

National Progress Report: Canada

March 31, 2016

2016 Nuclear Security Summit

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Canada

(March 2016)

Since the 2014 Nuclear Security Summit (NSS), Canada has strengthened nuclear security implementation domestically and significantly contributed to global nuclear security.

1. Strengthened Nuclear and Other Radiological Material Security

a) Nuclear Security

Vulnerable supplies of weapons-usable nuclear materials pose a significant international security threat given the potential for non-state actors to acquire and use them for malicious purposes. Physical protection of nuclear and radiological materials includes securing these goods against theft or sabotage, during use, storage, or transport.

Canada is committed to maintaining a world-class domestic nuclear safety and security system. Canada hosted its first International Atomic Energy Agency (IAEA) International Physical Protection Advisory Service (IPPAS) mission from October 19-30, 2015. The IPPAS mission reviewed Canada's regulatory and legislative framework for the security of nuclear facilities and material and visited nuclear power and research reactors to assess their physical protection systems. The mission concluded that Canada's nuclear security regime was strong, resilient and sustainable.

The 2016 Nuclear Threat Initiative's Nuclear Materials Security index ranks Canada third globally with respect to securing nuclear materials from the risks of both theft and sabotage. Canada continues to improve, having increased its score by 2 points from 2014, due to strengthened cyber security regulations and regulatory assessments for nuclear facilities, and by 8 points from 2012.

Canada is in the process of updating its March 2014 Design Basis Threat Analysis for nuclear high security facilities, building on international benchmarking and increased collaboration with domestic partners. Canada is also contributing to the revision of the IAEA's nuclear security guidance on the *Development, Use and Maintenance of the Design Basis Threat*.

Canada continues to enhance its fitness for duty requirements for nuclear facility personnel and will expand the target population for these beyond nuclear security forces at high security sites. The expanded requirements are expected to address substance abuse (impairment at the workplace) screening, hours of work monitoring, and physical, medical and psychological screening for an expanded worker population at nuclear power plants.

As part of the \$28 million commitment made at the 2014 NSS to enhance nuclear and radiological security internationally, Canada's Global Partnership Program (GPP) invested \$5.2 million in key physical protection upgrades at vulnerable nuclear facilities in Southeast Asia to help prevent the theft of nuclear materials. This support has resulted in strengthened physical protection of nuclear facilities through infrastructure upgrades and enhanced emergency response capabilities in the event of radiological accidents.

b) Radiological Security

Canada is one of the world's largest suppliers of highly radioactive sealed sources and supports their protection from potential loss, theft and malicious use. As part of the \$28 million commitment made by Canada at the 2014 NSS to enhance nuclear and radiological security, Canada's GPP has contributed \$7 million to strengthen the security and management of highly radioactive sources by enhancing physical security and local capacity, including through the provision of training, equipment and infrastructure. These projects have focused on countries with inventories of Canadian-origin material in Africa, the Americas, and Southeast Asia.

Canada continues its efforts to implement IAEA security requirements for radiological sources with Canadian industry. The Canadian Nuclear Safety Commission's (CNSC) regulatory document "*Security of Nuclear Substances: Sealed Sources*" is fully aligned with the IAEA's *Code of Conduct on the Safety and Security of Radioactive Sources*.

Canada continues to support IAEA and World Institute for Nuclear Security (WINS) training courses and workshops to assist other States to develop the competencies necessary for comprehensive radioactive source security. Canada participates in exchanges of information on programmes and technical solutions for improving the security of radioactive sources.

c) Transport Security

Further to a 2014 NSS joint statement on transport security of nuclear and radiological materials, Canada participated in the NSS Transport Security gift basket and contributed to good practice guides on the security of transport for civilian nuclear and other radioactive materials. These guides will be shared with other countries at the 2016 NSS, through the IAEA and the Global Initiative to Combat Nuclear Terrorism (GICNT), to inform future activity in this area.

Additionally, Canada co-sponsored the 2014 NSS maritime security joint statement and participated in the November 16-19, 2015 Wilton Park workshop which formulated recommendations to enhance the security of the global maritime supply chain, particularly through deterring, detecting and responding to nuclear and other radioactive materials out of regulatory control. The Canada Border Services Agency (CBSA) delivered a presentation on Canada's maritime detection architecture and related experiences.

Canada's GPP will contribute to transportation security projects, including the possibility of funding the provision of containers to safely and securely transport and consolidate radioactive sources into long-term storage.

Canada continues to support IAEA and WINS training courses and workshops to assist other States to develop the competencies necessary for a comprehensive security regime for the transport of nuclear and other radioactive material.

d) Nuclear Forensics Capabilities

Should nuclear or radioactive materials not under regulatory control be interdicted in Canada, it is essential for the Government of Canada to be able to identify where this material came from, the nature of the material, and the risks it poses so that the related security threat can be

addressed. Nuclear forensics is therefore a key element in responding to illicit trafficking of nuclear materials.

Further to its commitment at the 2012 NSS to promote the development of a national nuclear forensics capability, the Canadian National Nuclear Forensics Capability Project (CNNFCP) was started in May 2013 to help establish a national network of nuclear forensics laboratories and a national nuclear forensics library. The CNNFCP will conclude its research and development activities by the end of March 2016. The next step will be to build on existing capacity and formally create a network of nuclear forensics laboratories and a national nuclear forensics library. The Defence Research and Development Canada's Centre for Security Science and the CNSC are leading these efforts. The CNSC has committed to maintaining and operating a national nuclear forensics library on behalf of the Government of Canada.

e) Information and cyber security

In addition to protecting sensitive and classified nuclear information in all its forms, Canada believes that the protection of critical systems and equipment is important to nuclear safety, nuclear security, and emergency preparedness and response.

Canada has developed a national standard (CSA N290.7) to address cyber security at nuclear power plants and small reactor facilities. This standard was published in December 2014. Furthermore, nuclear power plant operators in Canada have in place cyber security programs aligned with international standards and best practices.

Canada hosted an IAEA National Training Course on Computer Security and Conducting Assessments in December 2015, with industry, regulator and government partner participants. This included a methodology for conducting computer security assessments at nuclear facilities that is consistent with international standards, IAEA guidance and recognized best practices regarding the protection of information and industrial control systems. Canada has robust procedures in this area, but believes that more work needs to be done to raise standards globally. Canada supports the efforts of the IAEA and WINS to develop such guidance for state-level government departments and agencies, regulatory bodies, nuclear facility operators, and research and educational institutes.

2. Contribution to Minimization of Sensitive Nuclear Materials

Minimizing the global stocks of highly-enriched uranium (HEU) and separated plutonium will help prevent non-state actors from acquiring such materials, thereby reducing the risk of nuclear terrorism. Canada remains committed to the minimization of HEU and has made strong progress domestically and internationally.

Canada is committed to eliminating the use of HEU in the production of medical isotopes. Canada has announced that it will cease the routine production of molybdenum 99 (Mo-99) from Atomic Energy Canada Limited's (AECL) Chalk River National Research Universal reactor in October 2016, and will remove this facility as a potential supplier of last resort in the international Mo-99 supply chain by March 2018, thereby ending HEU-based medical isotope production in Canada. The government continues to work to ensure a reliable global supply of medical isotopes.

At the 2010 NSS, Canada committed to repatriate its United States (U.S.)-origin HEU fuel stored at Chalk River Laboratories and has made good progress in implementing this repatriation initiative. Canada repatriated one shipment of used HEU fuel in 2010, another in 2012, and four more in 2015. The last and largest phase of the repatriation initiative for used HEU fuel started in August 2015, and is slated to conclude in May 2019.

Following Canada's March 2012 announcement of the expansion of the repatriation initiative, to include the return of additional HEU materials stored at Chalk River Laboratories, a second initiative was launched to repatriate AECL's inventory of HEU-bearing liquids that were generated as a by-product from medical isotope production. Shipments of HEU-bearing liquids are scheduled to commence in mid-2016, and be completed by May 2019.

Furthermore, the University of Alberta is taking steps to decommission its SLOWPOKE research reactor which operates on HEU fuel. The University of Alberta plans to repatriate the HEU fuel by May 2019. Once the decommissioning of the University of Alberta's research reactor has been completed, Canada will have only one remaining HEU-fueled research reactor.

Canada has assessed that approximately three-quarters of its inventory of plutonium is ready for dispositioning, and has initiated discussions with the U.S. to determine whether it would accept

the material for long-term management. The remainder will continue to be safely stored and will be used to support future research and development work.

Internationally, Canada assisted a U.S.-led reactor conversion and cleanout project for an HEU-fuelled SLOWPOKE research reactor in Jamaica, which was completed in October 2015.

3. Enhanced Efforts to Combat Illicit Trafficking in Nuclear and Radiological Materials

Increased efforts and capacity to prevent, detect and interdict illicitly trafficked nuclear and radiological materials are necessary to reduce the risk of non-state actors acquiring and using these materials in nuclear weapons or radiological dispersal devices. The CBSA is upgrading Canada's Radiation Detection Network (RADNet) to help prevent illicit trafficking. RADNet scans nearly all commercial marine containers entering Canada for the presence of radiation using stand-alone, automated radiation detection portals at the major marine ports. The CBSA is replacing aging equipment with advanced-radiation portal monitors, which enable greater sensitivity and source characterization to improve Canada's ability to combat the illicit trafficking of radiological material. Canada also participates in international information sharing on illicit trafficking in nuclear material through contributions to the IAEA Incident and Trafficking Database and bilateral cooperation.

Canada continues to implement a risk-based security compliance program for licensing of radioactive sources, and has implemented comprehensive import and export control programs for both Category 1 and 2 radioactive sources.

As part of the \$28 million Canadian commitment made at the 2014 NSS to enhance nuclear and radiological security, Canada's GPP has contributed \$15 million to strengthen the capacities of partner countries to detect and interdict illicit cargos of nuclear and radiological materials. This includes the provision of \$12.2 million to support the purchase of vehicle-based and man-portable radiation monitoring and detection equipment, and the installation of radiation portal monitors at key border crossings in Jordan. Canada's GPP has also provided \$2.3 million to support counter nuclear smuggling (CNS) initiatives in Peru, and has contributed funding to The International Criminal Police Organization (INTERPOL) for the delivery of training programmes in Southeast Asia and Jordan to help disrupt illicit trafficking activities. This support enhanced

the security of border crossings in Jordan and mitigated the risk of illicit trafficking of nuclear and radiological material in the region.

Further to Canada's co-sponsorship of the 2014 NSS gift basket on CNS, Canada participated in a workshop on CNS teams in vulnerable regions held in Amman, Jordan in November 2015. Participants exchanged experiences on the challenges in conducting investigations and operations to locate and secure illicitly trafficked nuclear or radioactive material. Canada also participated in the March 2016 CNS workshop held in Karlsruhe, Germany and hosted by the U.S. and the European Commission. This three day workshop addressed crime scene management and laboratory analysis of interdicted material with a focus on ensuring that nuclear smuggling investigations lead to successful prosecutions.

4. Support for International Legal Instruments

a) CPPNM/A and ICSANT

Canada believes that the universal implementation of the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT) would significantly augment existing global counter-terrorism efforts. Accordingly, Canada enacted legislation in 2013, known as Bill S-9 (the *Nuclear Terrorism Act*), which enabled Canada to ratify both the CPPNM/A and ICSANT. This legislation amended the Criminal Code in order to create a number of new offences related to nuclear terrorism, in accordance with the CPPNM/A and ICSANT.

Canada also continues to advocate for a strong multilateral framework for the global fight against nuclear terrorism, supporting IAEA efforts to promote the entry into force of the 2005 Amendment to the Convention on the Physical Protection of Nuclear Material (CPPNM/A) and encouraging States that have not yet done so to ratify the CPPNM/A as soon as possible.

Internationally, Canada has shared its experience on the development and design of its *Nuclear Terrorism Act*, highlighting obstacles and how they were overcome, to help other States facilitate their own legislative efforts. Since October 2011, Canada's GPP has provided \$720,000 towards six regional workshops and provided follow-up assistance for the purpose of assisting other countries with the implementation of CPPNM/A and ICSANT through identifying and

addressing obstacles to ratification. These workshops facilitated the ratification of the CPPNM/A by eight countries.

b) UN Security Council Resolution 1540

Canada supports the full and universal implementation of United Nations Security Council Resolution (UNSCR) 1540 as a key tool in the global fight against weapons of mass destruction (WMD) proliferation and terrorism. The Resolution imposes several binding obligations on States to establish and maintain domestic controls to enhance the security of nuclear materials, in line with the objectives of the NSS.

At the 2014 NSS, Canada and the Republic of Korea welcomed the support of 32 countries and the UN for the joint statement on the full and universal implementation of UNSCR 1540. This joint statement encouraged participating States to offer assistance to help other States implement the nuclear security provisions of UNSCR 1540 and to advance key 1540 Committee priorities. Canada also circulated the joint statement at the May 7, 2014, UNSC Special Session on the 10th anniversary of UNSCR 1540, where the text was submitted to the UNSC for inclusion in its record of the debate. At the 2016 NSS, Canada worked with Spain and the Republic of Korea to renew the 2014 joint statement on UNSCR 1540 with a 2016 joint statement outlining further voluntary actions for States to undertake, such as advocating for better coordination and cooperation between the 1540 Committee and key international nuclear security organizations and institutions.

Canada's GPP works closely with the 1540 Committee to look for ways to address outstanding needs for the implementation of UNSCR 1540, including a coordination role for the 1540 Committee. To this end, Canada welcomes the regular participation of 1540 Committee experts in recent Global Partnership Working Group meetings, and strongly supports the 1540 Committee's ongoing efforts to achieve the universal implementation of 1540.

Canada's GPP programming unit for UNSCR 1540 works to reduce the threat posed by terrorist acquisition of WMDs and related material by increasing States' capacities to prevent the proliferation of chemical, biological, radiological and nuclear (CBRN) weapons and their means of delivery, and establish domestic controls over related materials to prevent their illicit trafficking. The three main pillars of the GPP UNSCR 1540 programming unit are: 1) providing

CBRN related training and equipment; 2) providing legislative and regulatory assistance for CBRN-related treaties; and 3) enhancing export controls and border security. This GPP programming unit also works with the UNSCR 1540 Committee to respond to UN Member States' requests for assistance.

Domestically, Canada has provided the UNSCR 1540 Committee with an updated UNSCR 1540 National Implementation Action Plan further to a commitment made at the 2014 NSS. This plan outlines both domestic and international plans and priorities for implementing provisions of UNSCR 1540, which will further enhance Canada's ability to prevent WMD proliferation and terrorism.

5. Contribution To and Use of the IAEA's Nuclear Security-Related Activities and Services

Canada currently ranks as the third-largest national contributor to the IAEA's Nuclear Security Fund, having contributed over \$20.6 million through the GPP since 2004. Results include: physical upgrades to radiological security and associated facilities; radiological source recovery and end-of-life management; enhanced physical security and the lock-down of weapons-usable materials at nuclear sites; and enhanced capacities of Member States to manage and respond to nuclear and radiological threats. Canada actively contributes to the development of the IAEA's Nuclear Security Series, most recently by participating in the Nuclear Security Guidance Committee and assisting in the development of documents within the Nuclear Security Series. Canada also supported the revision of international guidance on measures against the insider threat, facilitated the development of related training materials and instructed at an international training course.

In 2014, Canada participated in and provided support for the organization of the International Conference on Advances in Nuclear Forensics. In June 2015, Canada participated in the International Conference on Computer Security in a Nuclear World: Expert Discussion and Exchange. Canada led a computer security demonstration, chaired a Main Session and two Technical Sessions and presented six papers. Canada welcomes the 2016 International Conference on Nuclear Security to be held in December 2016 and will participate actively in the Conference by supporting renewed engagement by IAEA Member States to tackle the challenge of nuclear security in light of new threats and challenges.

a) IPPAS Mission

Further to a commitment made at the 2014 NSS in The Hague, Canada hosted its first IAEA International Physical Protection Advisory Service (IPPAS) mission from October 19-30, 2015. At Canada's request, the IPPAS mission reviewed all five IPPAS modules, including Canada's security-related legislative and regulatory regime for nuclear material and nuclear facilities, as well as the security arrangements applied to the transport of nuclear material, the security of radioactive material and associated facilities and activities, and the information and computer security systems in place. The team visited several facilities, including power reactors and research reactors, to review physical protection systems.

The IPPAS Mission's final report provides a comprehensive overview of Canada's nuclear security regime which it assesses as robust, resilient and sustainable. Canada values the IPPAS mission's report and findings, noting in particular the opportunity to further hone our nuclear security regime and share our good practices. Canada remains a strong proponent of the voluntary disclosure of information from IPPAS missions in order to better build up a global repository of best practices and lessons learned and will publish a publicly available summary of the IPPAS mission report. Canada values the creation and implementation of IAEA Nuclear Security Guidance documents and supports continuously improving physical protection and nuclear security both nationally and globally. To this end, Canada has assisted the IAEA in its undertaking of IPPAS missions to other countries including the United Kingdom, Indonesia, Hungary, Romania, the U.S. and Australia.

b) Nuclear Security Support Centre

Nuclear Security Support Centres (NSSC) can help to ensure sustainable and effective nuclear security by facilitating the development of the necessary knowledge, expertise and skills for personnel with a responsibility for nuclear security. Canada therefore continues to support the IAEA in its efforts to establish NSSCs and provided a presentation at the August 2015 working group meeting on the Canadian Regulatory Framework and training of personnel at nuclear facilities.

The CNSC is continuing to explore the establishment of a virtual NSSC to help ensure sustainable and effective nuclear security. In May 2015, a workshop on "Meeting Canadian

Commitments for Demonstrable Competency in Nuclear Security Regulation and Implementation” was held with participation from Canadian nuclear security stakeholders and WINS with the goal of creating a common competency framework and professional development curriculum for nuclear security regulators and licensees.

6. Support for Nuclear Security-Related International Activities

Canada participates in all major nuclear security-related international activities, including the G-7 Nuclear Safety and Security Group (G-7 NSSG), the GICNT, the Proliferation Security Initiative (PSI), INTERPOL and the Global Partnership Against the Spread of Weapons and Materials of Mass Destruction (GP) and works with the UNSCR 1540 Committee and its Group of Experts.

a) Global Partnership Against the Spread of Weapons and Materials of Mass Destruction

In recognition of the threat posed by terrorist acquisition of weapons and materials of mass destruction (WMD) the then-G8 launched the GP under Canada’s leadership at the 2002 Kananaskis Summit. Canada is an active participant in the GP and co-chairs the Global Partnership Expansion and Outreach Working Group.

Canada’s GPP supports the GP with projects to prevent WMD proliferation and reduce the threat posed by CBRN terrorism. The GPP implements projects worldwide in priority areas including: nuclear and radiological security; biological security; and support for the implementation of UNSCR 1540 and chemical weapons destruction.

To date, Canada’s GPP has spent over \$1.2 billion on WMD threat reduction programming. At the 2014 NSS, Canada committed \$28 million to further nuclear security programming, which has been fully disbursed and resulted in enhanced physical security of nuclear facilities, with a focus on Southeast Asia, mitigation of the illicit trafficking of nuclear and radiological material in the Middle East, and enhanced the security of radioactive sources in Latin America.

At the 2016 NSS, Canada is pleased to announce \$42 million in additional projects to further enhance nuclear and radiological security, and maintain momentum beyond the NSS process.

b) Global Initiative to Combat Nuclear Terrorism

Canada is committed to the GICNT goal of strengthening global capacity to prevent, detect, and respond to nuclear terrorism. Canada is an active participant in GICNT events and exercises, including the Implementation and Assessment Group meetings and the GICNT biennial plenary meetings. Canada continues to lead in the development of technical advances in the area of nuclear forensics, and works closely with the GICNT Nuclear Forensics Working Group. For instance, Canada played a leading role in the development and delivery of technical exercises, including “Mystic Deer” in Budapest in October 2014 and “Glowing Tulip” in The Hague in March 2015. “Glowing Tulip” demonstrated the utility of strong legal provisions for criminalizing material out of regulatory control, highlighted good practices for laboratory management of forensics evidence, and provided partner countries with tools and information to increase the capacity of their national laboratories to provide expert testimony in a court of law.

Canada has also supported cross disciplinary events, such as the “Radiant City” event held in Karlsruhe, Germany, in May 2015, which examined the interplay between the areas of nuclear detection and forensics. Canada will continue its support of the GICNT by providing additional technical expertise for GICNT activities, such as Nuclear Forensics and Nuclear Detection work and other technical nuclear security work of the GICNT working groups.

c) Proliferation Security Initiative

Canada continues to work with other Proliferation Security Initiative (PSI) partners to enhance collective abilities to disrupt illicit shipments of nuclear and radiological weapons and related materials by sea, land, and air. This is accomplished through capacity-building exercises, the exchange of information and best practices, and participation in practical exercises. In September 2014, Canada funded a regional PSI Seminar in the Caribbean that brought together CARICOM partners to encourage their participation in the PSI and to enhance WMD interdiction-relevant capabilities and cooperation in the region. Canada also hosted the PSI Operational Experts Group (OEG) meeting in Ottawa in May 2015, which helped to focus PSI efforts on new proliferation challenges, including proliferation financing and intangible technology transfer. Domestically, Canada will continue to share domestic lessons learned with partners and contribute materials to the Critical Capabilities and Practices (CCP) Tools and Resources Library.

7. Partnering with External Stakeholders

a) Cooperation between Government and Nuclear Industry

Given the important role played by the nuclear sector in ensuring that standards in nuclear security are upheld, Canada continues to place emphasis on strong cooperation between industry and government. This helps to ensure relevance and transparency in the creation of domestic compliance systems for both nuclear safety and nuclear security. Ongoing efforts to phase out the use of HEU-based production of medical isotopes in Canada is one example of close cooperation between government and industry.

The Government of Canada has invested approximately \$60 million to support research and the development of alternatives to HEU technologies in the production of medical isotopes technologies, as well as to encourage their uptake by industry. Specific investments in alternative production technologies that do not use HEU and reduce radioactive waste in isotope production include the Non-Reactor-Based Isotope Supply Contribution Program (2010 – 2012) and the Isotope Technology Acceleration Program (2012 – 2016) by Natural Resources Canada. Additional efforts have been directed towards developing cyclotrons and linear accelerators for use in the production of the key medical isotope, technetium-99m. Partners in these programs have upgraded infrastructure and equipment, and are now undertaking the clinical trials necessary for licensing. These cooperative efforts aim to reduce the use of HEU as well as to achieve a more diverse and secure supply of isotopes.

Additionally, Canada participates in five multilateral export control regimes aimed at preventing the export of goods and technology that can be used in WMD programs or delivery systems: the Nuclear Suppliers Group (NSG) and Zangger Committee (ZC), the Australia Group (AG), the Missile Technology Control Regime (MTCR) and the Wassenaar Arrangement (WA). Under these arrangements, Canada has undertaken measures to control export of goods and technology in order to ensure that they are not used in WMD programs or delivery systems, and provided information to exporters regarding implementation of requirements under the *Export and Import Permits Act* and the *Nuclear Safety and Control Act*, which codify in Canadian law Canada's political commitments made through participation in the five foregoing regimes.

b) Partnership with NGOs

Canada was one of the founding donors to the WINS Academy, a leader in professional development and certification for nuclear security management, and continues to provide financial and technical support. Further to a commitment made at the 2014 NSS, Canada's GPP provided funding towards a project with the WINS to develop a competency framework for personnel and management with accountabilities for nuclear security. A related best practice guide was published in 2015. In the context of the 2016 NSS, Canada has worked with the United Kingdom and other contributors to the WINS Academy to issue a gift basket which encourages expansion of WINS' international certification program, and urges NSS participating states to contribute to the Academy's continued development.