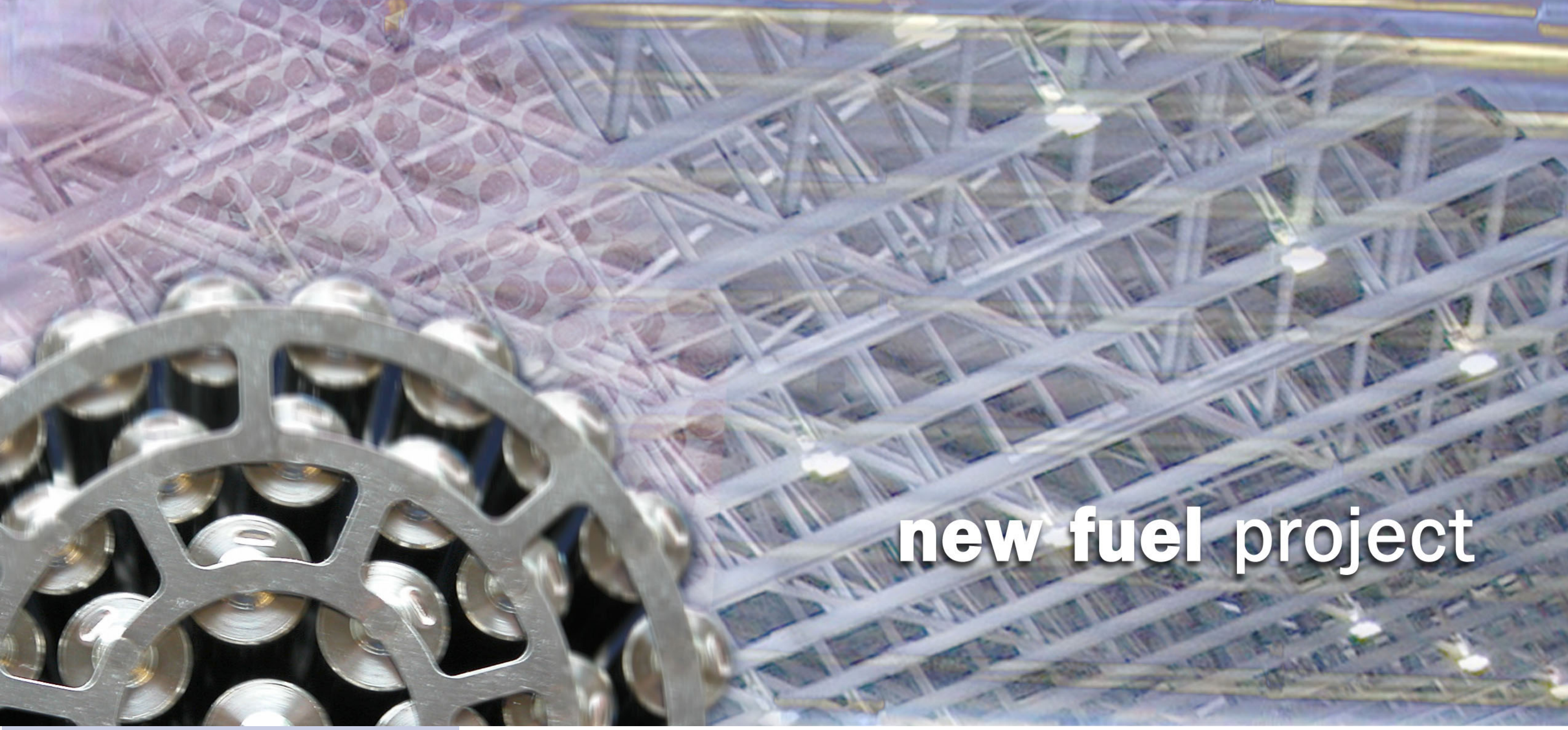

New Fuel Project for Bruce B

Project Description

December 2003

Bruce Power™

PROJECT DESCRIPTION

NEW FUEL PROJECT FOR BRUCE B

Revision 2

Prepared by:

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Recommended by:		December 17, 2003
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Approved by:		
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Accepted by:		
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1.0 GENERAL INFORMATION

1.1 General

Bruce Power plans to refuel the Bruce B reactors with low void reactivity fuel (known as "new-fuel")[1] containing a neutron absorber and slightly enriched uranium (SEU) beginning in 2006 following a successful demonstration irradiation (DI) scheduled for late 2004. The Bruce B reactors are currently operating at 90 per cent of maximum capacity based on an operating limit commitment made to the Canadian Nuclear Safety Commission (CNSC). This limitation was placed on the facility when studies revealed that safety margins for certain low probability accidents were notably reduced. The derating to 90 per cent of full power ensures that the adequate safety margin is maintained.

The use of new-fuel would substantially improve the safety margins of the reactors and allow them to operate at their design capacity. The new-fuel would be contained in a redesigned fuel bundle known as the CANFLEX fuel bundle.

Receipt, use, storage and management of fresh and used[2] new-fuel would be carried out in a similar way to the current-fuel. Figure 1.1 shows the fresh new-fuel bundles would be transported from the fuel manufacturer and received at the Bruce Power site. Use of new-fuel and management of used new-fuel would occur entirely on the Bruce Power site within facilities licensed by the CNSC.

The Bruce Power New Fuel Project comprises a demonstration irradiation in a Bruce B reactor and all of the activities included in the box on Figure 1.1, namely:

- Receipt of fresh new-fuel at the Bruce Power site;
- Storage of fresh new-fuel at Bruce B;
- Loading fresh new-fuel into Bruce B reactors;
- Operating the four Bruce B reactors using new-fuel;
- Removing new-fuel from the Bruce B reactors after depletion and storing it in the Bruce B wet storage irradiated fuel bays (IFBs); and
- Transferring used new-fuel to dry storage.

Replacing current-fuel in the Bruce B reactors with new-fuel requires only minor changes to some of the support systems of the power station. No changes to the major reactor structures, systems, or components (except the fuel itself) are required. Changes will also be required to the operating procedures and safety reports, which govern the day-to-day operations of the reactors.

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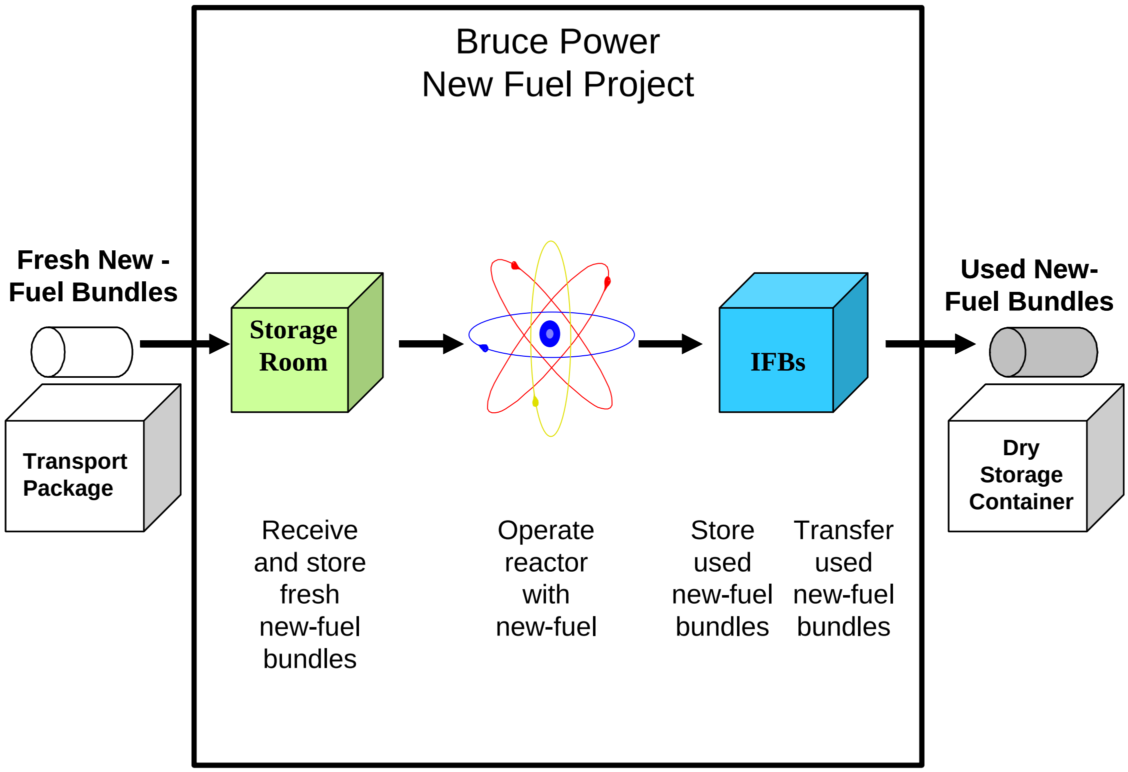
[1] Fuel used at the Bruce B reactors at present is termed "current-fuel".

[2] The term "used fuel" and "irradiated fuel" are used interchangeably.

The Bruce B nuclear generating station (operating licence, PROL 16.03/2003, issued by the CNSC) consists of four reactors which currently produce 3,360 megawatts (MW) of electricity. The facility, which is located entirely within the Bruce Power site, is operated by Bruce Power. The Bruce Power site is located on the shore of Lake Huron in the Municipality of Kincardine (see Figure 1.2). The use of new-fuel in the reactors is expected to provide sufficient extra safety margin to allow operation at 100 per cent full power. This would remove a significant barrier to restoring the operating capacity of the Bruce B nuclear generating station to the original design.

Figure 1.1
OVERVIEW OF BRUCE POWER NEW FUEL PROJECT



BRUCE POWER SITE LOCATION | **FIGURE 1.2**

Date: FEBRUARY 2003

Project: 021-1950

1.2 Potentially Interested Government Authorities

The following list indicates government agencies who may want to receive copies of the Project Description:

- Environment Canada;
- Natural Resources Canada (NRCan);
- Health Canada;
- Department of Fisheries and Oceans;
- Department of Indian Affairs and Northern Development;
- Ontario Ministry of the Environment (MOE);
- Ontario Ministry of Natural Resources (MNR);
- Ontario Ministry of the Solicitor General;
- Local Regional and Municipal Governments; and
- Grey Bruce/Owen Sound Health Unit.

1.3 Project Schedule

The following schedule is proposed for the Bruce Power New Fuel Project.

Submit Revised Project Description to CNSC	Late 2003
Demonstration Irradiation	Late 2004 – Late 2005
Anticipated CNSC approval	Mid 2006
Load new-fuel at first of four Bruce B reactors	Late 2006
Full complement of new-fuel in all Bruce B reactors	Mid 2008

1.4 Contacts

Bruce Power is the sole proponent for the operation of the New Fuel Project. There are no other co-proponents, such as federal government departments or agencies, for this project.

The contact information for the Project Manager for the Bruce Power New Fuel Project follows:

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Project Manager
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1.5 Federal Involvement

There is no federal government department or agency that is, or may be, providing financial support to the project.

1.6 Authorization Required

The CNSC is the federal authority responsible for the regulation of nuclear facilities in Canada. No amendment to the current operating licence PROL 16.03/2003 is required for the New Fuel Project. However, under Sections 4.2 and 4.3 of the operating licence, approval is required from the CNSC for Bruce Power to use the new-fuel design at the site and implement minor changes to support systems, where such approval is required by the operating license. As noted in Section 5(1) of the *Canadian Environmental Assessment Act* (CEAA), an environmental assessment (EA) is required when a federal authority has certain decision-making responsibilities for a proposed project. A clear, thorough Project Description, as early as possible in the project's planning phase, is required to assist the CNSC in determining whether it has a decision-making responsibility that triggers the need for an EA of the project. An appropriate Project Description should also reduce the likelihood that the CNSC will require further information from Bruce Power before making the above determination.

The Canadian Environmental Assessment Agency has issued an operational policy statement to guide the preparation of a Project Description, "*Preparing Project Descriptions Under the Canadian Environmental Assessment Act*" (OPS-EPO/5-2000). This Project Description has been prepared following this general guide for proponents and federal authorities as well as guidance provided by CNSC staff.

Compliance with provincial acts regarding air and water discharges is regulated through the requirements of Ontario's *Environmental Protection Act* and the *Ontario Water Resources Act*. The MOE regulates the discharge of non-radioactive substances through Certificates of Approval under these Acts and, in the case of liquid effluent releases, through regulations promulgated under the Municipal Industrial Strategy for Abatement (MISA). In addition, it is Bruce Power's practice to work closely with the municipal and regional governments to satisfy applicable local requirements.

1.7 Basis for the Project Description

As outlined in the Canadian Environmental Assessment Agency's operational policy statement, the purpose of a Project Description document is to:

1. **To allow the CNSC to determine the need for a federal EA pursuant to the CEAA.**

   As discussed above, an EA is required when a federal authority has certain decision-making responsibilities for a proposed project. A primary purpose of the Project Description is to allow the CNSC to make a determination on the need for an EA along with the type of assessment required.

2. **To promote efficient co-ordination of the EA with federal and provincial agencies.**

   Under the *Regulations Respecting the Co-ordination by Federal Authorities of Environmental Assessment Procedures and Requirements,* the federal authority receiving the Project Description (i.e., CNSC) uses the information to determine whether it is likely to require an EA of the project under CEAA and, if so, which other federal authorities may also have a responsibility or interest. The Project Description also provides the basis for the CNSC to consult with provincial EA authorities to determine any need for harmonization of the EA process. Early identification and notification of the appropriate federal and provincial authorities will help ensure that the process is efficiently coordinated among the various authorities, and that the proponent is informed of the federal EA requirements in a timely manner.

3. **To assist the CNSC in identifying potential environmental issues.**

   The Project Description should assist in early identification of potential environmental issues that should be considered in the preparation of the scope of the assessment document, in the event that an EA is required.

1.8 Project Description Organization

This Project Description is organized as follows:

Section 1 – "General Information", provides the context, contact, description and background for the proposed project.

Section 2 – "Project Information", provides a general overview of the project and describes the activities, components and systems that form the proposed project.

Section 3 – "Project Environment and Land Use Information", provides a general overview of the environmental features that could be affected by the proposed project.

Section 4 – "Project Interactions Matrix", provides an initial identification of the anticipated interactions between the New Fuel Project and the existing environmental features.

Section 5 – "Closure", provides a conclusion to the document.

Section 6 - "Bibliography", provides a list of sources, which provided the information used to develop the Project Description.

In addition there are two appendices:

Appendix A – List of Acronyms; and

Appendix B – Proposed Communications and Consultation Plan.

2.0 PROJECT INFORMATION

For the purposes of this Project Description, the Bruce Power New Fuel Project consists of the actions to perform a demonstration irradiation and to fuel the Bruce B reactors with low void reactivity fuel containing slightly enriched uranium[3] ("new-fuel") and to continue to generate electrical power.

2.1 New-fuel

Uranium is a naturally occurring radioactive element. Uranium is mined, refined and processed in Canada and manufactured into uranium dioxide ceramic fuel pellets contained within a zircaloy metal sheath for use in CANDU™ nuclear reactors. A number of metal sheaths are welded together to form a fuel bundle. A nuclear reaction occurs in a nuclear reactor through the fissioning or splitting of the atoms of one particular uranium isotope, U-235. Natural uranium contains 0.7 per cent U-235. (The remainder is the non-fissile isotopes U-234 and U-238). The Bruce B reactors currently use 37-element fuel bundles containing uranium oxide pellets made from natural uranium.

It is proposed to use a low void reactivity fuel bundle in the Bruce B reactors. The new-fuel would contain a neutron absorber and slightly enriched uranium dioxide containing approximately one per cent U-235. The slightly enriched uranium dioxide pellets would be contained within a 43-element CANFLEX fuel bundle. By way of comparison, light water reactors in the United States typically use uranium dioxide fuel enriched to three per cent U-235.

The new-fuel will be contained in a CANFLEX fuel bundle. A CANFLEX fuel bundle is shown in Figure 2.1 along with the current-fuel bundle for comparison. The CANFLEX bundle and the current-fuel bundle are similar in general appearance and function. The specific differences between the two bundles are summarized in Table 2.1.

The new-fuel composition is intended to reduce the probability of damage to the fuel bundles and fuel channel in the event of a large break loss of coolant accident, known as a "LOCA". A break in the large diameter piping in the reactor cooling circuit leads to a rapid depressurization and voiding of the coolant in the reactor core, i.e., the pressurized heavy water coolant turns rapidly to steam. A fundamental property of the reactor is that voiding of the coolant leads to an increase in reactor power, due to the positive void reactivity coefficient. The reactor shutdown systems respond rapidly to this power increase to quickly shut the reactor down. One of the design requirements is to avoid fuel channel damage leading to fuel channel failure following a design basis large LOCA, but if the power pulse following the LOCA is large enough, some damage to fuel channels may occur. The new-fuel design reduces the void reactivity coefficient and the size of the resulting power pulse in a large break LOCA, which in turn

[3] "Slightly" enriched means approximately one per cent concentration of U-235 compared to 0.7 per cent in the natural uranium in the current-fuel bundles.

provides greater assurance that fuel channel damage will be avoided. The new-fuel design is referred to as CANFLEX-LVRF, where LVRF stands for **l**ow **v**oid **r**eactivity **f**uel.

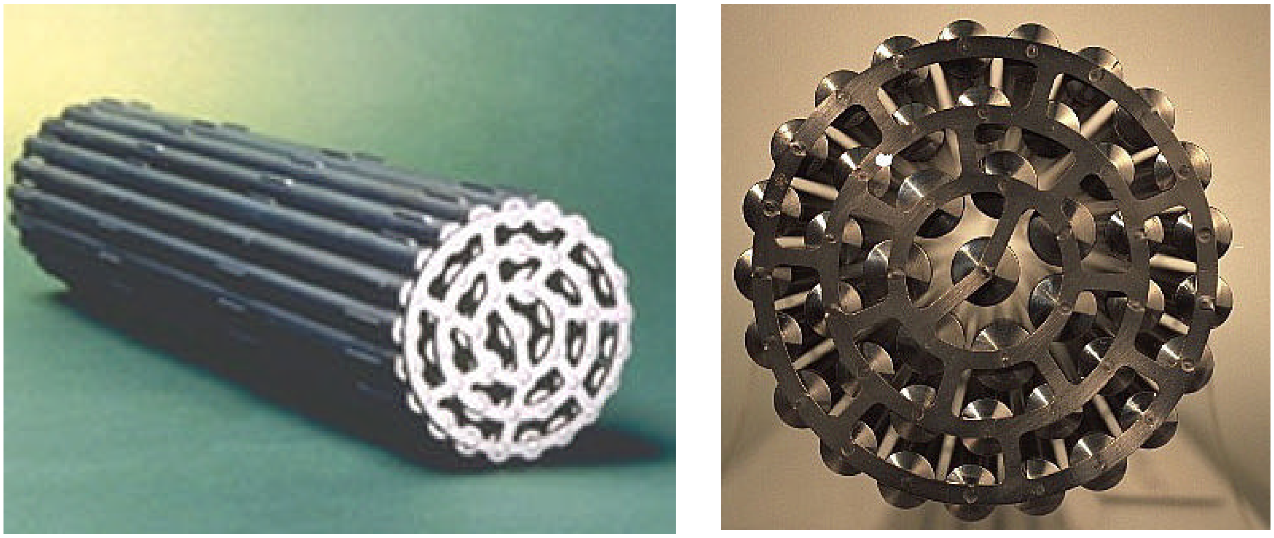
The new-fuel consists of a CANFLEX bundle containing slightly enriched uranium and a neutron absorber, dysprosium, in the form of a dysprosium oxide (Dy_2O_3). The purpose of the dysprosium is to increase neutron absorption preferentially at the centre of the fuel bundle, where flux peaks during the large break LOCA power pulse. Enrichment of the other elements compensates during normal operation, i.e., such that the reactivity of a new-fuel bundle under normal conditions is the same as the reactivity of a current-fuel bundle. The design of the new-fuel bundle involves the incorporation of approximately 13 per cent dysprosium in the central fuel element with slightly enriched uranium in all other elements.

Dysprosium is a non-radioactive, rare earth metal. It is used in magnets, halogen lamps and in the electronics industry. For use in new-fuel, dysprosium oxide will be mixed with uranium oxide powder such that the proportion of elemental dysprosium to elemental uranium is 13 per cent to form ceramic pellets that will be contained in the central element of the CANFLEX-LVRF fuel bundles.

Table 2.1
COMPARISON OF NEW-FUEL AND CURRENT-FUEL BUNDLES

	New-Fuel Bundle	**Current-Fuel Bundle**
Number of elements per bundle	43	37
Dysprosium central element	Yes	No
Concentration of U-235	1.0 %	0.71 % (natural uranium)
Critical Heat Flux buttons	Yes	No
Weight of fuel bundle	23.1 kg	24.2 kg
Weight of uranium per bundle	18.5 kg U (21.03 kg UO_2)	19.2 kg U (21.8 kg UO_2)
Weight of dysprosium per bundle	~ 73 g	None
Diameter of fuel bundle	102.77 mm (maximum)	102.77 mm (maximum)
Length of fuel bundle	495.3 mm	495.3 mm
Diameter of fuel elements	Slightly larger for centre and inner elements; slightly smaller for intermediate and outer elements	13.10 mm (maximum)
Zircalloy sheath thickness	$\leq$ 0.05mm reduction	0.38 mm (minimum) for all elements in the bundle

Figure 2.1
NEW-FUEL AND CURRENT-FUEL BUNDLES



New-Fuel Bundle[4]

Bruce B Current-Fuel Bundle

[4] Not actual bearing pad configuration for Bruce B.

2.2 Project Activities, Components and Systems

No alteration of the Bruce B facility is required or anticipated for the New Fuel Project. No new construction is required and the functions and operation of the Bruce B reactors will continue as designed. The safe execution of the project is based on the operating experience of Bruce B and other Bruce Power facilities at the site for over 25 years.

No alteration to the structures and facilities of the Bruce B facility is required or anticipated for the New Fuel Project. For example, no changes are required to the reactor building, reactor vaults, vacuum building, powerhouse, water intake and treatment facilities, electrical transmission facilities or station support, administration and security facilities. These structures and facilities will continue to perform as designed.

The New Fuel Project does not require change to any of the Bruce B process systems. For example the primary heat transport system (HTS), moderator system, steam and feedwater systems and condenser cooling water system will all continue to operate as they do when the reactors are fuelled with current fuel. Some auxiliary systems may require minor alteration to maintain and monitor the safe use of new-fuel. For example, the gaseous fission product monitoring system and the delayed neutron monitoring system will be adjusted to respond to the different operating conditions associated with new-fuel. Minor changes to the water chemistry in the IFBs and to the fire protection systems in the fuel storage room may also be required.

The New Fuel Project will require changes to some components used in some of the process systems. These changes include the redesign of the current-fuel bundle as described in Section 2.1, the possible addition of mechanical restraints to preserve bundle separation during storage in the IFBs (see sub-section 2.2.6) and possible changes to small fuel handling tools.

The New Fuel Project also will require a number of changes to operating practices and procedures, including measures to ensure the management of any risk of criticality associated with the new-fuel (see sub-section 2.3.2). These changes will include revision to a number of administrative procedures described in the facility operating manuals.

The following sub-section describes each of the activities associated with the use of new-fuel at Bruce B and identifies the necessary changes in Bruce B systems and procedures associated with the project. All significant differences from the current conditions are identified and described. It should be noted that the project is in the early planning stages with implementation planned for mid-2006. Thus some of the project details have not yet been fully defined and are the subject of on-going discussions with CNSC staff.

2.2.1 Demonstration Irradiation

As noted in sub-section 1.3, a demonstration irradiation (DI) using new-fuel is planned for late 2004 through late 2005. The purpose of the DI is to confirm the performance of new-fuel in a Bruce B reactor and to confirm that the new-fuel bundles are compatible with existing fuel handing systems. DI will include each of the steps that will be followed during routine use of new-fuel.

The DI will involve loading new-fuel bundles into two fuel channels in one of the Bruce B reactor units. This quantity of new-fuel is below the number of fuel bundles that criticality studies have shown could result in a criticality event (see sub-section 2.3.2).

The DI will include the receipt of 26 fresh new-fuel bundles at the Bruce Power site and storage in the fresh fuel storage area. Procedural and administrative changes may be necessary to safely accommodate receipt and storage. The new-fuel will be loaded into the reactor using existing equipment. During its time in the reactor, the performance of the new-fuel will be monitored. Following DI, the used new-fuel will be removed from the reactor, cooled and stored in the IFBs. Some of the irradiated new-fuel bundles will subsequently be removed from the IFBs and inspected to evaluate their performance during irradiation. Approval of the fuel design and, where required by the operating license, approval to implement minor changes to support systems (such as gaseous fission product monitoring and delayed neutron monitoring) in support of the DI are required from the CNSC prior to loading the fuel for the DI.

2.2.2 Receipt of Fresh New-fuel at the Bruce Power Site

As shown on Figure 1.1, the first step in using new-fuel at Bruce B is the receipt of fresh new-fuel at the site. Fresh new-fuel will be shipped by road from the fuel manufacturer to the Bruce Power site in boxes each containing between 20 and 40 fuel bundles. The new-fuel boxes will be contained within an approved shipping container or overpack meeting the requirements of the Packaging and Transport of Nuclear Substances Regulations. The transport vehicle will enter the Bruce Power site through the main guardhouse and will proceed directly to the building containing the fresh fuel storage areas at Bruce B. At the fuel storage area, the fresh new-fuel will be unloaded and removed from the shipping container or overpack. The shipping container or overpack will be returned to the fuel supplier prior to storing the new-fuel boxes.

Each shipment will comprise of approximately 600 new-fuel bundles. The new-fuel required to operate the four Bruce B reactors would involve less than one shipment per week.

2.2.3 Storage of New-fuel

With the exception of containing fresh new-fuel in a shipping container, the shipping and receipt of new-fuel at Bruce B is similar to current procedures. There are no gaseous or liquid releases from the fresh fuel storage areas. Radiation exposure to workers is low, controlled and monitored through standard operating practice.

After arriving on the Bruce Power site, the fresh new-fuel will be transferred into the storage areas prior to being loaded into the Bruce B reactors. Procedural and administrative changes (e.g. radiological surveys) to the fuel handling practices will be made where necessary to allow the fresh new-fuel to be safely unloaded and stored. The transport vehicle is unloaded into the storage area via the unloading bay doors. The pallets of new-fuel will be transported by forklift truck to the fresh fuel storage areas.

Preliminary assessment indicates adequate margin to criticality exists for all credible fuel handling scenarios in the new fuel storage area. Criticality analyses for severe conditions such as fire are being done to determine the likelihood of criticality and what mitigating provisions may be required, such as improvements to fire protection systems (see sub-section 2.3.2).

An amount of fresh new-fuel required to fuel the reactors for up to six months would be maintained in the Bruce B fresh fuel storage areas.

2.2.4 Loading of Fresh New-fuel into Bruce B Reactors

The fresh new-fuel is taken from the storage areas and transferred by crane to the fuel loading room. The fuel loading room is located one floor above ground level. Because of the design of the crane and pallet mover, only one box of new-fuel can be lifted and transferred at a time. In the fuel loading room the boxes of fresh new-fuel will be arranged in an array on the floor. In preparation for new-fuel loading, a crane will lift one box of new-fuel to the end of the room where it will be opened. Preliminary assessment indicates there is adequate margin to criticality for new-fuel using the existing fuel handling process and arrangement of fuel in the fuel loading room. New-fuel bundles will be removed from the boxes one at a time and placed horizontally on the fuel loading mechanism for transfer to the fuelling machine. The fuel loading mechanism can hold up to 16 new-fuel bundles. There are four fuel loading mechanisms in the fuel loading room: two each on opposite walls of the room.

With the exception of the initial loading of new-fuel bundles, refuelling of a CANDU reactor occurs using remotely controlled fuelling machines while the reactor is operating. A small portion of the new-fuel bundles in the reactor are routinely removed and replaced with fresh new-fuel. This is accomplished using a fuelling machine which loads fresh new-fuel from one side of the reactor while a similar machine removes an equivalent number of used new-fuel bundles from the opposite side of the reactor.

To load the fresh new-fuel into a reactor, the refuelling machine is disconnected from the reactor and is moved to receive the new-fuel bundles. The refuelling machine has eleven magazine positions, eight of which hold two bundles each allowing for 16 bundles to be transferred to the reactor. The remaining three chambers contain a closure plug and adapter, a shield plug and a spare closure plug and adapter.

All the operations and procedures required to load fresh new-fuel into Bruce B reactors are similar to those used for current-fuel. There are no gaseous or liquid releases from the fuel loading room. Radiation exposures to workers are low, controlled and monitored through standard operating practice.

2.2.5 Operation of Bruce B Reactors Using New-fuel

The Bruce B reactors will continue to be operated in a manner similar to the operation using current-fuel. The reactors will continue to operate to approximately the same exit fuel burn-up as present, i.e., approximately 200 MWh/kgU. The reactor core of each of the four Bruce B units will contain 5,760 fuel bundles containing approximately 108 tonnes of uranium once the current Core Conversion Project is completed. It is anticipated that the core conversion will be complete before new-fuel is used in a Bruce B reactor. Each fuel bundle typically remains in the reactor core for 6 to 18 months.

As is the case with any manufactured product, there is a small probability of defective fuel elements in a new-fuel bundle. These comprise of small pinholes in the fuel cladding that could result in the release of fission products from the new-fuel into the heat transport system (HTS) heavy water. Once in the HTS, these fission products are a potential cause of radiation exposure to workers. A purification system comprised of filters and ion exchange columns continuously removes fission products from the heavy water in the HTS. The HTS is a closed-loop system that does not directly interact with the environment. Over 30 years experience with current-fuel bundles (which are manufactured using the same process as is proposed for new-fuel bundles) shows that the number of defective bundles is very small. As well, the new-fuel is designed to give approximately the same burn-up as the current-fuel. It is anticipated that fission product inventories and behaviour will be similar for both types of fuel. As no significant change is expected, the impact on worker dose and chronic emissions to workers is considered to be negligible.

Processes are currently in place to identify the occurrence of a defective fuel element in a fuel bundle in any of the 480 fuel channels in a Bruce B reactor. This monitoring equipment will continue to be used, although some minor changes may be necessary with the new-fuel. In the event that a defective fuel element is detected, fuel bundles in the affected fuel channel would be removed from the reactor and transferred to wet storage in the IFBs.

The procedures required to operate the Bruce B reactors with new-fuel are similar to those used for current-fuel. The same nuclear reactions will occur in the reactor core and the same fission products, gaseous releases and liquid effluents will result. The presence of dysprosium in the central fuel element in each new-fuel bundle introduces the small possibility of a release of dysprosium and related radioactive activation products into the HTS as a result of a defect in the dysprosium fuel element. The impact of loose dysprosium on the HTS and reactor control will be assessed.

With the exception of the dysprosium mentioned above, there are no new or increased gaseous or liquid releases anticipated from the use of new-fuel compared with the current situation. Radiation exposures to workers and members of the public as a result of the operation of the Bruce B reactors are well below all applicable regulatory standards and are controlled and monitored through standard operating practice.

2.2.6 Storage of Used New-fuel in Bruce B Irradiated Fuel Bays

Once the new-fuel has been used up in the reactor, it is transferred to primary and secondary IFBs for storage of typically ten years. The water in the IFBs provides both the radiation shielding and cooling to allow the fuel to be safely stored. No change is anticipated in either the shielding or cooling requirements as a result of the new-fuel.

Used fuel is transferred from the reactor to the primary IFB using the fuelling machine. Used new-fuel will first be placed in the primary bay storage area via the fuelling machine for a minimum of six months and then it will be moved to the secondary IFB for longer term storage.

Similar to the current system, used new-fuel will be stored in storage trays 1.45 m long, 1.08 m wide and 12.7 cm high, with features at each corner for stacking. Each tray holds 24 fuel bundles in a single horizontal layer.

The spent new-fuel bundles will be moved through an underwater tunnel connecting the two bays. The trays in the secondary bays will be stacked to form a regular array of trays. The spent new-fuel bundles in these bays will be monitored periodically to verify the physical integrity of the fuel bundles. The water quality within the fuel bays will be monitored for turbidity, iodine, chloride and tritium. A water purification system maintains the water quality in the IFBs within specified standards.

Following burnup in the reactors there would normally be insufficient fissile material remaining in the used new-fuel bundles to allow a criticality event. Preliminary assessment indicates that there is adequate margin to criticality while the used new-fuel is stacked in trays in the irradiated fuel bays, even if some of the new-fuel bundles have been prematurely discharged from the reactor core. The existing design of the irradiated fuel bays is being reviewed to determine if additional physical barriers (e.g. mechanical restraints on bundles or trays to preserve separation, or the addition of a neutron absorber to the fuel bays) are required to further reduce the risk of criticality.

Other than the above-mentioned issue related to criticality, the operations and procedures required to manage used new-fuel in the IFBs are similar to those used for current-fuel. There are no new or increased gaseous or liquid releases. Radiation exposures to workers are low, controlled and monitored through standard operating practice.

2.2.7 Transfer of Used New-fuel to Dry Storage

At present, used current-fuel bundles are first stored in wet storage in water-filled IFBs. After typically 10 years of wet storage, they are moved to dry storage at Ontario Power Generation’s (OPG) Western

Used Fuel Dry Storage facility (WUFDSF) at the Bruce Power site. The WUFDSF has begun receiving used current-fuel from Bruce B and is operated by OPG under a separate waste management facility operating licence issued by the CNSC. The WUFDSF was the subject of an environmental assessment prior to being constructed.

Similar to used current-fuel handling practices, used new-fuel bundles would be transferred to dry storage after typically 10 years of wet storage. Presently, used current-fuel is stored in the dry storage containers. There are four storage modules (each containing 144 fuel bundles) in each dry storage container resulting in a total of 576 fuel bundles in each dry storage container. Based on a preliminary criticality assessment, no change to the storage modules or dry storage containers is anticipated to accommodate dry storage of used new-fuel bundles. Although the impact of heat load is yet to be confirmed, no change in the design of the dry storage container is expected.

2.3 Criticality

The primary difference between operating the Bruce B reactors with the current-fuel bundles and new-fuel relates to the control and management of the risk of a criticality event. New-fuel may introduce the possibility of a criticality accident where barriers are not currently in place outside the Bruce B reactors. The following sub-sections provide a brief description of the general causes and consequences of criticality events and the mitigating design features proposed to avoid such an event from occurring at Bruce B.

2.3.1 Overview of Historical Criticality Events

A nuclear criticality event is the occurrence of a self-sustaining neutron chain reaction that is either unplanned or behaves unexpectedly. In the appropriate geometry, and with an appropriate moderating material, uranium is capable of supporting a self-sustaining neutron chain reaction. Nuclear criticality results in the same reactions that occur in a nuclear reactor. The products of nuclear criticality are heat, radiation, and radioactive fission products.

These same processes that produce heat, radiation and fission products occur in a <u>controlled fashion</u> within the Bruce B reactors. Specifically:

- nuclear criticality is controlled and can be halted immediately using the emergency shutdown safety systems;
- fission products are contained and managed to protect people and the environment from radiation; and
- the heat produced is used beneficially to make steam, which drives a generator to produce electricity.

In the unlikely situation all engineered barriers and procedural controls fail to maintain adequate bundle separation, and the situation introduces appropriate moderating material while the new-fuel is outside the Bruce B reactors, it is possible that a nuclear criticality event involving new-fuel bundles could occur in the workplace. The immediate result of a nuclear criticality event would be the production of an uncontrolled and unpredictable radiation source that could be harmful, even lethal, to nearby workers. In an extreme situation, a self-sustaining nuclear reaction could result in mechanical damage to the fuel bundles and the release of fission products to the environment. Nuclear criticality events may last from a fraction of a second up to several minutes, but may persist for much longer times, depending upon the specific conditions. The longest duration workplace nuclear criticality event that ever occurred anywhere persisted for over 24 hours. A nuclear criticality event itself provides various mechanisms that tend to terminate the event and workers can also take actions to terminate events which may potentially persist for longer periods.

Since the 1940s, there have been approximately 60 nuclear criticality events that have been reported publicly. These known events have occurred in Argentina, Belgium, Canada, France, Japan, the Russian Federation, the United Kingdom, the United States, and Yugoslavia. None of these events involved the handling or storage of fuel bundles containing natural or enriched uranium [1].

As noted above, there is extensive international experience with the design and operation of nuclear systems so that criticality events are avoided. This experience includes the operation of nuclear generating stations using enriched uranium in the United States, the United Kingdom and elsewhere. Further, there are national and international standards for training, safety analysis, criticality alarm and detection systems, and accountability practice. This international practice and corresponding international standards will be used in demonstrating the CANFLEX-LVRF can be implemented while continuing to ensure safe design and operation of Bruce B in all respects.

2.3.2 Measures to Avoid Criticality Events at Bruce B

Bruce Power has conducted a number of preliminary studies to identify the conditions necessary to cause a criticality event involving new-fuel.

Preliminary calculations conducted for Bruce Power show that it is necessary to have at least 32 new-fuel bundles containing one per cent uranium for a criticality event to be possible. This determination is based on a conservative calculation that assumed the presence of a moderator, typically pure water, although the effect of the presence of some heavy water was also considered.

Criticality events are possible only during operations when more than 32 new-fuel bundles are present. Many of the activities involving new-fuel at Bruce B involve handling fewer new-fuel bundles than this. In addition, the DI involves only 26 fuel bundles. Table 2.2 identifies each of the fuel handling activities where new-fuel is involved and identifies what mitigating design features are proposed to avoid the possibility of a criticality event. Criticality mitigation includes physical features (e.g., separation of fuel bundles) and operating procedures. Similar mitigating measures are in use at other facilities handling enriched uranium and have been shown to be effective over many years of experience.

Table 2.2
SUMMARY OF MEASURES PROPOSED TO AVOID CRITICALITY EVENTS

Activity Involving New-fuel	Mitigating Design Feature to Avoid Criticality Event
Receipt of fresh new-fuel at Bruce Power site	Ensure adequate separation between fuel boxes and limit quantity of fuel bundles in fuel box
Storage of new-fuel	Ensure adequate separation of fuel bundles on storage racks
Loading of fresh New-fuel into Bruce B reactors	Ensure adequate separation of fuel bundles during staging. Once new-fuel is loaded into the fuelling machines, a criticality accident is not possible
Operation of Bruce B reactors using new-fuel	Criticality is controlled within the reactors. Containment and emergency shutdown systems exist to respond to nuclear accidents
Storage of used new-fuel in Bruce B Irradiated Fuel Bays	Ensure adequate separation of fuel bundles in storage trays and/or introduce neutron absorbing material
Transfer of used new-fuel to dry storage	Ensure adequate separation of fuel bundles in storage modules and/or introduce neutron absorbing material

2.4 Nuclear Safeguards

In 1970, the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) was established. Canada was one of the first countries to ratify the treaty and accept International Atomic Energy Agency (IAEA) inspection at its nuclear facilities. In support of the NPT, Canada provides technical support to the IAEA for the development of safeguards, schemes and techniques relevant to Canadian designed and built nuclear facilities.

In Canada, the CNSC represents the IAEA's interest in the safeguarding of new and used nuclear fuel. The IAEA requires surveillance monitoring equipment at various points in the receipt, use and management of fresh and used current-fuel. IAEA operations and requirements at Bruce B as a result of the use of new-fuel would remain the same as those currently in place.

2.5 Waste Sources and Emissions

This section describes the radioactive effluents, emissions and wastes along with the processes used to manage and control them. As indicated in previous sections, with the single exception of the dysprosium contained in the central fuel element of the new-fuel bundles, there will be no changes to the current process systems. As a result, no new waste sources or emissions are anticipated as a result of the introduction of new-fuel into the Bruce B reactors.

Bruce B has operated to ensure that radiological effluents and emissions are kept at a very small fraction of the regulatory limit set by the CNSC. Radiological monitoring programs are carried out and reported to the CNSC and the public. The CNSC sets dose limits for the maximum exposure of workers to radiation. Bruce B is operated in a manner to ensure that all doses are kept well below the regulatory limits. In addition, steps are taken to ensure that all radiation exposures and emissions are kept As Low As Reasonably Achievable (ALARA), social and economic factors being taken into account.

The results of the extensive environmental monitoring, as reported in Bruce Power's 2001 Radiation Environment Monitoring Program (REMP) [2] show the maximum dose to a hypothetical member of the public due to operation of all facilities on the Bruce Power site, was approximately 2 microsieverts (μSv). This is a small percentage of the annual legal limit of 1,000 μSv as well as the average Ontario natural background radiation level of 2,000 μSv per year.

2.5.1 Active Liquid Waste Collection and Treatment

The active drainage system collects most radioactive liquid effluents arising in the station. The primary sources of active wastes are the same for the current-fuel and new-fuel, and are:

- Unit active drainage, which collects water from the reactor auxiliary bay floor and equipment drains, and reactor equipment drains;
- Service building active drainage arises from active floor and utility drains and also laboratory and maintenance area drains; and
- A closed re-circulation system which is provided for purifying the water from each fuel storage bay. No overflow or discharge from the systems will normally exist, but lines are provided to permit discharging bay water to the active liquid waste collection system.

Active liquid wastes (ALW) entering drainage sumps are routinely monitored for radioactivity. Should threshold values be exceeded, the water is transferred to drums, the source identified and corrective action taken as appropriate. ALW can be contaminated by both mixed fission products (e.g., cesium-134, cesium-137 and iodine-131, etc.) and process systems activated corrosion products (e.g., cobalt-60, chromium-51 and zirconium-95, etc.). Some tritium activity is also likely to be present. Waste containing an appreciable amount of heavy water is retained for reclamation.

The active liquid waste is collected in a number of collection tanks; checked for radioactivity to verify that threshold limits are not exceeded and then processed through the ALW treatment system as required. The waste is sampled and analyzed for gross gamma activity and tritium prior to release in controlled fashion to the station discharge channel.

The above processes would continue with the use of new-fuel in the reactors and no significant change in waterborne releases from Bruce B is anticipated as a result.

2.5.2 Active Gaseous Releases and Treatment

The design intent at Bruce B is to limit the release of all gaseous radioactivity so that an individual at the exclusion boundary will receive, from all station emissions, only a very small fraction of the CNSC annual public dose limit.

All active or potentially active gases, vapours or airborne particulates that occur in the station are monitored and filtered, if necessary, prior to release to the atmosphere. In areas such as the reactor vaults, a closed ventilation system re-circulates the air through dryers to remove tritiated heavy water. Some air is exhausted through the pressure balance dryer and active exhaust system to maintain the containment at a slightly sub-atmospheric pressure. The active exhaust system contains high efficiency particulate air (HEPA) filters to remove particulates and charcoal filters to remove radioiodines.

The above processes would continue with the use of new-fuel in the reactors and no significant change in airborne releases from Bruce B reactors is anticipated as a result.

2.6 Solid Waste Management

As noted in Section 2.5, there will be no changes to the current reactor process systems, therefore there will be no new solid waste sources. Dry solid wastes, collected throughout Bruce B, are classified as radioactive, likely clean or non-radioactive depending on the area from which they originate. Typically, non-radioactive and likely-clean wastes arise from Zones 1 and 2, while radioactive wastes arise from Zone 3. A discussion of the three zones is provided below. In addition there are a number of unzoned areas, typically including buffer zones between facility structures and the perimeter security fence. Access to and from unzoned areas is always through a controlled zone.

Zone 1 is a clean area inside the protected area that is considered equivalent to the public domain. It includes lunchrooms and cafeterias. Zone 2 is an area that is normally free of radiological contamination, but could be subject to infrequent cross-contamination due to the movement of personnel and equipment from Zone 3. Zone 3 contains systems and equipment that may be sources of radiation or radiological contamination; the reactors are located in this zone.

Radioactive waste is collected, packaged and transferred to OPG's Western Waste Management Facility (WWMF) for treatment and storage. The WWMF is subject to a separate waste management facility operating licence issued by the CNSC. Bruce Power has contractual arrangements with OPG to manage radioactive wastes from Bruce B. Non-radioactive waste is collected and disposed of at the on-site landfill under contract with OPG or sent off-site for recycling, as appropriate. This conventional landfill is the subject of a Certificate of Approval issued by the MOE.

2.7 Resource / Material Requirements

The use of new-fuel does not require any fundamental change in the process of producing electricity from the Bruce B reactors nor does it require any different materials or resources compared with those used currently. The inputs to the overall electricity production process include:

- new-fuel;
- heavy water;
- lake water for cooling and services;
- chemicals;
- lubricants and oils; and
- other supplies, typical of any industrial or manufacturing facility.

3.0 PROJECT ENVIRONMENT AND LAND USE INFORMATION

3.1 Project Location

The Bruce B nuclear power station is located entirely within the Bruce Power site. The Bruce Power site is located on the eastern shore of Lake Huron, at a longitude of 81°30’30” west and latitude 44°20’00” north within the Municipality of Kincardine, Bruce County, Ontario. The Bruce Power site comprises a number of other facilities, including:

- Bruce Nuclear Generating Station – A (Bruce A);
- Radioactive Waste Operation Site 1 (RWOS-1);
- The Central Maintenance and Laundry Facility;
- The shutdown and partially dismantled Bruce Heavy Water Plant (Bruce HWP);
- The shutdown Douglas Point Reactor, owned by Atomic Energy of Canada Limited (AECL);
- Bruce Learning Centre;
- Bruce Alternate Steam Supply Plant;
- Sewage Processing Plant; and
- Office buildings and warehouses.

The Bruce Power site may be reached by Provincial Highway 21, and two concession roads Nos. 2 and 4. The nearest towns are Kincardine, located approximately 16 km to the south, and Port Elgin, located approximately 18 km to the north of the site.

3.2 Socio-Economic Features

The economic base of Bruce County (the County) is diverse and includes agriculture, tourism and recreation, a service sector, manufacturing, light industry, fishing and some aggregate resource extraction. The County has a significant agricultural sector involving over 3,750 farm operators (approximately 63 per cent of farms are family owned and operated) and is ranked number one in cattle in Ontario, with approximately half of all of the County farms dedicated to beef cattle production. Tourism and recreation, hospitality services and the area’s heritage-oriented tourism attractions and associated crafts manufacturing/retailing are well established.

Port Elgin is the largest community in the County and Kincardine is the closest urban centre to the Bruce Power site.

The overall population growth pattern for the County is stable. The towns of Port Elgin, Kincardine, Walkerton and Southampton are the largest nearby communities with 2001 populations of 9,865 (2,651 households), 6,113 (2,542 households), 5,036 (1,951 households) and 3,151 (1,402 households), respectively. The small village of Tiverton and the hamlets of Inverhuron and Underwood are all within eight kilometres of the site. Tiverton, located approximately seven kilometres from the site is the largest of these communities with a 2001 population of 743 (338 households). Inverhuron has a year-round population of approximately 200, plus seasonal cottagers of approximately 250.

The Bruce Power site is the single largest employer in the County, currently employing over 3,000 people. These full-time high paying jobs, along with the Bruce B related expenditures and tax payments, represent a major economic impetus to the local economy.

3.3 Environmental Features

The following information is based on the Bruce A Restart, Units 3 and 4 Environmental Assessment and Bruce 5-8 Environmental Effects Report completed for the Bruce Power site between 1999 and 2001.

3.3.1 Physical Geography

Generally, the topography in the area of the Bruce Power site is classified as smooth to gently undulating. The surface elevation is about 174 m along the shore and 195 m approximately 3 km inland. There are no major rivers or lakes in the vicinity of the site other than Lake Huron. A former tributary of the Little Sauble River, named Stream C drains into the southwest corner of the Baie du Doré to the north and the Little Sauble River empties into Inverhuron Bay to the south.

Within the immediate area of Bruce B, the land is flat to gently sloping, with a gradual rise in the easterly or inland direction. Along the shore, there is a narrow strip of beach shingles and some sand. Beyond this narrow strip, the land is a poorly drained bog plain due to the flatness of topography and the lack of any surface drainage system.

3.3.2 Surface Water Conditions

Bruce B is located on the shore of Lake Huron south of Baie du Doré. Lake currents are predominantly along shore. Waves as high as 1.8 m can be generated relatively quickly on the lake. Lake water temperature can be affected by the discharge of heated water from the condensing cooling water (CCW) discharge at Bruce B. This discharge results in a thermal plume with a temperature several degrees above ambient lake temperature.

Surface water runoff at the Bruce Power site is collected and conveyed by means of sloped areas and a series of drainage ditches leading to a system of precast concrete catch basins and manholes and connected by steel drainage pipes. The site has a large and complex storm sewer layout, which has a total of 16 outfalls. These outfalls discharge directly to Lake Huron.

3.3.3 Geological and Groundwater Conditions

The historical record of earthquakes for the region indicates very low seismic activity. According to a 1980 report by Energy Mines and Resources (now NRCan), over the period of 1899 to 1963, the maximum seismic event within the region was only sufficient to generate a peak ground motion at the site equal to one per cent gravity. Only two events are reported to have occurred within 100 km of the Bruce Power site. These events were reported in 1952, Richter magnitude (M) = 3.6 at 72 km and in 1958, M = 3.5, at 78 km from the site.

The glacial till is deposited directly on the bedrock surface over most of the area. The western part of the area has shear and joint planes that appear to be tight below the surface weathered rock. There is generally dense massive rock below a shallow depth of fractured and weathered surface rock. Thin clay seams and clay-filled fractures occur occasionally in the upper bedrock. Soft seams indicated by exploratory holes proved to extend over a significant part of the powerhouse foundation area.

Although there are local variations, groundwater movement within in the vicinity of Bruce B is generally towards Lake Huron. According to a 1999 OPG report, the principal hydrostratigraphic units descending from ground surface are as follows.

- A laterally discontinuous foreshore sand deposit;
- A coarse grained matrix supported sand and gravel;
- A dense fine-grained, glacial till aquitard; and
- A semi-confined carbonate bedrock aquifer.

3.3.4 Air Quality

Air quality monitoring in the vicinity of the Bruce Power site is typical of that in rural Ontario. There are no nearby sources of sulphur dioxide (SO_2), nitrogen oxides or acid gases. In the past, monitoring has been carried out for SO_2 in the vicinity of the site, because of emissions from the Bruce HWP and the Bruce Auxiliary Steam Supply plant. The Bruce HWP is shut down and is to be decommissioned. The largest source of on-site combustion gases at present is the Bruce Alternate Steam Supply Plant that provides heat and process steam to the site and to the nearby Bruce Energy Centre. There are also a number of minor sources of combustion gas emissions, including the standby generators at Bruce B.

Total suspended particulate (TSP) has been measured at several locations on the Bruce Power site. The daily TSP levels at all the monitoring locations were found to be similar, and were generally below the MOE 24-hour criterion of 120 $\mu m/m^3$. Total dustfall has also been monitored at a number of locations on the site and the MOE monthly criterion of 7.0 g/m^2/30 days was not exceeded at any monitoring location. Monitoring for SO_2 in the area found levels of between 27 and 52 parts per billion (ppb) with an average of 4 ppb, well below the MOE guideline value.

The REMP [2] measures tritium, radioactive particulate, carbon-14 and radioiodines in the atmosphere in the area of the Bruce Power site. The concentration of tritium in the area is routinely above normal background levels. The annual average tritium in air concentration at the site boundary in 2001 was 1.1 Bq/m^3 compared with an Ontario-wide background of 0.2 Bq/m^3. Radioactive particulates are routinely measured at background levels. The measured activity of carbon-14 in air at the site boundary in 2001 was averaged at 292 Bq/kg-C compared with an Ontario-wide background of 239 Bq/kg-C [2]. Radioidine levels at the site boundary are reported to be usually at background levels.

Existing noise conditions at Bruce B are influenced by several sources, including vehicle traffic and other facilities on the Bruce Power site. Lake Huron shore winds and waves can also be heard at the site.

3.3.5 Terrestrial Habitats and Communities

The natural environment in the vicinity of the Bruce Power site consists of a mosaic of immature to mature deciduous and coniferous forest, wetlands, open water, and old field. The Baie du Doré Provincially Significant Wetland is located at the northeast end of the Bruce Power site. A portion of the wetland is located within the Bruce Power site, although the majority of the wetland is located outside of the site fence. This wetland consists primarily of marsh communities and provides habitat for a wide variety of breeding birds and migrants, including a number of significant species. Bald eagles are present year-round, with a notable overwintering population in both the wetland and the area around the Bruce Power site. The Baie du Doré Wetland also provides habitat for other wildlife species, including muskrat, raccoon and painted turtle.

The Bruce Power site is large and much of it is forested with white cedar as the dominant tree species. The majority of the forest cover occurs outside of the Bruce B site study area, which consists primarily of industrial buildings and paved surfaces, with little natural vegetation or wildlife habitat.

Due to the size of the site and the area of forest there is an abundance of wildlife habitat present on the Bruce Power site. Abundant waterfowl and shorebird habitat is present along the portion of the Lake Huron shoreline on which the Bruce Power site is located. The Bruce B intake and discharge channels also provide habitat used by fish and waterfowl. In addition, a large deer population is present on the site. Other wildlife species present on the site include groundhog, raccoon, beaver, porcupine, brown bat, coyote, and a variety of breeding and migrant bird species, including wild turkeys.

3.3.6 Aquatic Habitat and Communities

Lake Huron is located at the western boundary of the site. As noted previously, there are no major rivers near the site. A former tributary of the Little Sauble River, named Stream C, drains into the southwest corner of the Baie du Doré to the north and the Little Sauble River empties into Inverhuron Bay to the south.

The nearshore zone of Lake Huron is characterized by rocky outcrops and as a result the aquatic habitat features are largely comprised of rocky substrates. As such habitat diversity in the study area is limited. The deeper, offshore areas also consist of primarily rocky substrate that provides spawning areas for regionally important fish species, such as lake and round whitefish, as well as habitat for deepwater sculpin.

3.4 Land Use and Resources

3.4.1 Land Use

Land use in the area surrounding the Bruce Power site falls into two general classifications. Along the shoreline is a recreation area while inland it is primarily used for agriculture.

Title to Inverhuron Provincial Park (the Park), which is situated at the southern boundary of the Bruce Power site, was acquired by Ontario Hydro so that CNSC siting guidelines for HWPs are satisfied. However, the Park is leased to the MNR who operate the southern portion as a provincial park on a day-use basis only. Access is restricted to the portion of the northern end of the Park that lies inside the exclusion radius of Bruce A. Following the shutdown of the HWP, consideration is being given to allowing overnight camping in this portion of the Park.

Cottage development in the Bruce County has been growing at a rate of five per cent per year since 1968. In recent years, the number of cottages along the shoreline within 40 km of the Bruce Power site has grown to approximately 5,800. There are also three conservation areas, two provincial parks and numerous private parks that offer camping and trailer facilities. MacGregor Point Park, located approximately 13 km north of Bruce A is a day-use and overnight camping facility.

3.4.2 Cultural and Archaeological Resources

Two registered archaeological sites, Upper Mackenzie (BbHj-6) and Dickie Lake (BbHj-12), are on record as having been located within the confines of the Bruce Power site.

As a result, a joint council meeting of the Chippewas of Saugeen and Chippewas of Nawash on March 10, 1998 resolved that the site previously known as Dickie Lake and the “Indian Burial Ground” was assigned an Ojibway name. The site is now known as Chiibegmegoong (Spirit Place).

Bruce Power and OPG are currently working cooperatively with the First Nations to address two specific issues related to:

- the on-going care of the burial ground within the Bruce Power site. Although the site itself is located on OPG property, access is controlled by Bruce Power; and

- consideration of a lake-wide monitoring program of lake whitefish in Lake Huron. Lake whitefish is an important commercial and traditional fish species for the First Nations.

3.4.3 Aboriginal Interests

There are two First Nations communities in the area of the Bruce Power site: the Chippewas of Saugeen First Nation Reserve No. 29; and the Chippewas of Nawash First Nation located at the Cape Croker Reserve No. 27.

The Chippewas of Saugeen First Nation Reserve No. 29 is located adjacent to the town of Southampton on the shoreline of Lake Huron, between the mouths of the Saugeen and Sauble Rivers, approximately 30 km north of the site. Provincial Highways 6 and 21 pass through the Saugeen Reserve. The population on this reserve in 1998 was estimated by the Department of Indian & Northern Affairs at 617, with an additional 773 members living off-reserve, many within the traditional territory in the County.

The Chippewas of Nawash First Nation is centred at Cape Croker Reserve No. 27, located on the north side of Colpoys Bay and the east shore of the Bruce Peninsula north of the town of Wiarton. The population on this reserve in 1998 was estimated by the Department of Indian and Northern Affairs at 718 with an additional 1,246 members living off-reserve many within the traditional territory in the County.

Both the Chippewas of Saugeen and Nawash First Nations have developed a wide range of community services, including a fire hall, health clinic, day care centre, recreation centre, police station and administration office. On-going use of their traditional lands and waters includes personal and communal harvesting of traditional foods and medicines such as fish, vegetables/plant material and wildlife.

There is no land claim currently filed or active that affects the land use rights of the First Nations associated with the Bruce Power site. The First Nations consider the surrounding waters part of their traditional territory. Their lands, water and resources are an essential part of their identity and culture, as well as their sustainable economy. The harvesting of fish from Lake Huron is an important source of food for both communities and the commercial fishery is important to their livelihood.

Metis people are recognised as a distinct group of Aboriginal peoples in the 1982 *Constitution Act*. There are a number of Metis people in the vicinity of the Bruce Power site who are part of the broad community and who are represented by the Saguingue Metis Council. The Council has shown a continuing interest in environmental studies relating to the operation of facilities on the Bruce Power site.

4.0 PROJECT INTERACTIONS MATRIX

One of the objectives of this Project Description is to assist the CNSC in early identification of potential environmental issues that should be considered in initiating the preparation of the scope of the assessment in the event that it is determined that an EA is required. The following section identifies the major interactions between the project and the environment, based on preliminary analysis, along with the issues that will most likely be required to be addressed in any EA.

4.1 Preliminary Project and Environment Interactions

The environmental components and the anticipated level of change between the project and the environment have been examined at a preliminary level. The results of this preliminary examination are provided in Table 4.1, which identifies the possible interactions between the New Fuel Project and various environmental components. Each of the interactions was examined to determine whether or not it might result in a change compared with existing conditions.

In Table 4.1, many of the interactions between the project and the environmental components are identified as “no change”. This suggests that the incremental effects of the New Fuel Project are anticipated to be indistinguishable from the effects of current operations.

Table 4.1
INTERACTIONS WITH THE ENVIRONMENT

Environmental Component / Sub-Components	Expected Change
ATMOSPHERIC ENVIRONMENT	
Air Quality	No change
Noise	
HYDROLOGY, WATER QUALITY AND AQUATIC ENVIRONMENT	
Lake Circulation	No change
Lake Water Quality	
Aquatic Biota	Potential for release of trace quantities of dysprosium (anticipated to be below levels of detection)
Aquatic Habitat	
TERRESTRIAL ENVIRONMENT	
Vegetation Communities	No change
Wildlife Habitat	
Wildlife Communities	
Natural Heritage System	
GEOLOGY AND HYDROGEOLOGY AND SEISMICITY	
Geology	No change
Hydrogeology	
Seismicity	
LAND USE AND RESOURCES	
Land use	No change
Transportation	
Landscape and Visual Setting	
RADIATION AND RADIOACTIVITY	
Radiation dose to general public	Under normal operating conditions, no change is anticipated. However, the use of new-fuel requires consideration of a criticality event and with it the potential for radioactive release in the work place and to the environment.
Radiation dose to workers	
Radiation dose to aquatic biota	
Radiation dose to terrestrial biota	

Environmental Component / Sub-Components	Expected Change
SOCIO-ECONOMIC CONDITIONS	
Population and Economic Base	As slightly enriched uranium is a new-fuel to be introduced in a CANDU reactor, people's feelings on personal safety may change.
Residents and Communities	
Community Infrastructure	No change
Community Services	
Municipal Finance and Administration	
PHYSICAL AND CULTURAL HERITAGE RESOURCES	
Physical Heritage Sites	No change
Cultural Heritage Sites	
ABORIGINAL INTERESTS	
Aboriginal Communities	As slightly enriched uranium is a new-fuel to be introduced in a CANDU reactor, feelings on personal safety among First Nations people and communities may change.
Traditional and Current Land Use	
Cultural Heritage and Spiritual Sites and Activities	
Affects on Mother Earth and Future Generations	
Employment and Business Opportunities	
Treaty Rights / Land Claims	

5.0 CLOSURE

In summary, this document is intended to provide the information:

- to allow the CNSC to determine the need for, and its role in, a federal EA under the *Canadian Environmental Assessment Act*;
- to enable other federal authorities, pursuant to the Federal Co-ordination Regulations, to determine their responsibilities or interests in the proposed project under CEAA;
- to provide the basis for the CNSC to consult with provincial EA authorities to determine any need for harmonization of the EA process with that of other jurisdictions; and
- to assist in early identification of potential environmental issues that should be considered in preparing the scope of assessment document.

This Project Description document has been prepared in accordance with CNSC staff guidance and the Canadian Environmental Assessment Agency's Operational Policy for such Project Descriptions.

6.0 BIBLIOGRAPHY

[1] Website (on January 22, 2003): http://ncsd.ans.org/site/factsheet.html Article entitled "*Nuclear Criticality Accidents in the Workplace*"

[2] Bruce Power. April 29, 2002. *Annual Summary and Assessment of Environmental Radiological Data for 2001*. Report No. B-REP-03419-00001-R00.

APPENDIX A

List of Acronyms

LIST OF ACRONYMNS

Acronym	Descriptive Term
AECL	Atomic Energy of Canada Limited
ALARA	As Low As Reasonably Achievable
ALW	Active Liquid Waste
Bruce A	Bruce A Nuclear Generating Station
Bruce B	Bruce B Nuclear Generating Station
Bruce Power	Bruce Power LP, or Bruce Power, Inc., as the case may be depending on context
CANDU™	A Canadian developed nuclear power reactor system. The name is derived from Canada Deuterium Uranium, indicating the moderator is deuterium or heavy water, and that the fuel is natural uranium.
CCW	Condenser Cooling Water
CEAA	Canadian Environmental Assessment Act
CNSC	Canadian Nuclear Safety Commission
The County	Bruce County
DI	Demonstration Irradiation
EA	Environmental Assessment
HEPA	High Efficiency Particulate Air
HTS	Heat Transport System
HWP	Heavy Water Plant
IAEA	International Atomic Energy Agency
IFB	Irradiated Fuel Bay
LOCA	Loss of Coolant Accident
LVRF	Low Void Reactivity Fuel
m**Sv**	microsieverts
M	Richter Magnitude
MISA	Municipal Industrial Strategy for Abatement
MOE	Ontario Ministry of the Environment
MNR	Ministry of Natural Resources
MW	Megawatts
New-fuel	Low void reactivity fuel containing a neutron absorber and slightly enriched uranium
NRCan	Ministry of Natural Resources Canada
NPT	Treaty of the Non-Proliferation of Nuclear Weapons
OPG	Ontario Power Generation

Acronym	Descriptive Term
The Park	Inverhuron Provincial Park
ppb	Parts per billion
REMP	Radiation Environmental Monitoring Program
RWOS	Radioactive Waste Operation Site
SEU	Slightly Enriched Uranium
SO_2	Sulphur dioxide
TSP	Total Suspended Solids
UO_2	Uranium dioxide, a form of uranium oxide
WUFDSF	Western Used Fuel Dry Storage Facility
WWMF	Western Waste Management Facility

APPENDIX B

Proposed Communications and Consultation Plan

Bruce Power

Communications and Consultation Plan

New Fuel Project

Revision 2
December 2003

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1.0 BACKGROUND

On November 2002, Bruce Power formally announced its intent to the Canadian Nuclear Safety Commission that it will proceed with the New Fuel Project (hereinafter referred to as the "Project"). The Project will design and implement in the reactors at Bruce B a low void reactivity fuel bundle containing a neutron absorber and slightly enriched uranium with approximately 1% uranium-235. The current fuel used in the Bruce B reactors is natural uranium with approximately 0.7% uranium-235. The four Bruce B reactors are located on the Bruce Power site in Kincardine, Ontario.

This Project is designed to reduce the increase in reactivity associated with the formation of coolant voids during certain postulated low probability accidents. The resultant increased level of safety will allow Bruce Power to operate the Bruce B reactors at 100 percent full power. The use of new-fuel also will allow Bruce Power to provide an additional 400Mw of electricity to the Ontario grid.

2.0 OBJECTIVE

The primary objectives of this communication plan are to:

- Deliver New Fuel Project information;
- Address community issues and concerns; and
- Provide opportunities for input by the community at large and to groups and individuals with a specific interest in the Project.

Bruce Power will work with Golder Associates to implement this communications and consultation plan and will ensure that Bruce Power's Corporate interests and messages are utilized to fulfill communication objectives.

As New Fuel Project issues and events arise, this document is open to review and revision to ensure appropriate action and response to the changing needs of interested public, stakeholders and interested groups.

Revisions to this Plan must be approved by the VP Corporate Communications and accepted by the New Fuel Project Manager.

2.1 Specific Objectives

To form the basis of the initial communications initiatives of the New Fuel Project an educational approach must be taken to allow a good understanding of the Project. The focus of the communications plan is to address New Fuel Project issues and provide information on the anticipated effects on the environment, human health and safety. After the initial announcement of the Project, the communications will address issues and questions such as the following:

1) What is the New Fuel Project?
2) What is the objective and timelines of the New Fuel Project?
3) What effect will the New Fuel Project have on the environment, human health and safety?
4) What are the differences between the proposed new-fuel and the fuel currently being used?
5) What are the benefits of using the new CANFLEX fuel?

3.0 COMMUNICATIONS PROGRAM

3.1 Focus Area

The primary focus area for this communications plan consists of the five municipalities proximate to the Bruce Power site. In addition, some members of the public, including stakeholders and interested parties that do not live in close proximity to the Bruce Power site will be included in all aspects of this communication plan. The municipalities identified, as the primary focus area for this communications plan could include the following five municipalities within 50-km of the Bruce Power site:

a) Huron Kinloss
b) Brockton
c) Arron Elderslie
d) Saugeen Shores
e) Kincardine.

In addition to these Bruce County municipalities, elected representatives and County officials in Bruce County could also be consulted.

3.2 Process

To maximize the effectiveness of this communication plan, the following key processes will be followed:

a) Identify interested stakeholders (defined in section 3.3, following) along with their communication needs. If required, establish an EA-specific stakeholder list as identified by CNSC.

b) Inform all stakeholders about the progress of the New Fuel Project i.e. milestones and key activities.

c) Provide opportunities for stakeholders to exchange information and identify and discuss any concerns they may have.

d) Ensure communications activities identified for the New Fuel Project align and do not conflict with other Bruce Power activities.

e) Document and maintain a record of all communication processes and outcomes.

f) Identify and document issues, comments and concerns raised by stakeholders related to the Project and Bruce Power in general, as they arise.

g) Develop and maintain an up-to-date stakeholder comment database.

h) Develop and document all appropriate responses to address issues as they arise.

3.3 Stakeholders

To ensure all interested members of public, individuals and groups are captured in this communication process, stakeholder identification will consider the following:

a) Past Bruce A Restart Environmental Assessment stakeholder list.

b) Interveners in the Bruce Power re-licensing process.

c) Response to advertisements/ brochures/newsletters.

d) Attendance at New Fuel Project public information sessions.

e) Suggestions.

Stakeholder groups and individuals will be identified in, but not limited to the following key stakeholder categories:

a) Regulatory Agency – Canadian Nuclear Safety Commission.

b) Federal government – local and area MPs, departmental and agency staff

c) Local Aboriginal communities

d) Provincial government – local and area MPPs, ministry and agency staff.

e) Regional and local municipal councils, agencies and staff.

f) Community Committees including Regional Nuclear Emergency Preparedness Group.

g) Bruce Economic Development Committee.

h) Bruce Energy Center Customers.

i) Established non-governmental organizations.

j) Neighbouring landowners in the vicinity of the Bruce Power site.

k) Community residents, ratepayers, business associations, and suppliers.

l) Bruce Power Employees.

m) General public.

n) Print and Broadcast Media.

3.4 Stakeholder Database

To ensure all pertinent stakeholder contact information is maintained, a stakeholder database, with the appropriate contact information, could be developed and kept current throughout the New Fuel Project period.

While building on the existing Bruce A Restart environmental assessment stakeholder database, this database will identify the name, address, phone, fax, email and affiliation.

3.5 Notification Advertisements and Letters

Media outlets such as: dailies, community papers, radio and television could be utilized to announce, in advance any New Fuel Project community involvement activities.

Direct mail flyers and advance notification letters will also be sent to persons on the contact list announcing these occasions in the event.

3.6 Stakeholder Contact

Appropriate stakeholder contact activities will be undertaken to conduct initial identification of stakeholder concerns and issues. Communication will be maintained throughout the Project period to ensure questions and concerns are addressed in a timely fashion as they arise. The number, severity, nature or frequency of the concerns and issues raised will determine the nature and frequency of the contact with stakeholder groups.

Key stakeholders will be notified of the Open House(s) through formal invitations, announcements in the media and through the regular Project newsletters.

3.7 Stakeholder Briefings and Interviews

All stakeholders with a known interest in the Project could be offered presentations and a chance to have questions and comments answered. Project material will be made available to participants in advance of any presentation. Where appropriate and in consultation with First Nations representatives, special meetings may be arranged for First Nation communities. All feedback received from these will be recorded for incorporation into the stakeholder comment database, response and issue management tracking system, as appropriate.

Regular Project updates will be presented to elected representatives of the following committees on a frequency commensurate of key Project activities and milestones at a minimum:

a) Impact Advisory Committee

b) Local Liaison Committee

3.8 Open House(s)

One or two Open Houses could be held throughout the initial phase of the Project to identify and address public concerns or issues pertaining to the Project.

The first Open House will be held at the Bruce Power Visitors' Centre. The second Open House would be held only if there is significant interest from the community with respect to the Project. The Open House(s) would provide a forum for two-way communication between participants and Bruce Power.

The planned schedule and focus of the Open House(s) is as follows:

Open House	Focus
1) Round 1 Late Winter/Early Spring 2004	➢ Project process and calendar ➢ Preliminary Project Description ➢ Public Communications Plan ➢ Public Questions and Answer Period ➢ Study process and components ➢ Project interactions with the environment
2) Round 2 (if sufficient interest is noted) Summer 2004	➢ Project calendar up-date ➢ Results of environmental assessment ➢ Comments received and responses

3.9 Community Displays

Following the Open House(s), the information provided at Open House(s), such as newsletters comment sheets, etc., will be available for viewing at identified local library information repositories.

The libraries used as public information repositories for the Project are:

a) Kincardine
b) Port Elgin
c) Tiverton
d) Southampton
e) Walkerton
f) Paisley
g) Hanover
h) Chesley

The location of the repositories will be made known to the community and interested stakeholders through the Project newsletters, web page and other information materials. Addition information repositories can be added if a need is identified.

3.10 Newsletters/Brochures

Newsletters/brochures relating to Project updates and the Open House(s) could be prepared and distributed to all contacts listed in the stakeholder database, residents and businesses in identified areas within the primary focus area. Two newsletters are currently planned. Newsletter # 1 could be issued late February 2004. Newsletter # 2 in Late June 2004

3.11 Web Site

A Project web page on the main Bruce Power web site will be established. The web site will serve as a vehicle to provide information to interested persons, as well as a mechanism to receive input from interested persons as an enhancement of the public consultation program. Information such as: scope, schedule, descriptions, events and contacts pertaining to the Project and the environmental assessment study process will be maintained current.

3.12 Comments and Issues Tracking

A comment database will be created to track, record and monitor all comments, correspondence and communications with stakeholders in the New Fuel Project communication process.

The Stakeholder Comment Database objectives are:

a) Identify and record the source of the comment (name of person or group)

b) Indicate the date and event of origin

c) Identify the type of communication and the original document for cross-referencing (letter, meeting report, email, voicemail report, etc.)

d) Provide a summary of the comment and response

e) Indicate the response action taken, when and by whom

f) Document how the response was communicated to the comment source, where applicable.

3.13 Media

The Media are an important vehicle to disseminate information to a wider audience. Bruce Power will ensure that the Media are advised of New Fuel Project events and the progress of these activities.