Canadian Nuclear Safety Commission Safeguards Program Annual Report 2007–08

Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire

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Canadian Nuclear Safety Commission
Safeguards Program Annual Report 2007-2008

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Canadian Nuclear Safety Commission
Safeguards Program Annual Report
2007–08

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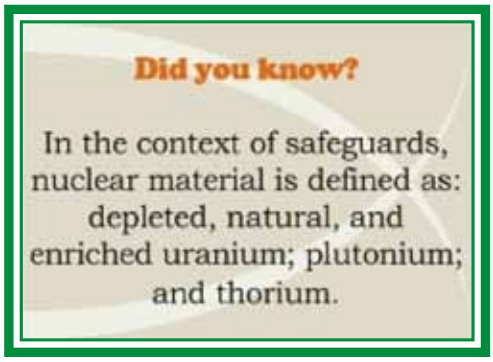
EXECUTIVE SUMMARY

The existence of nuclear energy carries with it both great promise and great responsibility. Along with the many peaceful applications of nuclear technology comes the potential threat represented by its misuse for the production of nuclear weapons. The international safeguards system, administered by the International Atomic Energy Agency (IAEA), is one pillar in the global response to this threat. The term "safeguards" refers to verification measures aimed at ensuring a State's compliance with international non-proliferation agreements under the Nuclear Non-Proliferation Treaty (NPT). It is essentially a system of monitoring and tracking nuclear material, to ensure that none of it is diverted from legitimate peaceful activities into illicit weapons programs.



The CNSC has been designated as the governmental organization responsible for the implementation of Canada's safeguards commitments. This report summarizes the work of the Safeguards Program in fulfilling this responsibility throughout the 2007-08 fiscal year.

The report is organized around the strategic framework of the CNSC. Part I lays out this framework and indicates how activities carried out by the Safeguards Program throughout the year contributed to the seven high level program priorities. Part II goes into more depth regarding these activities, while Part III describes some future directions for the Safeguards Program and international safeguards in general. Part IV provides information on IAEA activities carried out in Canada in the 2007-08 fiscal year, along with an indication of effort expended by both the IAEA and the CNSC. Finally, Part V offers some concluding remarks.

2007-08 Program Highlights

At its June 2008 Board of Governors meeting, the IAEA announced that it was once again able to draw the broad conclusion for Canada: namely, that all nuclear material in the country remained in peaceful activities. This conclusion is the ultimate indication of the success of the CNSC's Safeguards Program in implementing the requirements of Canada's international safeguards commitments throughout the 2007 calendar year.

Over the course of the 2007-08 fiscal year, the CNSC's Safeguards Program made significant progress towards the implementation of a State-level Integrated Safeguards Approach for Canada (see box, next page). This approach represents a new era for safeguards in Canada, moving away from the traditional, mechanistic facility-based system and towards a more risk-informed, information-driven regime, one which allows the IAEA to take State-specific characteristics into account in its application of safeguards measures and in its corresponding evaluation of results. One of the features of this new approach is the use of randomized inspections, implemented on an unannounced or short notice basis, which allows the IAEA to maintain the same level of confidence in its annual conclusions while carrying out fewer inspections overall.

A major milestone in the shift to this new approach occurred in July 2007, with the application of a transitional Simultaneous Physical Inventory Verification (SIM-PIV). While a number of facilities undergoing this annual exercise remained subject to traditional measures, the multi-unit power reactors were treated according to the integrated safeguards approach, which meant that each reactor had only a 50% chance of being selected for inspection. This transitional activity required extensive preparation by the CNSC, the IAEA, and Canadian industry and effectively demonstrated the gains in efficiency made possible by State-level integrated safeguards.

On that note, the 2007 calendar year was the first reporting period for which the IAEA experienced significant savings in effort related to the implementation of integrated safeguards for transfers of spent fuel to dry storage at the multi-unit power reactors: over a 50% reduction in inspection effort, as compared to traditional safeguards. Further savings are expected as experience is gained and as more Canadian facilities come under an integrated safeguards approach.

In Focus: The State-level Safeguards Approach

The development and implementation of the State-level safeguards concept over the past decade represents a fundamental change to the IAEA's safeguards system. During that period and continuing to this day, the IAEA is seeking to gain a comprehensive understanding of the nuclear fuel cycle and related activities in individual States.

The objective is to expand the Secretariat's activities beyond the verification of declared nuclear material at declared facilities, to include an assessment of the consistency of information on a State's entire nuclear program or activities. Accordingly, many of the safeguards strengthening measures, especially those set out in the Additional Protocol, provide the Secretariat with enhanced information about a State's activities and enhanced access to locations within a State.

This knowledge feeds into the very comprehensive and dynamic State Evaluation Process, which provides the basis for planning safeguards activities in a State, for drawing the annual safeguards conclusion about a State, and for reporting on safeguards implementation and evaluation to the Board of Governors and to the international community at large.

Currently, the Secretariat is applying the State-level concept to all States. Specifically, individual State Evaluation Reports are being prepared for every State, and these reports are being reviewed annually in the context of drawing safeguards conclusions and determining inspection efforts. However, the greatest expression of the concept can be found in those States with both a Comprehensive Safeguards Agreement and an Additional Protocol in force, and for whom the Secretariat has drawn the conclusion that all nuclear material in the State remains dedicated to peaceful activities. In these circumstances, the IAEA can implement unique State-level integrated safeguards approaches, that are based upon agreed model frameworks at both the State and the facility level and which can maximize the use of State specific characteristics in the context of safeguards implementation and evaluation.

The wide scale implementation the State-level integrated safeguards approach is very important, for it will provide the foundation necessary to support the evolution of safeguards over the next decade, in a manner which significantly addresses the foreseeable challenges.

OVERVIEW

Background

The Treaty on the Non-Proliferation of Nuclear Weapons (often referred to as the Non-Proliferation Treaty, or NPT) came into force on March 5, 1970 and has become the most widely adhered to arms control treaty in history. Article II of the NPT requires a non-nuclear weapon State (NNWS) party to the treaty to undertake not to receive the transfer of, control, manufacture, or otherwise acquire nuclear weapons or other nuclear explosive devices. Under Article III, a NNWS signatory is furthermore required to conclude a safeguards agreement with the IAEA (the "Agency"), for the purpose of verifying compliance with the obligations under Article II.

In 1972, Canada became one of the first States to bring a comprehensive safeguards agreement (CSA) with the IAEA pursuant to the NPT into force, followed by the entry into force of the protocol additional to that agreement (the "Additional Protocol" or AP) in 2000.

Article 7 of the Safeguards Agreement requires the establishment and maintenance of a State System of Accounting for and Control of nuclear material subject to safeguards (SSAC). In a broad sense, the SSAC is responsible for providing the IAEA with information and facility access in accordance with the safeguards agreement and the AP.

In Canada, the role of the SSAC is carried out by the CNSC, more specifically by the CNSC's Safeguards Program. This designation is consistent with the mandated objectives of the CNSC, as described under paragraphs 3(b) and 9(a)(iii) of the *Nuclear Safety and Control Act*. Functionally speaking, the Safeguards Program is administered by two divisions within the CNSC: the International Safeguards Division (ISD) and the Safeguards Accounting and Technology Division (SATD, previously the Technical Development and Services Division), both within the Directorate of Security and Safeguards (see Annex C for the organizational charts for ISD, SATD, and DSS). In addition, the Non-proliferation and Export Control Division (NPECD) contributes to the Safeguards Program through the gathering of data related to the export and import of certain items subject to the safeguards agreement. The CNSC also manages and funds a research and development program known as the Canadian Safeguards Support Program (CSSP). While the CSSP provides a wide range of support to the IAEA's safeguards regime, the first priority of the program is to address safeguards issues in Canada. A more fulsome description of the activities undertaken by the CSSP is outlined in a separate annual report.

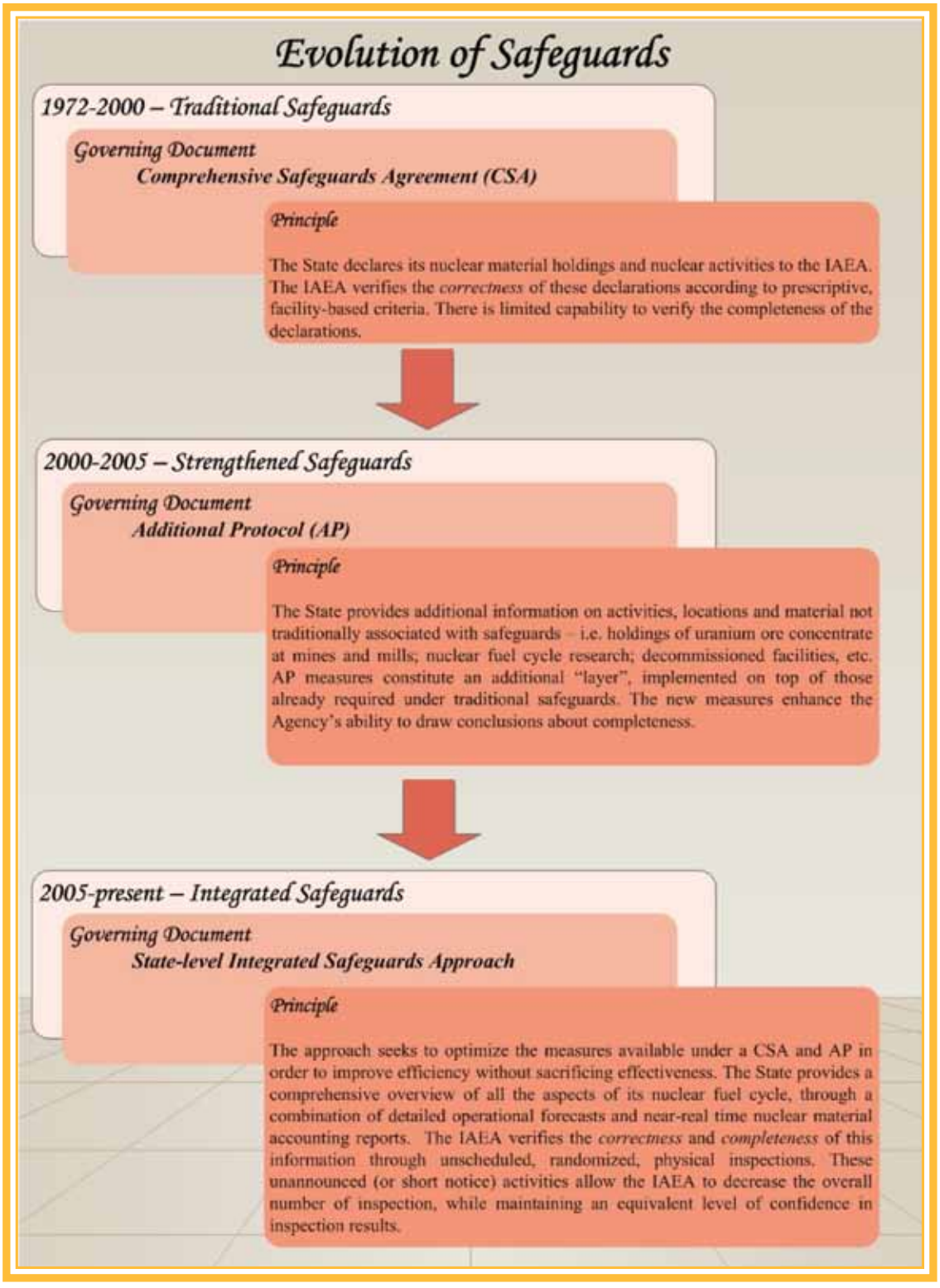
During the 2007-08 fiscal year, the CNSC's Safeguards Program utilized 14.63 FTEs – 11.38 for ISD and 3.25 for SATD.

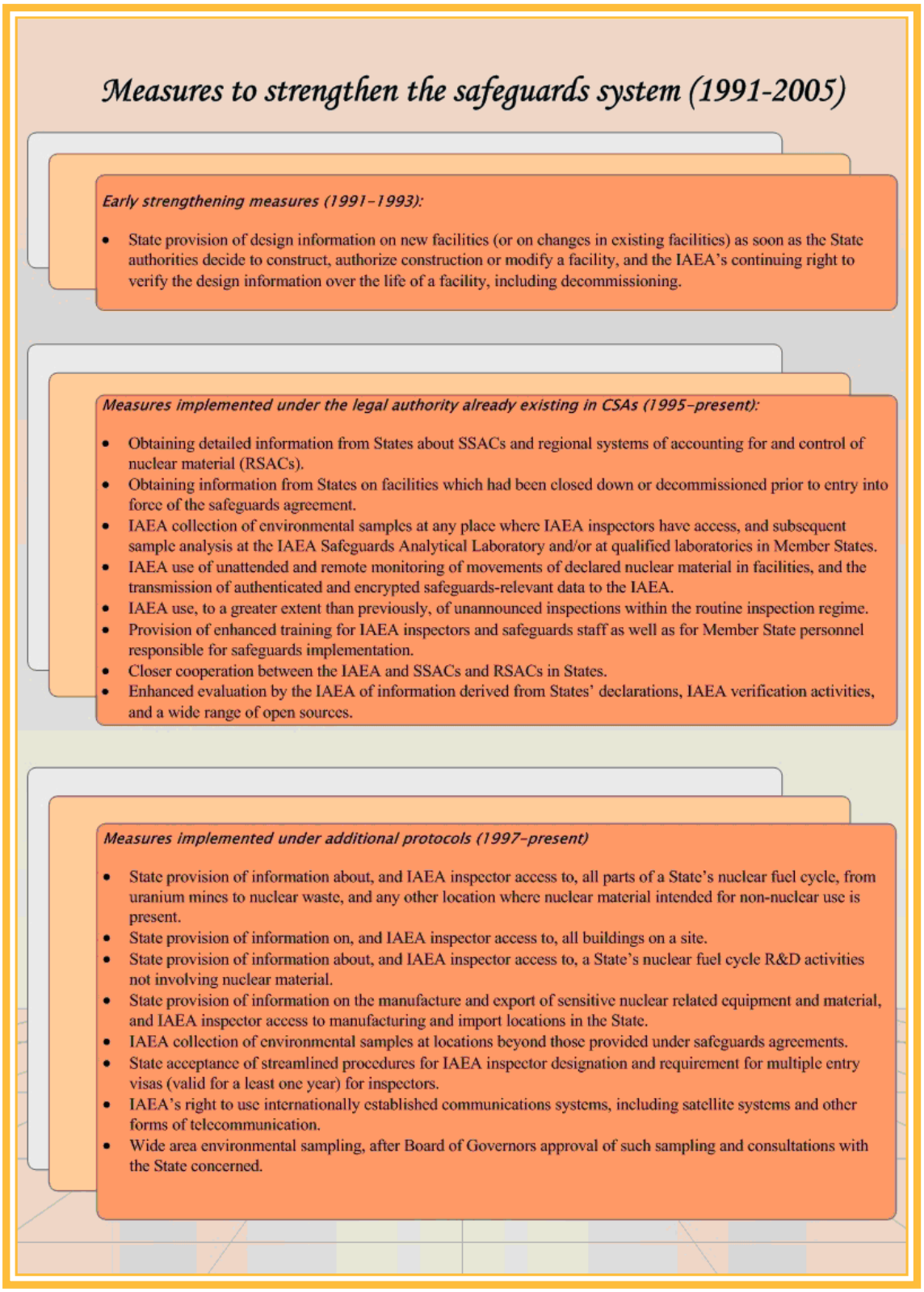
Mission and Mandate

It is the CNSC's mission to regulate the use of nuclear energy and materials to protect the health, safety and security of Canadians and the environment, and to respect Canada's international commitments on the peaceful use of nuclear energy. Within this context, the mandate of the Safeguards Program is as follows:

- To provide credible assurance to Canada and to the international community that all declared nuclear material is in peaceful, non-explosive uses and that there are no undeclared nuclear material or activities in this country;

- To implement the Canada/IAEA Safeguards Agreement and Additional Protocol;
- To contribute to the identification and analysis of new verification issues/challenges and to the development and implementation of safeguards approaches, measures, and procedures to appropriately address those issues/challenges; and
- To provide authoritative advice to the President of the CNSC, the Minister of Natural Resources, and the Government of Canada on the development and application of nuclear non-proliferation and safeguards policy.


Evolution of Safeguards
1972-2000 – Traditional Safeguards
Governing Document
Comprehensive Safeguards Agreement (CSA)
Principle
The State declares its nuclear material holdings and nuclear activities to the IAEA. The IAEA verifies the correctness of these declarations according to prescriptive, facility-based criteria. There is limited capability to verify the completeness of the declarations.
2000-2005 – Strengthened Safeguards
Governing Document
Additional Protocol (AP)
Principle
The State provides additional information on activities, locations and material not traditionally associated with safeguards – i.e. holdings of uranium ore concentrate at mines and mills; nuclear fuel cycle research; decommissioned facilities, etc. AP measures constitute an additional "layer", implemented on top of those already required under traditional safeguards. The new measures enhance the Agency's ability to draw conclusions about completeness.
2005-present – Integrated Safeguards
Governing Document
State-level Integrated Safeguards Approach
Principle
The approach seeks to optimize the measures available under a CSA and AP in order to improve efficiency without sacrificing effectiveness. The State provides a comprehensive overview of all the aspects of its nuclear fuel cycle, through a combination of detailed operational forecasts and near-real time nuclear material accounting reports. The IAEA verifies the correctness and completeness of this information through unscheduled, randomized, physical inspections. These unannounced (or short notice) activities allow the IAEA to decrease the overall number of inspection, while maintaining an equivalent level of confidence in inspection results.


Measures to strengthen the safeguards system (1991-2005)
Early strengthening measures (1991–1993):
• State provision of design information on new facilities (or on changes in existing facilities) as soon as the State authorities decide to construct, authorize construction or modify a facility, and the IAEA's continuing right to verify the design information over the life of a facility, including decommissioning.
Measures implemented under the legal authority already existing in CSAs (1995–present):
• Obtaining detailed information from States about SSACs and regional systems of accounting for and control of nuclear material (RSACs).
• Obtaining information from States on facilities which had been closed down or decommissioned prior to entry into force of the safeguards agreement.
• IAEA collection of environmental samples at any place where IAEA inspectors have access, and subsequent sample analysis at the IAEA Safeguards Analytical Laboratory and/or at qualified laboratories in Member States.
• IAEA use of unattended and remote monitoring of movements of declared nuclear material in facilities, and the transmission of authenticated and encrypted safeguards-relevant data to the IAEA.
• IAEA use, to a greater extent than previously, of unannounced inspections within the routine inspection regime.
• Provision of enhanced training for IAEA inspectors and safeguards staff as well as for Member State personnel responsible for safeguards implementation.
• Closer cooperation between the IAEA and SSACs and RSACs in States.
• Enhanced evaluation by the IAEA of information derived from States' declarations, IAEA verification activities, and a wide range of open sources.
Measures implemented under additional protocols (1997–present)
• State provision of information about, and IAEA inspector access to, all parts of a State's nuclear fuel cycle, from uranium mines to nuclear waste, and any other location where nuclear material intended for non-nuclear use is present.
• State provision of information on, and IAEA inspector access to, all buildings on a site.
• State provision of information about, and IAEA inspector access to, a State's nuclear fuel cycle R&D activities not involving nuclear material.
• State provision of information on the manufacture and export of sensitive nuclear related equipment and material, and IAEA inspector access to manufacturing and import locations in the State.
• IAEA collection of environmental samples at locations beyond those provided under safeguards agreements.
• State acceptance of streamlined procedures for IAEA inspector designation and requirement for multiple entry visas (valid for a least one year) for inspectors.
• IAEA's right to use internationally established communications systems, including satellite systems and other forms of telecommunication.
• Wide area environmental sampling, after Board of Governors approval of such sampling and consultations with the State concerned.

PART I – CONTRIBUTION TO CNSC CORPORATE FRAMEWORK

The CNSC uses a strategic framework for planning, monitoring and reporting. The reporting of CNSC's performance against its plans is structured in terms of the following five immediate outcomes:

1. A clear and pragmatic regulatory framework;
2. Individuals and organizations that operate safely and conform to safeguards and non-proliferation requirements;
3. High levels of compliance with the regulatory framework;
4. CNSC cooperates and integrates its activities in national/international nuclear fora; and
5. Stakeholders' understanding of the regulatory program.

The CNSC's strategic framework is underlined by its management and enabling infrastructure, which permit the CNSC to perform the necessary activities to meet the requirements of good governance with a high level of accountability.

In 2007-08, the CNSC's Safeguards Program continued to contribute to these strategic outcomes in the pursuit of the Program's priorities. The table on the following page outlines these priorities and the corresponding links to the five immediate outcomes.

Table 1: Safeguards Program priorities and link to CNSC strategic outcomes

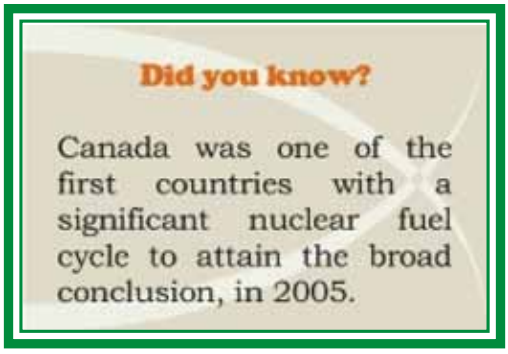
Priority	Activities	Immediate Outcome				
		1	2	3	4	5
Effectively implement the Canada-IAEA safeguards agreements	Continue efforts required to maintain IAEA's broad conclusion for Canada		X			
	Conduct Working Level Meetings with licensees and/or IAEA to address issues of safeguards significance					X
	Complete annual update to Canada's declaration under the Additional Protocol		X			
	Assist licensees in creating or revising DIQs		X			
	Participate in Commission hearings	X				
	Contribute to CMDs and other licence reviews of safeguards significance		X			
	Participate in Canada-Agency Safeguards Implementation Consultations & associated working level meetings			X		
Effectively implement CNSC's nuclear material accounting (NMA) program	Complete CNSC regulatory standard RD-336	X				
	Enhance CNSC's nuclear material accounting system (NMAS)		X			
	Audit licensees' nuclear material accounts			X		
	Reconcile licensee accounts with CNSC accounts			X		
	Prepare accounting reports for IAEA			X		
Contribute to the conceptualization, development, and implementation of strengthened IAEA safeguards	Consult with IAEA on transition to integrated safeguards (IS)	X				
	Establish necessary processes & procedures for implementing IS	X				
	Participate on the IAEA Director-General's Standing Advisory Group on Safeguards Implementation (SAGSI)				X	
	Participate in technical consultations and field trials				X	
Strengthen national capability to provide independent assurance of safeguards objectives	Develop concept for national verification program	X			X	
Continue outreach program with stakeholders	Consult with industry on issues related to safeguards implementation					X
Provide timely and accurate advice to CNSC, DFAIT, and VPERM on matters pertaining to safeguards and safeguards implementation	Consult regularly with departments referenced				X	
	Contribute to Canadian positions at IAEA General Conference and Board of Governors				X	
Contribute to efforts to provide technical support for the IAEA/CNSC verification program	Contribute to development and implementation of the safeguards mailbox concept		X			

PART II – SAFEGUARDS ACTIVITIES

1. Effectively implement the Canada-IAEA safeguards agreements

Broad Safeguards Conclusion

The primary focus of the CNSC's Safeguards Program is on ensuring that Canada remains in compliance with its international safeguards obligations. Achieving this goal annually enables Canada to maintain the broad safeguards conclusion – a conclusion drawn each year by the IAEA, indicating that *all nuclear material in the country remained in peaceful activities.* It is important to note that it is not necessary for the IAEA to actually detect diversion of declared nuclear material or to detect undeclared nuclear material or activities, in order to lose the broad conclusion. All that is necessary is for the IAEA to conclude that, on the basis of its evaluation over a given year, it was unable to provide credible assurance about the absence of the above two scenarios.



In working towards the annual broad conclusion, the Safeguards Program: (i) makes all the required reports to the IAEA; and (ii) ensures that the IAEA can effectively verify these reports. Pursuant to the first element, the CNSC maintains a national nuclear material accounting system (commonly referred to as NMAS) based on accountancy records received from licensees. In addition, the CNSC provides an annual declaration as required by the Additional Protocol. Both NMAS and the Additional Protocol declaration are covered in more detail below. The pursuit of element (ii) requires extensive activity on several levels including: establishing and maintaining up-to-date procedures with the IAEA for the effective implementation of the Safeguards Agreement in Canada; contributing to the development of safeguards approaches for application within Canada; ensuring that each facility in Canada has an appropriate programme and related procedures in place necessary to meet the safeguards conditions of the relevant facility licenses; participating in various verification activities undertaken by the IAEA; resolving questions, inconsistencies and anomalies identified by the IAEA; and resolving implementation issues identified by the IAEA and/or Canadian facilities.

In the 2007-08 fiscal year, the IAEA was once again successful in drawing the annual broad conclusion for Canada.

In Focus: Safeguards Conclusions

The 'products' of safeguards implementation are the safeguards conclusions drawn annually by the IAEA for each State with a safeguards agreement in force. The safeguards conclusions that are drawn – and the nature and scope of the assurance that can be given – depend on the type of safeguards agreement that a State has brought into force and whether or not the State has also concluded an additional protocol. Optimum assurance (in the form of the so-called "broad conclusion") is possible only for one category of States, i.e. States with both a CSA and an additional protocol. This is because it is only for this category of States that the IAEA has the authority to use the full range of verification tools that it has available.

IAEA Safeguards Staying Ahead of the Game (2007)

CASIC

The Canada-Agency Safeguards Implementation Consultation (CASIC) meeting, held twice a year since 1980, is an essential element for ensuring compliance with the Canada-IAEA safeguards agreements. It provides a forum for the CNSC and the IAEA to discuss issues of safeguards implementation in Canada at a high level, as well as a means to track actions on both sides related to particular issues. Recent CASIC topics include: the transition to State-level Integrated Safeguards; the IAEA's Safeguards Implementation Report as it pertains to Canada; and updates on current and proposed directions of the IAEA Secretariat and of the Canadian nuclear industry. On 30-31 May, 2007 a CASIC meeting was held in Ottawa, attended by eleven members of the Safeguards Program (nine from ISD, two from SATD). The second CASIC during the 2007-2008 fiscal year took place in Vienna on 29-30 November, 2007. Due to travel requirements only five members of the Safeguards Program were present at this meeting (four from ISD, one from SATD). Immediately prior to both CASIC meetings, a number of working level meetings were held with the IAEA, to discuss certain implementation issues in more depth (see next section).

Working Level Meetings

In the course of implementing safeguards in Canada the CNSC's Safeguards Program engages in numerous working level meetings with the IAEA, licensees, or both, in order to discuss a wide variety of safeguards issues. Table 2 summarizes the working level meetings held in the past fiscal year.

Table 2: Working Level Meetings held in fiscal year 2007-08

Date	Participants	Topic
April 2007, October 2007, January 2008	IAEA, Bruce Power, OPG	State-level integrated safeguards approach for multi-unit CANDU stations
May 2007	IAEA	Safeguards implementation issues in Canada
June 2007	Gentilly-2, Point Lepreau	State-level integrated safeguards approach for CANDU 600 stations
September 2007	IAEA, Gentilly-2	IAEA field-testing of equipment
November 2007	Cameco Port Hope, Zircatec, GE Peterborough, GE Toronto	State-level integrated safeguards outreach for conversion & fuel fabrication facilities
November 2007	IAEA, AECL Chalk River	AECL, CNSC and IAEA trilateral meetings on CRL projects
November 2007	MDS Nordion	Discussion on Nuclear Material Accounting System
November 2007	IAEA	Safeguards implementation issues in Canada
January 2008	IAEA, Cameco Blind River, Cameco Port Hope, Zircatec, GE Peterborough, GE Toronto	Multilateral meetings on State-level integrated safeguards approach for bulk-handling facilities
January 2008	IAEA, AECL Chalk River	Trilateral meetings on CRL Nuclear Material Accounting System
February 2008	IAEA, AECL Chalk River	Trilateral meetings on CRL projects
March 2008	IAEA	Meeting with Vienna on LWR safeguards

Annual Update to the Additional Protocol Declaration

Under the Additional Protocol, the CNSC is required to submit an annual declaration to the IAEA regarding Canada's nuclear fuel cycle by May 15th of every year. Table 3 summarizes the information required under each relevant article of the AP.

Table 3: Information required under the annual AP declaration, article by article

AP Article	Information required
2.a.(i)	Nuclear fuel cycle-related R&D activities not involving nuclear material carried out anywhere that are funded, specifically authorized or controlled by, or carried out on behalf of, Canada
2.a.(iii)	General description of each building on each safeguarded site in Canada
2.a.(iv)	Description of the scale of operations for each location in Canada engaged in Annex I activities*
2.a.(v)	Information specifying the location, operational status and estimated annual production capacity of uranium mines and concentration plants
2.a.(vi)(a)	Information on quantities, chemical composition, etc. of source material before the starting point of safeguards for each relevant location in Canada
2.a.(vii)	Information on quantities, uses, and location of nuclear material exempted from safeguards
2.a.(x)	General plans for the succeeding ten-year period relevant to the development of the nuclear fuel cycle and nuclear fuel cycle-related R&D
2.b.(i)	Nuclear fuel cycle-related R&D activities not involving nuclear material related to enrichment, reprocessing or high level waste processing not funded, authorized or controlled by Canada

* Refers to Annex I of the AP; includes the manufacture of equipment or material related to the nuclear fuel cycle (e.g. zirconium tubes, heavy water, flasks for irradiated fuel, etc.)

The information provided under the Additional Protocol declaration is intended to provide the IAEA with a fuller and clearer understanding of the nuclear activities in Canada, and contributes to the Agency's ability to draw its annual safeguards conclusion. Information is gathered from over 30 members of the nuclear industry, covering the entire natural uranium fuel cycle, research facilities, and manufacturers of certain nuclear-related products. CNSC safeguards staff typically spends nearly 330 hours over six months reviewing, revising, and compiling the information, which must then be re-formatted using software provided by the IAEA prior to submission. This work represents a significant use of the CNSC's Safeguards Program resources every year.

The CNSC submitted the 2007 update to Canada's declaration (covering the 2007 calendar year) under the Additional Protocol on 12 May 2008, three days before the annual deadline.

Facility Design Information

A fundamental component of safeguards implementation in Canada is the Design Information Questionnaire (DIQ), a document prepared by safeguarded facilities, containing information concerning nuclear material subject to safeguards and the features of those facilities relevant to safeguarding such material. DIQs are used by the IAEA to design the facility safeguards approach and establish key measurement points for the purposes of inventory and flow verification. DIQs are living documents that are updated periodically to reflect any safeguards-relevant changes to a facility. The CNSC's Safeguards Program monitors the status of Canadian DIQs, assists licensees in the preparation and revision of these documents, and submits the final versions to the IAEA.

During the past year, the ongoing push to update Canadian facility design information continued, with nine DIQs reviewed by the CNSC and submitted to the IAEA (see Table 4).

Table 4: Design Information Questionnaires submitted in 2007-08

Facility	Date Submitted
AECL Chalk River Labs (Health Services)	April 2007
AECL Chalk River Labs (Chemistry)	April 2007
AECL Chalk River Labs (Fuel Engineering)	April 2007
AECL Chalk River Labs (Workshop)	April 2007
AECL Chalk River Labs (Waste Management Area)	September 2007
AECL Chalk River Labs (Waste Management Area)	September 2007
Cameco Port Hope	November 2007
Stern Laboratories	November 2007

Commission Member Documents and Corporate Reports

The CNSC's Safeguards Program contributes regularly to the preparation of Commission Member Documents (CMDs) related to licensing activities. Over the fiscal year, thirteen CMDs of safeguards relevance were reviewed and CNSC safeguards staff attended nineteen Commission hearings or meetings.

Throughout the course of the past year, the Safeguards Program also contributed to numerous other corporate documents, including the Report on Plans and Priorities, the CNSC's 2006-07 Annual Report, and the annual Power Reactor Industry Report.

2. Effectively implement CNSC's nuclear material accounting (NMA) program

CNSC Regulatory Document RD-336

A new CNSC regulatory document RD-336, entitled, "Reporting of Nuclear Material" (formerly called S-336), has been undergoing intensive review by CNSC staff and management since 2004. RD-336 will replace the current AECB 1049 Rev. 2 reporting requirements. A public comment review of this document was completed in March 2007, after which it received a thorough assessment by CNSC legal staff. RD-336 is currently being edited and a second brief public comment period is planned for September/October 2008, prior to completing the final steps to have this document approved and published.

Nuclear Material Accounting System (NMAS)

The CNSC's Safeguards Program maintains a national electronic system of accounts for nuclear material based on accountancy records received from licensees, known as the Nuclear Material Accounting System (NMAS). During the 2007-08 fiscal year, a number of enhancements were made to NMAS to improve its functionality. Currently, NMAS is undergoing upgrades to provide additional functionality to enable it to capture all the new information required by the new RD-336 and to track exempted material in Canada.

Nuclear materials accounting

Licensee nuclear material accounts are reconciled with the national system of accounts in NMAS on a monthly basis and closed on an annual basis as part of the Physical Inventory Verification (PIV) exercises. No significant accounting issues arose from this process during the review period. All required accounting reports were dispatched to the IAEA, as summarized in Table 5. This includes the monthly Inventory Change Reports (ICR), and the annual Physical Inventory Listing (PIL) and Materials Balance Reports (MBR). The IAEA has confirmed that all Materials Balance Reports, which compare the amount of nuclear material recorded on a facility's ledgers with the amount physically present at the facility, were acceptable.

Table 5: Nuclear material accountancy reports submitted to the IAEA

Report Type	Number of Reports Submitted	Number of Report Lines
ICR	315	6,848
PIL	45	8,400
MBR	45	855
Total	**405**	**16,103**

During the 2007-08 fiscal year, work continued on the implementation of a new accounting principle for making corrections to nuclear material accountancy reports, called the Virtual Replacement Correction Principle. The implementation of this principle will bring CNSC safeguards reporting in line with IAEA accounting standards. Trial reports making use of virtual replacement corrections are expected to begin in mid-2009, with the intention for the CNSC to implement this principle in 2010.

3. Contribute to the conceptualization, development, and implementation of strengthened IAEA safeguards

State-Level Integrated Safeguards Implementation

Throughout the fiscal year, work continued on the implementation of the State-level integrated safeguards approach (SLA) – the next step in the evolution of safeguards in Canada. Canada's SLA divides the domestic fuel cycle into four sectors, based on commonality of function from a safeguards perspective:

- Sector 1 – a) Power reactors and associated dry storages;
  b) Conversion and fuel fabrication facilities
- Sector 2 – Chalk River Laboratories
- Sector 3 – Research reactors, static dry storages, and other small locations
- Sector 4 – Mines, mills, and decommissioned facilities

Prior to this fiscal year, State-level integrated safeguards (IS) procedures had been approved for the portion of Sector 1(a) related to transfers of spent fuel to dry storage, and for Sector 3. During 2007-08, consultations were held among the IAEA, the CNSC, and Canadian industry, regarding the IS procedures for: the remaining portion of Sector 1(a) (related to the generating stations); Sector 1(b); and Sector 2 (see section on Working Level Meetings). These discussions laid the groundwork for the implementation of an IS approach for these sectors before the end of the 2008 calendar year, with the exception of Sector 2, which is expected to take longer due to the complexity and size of the Chalk River site. The development of these approaches is a significant undertaking that involves extensive work from all parties.

This fiscal year also saw the first indications of savings in IAEA inspection effort due to the implementation of an IS approach for transfers of spent fuel to dry storage at multi-unit CANDU stations (outlined in the 2006-07 Safeguards Program Annual Report). As noted above, one of the main concepts under the Canadian State-level integrated safeguards approach is the application of a randomized, unannounced or short notice inspection regime, allowing the Agency to reduce the number of overall inspections and still statistically maintain full coverage of nuclear material and activities. In the case of spent fuel transfers, the use of randomized, unannounced inspections, in place of one hundred percent visual surveillance of transfers of spent fuel, has allowed the IAEA to cut its person-days of inspection in this area by over half. These savings also translate into a benefit for the power reactors in terms of a less intrusive inspection schedule and a greater flexibility to perform transfer activities without the presence of the IAEA.

SAGSI

At the request of the IAEA Director General, the director of ISD participates on his Standing Advisory Group on Safeguards Implementation (SAGSI), which provides expert advice on the technical objectives and implementation parameters of IAEA safeguards and on the effectiveness and efficiency of specific implementation practices. SAGSI consists of experts from 17 countries.

Did you know?

The CNSC representative to SAGSI was appointed as the chair of this body in 2007, the first Canadian to hold this position since 1976.

SAGSI held two plenary sessions and two working group meetings during the 2007-08 fiscal year. Topics discussed during these meetings include, *inter alia*: the development and use of the Physical Model (a comprehensive technical compendium describing processes, technologies and acquisition paths for the production of weapons-useable fissile material and related detection indicators); the concept of proliferation resistance and its relationship to safeguards; the development of the State Evaluation Process, which is an essential aspect of improving the effectiveness and efficiency of the IAEA's verification

system; the Safeguards Implementation Report for 2006; long term strategic planning for the Department of Safeguards, including the Director General's 2020 Vision initiative; and the efforts by the IAEA's Department of Safeguards to develop a nuclear trade and technology analysis capability.

JAEA-IAEA Workshop on Advanced Safeguards Technology

On November 13-16, 2007, the Japanese Atomic Energy Agency (JAEA) and the IAEA jointly organized an international workshop to discuss safeguards challenges related to the future nuclear fuel cycle. The workshop examined novel safeguards technologies and the concept of proliferation resistance in the design of new nuclear facilities. Two members of the CNSC's Safeguards Program attended the workshop. As an outcome of this workshop, the CNSC anticipates that there will be increasing emphasis by the IAEA on proliferation resistance and safeguards-by-design for new nuclear facilities in Canada and elsewhere.

International Technical Meetings

The 48th annual meeting of the Institute for Nuclear Materials Management (INMM) was held 8-12 July 2007, in Tucson, Arizona, involving 926 attendees and 321 papers. The CNSC has been a Sustaining Member of the INMM – an organization that seeks to promote research, establish standards, and disseminate information on all aspects of nuclear material management – since 2005. The CNSC's Safeguards Program contributed three papers to the 2007 INMM annual meeting, including one presented by the Director of ISD, entitled: *Safeguards in Canada: Some Reflections on the Past, Present, and Future*.

The 8th International Conference on Facility Operations-Safeguards Interface, organized by the INMM and the American Nuclear Society, was held in Portland, Oregon from 30 March to 4 April, 2008. This meeting was attended by two CNSC safeguards staff members, one of whom gave a special presentation upon request entitled *Safeguards Capability Development Efforts in Canada*, which described the recruitment and development of CNSC safeguards staff in Canada and related future challenges.

4. Strengthen national capability to provide independent assurance of safeguards objectives

During the fiscal year, the Safeguards Program continued to work on the development of a proposal for a National Verification Program (NVP), which would improve the CNSC's knowledge of the type, quantity, location and use of nuclear material holdings throughout the country. The proposal will be the basis for further consideration of this initiative.

Work on the NVP was prompted by changes in the safeguards regime, including efforts to strengthen the international safeguards system and the IAEA's increasing reliance on the domestic nuclear authority in a given State. Development of such a system would, furthermore, bring Canada in line with international norms in terms of existing domestic programs implemented by other non-nuclear weapons States signatory to the NPT.

5. Continue outreach program with stakeholders

As part of the CNSC's corporate Outreach Program, the Safeguards Program is committed to an agenda of transparent communication and consultation with stakeholders, with the goals of improving familiarity with existing safeguards measures and introducing licensees to emerging approaches. The table on the following page illustrates the outreach activities held during the period under review.

Table 6: Outreach activities held in fiscal year 2007-2008

Date	Licensee	Topic
October and November 2007	Cameco Blind River, Cameco Port Hope, Zircatec, and GE-Hitachi	Review of IAEA's draft conceptual Integrated Safeguards Approach for Natural Uranium Fuel Cycle Facilities in Canada and its implementation over the subsequent six months; conducted through three separate meetings

6. Provide timely and accurate advice to CNSC, DFAIT, and VPERM on matters pertaining to safeguards and safeguards implementation

As the source of Canadian technical expertise in the field of safeguards and verification, the CNSC's Safeguards Program regularly provides expert advice to various government entities on this subject. Of particular note in this regard is the IAEA's annual General Conference (GC) held in September of every year ISD provides background briefings on safeguards for the Canadian delegation to the GC, as well as taking the lead within the delegation for the negotiation of the annual resolution on safeguards. ISD also provides support to the Canadian delegations to the IAEA Board of Governors (BoG) meetings, held throughout the year on issues pertaining to safeguards and safeguards implementation.

This fiscal year saw the beginning of the 2010 review cycle of the NPT. The review cycle consists of two to three Preparatory Committees (PrepComs), leading up to a Review Conference (RevCon) held every five years, where States Party to the Treaty meet to assess implementation of the NPT and, where appropriate, to make recommendations. The first PrepCom in the current cycle was held in Vienna, from April 28 to May 9, 2007. The Safeguards Program was involved extensively in the drafting of Canada's overview strategy, working papers, implementation reports, opening statements, and interventions for the PrepCom, and provided technical and policy advice to the Canadian Delegation throughout the meeting, with particular focus on non-proliferation, safeguards, and peaceful uses of nuclear energy.

Finally, in December 2007, CNSC safeguards staff participated in bilateral meetings with two States on international safeguards concepts and implementation for CANDU reactors.

7. Contribute to efforts to provide technical support for the IAEA/CNSC verification program

Safeguards Mailbox

The CSSP provided assistance to the IAEA in the development of an electronic channel of communication between the IAEA, the CNSC, and Canadian industry – the so-called "safeguards mailbox". Submission of information to the IAEA through such an electronic mailbox is a requirement of integrated safeguards. The CSSP has also provided guidance to licensees on the use of the mailbox system.

For more information on this and other technical support initiatives, see the CSSP Annual Report.

PART III – FUTURE DIRECTIONS

Future Directions in Domestic Safeguards

The main focus of the CNSC's Safeguards Program continues to be the transition to the full implementation of the State-level Integrated Safeguards Approach for Canada. Achieving this goal requires an unprecedented level of activity on the part of the CNSC in order to negotiate new approaches and procedures required with the IAEA and with Canadian facilities. As indicated above, this is being pursued on a sector by sector basis with full implementation planned for mid-2009. Teething pains have been significant in the introduction of randomized short-notice inspections supported by the provision of real-time operational information. The Safeguards Program is investing considerable effort in ensuring that these teething pains remain manageable and do not undermine Canada's continued compliance with its safeguards agreements.

Future Directions in International Safeguards

As discussed elsewhere in this report, the development and implementation of the State-level safeguards concept over the past decade represents a fundamental change to the IAEA's safeguards system. The very scope of this change has introduced a new set of challenges for the IAEA, both in respect to safeguards implementation and evaluation. While the State-level approach is applicable to all States, the greatest impact will be in those States under integrated safeguards. In this context, there are several identifiable challenges. These include, *inter alia*:

(i) Establishing the appropriate balance between quantitative and qualitative elements within State-level integrated safeguards approaches;

(ii) Strengthening the IAEA's capabilities to provide credible assurance regarding the absence of undeclared nuclear material and activities in a given State;

(iii) Ensuring consistency and transparency in the processes that underlie the State-level approach and in the application of those processes; and

(iv) Ensuring appropriate reporting on the implementation of the State-level approach and on the results derived therefrom.

In addition to these challenges, the IAEA must grapple with the financial and human resource issues as the demands on the safeguards system continue to grow, as well as issues relating to non-compliance. It is worth noting that, in the Agency's own words:

> "*Meeting future challenges will require a robust IAEA 'toolbox' containing: the necessary legal authority to gather information and carry out inspections, state-of-the-art technology, a high calibre workforce and sufficient resources.*"
>
> *IAEA 20/20 Vision for the Future (February 2008)*

PART IV – IAEA INSPECTION ACTIVITIES

1. IAEA inspection activities

Overview

The IAEA carries out frequent inspection activities within Canada, as part of its efforts to verify that Canada is in compliance with its international safeguards obligations. These activities differ in terms of purpose, scope, and timing and have changed with the evolution of safeguards, primarily in terms of the move from systematic, scheduled activities to randomized, short notice (or unannounced) inspections (see box).

In the 2007-08 fiscal year, Canada was in a period of transition from traditional to integrated safeguards. This means that some Canadian nuclear facilities were subject to traditional forms of IAEA inspection activities, while some experienced IS-style inspections, resulting in a relatively complex inspection regime. The total number of IAEA activities undertaken in Canada in this reporting period is summarized in Table 7.

Table 7: IAEA activities carried out in Canada in 2007-2008

Activity Type	Number
Physical Inventory Verification (PIV)	34
Interim Inventory Verification (IIV)	98
Short Notice Randomized Inspection (SNRI)	1
Unannounced Inspection (UI)	101
Design Information Verification (DIV)	29
Complementary Access (CA)	6
TOTAL	**269**

Physical inspections

Among the various types of IAEA activities listed in Table 7, it is useful to draw out those that are concerned with the verification of physical material – namely PIVs, IIVs, SNRIs, and UIs – as these typically require intensive effort from all parties and, generally speaking, involve the highest level of operator support. Table 8 shows the distribution of these types of inspection across the Canadian nuclear fuel cycle. Recall that these numbers were in a state of flux during the 2007-08 fiscal year due to the transition to integrated safeguards.

Table 8: IAEA inventory inspections carried out in Canada in 2007-08

Facility category	PIV	IIV	SNRI	UI
AECL Chalk River Laboratories	18	78	N/A	13*
Uranium refining, conversion, and fuel fabrication	5	10	N/A	N/A
Power reactors and waste management facilities	7	10	N/A	88
Research reactors, static dry storages, and LOFs	4	--	1	N/A
TOTAL	**34**	**98**	**1**	**101**

* Although AECL CRL is not yet under an integrated safeguards approach, it is still subject to UIs under traditional safeguards. This is a reflection of the nature of the nuclear material handled on the site (namely HEU and Pu).

Simultaneous Physical Inventory Verifications (SIM-PIVs)

The majority of the PIVs listed in Table 8 are carried out in two major simultaneous exercises every year: one focusing on AECL's Chalk River Laboratories (which is actually broken into two phases, based on the nature of the facilities verified) and one covering the so-called natural uranium "zone", which involves all conversion, fuel fabrication, and power reactor facilities. These simultaneous PIVs, referred to as SIM-PIVs, are significant annual undertakings, requiring extensive resources from the IAEA, the CNSC, and affected licensees.

The 2007 Chalk River SIM-PIV took place over a one week period in May and three additional days in June, covering a total of 11 facilities on the Chalk River Laboratory site. Altogether, the inspection activities involved two CNSC safeguards staff members (consuming approximately 0.05 FTEs) and 11 IAEA inspectors.

Due to the fact that some facilities within the natural uranium zone were under an integrated safeguards approach prior to the 2007 SIM-PIV, while others remained under traditional safeguards, a "transitional SIM-PIV" was applied. In effect, this meant that the multi-unit power reactors were subject to a 50% probability of being selected for physical inspection; the dates for the PIV activities at each reactor were set in advance, and the result of the selection probability was communicated to the CNSC, and hence the licensee, 24 hours prior to each inspection date. All other facilities experienced a traditional SIM-PIV.

The 2007 transitional natural uranium zone SIM-PIV lasted approximately two weeks (although preparations began at least two months in advance), involved 13 nuclear facilities, as well as two smaller locations, and made use of 11 CNSC personnel in the field (0.22 FTEs), along with 24 inspectors from the IAEA.

Overall, the two 2007 SIM-PIV exercises went well. In each case, the facilities were well prepared and operator support was excellent. For the most part, the activities proceeded according to schedule and were concluded in the allotted time or earlier.

2. Inspection effort

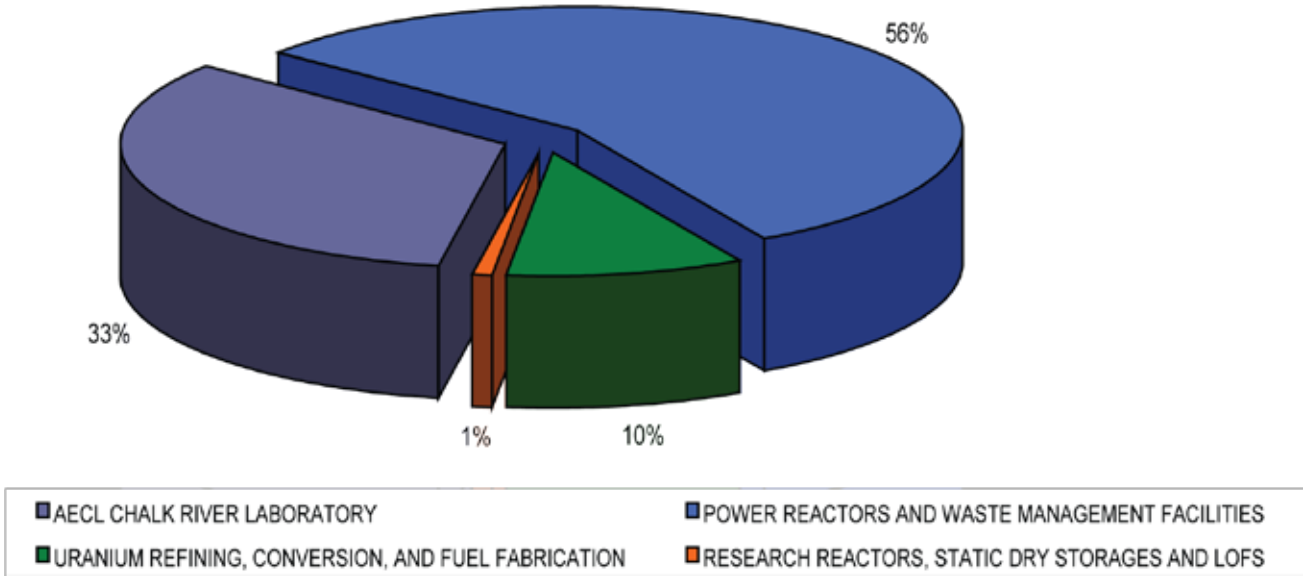
The IAEA measures its inspection efforts through a unit of measurement called person-days of inspection (PDIs), which is essentially the number of IAEA inspectors involved in an inspection multiplied by the duration of the inspection, in days. While the number of PDIs is a useful indication of the amount of effort expended by the IAEA in Canada, it is important to note its limitations. Essentially, the IAEA records a PDI as soon as an inspector arrives at the site, regardless of the duration of the inspection, which makes it difficult to assess the true extent of the effort expended. Furthermore, the IAEA distinguishes between "inspections" and "visits", in that PDIs are only recorded for the former. This means that effort for DIVs and CAs (the two main types of IAEA activities that are regarded as "visits") are not counted separately, although since these activities often take place in conjunction with other "inspections" (particularly DIVs), the effort expended often gets rolled into the inspection PDIs. Finally, PDIs are only recorded for effort at facilities or locations that are officially identified in the IAEA's system, as signified by the existence of a so-called Facility Attachment (a negotiated document that lays out the safeguards measures for a particular facility). As a result, inspections at facilities for which a Facility Attachment is not in force do not get recorded as PDIs.

In the 2007-08 fiscal year, the IAEA expended 908 PDIs in Canada (see Table 9). The percentage of inspection effort by fuel cycle sector is shown in Figure 1.

Table 9: IAEA PDIs expended in 2007-08 in Canada, by facility

AECL CHALK RIVER LABORATORY	
UNIRRADIATED MATERIAL STORAGE	66
NRX REACTOR	4
DEDICATED ISOTOPE FACILITY	7
NRU REACTOR	71
FUEL FABRICATION	81
SPENT FUEL STORAGE	36
SPENT FUEL CANISTER STORAGE	5
FUEL FABRICATION FACILITY	4
SPENT FUEL STORAGE	20
WASTE STORAGE SYSTEM	1
BIOLOGY, CHEMISTRY, PHYSICS LABS	6
URANIUM REFINING, CONVERSION, AND FUEL FABRICATION	
CAMECO BLIND RIVER	18
CAMECO PORT HOPE	45
ZIRCATEC	11
GENERAL ELECTRIC, TORONTO	7
GENERAL ELECTRIC, PETERBOROUGH	10
POWER REACTORS AND WASTE MANAGEMENT FACILITIES	
DARLINGTON NGS	13
BRUCE "A" NGS	58
BRUCE "B" NGS	44
PICKERING NGS	36
GENTILLY II NGS	140
POINT LEPREAU NGS	119
DARLINGTON WASTE MANAGEMENT	1
WESTERN WASTE MANAGEMENT	66
PICKERING WASTE MANAGEMENT	32
RESEARCH REACTORS, STATIC DRY STORAGES AND LOFS	
GENTILLY I DRY STORAGE	1
WHITESHELL DRY STORAGE	3
MCMASTER UNIVERSITY RESEARCH REACTOR	1
LOCATION OUTSIDE FACILITY	2
TOTAL	**908**

Figure 1: Percentage of IAEA PDIs utilized in each sector of the fuel cycle in 2007-08



3. CNSC participation in IAEA activities

To the extent possible, CNSC safeguards staff participate in inspection activities carried out by the IAEA in order to facilitate the exercise, mediate any disputes that may arise, and carry out domestic compliance activities whenever possible. However, participation is dictated by the level of available resources, as well as the nature of the particular activity.

CNSC attendance at routine, scheduled inspections – namely PIVs and IIVs – is generally high, with close to 100% participation in the intensive annual SIM-PIV exercises. Note that, since DIVs are typically carried out in conjunction with either a PIV or an IIV, CNSC attendance at these activities is not counted separately. Figure 2 indicates CNSC participation for scheduled inspections in the 2007-08 fiscal year.

By contrast, it is much more difficult for CNSC safeguards staff to attend short notice randomized inspections given the short lead time. That being said, particular effort is being made to attend SNRIs during the current transitional phase, in order to address potential problems arising from unfamiliarity with this new type of activity. Thus, CNSC safeguards staff attended the single SNRI that was performed in the 2007-08 fiscal year. Unannounced inspections, on the other hand, are called with no prior notice at all, making it impossible for the CNSC to attend (with the exception of AECL Chalk River, see below).

Similarly, CAs are typically arranged on a short notice basis; as a result, and based on a risk assessment of the locations chosen for access, CNSC safeguards staff do not attend all CAs conducted by the IAEA; out of six CAs carried out in 2007-08, only one was attended by a safeguards staff. Figure 3 provides a review of CNSC participation in CAs carried out in Canada since 2000 (see Annex E for further details).

Note that, with the introduction of a safeguards officer to the CNSC's AECL Chalk River Laboratory site office, it is now possible for CNSC safeguards staff to attend nearly all IAEA inspections carried out at this site, including CA and UIs.

Figure 2: CNSC participation in scheduled IAEA inventory verifications (IIVs and PIVs) in 2007-08

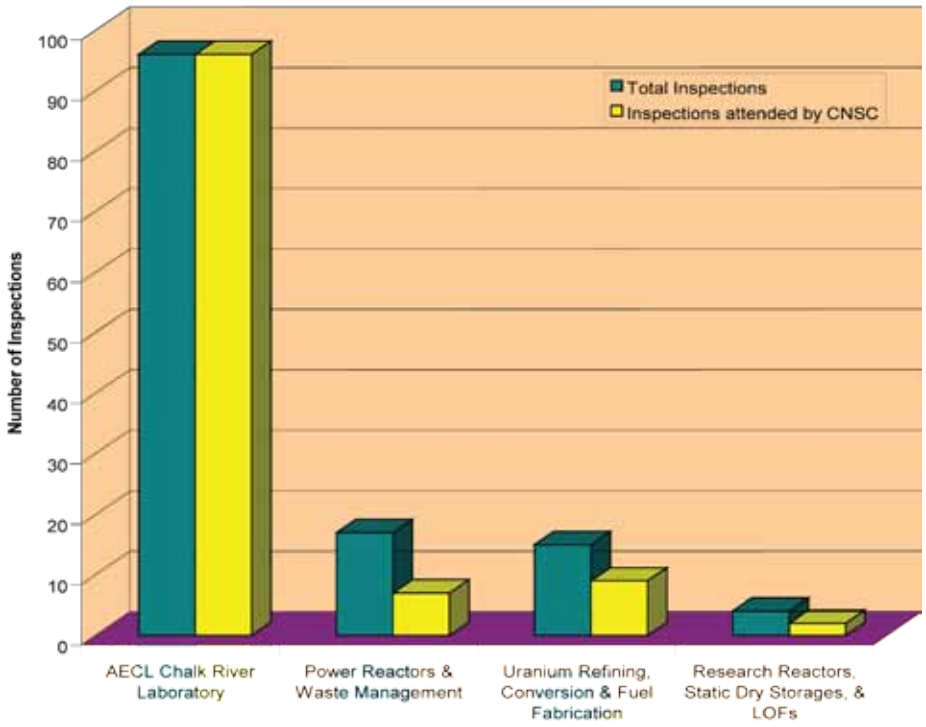
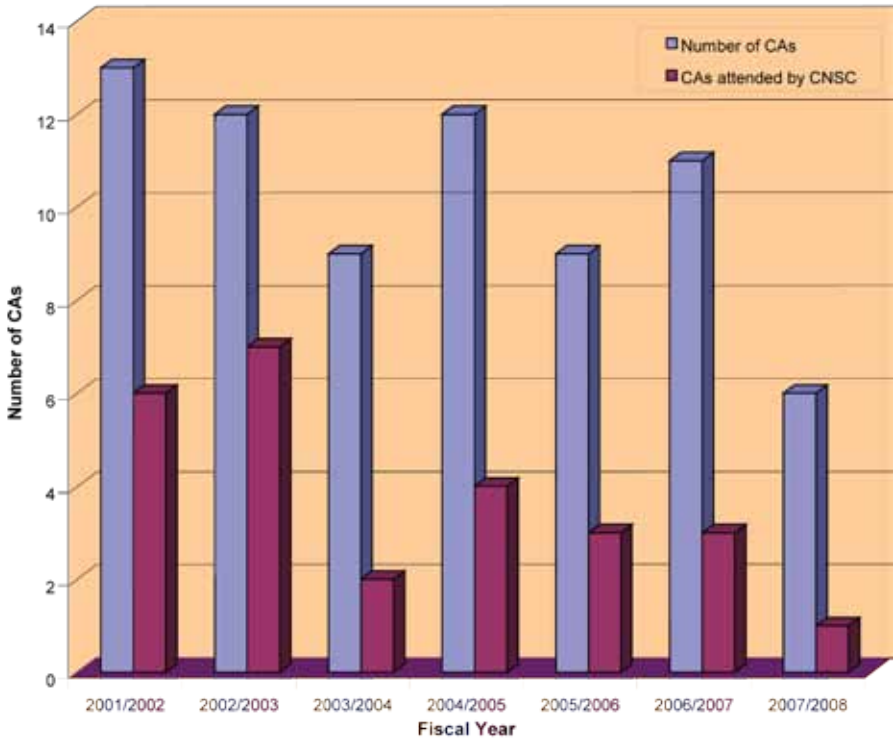


Figure 3: CNSC participation in IAEA complementary accesses carried out in Canada from 2000 to 2008



PART V – CONCLUSIONS

During the 2007-08 fiscal year the CNSC's Safeguards Program successfully achieved its objectives as outlined in Part I of this report. Primary among these was the maintenance of the broad conclusion provided by the IAEA to the effect that all nuclear material in Canada remained in peaceful activities. Significant progress was made in the transition to the State-level integrated safeguards approach, including the development of agreed procedures for licensees, the CNSC, and the IAEA. Concrete evidence of the optimization of resources made possible under this new approach, was demonstrated through savings in inspection effort related to transfers of spent fuel to dry storage at the power reactors, as compared to traditional safeguards. The IAEA carried out over 250 safeguards activities in Canada throughout the fiscal year, expending 908 person-days of inspection. The CNSC's Safeguards Program facilitated all of these activities, with approximately 40% active, in-field participation. Finally, the CNSC continued to contribute to the enhancement of the international safeguards system through its ongoing work in SAGSI as well as other international fora.

ANNEX A – ACRONYMS

Acronym	Full Term
AECL	Atomic Energy of Canada Limited
AECB	Atomic Energy Control Board (now CNSC)
AP	Additional Protocol
CA	Complementary Access
CANDU	Canadian Deuterium Uranium
CASIC	Canadian/IAEA Safeguards Implementation Consultations
CMD	Commission Member Document
CSSP	Canadian Safeguards Support Program
CNSC	Canadian Nuclear Safety Commission
CRL	(AECL) Chalk River Laboratory
CSA	Comprehensive Safeguards Agreement
DFAIT	Department of Foreign Affairs and International Trade
DIQ/DIV	Design Information Questionnaire/Verification
DSS	Directorate of Security and Safeguards
DU	Depleted Uranium (< 0.72% U-235)
HEU	Highly Enriched Uranium (> 20% U-235)
IAEA	International Atomic Energy Agency
ICR	Inventory Change Report
IIV	Interim Inventory Verification
INMM	Institute for Nuclear Materials Management
IS	Integrated Safeguards
ISD	International Safeguards Division
JAEA	Japanese Atomic Energy Agency
LEU	Low Enriched Uranium (~3- 20% U-235)
LOF	Location Outside Facility
MBR	Material Balance Report
NGS	Nuclear Generating Station
NSCA	Nuclear Safety and Control Act (2000)
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
NU	Natural Uranium (~0.72% U-235)
NWS	Nuclear Weapon State
NNWS	Non Nuclear Weapon State
OPG	Ontario Power Generation
PDI	Person Days of Inspection
PIL	Physical Inventory Listing
PIT	Physical Inventory Taking
PIV	Physical Inventory Verification
SAGSI	Standing Advisory Group on Safeguards Implementation
SATD	Safeguards Accounting and Technology Division
SIM-PIV	Simultaneous Physical Inventory Verification
SLA	State-Level Approach
SNRI	Short Notice Random Inspection
SSAC	State System of Accounting and Control
TDSD	Technical Development and Services Division
UI	Unannounced Inspection
WMF	Waste Management Facility

ANNEX B – GLOSSARY OF TERMS

Additional Protocol: a protocol additional to a State's Safeguards Agreement with the IAEA in order to strengthen the effectiveness and improve the efficiency of the safeguards system.

Broad Conclusion: the most comprehensive safeguards conclusion that can be drawn by the IAEA, indicating that: (i) all declared nuclear material in a State has been accounted for and is in peaceful, non-explosive uses and (ii) there is credible assurance that there are no undeclared nuclear materials or activities.

Canada-Agency Safeguards Implementation Consultation (CASIC): official bi-annual meeting held between the CNSC and the IAEA, to discuss high-level issues related to the implementation of safeguards in Canada.

Complementary Access: the right of the IAEA pursuant to the Additional Protocol for short-notice access to any location in Canada in order to: confirm the absence of undeclared nuclear material and activities; resolve a question relating to the correctness and completeness of information provided by the State; and confirm the decommissioned status of facilities and locations declared by the State.

Comprehensive Safeguards Agreement: an agreement pursuant to the NPT concluded between the IAEA and a given Non-Nuclear Weapon State that applies safeguards on all nuclear material in all nuclear activities in that State.

Design Information Verification (DIV): activities carried out by the IAEA at a facility to verify the correctness and completeness of the design information provided by the State.

Facility: a reactor, a critical facility, a conversion plant, a fabrication plant, a reprocessing plant, an isotope separation plant or a separate storage installation, or any location where nuclear material in amounts greater than one effective kilogram is customarily used.

Integrated Safeguards: the optimum combination of all safeguards measures under a Comprehensive Safeguards Agreement and an Additional Protocol to achieve maximum effectiveness and efficiency.

Interim Inventory Verification (IIV): an inspection activity covering inventory transactions (e.g. receipts) that have taken place since the last inspection.

Inventory Change Report (ICR): an accounting report provided by the State to the IAEA showing changes in the inventory of nuclear material.

Location Outside Facility (LOF): any installation or location, which is not a facility, where nuclear material is customarily used in amount of one effective kilogram or less.

Material Balance Report (MBR): an accounting report provided by the State to the IAEA showing the material balance based on a physical inventory of nuclear material actually present at a facility.

Nuclear Material: any source or special fissionable material as defined in Article XX of the IAEA Statute (in practice, this means uranium, thorium, and plutonium).

[1]Note: an "effective kilogram" is a special unit used in safeguards equal to the weight (in kilograms) of a quantity of safeguarded material multiplied by a factor determined by its enrichment level.

Nuclear-Weapon State(s) (NWS): those States recognized by the NPT as having nuclear weapons as of 1 January 1967 when the Treaty was negotiated; namely, the United States, Russia, the United Kingdom, France, and China. All other signatories of the NPT are recognized as Non-Nuclear Weapon States (NNWS).

Person-Day of Inspection (PDI): a day during which a single inspector has access to a facility at any time for a total of not more than eight hours.

Physical Inventory Listing (PIL): a report provided by the State to the IAEA in connection with a physical inventory taking by the operator listing all the nuclear material on site.

Physical Inventory Verification (PIV): an inspection activity covering all nuclear material at a facility based on the operator's declaration of material inventories; typically conducted on an annual basis, although could be more or less frequent depending on the size of, and material handled by, a given facility.

Safeguards: a system of international inspections and other verification activities undertaken by the IAEA in order to evaluate, on an annual basis, a State's compliance with its obligations pursuant to its safeguards agreements.

Safeguards Implementation Report (SIR): The report of the Director-General of the IAEA to the Board of Governors on the annual findings and conclusions of the IAEA, which result from the implementation of safeguards in accordance with the various types of safeguards agreements.

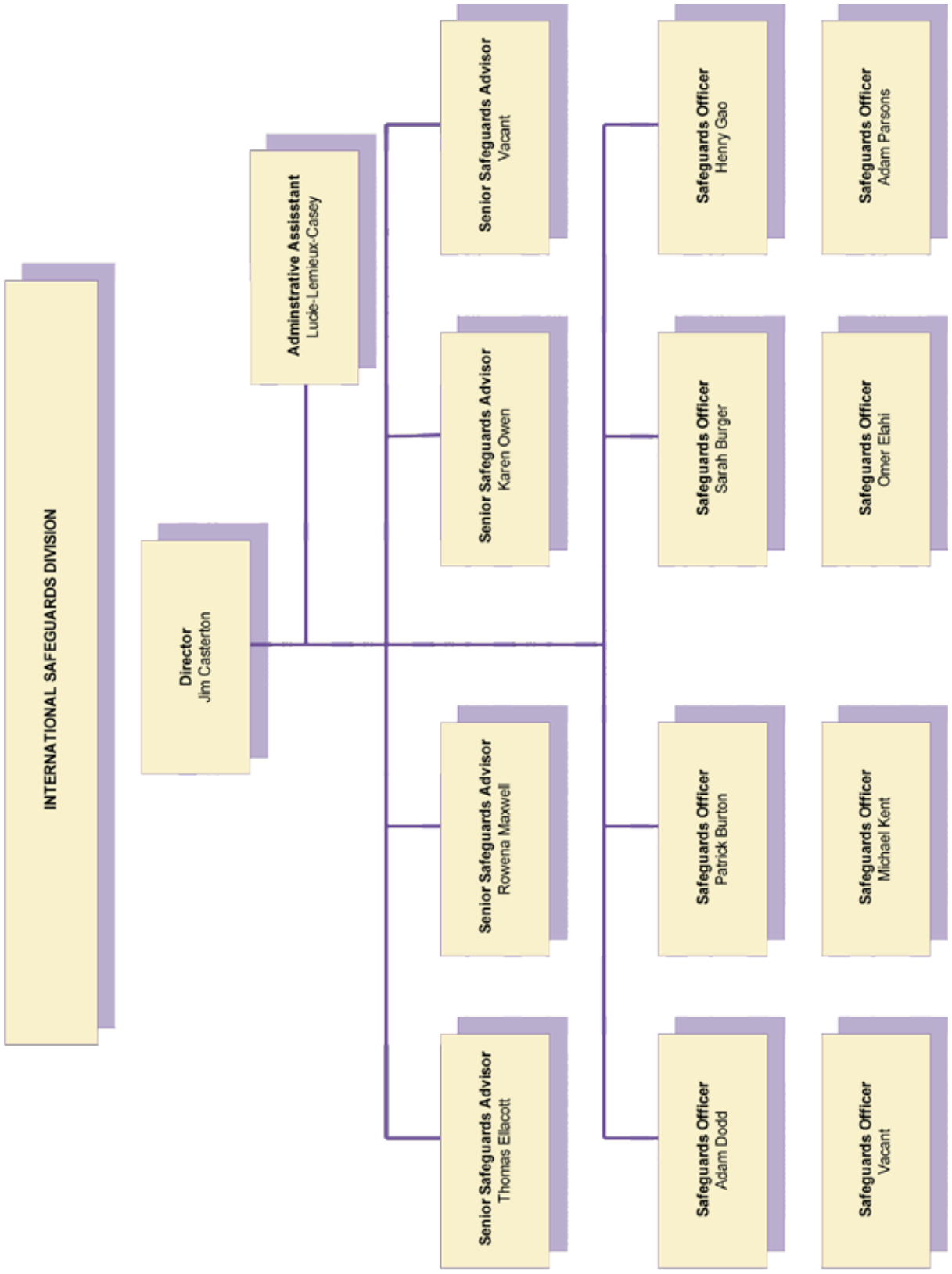
Starting Point of Safeguards: the point in the nuclear fuel cycle at which safeguards measures are first applied, as defined under Paragraph 34(c) of the Safeguards Agreement; in Canada, this means the input of uranium ore concentrate to the process line at Cameco's Blind River refinery.

State-Level Integrated Safeguards Approach (SLA): a new conceptual approach to safeguards that is based upon State-level (rather than facility-level) considerations; only possible in a State for which the broader conclusion has been drawn.

State System of Accounting and Control (SSAC): a national organization responsible for implementing the obligations of a State pursuant to its safeguards agreements with the IAEA.

Treaty on the Non-Proliferation of Nuclear Weapons (NPT): The cornerstone of the nuclear non-proliferation regime, which entered into force in 1970, with the aims of: preventing the spread of nuclear weapons and weapons technology; fostering the peaceful uses of nuclear energy; and furthering the goal of disarmament. Article III of the NPT requires each non-nuclear weapon State party to the NPT to accept IAEA safeguards on all nuclear material in all peaceful nuclear activities within the territory of such State, under its jurisdiction, or carried out under its control anywhere.

ANNEX C – ORGANIZATIONAL CHARTS



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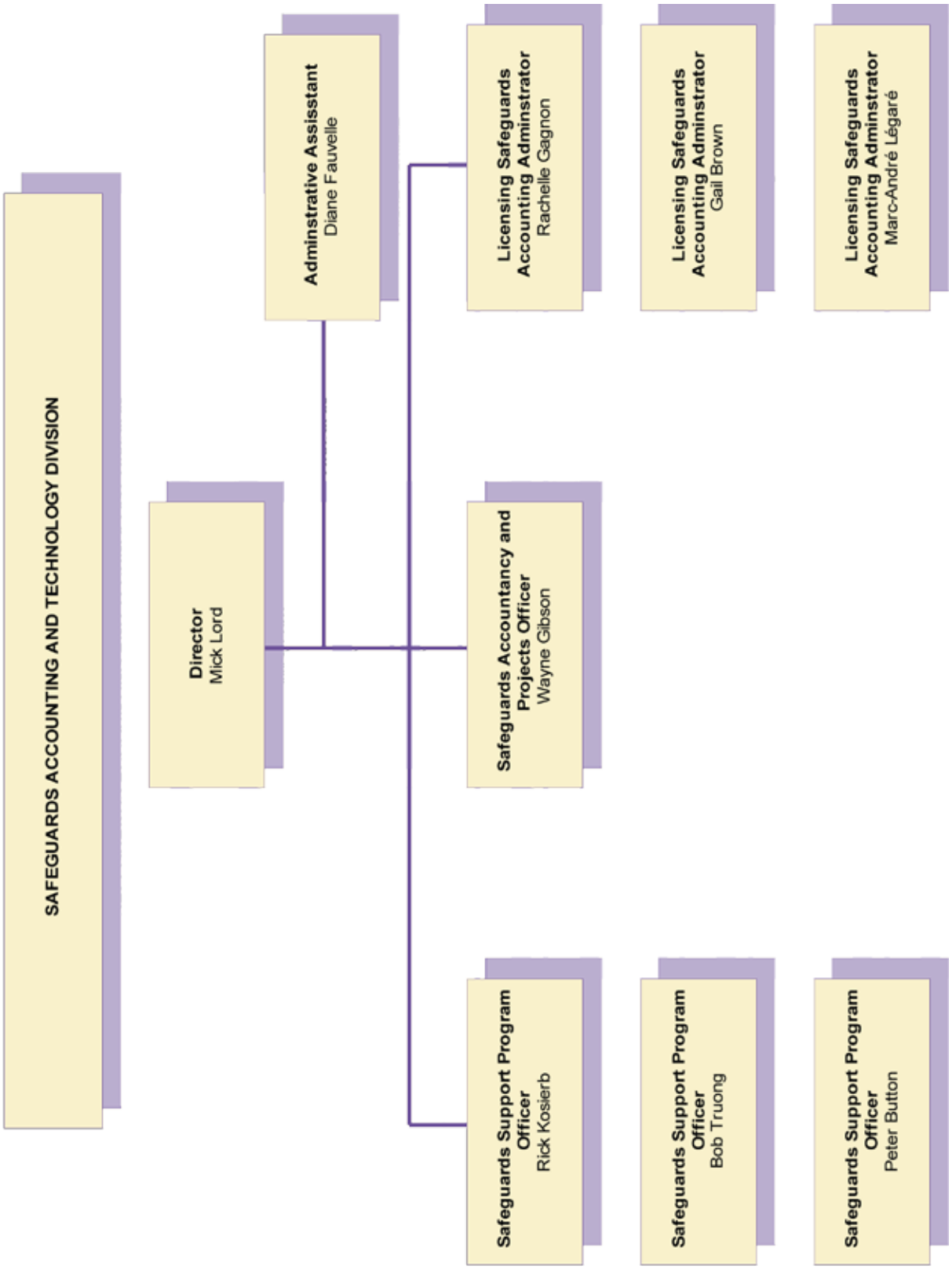

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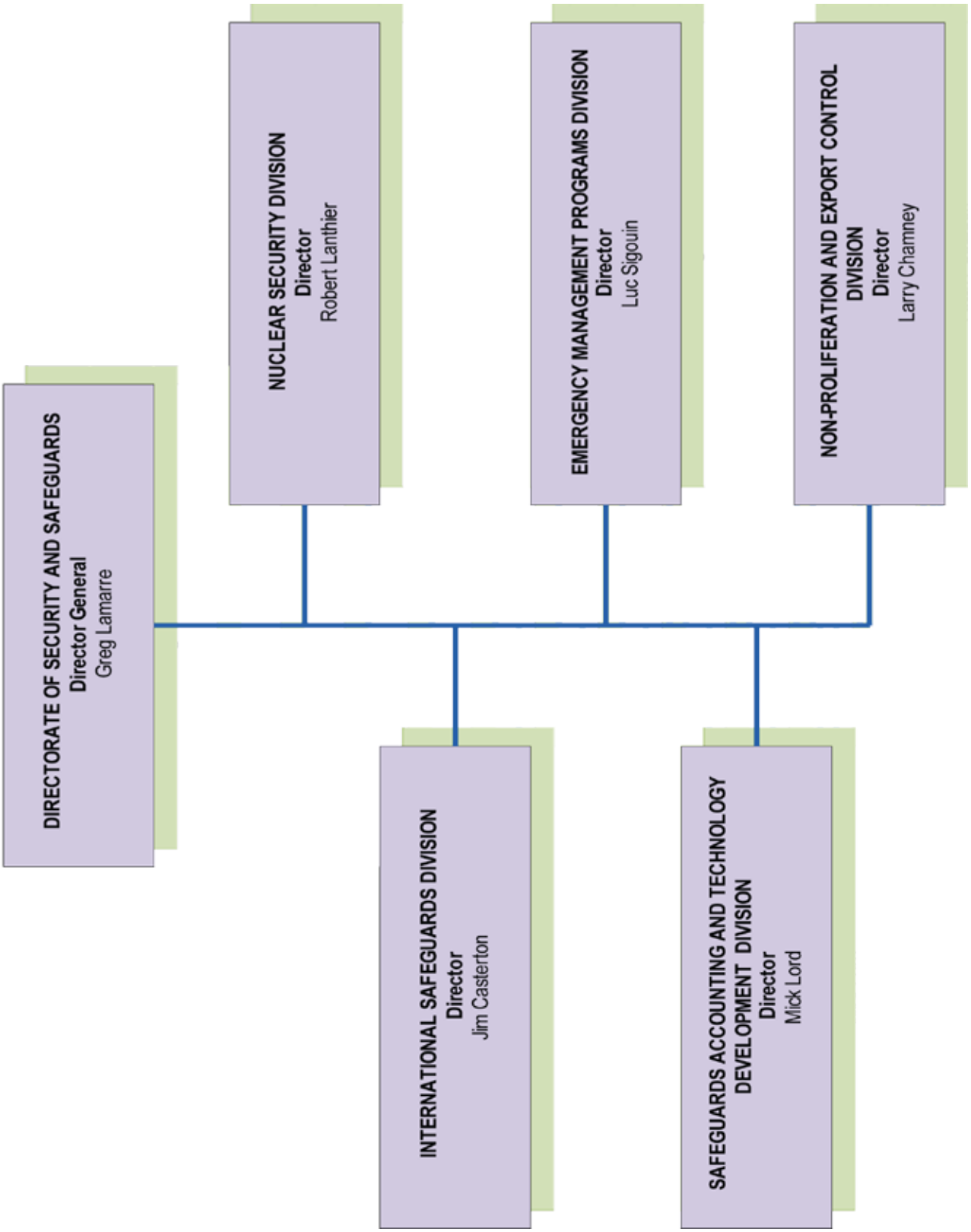
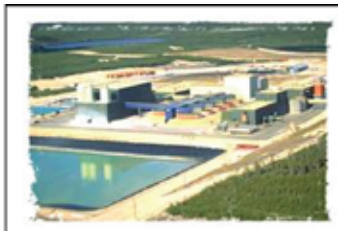


ANNEX D – OVERVIEW OF CANADIAN NUCLEAR FUEL CYCLE



Uranium Mining and Milling
Saskatchewan

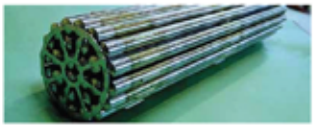
Uranium Refining
Cameco Blind River

Uranium Conversion
Cameco Port Hope

Spent Fuel Dry Storage
Pickering
Bruce
Darlington
Gentilly-2
Point Lepreau

Static Dry Storages
AECL Whiteshell
Douglas Point
Gentilly-1

Nuclear Power Reactors
Bruce A & B
Pickering A & B
Darlington
Gentilly-2
Point Lepreau



Fuel Fabrication
Zircatec
GE - Hitachi

Nuclear Research and Development
AECL Chalk River Laboratory

Research Reactors
Dalhousie University, Royal Military College, Saskatchewan Research Council, École Polytechnique de Montréal, University of Alberta, McMaster University

Locations Outside Facilities
Stern Laboratories, TRIUMF, AECL Sheridan Park, Kinectrics, MDS Nordion

ANNEX E – COMPLEMENTARY ACCESS IN CANADA

No.	Date	Location
1	11 July 2001	Rabbit Lake
2	23 July 2001	Cameco Blind River
3	24 July 2001	Stanleigh Mine
4	19 September 2001	Bruce Heavy Water Plant
5	20 September 2001	AECL Douglas Point
6	12 October 2001	Cameco Port Hope
7	15 October 2001	Cameco R&D Lab (Saskatoon)
8	18 October 2001	AECL Whiteshell Labs (WR-1)
9	24 October 2001	Cameco Blind River
10	14 November 2001	Darlington NGS, Bldg. 42
11	15 November 2001	Pickering NGS, Bldgs. 20, 21, 22, 24, 25, 26, & 28
12	22 November 2001	AECL Chalk River, Bldgs. 145, 105, & 492
13	14 March 2002	AECL NPD (Rolphton)
14a	25 April 2002	Combustion Engineering (Moncton)
14b	18 August 2002	Combustion Engineering (Moncton)
15	1 May 2002	MDS Nordion
16	9 July 2002	AECL Chalk River, Bldg. 215
17	11 July 2002	Gentilly-1
18	16 July 2002	GE Peterborough
19	19 July 2002	Cameco Port Hope
20	23 July 2002	AECL Chalk River, Bldg. 220
21	24 July 2002	AECL Whiteshell Labs, Bldg. 415
22	12 August 2002	AECL Chalk River, Bldg. 412
23	26 September 2002	McClean Lake Project (Saskatchewan)
24	1 October 2002	Cameco Blind River
25	5 March 2003	AECL CRL, Bldgs. 223 & 228
26	30 May 2003	Cameco Port Hope, Bldgs. 40, 41, 42
27	6 June 2003	Point Lepreau
28	29 July 2003	Darlington NGS
29	31 July 2003	Gentilly-2 NGS
30	8 October 2003	Zircatec Precision Industries
31a	25 November 2003	Westinghouse Plants 1 and 2
31b	13 January 2004	Westinghouse Plant 1
32	11 December 2003	AECL CRL, Bldg. 467
33	22 January 2004	WUFDSF, Bldgs. 578 and 714
34	27 January 2004	AECL CRL, Bldg. 250
35	3 June 2004	Point Lepreau
36	4 June 2004	Westinghouse, Varennes Quebec
37	14-17 June 2004	AECL CRL, Multiple Bldgs.
38	30 June 2004	Bruce NGS, Bldgs. 173, 176, 179, 180, 500, & 917
39	13 September 2004	McMaster Nuclear Reactor
40	14 September 2004	Cluff Lake
41	15-16 September 2004	TRIUMF
42	22-23 September 2004	AECL WL, Bldgs. 417, 421, 431, 432, 433, 503
43	1 October 2004	Earth Sciences Extraction Company, Calgary
44	9 December 2004	AECL CRL, Bldg. 200

ANNEX E – COMPLEMENTARY ACCESS IN CANADA

45	13 December 2004	AECL CRL, Bldg. 137
46	23 February 2005	AECL CRL, Bldg. 375
47	26 April 2005	Gentilly-2 NGS, Various Bldgs.
48	13 May 2005	AECL CRL, Bldg. 168
49	30 June 2005	Pickering NGS, D2O Plant, Feed Storage Area
50	20 July 2005`	AECL Sheridan Park, Bldg. SP1
51	25 August 2005	Bruce A, Bldgs. 109 and 116
52	06 October 2005	AECL CRL Bldgs. 591 and 599A
53	14 October 2005	Darlington NGS Bldgs. 22 and 135
54	24 October 2005	AECL Whiteshell, Bldgs. 303, 304, 306, 307, 307A
55	10 November 2005	Kinectrics
56	21 April 2006	Point Lepreau Bldgs 12, 22, 41, 42
57	28 April 2006	Gentilly-1
58	11 May 2006	AECL CRL Bldgs. 204A and 204B
59	23 May 2006	Cameco Port Hope
60	21 June 2006	Bruce Power, Bldg. 943
61	8 August 2006	AECL NPD
62	29 September 2006	AECL Chalk River Bldg. 320
63	24 October 2006	Whiteshell Labs, Bldgs. 100 and 300
64	1 November 2006	MDS Nordion
65	20 November 2006	AECL CRL Bldg. 469
66	8 March 2007	AECL CRL Bldg. 215
67	30 April 2007	AECL CRL Bldg. 610
68	12 June 2007	Bruce NGS A & B
69	25 July 2007	Whiteshell Labs
70	2 October 2007	AECL CRL Bldg. 459
71	27 November 2007	Darlington NGS
72	26 March 2008	Pickering NGS A&B
73	7 April 2008	AECL CRL Bldg. 210
74	11 April 2008	Point Lepreau Waste Storage Area
75	15 May 2008	Whiteshell Labs
76	3 June 2008	Key Lake Mill
77	10 July 2008	AECL CRL Bldg. 456

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