

Record of Proceedings, Including Reasons for Decision

In the Matter of

Applicant

Bruce Power Inc.

Subject

Application to Begin the Demonstration
Irradiation Phase of the Bruce B New Fuel
Project

Date of Hearing

May 19, 2006

RECORD OF PROCEEDINGS

Applicant: Bruce Power Inc.

Address/Location: Bruce Power Inc., Box 3000 - B06, 177 Tie Road, Municipality of Kincardine, R.R.#2, Tiverton, Ontario N0G 2T0

Purpose: Application to begin the demonstration irradiation phase of the Bruce B New Fuel Project

Application received: December 8, 2005

Date of hearing: May 19, 2006

Location: Canadian Nuclear Safety Commission (CNSC) Public Hearing Room, 280 Slater St., 14th. Floor, Ottawa, Ontario

Members present: A.R. Graham, Chair
M. J. McDill
C.R. Barnes

Secretary: M. Leblanc
Recording Secretary: P. Bourassa
General Counsel: J. Lavoie

Licence: Amended
Date of Decision: May 19, 2006

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Introduction

1. Bruce Power Inc. (Bruce Power) has applied to the Canadian Nuclear Safety Commission (CNSC¹) for approvals and an amendment to the Bruce B reactor operating licence in order to begin the demonstration irradiation phase of the Bruce B New Fuel Project. The new fuel design is a Low Void Reactivity Fuel (LVRF) that contains slightly enriched uranium and a neutron absorber. It is called the CANFLEX-LVRF fuel design.
2. The project's intended result is to increase safety through the use of a new fuel. Demonstration irradiation is a confirmation process that follows the qualification of a new fuel. The results will determine if the fuel will perform as intended under normal operations. It is a conservative, safety conscious step towards full core implementation.
3. Bruce Power has proposed that the demonstration irradiation for the new fuel be performed in two of 480 fuel channels of the Bruce B Nuclear Generating Station (NGS) Unit 6 or 7 for the duration of approximately one year, under normal operating conditions. The remaining 478 fuel channels would continue to be fuelled with natural uranium.

Issues

4. In considering the application, the Commission was required to decide, pursuant to subsection 24(4) of the *Nuclear Safety and Control Act*²:
 - a) if Bruce Power is qualified to carry on the activity that the amended licence would authorize; and
 - b) if, in carrying on that activity, Bruce Power would make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

Hearing

5. Pursuant to section 22 of the NSCA, the President of the Commission established a Panel of the Commission to hear the application.

¹ In this *Record of Proceedings*, the *Canadian Nuclear Safety Commission* is referred to as the "CNSC" when referring to the organization and its staff in general, and as the "Commission" when referring to the tribunal component.

² S.C. 1997, c. 9

6. The Panel of the Commission (hereafter referred to as the Commission), in making its decision, considered information presented for a hearing held on May 19, 2006 in Ottawa, Ontario. During the hearing, the Commission received written submissions from CNSC staff (CMD 06-H116 and 06-H116.A). CMD 06-H116.A included the letters of application from Bruce Power. A separate CMD from Bruce Power was not considered necessary under the circumstances. Bruce Power and CNSC staff answered questions from the Commission.
7. The hearing was conducted in accordance with Rule 3 of the *Canadian Nuclear Safety Commission Rules of Procedure*³. In establishing the process, a standing panel on procedural matters determined that it was not necessary to hold a public hearing on the matter.

Decision

8. Based on its consideration of the matter, as described in more detail in the following sections of this *Record of Proceedings*, the Commission concludes that Bruce Power is qualified to carry on the activity that the amended licence will authorize. The Commission is also satisfied that Bruce Power, in carrying on that activity, will make adequate provision for the protection of the environment, the health and safety of persons, and the maintenance of national security and measures required to implement international obligations to which Canada has agreed. Therefore,

the Commission, pursuant to section 24 of the *Nuclear Safety and Control Act*, amends the Bruce B Power Reactor Operating Licence to authorize the commencement of a demonstration irradiation of CANFLEX Low Void Reactivity Fuel (LVRF) in Unit 6 or 7. The Commission also approves of the use of the CANFLEX-LVRF fuel bundle design and the modification to the Operating Policies and Principles (OP&P).

9. The Commission includes in the licence the conditions recommended by CNSC staff as set out in CMD 06-H116.
10. The Commission approves of the modifications to the OP&P as recommended by CNSC staff and set out in CMD 06-H116.

Issues and Commission Findings

11. In order for Bruce Power to proceed with the demonstration irradiation, the Commission had to be certain that sufficient steps had been taken to ensure that the health, safety, security, and environmental requirements had been met. The Commission reviewed Bruce Power's performance in several areas, including design and analysis, operating performance, and emergency preparedness, radiation protection, and environmental

³ SOR/2000-211

protection.

Design and Analysis

12. CNSC staff conducted extensive verifications of the design of the CANFLEX-LVRF fuel bundles in order to confirm that the fuel would comply with all of the requirements for Bruce B NGS reactors.
13. The Commission sought assurances that the details concerning the design of the fuel bundles, including pad spacing and minimum height specification, would be within the design specifications presented in the CMD 06-H116. The CNSC staff, along with the Bruce Power staff, assured the Commission that the new fuel bundle design met all of the design requirements, including the weight, diameter, and length of the fuel bundle, as well as the pad spacing and minimum height specification.
14. In the reactor physics assessment, CNSC staff determined that using two of 480 channels would not have a significant or negative impact on the reactor core design. The CNSC staff stated that the computer codes for the remaining channels and the global behaviour of the reactor would need only small incremental changes. Additional surveillance and monitoring measures were also put in place by Bruce Power to ensure safe operation of the Bruce NGS B reactors.
15. Using data from the Chalk River National Research Universal (NRU) reactor, CNSC staff determined that the new design would be capable of operating continuously at the power levels, burn up levels, and power changes it would experience during the demonstration irradiation with a low probability of mechanical failure.
16. Based on its analysis of the CANFLEX-LVRF mechanical behaviour and fuel design analysis programs, CNSC staff stated that the new fuel would be compatible with the system as per its design specifications and would be capable of operating safely under the normal and abnormal operating power reactor conditions of the demonstration irradiation.
17. Based on the above information and considerations, the Commission concludes that the CANFLEX-LVRF fuel bundle design is adequate for the purpose of protecting health, safety and the environment during the proposed project. The Commission therefore approves the use of the new fuel bundle design, pursuant to licence condition 4.3 of the Bruce B Power Reactor Operating Licence PROL 16.06/2009.

Operating Performance

18. In regards to the operating performance of Bruce Power, the most recent CNSC annual review, "Annual CNSC Staff Report for 2004 on the Safety Performance of the Canadian Nuclear Power Industry," indicated that CNSC expectations that adequate measures to protect health, safety, security and the environment have been taken were met. CNSC staff

also noted that Bruce Power's technical surveillance program is acceptable.

19. The Commission sought further information on Bruce Power's ability to handle the CANFLEX-LVRF fuel bundles. In response, Bruce Power stated that the implementation of a criticality safety program, along with its experience handling natural fuel, would ensure that the stringent standards for handling the fuel would be met. Bruce Power also noted that it will take additional measures in the areas of fuel handling, fuel management, and reactivity management. CNSC staff stated that these additional measures, along with the current practices, were adequate to ensure safe handling.
20. Based on this information, the Commission concludes that the current programs and practices and Bruce Power's past performance indicate that the facility will continue to be operated safely during the course of the demonstration irradiation. The Commission approves the modifications to the OP&P as recommended by CNSC staff in CMD 06-H116 and adds new licence conditions to reflect them.

Radiation Protection, Environmental Protection, Emergency Preparedness

21. CNSC staff explained that the radiological hazards associated with the new fuel were not inconsistent with normal hazards at a nuclear plant. In this regard, CNSC staff stated that Bruce Power's current Radiation Protection Program was adequate to cover the radiological hazards associated with the new fuel.
22. The existing environmental protection and monitoring programs were rated as meeting expectations in the CNSC annual review in 2004. CNSC staff noted that these programs would not be affected by the use of the new fuel and thus stated that adequate provisions have been made for the protection of the environment.
23. In the last CNSC annual review in 2004, Bruce Power's emergency preparedness program was rated as exceeding CNSC expectations. CNSC staff stated that the emergency preparedness program was also adequate for the demonstration irradiation.
24. Based on this information, the Commission finds that Bruce Power will continue to make adequate provision for the protection of persons from radiation and for the protection of the environment during the demonstration irradiation. The Commission concludes that Bruce Power's emergency preparedness is adequate for the purpose of the proposed project.

Security

25. With respect to site security, the new fuel signifies a change to a category III material as defined in the *Nuclear Security Regulations*⁴. CNSC staff reviewed Bruce Power's security in this regard and was satisfied that the nuclear security requirements were met. CNSC staff also inspected the fresh fuel storage area and was satisfied that it met the *Nuclear Security*

⁴ SOR/2000-209

Regulations requirements.

26. The Commission concludes that Bruce Power has made, and will continue to make, adequate provisions for ensuring the physical security of the Bruce NGS.

Safeguards

27. With respect to safeguards, CNSC staff reported that Bruce Power has submitted updated design information regarding the use CANFLEX-LVRF fuel at Bruce NGS B. CNSC staff noted that, pursuant to the Canada/IAEA safeguards agreements, it has in turn submitted this information to the International Atomic Energy Agency (IAEA).
28. CNSC staff noted that the safeguards program at Bruce Power meets safeguards requirements relevant to the utilization of CANFLEX LVRF fuel at Bruce NGS B.
29. The Commission concludes that Bruce Power has made, and will continue to make, adequate provisions in the area of safeguards that are necessary for maintaining national security and respecting the international agreements that Canada has signed.

Conclusion

30. The Commission has considered the information and submissions on record. Based on the design information for the demonstration irradiation phase presented by Bruce Power and CNSC staff, as well as Bruce Power's past operating performance, the Commission concludes that Bruce Power has the capacity to safely carry out the demonstration irradiation activities using the new CANFLEX-LVRF fuel bundle design in accordance with the NSCA.
31. The Commission concludes that Bruce Power is qualified to carry on the activity that the proposed amended licence would authorize. The Commission is also satisfied that Bruce Power, given the measures and programs to control the hazards that are in place or will be in place, will continue to make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and the measures required to implement national obligations agreed to by Canada.
32. The Commission therefore amends the Bruce B Power Reactor Operating Licence PROL 16.06/2009. This amendment is to authorize the commencement of a demonstration irradiation of CANFLEX Low Void Reactivity Fuel (LVRF) in Unit 6 or 7 at the Bruce B NGS, located in Tiverton, Ontario.
33. The Commission also approves the use of the CANFLEX-LVRF fuel bundle design and the modifications to the OP&P as recommended by CNSC staff and set out in CMD 06-H116.
34. The Commission includes in the licence all of the conditions recommended by CNSC staff,

as set out in CMD 06-H116.

Marc A. Leblanc
Secretary,
Canadian Nuclear Safety Commission

Date of decision: May 19, 2006

Date of release of Reasons for Decision: July 7, 2006