitsubishi.

8 (Off-mic question)

9 MR. PALMISANO: Babcock & Wilcox, Canada.

10 Yes. B&W, Canada. We brought in MPR Associates, which
11 is a leading problem-solving firm, both in the nuclear
12 and non-nuclear industry, renowned for their ability
13 to deal with difficult, technical issues.

14 We immobilized EPRI, the Electric Power
15 Research Institute. This is the electric utilities
16 industry's research group where we do cutting-edge
17 research across the board in the electric utility
18 industry, including nuclear. This is where we share
19 technical information, and in the nuclear side, we
20 maintain some technical standards that we operate and
21 maintain our plants to, particularly for steam
22 generators.

23 We also brought in other industry personnel
24 from sister utilities with similar steam generators with
25 good expertise to assist us, and as has been mentioned,

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1 some recognized academics and consultants who do serious
2 research in thermal hydraulic analysis, vibration
3 analysis, and steam generator testing.

4 So, we have assembled a team, and I think
5 it has been alluded to, this is virtually an unparalleled
6 effort in the industry. The sharing, the cooperation,
7 the critical nature of this work has been the best I
8 have seen, and I think Mr. Werner's comments have echoed
9 that.

10 Now, the team was established not just to
11 assist us, but to also challenge our work. We wanted
12 to make sure that we put in place not just getting good,
13 solid technical assistance, but a good critical
14 challenge.

15 We used an expert panel board process. The
16 team forms up on site every three to four weeks, and
17 we spend one to two days reviewing the result of our
18 work to date, making presentations, getting critical
19 comments and getting some redirection, if you will, on
20 things that they feel we should investigate more fully.

21 They have turned out to be quite valuable
22 and we are continuing their use through our remaining
23 technical work and our restart decisions as we formulate
24 our final plans.

25 Next slide. So what have we determined in

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1 terms of cause? The specific mechanism -- you have heard
2 the NRC discuss this, and I'll use the term -- it's called
3 fluid-elastic instability.

4 Basically, that is causing some of these
5 tubes, these selected tubes, to vibrate excessively to
6 where they are contacting adjacent tubes. That is not
7 the way these steam generators are designed to operate.

8 It's a vibration mechanism that should not be
9 occurring.

10 We see this. This is causing the excessive
11 wear and it's in this limited area of the Unit 3 steam
12 generators. It is caused, this fluid-elastic
13 instability or tube vibration, is caused by high steam
14 flow velocities -- and this has already been alluded
15 to -- very dry steam, in other words, very localized
16 areas where there is very dry steam, very little liquid
17 as the water is boiled to steam, and inadequate tube
18 support structure, that anti-vibration bar structure,
19 in the U-bend region around these tubes that are
20 experiencing wear. The tube support structure is not
21 providing sufficient restraint.

22 So a combination -- high stream flow
23 velocities, very dry steam and the interaction with this
24 tube support structure in the Unit 3 steam generators.

25 Again, we do not see much evidence of this phenomenon

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1 in Unit 2 because Unit 2 clearly has a tighter tube
2 support structure than Unit 3 does.

3 Our findings correlate very well with the
4 NRC's comments on the thermal hydraulic analysis.
5 These conditions were not predicted clearly during the
6 design phase to be as severe as they are. We are in
7 agreement with the NRC's conclusions on that. And also,
8 the differences between Unit 3 and Unit 2, likely due
9 to manufacturing tolerance differences and
10 manufacturing process differences, seem to explain the
11 difference between Unit 2 and Unit 3, and we are in
12 agreement with the NRC's Augmented Inspection Team on
13 those.

14 Now, we have a good understanding of the
15 cause of the tube vibration which causes the
16 tube-to-tube wear. Our expert panel has reviewed this
17 several times. They have challenged us and they are
18 in concurrence with our conclusion as far as what is
19 causing the tube-to-tube wear.

20 Next slide, please. So, the next steps.

21 And again, I'd like to emphasize something you have
22 heard Pete be very clear on and the NRC say, we are taking
23 as much time as necessary to ensure this is understood
24 and that this is properly corrected. So that has been
25 a theme from the start of this investigation.

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1 So, we are following up with the Augmented
2 Inspection Team's additional request. Two of their
3 open items clearly are related to the cause. They have
4 legitimate needs for more information on the other open
5 items and our team is supplying that information as it
6 becomes available and working with the inspection team.

7 We are designing and implementing our
8 corrective actions to prevent this tube vibration from
9 occurring, based on our understanding of the mechanism.

10 We are developing additional information
11 as stated in the Confirmatory Action Letter which we
12 committed to prior to restart that we know we need to
13 submit, and we are continuing to work to develop
14 intermediate and longer term solutions to this problem.

15 As Pete said, we are disappointed in this
16 and we are working on longer term solutions. And those
17 longer term solutions will require extensive analysis,
18 mock-up and testing prior to being implemented.

19 In summary, we have identified the cause
20 of the unexpected tube-to-tube wear. We are in
21 agreement with the comments as discussed by the NRC
22 tonight.

23 We continue to take a rigorous, deliberate
24 and conservative approach to completing our remaining
25 actions, and we are taking as much time as necessary

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1 to insure safety.

2 With that, let me turn it back to Pete
3 Dietrich.

4 MR. DIETRICH: Thank you. By bringing
5 together experts in thermal hydraulics and steam
6 generator design and --

7 (Sound system interference)

8 MR. DIETRICH: tests and analysis
9 mentioned by Tom Palmisano, we have determined the cause
10 of the unexpected tube-to-tube wear.

11 We are working on different options and
12 solutions for the future. We have

13 (No audio)

14 MR. BLOUNT: Thank you, Pete. We
15 appreciate those comments. Looking at our path
16 forward, it's important to note that the NRC still has
17 much more information to review. The cause evaluation
18 has been completed by SONGS and they are working on
19 additional actions to prevent the tube-to-tube wear from
20 occurring again.

21 We currently do not know what the final
22 actions will be. So for the NRC to speculate on what
23 is going to occur would not be appropriate. However,
24 I will tell you what we do know.

25 We continue to review information as it

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1 becomes available, and as the Augmented Inspection Team
2 continues to review information, we ask SONGS additional
3 questions, and we request additional information, as
4 you have heard.

5 Our inspection will continue until we are
6 satisfied we have sufficient or enough information to
7 make a determination. Based on the Confirmatory Action
8 Letter, we will have to complete additional inspections
9 once SONGS informs us that they --

10 (No audio)

11 MR. DIETRICH: letter before we will go out
12 and do those inspections.

13 Portions of our AIT team will be called upon
14 to go out and do follow-up inspections on the 10 items
15 that we discussed earlier that were identified as part
16 of this inspection.

17 The NRC does plan to have additional public
18 meetings to keep you informed of our activities. As
19 part of our plans, we will have meetings with SONGS
20 designed to present their readiness plan associated in
21 response to the Confirmatory Action Letter.

22 After we have completed our inspection, we
23 will have another meeting to discuss the results of that
24 inspection. In addition, there are some type of public
25 meeting and press conference that will be held by the

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1 senior management, NRC senior management, to discuss
2 any future NRC decision about the acceptability of
3 resumption of power operations. That decision will be
4 based on discussions with both the Region 4 and NRC
5 headquarter senior management.

6 And finally, as part of our normal process,
7 and how the NRC does business, we look back at our
8 inspection program and we look to see, are there things
9 out of this event that we should have seen earlier?
10 Are there processes that we should have been engaged
11 in, to help us learn how to get better at what it is
12 that we do? Is there something that we could have been
13 doing do better, or looking at, prior to this event
14 occurring, that would have precluded that event? That
15 is also to help our inspection efforts going forward.

16 So with that, I'd like to turn it over to
17 Elmo Collins for closing remarks. Elmo?

18 MR. COLLINS: Well, thank you, Tom. To
19 conclude the business portion of the meeting, I will
20 say thank you to the residents of California for being
21 here tonight and thank you for listening attentively.

22 I have been quite

23 (No audio)

24 MR. COLLINS: how polite and how patient
25 you have been as we move through a lot of information

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1 tonight. So I thank you for that.

2 I want to thank this Augmented Inspection
3 Team that we have talked about. A lot of hours of work
4 has gone on of people with high expertise. And so I
5 am glad we were able to hear the results of their
6 inspection and I hope it was informative for you.

7 I want to thank Edison, Mr. Dietrich, for
8 your presentation and response to the information you
9 shared with us. And lastly, I probably would be remiss,
10 if we didn't all express our appreciation to the
11 representatives from the Orange County Sheriff's Office
12 who are here looking out after our safety. So give them
13 a round of applause.

14 (Applause)

15 MR. COLLINS: I know --

16 (No audio)

17 FACILITATOR DANIEL: Thank you Elmo. you,
18 Elmo. Thank you Southern California Edison and NRC.
19 Thank you audience, ladies and gentlemen, for being
20 so attentive, as Elmo --

21 (No audio)

22 FACILITATOR DANIEL: We are going to take
23 a --

24 (No audio)

25 FACILITATOR DANIEL: We are going to start

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1 back at 7:20 sharp with a question and comment period.

2 In the meantime, Mr. Collins is going to be doing a

3 media interview, I believe --

4 (No audio)

5 FACILITATOR DANIEL: Enjoy the break. We

6 will see you at 7:20. Thank you.

7 (Whereupon, at 11:17 a.m., DVD 1 ended)

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