

**Canadian Nuclear
Safety Commission**

**Commission canadienne de
sûreté nucléaire**

Panel Hearing

Audiences des Formations

May 19, 2006

Le 19 mai 2006

Public Hearing Room
14th floor
280 Slater Street
Ottawa, Ontario

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

Commission Members present

Commissaires présents

Mr. Alan R. Graham
Dr. Christopher R. Barnes
Dr. Moyra McDill

M. Alan R. Graham
M. Christopher R. Barnes
M^{me} Moyra McDill

General Counsel:

Jacques Lavoie

Conseil général

Jacques Lavoie

Secretary:

Mr. Marc A. Leblanc

Secrétaire:

M. Marc A. Leblanc

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Ottawa, Ontario

--- Upon commencing on Friday, May 19, 2006
at 4:04 p.m.

Opening Remarks

THE CHAIRPERSON: Good afternoon, ladies and gentlemen, and we apologize for the delay but because of Commission business we're running a little bit late, but we'll try and deal with this in an appropriate way.

Mr. Secretary, do you have anything to read first or not?

THE SECRETARY: No.

THE CHAIRPERSON: Okay. Good afternoon, and welcome to the panel hearing on the Application of Bruce Power to begin the Demonstration Irradiation phase of the Bruce B New Fuel Project.

My name is Alan Graham and I'll be presiding the hearing.

Bruce Power Inc.:
Application to begin the
Demonstration Irradiation
Phase of the Bruce B New
Fuel Project

1 **THE CHAIRPERSON:** We also have with us Dr.
2 McDill on my far right and Dr. Barnes that will be joining
3 us in the hearing.

4 In addition to Mr. Leblanc, as you all
5 know, who is the Secretary of the Commission, we also have
6 Mr. Jacques Lavoie who is General Counsel who is also on
7 the podium here today.

8 The Commission Members have read the
9 written submissions filed by CNSC -- no, pardon me, I'm
10 getting ahead of myself here, I guess.

11 I would like to note that the Commission is
12 still on enhanced security, as you're all aware, and as
13 are many of our facilities and, as such, as appropriate,
14 take measures to ensure that security matters of a
15 sensitive nature are not discussed in public and will, if
16 necessary, we can move in camera at any time to discuss
17 security matters.

18 The Commission Members have read the
19 submission filed by CNSC staff, as outlined in Commission
20 document 06-H116 and 06-H-116.A.

21

22 **06-H116**

23 **Written Submission from**

24 **CNSC staff**

25

I would like to ask CNSC staff whether they

1 wish to give a brief presentation or add anything to the
2 written submission. I will turn to Mr. Phil Webster -- I
3 believe is here today -- who is the Regulatory Program
4 Director of the Bruce Regulatory Program Division.

5 Mr. Webster, the floor is yours.

6 **MR. WEBSTER:** Thank you, Mr. Graham.

7 For the record, I'm Phil Webster, Director
8 of the Bruce Regulatory Program Division.

9 We are aware, as is the Commission, that
10 the process for this is evolving. The advice to us was
11 that the Commission didn't want a presentation but an
12 opening statement. So I'll just say a few words on that
13 line.

14 As you can see, I'm joined here by a number
15 of our specialist colleagues today. I'd like to introduce
16 two in particular, Mr. Wade Grant on my left who was a
17 project manager for our evaluation of this New Fuel, and
18 immediately behind him, Monsieur Michel Couture, who was
19 the technical coordinator within our Assessment and
20 Analysis Directorate. I'm joined as well by a team of our
21 specialists.

22 The background to this: In December 2005
23 Bruce Power applied for approvals and a license amendment
24 in order to carry out a Demonstration Irradiation of 24
25 CANFLEX Low Void Reactivity Fuel Bundles. The requested

1 activity would allow the performance of the fuel in the
2 core to be evaluated against expectations. In doing so,
3 it will cause some possible slight perturbations for two
4 to the reactor core for approximately a one year duration.
5 The Demonstration Irradiation is one phase of the New Fuel
6 Project, the purpose of it being, as is stated by the
7 licensee in its Application, to enhance the safety
8 margins.

9 The Application before you today is solely
10 for the purpose of authorizing the Demonstration
11 Irradiation, a decision for any possible full core
12 implementation has not yet been made. If it is, the
13 licensee and ourselves will appear before you at a future
14 date.

15 Staff has reviewed the request and the
16 supporting information and has concluded that it's
17 complete and it demonstrates that the Applicant has made
18 adequate provision for the protection of health, safety,
19 security and the environment.

20 I would like to make one administrative
21 correction to the CMD on page 16 in Item C-6. The last
22 sentence of the second paragraph should read that:

23 "Bruce Power's environmental
24 performance was rated "B" or
25 meets expectations".

1 We inadvertently noted it "exceeds expectations".

2 That concludes our opening statements. We
3 and the licensee are available to answer questions.

4 **THE CHAIRPERSON:** Thank you very much, Mr.
5 Webster.

6 Does Bruce Power wish to have any opening
7 comments with regard to this hearing?

8 **MR. SAUNDERS:** Frank Saunders for Bruce
9 Power.

10 Just very briefly, as CNSC staff have
11 indicated, we seek to use this fuel to improve in all
12 safety margins of the reactor. We have already been
13 through the design and testing phases that are possible,
14 you know, at that stage, and we're now ready to proceed
15 with commissioning trials. To do that, we need to amend
16 their operating policies and principles and their reactor
17 operating license to allow us to install them.

18 So we're here today to request those
19 amendments.

20 I have with me on my right, Robert Chun,
21 who is our Manager of Nuclear Safety Analysis; Chris
22 Elliott who is our Manager of Design and Mike Liska who is
23 the Project Manager for this project for us and behind me
24 Maury Burton who has been our regulatory interface on the
25 project. These gentlemen are a little better equipped

1 than I to answer the detailed questions you might have.
2 So they're here for that and we do agree with the
3 conclusions of the CMD from staff.

4 **THE CHAIRPERSON:** Thank you very much, Mr.
5 Saunders.

6 And for the record, I didn't introduce you
7 correctly that you are the Vice-President, Safety,
8 Environment and Assessment; is that correct? And that's
9 for the record.

10 Okay. And I will open the floor to CNSC
11 Members for comment.

12 Dr. McDill.

13 **MEMBER MCDILL:** Thank you. I'll start with
14 a relatively straightforward question. On page 22 of the
15 CMD H116, reference 2 is stated as "removed" and I'm not
16 sure what that means because reference 2 is referred to.
17 So are the references -- well, perhaps you could just
18 clarify that for me so I know what's happening there?

19 **MR. WEBSTER:** Phil Webster, for the record.
20 I'll ask Wade Grant to answer that question, please.

21 **MR. GRANT:** Wade Grant, for the record,
22 Senior Regulatory Program Officer with the Bruce
23 Regulatory Program Division.

24 Reference 2 is actually inadvertently a
25 duplicate of the design -- the fuel bundle design document

1 which is Reference 14.

2 **DR. McDILL:** Thank you.

3 **MR. GRANT:** I apologize for any confusion.

4 **DR. McDILL:** Then, on page 15 of the same
5 CMD where it refers to the Mark 4 design Reference 2 and
6 its development 14, they should both be 14?

7 **MR. GRANT:** That is correct -- sorry, Wade
8 Grant, for the record.

9 **DR. McDILL:** Thank you. That's a bit of a
10 help.

11 My questions are -- I guess there are a
12 number of questions. My first question is what precisely
13 was the difficulty in the stack up -- tolerance stack up
14 analysis in terms of the pad spacing and what design
15 changes did it result in? In the letter -- in the letter
16 from -- in the letter dated March 8, 2006 to Mr. Webster,
17 paragraph 2, there was an issue in manufacturing with
18 stack up of tolerances on the spacer pad heights and that
19 has required some rework. Does that rework change any of
20 the essential dimensions referred to in the table of H116?

21 **MR. WEBSTER:** I'd like to ask Michel
22 Couture to answer that question, please.

23 **MR. COUTURE:** Michel Couture, for the
24 record.

25 These -- first, there has been some slight

1 changes to the spacer pad heights in some cases, but they
2 are still within the design specifications. So it doesn't
3 change the overall qualification of the fuel. The reason
4 why they had to do this is that there is a -- eventually,
5 once they manufacture the bundles they have to go through
6 a final test, which is what they call the bent tube gauge
7 test, and this is essentially a cylinder that the bundle
8 has to go through and the bundle did not go through the
9 first manufactured bundle, so they had to reexamine and do
10 an analysis of the reasons why, and they came to the
11 conclusion that these were due to the bundle -- the spacer
12 pad that separates the elements had to be reworked
13 slightly. So we're talking about two fractions of
14 millimeters here.

15 **MEMBER McDILL:** Perhaps I could ask Bruce
16 if they wish to comment on that?

17 **MR. LISKA:** For the record, Mike Liska,
18 Bruce Power Project Manager.

19 Michel is correct. There were no changes
20 to the minimum height specifications for the design
21 drawing. The bundles were actually manufactured such that
22 the spacer pads were a little bit too far away from the
23 minimum specifications. We then reworked the bundles to
24 bring the spacer pads back down closer to minimum
25 specification. The reassembled bundles went through the

1 bent tube gauge test.

2 **MEMBER McDILL:** And all of the engineering
3 change, drawings and documentation is now complete for
4 that on a permanent basis?

5 **MR. LISKA:** There were no changes to the
6 engineering drawings at that time.

7 Mike Liska, for the record.

8 **MEMBER McDILL:** My next question relates to
9 the CMD this morning and the -- and I asked if I could
10 bring it forward in section C1.10.1 and the 4H container
11 referred to on pages C-12 and C-13.

12 The container for the Demonstration
13 Irradiation is stated to generate too much heat if it
14 catches fire and I wanted to inquire as to whether or not
15 that has been resolved for the -- is that going to be an
16 issue for the Demonstration Irradiation and how will it be
17 resolved for the next step. Perhaps I could ask both
18 parties?

19 **MR. WEBSTER:** Phil Webster, for the record.

20 I'd like to ask Dr. Vladymir Khotylev to
21 explain in detail. Staff's overall conclusion, as
22 expressed in the Screening Report is that we don't see any
23 major problems with the use of this Low Void Reactivity
24 Fuel in terms of the handling prior to its being inserted
25 into the core but as for the actual -- the heat loading in

1 the fire -- I'll ask Dr. Khotylev to respond.

2 **DR. KHOTYLEV:** For the protocol, Dr.
3 Khotylev.

4 I would like to clarify that statement in
5 the Environmental Assessment Report, probably slightly --
6 it is approximate statement was put in this report. We
7 obviously can confidently state for the Commission Members
8 that problems which were noted in that report probably
9 they are operational problems. They are not safety-
10 related problems because this package, 4H package, as
11 certified -- was certified according to Canadian
12 regulations and United Nations regulations.

13 Canadian certificate CDN-4212-BUF is in
14 front of me and I can clearly see that all tests which --
15 all kinds of tests which have been done in order to
16 certify the package including drop tests, fire tests, all
17 other tests according to United Nations regulations and
18 Canadian regulations have been done many years ago. This
19 package is appropriate for transportation of much higher
20 enriched uranium and if we speak about safety concerns or
21 safety aspects of operation of this package, we can tell
22 that, for instance if we assume three times higher
23 enrichment than it is in slightly enriched uranium
24 bundles, 3 per cent enriched uranium, allowable number of
25 packages which can --from critical safety point of view --

1 which can be transported and stored safely is 29. It
2 means if 29 packages during transportation on the road --
3 and everyone is speaking about storage and conditions and
4 so on, fuel storage conditions -- so even if 29 packages
5 together will be all dropped, all burned in a fire and
6 then put together and flooded, critical safety concerns
7 would not be -- there will be no significant, no critical
8 safety concerns whatsoever.

9 Thank you.

10 **MEMBER McDILL:** Then why redesign it? Why
11 the New Fuel package will virtually eliminate the issue of
12 et cetera, et cetera?

13 **MR. WEBSTER:** Phil Webster, for the record.

14 What we're looking at here is what
15 sometimes is described as a prompt critical response of
16 CANDU reactors. In the event of certain large loss
17 coolant accidents, which are almost a hypothetical
18 category of accidents, requires a certain pipe to break in
19 a certain way at a certain place. Then the neutronics
20 behaviour of the core could very briefly overwhelm the
21 ability of the shutdown system to control the reaction.
22 In the absence of good experimental evidence we can't be
23 sure that this is the behaviour. Rather, we're not
24 sufficiently confident that it's not the behaviour.
25 Replacing natural uranium bundles with these low void

1 reactivity bundles, that would, because of its behaviour
2 in the event of a large loss of coolant accident, that
3 would remove the prompt critical response of the reactors.
4 So that's the safety benefit that we, the regulator, and
5 Bruce Power, the licensee, sees from the use of these
6 bundles.

7 **MEMBER MCDILL:** Thank you. I understand
8 that. It was the apparent contradiction between the
9 current package generating too much heat and the new fuel
10 package. I understand that maybe it's -- perhaps it's
11 just the wording. The text is referring to the new fuel
12 and I'm referring to the package. Perhaps that's the
13 difficulty.

14 Perhaps Bruce would like to comment.

15 **MR. ELLIOTT:** Chris Elliot for the record.
16 There's two packages for the Demonstration
17 Irradiation we're using these 4H containers. They take a
18 very small number of bundles. Basically we can only
19 transport eight bundles. Looking forward towards our full
20 core implementation we're redesigning the packages such
21 that we can transport a larger number, which is in the
22 commercial -- basically in the commercial quantities. So
23 that's the reason for redesigning it.

24 **MEMBER MCDILL:** Thank you.

25 **THE CHAIRPERSON:** Dr. Barnes.

1 **MEMBER BARNES:** I just had I think, two
2 questions. The first is on page 5 of 23, referring to
3 that. This is B4, the CANFLEX LVRF Demonstration
4 Irradiation and forgive me if I just read.

5 The first sentence of the first paragraph:

6 "The Demonstration Irradiation, DI, is
7 a confirmation process after the
8 qualification of a new fuel."

9 And the next paragraph,

10 "The results or findings of the
11 Demonstration Irradiation will
12 contribute towards a judgement and
13 recommendation by the CNSC staff as to
14 whether Bruce Power should be allowed
15 to proceed with the full core
16 conversion plan. Therefore, it is
17 important that the Demonstration
18 Irradiation be conducted in a way that
19 provides important and useful
20 information with which CNSC staff can
21 make this judgement."

22 And so I'm going to ask staff, is this
23 document that you've prepared -- do you think that this is
24 structured in such a way that someone who isn't CNSC
25 staff, a potential intervenor or Commissioner for example,

1 will know what defines, in a sense, success in this
2 demonstration. I don't see in here, in a sense, what
3 might be the milestones or the protocols or the standards
4 spelled out. The rest of the document goes down into a
5 level of detail, which really doesn't define at the end of
6 this demonstration how you will have shown whether it's
7 successful or not successful or some variances in between.
8 Is that a fair criticism?

9 **MR. WEBSTER:** Phil Webster, for the record.

10 I think because you and we are still
11 learning just what is expected in this process, we've
12 attempted here to give you what's almost a re-licensing
13 CMD. We've covered every area that could be relevant, but
14 we take your point that we perhaps haven't clarified what
15 the successful outcome would be.

16 I'd like to ask Mr. Bob Gibb to speak a
17 little further to this. He's the person who's responsible
18 for that part of the CMD. Perhaps he can shed some light.
19 But while he's preparing, let me try to give my -- at
20 least my interpretation of it -- the intention is to leave
21 two channels worth of bundles in the reactor for about one
22 year and then they'll undergo a very thorough examination,
23 I think at Chalk River in the hot cells there.

24 It's really a matter of making sure that
25 they do indeed perform in the manner which one would

1 expect from the analysis and the projections. Also of
2 course, that they don't cause any other problems with the
3 core or the fuelling mechanism while they're in the core.

4 So with that, I'll pass to Mr. Gibb and
5 perhaps he can answer your question in more detail.

6 **MR. GIBB:** Hello. It's Bob Gibb, for the
7 record.

8 I reviewed, I'm one of the ones that
9 reviewed the Demonstration Irradiation. The Demonstration
10 Irradiation is a trial of a prototype of a new design.
11 It's typical in a design development project to build
12 prototypes and use them and test them out before you move
13 on to full production of a prototype.

14 The evaluation of the success is a mixture
15 of commercial viability since this was to become a
16 production fuel versus performance characteristics versus
17 those characteristics, which are important to safety. So
18 the staff review focussed on the collection of information
19 to ensure that as much information as possible could be
20 collected, that there was a process for reviewing and
21 assessing that information. The part of that collection
22 of information that's of interest to staff is those
23 aspects that reveal the fuel qualification confirmed that
24 the fuel as it was qualified meets those qualifications in
25 a realistic condition. But you don't verify all the

1 qualifications so there's a judgemental factor involved
2 and the success of the project isn't entirely safety.
3 It's partially commercial, so hence the sort of abstract
4 words about the goals.

5 But the specific CNSC objective is to
6 review the results of the Demonstration Irradiation and
7 confirm that those fuel qualification aspects that can be
8 measured are confirmed.

9 **MEMBER BARNES:** Thank you. And I would
10 agree that a focus of the Commission shouldn't necessarily
11 be on the commercial side. It's on the safety side. But
12 I would still turn the question back to you and ask, in
13 this document that we're -- that you've given us in order
14 to essentially approve this step, do you think that you
15 have given us the information on which we would know how
16 there would be a failure of this sort of experimental
17 pilot project.

18 When would you accept this has not proven
19 the demonstration? In a sense, we're giving approval here
20 but I don't see how in a year's time, we will, from the
21 information here, I can believe there are reasons, I'm
22 just saying in this document, I don't think if we look
23 back a year from now, that we'll be able to say, "Oh,
24 that's right, it didn't pass this level and therefore it
25 failed." Or "It did pass this series of aspects and

1 therefore it should be qualified".

2 **MR. WEBSTER:** Phil Webster, for the record.

3 As Mr. Gibbs explained, this is an interim
4 step towards what will likely eventually be a full-core
5 load and what staff is trying to express to the Commission
6 today is that we've verified that Bruce Power has taken
7 all reasonable steps to make sure that the experiment can
8 be conducted safely and we're seeking the Commission's
9 permission to permit that.

10 As to whether or not the licensee would
11 know if the experiment is successful, I think this would
12 be verified throughout the course of the year. Provided
13 the reactor -- the physics response was as expected,
14 provided there were no fuel failures and no problems with
15 the fuelling mechanism.

16 Perhaps I can ask Bruce Power to speak to
17 that a little bit further.

18 **MR. CHUN:** Good afternoon Commission Chair,
19 Member of the Commission. For the record, my name is
20 Robert Chun, Manager of Nuclear Safety Analysis and
21 Support Department.

22 I echo some of the statements made by the
23 CNSC staff, but I thought I would give you a general
24 answer before I answer specific questions that you ask.
25 And hopefully I can shed some light on that.

1 First of all, I want to mention that Bruce
2 Power had worked closely with our fuel design agent,
3 Atomic Energy of Canada to execute a very rigorous fuel
4 design program and we have completed all the design
5 activity including all the design calculations and all the
6 qualification tests. So we have also undertaken various
7 reviews at different stage including an independent design
8 review by Atomic Energy of Canada themselves as well as
9 our Bruce Power's own internal review to ensure the design
10 assurance is high and Bruce Power is ready to accept and
11 use the fuel.

12 So with the completion of the design
13 activities, our plan is to conduct a Demonstration
14 Irradiation by loading the fuel in two fuel channels as
15 you know. The Demonstration Irradiation is a prudent step
16 before we do production loading of the fuel. It is not
17 formally a mandatory step as part of the design process.
18 It is intended to confirm the negative, to confirm that
19 the new fuel would perform as per the design under reactor
20 operating condition. So we are looking for to make sure
21 there is no surprise in that.

22 So in terms of answering your specific
23 questions, what we're looking for, Bruce Power had provide
24 CNSC staff and we have produced a Demonstration
25 Irradiation plan where in that plan we'll lay out some of

1 what you would refer to as a set criteria.

2 For example, we were looking at whether
3 there are unexpected or unacceptable events when we load
4 the fuel into these fuel channels, there is unacceptable
5 interaction between the fuel and pressure tube and other
6 reactor components.

7 We'll be looking at the performance of the
8 fuel for example, looking at the mechanical performance,
9 impact on physic behaviour and the fuel performance and
10 we'll also be doing inspection of fuel, after the fuel are
11 discharged from the channels.

12 So again, I emphasize we are not looking to
13 expect to see anything contrary to what we have designed.
14 This is a prudent step to ensure that we do not have any
15 unacceptable findings and as the CNSC staff indicated,
16 there's also a production aspect to familiarize ourselves
17 with how we handle the fuel, how we trial some of the
18 operating procedures and so forth. So I hope that helped
19 to answer the question.

20 Thank you.

21 **MEMBER BARNES:** Thank you. It did.

22 The second point I'd raise, which again is
23 somewhat general and it's related to staff and this is on
24 page 8. So it's staff's observation in the middle part of
25 C-1, Operating Performance and I'll read, again for the

1 record,

2 "Bruce Power does not have
3 operating experience with
4 slightly enriched uranium fuel."

5 And then the second, the next paragraph
6 starts off,

7 "Also, Bruce Power has no
8 experience in out of core
9 handling of slightly enriched
10 uranium fuel."

11 And it goes on to make some slight
12 qualifications. Perhaps I could invert this and suggest
13 that CNSC staff doesn't have experience in this area too,
14 unless I'm mistaken. So to what extent is staff, in a
15 sense, preparing itself for this evaluation capability.
16 In a sense, the last paragraph is,

17 "As a result, CNSC staff expects
18 Bruce Power operation performance
19 will continue to meet
20 expectations."

21 Does CNSC staff have to do very much in
22 order to make sure that you're right on top of using
23 slightly enriched fuel?

24 **MR. WEBSTER:** Phil Webster, for the
25 record.

1 As we heard Mr. Hawthorne explain this
2 morning, the characteristics of this very slightly
3 enriched fuel are really not very different from that of
4 the natural uranium fuel, with which we and the licensees
5 also are very familiar. There may be some slight
6 differences in handling of the new fuel because of the
7 potential for an increased criticality issue, but for the
8 Demonstration Irradiation, that's not the case.

9 Overall, we don't feel that staff
10 would have any problems regulating the necessary aspects
11 of this new fuel.

12 Thank you. That's all Mr. Chair.

13 **THE CHAIRPERSON:** Thank you. That was
14 the question I was going to ask with regard to page 8.

15 So Dr. McDill, do you have any other
16 questions.

17 Okay, if that's it, then, Secretary.

18 **M. LEBLANC:** This completes the record
19 for the hearing on the matter of the application by Bruce
20 Power to begin the Demonstration Irradiation phase of the
21 Bruce B New Fuel Project.

22 The Commission will deliberate and
23 will publish its decision in due course. It will be
24 posted on the CNSC Website and will be distributed to
25 participants.

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Thank you.

THE CHAIRPERSON: Thank you for your
attendance. See you all next month.

Thank you very much.

--- Upon adjourning at 4:32 p.m.