

**Canadian Nuclear  
Safety Commission**

**Commission canadienne de  
sûreté nucléaire**

**Public hearing**

**Audience publique**

**July 5<sup>th</sup>, 2010**

**Le 5 juillet 2010**

Public Hearing Room  
14<sup>th</sup> floor  
280 Slater Street  
Ottawa, Ontario

Salle d'audiences publiques  
14<sup>e</sup> étage  
280, rue Slater  
Ottawa (Ontario)

**Commission Members present**

**Commissaires présents**

Mr. Michael Binder  
Dr. Moyra McDill  
Mr. Dan Tolgyesi  
Mr. Alan Graham  
Dr. Ronald Barriault

M. Michael Binder  
Mme Moyra McDill  
M. Dan Tolgyesi  
M. Alan Graham  
M. Ronald Barriault

**Secretary:**

**Secrétaire**

Mr. Marc Leblanc

M. Marc Leblanc

**Senior Counsel :**

**Conseiller principal:**

Ms. Lisa Thiele

Mme Lisa Thiele

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Ottawa, Ontario

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--- Upon commencing at 2:32 p.m. /

L'audience débute à 14h32

**Opening Remarks**

**M. LEBLANC:** Bonjour, mesdames et messieurs.

Bienvenue aux audiences publiques de la Commission  
canadienne de sûreté nucléaire.

Mon nom est Marc Leblanc. Je suis le  
secrétaire de la Commission et j'aimerais aborder certains  
aspects touchant le déroulement des audiences.

The Canadian Nuclear Safety Commission is  
about to start a series of two public hearings this  
afternoon, starting with AECL's request to restart the NRU  
in Chalk River, to be followed later today with an  
opportunity to be heard on an order issued by a CNSC  
Designated Officer to the Saskatchewan Research Council  
regarding the Gunnar facility in Northern Saskatchewan.

During today's business, we have  
simultaneous translation. Des appareils de traduction  
sont disponibles à la réception. La version française est  
au poste 8 and the English version is on channel 7.

Please keep the pace of speech relatively

1 slow so that the translators have a chance of keeping up.

2 Les audiences sont enregistrées et  
3 transcrites textuellement. The transcripts will be  
4 available on the website of the Commission early next  
5 week.

6 To make the transcripts as meaningful as  
7 possible, we would ask everyone to identify themselves  
8 before speaking.

9 I would also like to note that this  
10 proceeding is being video webcasted live and that the  
11 proceeding is also archived on our website for a three-  
12 month period after the closure of the hearing.

13 As a courtesy to others in the room, please  
14 silence your cell phones and other electronic devices.

15 Monsieur Binder, président et premier  
16 dirigeant de la CCSN, présidera les audiences publiques  
17 d'aujourd'hui.

18 Mr. Binder.

19 **THE CHAIRMAN:** Merci, Marc, and good  
20 afternoon to everybody and welcome to the hearing of the  
21 Canadian Nuclear Safety Commission.

22 Mon nom est Michael Binder. Je suis le  
23 président de la Commission canadienne de sûreté nucléaire  
24 et je vous souhaite la bienvenue, and welcome to all of  
25 you who are joining us through webcasting.

1 I'd like to begin by introducing the  
2 Members of the Commission that are here with us today. On  
3 my right are Dr. Moyra McDill and Mr. Dan Tolgyesi. On my  
4 left are Mr. Alan Graham and Dr. Ronald Barriault.

5 You heard from Marc Leblanc and we also  
6 have with us Lisa Thiele, General Counsel to the  
7 Commission.

8 So, Marc?

9 **MR. LEBLANC:** Yes. Before adopting the  
10 agenda, please note that three supplementary Commission  
11 Member Documents or CMDs were added to the agenda after  
12 publication on June 28, 2010, as listed on the updated  
13 agenda.

14 We have on the agenda a public hearing of  
15 the application by Atomic Energy of Canada Limited for the  
16 restart of the National Research Universal or NRU reactor  
17 located at the Chalk River Laboratories, CRL, site in  
18 Chalk River.

19 This will be followed by a hearing  
20 providing an opportunity to be heard to Saskatchewan  
21 Research Council on an order issued by a DO regarding the  
22 Gunnar site in Northern Saskatchewan.

23

24 **10-H13 / 10-H13.A / 10-H13.B**

25 **Adoption of Agenda**

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**THE CHAIRMAN:** Okay. With this information, I would like now to call for the adoption of the agenda by the Commission. Do we have concurrence?

For the record, the agenda is adopted.

So let's now begin the hearing on the restart of the NRU reactor and you can see there's great interest in this story that we're going to hear. I assume it's not only a domestic interest; it's in fact an international interest.

Marc?

**ONE DAY PUBLIC HEARING**

**Atomic Energy of Canada**

**Limited (AECL):**

**Application for the restart of the**

**National Research Universal**

**(NRU) Reactor located at the**

**Chalk River Laboratories (CRL)**

**site in Chalk River, Ontario**

**MR. LEBLANC:** This is a one-day public hearing. The Notice of Public Hearing 2010-H-07 was published on June 11 to inform the public of this upcoming public hearing and the availability of the Commission

1 Member Documents.

2 A revised notice was published on June 16<sup>th</sup>  
3 to announce the date of the hearing and the deadline for  
4 filing interventions. A second revision was posted on  
5 June 25<sup>th</sup> to change the date of the hearing to today.

6 The public was invited to participate  
7 either by oral presentation or written submission. June  
8 23<sup>rd</sup> was the deadline set for filing by intervenors. The  
9 Commission received four interventions from the public.

10 I note that supplementary information has  
11 been filed by AECL, as listed on the updated agenda.

12 **THE CHAIRMAN:** Okay. So I'd like to start  
13 the hearing by calling on a presentation from AECL as  
14 outlined in our CMD 10-H12.1, 12.1A and 12.1B.

15 I understand that Mr. MacDiarmid, you're  
16 going to make the presentation. The floor is yours.

17

18 **10-H12.1 / 10-H12.1A / 10-H12.1B**

19 **Oral presentation by**

20 **Atomic Energy of Canada Limited**

21

22 **MR. MacDIARMID:** Thank you very much, Mr.  
23 President. Good afternoon and thank you, ladies and  
24 gentlemen.

25 For the record, my name is Hugh MacDiarmid,

1 President and CEO of Atomic Energy of Canada Limited.

2 Je voudrais vous présenter monsieur Bill  
3 Pilkington, agent principal du nucléaire pour EACL, et  
4 monsieur Hank Drumhiller, vice-président et directeur  
5 général Opérations, et aussi plusieurs membres de notre  
6 équipe de gestion qui sont ici aujourd'hui.

7 My colleagues and I are here today to  
8 report that we have successfully repaired and leak-tested  
9 the NRU vessel. We are seeking approval to refuel past  
10 the guaranteed sub-critical condition.

11 I want to thank Commissioners for  
12 accommodating our request to reschedule this hearing. I  
13 do appreciate that the extensive demands on your time  
14 caused a lot of you to move your schedules around.

15 Completing the repairs to the NRU is a  
16 testament to more than a year of dedicated around-the-  
17 clock effort by hundreds of AECL employees and contract  
18 staff.

19 I want to take this opportunity to  
20 recognize the efforts and achievements of our team at  
21 Chalk River, as well as the contributions and support from  
22 the Canadian nuclear industry.

23 We have engaged some of Canada's leading  
24 companies as supplier partners to support us in our  
25 efforts. The demonstrated thoroughness and creativity in

1 taking on the challenges that have never been experienced  
2 before confirms the world-class status of the Canadian  
3 nuclear industry.

4 We have also engaged some of the world's  
5 leading experts to ensure the effectiveness of the repair  
6 techniques that we have deployed.

7 I want to acknowledge also the timely and  
8 capable support of CNSC staff. They have displayed a high  
9 level of professionalism throughout.

10 As I have said on a number of occasions  
11 before Parliament, AECL takes its responsibilities very  
12 seriously to provide a reliable supply of medical isotopes  
13 to Canada and the world. It has been our foremost  
14 operational priority.

15 In order to ensure this reliable supply of  
16 isotopes, we have taken every reasonable action throughout  
17 the outage to improve NRU's ongoing safety and reliability  
18 and this will continue.

19 We, at AECL, are confident NRU is now ready  
20 to resume safe operation.

21 Let me now turn over the proceedings to  
22 AECL's Chief Nuclear Officer, Bill Pilkington, in order  
23 that he can provide a more comprehensive presentation.

24 Thank you.

25 **MR. PILKINGTON:** Good afternoon, Doctor

1 Binder and Members of the Commission.

2 For the record, my name is Bill Pilkington,  
3 Senior Vice-President and Chief Nuclear Officer.

4 As Mr. MacDiarmid mentioned, we are here to  
5 provide you with an update on our progress on repairing  
6 the NRU reactor vessel and on our preparations to return  
7 the NRU to service.

8 My remarks today will follow the outline on  
9 the slide you see before you with emphasis on the repairs  
10 conducted, future activities and why we are confident that  
11 the react can be safely returned to service.

12 On May 15<sup>th</sup>, 2009, a heavy water leak was  
13 detected from the NRU reactor. The leak was traced to the  
14 gas-filled annulus between the heavy water filled reactor  
15 vessel and the light water reflector.

16 The picture in the upper left shows the  
17 water that was seen to be seeping through corrosion on the  
18 outside surface of the vessel. No corresponding hole  
19 could be seen on the inside of the vessel until the  
20 surface was prepared for repair as shown in the lower  
21 right picture.

22 The consequences of the heavy water leak  
23 were minimal as the water was collected and stored. Some  
24 tritium from evaporation was exhausted through the NRU  
25 ventilation system but the amount remained well below

1 regulatory limits.

2 This slide shows a picture of the NRU  
3 reactor and a schematic illustrating the location of the  
4 leak in relation to the nearest access point on the upper  
5 deck, nine metres above the bottom of the vessel. Access  
6 to the interior of the vessel is through apertures that  
7 are 12 centimetres in diameter, roughly the size of my  
8 hand.

9 In addition, the reactor deck is only 3.7  
10 meters in diameter, limiting the area for staging and  
11 executing the in-vessel work. And the pointer right now  
12 on the presentation is pointing to roughly the centre of  
13 the deck.

14 One way to appreciate the difficulties of  
15 examining and repairing the vessel is to think of  
16 repairing the basement wall of a two-storey house by  
17 working from the roof through a length of drain pipe.

18 In the case of the NRU vessel, the work was  
19 made more challenging by high radiation fields that pose a  
20 risk for staff and can damage electronic equipment. This  
21 is a detailed schematic of the base of the NRU vessel  
22 showing the annulus, light water reflector, and the  
23 location of the leak at the bottom of the annulus shown by  
24 the red arrow.

25 The black arrow below indicates the

1 circumferential weld at the base of the vessel that is  
2 used as a reference elevation. Note that the vessel wall  
3 thickens below the circumferential weld.

4 The actual condition of the inside surface  
5 of the vessel was relatively clean with about one  
6 millimetre coating of gibbsite. Gibbsite is a corrosion  
7 product of aluminum that is formed in water.

8 Outside the vessel there was corrosion  
9 product build-up on the lower vessel wall, the floor of  
10 the light water gutter, and the wall of the reflector.  
11 Also, the heavy water gutter was filled with corrosion  
12 products and the lip was corroded away in some areas.

13 The first step in assessing the vessel  
14 condition was a visual inspection of the full  
15 circumference of the NRU vessel. The pictures on this  
16 slide show a team of AECL staff using a remote camera to  
17 examine the vessel. The visual inspection was followed by  
18 a comprehensive non-destructive or NDE campaign undertaken  
19 over five months to determine the thickness of the vessel  
20 wall.

21 Progressively more sophisticated probes and  
22 delivery systems were used to expand the area of  
23 inspection and the quality of data. This represents one  
24 of the largest NDE campaigns carried out in the nuclear  
25 industry on a single reactor component with over two

1 million data points collected.

2 This is a composite of the NDE data into  
3 one image of a band of the vessel wall from just below the  
4 circumferential weld to a height of about 250 millimetres  
5 above the weld. The original wall thickness was 8  
6 millimetres as indicated by dark brown and darkens further  
7 as the vessel wall thickens below the circumferential  
8 weld.

9 Lighter shading indicates the degree of  
10 wall loss. The remaining wall over most of the vessel is  
11 more than seven millimetres. Patches of regional wall  
12 reduction were found at the base of the vessel extending  
13 upward from the level of the floor of the J-rod annulus  
14 about 50 millimetres above the circumferential weld.

15 These show up as light coloured areas in  
16 the figure, with some pockets of highly localized  
17 corrosion below the areas of regional corrosion. The  
18 areas to note are J-rod 13 to 18 as the largest area of  
19 corrosion; the corrosion sites between J-rod 21 and J-rod  
20 30; and the leak site at J-rod 41.

21 With the challenges posed by the high  
22 radiation environment and limited access, proven remote  
23 welding technology was chosen as the preferred method of  
24 repair. All activities had to occur within a 12-  
25 centimetre hole, 9 metres away.

1                   The picture shows the congestion at the top  
2 of the NRU reactor in carrying out in-vessel work.  
3 Parallel development was carried out on mechanical repair,  
4 welded structural plates, and weld build-up. All have  
5 proven valuable.

6                   In November 2009 localized weld build-up  
7 was selected as the primary repair strategy. Extensive  
8 qualification and practice were undertaken before going to  
9 the reactor, using bench tests and integrated tests in  
10 full scale mock-ups.

11                   Hundreds of AECL and contractor staff  
12 worked around the clock for more than a year. Through the  
13 course of the inspection, tooling development and repair,  
14 more than 350 contractor staff have provided tooling and  
15 services.

16                   A number of mock-ups were built to develop  
17 and test tooling and procedures. The photo is a full-  
18 height mock-up in the NRX reactor hall. Another full-  
19 height partial mock-up was built in the mechanical  
20 equipment design building specifically to test tooling  
21 developed at Chalk River. And three full-height welding  
22 stations were set up at the supplier of the welding  
23 technology, Liburdi Automation.

24                   They did this by cutting a hole in their  
25 roof and erecting a tent to house the weld control

1 stations and accommodate the full height of the tools. In  
2 addition, three full-height mock-ups were built adjacent  
3 to the NRU vessel to carry out final weld development and  
4 training with in-vessel tools.

5 A full wall section coupon was required to  
6 determine the corrosion mechanism that caused deep  
7 penetrations like the one that led to the leak. In the  
8 picture on the left, the hole saw for cutting the coupon  
9 is seen being tested in a mock-up. The actual cutter is  
10 indicated by the blue box.

11 The tooling was designed to fold up to fit  
12 through the 12-centimetre aperture and then unfold to  
13 deploy in the vessel. The radiation of the NRU vessel has  
14 modified the original material properties through  
15 transmutation and alteration of the microstructure.  
16 Tooling was developed to remove thin scoop samples about  
17 the size of a Canadian quarter from the vessel wall.

18 In the picture on the right the scoop  
19 cutting wheel is highlighted by the green circle and the  
20 scoop sites by the blue box. Each scoop is large enough  
21 to study material properties without requiring repair of  
22 the vessel. Scoops were used to confirm that there was no  
23 material sensitization or intergranular corrosion and to  
24 determine mechanical properties of the wall material for  
25 structural analysis and welding.

1                   In addition, a sample weld was carried out  
2                   on a scoop which was sectioned to examine the properties  
3                   of the weld and its heat affected zone.

4                   On the left is a picture of the site where  
5                   the vessel wall scoops were removed from typical vessel  
6                   wall material from the weld, and from the heat-affected  
7                   zone at one of the vertical seam welds. One of the  
8                   removed scoops is shown in a metal sample holder.

9                   On the upper right is a picture of the  
10                  coupon hole next to the leak site taken from inside the  
11                  vessel. You can see the corrosion in the J-rod annulus  
12                  beyond.

13                  The bottom right picture is the coupon in  
14                  the cutting tool and you can see the corrosion on the  
15                  surface of the coupon.

16                  Specialized tooling was required to clean  
17                  the vessel in preparation for welding and to vacuum the  
18                  vessel after repairs had been completed. The picture on  
19                  the left shows staff manipulating tooling through a 12-  
20                  centimetre hole with the indexing portion of the cleaning  
21                  tool on the left, it's the aluminium structure.

22                  The picture on the right is the head of a  
23                  cleaning tool being tested in a mock-up.

24                  A number of different tools were developed  
25                  to carry out the repair steps including, from left to

1 right, grinding, plate placement and a vertical weld tool.

2 The right-hand schematic illustrates how  
3 the tools were designed to pass through the 12-centimetre  
4 aperture, work around in-vessel obstructions and deploy  
5 accurately and reliably to the vessel wall.

6 The tools also had to meet stringent AECL  
7 standards for use in a reactor, undergo foreign material  
8 exclusion inspections and retract reliably to be able to  
9 exit the vessel after completing a task.

10 Mock-ups were used extensively to ensure  
11 high quality welding operations could be performed  
12 reliably. For the final repair site, over 100 test plates  
13 were welded in the mock-ups before executing the repair in  
14 the vessel.

15 A preliminary fitness for service  
16 assessment was used to determine the sites on the vessel  
17 wall that required repair to re-establish leak tightness,  
18 structural integrity and corrosion allowance. This slide  
19 shows the locations of the 10 repair sites and the  
20 location of the test weld. These areas are outlined in  
21 red.

22 Each repair site required a complex  
23 sequence of weld development, welder qualification and  
24 reliability testing, integration testing, the actual  
25 repair work, NDE and certification of the repair.

1                   Before any repairs were undertaken, in-  
2 vessel welding was proven with a test weld carried out  
3 December 3<sup>rd</sup>, 2009. Full NDE of the test weld confirmed  
4 the in-vessel weld process was acceptable.

5                   In addition, a scoop sample was removed to  
6 examine the condition of both the weld material and the  
7 heat affected zone adjacent to the weld.

8                   Metallography results were reviewed by AECL  
9 and external materials and welding experts to confirm the  
10 material condition was acceptable and the repairs could  
11 proceed. The basic repair technology used weld overlay to  
12 build up the wall thickness and re-establish the  
13 mechanical strength. The overlay could be vertical or  
14 horizontal depending on the desired feature and in-vessel  
15 constraints.

16                   In the month of December, five sites were  
17 welded and NDE completed to confirm quality repairs. The  
18 expectation was that, as the welders gained experience,  
19 their skill and confidence would improve to offset the  
20 challenges posed by the increasing size of later repair  
21 sites.

22                   However, application of a prudent and  
23 rigorous approach to the larger more complex sites  
24 required a unique repair design for each site.

25                   J-rod 41 was the original leak site and the

1 location where the through-wall coupon was removed to  
2 identify the corrosion mechanism causing deep corrosion  
3 pockets. A 1.5-millimetre thick backing strip was used to  
4 cover the hole and the leak location and the adjacent  
5 coupon removal site.

6 The upper left shows tacking the backing  
7 strip in place. The lower left shows additional tacks and  
8 fillet welds to secure the backing strip. The picture on  
9 the right shows the weld build-up applied to complete the  
10 repair.

11 In addition to repairing the holes at J-rod  
12 41, backing strips were used to support weld build-up in  
13 regions of very thin vessel wall. At J-rod 23, this  
14 repair technology reached its limit of application. With  
15 the thin vessel wall achieving a quality repair was very  
16 challenging.

17 A new concept was developed to provide a  
18 repeatable repair. This concept was based on putting a  
19 window frame of weld build-up around the plates as shown  
20 in the centre photo, followed by a weld overlay of the  
21 plates and window frame to complete the repair as shown on  
22 the right.

23 **(SHORT PAUSE/COURTE PAUSE)**

24 **MR. PILKINGTON:** Okay. Do I need to repeat  
25 anything? Excuse the delay. I'll pick up on the J-rod 23

1 repair.

2 So in addition to repairing the holes at J-  
3 rod 41, backing strips were used to repair regions of very  
4 thin vessel wall. And so on J-rod 23, with the thin  
5 vessel wall, achieving a quality repair was very  
6 challenging.

7 A new concept was developed to provide a  
8 repeatable repair and this concept was based on putting a  
9 window frame of weld build-ups around the plates and  
10 that's shown in the centre picture, followed by weld  
11 overlay of the plates and the window frame to give the  
12 completed repair as shown on the bottom right.

13 J-rod 23 was the last site that could use  
14 full weld overlay as the stresses for the larger weld  
15 areas approached the allowable limits to avoid disturbing  
16 the lower vessel seal.

17 For the larger repairs, structural plates  
18 were welded to the vessel to reduce the extent of weld  
19 overlay and the resulting stresses. In this approach, the  
20 plates were thicker and designed to re-establish  
21 mechanical strength of the vessel wall without the  
22 covering of weld overlay.

23 The first application was the J-rod 25/27  
24 repair site using four plates 3 millimetres thick. The  
25 tooling used to install the plates had to be modified to

1       tack structural plates in place as shown in the lower  
2       right picture taken in the vessel following plate  
3       installation.

4               New weld and NDE techniques also had to be  
5       developed to ensure qualified structural welds at the  
6       plate edges and between plates.

7               The completed test plate, number 24, which  
8       is the one shown in the picture on the left, was produced  
9       in a mock-up and it's shown in that upper picture. In  
10      all, more than 30 test plates were produced prior to  
11      completing the J-rod 25/27 repair in the vessel.

12              J-rod 13/17 was the last and most  
13      complicated repair covering an area of more than twice the  
14      size of the next largest repair.

15              To understand the discussion that follows,  
16      you have to know that the plates were numbered in order of  
17      installation, in vertical rows starting at the top left.

18              So the mouse is now over plate number 1,  
19      and then 2, 3; then the next row is 4, 5, 6 and then 7, 8,  
20      and not yet installed 9.

21              A three-by-three array of 4-millimetre  
22      thick structural plates was used to reduce the weld stress  
23      on the vessel lower seal. This was an evolution of  
24      previous repairs but still required development of nine  
25      specific weld processes plus NDE procedures for the unique

1 groove welds between the plates.

2 The top left picture shows 8 of 9 plates  
3 installed. The tack on the sixth plate, which the mouse  
4 is showing, melted through the thinned vessel wall  
5 requiring a modification to the placement of the ninth  
6 plate.

7 The bottom left picture shows the complete  
8 installation of the plates and the horizontal and vertical  
9 window frame of 4-millimetre weld build-up in the vessel.

10 The bottom right picture shows the addition  
11 of a large area of horizontal 3-millimetre build-up on the  
12 left side of the completed repair.

13 J-rod 13/17 is the only repair site that  
14 required significant rework after the initial welding was  
15 complete. Post-weld eddy current testing indicated a  
16 surface breaking flaw between plates 8 and 9 extending  
17 across into the groove between plates 5 and 6 and down  
18 between plates 6 and 9. These are all located in the  
19 lower right corner of the repair.

20 Follow-up visual inspection showed a crack  
21 in the groove wells. The crack is believed to have  
22 occurred as the large weld build-up was being carried out  
23 on the left-side of J-Rod 13 to 17 repair.

24 Displacement during the large area of weld  
25 build-up, as shown on the finite element model, combined

1 with lack of fusion is believed to have caused the crack.

2 Note that the deflection shown in the  
3 finite element model have been exaggerated to make them  
4 visible in this picture or in this figure.

5 The two horizontal and one vertical crack  
6 tip were ground out and welded. The length of the crack  
7 was then excavated to a depth of 2 millimetres and  
8 rewelded. Two attempts were required to achieve an  
9 acceptable weld. Portions of the rework weld were then  
10 ground to improve NDE capability.

11 Visual inspection was repeated for the  
12 whole J-Rod 13/17 repair area. Any current testing was  
13 repeated over the repair area and for the groove weld  
14 between Plates 7 and 8.

15 Prior to declaring repairs complete, given  
16 the challenges and complexity of the J-Rod 13/17 repair, a  
17 workshop was held, including internal and external experts  
18 to consider if sufficient repair and inspection had been  
19 carried out to assure a quality repair. Consensus  
20 supported declaring the repair complete.

21 Post-weld inspection results have  
22 demonstrated the success of the weld repair program.  
23 Engineering has assessed the small areas of lack of fusion  
24 and determined they do not affect the effectiveness of the  
25 repair.

1                   One reportable indication was identified in  
2                   the heat-affected zone of the J-Rod 23 repair and shown in  
3                   red and it will require follow-up monitoring.

4                   Following declaration that the repairs were  
5                   complete the NRU vessel was refilled with water.

6                   An in-service leak test witnessed by the  
7                   responsible authority did not find any evidence of water  
8                   leakage from the vessel.

9                   Trace amounts of tritium were measured in  
10                  the J-Rod Annulus between the vessel and reflector during  
11                  the vessel fill but there were no signs of moisture.

12                  Ongoing monitoring over several days with  
13                  the vessel full indicated tritium levels trending toward  
14                  background.

15                  Additional visual inspections were  
16                  undertaken of the inside of the vessel in the region where  
17                  tritium was detected. No flaws or imperfections were  
18                  found.

19                  Tritium readings remained close to  
20                  background levels when the vessel was refilled following  
21                  the visual inspection.

22                  So, Mr. Chairman, if it would be of help, I  
23                  have brought samples of weld plates that I could use to  
24                  help show the actual size of these repairs.

25                  **THE CHAIRMAN:** By all means. I know you

1 can get really excited about the engineering of welding  
2 but I really would like to see it and feel it.

3 **MR. PILKINGTON:** Okay. So these are the  
4 test plates that were used for the repair sites and so I'm  
5 going in sequence, really, on the last four repairs.

6 And the first one is of interest because as  
7 you can see it was where the coupon was removed and so we  
8 have that hole and we also have right next to it the  
9 origin of the leak. This is the J-Rod 41 coupon.

10 So this shows the area of corrosion and  
11 this shows the repair that was used to -- to return to  
12 structural strength and leak tightness. So we have a  
13 structural plate that was welded in place and then that  
14 was overlaid with horizontal weld to complete the repair.

15 Okay, so that is J-Rod 41.

16 The next one is the J-Rod 23 repair and I  
17 don't know if you can see the difference but -- but the  
18 corrosion, although over a small area, was quite  
19 extensive. The vessel wall was quite thin at this  
20 location.

21 And by the way, I would just point out that  
22 these are actually accurate reproductions of the profile  
23 of the vessel wall. They were machined using the NDE data  
24 from all of the inspections that were done. So they very  
25 accurately represent the condition of the vessel wall,

1       except of course they're not covered with corrosion  
2       products.

3                       **THE CHAIRMAN:** Including the thickness?

4                       **MR. PILKINGTON:** Yes.

5                       So the -- yes, and this represents the  
6       original 8 millimetre thickness of the vessel wall.

7                       This repair was the one that resulted in  
8       the most welding stress, J-Rod 23, and required us to move  
9       to a different strategy for larger sites.

10                      And you can see on this plate that this is  
11       -- this is deformation from the welding, this is not the  
12       normal shape of the plate.

13                      Now, the vessel would not have seen this  
14       much stress because it's a much better heat sink but this  
15       does give you an indication of the kinds of stresses that  
16       the welding creates.

17                      And so in this one we had two backing  
18       plates and then the window frame around and then an  
19       overlay of weld build-up over that.

20                      So then we go to J-Rod 25/27, we see a  
21       broader area of corrosion and the repair, this time the  
22       first application of structural plates and so we have four  
23       3 millimetre thick structural plates and then we've  
24       created this window frame of weld build-up between and  
25       around the plates to complete the repair.

1                   And finally -- just testing the strength of  
2 my assistant here.

3                   Finally, you'll recognize the 3 x 3 of the  
4 J-Rod 13/17 repair. Now, this is only representative  
5 because in fact this was an early test model for this  
6 repair and it does not actually represent the spacing of  
7 the plates in their final configuration but it does give  
8 you an idea on the plated area. And if you remember, not  
9 only is there the plated area but there's a fairly large  
10 area above, below, and mainly on this side, a very build-  
11 up, this was the build-up that caused the deformation of  
12 the vessel and created the problem.

13                   So the point to make here is really the  
14 size of the area of corrosion and so that final repair  
15 essentially covered from one side of this plate almost to  
16 the other.

17                   And it's also clear that -- well, actually,  
18 you cannot really see the general scalloping, you can feel  
19 it in this area but you can't see it from looking at the  
20 plate, but the wall is thinner all the way across.

21                   But what is visible is the deep  
22 penetrations or deep pockets that have been formed and  
23 it's not too hard to see that they essentially are formed  
24 along a waterline; okay?

25                   So that is perhaps the important thing to

1 note from this repair, as well as the fact that on this  
2 repair they are very deep over a large area.

3 In fact, on this repair, when we did the  
4 vessel cleaning prior to welding there were actually a  
5 couple of areas that went through a wall.

6 So looking at the corrosion on J-Rod 13 to  
7 17 is then a good segue into talking about the corrosion  
8 mechanism.

9 **THE CHAIRMAN:** Thank you for this  
10 representation.

11 You realize that all of this material now  
12 is formal record here. You've got to leave it with us  
13 now. At least for a period of time so people can examine  
14 it.

15 **MR. PILKINGTON:** Yes. To be honest, I  
16 didn't realize that.

17 So moving on; based on the evidence from  
18 the corrosion coupon and experience with the corrosion in  
19 the annulus between the vessel and reflector -- sorry,  
20 just a second. I'm on the wrong slide. Okay.

21 So we're now turning to the source of the  
22 degradation of the NRU vessel and so there were two  
23 related corrosion mechanisms that have been identified.

24 First, there's a regional wall loss that  
25 results in a scalloped reduction -- which is being shown

1 by the mouse -- in the wall thickness illustrated with NDE  
2 results on the left picture at the J-Rod 41 leap site.

3 Second, as shown in the cross-section of  
4 the coupon removed from J-Rod 41, localized corrosion  
5 pockets can form below the regional wall loss at a level  
6 that would correspond to the water line in the annulus, as  
7 I showed you on the J-Rod 13 to 17 plate.

8 Based on the evidence from the corrosion  
9 coupon and experience with corrosion in the annulus  
10 between the vessel and reflector, both the regional  
11 corrosion and the localized corrosion pockets resulted  
12 from nitric acid formed by irradiation of air in the  
13 presence of light water from reflector leaks.

14 Carbon dioxide is distributed into the  
15 annulus to displace air, but the delivery has not always  
16 been effective. Regional corrosion shown here in NDE  
17 results from J-rods 13 to 17 is due to contact of acidic  
18 water with the vessel, for example, due to splashing or  
19 spraying.

20 Corrosion pockets, shown in the magnified  
21 view of NDE results from J-rod 41, result from an electro-  
22 chemical cell where acidic water running down the vessel  
23 wall contacts oxygen-rich water from the reflector leaks.  
24 Analysis of the coupon from J-rod 41 confirmed that no  
25 other contaminants were driving the electro-chemical

1 process.

2 The series of pictures from top left to  
3 bottom right show the condition of the J-rod annulus,  
4 first when the vessel was installed, then an area of  
5 typical corrosion; next, increased corrosion at the leak  
6 site and finally the improvement achieved through  
7 vacuuming in the annulus.

8 The strategy to reduce and arrest corrosion  
9 is based on reducing air and water ingress. Immediate  
10 action has been taken to address water leaks and clear  
11 drains to eliminate pooling and splashing on the vessel  
12 wall.

13 Action has also been taken to reduce air  
14 leaks and improve the delivery of CO<sub>2</sub>. Going forward, CO<sub>2</sub>  
15 purity and the pH of water drained from the annulus will  
16 be closely monitored. Further reductions of water and air  
17 ingress will be achieved through physical improvements  
18 during regular planned maintenance outages.

19 Additional mitigation measures are under  
20 consideration including the application of a cold spray  
21 sacrificial aluminum coating, repair of the reflector  
22 leaks, and changes to the reflector water chemistry.

23 Recognizing that corrosion was not  
24 anticipated in the vessel condition assessment performed  
25 in 2004 and 2005, AECL undertook actions to ensure that

1       there were no concerns with the assessments of other NRU  
2       systems.

3                 First, the condition assessment process was  
4       reviewed to ensure there was no generic problem with the  
5       process and none was found.

6                 Second, an independent process of review  
7       was carried out by an expert panel to validate the results  
8       of the condition assessments. And no gaps of safety  
9       significance were found.

10                Going forward, the integrated safety review  
11       that is currently underway to support licence renewal will  
12       address gaps to modern codes and standards. The isotope  
13       supply reliability program is improving plant life  
14       management including the maintenance program and system  
15       health monitoring.

16                In assessing the NRU's fitness for service,  
17       regional corrosion compromised the vessel's ability to  
18       withstand specified loads. The top graphic on the slide  
19       shows the results of finite element analysis used to  
20       determine site requiring repair. The lower graphic shows  
21       acceptable mechanical performance following repair.

22                Continued fitness for service will be  
23       verified through in-service inspections conducted during  
24       planned maintenance outages. In future, the reliability  
25       of NRU operation will be enhanced through longer planned

1 maintenance outages.

2                   These longer outages will start with the  
3 first within nine months of return to service and then  
4 will occur annually thereafter subject to review based on  
5 NRU performance and outage experience.

6                   The duration of annual maintenance outages  
7 will be set by the critical path activities and are  
8 expected to be about four weeks in duration.

9                   In-service inspection will monitor wall  
10 thickness and thereby assure ongoing structural integrity.  
11 The inspection program and ongoing mitigation reduces but  
12 does not eliminate the potential for highly localized  
13 corrosion pockets.

14                   Such corrosion pockets do not impact the  
15 structural integrity but could lead to a heavy water leak.  
16 Tooling is being developed to effect a mechanical repair  
17 of a small leak without defueling or draining the reactor.

18                   Causes for the NRU leak event have been  
19 assessed and found to be consistent with opportunities for  
20 improvement identified in a 2008 and 2009 safety culture  
21 survey. Corrective actions have been rolled into AECL's  
22 improvement program called Voyageur Phase II.

23                   Broad elements of the program are:

24                   1. To improve equipment reliability to  
25 ensure a low tolerance for equipment issues, eliminate

1 work-arounds, improve maintenance programs, spares and  
2 system health monitoring;

3 2. To reinforce desired organizational  
4 behaviours such as a questioning attitude and the use of  
5 event-free tools;

6 3. To improve problem identification and  
7 corrective action to consistently identify and address  
8 problems with a very low significance level;

9 4. To improve the use of operating  
10 experience to learn from internal and external events;

11 5. To improve standards for operation;  
12 for example, through improved procedural adherence, outage  
13 planning and the WANO peer review process; and finally

14 6. To improve leadership and oversight  
15 through the strengthening of our leadership academy,  
16 change management, and observation and coaching.

17 Measures of improvement will include site  
18 and departmental level event free-day resets, interim  
19 safety culture surveys, equipment reliability indicators,  
20 and a health index for the corrective action program.

21 Human resources, equipment upgrades to  
22 address obsolescence and equivalency, spare parts, and  
23 program improvements are all funded through the isotope  
24 supply reliability program.

25 The NRU outage provided an opportunity to

1 carry out maintenance and inspection activities that  
2 cannot be completed within the normal operating cycle.  
3 Safety and reliability improvements were made to the heavy  
4 water system, to the processed water system, the fuel rod  
5 flask, and control rod systems. All outstanding  
6 maintenance activities requiring the reactor drained and  
7 defueled were completed.

8 To address CNSC staff inspection findings,  
9 comprehensive system walk-downs were completed on the  
10 seven NRU safety upgrades during the outage and all  
11 findings have been reviewed and dispositioned.

12 As we proceed with the NRU Return to  
13 Service Program, the safety upgrades will be confirmed  
14 fully operational, fully tested, and fully capable of  
15 performing their safety functions.

16 As part of the NRU Return to Service  
17 Program, the NRU readiness for service process will assure  
18 all systems are fully operational and fully tested. A  
19 detailed integrated plan has been produced for all  
20 maintenance, testing, system configuration, and training  
21 activities and is being executed as shown by the work-down  
22 curve.

23 A dedicated team was assembled in September  
24 2009 to put together the step-by-step procedures supported  
25 by checklists needed to safely and efficiently return

1 systems to service. Operating experience from the restart  
2 in 1991 was reviewed and included in the development of  
3 procedures and checklists.

4 More than 2000 activities have been  
5 identified and scheduled. The return to service is  
6 supported by a dedicated outage control centre and fix-it  
7 now teams to address emergent issues on equipment that has  
8 been laid up for a year.

9 Training associated with the NRU return to  
10 service includes both update training on new procedures  
11 that have been developed and associated with restart  
12 activities, and refresher training on activities that have  
13 not been routinely performed during the outage.

14 Training is being delivered close to the  
15 time it is required for maximum benefit. This chart shows  
16 the over 400 training activities leading up to refilling  
17 the reactor vessel. Similar programs are being delivered  
18 prerequisite to starting to refuelling activities and  
19 prior to restarting the reactor to low power operation.

20 In the months prior to the May 14<sup>th</sup>, 2009  
21 shutdown, it was suspected that there was one or more  
22 defects in the NRU driver fuel. The current driver fuel  
23 design has had excellent performance since it was  
24 introduced in NRU in the early 1990s. Until coolant  
25 activities rose in late 2008, there has been no record of

1 defects.

2           Suspect fuel was removed from the reactor  
3 in January through March of 2009 and fission product  
4 activity in the coolant was decreasing consistent with the  
5 defects having been removed from core. Subsequent  
6 examination of the suspect fuel removed has confirmed  
7 there were defects.

8           A total of four defects have been found and  
9 all are similar to the one shown on the slide. They occur  
10 at the ends of the fuel elements as a split in the  
11 aluminium fuel sheath in an area where the sheath has  
12 bulged.

13           The defect mechanism appears to occur early  
14 in the service interval of the fuel. Defects are limited  
15 to batches of fuel manufactured before February 2008.  
16 Based on the location and nature of the defects, the most  
17 likely cause is organic contamination introduced during  
18 the manufacturing process.

19           No fuel from the batches with known defects  
20 will be reloaded in the NRU for start-up. Steps have been  
21 taken to ensure the likelihood of fuel failure following  
22 restart is acceptably low. The majority of fuel to be  
23 reloaded was in the NRU when the shutdown occurred and was  
24 demonstrating good performance.

25           As a further contingency measure, the

1 procedure for responding to rising coolant activity  
2 levels, which may indicate a new defect, has been enhanced  
3 to assure appropriate measures are taken in the unlikely  
4 event of future fuel defects.

5 The June 23<sup>rd</sup> earthquake was a magnitude 5  
6 centred north of Ottawa. A Government of Canada seismic  
7 monitoring station is located on the Chalk River site.  
8 The peak ground acceleration at Chalk River was 0.006g,  
9 where g is the acceleration due to gravity. This would  
10 equate to an earthquake with a magnitude between 3 and 4  
11 centred at Chalk River.

12 NRU's safety functions have been qualified  
13 for an earthquake of magnitude 6 and in addition NRU has a  
14 seismic trip set at 0.06g.

15 Nuclear facilities and buildings were  
16 walked down by operations following the earthquake and  
17 assessed by engineering to confirm no damage had occurred.

18 At the time of the earthquake, the in-  
19 service leak test was in progress on the reactor vessel.  
20 To provide assurance of vessel integrity, those areas that  
21 had been completed were re-inspected. Also, the vessel  
22 was drained and an additional visual inspection was  
23 performed that included the larger repair sites with no  
24 anomalies found.

25 On communications, regular updates have

1       been provided to the public and stakeholders generally on  
2       a weekly basis to ensure they were kept informed of  
3       progress. Update number 63 was issued June 30.

4               AECL has set up the [www.NRUCanada.ca](http://www.NRUCanada.ca)  
5       website in July of 2009 with frequent updates to provide a  
6       wealth of information to all stakeholders. Weekly  
7       briefings have been held with senior government officials  
8       to report progress on the repair and return to service.

9               Phone-in meetings have been arranged with  
10      healthcare stakeholders and local officials when  
11      significant developments have occurred which may impact  
12      their constituents; for example, extensions to the repair  
13      schedule or major milestones such as the completion of  
14      repairs.

15              AECL is in regular communication with the  
16      other major isotope producers on projections for the NRU  
17      return to isotope production through the Association of  
18      Imaging Producers and Equipment Suppliers, or AIPES, in  
19      Brussels.

20              In summary, the NRU vessel has been  
21      successfully repaired and is fit for service. AECL is  
22      confident that all requirements for safely restarting the  
23      NRU have been met. We respectfully request approval to  
24      reload fuel past the guaranteed sub-critical condition  
25      thereby allowing full return to service and resumption of

1 NRU operation and medical isotope production.

2 Thank you, Mr. Chair.

3 **THE CHAIRMAN:** Thank you.

4 I'd like to move now to a presentation from  
5 CNSC Staff, as outlined in CMD 10-H12.

6 Mr. Jammal, the floor is yours.

7

8 **10-H12**

9 **Oral presentation by**

10 **CNSC Staff**

11

12 **MR. JAMMAL:** Bonjour, monsieur le président  
13 et membres de la Commission.

14 For the record, my name is Ramzi Jammal,  
15 Executive Vice-President and Chief Regulatory Operations  
16 of the Canadian Nuclear Safety Commission.

17 Avec moi aujourd'hui l'équipe de la  
18 Commission canadienne de sûreté nucléaire. I start with  
19 Mr. Peter Elder, Director General of the Directorate of  
20 Nuclear Safety and Facilities Regulation; Mr. Miguel  
21 Santini, Director of the Chalk River Laboratories'  
22 Compliance and Licensing Division; Dr. Etienne Langlois,  
23 Project Officer responsible of regulatory oversight for  
24 the NRU Operations.

25 With me also, our specialists, licensing

1 compliance team, and through video our Nuclear Site  
2 Inspectors office to including Mr. Reuben Marini.

3 Mr. President, Members of the Commission,  
4 the NRU shutdown has impacted multiple directorates at the  
5 CNSC. Over the last 13 months, CNSC staff performed  
6 various regulatory activities other than those specified  
7 in the NRU restart protocol.

8 CNSC staff executed licence amendments as  
9 requested without delays and without compromise to safety.  
10 In specific, the Directorate of Nuclear Substance  
11 Regulations amended no later than 24 hours requests from  
12 hospitals and clinics to increase their possessions,  
13 possession limits, to change their inventories in order to  
14 have alternate isotopes.

15 Mr. President, the spent resources for  
16 regulatory efforts were above the planned regulatory  
17 activity and CNSC staff provided 24/7 services and in  
18 specific Doctor Langlois and our site office at Chalk  
19 River.

20 I'd like to give you a brief background.

21 In May 2009, a small leak was discovered in  
22 the vessel of the NRU reactor at Chalk River Laboratory.  
23 The reactor was placed in a safe shutdown condition and  
24 AECL subsequently decided to de-fuel and drain the reactor  
25 to complete inspection and repair activities.

1                   While most aspects of such repair are  
2 covered by the existing conditions of the current Chalk  
3 River Laboratories licence, this repair and restart  
4 required unique considerations that are beyond CNSC staff  
5 approval.

6                   Hence, we're before you requesting an  
7 approval to re-fuel the reactor and put it into beyond the  
8 defined temporary guaranteed sub-critical condition.

9                   As part of CNSC clarity of requirements and  
10 transparency, AECL-CNSC established an NRU restart  
11 protocol and this protocol was signed by both presidents  
12 of the Commission and AECL.

13                   The protocol is an administrative tool that  
14 clearly documented the regulatory requirements so the  
15 repair and the restart or return to service is done in  
16 accordance with applicable codes and standards.

17                   Mr. President, among other things in the  
18 protocol was the conflict resolution that was frequently  
19 invoked and this was done at my level and Mr. Pilkington's  
20 level.

21                   In this slide, I show you the map with  
22 respect to the NRU restart protocol and sections in the  
23 CNSC CMD in order to indicate how the protocol has been  
24 executed during the course of the vessel repair and the  
25 NRU return-to-service projects.

1                   The protocol is now closed and CNSC staff  
2 confirm that all the necessary information to make a  
3 recommendation to the Commission for this approval has  
4 been received and that the protocol has met its intent by  
5 enhancing communication between the two organizations and  
6 very close management oversight.

7                   Today's presentation will provide details  
8 on CNSC staff's assessment of the information provided by  
9 AECL to support the NRU reactor's return to service. But  
10 before I hand the presentation over to Mr. Elder, I wish  
11 to make the following statements.

12                   Has the NRU been repaired safely? The  
13 answer is yes. Has the repair re-established the  
14 structural integrity? The answer is yes.

15                   However, the rest of the presentations will  
16 discuss the operational reliability and the need for  
17 operational experience and cultural changes at the AECL.

18                   I will now pass the presentation on to Mr.  
19 Elder.

20                   **MR. ELDER:** Thank you, Mr. Jammal.

21                   Today's presentation consists of seven  
22 parts. First, I will provide an update on the vessel leak  
23 repair and CNSC staff's overall conclusion on the repair.  
24 Then Mr. Santini will go through the other four areas  
25 assessed by CNSC staff during this extended outage

1 associated with the decision to allow restart and  
2 continued refuelling.

3           Afterwards, we will provide information on  
4 additional activities not directly linked to the restart  
5 of NRU but that would be of interest to the Commission.

6           Finally, we will provide CNSC staff's  
7 conclusions and recommendations.

8           As listed in the restart protocol, CNSC  
9 staff required AECL to complete the following activities  
10 during the vessel leak repair project: conduct a root  
11 cause investigation into the leak.  
12 This was divided into two parts: a technical  
13 investigation focussed on the vessel and the cause of the  
14 corrosion, and a wider organizational investigation onto  
15 why the vessel was allowed to get into such a condition.

16           The results of the second part will be  
17 discussed later in the presentation.

18           Then AECL was required to perform an  
19 extensive assessment of the vessel to determine its  
20 complete condition, define a repair strategy and a  
21 detailed repair plan based on the condition assessment and  
22 the technical root cause, implement a mitigation strategy  
23 again based on the cause of the leak, demonstrate that  
24 acceptable repair had been done in accordance with  
25 applicable codes and standards, and finally to produce a

1 fitness-for-service safety case for the vessel showing  
2 structural integrity will be maintained with an acceptable  
3 safety margin.

4 To achieve a high level of confidence in  
5 the reactor vessel repair initiative, CNSC staff required  
6 a comprehensive conditional assessment to evaluate the  
7 state of the vessel, the extent of corrosion damage, the  
8 general fitness for service of the vessel and the repair  
9 options.

10 As has been stated by AECL, the original  
11 leak occurred at location JR-41 but there was also heavy  
12 local corrosion at other locations at the same elevation  
13 near the floor of annulus. And at two locations, JR-41  
14 and JR-13/17, there were through-wall penetrations. That  
15 is to say there was no metal left in these locations in  
16 small areas.

17 It should be noted however that very little  
18 general corrosion was identified in the rest of the  
19 vessel. This was also true for other structures  
20 associated with the vessels and the walls of the light  
21 water reflector tank.

22 Given the extent of corrosion in the  
23 annulus at this floor level, it was evident that repair  
24 was required to re-establish the structural integrity of  
25 the vessel and to re-establish the design criteria.

1                   The state of the NRU vessel revealed by the  
2 non-destructive testing inspection showed the vessel had  
3 been subject to a degradation mechanism that was more  
4 active than previously believed. AECL submitted a  
5 corrosion report which identified the main cause of leak -  
6 - vessel leak was nitric acid attack in the J-rod annulus  
7 on the outside of the vessel wall attributed to nitric  
8 acid production from ingress of both air and water into  
9 the J-rod annulus.

10                   The presence of air results in the  
11 radiolysis production of oxides of nitrogen that dissolve  
12 in water to form nitric acid. The source of the water in  
13 the J-rod annulus is a leakage from the light water  
14 reflector.

15                   After reviewing the submissions and the  
16 data provided by AECL, CNSC staff has accepted AECL's  
17 conclusion that corrosion by nitric acid is the main cause  
18 of the observed degradation of the NRU vessel wall.

19                   However, the studies to date have not  
20 conclusively dismissed other possible secondary mechanisms  
21 and there is limited data on the corrosion rates for  
22 nitric acid.

23                   Therefore, ongoing inspections are required  
24 to reduce the uncertainty in the corrosion rates and to  
25 continue to eliminate other potential sources. These

1 inspections will be detailed on later slides in this  
2 presentation.

3 To address the corrosion -- vessel  
4 condition degradation, AECL has developed short-term and  
5 long or medium-term mitigation strategy which I'll discuss  
6 on the next slide.

7 As I mentioned earlier, the cause of the  
8 corrosion is nitric acid production in the annulus. To  
9 mitigate this mechanism, AECL has developed a  
10 comprehensive J-rod annulus mitigation strategy.

11 To date, AECL has implemented six elements  
12 of the strategy, including installation of a new CO<sub>2</sub>  
13 injection system to displace the air in the annulus and  
14 improve the sampling of the CO<sub>2</sub> that is injected,  
15 installation of new upper seals and lower J-rod seals  
16 again to reduce air ingress, and the cleaning of annulus  
17 drains to provide better drainage of water and prevent  
18 standing water formation.

19 However, these elements do not stop the  
20 corrosion but should slow it down. The effectiveness of  
21 the elements can only be proven through routine  
22 inspections after restart since the reflector has been  
23 emptied and air ingress conditions change during  
24 operation.

25 Post the restart, AECL will need to

1 continue to reduce the air leakage and reflector leaks in  
2 the annulus at future extended outages and continue to  
3 develop the strategy and implement a contingency plan if  
4 there is further corrosion.

5 One aspect they are discussing is  
6 investigating the application of a sacrificial aluminium  
7 coating that would act as a barrier to arrest vessel  
8 corrosion. And as a contingency, AECL is developing a  
9 mechanical repair tool for small leaks that can repair  
10 without de-fuelling the reactor.

11 I will now shift the focus of the  
12 presentation to the repair strategy.

13 As has been noted by Mr. Jammal, many  
14 aspects of the NRU vessel repair are covered by existing  
15 conditions in the Chalk River Laboratory site licence and  
16 these conditions remain enforced for the current repairs.

17 The key requirements stem from the CSA  
18 Standard N285 series on pressure retaining systems and the  
19 associated American Standard of Mechanical Engineering's  
20 *Boiler and Pressure Vessel Code*.

21 Through the NDE's, AECL identified 10 sites  
22 requiring repair around the base of the vessel. These  
23 range from small areas of a few millimetres to extended  
24 regions as has been presented by AECL.

25 The selection of the repair sites is

1 consistent with the requirement that structural integrity  
2 in vessel be re-established while minimizing the risk of  
3 damaging the bottom seal during welding.

4 CNSC staff accepted the approach proposed  
5 by AECL to use ASME Code Section 11 in defining the repair  
6 requirements for the NRU vessel. Use of this section of  
7 the Code requires regulatory approval for the repair plan  
8 for the vessel and inspection and test plans for each  
9 repair site.

10 These inspections and test plans included a  
11 detailed description of the post-repair non-destructive  
12 testing and examination, including the techniques that  
13 will be used and the limitations of those techniques for  
14 each site.

15 CNSC staff approved the repair plan and the  
16 test procedures for each repair site prior to the start of  
17 welding that included a description of the repair  
18 procedure, the repair areas, the tooling required and the  
19 staff training required.

20 I will now present more details on the  
21 post-repair inspections.

22 After all the repairs and the post-repair  
23 inspections are complete, and prior to restart of the  
24 reactor vessel, AECL was required to submit a repair  
25 report. The repair report, including all the supporting

1 documents for each repair site, must demonstrate that  
2 established codes, standards and processes for the vessel  
3 repairs have been followed and the detailed results of the  
4 post-repair inspections confirm the vessel fitness for  
5 service.

6 Given the tight timeline for the return to  
7 service and the complexity of the information to be  
8 collected in support of the repair report, AECL submitted  
9 the supporting documentation for the first nine of the 10  
10 repair sites and prior to the final repair report.

11 However, AECL cannot bring the reactor  
12 critical until CNSC staff has approved this final report.

13 AECL has now submitted the final report and  
14 I'll discuss the results of the last repair on the next  
15 slide.

16 CNSC staff can confirm that repairs and the  
17 post-repair inspections completed to date were all done in  
18 accordance with the repair plan and demonstrate the re-  
19 establishment of structural integrity of the vessel.

20 We will provide in writing to the  
21 Commission an update when the final repair report has been  
22 fully reviewed and accepted.

23 I will now turn to the final last repair.  
24 As stated by AECL this final repair is complete and this  
25 was the largest and most complex repair site compared --

1 in comparison with the previous nine ones.

2 As AECL has stated, the initial NDE  
3 confirmed a crack in the welding and AECL then went back  
4 and developed a weld repair strategy to repair the crack  
5 and this weld repair was completed on June 14<sup>th</sup>, 2010 and  
6 the NDE on the day afterwards. So this was after the  
7 publication of our CMD.

8 Since then CNSC staff has received the  
9 final repair report, including the details of this repair.  
10 While we are still doing our comprehensive review the  
11 preliminary review has not identified any problems with  
12 this repair and include that the vessel is fit to return  
13 to service.

14 In order to monitor future reactor vessel  
15 conditions on a continuing basis AECL has developed an in-  
16 service inspection program, using non-destructive  
17 examinations to identify and monitor any deterioration in  
18 integrity of the vessel on a continual basis.

19 Inspections are mandatory under CSA  
20 Standard N285.4 and the first inspection must be no later  
21 than nine months after the NRU restart.

22 To support operation of NRU AECL is  
23 required to submit a comprehensive safety case that  
24 demonstrates the reactor vessel is repaired and fit for  
25 service. AECL has done this in two stages; a preliminary

1 assessment was developed again to determine the areas that  
2 needed to repair and this was accepted by CNSC staff.

3 The final assessment is to be completed  
4 within 90 days after the return -- after returning the  
5 vessel to service and this report integrates the results  
6 of all the post-repair NDU results, as well as the final  
7 corrosion reports and will define the ongoing inspection  
8 requirements and frequency beyond the first inspection.

9 The final assessment will also analyse  
10 uncertainties in the NDE results and tools and that will  
11 be again developed into identifying focused areas for  
12 future inspections.

13 As stated by AECL, there will be a planned  
14 extended maintenance outages of NRU in the future of about  
15 three to four weeks with the first one reoccurring within  
16 nine months.

17 In these outages they will conduct not only  
18 the inspections required but also additional vessel life-  
19 management activities like continued corrosion mitigation  
20 and other maintenance activities.

21 Thereafter, the NRU maintenance outage of  
22 about four weeks duration is planned, at least annually,  
23 to ensure continued and ongoing fitness or service of the  
24 vessel.

25 The actual interval between maintenance

1 outages will depend on the results of the inspections of  
2 the previous outage.

3 CNSC staff has concluded that the  
4 maintenance of the vessel fitness for service case is an  
5 ongoing activity that needs to be accounted for, and  
6 account for new inspection information and we believe  
7 that, again, the fitness for service case needs to be  
8 updated to include new supporting information to support  
9 licence renewal in 2011.

10 This slide presents information since CNSC  
11 staff CMD was issued on June 11<sup>th</sup>. After the completion  
12 of the final repair AECL did perform the leak test, as  
13 required by the repair plan. The leak test was witnessed  
14 by the appropriate authority and it verified that the  
15 annulus region was dry during the leak test which took  
16 about two days to do.

17 As noted, AECL did measure small  
18 concentrations of gaseous tritium above baseline levels  
19 prior -- after refilling the vessel and specifically in  
20 the area between J-Rod annulus 13 and 23.

21 There are several potential sources of  
22 tritium in the annulus but obvious potential source was  
23 the vessel repairs.

24 However, at no time was water observed in  
25 the annulus, meaning that any potential leak from the

1 vessel would be extremely small.

2 AECL did decide to empty the vessel to  
3 further investigate the source of this tritium, detailed  
4 visual inspections to the repair sites were made from the  
5 inside and outside and no visible cracks were identified  
6 nor was any moisture.

7 This met the Code requirements and CNSC  
8 staff has no concerns with the safety case for the vessel.

9 As the Commission is aware, there was an  
10 earthquake on June 23<sup>rd</sup>, centred near Ottawa. The  
11 earthquake was felt at Chalk River and as stated at the  
12 June 28<sup>th</sup> Commission meeting the vessel was full at the  
13 time of the earthquake. The leak test verifications were  
14 repeated after the earthquake and again, no signs of a  
15 leak were identified.

16 The visual inspections were also -- I just  
17 discussed above, about looking for source of tritium were  
18 also done after the earthquake and they serve -- so they  
19 service part of the post-earthquake verification and that  
20 again no damage was identified.

21 Just to note, in addition to the vessel the  
22 NRU building and as well as all buildings and structures  
23 and facilities, including the ground -- underground and  
24 aboveground waste storage tanks were verified post-  
25 earthquake and no damage was identified.

1                   CNSC staff remain satisfied the NRU has the  
2 required seismic protection in place.

3                   So CNSC staff concludes that AECL has  
4 conducted a thorough examination of the vessel that  
5 allowed them to identify they needed repairs, CNSC staff  
6 has verified that the vessel was repaired in accordance  
7 with applicable nuclear standards and noting of course  
8 that we are still doing our detailed confirmatory review  
9 of the final report.

10                  The repaired vessel is fit for service,  
11 provided the initial period of operation for the NRU is  
12 limited to no more than nine months. This will ensure the  
13 first in-service inspection is conducted while there are  
14 still margin to the corrosion allowance to cover the worst  
15 possible scenario, i.e. the highest potential corrosion  
16 rate.

17                  Second, in the long-term ongoing  
18 inspections will require NRU to be operated in a different  
19 fashion than previously. Planned extended outages will be  
20 needed as part of the operating regime. AECL has  
21 indicated its intention to plan yearly extended outages,  
22 exact timing and periodicity of the subsequent inspections  
23 will be determined once the final fitness for service  
24 report is submitted.

25                  The leak test has been performed and CNSC

1 staff have reviewed the preliminary results of the last  
2 area and is satisfied that the vessel's structural  
3 integrity is acceptable.

4 While AECL has had a process in place to  
5 monitor and measure tritium presence in the annulus as a  
6 possible source of leak congestion, CNSC staff has  
7 required AECL to enhance this process to make sure that  
8 there is a determined leak detection limit and the  
9 prescribed actions, if a leak is detected, are documented  
10 and the operators are appropriately trained.

11 So we're again looking for extra mitigation  
12 in case of a potential leak.

13 I will now pass the presentation over to  
14 Mr. Santini who will discuss the other issues around the  
15 extended outage.

16 **MR. SANTINI:** Thank you, Mr. Elder.

17 The NRU return to service project includes  
18 all of the activities other than the vessel repair that  
19 must be completed prior to the NRU restart.

20 The RTS plan is divided into three groups  
21 of activities; field work, procedures and supporting  
22 activities.

23 The last time the NRU Reactor underwent an  
24 approach to critical after an extended shutdown of more  
25 than six months was 1991. Hence, many activities related

1 to these RTS are considered non-routine.

2 As such, the CNSC required AECL to submit  
3 all of the documentation to demonstrate the systematic  
4 approach to the return to service and carried out several  
5 onsite verifications in relation to this project.

6 CNSC staff is satisfied that the plans, the  
7 procedures and the training developed by AECL adequately  
8 support a safe start of the NRU reactor and that the  
9 number of certified staff is sufficient to support restart  
10 activities.

11 At this time, the RTS activities are still  
12 in progress. Before approach to critical for restart,  
13 AECL needs to declare the reactor ready for service. CNSC  
14 staff will continue to closely monitor the remaining RTS  
15 activities through compliance inspections. CNSC staff's  
16 assessment of RTS activity further concludes that the core  
17 can be reloaded and the reactor will operate within the  
18 safety -- safe envelope established in the current licence  
19 and CNSC staff is satisfied that the RTS activities on the  
20 training of the NRU personnel are adequate in supporting a  
21 savoury start of the NRU reactor.

22 Next I would provide information on the  
23 organization of human factor issues that contributed to  
24 the NRU vessel leak event. Several organizations on human  
25 factor issues contributed to the NRU vessel leak event

1 over many years of operation and management and  
2 structures.

3                   These casual factors point to  
4 organizational weaknesses that are consistent with the  
5 results of the safety culture of self-assessment that AECL  
6 performed in 2008. AECL and CNSC staff agreed that the  
7 corrective action plan should therefore address both the  
8 root cause for this event and the 2008 safety culture  
9 self-assessment.

10                   CNSC staff concludes that the corrective  
11 action plan has identified essential elements required to  
12 correct the organizational weaknesses that led to the  
13 vessel leak. The plan is ambitious and it covers a broad  
14 range of activities from the development of human  
15 performance to new policies and implementation of best  
16 industry practices.

17                   For some causal factors, the CAP relies  
18 heavily on the isotope supply reliability program, to  
19 support some assurances of a stability, funding our  
20 resources. However, the ability of these programs to  
21 effectively provide the required stability and resources  
22 in the long term will not be verified since it depends on  
23 continued funding from the federal government.

24                   As a result of this, CNSC staff recommends  
25 the Commission request AECL to provide updates of the

1 details of the corrective action plan implementation every  
2 six months for at least the next two years.

3 This slide provides information on the gaps  
4 in the 2004 and 2005 vessel condition assessment that were  
5 uncovered with the event which were initially performed by  
6 AECL for the NRU re-licensing in 2005. These gaps raised  
7 doubts about the validity of the other condition  
8 assessments performed by AECL for this year's licence  
9 renewal. For that reason, CNSC staff required AECL to  
10 review all of the previous condition assessments, to  
11 identify of any potential gaps that may have an impact on  
12 safety.

13 AECL carried out a high level assessment  
14 using the Phenomena Identification and Ranking Table,  
15 PIRT, process which is based on a systematic top-down  
16 approach in assessing importance of the phenomena on the  
17 system and then the component -- on the component levels -  
18 - and then at the likely phenomenon level. AECL's PIRT  
19 looked at the risk to safety and reliable operation of NRU  
20 to the year 2021.

21 CNSC staff concurs with the conclusion of  
22 the PIRT process and the overall conclusion that there is  
23 little impact to safety as a consequence of the gaps  
24 identified in the process. However, the remaining issues  
25 with respect to the shortcoming of identifies in the 2004-

1           5 assessment may have an impact on operating reliability.

2                           Some of the gaps have been addressed  
3 through AECL's extended activity project within the  
4 current outage but AECL has committed that any remaining  
5 items will be addressed in the integrated safety review  
6 for licence renewal and the Isotope Supply Reliability  
7 Program.

8                           CNSC staff is currently performing a  
9 thorough review of AECL's condition assessment under the  
10 integrated safety review in preparation for the CRL  
11 licence renewal next year as is considered an important  
12 component for the continued operation of the NRU reactor.

13                           Prior to the shutdown of the vessel leak,  
14 AECL has reported high activity of fission products in the  
15 heavy water and it was later found out that this was due  
16 to the presence of defective fuel in the reactor. Given  
17 that this is a rare event and it appeared that it was more  
18 than one defective fuel element, CNSC staff required AECL  
19 to demonstrate that there was not a generic problem with  
20 NRU fuel and provided its assurances that the fuel loaded  
21 in the reactor, irradiated or fresh, is not likely to  
22 fail.

23                           At this time, AECL's investigation is not -  
24 - into the defective fuel is not complete and therefore  
25 CNSC staff believes that AECL cannot give assurances that

1 the fuel loaded in the reactor is unlikely to fail.  
2 Therefore, CNSC staff required AECL to put in place  
3 additional mitigating measures.

4 In response, AECL developed the NRU heavy  
5 water system high radiation identification and response  
6 procedure to mitigate any impact of any future fuel  
7 failures which can lead up to the reactor shutdown if the  
8 failed fuel is not promptly localized.

9 CNSC staff concluded that this is an  
10 important extra barrier. This procedure will reduce the  
11 risk of prolonged operation of the reactor with defective  
12 failed fuel precluding contamination of the primary system  
13 with fission products and provides risk mitigation.  
14 Ultimately this procedure will enhance workers' protection  
15 and be consistent with the ALARA principle.

16 With this extra mitigation, CNSC staff  
17 concurs with AECL that the risk to the health and safety  
18 of workers, the public and the environment due to fuel  
19 failure are acceptable. However, the risk to fuel failure  
20 has not been properly addressed yet so the risk to  
21 operational reliability has not been adequately mitigated.

22 In June 2010, CNSC staff performed an  
23 inspection of AECL fuel manufacturing quality assurance  
24 and its relation to the fuel effect investigation. The  
25 results of this inspection are still being analyzed but

1       some weaknesses in the QA, quality assurance, were found  
2       and AECL will need to address those to improve the fuel  
3       manufacturing process.

4               The following three slides will present  
5       information on the additional outage activities performed  
6       by AECL that were not required for restart and are  
7       presented today for information only.

8               The extended shutdown of NRU was a unique  
9       opportunity to perform maintenance and other activities on  
10      the reactor and its systems that are normally limited by  
11      time constraints, excessive radiation fields and other  
12      obstacles. The Extended Activity Project, EAP, was  
13      developed by AECL to take advantage of this extended  
14      outage.

15              The scope of the EAP work included a large  
16      number of jobs selected by an AECL expert panel using a  
17      risk-based approach applied to a list of tasks based on  
18      such items like the plant life management recommendations,  
19      longstanding maintenance and repair work, preventive  
20      maintenance backlogs, NRU safety upgrade walk downs and  
21      work identified as part of the protocol for the NRU  
22      licensing activities.

23              In the time allowed, AECL completed more  
24      than 75 percent of the activities initially identified in  
25      the EAP.

1                   On March 19<sup>th</sup>, 2010, AECL declared this  
2 project closed. The remaining activities initially  
3 planned under the EAP were deferred to future extended  
4 shutdowns. AECL's declaration included safety and impact  
5 assessment, as justification for these deferrals for  
6 future outages.

7                   CNSC staff concurs with AECL's assessment  
8 and will be monitoring to make sure that the outstanding  
9 activities are included in the future outage work.

10                  Another additional outage activity  
11 performed by AECL is the NRU safety upgrades walkdowns.  
12 In 2006 QA audit on the upgrades, CNSC staff found that  
13 some of the construction activities were not carried out  
14 in accordance with the requirement of CSA 286.3.

15                  One major part of the EAP project was the  
16 completion of the comprehensive walkdowns of the seven NRU  
17 upgrades to verify that the field installation conforms to  
18 the requirements of the standard.

19                  The walkdowns of all NRU upgrades were  
20 completed by AECL during this extended outage and resulted  
21 in numerous findings following AECL's accepted corrective  
22 action program.

23                  The significance of these findings were  
24 classified in accordance to safety impact; again,  
25 following AECL's accepted corrective action program.

1           About 150 findings were classified by AECL  
2           as "must-do's" before reactors restart since they had a  
3           potential impact on safety.

4           The most significant findings were missing  
5           seismic analysis documentation for the new emergency core  
6           cooling and the qualified emergency water supply systems.

7           AECL had to re-design the supports --  
8           seismic reports. CNSC staff will verify that the seismic  
9           reports are replaced before restart.

10          Two inspections based on random sampling  
11          were carried out to verify completion of the work related  
12          to the walkdown findings when declared completed by AECL.  
13          In a few cases, CNSC staff has requested original  
14          documentation to AECL to support the completion  
15          declaration.

16          CNSC staff is planning a 100 percent  
17          verification of all significant walkdown findings and will  
18          update the Commission on future -- on the results in the  
19          future.

20          At this time, CNSC staff is of the opinion  
21          that AECL is on track to resolve all safety significant  
22          findings prior to restart. To date, all safety upgrades  
23          are installed and operational.

24          Based on the review of AECL's submissions,  
25          inspections of AECL projects and discussions of technical

1 items, CNSC staff concludes that the NRU Reactor vessel  
2 has been repaired as to be fit for service noting that  
3 AECL has made an acceptable safety case for continued  
4 operation and the vessel leak test has been performed and  
5 accepted by TSSA.

6 Therefore, CNSC staff recommends that the  
7 Commission approve the return to service of the NRU noting  
8 that the acceptance of the final repair report by CNSC  
9 staff is pending and the in-service inspections of the  
10 vessel are mandatory and the first inspection must be no  
11 later than nine months after the NRU restart.

12 CNSC staff also recommends the Commission  
13 to request AECL to provide updates on the progress on  
14 effectiveness of the organizational corrective action plan  
15 every six months after the restart of the reactor.

16 This concludes CNSC staff's presentation.  
17 We are now ready to answer any questions the Commission  
18 may have.

19 **THE CHAIRMAN:** Thank you.

20 First of all, what I would like to do is --  
21 we're going to do one round of questions then listen to  
22 the interventions that were filed with us and then -- and  
23 then go for another round of questions.

24 Before we start, I'd like to recognize that  
25 we have some representatives from the Emergency Management

1 of Ontario, should people want to question their views  
2 about the seismic event or anything else associated with  
3 the emergency planning.

4 So with that introduction let me start with  
5 Mr. Graham.

6 **MEMBER GRAHAM:** Thank you, Mr. Chair.

7 I'd just like to start off on a -- first,  
8 on a positive note saying that I believe that AECL have  
9 assembled perhaps the largest group of engineers and  
10 scientists and so on to get this repair fixed and you're  
11 to be congratulated for getting that done.

12 However -- and I'll say "however" -- the  
13 rest of my questions are perhaps not going to be quite  
14 that complimentary but I'll start off by that we heard  
15 today that the vessel has been leak-tested and is ready  
16 for restart.

17 We've heard from CNSC staff that the  
18 repairs report by CNSC staff is still pending. My  
19 question first of all to AECL is: When do you foresee  
20 meeting the CNSC requirements and being able to restart  
21 the reactor?

22 **MR. PILKINGTON:** This is Bill Pilkington,  
23 for the record.

24 AECL has submitted the information for the  
25 final repair report. I believe that was done last

1 Tuesday.

2                   However, there will be time required --  
3 it's quite an extensive package of documentation and there  
4 will be time required for the CNSC to review that.

5                   **MEMBER GRAHAM:** To CNSC staff then: When  
6 do you foresee the final approval for the reactor to be  
7 restarted?

8                   **MR. ELDER:** So I'd just explain what we  
9 mean by in terms of "pending".

10                   Again, this is -- this is the written  
11 documentation that everything has been done. So what we  
12 do is we compare it against what was supposed to be done  
13 to all their evidence that it has been done.

14                   So it's a final confirmation step.

15                   All the requirements are already laid out  
16 in the original repair plan. The repair report just  
17 demonstrates that it was done appropriately.

18                   We are currently reviewing that. As Mr.  
19 Pilkington said, it was sent on Tuesday, we didn't  
20 actually receive the whole memory stick that it came on  
21 until we actually got it in our offices on Friday. So  
22 we're doing -- reviewing that right now. We figure it's  
23 about a week.

24                   So by the end of this week or maybe at the  
25 latest early next week, we would be -- have done that

1 confirmatory review.

2 Again, it's to make sure that they've  
3 dotted the t's and crossed the i's on that final repair.

4 We've seen the preliminary data. There is  
5 nothing in the preliminary data that indicates a problem  
6 but we are going to do a comprehensive walk-through of it  
7 to make sure that everything was done that was supposed to  
8 be done.

9 **MEMBER GRAHAM:** So back to AECL, you're  
10 looking at probably by the end of July you would be -- the  
11 reactor would be in full operation?

12 **MR. PILKINGTON:** So our current schedule  
13 would have the reactor operating at high power by the end  
14 of July and first delivery of isotopes.

15 **MEMBER GRAHAM:** Then, after that, you're  
16 down, what? Generally, on a 30-day basis, down three to  
17 four days on general maintenance; that's been the routine  
18 of operating of the NRU?

19 **MR. PILKINGTON:** Bill Pilkington, for the  
20 record.

21 Currently, the NRU is operating on a 28-day  
22 cycle of which 23 days would be operation and five days  
23 would be maintenance and testing.

24 And as said in the presentations, that will  
25 now be augmented by an annual extended maintenance

1 shutdown.

2 **MEMBER GRAHAM:** And that annual extended  
3 maintenance shutdown would be at about nine months or at  
4 six months?

5 **MR. PILKINGTON:** So the first planned  
6 shutdown will be within nine months.

7 So we would expect it will occur sometime  
8 in the first calendar quarter of 2011.

9 Following that, planned outages will occur  
10 on an annual basis.

11 **MEMBER GRAHAM:** Thank you.

12 And the next line of questioning is with  
13 regard to -- you were before us about three years ago for  
14 licence renewal, had -- did all this corrosion that we're  
15 hearing about today and have heard about for the last 14  
16 months, did that occur -- all occur after you came before  
17 us, three years ago?

18 **MR. PILKINGTON:** Bill Pilkington, for the  
19 record.

20 No, that corrosion has been progressing for  
21 a number of years.

22 **MEMBER GRAHAM:** I keep a bit of a library  
23 on CNSC -- on AECL appearing before us and it's quite  
24 large, for different reasons: for licence renewals, for  
25 other significant development reports, for other things.

1                   And when you came before us with regard to  
2                   -- in reading back -- you came before us in renewing that  
3                   50 year-old reactor and so on and the robustness for  
4                   service.

5                   I'm wondering why you hadn't done the type  
6                   of inspections that now occurred and caused a 14-month  
7                   shutdown. Why was that overlooked?

8                   **MR. PILKINGTON:** Bill Pilkington, for the  
9                   record.

10                  My review of the information and of the  
11                  findings of the root cause assessment that was done for  
12                  both the technical root cause and organizational root  
13                  cause would indicate that the corrosion that was occurring  
14                  in the vessel was not identified in the condition  
15                  assessment that was done for licence renewal in 2006.

16                  And a part of that was that, at the time,  
17                  the technology did not provide for non-destructive  
18                  examination at the base of the vessel where the build up  
19                  of gibbsite -- that's the oxide of aluminum in water --  
20                  where the build-up of gibbsite was heavier.

21                  And there was an assumption made in the  
22                  condition assessment that because carbon dioxide is  
23                  heavier than air, that the carbon dioxide concentrations  
24                  should be higher, lower in the vessel and, therefore,  
25                  there should not be a concern since measurements higher up

1 had indicated very very little corrosion of the wall.

2 So with the limitations of the inspection  
3 and assumptions that proved not to be true, we ended up  
4 with this corrosion going unnoticed.

5 **MEMBER GRAHAM:** Well, that's correct. Your  
6 assumptions were wrong and by that -- but prior to your  
7 application for renewal of the licence three years ago,  
8 you did do coupon analysis, I believe, in various parts of  
9 the vessel and to my knowledge, some of those coupons were  
10 never examined. Is that correct?

11 **MR. PILKINGTON:** Bill Pilkington, for the  
12 record.

13 So I did not bring with me experts on  
14 corrosion coupons to today's hearing. And so I believe  
15 that coupons were not examined at that time because they  
16 were felt not to represent the conditions in the vessel.

17 **MEMBER GRAHAM:** Well, yes. But then you  
18 were wrong again.

19 I'd like CNSC to comment on the fact that  
20 three years ago, we issued a licence for five years on the  
21 information that was provided to this Commission, on the  
22 information that the reactor was fit for service for the  
23 next five years, and less than two years into that  
24 licence, the reactor had to be shut down.

25 Did you not get sufficient information from

1 AECL or was there some oversight on behalf of both  
2 parties?

3 **MR. ELDER:** First, we did, in terms of  
4 coming up to that licence renewal, ask AECL to do a  
5 condition assessment of all the systems and they  
6 identified 21 systems that were done. And we looked at  
7 overall what they were done and the importance to the  
8 safety functions in the reactor.

9 So we looked at those things in terms of  
10 what risk were in gaps in those assessments -- going to  
11 cause in terms of looking at the importance of this one.  
12 And when you looked -- they did do an assessment of the  
13 condition, as Mr. Pilkington said.

14 They did do a condition assessment of the  
15 vessel. It obviously missed something, but you have to  
16 look at it in terms of what the safety consequences of  
17 that was, given that they detected the leak well before it  
18 became a safety issue and then it had a very limited  
19 safety impact because they shut down and had to fix it.  
20 It had a very large operational impact on them but a very  
21 minimal safety impact.

22 So again, when we're looking at it  
23 from a safety point, it didn't -- and the work  
24 they've done since then has not identified any major  
25 gaps in their safety case.

1                   **MEMBER GRAHAM:** AECL is before us today  
2 giving us an update on restart. We've heard of over --  
3 missed information and so other things that have led to  
4 this which -- and I could ask what this last 14 months has  
5 cost AECL at repairing the NRU and I will ask that.

6                   But my other -- my first question is, are  
7 there anything else that is being overlooked today that  
8 you can assure this Commission that when you start up that  
9 you will be able to get the next nine months, then a large  
10 shut down, then back for the balance of the licensing  
11 period?

12                   Are you confident -- because I've read the  
13 organizational improvements and read what your improved  
14 standards, improved leadership and oversight. And, you  
15 know, CNSC [sic] has been before us before with those  
16 exact same words. They've been before us back in 1998-99.  
17 They were back before us in 2003-2004. And they were  
18 always going to do better, always going to put together a  
19 better organization, always going to put together a better  
20 leadership.

21                   And what I want to know today is, as a  
22 Commissioner and as a Commission, are we in the position  
23 to be assured that these words are not just words?  
24 They've got to be meaningfully put together to establish  
25 credibility within AECL.

1                   **MR. PILKINGTON:** Bill Pilkington, for the  
2 record.

3                   We've put a lot of effort in this  
4 presentation this afternoon to talk about the improvements  
5 that have been made and the improvements that are  
6 underway.

7                   In terms of the equipment, we have taken  
8 advantage of this period of outage to do much more than  
9 simply repair our reactor vessel.

10                  We have undertaken maintenance that  
11 requires the reactor defueled and drained with this  
12 opportunity. In fact, we've done all outstanding  
13 maintenance that requires that condition. We've done much  
14 more in terms of inspections.

15                  We've done walkdowns of systems to verify  
16 their installation exactly meets the design. We've taken  
17 the opportunity to undertake further inspections. We've  
18 reviewed condition assessments. We've returned to  
19 condition assessments using the PIRT process from a  
20 different approach to get a second view that, in fact,  
21 nothing has been overlooked.

22                  And going forward, we will start up with a  
23 reactor in a much better condition than it was when we  
24 shut down. We will always operate the NRU safely. We  
25 will not operate it in an unsafe condition, but we have

1 done more work in this outage to improve the reliability  
2 going forward than simply repairing the vessel.

3 And if I just might add that we continue to  
4 invest in improvement in the NRU through the isotope  
5 supply reliability program. We have funding available and  
6 we have a program in place whose sole purpose is to  
7 improve the reliability of NRU operation, and that program  
8 continues.

9 I am confident that we will operate safely  
10 and reliably through the next operating interval.

11 **MEMBER GRAHAM:** Mr. Chair, I have a lot of  
12 other questions, but I want to pass it on to my  
13 colleagues.

14 But just one question I had -- what have  
15 you -- what has this whole episode cost since last May?

16 **MR. MacDIARMID:** Hugh MacDiarmid, for the  
17 record.

18 I did make a comment when I appeared before  
19 the House of Commons Standing Committee just a couple of  
20 months ago that still holds, which is that the total cost  
21 will be in the neighbourhood of \$115 million.

22 **THE CHAIRMAN:** That's including all the  
23 repair plus the extra?

24 **MR. MacDIARMID:** That's correct. I'm  
25 sorry, I should clarify that.

1                   That does include -- in a sense that's our  
2 cash requirement, which includes foregone revenues from  
3 isotope production.

4                   **THE CHAIRMAN:** But ---

5                   **MR. MacDIARMID:** So direct costs are about  
6 80 -- about 90 million of that total.

7                   **THE CHAIRMAN:** Any of these costs are also  
8 towards getting the licence renewed into 2011? I thought  
9 you've done a lot of additional work.

10                  **MR. MacDIARMID:** That would include the  
11 extended activities program component of that, which does  
12 contribute to the readiness for the licence renewal.

13                  **THE CHAIRMAN:** Okay. Thank you.

14                  Dr. McDill?

15                  **MEMBER McDILL:** Thank you, Mr. Chair.

16                  I'd like to begin by acknowledging the  
17 technical complexity and challenge of what's been done  
18 over the shutdown period.

19                  My questions, Mr. Chair, are principally  
20 technical in nature and for the purposes of providing some  
21 transparency to the public reviewing this document.

22                  In your presentation, AECL, on page 5, you  
23 show the schematic of the vessel.

24                  Could you point out or tell me where the  
25 lower vessel seal is with respect to that schematic so

1           that I understand the residual stress comments later in  
2           the document?

3                       **MR. PILKINGTON:** Bill Pilkington, for the  
4           record.

5                       I believe the lower vessel seal would not  
6           be visible -- or actually, I guess it is.

7                       If you look at the lowest point ---

8                       **MEMBER MCDILL:** Maybe we could have the --  
9           could we have it up?

10                      **MR. PILKINGTON:** Could we put it on the  
11           screen?

12                                       **(SHORT PAUSE)**

13                      **MEMBER MCDILL:** It's Slide 5 -- 4 and 5.

14                      **MR. PILKINGTON:** There we go.

15                      Okay, we'll just leave it in that format.

16                      But I think if you can put the mouse over the -- or we'll  
17           get help.

18                      Thank you for the help.

19                      I think if you just put the mouse over the  
20           -- this is the mechanical seal at the base of the vessel.  
21           So you're only seeing the top portion of it, it's a  
22           double-knife edge aluminium seal and there is a helium  
23           interspace.

24                      **MEMBER MCDILL:** And where are the bolts  
25           that are referred to for that seal, roughly? I know

1 they're not on the image but can you talk to them?

2 **MR. PILKINGTON:** So I believe the bolt  
3 circle actually passes through the seal but let me -- let  
4 me pass that question to Randy Lesco, our Chief Nuclear  
5 Engineer.

6 **MR. LESCO:** So for the record, my name is  
7 Randy Lesco. I'm the General Manager of Engineering and  
8 the Chief Nuclear Engineer for the site.

9 The actual bolts actually pass between the  
10 two knife edges of the seal.

11 **MEMBER McDILL:** Thank you. That's helpful.

12 My next question, it relates to your Slide  
13 21, but any of the ones with plates would be okay.

14 What is the material of the plates that  
15 have been applied, for example, in JR13 to 17? You  
16 haven't discussed the material.

17 I know what the material of the vessel is,  
18 it's an irradiation hardened 5052, I believe, but what are  
19 the plates?

20 **MR. PILKINGTON:** Again, I'll direct that  
21 question to Randy Lesco.

22 **MR. LESCO:** Randy Lesco, for the record.  
23 It's made out of 5052 aluminium.

24 **MEMBER McDILL:** So it's Virgin 5052?

25 **MR. LESCO:** That is correct.

1                   **MEMBER McDILL:** Okay.

2                   And the filler weld, what alloy was that?

3                   **MR. LESCO:** Randy Lesco, for the record.

4                   It was 4047 aluminium.

5                   **MEMBER McDILL:** Is there any -- is there  
6 any long-term issue with chemical corrosion or galvanic  
7 corrosion between any of those materials and, if there is,  
8 how would you detect it in medium to long-term?

9                   And maybe staff can comment on the answer.

10                  **MR. LESCO:** Randy Lesco, for the record.

11                  So that assessment was done ---

12                  **MEMBER McDILL:** Sorry, I can barely hear  
13 you.

14                  **MR. LESCO:** Randy Lesco, for the record.

15                  So that assessment was done to ensure that  
16 we did not have galvanic corrosion between the well fill  
17 material 4047 and the 5052 aluminium.

18                  **MEMBER McDILL:** And staff concurs?

19                  **MR. ELDER:** Sorry, I'll ask Raoul Awad, our  
20 technical lead on this one, to answer.

21                  **MR. AWAD:** Raoul Awad, for the record.

22                  We believe that 4047 and 5052 will behave  
23 in the same manner regarding the corrosion.

24                  **MEMBER McDILL:** I'm more concerned about  
25 the risk of galvanic corrosion or some inter-material

1 corrosion.

2 **MR. AWAD:** We don't have any indication  
3 that can confirm there could be galvanic corrosion between  
4 them.

5 **MEMBER McDILL:** Thank you.

6 My next question is with respect to the  
7 finite element analysis and you presented a deformation  
8 map on Slide 22.

9 You removed a coupon from the vessel to  
10 determine material properties but, in your finite element  
11 analysis, were you able to use that coupon to develop a  
12 constitutive model or to predict the high temperature  
13 behaviour of the material during welding or were you able  
14 to use a constitutive model and material properties from  
15 other -- some other sources?

16 **MR. LESCO:** Randy Lesco, for the record.

17 So we did use some of the data associated  
18 with that material properties that we measured from the  
19 coupon, as well as the scoop samples.

20 **MEMBER McDILL:** So you did high temperature  
21 tests on the sample to determine its yield strength at  
22 welding temperatures?

23 **MR. LESCO:** So let me just step back one.  
24 Randy Lesco, for the record.

25 What we did in terms of developing this

1 finite element metals or the techniques for analysing the  
2 deformations, we actually did sample coupons in terms of  
3 measuring the heat input prior to actually welding  
4 demonstration coupons.

5 **MEMBER McDILL:** Did staff look at the  
6 source of the constitutive model for these predictive  
7 measurements?

8 Is an industry code used? Where did the  
9 high temperature properties come from?

10 I can understand the heat input and  
11 velocity coming from the test welds but the behaviour is a  
12 bit more challenging?

13 **MR. AWAD:** Actually, we looked at it from  
14 two perspectives: the first one is the qualification of  
15 the weld itself and the second one is the final fitness  
16 for service assessment will model all the stress generated  
17 in the -- in the vessel.

18 But for this particular one, we didn't look  
19 at it.

20 **MEMBER McDILL:** So this prediction map of  
21 deflection from welding, this is one use of the finite  
22 element analysis and the other one, the fitness for  
23 service on Slide 29, I'll come to, this image on Slide 22,  
24 you've exaggerated the deformations by 1000 times, 100  
25 times, 10,000 times? It's not in the picture.

1                   And what is the red spot on the left that's  
2                   at the opposite end of the deformation?

3                   This is -- you're using this to talk about  
4                   the crack so it's very unclear in this map what things  
5                   are. Perhaps you could explain.

6                   **MR. PILKINGTON:** Okay, Bill Pilkington, for  
7                   the record.

8                   I'm just going to generally go back over  
9                   what this picture is describing.

10                  We were aware before we completed the  
11                  repair at J-Rod 1317 that the welding on the left-hand  
12                  side, which is a large area of 3 millimetre weld build-up,  
13                  would result in significant deformation of the vessel.

14                  And so, prior to doing the welding, we did  
15                  look at the expected deformation and I believe it was in  
16                  the order of 5 to 6 millimetres, maximum, which I think is  
17                  your red spot.

18                  And so we made sure that our tooling would  
19                  be able to complete the repair with that amount of  
20                  deformation occurring during the repair process.

21                  The significance is that there was also  
22                  deformation that occurred on the right-hand side of the  
23                  repair due to the work occurring on the left.

24                  And so that deformation was, we believe,  
25                  the source of the cracking that occurred as that cracking

1 was not there when the repair was completed on the right-  
2 hand side but was there after the complete build-up was  
3 done on the left-hand side.

4 Or excuse me -- excuse me -- and the other  
5 point is that I believe that the amount of deformation on  
6 the right-hand side was between 2 and 3 millimetres.

7 **MEMBER MCDILL:** Thank you.

8 Does staff want to follow-up on that?

9 **MR. AWAD:** Raoul Awad, for the record.

10 I will ask Mr. Blair Carroll to comment  
11 this one.

12 **MR. CARROLL:** Blair Carroll, for the  
13 record. I'm a Technical Specialist with Operational  
14 Engineering Assessment Division.

15 With regards to deflections of the vessel  
16 wall, the licensee used laser profilometry after -- after  
17 welding to measure the deflections and compare that back  
18 to the behaviour predicted in the numerical models.

19 And with regards to your previous question  
20 regarding the post-weld behaviour of the material, one of  
21 the tests that was done beforehand was with one of the  
22 scoop samples taken from the vessel to actually weld a  
23 bead of -- weld a bead over top of that coupon as it was  
24 contained within a larger plate of aluminium and the  
25 licensee went back in after the coupon was welded and

1 looked at the metallurgy and the mechanical properties of  
2 that post-welded coupon to help them predict how the  
3 numerical model would behave compared to the actual welds  
4 on the vessel.

5 **MEMBER McDILL:** Okay. So it would appear  
6 there was some back and forth iterative development  
7 between the experiments and the FEA model to get a  
8 harmonized model then; is that correct?

9 Okay. Thank you.

10 My next question is with respect to Slide  
11 23 which I think is the next slide actually. Thank you.

12 With respect to the red "R" in JR-23 and  
13 the -- that was a flaw in the heat affected zone and  
14 there's a follow-up coming.

15 What is the nature of the reportable flaw?  
16 Is it a -- it's obviously not a lack of fusion, but what  
17 is it? What was it?

18 **MR. LESCO:** Randy Lesco, for the record.

19 So basically it was a flaw that was  
20 detected on the left-hand side, top corner of the weld  
21 which was picked up by ultrasonic examination and it was  
22 slightly a sub-inner surface defect roughly in the order  
23 of 60 millimetres long -- or makeup of 60 millimetres  
24 long.

25 **MEMBER McDILL:** How will that be

1           dispositioned in over time? What's -- it's been cleared,  
2           like you're tracking it?

3                       **MR. LESCO:** Randy Lesco, for the records.

4                       That's correct. So it will be part of our  
5           ongoing in-service inspection to monitor that indication.

6                       **MEMBER MCDILL:** And staff, can you comment  
7           on that please?

8                       **MR. ELDER:** In terms of the disposition it  
9           comes up to making sure that this becomes part of their  
10          in-service inspection to go back and revisit that  
11          indication on a routine basis.

12                      So it may not be annually, but, you know,  
13          to see if there's any growth in that crack. It doesn't  
14          pose an issue right now, but it certainly is part of the  
15          -- it will become part of their in-service inspection to  
16          continually monitor that.

17                      **MEMBER MCDILL:** And it's oriented in some  
18          manner in which it won't experience any kind of crack  
19          opening mode to the best of your knowledge?

20                      **MR. LESCO:** Randy Lesco, for the record.

21                      That is correct.

22                      **MEMBER MCDILL:** Thank you. And similar  
23          comments then, please, with respect to the 4-5 lack of  
24          fusion. I realize again that the technical authority has  
25          cleared these but how will AECL and staff monitor the lack

1 of fusion?

2 **MR. LESCO:** Randy Lesco, for the record.

3 So basically when we were designing the  
4 repair we had taken into account some inefficiencies in  
5 terms of the weld and so these have been demonstrated in  
6 our structural assessment that some minor lack of fusion  
7 is acceptable and will not increase in size during  
8 operation of the vessel.

9 **MEMBER McDILL:** Staff?

10 **MR. ELDER:** Just a comment. When we're  
11 looking at this one, we're making sure that none of them  
12 had a potential impact on structural integrity so that  
13 then they go into the ongoing monitoring program to make  
14 sure that they do not get any bigger but we have no  
15 evidence to support that they would get bigger than where  
16 they are.

17 **MEMBER McDILL:** AECL showed us some models  
18 of test welds and test combinations with considerable  
19 deformation. Now I realize those are plates and they're  
20 separate from the vessel and so we don't have the heat  
21 sink and neither do you have the constraint that the  
22 vessel applies.

23 So my concern is with all of these flaws  
24 that there isn't some local bending going on. These are  
25 very complex welds with multiple side-by-side passes with

1 one pass sort of heat treating the previous perhaps to  
2 some extent but ultimately with large residual stresses.

3 Does AECL or does staff have a concern  
4 about local bending that's happening?

5 I realize you've got a predictive FEA and  
6 I'll come to the predictive FEA in a minute but I'm very  
7 concerned about localized bending going on in this loaded  
8 vessel. I realize the pressures are low, it's low  
9 temperature, low pressure, but --- maybe AECL first?

10 **MR. LESCO:** Randy Lesco, for the record.

11 So basically to ensure that we don't have  
12 an issue with respect to residual stresses or local  
13 bending, part of our ultrasonic examination was to look  
14 into the heat affected zone to ensure that we do not have  
15 any indications associated with that issue.

16 **MEMBER McDILL:** My last question, or last  
17 series of questions -- you want me to go to round 2?

18 **THE CHAIRMAN:** No, I still want somebody to  
19 translate to me what this discussion was about. Somebody  
20 better tell me what is the safety concern here that Dr.  
21 McDill and AECL and stuff are talking about.

22 Is there any safety concern? I mean,  
23 you're showing an "R" in red. It's reportable. To me  
24 it's a red flag. So please explain to me in terms of  
25 safety language.

1                   **MR. PILKINGTON:** This is Bill Pilkington,  
2 for the record.

3                   And again, I won't challenge the discussion  
4 that just went on but I would say that -- make the point  
5 that for the areas of lack of fusion, as was stated, the  
6 structural analysis of the repair took into account that  
7 there would be some areas of lack of fusion and so  
8 allowances were made in the structural analysis.

9                   So our engineering has reviewed the lack of  
10 fusion that was identified and determined that it is well  
11 within the allowances in the structural analysis.

12                   So our view would be that the lack of  
13 fusion does not pose a safety issue. It's well within the  
14 structural analysis that was done.

15                   In the case of the reportable indication on  
16 J-rod 23, we do not believe that that feature will grow in  
17 service. The stresses in operation are essentially the  
18 same as the stresses with the vessel at rest.

19                   However, for that indication, we will go  
20 back and re-do the NDE on it to confirm that it remains  
21 the same as when it was found and so that confirmation  
22 over successive inspections over successive years of  
23 outage will confirm that it in fact is not growing and  
24 does not present any safety hazard.

25                   **THE CHAIRMAN:** Staff want to comment on



1 direction which is along the axis of  
2 small cracks and the lower heat  
3 affected zones so there's no driving  
4 force."

5 I'm concerned again about local bending.  
6 That given, looking at your before and after repair stress  
7 field maps, there's no indication here of what these are.

8 Is this effective stress? Is this hoop  
9 stress? Are these deformations? It says "stress fields";  
10 so I'm presuming we have stresses here.

11 And in the one on the lower quadrant of the  
12 image, does that finite element model take into account  
13 the total new geometry of the vessel with the welded  
14 plates or is it an optimized vessel geometry?

15 So there's a complex set of questions  
16 there. Thank you.

17 **MR. LESCO:** Randy Lesco, for the record.

18 So what you see in the lower picture is an  
19 actual model of the vessel at repair which includes where  
20 we have indicated areas of wall loss from the original  
21 vessel. So that is a representation of the vessel after  
22 repair.

23 What you see there is basically a stress  
24 field of the local membrane stresses after the repair.

25 **MEMBER McDILL:** Thank you.

1                   So it includes the full geometry, all the  
2 welded ---

3                   **MR. LESCO:** Randy Lesco, for the record.

4                   I just wonder if you could repeat your  
5 question, Dr. McDill?

6                   **MEMBER McDILL:** That's fine. I was waiting  
7 for the discussion to -- so you've told me that includes  
8 the geometry with the new plates, all the new welds  
9 completely, every single one? There's no optimization  
10 there?

11                  **MR. LESCO:** Randy Lesco, for the record.

12                  So that basically reflects the as-repaired  
13 vessel.

14                  **MEMBER McDILL:** Thank you.

15                  And does staff want to comment on the use  
16 of membrane stresses in this application? Effective  
17 stress I would have thought was ---

18                  **MR. CARROLL:** Blair Carroll, for the  
19 record.

20                  This is only one component of the vessel  
21 stress analysis. We haven't received the final fitness  
22 for service assessment yet but we do appreciate your  
23 comments with regards to local bending stresses and we  
24 expect that the laser profilometry measurements that have  
25 been taken before and after welding at these locations

1 will help us determine what the bending stress components  
2 are so that they can be incorporated in the fitness for  
3 service assessment as well.

4 **MEMBER MCDILL:** Thank you, Mr. Chair. I  
5 have only one last question and once again it's the fact  
6 that we can't inspect this area and following up Mr.  
7 Graham's comments, there's a certain nervousness up here  
8 on the dais with respect to lack of inspection.

9 So perhaps you could comment on when will  
10 the tool be developed so we can -- so there will be an  
11 inspection of that area?

12 **MR. PILKINGTON:** Bill Pilkington, for the  
13 record.

14 The tooling to do this inspection is  
15 currently under development and we will have the tooling  
16 available and the qualified procedures available to  
17 complete this inspection in our first extended shutdown  
18 within the first calendar quarter of 2011.

19 **MEMBER MCDILL:** Thank you.

20 And staff is satisfied that there is  
21 sufficient conservatism that this lack of inspection is  
22 not an issue at this time?

23 **MR. ELDER:** Yes, and that's one of the  
24 factors when we came with the nine months is going back  
25 and looking at all the information we had and looking for,

1       you know, obviously we are going to when we get the final  
2       fitness for service reports within the three months.  
3       We'll inform you if any of this changes our opinion but  
4       right now we're fully satisfied with the nine months as  
5       acceptable.

6                   **MEMBER MCDILL:** Thank you, Mr. Chair.  
7       That's all my questions for round one.

8                   **THE CHAIRMAN:** Okay. Trying to get round  
9       one finished before we take a break.

10                   Mr. Tolgyesi?

11                   **MEMBER TOLGYESI:** Merci, monsieur le  
12       président.

13                   When you are looking historically, leaks  
14       are closely related today in NRU's history. The first  
15       vessel started to leak in 1957 and then was established  
16       that the cause is probably nitric acid.

17                   Was this corrosion due to nitric acid the  
18       main reason to replace the vessel in 1970-72?

19                   **MR. PILKINGTON:** It's Bill Pilkington, for  
20       the record.

21                   And I believe the replacement took place  
22       between 1972 and 1974 and the vessel was replaced because  
23       of nitric acid corrosion.

24                   There's a couple of things that could be  
25       added. One is that the vessel material for the first

1 vessel was susceptible to intergranular corrosion and the  
2 50-52 alloy of the current vessel is not, and in fact has  
3 proven not to be.

4 And the second thing is that the inert gas  
5 in the J-rod annulus CO<sub>2</sub> I believe was added with the  
6 installation of the second vessel. So I believe the first  
7 vessel had air in the space between the vessel and the  
8 reflector.

9 **MEMBER TOLGYESI:** And after replacing the  
10 vessel in the early seventies, leaks continued through  
11 mechanical seal mainly, that's what you were saying?

12 **MR. PILKINGTON:** That is correct that leaks  
13 in the reflector appeared even in the second vessel  
14 within, I think, two years of it being put into service.  
15 So there was a design issue with both vessels in that they  
16 were susceptible to leaks developing in the reflector.  
17 That would be light water leaks.

18 **MEMBER TOLGYESI:** Was the mechanical seal  
19 part of this examination and what are the results?

20 **MR. PILKINGTON:** Bill Pilkington, for the  
21 record.

22 Could you explain what you mean by the  
23 mechanical seal?

24 **MEMBER TOLGYESI:** But you were saying that  
25 there are some leaks through mechanical seal. Do you

1 still have some leaks through mechanical seal or not?

2 **MR. PILKINGTON:** Okay. Bill Pilkington,  
3 for the record.

4 So the true mechanical seal, there's one at  
5 the top of the vessel and one at the base of the vessel  
6 and both of those have not had a history of leaks since  
7 early in the installation.

8 However, the reflector has had a history of  
9 leaks and these leaks have generally occurred at tubes  
10 that run through the water box and into the J-rod annulus.  
11 And so these tubes in the reflector have chronically  
12 developed leaks and a number of actions have been taken  
13 over the years to mitigate these leaks but they have not  
14 eliminated them.

15 **MEMBER TOLGYESI:** You were saying that in  
16 2004-2005 assessment, focus was on corrosion at the upper  
17 part of the vessel where the first vessel failed. That  
18 was the main reason. It was the upper part.

19 However, the leakage in the 2009  
20 nondestructive examination is concentrated on the bottom  
21 300 millimetres of 9,000 because it's nine metres height I  
22 think.

23 How could you explain that this wide gap in  
24 2004 assessment and what we find in 2009 because it's the  
25 kind of what we were saying that's supposed to be? In

1           2004, we said it's supposed to be on the upper part the  
2           corrosion and what we find that it's quite worse, much  
3           worse and it's in the bottom part, which we did not expect  
4           probably, or did you?

5                       **MR. PILKINGTON:**   So Bill Pilkington, for  
6           the record.

7                       From the best of what I have learned that  
8           the original vessel failed I believe at the bellows. I  
9           think there's a couple of expansion bellows partway up but  
10          generally in the higher level or higher elevation of the  
11          vessel. I believe those were the areas that were most  
12          subject to corrosion on the first vessel and so in the  
13          inspections done in 2004-2005, that area was the focus of  
14          those inspections.

15                      After the leak occurred in May 2009, we did  
16          do a very thorough inspection at the base of the vessel  
17          which before wasn't possible. So we have a very accurate  
18          map of the lower portion of the vessel, the lower 300  
19          millimetres.

20                      We also did samplings of wells higher up in  
21          the vessel and other areas higher up in the vessel  
22          including these bellows. So we have done, on a sampling  
23          basis, a broad examination of the vessel. However the  
24          focus here has been on the area that has shown corrosion  
25          and that was the cause of the vessel leak.

1                   **MEMBER TOLGYESI:** What you are saying you  
2 are mainly examining -- visual examination and non-  
3 destructive examination of 300 millimetres, except of six  
4 vertical welds which you scan from bottom to the top or  
5 from top to the bottom.

6                   **MR. PILKINGTON:** Yes, so I can confirm that  
7 we did do further NDE inspections of the vertical welds in  
8 the vessel, and we did do vertical strips over the length  
9 of the vessel, but I cannot confirm how many we did.

10                   **MEMBER TOLGYESI:** What you are saying on  
11 page 35, "Phase 3, six vertical scans were conducted from  
12 the top of the vessel to the bottom circumstantial weld  
13 using phase RAUT." So there were six at least.

14                   **MR. PILKINGTON:** Okay, the consensus of  
15 recollection is six, but I don't have that as a fact.

16                   **MEMBER TOLGYESI:** And do you have any  
17 results of these scans?

18                   **THE CHAIRMAN:** Mr. Elder?

19                   **MR. ELDER:** I won't guess -- of the six.  
20 My recollection is it was six as well, but one of the  
21 things that was very important for us is they repeated  
22 some of the scans they had done in 2004 and 2005, so we  
23 could see that there was no degradation between those two  
24 scans.

25                   So again, that confirmed that there's not

1 something active happening in the rest of the vessel, only  
2 at this corrosion at the bottom. Which was not because of  
3 limitations to tools and the time they had to look at was  
4 not identified in that 2004-2005 scan.

5 So it was very important that -- for us,  
6 they did two things that were very important. They  
7 repeated scans, so they have data from 2004-2005 and again  
8 in 2009, and they looked at the welds. There are a number  
9 of vertical welds in the vessel, and they looked at those  
10 vertical welds as well, which were -- again, because they  
11 were a weld, they could be potentially susceptible to a  
12 different corrosion.

13 And again, there was no -- there was just a  
14 very minimal -- I say very minimal corrosion -- within the  
15 technique you'll get, it's greater than seven millimetres,  
16 between seven and eight, eight being the -- within the  
17 uncertainty and the technique there's full wall.

18 **MEMBER TOLGYESI:** So you were too fast for  
19 me because I was asking for results. I couldn't find it.

20 You were saying that in Phase 4 that  
21 examination -- you did examination on the walls behind the  
22 baffle blocks in the Figure 2.2, but I cannot find; where  
23 is this baffle blocks, what you call them?

24 **MR. PILKINGTON:** It's Bill Pilkington, for  
25 the record.

1                   It shows quite well on one of the early  
2 slides, I think about the third or fourth slide in.

3                   **MEMBER TOLGYESI:** Yes.

4                   **MR. PILKINGTON:** So we're working on the  
5 mouse, so that the structure that you see that is angled -  
6 --

7                   **MEMBER TOLGYESI:** Yes?

8                   **MR. PILKINGTON:** --- is a baffle block.

9                   **MEMBER TOLGYESI:** Okay.

10                  **MR. PILKINGTON:** I believe it's a heat  
11 shield in order to reduce radiation heating of the  
12 material behind it.

13                  Oh yes, so the Phase 4 inspection, we had  
14 to design a probe that had a geometry low enough profile  
15 to be able to scan behind the baffle block.

16                  **MEMBER TOLGYESI:** And at page 3.7, you are  
17 saying that, "these examinations..." -- you were enumerating  
18 them -- "...did not reveal any abnormal thinning in the  
19 vessel walls."

20                  What's abnormal and what's normal?

21                  **MR. PILKINGTON:** It's Bill Pilkington, for  
22 the record.

23                  I have a limited technical capability to  
24 answer that question, but I am aware that on the Phase 4  
25 scans, there was a significant amount of indication that

1 was due to the original welds in the vessels. And so in  
2 the data that was taken, the analyst had to look, take  
3 into account the -- what they were seeing from the  
4 original welds in the vessel and look for abnormalities.

5 We were really looking for wall thickness  
6 and for significant changes in wall thickness, and we  
7 identified none at those lower elevations.

8 **MEMBER TOLGYESI:** And just one in this  
9 round, you were talking about thickness of the scoops  
10 which were from 0.36 to 3.43 millimetres; 3.43 over 8 is  
11 about 42 percent. It's quite thick, scallop sample.

12 **MR. PILKINGTON:** It's Bill Pilkington, for  
13 the record.

14 Yes, I believe those would be the depth of  
15 the depressions that were produced when the scoops were  
16 removed. So the scoops themselves, the samples were  
17 thinner by the width of the blade that had to cut them.

18 Now those scoops were taken, there was  
19 actually -- they were taken from areas of full wall of the  
20 vessel. And so because of the benign shape of the scoop  
21 and because of the wall thickness where they were taken,  
22 there was adequate structural strength and corrosion  
23 allowance remaining after the samples were taken.

24 **MEMBER TOLGYESI:** And you know when you are  
25 looking -- I don't know what was the figure -- it's 4.1.

1 It was in a -- you know, you were showing the spots where  
2 you were welding. These 10 -- here, Slide 15.

3 When you are looking at these colour codes,  
4 you know, when you were showing these 10 places where you  
5 were welding, there are some next to JR-30, which is close  
6 to similar colour as the JR-30, if you consider was the  
7 thickness. And why you didn't do any work there?

8 It's similar to the left on -- the JR-13/17  
9 is a spot. Are some reasons why you didn't do welding  
10 there or it's eventually a potential of leakage or  
11 corrosion?

12 **MR. PILKINGTON:** So the strategy was to do  
13 repairs in areas that, through the structural analysis,  
14 would not meet structural requirements plus corrosion  
15 allowance or that had a leak existing.

16 So in JR-41 where we had both, a leak and a  
17 coupon removed, the repair was obvious.

18 But when you look at some of the other  
19 areas, unfortunately, the strips are not blown up that  
20 large, but you may see very small areas of very deep  
21 penetrations.

22 As I showed in the samples that I had, the  
23 general scalloping that occurred from the general  
24 corrosion mechanism really was an issue in few sites. The  
25 other issue of deep pockets or deep penetrations was, I

1           guess, the main reason for needing to do repairs.

2                       So when you look at those sites, every area  
3           that we did not repair has sufficient material for  
4           structural -- to meet structural requirements and to have  
5           an adequate corrosion allowance.

6                       And so the mitigating strategies that we're  
7           taking to arrest corrosion will prevent those from ever  
8           reaching the point of requiring repair.

9                       **MEMBER TOLGYESI:** My last is just -- tell  
10          me in the future -- now, you have all these technologies  
11          to measure the thickness -- what is the minimum thickness,  
12          what you will reach, you will act to make sure that the  
13          vessel is safe; six, four, three millimetres?

14                      **MR. PILKINGTON:** Bill Pilkington, for the  
15          record.

16                      I believe that the minimum thickness is not  
17          an absolute but is a function of the stress at every  
18          location on the vessel.

19                      So we will take measurements of the wall  
20          thickness going forward, and we would put those into our  
21          stress analysis to determine that we still have full  
22          structural integrity and sufficient corrosion allowance  
23          for whatever the next operating interval would be.

24                      **MEMBER TOLGYESI:** Okay, thank you.

25                      **THE CHAIRMAN:** Dr. Barriault?

1                   **MEMBER BARRIAULT:** Thank you, Mr. Chairman.

2                   First of all, I would like to comment also  
3 really on the fact that it's been a very interesting,  
4 fascinating engineering process for me to follow during  
5 the repair of this vessel.

6                   However, I often wonder really whatever  
7 happened to the person that you had responsible for  
8 corrosion management. Does that function still exist?

9                   I understood from previous presentation  
10 that you had a person responsible for monitoring the  
11 corrosion in this vessel during its operation; is that  
12 correct?

13                   **MR. PILKINGTON:** Bill Pilkington, for the  
14 record.

15                   That would not be entirely correct, and one  
16 of the challenges we faced as an organization is accepting  
17 conditions, equipment conditions, that really should be  
18 brought to the attention of the organization.

19                   And so we have world-class corrosion  
20 experts and we've in fact brought them into play in  
21 dealing with this issue. However, the people that had the  
22 corrosion knowledge and understood the consequences didn't  
23 have the information to tell them that there was a  
24 corrosion issue in the vessel.

25                   **MEMBER BARRIAULT:** So -- I'm sorry.

1                   **MR. PILKINGTON:** I would just say that the  
2 staff who were working with the vessel didn't recognize  
3 the risk that this corrosion presented.

4                   **MEMBER BARRIAULT:** So were these people  
5 involved before this problem, or after the problem  
6 appeared?

7                   **MR. PILKINGTON:** So our corrosion people  
8 would have been involved in the condition assessment that  
9 was done in 2004-2005. I believe they have not been  
10 involved in general ongoing corrosion monitoring in the  
11 vessel that contributed to the condition assessment that  
12 was done.

13                   **MEMBER BARRIAULT:** With the change in  
14 management culture, do you see an involvement of these  
15 people at the onset?

16                   **MR. PILKINGTON:** So the organization that  
17 we are moving to is one where our operating and  
18 maintenance staff will not accept low standards of  
19 equipment condition and where anything that appears to be  
20 of a low standard will be raised to the attention of the  
21 organization for disposition.

22                   And that's the way that the people who  
23 understand the science of the corrosion will be brought  
24 into the loop as a part of the overall health monitoring  
25 of the NRU systems.

1                   **MEMBER BARRIAULT:** If I can -- I'm sorry.

2                   If I can ask the same question of the CNSC  
3 staff -- are you comfortable that all of the reactor  
4 vessels out there do not have corrosion problems?

5                   **MR. ELDER:** In terms of this type of  
6 corrosion, you've got to understand this is a research  
7 reactor. It's actually a unique research reactor in terms  
8 of having aluminum vessel.

9                   **MEMBER BARRIAULT:** I understand that.

10                  **MR. ELDER:** Yeah.

11                  **MEMBER BARRIAULT:** But there are other  
12 vessels out there.

13                  **MR. ELDER:** There are other vessels out  
14 there and they -- I'm going back into the power reactor.  
15 They're much more -- they've always had more defined  
16 inspection programs based on the higher risk systems, the  
17 high-pressure systems and high-pressure, high-temperature  
18 systems.

19                  And as I said there has been a structured  
20 program. If there has been a -- from our perspective on  
21 this one is how you translate those down into a low-  
22 pressure system. We're looking at -- you know, certainly  
23 we've figured out how NRU going forward has to have in-  
24 service inspection.

25                  What we're looking at what does this mean

1 for other systems. We have no other reactors. We have no  
2 indication of a problem but in general how would you  
3 approach it differently so you would not develop this  
4 problem in another one. So we are looking at that.

5 **MEMBER BARRIAULT:** Okay. So what I'm  
6 hearing then is that you're not completely comfortable at  
7 this point but you're going to look into it.

8 **MR. ELDER:** We are comfortable where we are  
9 but we want to make sure that we don't end up down this  
10 road 10 to 15 years in the future with something else.

11 **MEMBER BARRIAULT:** Thank you.

12 My next issue to the CNSC staff is with  
13 Slide 19. It's mentioned -- and you don't have to look it  
14 up -- what it mentions in there is that there was no  
15 safety issue to the public with this reactor and I would  
16 like to beg to disagree with that.

17 And the reason why I disagree is because I  
18 think that the shut down of isotope production created a  
19 safety issue with the public in Canada and internationally  
20 for that matter. But we won't belabour that one.

21 A few medical questions really -- during  
22 the repair of the vessel, did you have any work-related  
23 injuries or lost time injuries?

24 **MR. PILKINGTON:** It's Bill Pilkington, for  
25 the record.

1                   And we did have -- we have had lost time  
2 accidents on site. I believe over the space of the outage  
3 we have had a total of four. I'm not pleased with that as  
4 our record of performance. However, I would point out  
5 that as a site, our lost time accident rate actually  
6 decreased in the past year over the prior year. But  
7 again, we're continuing to focus on safety and improving  
8 that record.

9                   **MEMBER BARRIAULT:** So we did have some  
10 safety issues to the public, I guess, or to the workers,  
11 for that matter.

12                   And the next point really is that you  
13 mention that you're going to have isotope production in  
14 early July. Do you have a date on that, or am I wrong in  
15 assuming this?

16                   **MR. PILKINGTON:** I'm sorry. We were saying  
17 that we expect to ship isotopes by the end of July.

18                   **MEMBER BARRIAULT:** By the end of July.  
19 Okay.

20                   On that same point, the cost to repair is  
21 150 million, if I understand correctly a while ago. Will  
22 that cost be passed on to the health, I guess, management  
23 of this country with the increase in costs for isotopes or  
24 will you just absorb that cost?

25                   Or is that confidential information?

1 I don't want to get into ---

2 **MR. MACDIARMID:** Hugh MacDiarmid, for the  
3 record.

4 Basically we're -- we have a combination  
5 here of a commercial revenue stream from the sale of  
6 isotopes ---

7 **MEMBER BARRIAULT:** Exactly.

8 **MR. MACDIARMID:** --- and we forego that --  
9 we have foregone that for the past year and it will be  
10 resumed.

11 But we simply bring those revenues in as  
12 part of our normal commercial arrangements, commercial  
13 contract, and then when it comes to unanticipated  
14 expenditures such as this, we do need to seek additional  
15 funding from the government which is done through the  
16 annual cycle or supplements as necessary.

17 So it will -- the additional costs that  
18 were not built into our original plans are indeed being  
19 borne by the government.

20 **MEMBER BARRIAULT:** So I guess what I'm  
21 hearing is that we're not operating on a cost-recovery  
22 system. We're operating on a subsidized system to the  
23 health industry, no? Am I correct?

24 **MR. MACDIARMID:** I think I'd -- rather than  
25 judging it I'll simply say that we operate within our

1 contract and the contract does provide for the recovery of  
2 some of our costs. But again we've been rather clear that  
3 if you were to look at the full costs of producing  
4 isotopes, they're substantially greater than the revenues  
5 we generate.

6 **MEMBER BARRIAULT:** Okay. And I guess I'm  
7 not going to ask if in the future you want to change that.  
8 I'll leave that alone.

9 Next question really -- the repair to the  
10 vessel. What do you think is the life expectancy of this  
11 or do we know at this point? Or perhaps it's all unknown  
12 at this point.

13 **MR. PILKINGTON:** It's Bill Pilkington, for  
14 the record.

15 And so we have provided a repair that meets  
16 the structural requirements and provides for some  
17 corrosion allowance. And so our success at fully  
18 arresting corrosion essentially will determine the life of  
19 the vessel.

20 So we believe that through the mitigating  
21 strategies that we have in place and the additional  
22 strategies which we will be implementing, we will be able  
23 to show the vessel fit for service through its expected  
24 life.

25 **MEMBER BARRIAULT:** And what is the expected

1 life?

2 **MR. PILKINGTON:** So the target in the  
3 repair program was to assure a vessel life beyond 2016,  
4 likely out to beyond 2021.

5 **MEMBER BARRIAULT:** Okay, so we're looking  
6 at about another 10 or 11 years, I guess. Yeah.

7 We mentioned earlier that you were going to  
8 look at sacrificial aluminum coating to prevent, I guess,  
9 galvanic action in the future or to prevent problems with  
10 corrosion. Do you care to expand a little more on that?  
11 How do you propose to do that? Is it a lining that's  
12 going to be placed inside the vessel or is it just paint,  
13 or what is it?

14 **MR. PILKINGTON:** Okay. It's Bill  
15 Pilkington, for the record.

16 And so cold spray is a technique by which  
17 essentially pure aluminum is sprayed in very fine  
18 particles at very high velocities, I think using helium as  
19 a carrier gas. And it actually mechanically welds to the  
20 surface that it's sprayed on.

21 And so we actually just completed within  
22 the last week a factory acceptance test of a process that  
23 proved very very positive. It's able to apply coatings up  
24 in the range of three to four millimetres onto a wall with  
25 good adhesion and provide excellent coverage. So we see

1 this as a very likely -- a good candidate for part of our  
2 mitigation program going forward.

3 **MEMBER BARRIAULT:** Thank you.

4 That's all for now, Mr. Chairman. Thank  
5 you.

6 **THE CHAIRMAN:** Thank you.

7 Just a couple of observations. First of  
8 all, the one thing that really surprised me that -- to  
9 learn that there was not an extending shutdown since 19 --  
10 a planned extended shutdown since 1991, if I got it right,  
11 which the two organizations -- I cannot understand how  
12 that was allowed to go on because I thought you do need  
13 some relief from operational pressures to take like a very  
14 good look, in a more fundamental way at the vessel.

15 And I'm happy to see that, from now on,  
16 it'll become a general practice which I assume was a good  
17 management practice to all nuclear kind of facilities  
18 internationally.

19 Am I -- am I correct about that?

20 So you care to comment on this, AECL?

21 **MR. PILKINGTON:** It's Bill Pilkington, for  
22 the record.

23 And so it is normal nuclear utility  
24 practice to take shutdowns on some period and, in fact,  
25 nuclear utilities are finding that they can extend their

1 operating intervals between shutdowns.

2           However, there does normally need to be a  
3 maintenance shutdown and one that allows for the  
4 implementation of improvements to the plant on some  
5 frequency.

6           And so, operating the NRU on the cycle I  
7 believe that was actually a shorter cycle than 28 days  
8 some years ago but this allowed for only very short  
9 intervals to carry out maintenance and inspection.

10           So certainly, as the NRU has aged, the  
11 benefit from taking extended shutdowns on some frequency  
12 has also increased and so we see that as the optimum path  
13 for safety and reliability going forward.

14           **THE CHAIRMAN:** I understand you -- it's  
15 just probably a situation where the isotope production,  
16 pressures, may have driven -- I think, I'm guessing, may  
17 have driven you guys to try to do everything within five  
18 days but I'm surprised that the regulator, us, didn't  
19 insist on a little bit more extended shutdown so you can  
20 take a look at a more profound way at the systems and  
21 what's wrong with them.

22           So I don't know if you care to comment on  
23 that: do you?

24           **MR. JAMMAL:** If you want me, sir, I will  
25 comment.

1                   It's Ramzi Jammal, for the record.

2                   The safety is our responsibility, the  
3                   operation is the responsibility of the operators. So as  
4                   long as there were no indications with respect to the  
5                   safety and the corrective action plan that was done with  
6                   respect to the self-assessment conducted by AECL and the  
7                   inspection that we've carried out ourselves with respect  
8                   to corrective action plan that highlighted exactly to what  
9                   you were saying, that the isotope production trumpeted any  
10                  of the operation's perspective.

11                  But we lived through the safety components,  
12                  the verification of safety and were able to manage with  
13                  respect to the balance, the fact of the isotope production  
14                  and the safety.

15                  **THE CHAIRMAN:** Thank you.

16                  We've moving to a little bit more positive  
17                  thing. I'm still amazed at the technology that AECL  
18                  developed and, in fact, my question is now you have now  
19                  developed the capacity to fix this vessel forever and  
20                  ever.

21                  What is the meaning of "end of life" here  
22                  if you can actually keep welding?

23                  I'm sure Dr. McDill will have a point of  
24                  view on this. There must be a limit somewhere but, I  
25                  mean, what is the limit if you can actually keep on fixing

1           it?

2                           And if you are able to actually do the  
3           fixing from outside, you don't even have to drain this  
4           machine, so what is the meaning of how long you can keep  
5           the machine running?

6                           **MR. PILKINGTON:**   It's Bill Pilkington, for  
7           the record.

8                           And I might just go back because I didn't  
9           mention when I spoke of cold spray that that would be  
10          applied to the outside surface of the vessel from the J-  
11          Rod Annulus.

12                           I guess the challenge here is that it would  
13          not be cost-effective to remove the fuel and the heavy  
14          water from the vessel on a periodic basis to do more  
15          extensive repairs.  And, with the stresses induced in the  
16          vessel, there certainly are limits to the amount of repair  
17          that can be done.

18                           So first of all, I don't believe the vessel  
19          has an infinite life.  I believe that we can show it fit  
20          for service for many years into the future.

21                           But the other thing is that -- that NRU is  
22          now, I think a 53 year-old reactor and so there's more  
23          maintenance required, there's more obsolescence issues to  
24          be faced, there's more gaps between current standards that  
25          need to be addressed.

1           And so, in licence renewal, we're investing  
2           in assessing the improvements that will -- need to be made  
3           in the next licence interval and there will be significant  
4           cost involved in making those improvements.

5           So at some point in time, you know, the  
6           investment required to continue to operate would exceed  
7           that, that would be -- make good business sense, I guess.

8           **THE CHAIRMAN:** My last question then, it's  
9           -- I think I asked you that question previously: So you  
10          stand by your decision about not replacing the vessel but  
11          rather keep on repairing it?

12          **MR. PILKINGTON:** So I have heard from some  
13          quarters the question raised on whether it would have been  
14          a better strategy to replace the NRU vessel with a new one  
15          and the main driver for the strategy that was taken was to  
16          minimize the duration that the NRU was unavailable for  
17          isotope production.

18          So we will have been out of service for 13  
19          to 14 months by the time we return to isotope production  
20          and the time to acquire and install a new vessel would  
21          have been in the order of 48 months or more.

22          So the real driver for that decision was to  
23          minimize the time that NRU was unavailable as opposed to  
24          looking for a solution that would allow for the longest  
25          life extension.

1                   **THE CHAIRMAN:** Thank you.

2                   I think this is a good time to take a break  
3 for about 10 minutes -- until 5:30.

4                   Thank you.

5 --- Upon recessing at 5:17 p.m.

6 --- Upon resuming at 5:32 p.m.

7                   **THE CHAIRMAN:** Okay, we are now moving to  
8 the interventions.

9                   We have one oral presentation and three  
10 written submissions, so I would like to start with the  
11 oral presentation by the Canadian Nuclear Workers' Council  
12 as outlined in CMD 10-H12.2.

13                   And I understand, Mr. Shier, you're going  
14 to make the presentation. Please carry on.

15

16 **10-H12.2**

17 **Oral presentation by the**  
18 **Canadian Nuclear Workers' Council**

19

20                   **MR. SHIER:** Thank you.

21                   For the record, my name is David Shier; I'm  
22 the President of the Canadian Nuclear Worker Council and  
23 with me today is Mr. Gabe Peplinski and Mr. Gordon Tapp.

24                   Mr. Peplinski is a representative from the  
25 Power Workers Union at AECL's Chalk River site and

1 represents the operators and Mr. Tapp is the President of  
2 the Chalk River Technician and Technologists Union; and  
3 both Mr. Tapp and Mr. Peplinski both actually worked on  
4 the repairs at the NRU.

5 The Canadian Nuclear Workers' Council is a  
6 council union to represent members working in the Canadian  
7 nuclear industry and the majority of the union at AECL are  
8 members of the council.

9 I should point out that the other unions at  
10 Chalk River Laboratories have had input into our  
11 submission and are in full support.

12 Our presentation will be non-technical but  
13 we believe that is important that the Commission and the  
14 public hear the views of the workers that were involved in  
15 this endeavour over the past 14 months.

16 And we are here today to request support  
17 for AECL's request to restart the NRU Reactor and our  
18 presentation will be brief.

19 Workers at AECL/Chalk River have naturally  
20 been fully engaged in the rehabilitation of the NRU.  
21 During the past 14 months of work at this site, I've had  
22 many challenges, changing work environments, et cetera  
23 during this project.

24 Many workers were brought in from other  
25 facilities on-site to assist the NRU work and this created

1 a need for training and safety orientation for many of  
2 these workers. Many workers required many additional  
3 hours to complete this work.

4 Fortunately, during this period, there were  
5 -- or unfortunately, there were four lost time injuries  
6 but only two of them would be related directly to the  
7 actual NRU rehabilitation.

8 During maintenance and repair at nuclear  
9 facilities, there is a tendency that worker radiation dose  
10 increase. During the NRU work, no worker received a dose  
11 above the regulatory limit.

12 It needs to be pointed out that workers at  
13 Chalk River have been under an extreme pressure during  
14 this period. There was the issue of concerns for their  
15 livelihood as well as the fact that NRU and medical  
16 isotopes have and are still big news. The public is now  
17 aware of the location of the Chalk River Laboratories and  
18 these workers have been required to answer many questions  
19 from family, friends and the public.

20 Union leaders from Chalk River are  
21 constantly being asked questions at labour events that  
22 they attend, and their answers to these queries were  
23 always optimistic that the NRU would be repaired and would  
24 return to service.

25 The workers at Chalk River live with their

1 families in the vicinity of the facility, and you can be  
2 assured that if there were any safety issues in regard to  
3 the NRU, that the on-site unions would bring them to the  
4 forefront.

5 The workers at the Chalk River site are  
6 very proud of their work in the repairs of the NRU over  
7 the last 14 months. The Canadian Nuclear Worker Council  
8 is of the opinion that the repairs to the NRU are complete  
9 and AECL meets all requirements for the reactor to be  
10 operated safely.

11 We therefore urge the Commission to approve  
12 the start-up of the NRU as requested. We will naturally  
13 be happy to answer any questions you may have. Thank you.

14 **THE CHAIRMAN:** Thank you. The floor is  
15 open. Questions? Mr. Graham?

16 **MEMBER GRAHAM:** We heard from AECL's  
17 presentation that there have been improved standards of  
18 operation in the last year. Would you mind giving us an  
19 overview of what those improved standards have been in  
20 operation at AECL?

21 **MR. SHIER:** I'll ask Mr. Tapp or Mr.  
22 Peplinski to -- and they are right from the site to  
23 comment on that.

24 **MR. PEPLINSKI:** For the record, Gabriel  
25 Peplinski.

1                   Training is ongoing. There's training to  
2 re-introduce us to courses and jobs we haven't done since  
3 we've been shut down. Ongoing new programs are trained  
4 up. It seems like, not in a bad way, but we're always  
5 shuffling our staff around in the training courses, so we  
6 can get the training done as well as do the work; so it is  
7 an ongoing process and it's very intense.

8                   **MEMBER GRAHAM:** Can you give us a little  
9 overview of those new programs that you refer to of what  
10 new programs have been initiated and also what  
11 improvements have also been done with regard to leadership  
12 and oversight?

13                   **MR. PEPLINSKI:** The event-free tools have  
14 been introduced in the past couple of years and a  
15 refresher periodically is a standard. Radiation  
16 protection courses too for all the non-radiation workers,  
17 so we can monitor situations ourselves a little more  
18 closely. Just normal training and safety is part of the  
19 regimen as well now.

20                   **MEMBER GRAHAM:** Were radiation production  
21 courses not in place before?

22                   **MR. PEPLINSKI:** We were -- had Group 3  
23 training but now there are certain parameters that we can  
24 do on our own in a Group 2 course. So up to a certain  
25 level, we can monitor ourselves, monitor the work station

1 and if it's above that, then we have to get radiation  
2 protection support to help us.

3 But it streamlines the process a bit  
4 because if there's certain jobs that past practice shows  
5 that they're not rated really high contamination areas, we  
6 can go ahead and do them without slowing the worker,  
7 drawing people from other work areas.

8 **MEMBER GRAHAM:** Have you seen a change in  
9 the resources with regard to program improvements?

10 **MR. PEPLINSKI:** The dose rate is down per  
11 year. We have tritium masks for work in our rod bays, our  
12 tritium dose intake is down. We're working on rod bay  
13 improvement. We have meetings ongoing about that in order  
14 to clean it up to make it -- that was one of the major  
15 dose areas before.

16 There was very little dose actually taken  
17 by anybody on top of the reactor because all of the  
18 reactor was de-fuelled and if we were over on an open  
19 position, there was a beam. But other than that, it was a  
20 very, very clean area and periodically it was wiped up and  
21 mopped by RP support.

22 **MEMBER GRAHAM:** In AECL's presentation they  
23 talked about reinforcing strong organizational behaviours  
24 that, e.g., questioning attitudes, et cetera. Had there  
25 been a problem with regard to attitudes in the past?

1                   **MR. PEPLINSKI:** Not so much a problem but  
2 maybe more complacency by the workers somewhat. I don't  
3 want to pick on us, but we just got a reinforcement that  
4 we, you know, we have to -- continually upgrade ourselves  
5 as well and be aware of what goes on around us a little  
6 more.

7                   **THE CHAIRMAN:** Just on that point, there is  
8 no -- let me use maybe indelicate language -- there's no  
9 fear about reporting something that workers feel should be  
10 reported and fixed or taken up the line?

11                   **MR. TAPP:** For the record, I'm Gordon Tapp.  
12                   Right now, we have a process in place  
13 called the impact system where if somebody sees something  
14 that's out of the ordinary, whether it's safety related or  
15 not, they can immediately put this into the system and  
16 it's brought to attention of the appropriate management,  
17 and management reviews it and then it's brought up the  
18 line.

19                   If it's of safety concern, of course, the  
20 Site Safety and Health Committee, which is run jointly by  
21 management and union, is always there where these issues  
22 can be brought up and there's been no retribution. I  
23 don't think there's any fear of retribution to bring any  
24 important item of significance up.

25                   **THE CHAIRMAN:** Thank you. Dr. Barriault?

1                   **MEMBER BARRIAULT:** Over the last year or  
2 two, have you had any work stoppage for what's considered  
3 an unsafe worksite?

4                   **MR. TAPP:** For the record, Gordon Tapp.

5                   No, I don't believe we have any records of  
6 work stoppage or work refusals that have been brought  
7 forward to the Site Safety and Health Committee.

8                   **MEMBER BARRIAULT:** Would these four work  
9 related injuries that you've had on shutdown, and I don't  
10 want to get into personal medical history, but is there  
11 anything that could have been done to prevent these  
12 injuries?

13                   **MR. TAPP:** For the record, Gordon Tapp.

14                   For two of these injuries, I was actually  
15 the Site Safety and Health Committee person that  
16 investigated it for the Hazardous Occurrence and Injury  
17 Report. For a lot of them it's attention to detail; you  
18 know, you saw the pictures of how congested the top of the  
19 reactor was. One of the injuries happened up there where  
20 a person twisted her ankle. It's as simple as that. And  
21 it's just because it's a little bit of a hazard. I know  
22 when I went up to investigate it, you had to step-stone  
23 around things.

24                   And the other injury that I was aware of,  
25 down the rod bays again, it was a moment of inattention

1 and people made assumptions. A minor injury occurred but  
2 overall usually the level of awareness once these things  
3 happen is raised and factors put in to mitigate future  
4 incidents.

5 **MEMBER BARRIAULT:** Thank you, Mr. Chairman.  
6 Thank you.

7 **THE CHAIRMAN:** Thank you very much.

8 The next intervention is a written  
9 submission from Ms. Darlene Buckingham as outlined in CMD  
10 10-H12.3.

11  
12 **10-H12.3**

13 **Written submission from**  
14 **Darlene Buckingham**

15  
16 **THE CHAIRMAN:** Any questions? No question?  
17 Okay, I'll have a little kind of observation.

18 On the second page, this is really  
19 something that I'm sure maybe, Dr. Barriault, you'll have  
20 a view on.

21 The second paragraph it starts,

22 "Now what about radioactive isotope  
23 used for medical purposes? This has  
24 been blown up and distorted by the  
25 medical profession as saving lives."

1                   You want to say something?

2                   **MEMBER BARRIAULT:** I think you're asking me  
3 a question; are you? Yes.

4                   **THE CHAIRMAN:** What I'd like to hear is  
5 AECL. Would you like to react to this?

6                   **MR. PILKINGTON:** Bill Pilkington for the  
7 record.

8                   And no, Dr. Binder, we do not have a  
9 comment on that.

10                  **THE CHAIRMAN:** Anybody else has any other  
11 observation or question?

12                  Okay, thank you.

13                  The next submission is a written submission  
14 for Ms. Jennifer Tsun as outlined in CMD 10-H12.4.

15

16                  **10-H12.4**

17                  **Written submission by**

18                  **Ms. Jennifer Tsun**

19

20                  **THE CHAIRMAN:** Mr. Graham.

21                  **MEMBER GRAHAM:** A couple of questions and I  
22 know one of them was answered already today with regard to  
23 after the earthquake inspection. And I guess the  
24 intervenor on the top of page three brought up the subject  
25 of spent fuel dry storage silos and dry casts. And you do

1 have a lot of tile holes with storage -- tile storage, I  
2 believe -- on site.

3 Have those been inspected also after the  
4 earthquake to see that there was no damage?

5 **MR. PILKINGTON:** It's Bill Pilkington, for  
6 the record.

7 And our waste management areas were  
8 inspected following the earthquake and no damage or  
9 abnormality was identified.

10 **MEMBER GRAHAM:** So not only -- we're not  
11 only talking about the reactor; we're talking about all of  
12 the facilities on site whether it be storage tanks,  
13 underground storage of waste, and so on. Those have all  
14 been inspected?

15 **MR. PILKINGTON:** Bill Pilkington, for the  
16 record.

17 And that is correct. There was a broad  
18 inspection of all of the facilities at the Chalk River  
19 site carried out.

20 **MEMBER GRAHAM:** The only other question I  
21 had with regard to -- and it was with regard to  
22 earthquakes and so on and you gave the observation  
23 somewhere that -- and I had it somewhere here with regard  
24 to the size of an earthquake and what the readings were on  
25 site and so on.

1                   And the largest it's been or the plant has  
2                   been designed for, I believe, .24 if I have that correct?  
3                   And the largest that's ever been in that vicinity was a  
4                   .25? Am I correct on that or I find my notes here  
5                   somewhere.

6                   Would you like to comment on that with  
7                   regard to the size of a seismic event?

8                   Yes, the plant was built to a seismic event  
9                   of .24 Gs. At Chalk River, the last one that we just had  
10                  the other day was a .006 G measurement at Chalk River, but  
11                  there has been no historic record in that area of more  
12                  than .07.

13                  But they are -- the design is -- pardon me,  
14                  the earthquake at the epicentre was a .14, I believe, in  
15                  Quebec where the epicentre was, which is significantly  
16                  higher than Chalk River. But you go on to say that no  
17                  historic observations of an earthquake in the vicinity of  
18                  Chalk River of that magnitude -- but there have been up to  
19                  .25. And in it's 1 in 1000 years it would be a .25 -- I  
20                  believe that's what you're saying.

21                  My question would be -- is 1 in 1000 is  
22                  significant. It's a long time away but as my colleague  
23                  always uses the comparison, the Ocean Ranger was 1 in 1000  
24                  also. And it happened. So I'm just wondering about -- if  
25                  the epicentre was right at Chalk River and it was a .25, I

1 know you have automatic shut downs, but what damage would  
2 that cause to the reactor?

3 **MR. PILKINGTON:** It's Bill Pilkington for  
4 the record.

5 And I do not have very strong knowledge on  
6 either the seismic history in the Chalk River area or the  
7 details around the seismic design. So I do know that  
8 there has never been an earthquake in that area recorded  
9 near the design basis of .25 G and that is the earthquake  
10 that the plant was designed to.

11 And so under that condition I believe that  
12 the plant would be safely shut down and that the fuel  
13 would be cooled essentially indefinitely. I do not  
14 believe that one could conclude that the structures would  
15 remain operable as a reactor going forward. But the plant  
16 would be in a safe state following a seismic event of that  
17 magnitude.

18 By the way, I appreciate that you corrected  
19 the fact that the seismic activity on the recent  
20 earthquake was .006 G. When I was making my presentation  
21 I left out a zero.

22 **MEMBER GRAHAM:** Correct -- 006 is what it  
23 was but it was 014 -- 0.14 at the epicentre which was 100-  
24 and-some kilometres away. But if the epicentre had been  
25 closer, it would have been higher.

1                   I understand we have Emergency Measures  
2 Ontario, Mr. Chair. I just wonder if they have any  
3 comments or anything to add with regard to their concerns  
4 with regard to earthquake or seismic activities in the  
5 vicinity of Chalk River in view of the fact that the last  
6 one that was several weeks ago was a 0.14 which is  
7 significantly high. It's up almost to what your design is  
8 for the whole plant.

9                   Emergency Measures Ontario here?

10                  **MR. MORTON:** Thank you for the opportunity.  
11 For the record, my name is Mike Morton. I'm a deputy  
12 chief with Emergency Management of Ontario. I am joined  
13 by Dave Nodwell who is our manager for planning and  
14 exercises, and Kathy Blyer who is one of our senior  
15 nuclear planners.

16                  In terms of the impact of a seismic event,  
17 we really plan overall for the effects of any event that  
18 might cause offsite consequences so regardless of what the  
19 cause is, we look really at what would be the worst  
20 accident that could occur. And in terms of the Chalk  
21 River facility, we're looking at the loss of coolant and  
22 also a subsequent failure of the emergency cooling system  
23 which would result potentially in some sort of offsite  
24 release of radiological material.

25                  And that would then, in accordance with the

1 provincial Nuclear Emergency Response Plan trigger a  
2 protective measure depending on the offsite dose ranging  
3 from sheltering, which is by far more likely than the  
4 others which would be evacuation or KI administration.

5 **MEMBER GRAHAM:** Are you satisfied that AECL  
6 have a sufficient plan in place for seismic activities or,  
7 I should put, for all possible accidents? Are you -- is  
8 the Emergency Response Plan filed with you and are you  
9 satisfied that it's sufficient to meet all the needs at  
10 Chalk River?

11 **MR. MORTON:** Our primary concern is with  
12 plans that would be in place for the offsite response, so  
13 primarily looking at the plans that would be filed by Deep  
14 River, Laurentian Hills which should be the municipalities  
15 potentially impacted.

16 Those plans were last exercised in 2007 and  
17 are currently undergoing some upgrading and review. We  
18 are confident that we can respond effectively to an  
19 incident at the provincial level and over the next months  
20 we'll be working very closely with the facility and the  
21 municipalities to put forward an updated version based on  
22 lessons of that exercise to ensure that we are indeed at  
23 the best possible programmic level in terms of  
24 international practice for emergency management.

25 **MEMBER GRAHAM:** Would CNSC or CNSC first or

1 AECL care to respond to first of all the revisions to the  
2 2007 plan and how that -- the new plan that's under review  
3 -- how that new plan will correspond with other emergency  
4 response plans for other bordering communities at other  
5 nuclear facilities?

6 So I guess what -- it should maybe be the  
7 AECL first.

8 **MR. WHITE:** Andrew White, Chief Regulatory  
9 Officer and General Manager.

10 We have our own emergency preparedness  
11 program onsite and that program takes into account a broad  
12 range of possible threats to the site, including things  
13 like earthquakes or major failures of systems, and these  
14 plans are exercised on a regular basis and I believe that  
15 they interface with the communities and the EMO. So I  
16 think that our plans are robust and would deal with any of  
17 these types of circumstances.

18 **MEMBER GRAHAM:** The question was how are  
19 you responding to the 2007 update that was referred to by  
20 Emergency Preparedness? Are you preparing one and when  
21 will it be available and when -- how much different will  
22 it be and so on?

23 **MR. WHITE:** Andrew White for the record.

24 These updates are primarily with the  
25 communities, so we would interface with the communities

1 and aid them in their updates. So our plan is really in  
2 terms of how we interface with the communities in their  
3 updates and so we are working with them as they work on  
4 their updates right now.

5 **THE CHAIRMAN:** I can't resist. I got you  
6 -- we've got you in front of us and I want to ask a little  
7 bit a general question and that is the role of alerting  
8 the citizens that there's an emergency. I'm talking about  
9 sirens. Now, we used to have sirens -- you guys are too  
10 young to remember World War II sirens.

11 We discontinued them but now I'm told that  
12 -- I thought that was an agreement that in certain  
13 communities in a certain situation, you should have  
14 sirens. Now, is that true in all facilities; would it  
15 apply to Chalk River, Deep River? What is your view about  
16 sirens and do you enforce them or not?

17 **MR. MORTON:** Under the provincial nuclear  
18 emergency response plan, which was recently upgraded and  
19 then subsequently approved by the Ontario Cabinet in 2009,  
20 we set standards for public alerting. So rather than  
21 outlining the specific methodology for meeting those  
22 standards, we stated in the current nuclear emergency  
23 response plan that the communities must be able to alert  
24 those both indoors and outdoors of an incident within 15  
25 minutes.

1           For the area around Chalk River, and it's a  
2           nine kilometre zone from the site, the indoor requirement,  
3           we are indeed satisfied with; there's a phone dialing  
4           system.

5           The outdoor system currently relies on  
6           going through communities with vehicles that have PA  
7           systems. One of the things that we are looking at  
8           following the exercise of 2007 and the current revision to  
9           the plan is whether the community can go further to  
10          guarantee that that outdoor requirement can absolutely be  
11          done within the 15-minute standard.

12          There's currently some question following  
13          the exercise of whether it can be carried out in the exact  
14          15-minute timeframe and, as a part of this planned review,  
15          we want to make sure with complete satisfaction that the  
16          people who may be outside at the time of incident would  
17          not -- who would not potentially receive a phone call, can  
18          be made aware.

19          Certainly, looking at sirens would be one  
20          of the methodologies that I'd imagine they would want to  
21          look at in reflecting on that standard.

22                 **THE CHAIRMAN:** Just by way of information,  
23          our little exercise, does the Can-seismic thing prove that  
24          the so-called priority phone line did not work; they were  
25          jammed? So the 15 minutes as standard to reach citizen is

1 a very high standard, and I'm not sure we figured out how  
2 to do it properly yet.

3 **MR. MORTON:** From a -- from the perspective  
4 of Ontario, we certainly want to make sure that without a  
5 doubt, that standard can be met within 15 minutes and,  
6 again, I think that's a very important line of discussion  
7 for the reissuing of this plan over the next months.

8 **THE CHAIRMAN:** Thank you. Mr. Graham?  
9 Anybody else? Dr. Barriault.

10 **MEMBER BARRIAULT:** My question is to AECL.  
11 In this presentation, the comment was made that a rad-  
12 waste incinerator is in operation at Bruce and one is  
13 proposed for Chalk River. Now I don't know if that's  
14 going to deal with the NRU Reactor at all, and that's what  
15 we are dealing with.

16 But could you comment on what a Rad-waste  
17 incinerator is? I would assume it's something that burns  
18 contaminated clothing, radioactive material.

19 **MR. PILKINGTON:** Excuse me, but could you  
20 clarify where that appears in our presentation?

21 **MEMBER BARRIAULT:** It's not in your  
22 presentation; it's the presentation that was made by this  
23 intervenor a few minutes ago ---

24 **MR. PILKINGTON:** Okay ---

25 **MEMBER BARRIAULT:** --- that we are talking

1 about now.

2 **MR. PILKINGTON:** Okay, so we are not aware  
3 of any plans that AECL has to go forward with construction  
4 of an incinerator.

5 **MEMBER BARRIAULT:** Okay. Thank you.

6 Does CNSC want to comment on this because  
7 it comments on the fact that it releases radioactive  
8 material into the environment.

9 **MR. SANTINI:** This is Miguel Santini for  
10 the record.

11 No, we don't have any -- AECL does not have  
12 any incinerator and we haven't seen any plans from them  
13 either.

14 **MEMBER BARRIAULT:** Does Bruce have one?

15 **MR. SANTINI:** I'm not aware of the Bruce  
16 site waste facility -- not to our knowledge, I'm told.

17 **MEMBER BARRIAULT:** Thank you, Mr. Chairman.

18 **THE CHAIRMAN:** Well I'd like to follow up  
19 on this.

20 This intervenor makes some interesting  
21 statement maybe -- that you know, somebody got to count  
22 here.

23 First of all, plutonium from Russia -- this  
24 is -- I'm talking at -- I don't know, there's no page  
25 number but if you look at the -- I think the second page,

1 it says that the growing piles of nuclear waste includes  
2 weaponable plutonium shipped from Russia in the U.S. and  
3 stored underground.

4 Anybody can comment? I wasn't aware that  
5 you guys received plutonium from Russia.

6 **MR. PILKINGTON:** So again it's a topic that  
7 we didn't come with a lot of knowledge, but I do  
8 understand that there have been experiments done in the  
9 past with finding ways to downblend reactor grade --  
10 sorry, not reactor grade, weapons grade materials in order  
11 to turn it into reactor fuel. And so there may have been  
12 experimental amounts of these materials used at Chalk  
13 River but certainly no significant quantities.

14 **THE CHAIRMAN:** Mr. Graham?

15 **MEMBER GRAHAM:** I believe we have been  
16 briefed before that you had 25-kilos or something had been  
17 shipped on two different occasions back a number of years  
18 ago for some tests. That was reported, made public but  
19 I'm not sure whether that has been used or disposed of,  
20 but it was a very small quantity and I think if I check my  
21 records, it's about 25 kilos.

22 **MR. PILKINGTON:** Bill Pilkington for the  
23 record.

24 And I'm afraid I cannot comment on specific  
25 quantities simply because I do not know.

1                   **MR. SANTINI:** Miguel Santini for the  
2 record.

3                   There have been very small quantities of  
4 plutonium shipped from weapons from Russia that were used  
5 for experimental MOX fuel, but those were in the order of  
6 grams -- grams, yes.

7                   **MR. JAMMAL:** If I may, to put it in  
8 perspective here, this is the amount of MOX that was  
9 shipped is the equivalent of a plutonium to be used in a  
10 pacemaker in the old design.

11

12                   **10-H12.5**

13                   **Witness Submission from**

14                   **Bill MacCallum**

15

16                   **THE CHAIRMAN:** Okay. Thank you. Anything  
17 else on this one? Thank you very much.

18                   The next witness submission is from Mr.  
19 Bill MacCallum as outlined in CMD 10-H12.5. Questions?

20                   He makes a statement in the first paragraph  
21 here that "while NRU can produce 30 percent of the world  
22 requirement, it has the capacity to provide 100 percent of  
23 isotope requirement."

24                   Is that true?

25                   **MR. PILKINGTON:** It's Bill Pilkington, for

1 the record.

2 And certainly in the past the NRU has had  
3 the capability to meet the full global demand or I would  
4 say that demand has grown to the point that, at this time,  
5 on a steady ongoing basis, NRU would not be sufficient to  
6 meet full world demand.

7 **THE CHAIRMAN:** Anything else?

8 Okay, thank you.

9 So this concludes the questions regarding  
10 interventions. So we're now going into the second round  
11 and Mr. Graham, you've got the floor again.

12 **MEMBER GRAHAM:** Just a couple of questions.

13 First of all to CNSC, this is not --  
14 there's no licence attached because this is not a licence  
15 renewal but are there licence amendments or are there --  
16 because there is going to be some -- I read in different  
17 places about licence conditions that would be put in  
18 place.

19 I'd like you to comment on licence  
20 conditions but I'd also like you to comment on: Is AECL  
21 operating under your new handbook procedure and are these  
22 conditions put into the handbook in that way?

23 **MR. ELDER:** Peter Elder, for the record.

24 We're not, at this time, have identified  
25 any changes that have to be done to the licence.

1           So part of the reason for the approval  
2           today is they wanted to do something that was outside  
3           their licence; this is to bring them back in.

4           There are some ongoing -- we mention in a  
5           couple places about new procedures. There's a general  
6           requirement that'd licence them to follow those  
7           procedures, so they are captured.

8           For licence renewal next year, we are  
9           working on the handbook and, if we identify going forward,  
10          in terms of -- on the corrective action program or when we  
11          get the final fitness for service report that there are  
12          licence conditions that we need to add before licence  
13          renewal, we'll bring that to you at the updates that we're  
14          planning.

15          But we don't have anything that has to be  
16          changed today; it's really to make sure that, before they  
17          restart it, they were back within the licensing basis.

18                 **MEMBER GRAHAM:** Thank you.

19          My other question -- my only other question  
20          that I had at this time -- well, I guess I had two.

21          The first one is with regard to the rods  
22          and the defective fuel and the defective fuel comments:

23                         "... and AECL disassembled and inspected  
24                         10 of 28 suspected rods as part of  
25                         initial investigation.

1 AECL found splits in the aluminium  
2 cladding ..."

3 which we saw today in the overviewsi

4 "... of two of those suspended fuel  
5 rods."

6 Two of ten is about 20 percent. Why were  
7 not all 28 inspected?

8 Or have I not got the right context of 10  
9 versus 28 and so on?

10 And that would be to AECL.

11 **MR. PILKINGTON:** Okay, it's Bill  
12 Pilkington, for the record.

13 We did, in fact, initially inspect the 10  
14 which we believed had the highest probability of having  
15 defect elements and, following that, we did disassemble  
16 and inspect four more.

17 So in essence, we have inspected 14 of the  
18 rods.

19 I would point out that we would see  
20 diminishing return because we've gone from the most  
21 probable rods towards the less and that, in keeping with  
22 ALARA, there is significant dose expended in disassembling  
23 these rods to be examined.

24 **MEMBER GRAHAM:** Okay, so you've done 50  
25 percent of them, 10 to 14, 14 of the 28, and you say it's

1 a diminishing -- we just hope that there won't be a  
2 significant development report in the months to come that  
3 there were found to be another defective rod.

4 In reading that, it more or less indicates  
5 that you still have those rods in stock. Why would they  
6 not have been sent back to the -- as defective, sent back  
7 to the manufacturer as non-useable?

8 Why would you -- why would you keep any of  
9 them and not demand a whole new batch?

10 **MR. PILKINGTON:** So it's Bill Pilkington,  
11 for the record.

12 And they, effectively, have been sent back  
13 to the manufacturer because the manufacturer is AECL.

14 However, from the point of view of  
15 disposing of them, they are quarantined, they will not be  
16 used and we'll have to look at the most effective way of  
17 recovering the materials.

18 **MEMBER GRAHAM:** Thank you. I didn't  
19 realize that.

20 The other -- the only other question I have  
21 is with regard ---

22 **THE CHAIRMAN:** Before you leave this, I  
23 still want to hear somebody tell me what are the safety  
24 issues, if any, with operating with this defective fuel  
25 bundles.

1                   **MR. PILKINGTON:** Bill Pilkington, for the  
2 record.

3                   And I will give a position from AECL in  
4 that small defects of this type do not represent a  
5 significant safety issue.

6                   However, we have just put a full charge of  
7 new moderator water into the reactor to reduce the tritium  
8 and we've reduced the tritium by a factor of 10 which is  
9 -- has a very positive impact on both staff exposures and  
10 also on releases to the environment.

11                  The existence -- the continued existence of  
12 defects in the reactor does release radionuclides into the  
13 coolant and, once released, these nuclides take a  
14 significant amount of time to remove.

15                  And so they increase the radiation fields  
16 in the facility and, as I said, once released it takes a  
17 significant amount of time to bring the coolant back to  
18 the very low activity levels.

19                  So, really, the issue here is around ALARA,  
20 it's around minimizing worker dose and it's around  
21 maintaining a clean reactor for operation and maintenance.

22                  **THE CHAIRMAN:** So to staff, you're going to  
23 -- what's your proposal to -- if this problem kind of fix  
24 according to some timeline that AECL puts forward?

25                  **MR. ELDER:** Peter Elder, for the record.

1                   There are two things we're looking at:  
2                   obviously, they have to complete their investigation on  
3                   the cause and make any changes that -- in their fuel  
4                   manufacturing side.

5                   The other one we've required them to do is  
6                   put in a defined procedure for how they will deal with  
7                   potential defects that they identify.

8                   So a more strict monitoring of their  
9                   coolant chemistry and then defined actions about what will  
10                  they do when they find something to make sure they are  
11                  dealt with before they become any sort of risks to any of  
12                  the workers.

13                  So it's an extra barrier to make sure that  
14                  they identify and remove the defect fairly quickly, in a  
15                  timely -- but there's no immediate concern here.

16                  This is again something that we want to  
17                  make sure there wasn't a widespread problem that would  
18                  cause a problem immediately after restart and that they  
19                  have then procedures in place to make sure they don't get  
20                  into a problem where there are increased doses to workers  
21                  for doing routine maintenance or other things.

22                  **THE CHAIRMAN:** Okay, thank you.

23                  Mr. Graham?

24                  **MEMBER GRAHAM:** The question I had was with  
25                  regard to the vessel. Your indication of the present,

1 just before we took a short break, was four years for a  
2 new vessel.

3 Four years from the time of ordering it  
4 'till it was installed; but if there was one on order and  
5 it was planned, my understanding is about two years; is  
6 that correct?

7 **MR. PILKINGTON:** That's Bill Pilkington,  
8 for the record.

9 So that's a very rough approximation but I  
10 would agree that that's -- that would be correct.

11 **MEMBER GRAHAM:** Two years for  
12 manufacturing, two years for installation.

13 My concern is is that, in planning for the  
14 future, the vessel now is about 36 years old. At the time  
15 of the licensing -- re-licensing, it'll be about 39 years  
16 old and at the end of that licence period, if you had  
17 another licence period, it'd be 44 years old.

18 Is there any planning or any policy at AECL  
19 to look towards the purchase or the ordering of a new  
20 vessel down the road or is it strictly the policy that you  
21 -- at the end of life of this reactor, you'll be out of  
22 the isotope production business?

23 **MR. PILKINGTON:** It's Bill Pilkington, for  
24 the record.

25 And I think the answer to that probably

1 goes beyond AECL because those are long-term strategic  
2 decisions for Canada.

3 I would simply offer from AECL's  
4 perspective, we have studied vessel replacements and NRU  
5 refurbishments in the past, we currently have no plans to  
6 extend the life of NRU beyond the life of its components  
7 of which the vessel is one.

8 So we believe that through inspection and  
9 maintenance that we can continue to operate with the  
10 current vessel through the next licence interval and  
11 likely through the one beyond that and to be able to show  
12 fitness for service.

13 But the horizon beyond 2021, there would  
14 need to be a long-term strategy in place.

15 **MEMBER GRAHAM:** Just for rule of thumb,  
16 what would a new vessel cost today?

17 **MR. PILKINGTON:** So as a part of the  
18 current outage, we did dust off some studies that had been  
19 done and we came up with a very rough number for the  
20 complete outage which would include a vessel replacement  
21 and very minimal upgrading of other parts of the facility  
22 in parallel with that, not a full refurbishment of the  
23 NRU, and the price tag was in the range of 400 million.

24 **MR. MacDIARMID:** If I might just volunteer  
25 one additional comment, it's Hugh MacDiarmid, for the

1 record.

2 The Minister of Natural Resources did  
3 commission the expert panel on isotope production options  
4 and clearly that process was one that was designed to  
5 explore any and all avenues that would be productive and  
6 worth pursuing in the future.

7 So our marching orders are to be producing  
8 as quickly as we can, produce reliably through to the end  
9 of our licence period, secure the renewal through 2011 to  
10 2016 and during that period of time a full range of  
11 options are going to be pursued.

12 **THE CHAIRMAN:** Thank you.

13 Dr. McDill?

14 **MEMBER McDILL:** Two final questions. On  
15 the first fill you found some -- or noticed some tritium  
16 which on refill you didn't detect. Is there any sense  
17 going forward of where that tritium came from?

18 **MR. PILKINGTON:** It's Bill Pilkington, for  
19 the record.

20 And so we have not been able to identify  
21 the source of the tritium. We have looked at the systems  
22 that, I guess, physically interact with the J-rod annulus  
23 trying to identify what might have been the likely source  
24 and to this point we're still investigating. But to this  
25 point we have not identified a source.

1                   And then we looked at the possibility that  
2                   the tritium was as a result of filling the vessel and that  
3                   it may have come from the vessel. And so to that end we  
4                   drained the vessel and did a very thorough visual  
5                   inspection of the quadrant of the vessel where we had seen  
6                   elevated tritium in the J-rod annulus.

7                   And even before we drained the vessel for  
8                   that inspection, the tritium levels had essentially  
9                   returned to background level. We have filled the vessel  
10                  actually twice since and on neither occasion have we seen  
11                  any significant increase in the tritium levels as we did  
12                  the first time that we filled the vessel.

13                  So at this point we'll continue to monitor  
14                  but we will not be taking further action.

15                  **MEMBER McDILL:** Thank you.

16                  Does staff have any comment to add?

17                  **MR. ELDER:** Two things on this as said is  
18                  we have no concerns about the structural integrity; so  
19                  we're confident on the structural integrity on this one.  
20                  Because obviously they haven't been able to find a  
21                  definitive cause, we've asked to make sure that they have  
22                  proper procedures in place in case a leak, actually a  
23                  measurable leak does develop.

24                  So they will have procedures in place to  
25                  take appropriate action in a timely fashion if they

1 actually get a measurable release of -- a measurable leak.

2 But at this point what they're measuring is  
3 very, very small quantities and it would be extremely  
4 difficult to actually pinpoint a definitive source.

5 **MEMBER McDILL:** And what constitutes a  
6 "measurable leak"?

7 Maybe we should ask AECL.

8 **MR. PILKINGTON:** One for which we could  
9 have a reasonable expectation of being able to locate it.  
10 I would look to the example of very small steam generator  
11 leaks in utility reactors and the fact that until you get  
12 to a certain level you're really expending dose and  
13 staying in a shutdown state with essentially no  
14 opportunity to identify the source.

15 **MEMBER McDILL:** Thank you.

16 And my final question is for the scientific  
17 and engineering community. When will they have access to  
18 the neutron beam lines for further scientific work? Or is  
19 that something that you cannot speak to?

20 **MR. PILKINGTON:** Today I have come ready to  
21 be able to speak to that question.

22 And so we have talked to officials of the  
23 National Research Council and they have not really found  
24 an alternative facility for the work that they would do on  
25 the NRU. They have taken the opportunity of the shutdown

1 to do maintenance and improvements to their equipment and  
2 they're very much looking forward to the return to service  
3 of NRU.

4 The facility will essentially be available  
5 to them from the time that we raise the power on the  
6 reactor. However, they have indicated that there will be  
7 time required on their end to re-energize programs that  
8 have been put on hold. They would be expected -- they  
9 expect to be back to full utilization by next spring.

10 **MEMBER McDILL:** Thank you, Mr. Chair.

11 **THE CHAIRMAN:** Thank you.

12 Mr. Tolgyesi?

13 **MEMBER TOLGYESI:** Merci.

14 I hope that you will include these  
15 scientific requirements when you evaluate the long-term  
16 options for the NRU because as what you said, it's a  
17 unique place where you could do that. So it should be  
18 incorporated.

19 I have just maybe one comment. On Figure  
20 3.2 it's a little bit hard to read what's there and where  
21 it is -- this latest configuration of NRU reactor. It's  
22 not too clear, the numbers and letters and you know.  
23 What's where?

24 I could read just only that the red "x" is  
25 adjacent to the J-rod position 41 but when you're looking

1 at all those -- all the numbers and figures, it's not so  
2 easy to read. I don't know if it's only on my copy but I  
3 am quite sure it's on all of the copies.

4 I have one question. What you were saying  
5 that to do all this repair work you were putting some  
6 plates and welding on the top which could go to 3 or 4  
7 millimetres or even thicker; it depends on conditions.

8 So how these plates and welding and  
9 eventual, if any, heat deformation, you were talking about  
10 it could be that the vessel could be -- that the wall  
11 could be deformed.

12 How it will affect -- there will be some  
13 restrictions. How it will affect the performance of the  
14 vessel specifically of the annulus?

15 **MR. PILKINGTON:** It's Bill Pilkington, for  
16 the record.

17 And so the deflections on the vessel wall  
18 resulting from the repairs would come from the build-up,  
19 the additional material that's put on and then also from  
20 the deflections from welding stress.

21 And so even adding those together you would  
22 be looking at deflections significantly less than 10  
23 millimetres. And so in terms of the operation of the  
24 reactor, those would be insignificant and in terms of the  
25 function of the J-rod annulus which I believe is about 15

1 centimetres across, there would also be no effect.

2 So the way the NRU reactor is designed,  
3 there is very low flow in the vessel at the locations of  
4 the wall. And so there would not be really any  
5 significant change in the operating performance of the NRU  
6 because of the physical changes.

7 **MEMBER TOLGYESI:** But when you're looking  
8 where the leak is located, it's in a heavy water gutter  
9 which is much thinner than the annulus which is 15  
10 centimetres. The gutter is quite -- I don't know. It  
11 seems to be maybe a centimetre or so and then when you do  
12 10 or 15-millimetre restriction, which is more important?

13 **MR. PILKINGTON:** Bill Pilkington for the  
14 record.

15 And so the maximum deformations are well  
16 above the reference circumferential weld and the vessel  
17 wall thickens significantly below the circumferential  
18 weld. We would not expect to see any significant  
19 deflections in the area that's adjacent to the gutter.

20 **MEMBER TOLGYESI:** And my last is you were  
21 saying that gutters were filled with corrosion products  
22 and even the lip was corroded so it disappeared. It's  
23 some effect of this lip if it disappearing or there is no  
24 operational problem?

25 **MR. PILKINGTON:** So originally on the

1 design, I believe the lip was to provide separation for  
2 light water leaks and heavy water leaks and the gutter was  
3 intended to collect heavy water leakage and it has drains  
4 associated with it.

5 So in looking at the work to put the NRU  
6 back into operation, our inspections indicated that we did  
7 not have significant corrosion occurring as a result of  
8 having corrosion products in the gutter. So as we go  
9 forward, we'll be looking at a strategy on what to do  
10 about that configuration but for the present it was felt  
11 the best thing was to not change the condition that we  
12 know is not aggressive.

13 **MEMBER TOLGYESI:** And my last. When you  
14 are looking at the maintenance schedule, you were talking  
15 about 28 day periods of which 23 are production, five are  
16 maintenance. If you are looking over the year, it's about  
17 12 periods which means 12 times 5 is 60 days -- I will say  
18 lost; not lost but not producing isotopes. When you're  
19 adding to this one month shutdown, because that's what you  
20 will do about annually, this is about a 50 percent  
21 increase. How it will affect?

22 **MR. PILKINGTON:** So this is Bill Pilkington  
23 for the record.

24 The choosing of five day outages was done  
25 specifically because we can continue to harvest isotopes

1 in the period that the reactor's shut down. So in fact,  
2 with that 28 day cycle there is no interruption in the  
3 production of isotopes.

4 I think the other thing that's important is  
5 that we have much better communications with the worlds  
6 isotope producers and so we can, in fact, schedule outages  
7 and the other producers in the world can adjust their  
8 outages and production schedules to ensure that there is  
9 no reduction in supply when we're shut down.

10 **MEMBER TOLGYESI:** Is there -- the one of  
11 intervenors by Mrs. -- I don't know who was that -- Mrs.  
12 Darlene Buckingham -- she was saying that many medical  
13 doctors are now saying that this using radioactive  
14 isotopes are being overused. Are you witnessing this  
15 increase of isotopes, a need for isotopes for medical  
16 purposes?

17 **MR. PILKINGTON:** So it's Bill Pilkington  
18 for the record. I'm afraid we have nobody in our group  
19 today who could give an answer to that kind of a question.

20 I could point out that the medical  
21 community has done really a great job over the period that  
22 NRU and another significant supplier have been out of  
23 service to make the most of the isotope supply that is  
24 available; to schedule diagnostics procedures, to not lose  
25 isotope to decay, to look for alternatives that can be

1 used for some procedures. So I would say the medical  
2 community's done an excellent job of mitigating the  
3 shortage but I can't comment on the value of the supply to  
4 the medical community.

5 **MEMBER TOLGYESI:** I will ask that Dr.  
6 Barriault after. Thank you.

7 **THE CHAIRMAN:** Thank you, Dr. Barriault?

8 **MEMBER BARRIAULT:** Thanks. Merci.

9 On Slide 22 of CNSC, there's a comment that  
10 upset me a little bit and it says on a walk-down resulted  
11 in numerous finding; field installation not matching  
12 documentation. I guess the question I have is that poor  
13 record keeping or is it cooking the books?

14 Slide 22. Additional outage activities,  
15 NRU upgrade walk-downs. It's third bullet down. CNSC to  
16 comment on it.

17 **MR. ELDER:** Okay, first I'll go back and  
18 give you a history -- Peter Elder for the record -- in  
19 terms of the walk-downs. It's going back and people  
20 around will remember that we did evaluation 2006 of the  
21 quality assurance around those upgrades.

22 We, at that time, had trouble finding all  
23 the documentation that showed they were done in a quality  
24 manner. Part of the solution to that, to establish that  
25 there was a quality installation, was to have AECL do

1 these walk-downs and what they were looking for in the  
2 walk-downs was exactly that -- does the field insulation  
3 match their documentation?

4 We asked them to do this because we  
5 expected, based on their 2006 audit, to find instances  
6 where there was not a match. The walk-downs did find  
7 these, a number of them, and then from there AECL used  
8 their corrective action program to classify all those, to  
9 address them and they're addressing all the ones that had  
10 any potential safety impact prior to restart. So in terms  
11 of it looks like, you said, that's what the walk-down was  
12 looking for. It was looking for mismatch between the  
13 field insulation and what was documented. We ---

14 **MEMBER BARRIAULT:** Go ahead. I'm sorry.

15 **MR. ELDER:** --- and we expected them to  
16 find things based on what came out of our previous audit.

17 **MEMBER BARRIAULT:** So what I'm hearing then  
18 is it was poor record keeping rather than ---

19 **MR. ELDER:** Well, whether it was poor  
20 record keeping, it was not following through a number of  
21 stages that the proper quality assurance procedures when  
22 the upgrades were put in and recognizing they were put in  
23 over a number of years.

24 **MEMBER BARRIAULT:** So there's no way of  
25 knowing if it was poor record keeping or else somebody

1 making inadvertent entries.

2 **MR. ELDER:** It's very hard to know. All we  
3 can end up finding is that we couldn't find the  
4 documentation whether it was record keeping or not  
5 following procedures, we can only come back with the  
6 finding that there was a mismatch and this is where.

7 This is the solution to make sure that what  
8 was there matches the documentation.

9 **MEMBER BARRIAULT:** Thank you. I don't know  
10 if it's fair -- does AECL care to comment on this?

11 **MR. PILKINGTON:** It's Bill Pilkington for  
12 the record.

13 And so I would comment that the  
14 installation of these upgrades over short outages over a  
15 very long period of time did present -- I think an unusual  
16 challenge to both our organization in carrying out the  
17 work and also to our organization and the regulator to  
18 provide proper oversight.

19 And so the solution, I agree, was for us to  
20 go back and walk-down each of these systems and confirm  
21 that our design documentation was exactly the same as the  
22 field installation and so we did find a number of  
23 discrepancies and we have assessed those to determine what  
24 we felt needed to be corrected in the field, what could be  
25 documentation updates, what would require future planned

1 maintenance activities and so these have all been assessed  
2 and acted on accordingly.

3 **MEMBER BARRIAULT:** Thank you. Just two  
4 more short questions.

5 My next question, really, is that -- and  
6 it's of a, I guess, just a yes or no answer. During your  
7 shutdown, did you get the chance to test the backup  
8 electrical system on the famous pumps that we had  
9 discussed some years ago?

10 **MR. PILKINGTON:** No.

11 However -- Bill Pilkington for the record  
12 -- however, having said that, only because with the fuel  
13 and water out of the core there wasn't a requirement for  
14 that system to be available. As a part of our return to  
15 service, all of these systems are being thoroughly tested  
16 to confirm that they are fully available to perform their  
17 safety functions and in fact we have already operated the  
18 DC motors on the pumps in question.

19 **MEMBER BARRIAULT:** Thank you. Mr.  
20 Chairman, just one brief question and you can rule me out  
21 of order if you want to.

22 If I ask you to do some crystal ball  
23 gazing, do you see anything in there that looks like a  
24 Maple reactor in the future?

25 **MR. MacDIARMID:** No.

1 Hugh MacDiarmid, for the record.

2 **THE CHAIRMAN:** Anything else?

3 I've got a couple of questions here. Let  
4 me start with a kind of a multi parts one.

5 I am -- I don't want to deal with some  
6 historical issues. So I'm looking forward to what is it  
7 that we can expect to be achieved in the planned -- in the  
8 next big planned shutdown within the nine months?

9 And the reason is because on Slide 33, I  
10 was struck that you still identify something like 833  
11 activities not complete. According from your slide, if  
12 you look at Slide 33, I am anal keeping up to commitments  
13 on both sides now of the organization.

14 So can we -- can you assure us that within  
15 the next -- after the next planned shutdown, the extensive  
16 shutdown, that those 833 will not be -- shall we say all  
17 be complete?

18 And while you're thinking about that, you  
19 know my favourite question I always ask you is when the  
20 reflector is going to be fixed, if ever? Because as you  
21 know, this NRU, if you're coming back after 14 months, it  
22 will still be the old leaky machine and that's something  
23 that you'll have to explain to the public why it's still  
24 leaking.

25 **MR. PILKINGTON:** Okay. Bill Pilkington,

1 for the record and I'll start with your first question and  
2 those 800 and some odd activities are all activities that  
3 will be completed before the NRU is back into service. So  
4 these are all activities to be completed in this -- within  
5 this shutdown.

6 And I would point out this is an  
7 accumulation of all planned activities. So every piece of  
8 maintenance, every preventative maintenance, every test  
9 that needs to be carried out, every significant operation  
10 that needs to be carried out, everything is captured; in  
11 fact, even training activities.

12 Everything is captured on that work-down  
13 curve because we have to make sure that all of them get  
14 done at the appropriate time between now and return to  
15 high power operation.

16 **THE CHAIRMAN:** Does that include the gaps  
17 that were identified in the walkabout?

18 **MR. PILKINGTON:** So that includes all of  
19 the gaps that have been assessed to require or suggest  
20 that we should do physical work in this shutdown, but it  
21 does not include all of the findings.

22 If I can speak to the next planned outage -  
23 - so the major activities that would be carried out in the  
24 next planned outage would be the inspections that we be  
25 called up as a result of the repairs that have been done

1 and the continued effort on mitigation of corrosion.

2 So we'll be taking measurements of CO<sub>2</sub> gas  
3 purity and of pH of the water that we drain from the J-rod  
4 annulus and we'll be using that to look at whether we have  
5 fully mitigated corrosion now and using that to plan what  
6 measures we will take in the next outage to improve that.

7 We are also working towards methods of  
8 reducing and eventually eliminating the leakage from the  
9 reflector. And so in the first five-day outage following  
10 return to service, we currently plan to introduce a carbon  
11 fibre compound which has shown effective in other  
12 utilities at reducing similar kinds of leaks and we are  
13 pursuing tooling and repair strategies to be able to  
14 better repair leakage from the reflector.

15 And I believe you had a second question  
16 that I may not have addressed.

17 **THE CHAIRMAN:** Staff, you want to comment  
18 on all of this is going to be done before the return to  
19 service, the 800 -- it's a big number.

20 **MR. ELDER:** Peter Elder, for the record.

21 What's on that Slide 33 is the remaining  
22 activities on the return to service plan. So this is what  
23 we're monitoring and this is what our site inspectors will  
24 be monitoring for the next month or three weeks to make  
25 sure all those ones are done.

1                   Again, we have looked at the plans. We  
2 have looked at their procedures for doing this and this is  
3 carrying out those procedures. So that's going back in  
4 doing all their -- there's a lot of maintenance you can't  
5 do until the system is actually operational. So they have  
6 to do all that. There are a number of tests they have to  
7 do and that's all in those 800 items and that's what we  
8 are monitoring in terms of the return to service plan.

9                   And below, if you look on the chart, you  
10 probably -- it's small. My version is small but I can  
11 just read it saying the end of that is July 25<sup>th</sup> is  
12 getting down to zero and having experience, I'm looking at  
13 these ones on other big projects. This is the trend you  
14 like to see. They've stopped growing about a few weeks  
15 ago. It's a very good sign.

16                   Usually as you go in and put things back in  
17 service, you find items. So the better planning you do,  
18 the better you start to work down that curve and you stop  
19 adding maintenance items in that. So we're -- they look  
20 like they're on track.

21                   **THE CHAIRMAN:** So all the other outstanding  
22 issues, including documentations, gaps, all of these, by  
23 when that will be sort of done, particularly the legacy  
24 from '95, '96, or '94-'95, something like that?

25                   **MR. ELDER:** What we've done in terms of --

1 Peter Elder, for the record -- in terms of -- we're  
2 tracking all of these things in terms of anything that's  
3 not going to be done by July 25<sup>th</sup> and in our view and  
4 we've communicated to AECL that we expected all to be done  
5 certainly before they show up for a licence renewal  
6 hearing in about a year from now.

7 So they've got -- what they have to do at  
8 the outage they have to do in the first outage. Anything  
9 that they get done during the shorter periods or  
10 operational they have time to do but we're looking at that  
11 one all being resolved by the time they come back for  
12 licence renewal.

13 **THE CHAIRMAN:** Okay. My last question  
14 exactly relates to this.

15 What did this stoppage do to the critical  
16 part towards October 2011, if anything? Did it slow you  
17 down, speed you up?

18 **MR. PILKINGTON:** Bill Pilkington, for the  
19 record.

20 It actually did both. That fact that we  
21 were shut down gave us an opportunity to access equipment  
22 for things like these walk-downs that would have been  
23 very, very difficult to schedule around short outages.

24 So in terms of the work that is more  
25 difficult or most difficult to get done, it presented us

1 with an opportunity.

2 The other side of that coin is that we have  
3 committed our resources very heavily to the repair and  
4 return to service and so the things relating more to  
5 documentation and analysis we will have to accelerate our  
6 efforts in order to be ready for licence renewal.

7 However, I point out that the most  
8 difficult challenges around getting access to field  
9 equipment is something that was available to us in this  
10 shutdown.

11 **THE CHAIRMAN:** Thank you.

12 Doctor McDill?

13 **MEMBER MCDILL:** One last question. You  
14 have all of these marvellous wonderful tools. What's  
15 going to happen to them?

16 **MR. PILKINGTON:** We do have an arm of AECL  
17 whose job is services and so we have great expertise  
18 between ourselves and our contractors, all of which could  
19 be available to anyone who needs them.

20 In terms of the actual tools, we will be  
21 storing the tools until there is a requirement for them  
22 and we of course have learned for the design of all these  
23 tools and so we have that learning to apply both to our  
24 unit and to others.

25 **MEMBER MCDILL:** Thank you.

1                   **THE CHAIRMAN:** Thank you. Last chance?

2                   Well, thank you very much. Thank you for  
3 your patience and perseverance with us here.

4                   We shall take -- anything I need to do now,  
5 Marc?

6                   **MR. LEBLANC:** Well, the Commission will  
7 confer with regards to the information that it has  
8 considered today and then determine if further information  
9 is needed or whether the Commission is ready to proceed  
10 with a summary decision in a very short time period. So  
11 we will advise accordingly.

12                   **THE CHAIRMAN:** Okay. Thank you.

13                   We will reconvene in 10 minutes.

14 --- Upon recessing at 6:44 p.m. /

15                   L'audience est suspendue à 18h44

16 --- Upon resuming at 7:03 p.m.

17                   L'audience est reprise à 19h03

18                   **THE CHAIRMAN:** Okay, good afternoon.

19                   My name is Michael Binder. Je suis le  
20 président de la Commission canadienne de sûreté nucléaire.

21                   And the next item on the agenda is the  
22 opportunity to be heard to Saskatchewan Research Council  
23 on the Order issued on June 18 by the Designated Officer.

24                   So I wish to welcome Mr. Joe Muldoon, Vice  
25 President, Environment and Forestry for SRC.