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RADON EXPOSURE IN NOVA SCOTIA: CHALLENGES AND SOLUTIONS WORKSHOP

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1.0 INTRODUCTION

Radon is a naturally occurring radioactive gas that is formed when uranium decays in soil and rock. It is the second leading cause of lung cancer after smoking. In Nova Scotia it is estimated that 11% of the population lives in homes that exceed the indoor air radon guideline, compared to the national average of 7%. There are approximately 710 lung cancer deaths each year in Nova Scotia. Based on Health Canada's estimate that 16% of lung cancer deaths are attributable to radon, it is estimated that radon causes more than 100 deaths per year in Nova Scotia.

A workshop entitled "Radon Exposure in Nova Scotia: Challenges and Solutions" was held on May 26th, 2016 in Halifax to discuss this problem. It was co-presented by CAREX Canada, Health Canada, the Government of Nova Scotia, the Canadian Association of Radon Scientists and Technologists (CARST), and the Canadian National Radon Proficiency Program (C-NRPP). The workshop was an opportunity to gain a better understanding of radon exposure in Nova Scotia and surrounding regions, and identify opportunities for reducing those exposures. Specific objectives of the workshop were to:

- Learn about radon exposure and prevention efforts in the region;
- Connect with others working on radon in multiple jurisdictions; and
- Identify opportunities to develop radon exposure prevention policies and programs.

The workshop was attended by approximately 50 people including industry professionals (44%), researchers (19%), public health practitioners (7%), occupational health and safety officers (4%), epidemiologists (4%) and other professionals (building engineer, home inspector, NGO, educator, counsellor, geoscientist) (22%).

This report provides a summary of the workshop presentations and associated discussions. Copies of the presentations are available on the CARST website: <http://www.carst.ca/NovaScotia2016>.

2.0 PRESENTATIONS – KEY POINTS

2.1 Opening Remarks

Dr. Robert Strang, Chief Public Health Officer, Government of NS

- Radon is an important public health issue in Nova Scotia and this workshop provides an opportunity to bring together professionals from multiple disciplines to help reduce radon exposures.
- It is estimated that radon causes 114 lung cancer deaths in Nova Scotia each year, based on Health Canada's estimate that 16% lung cancer deaths are linked to radon.
- In 2007, Nova Scotia initiated an indoor air radon testing program for all provincially-owned buildings (including schools, health care facilities, public housing, and government offices). Approximately 19,000 radon tests have been done on more than 2,000 buildings.
- In 2010, new National Building Codes were introduced to protect against radon. Nova Scotia has adopted these codes. The new codes require new homes to have a vapour barrier to reduce radon entry and a 'rough-in' for a radon reduction system.
- The Province has made good progress dealing with radon in public buildings, but more work is needed to ensure homeowners are testing and when needed, mitigating.

2.2 Radon and Lung Cancer

Dr. Anne-Marie Nicol, CAREX Canada

- Radon is one of the most important causes of lung cancer world-wide.
- CAREX Canada research shows that radon is the highest priority indoor air carcinogen (compared to other chemicals such as asbestos, benzene, formaldehyde). It is clearly linked to lung cancer; radon is ranked as a known carcinogen by the International Agency for Research on Cancer. New research is looking at radon's link to other effects, such as blood cancer.
- Statistics Canada's 2013 Households and the Environment Survey results show that approximately 30% of Nova Scotians that have heard of radon were able to correctly describe it, and only a small percentage of homeowners in the province have tested

their homes.

- Reasons for people not testing include: testing is optional (i.e., not required by regulation), denial or lack of awareness of radon risk, lack of access to test kits, and fear of remediation costs.
- To reduce radon exposure there is a need for: leadership from multiple agencies and groups (government, trades, researchers, real estate professionals, etc.), increased awareness, and financial incentives (tax credits, renovation incentives).

2.3 *Radiation 101: Radon*

Dr. Roby Austin, Saint Mary's University

- Radon is a naturally occurring chemical element and noble gas. It is colourless, odourless, and tasteless. It is radioactive with a half-life of 3.8 days and decays by emitting alpha particles.
- Radon is particularly dangerous because it is a gas, which provides a fast mode of transportation into the body by inhalation.
- The alpha particles emitted during radon decay shear through the DNA in lung tissue and increase the likelihood of errors in DNA replication, which can lead to developing cancer.
- Radon is analogous to a bull in a china shop, with the large alpha particle emissions being destructive to lung tissue.

2.4 *Radon: What You Need to Know, Federal Regulations, Guidelines, and the Cross-Canada Radon Survey*

Lance Richardson-Prager, Health Canada

- Health Canada radon priorities include national mapping/databases, building codes, and outreach/education.
- In 2007 the Canadian guideline for exposure to radon in indoor air was lowered from 800 Bq/m³ to 200 Bq/m³. The Canada Labour Code still uses 800 Bq/m³ in federal workplaces.
- In 2007 a radon testing program was initiated in federal buildings. As of 2013,

approximately 13,000 buildings had been tested, 3.8% of which exceeded the radon guideline.

- The Cross-Canada Survey of Radon Concentrations in Homes report was published by Health Canada in 2012. Approximately 14,000 radon tests were completed in households across the country. The results showed 6.9% of Canadians live in homes with radon levels above the current guideline. In Nova Scotia there were 595 tests done and the results showed that 10.7% of those homes had radon levels above the guideline.

2.5 Radon and Real Estate Transactions

Dawn Dauphinee, DOMUS Realty

- There seems to be increasing awareness about radon among homebuyers over the last 1-2 years.
- The timeline for most real estate transactions is 7-12 days, so there is not enough time to carry out the recommended 90 day radon test. Only short-term tests are possible (2-3 days).
- Homebuyers are using the online NS Department of Natural Resources radon risk map to help decide whether or not to test for radon.
- Homebuyers are concerned about the potential conflict of interest if the same person that tests for radon is selling mitigation solutions. Some people also consider radon to be an unjustified concern or fad that will eventually pass.
- Real estate agents generally have limited interest in learning about radon. A recent workshop was offered in which 50 real estate agents registered, but only 10 attended.
- Suggestions for improvement include: make radon testing a Canada Mortgage and Housing Corporation (CMHC) requirement (currently this is not a requirement for CMHC mortgages), provide radon literature to real estate agents to give to homebuyers, do a radon information mail-out via Canada Post when someone changes their mailing address.

2.6 Mapping Radon in Nova Scotia

John Drage, NS Dept. of Natural Resources

- Several indoor air radon surveys have been carried out in Nova Scotia buildings since the 1970s, including: 700 homes in 1990 (8% exceeded 200 Bq/m³), 19,000 tests on provincially owned buildings from 2007-2016 (6% exceeded 200 Bq/m³) and 600 homes (Health Canada Cross-Canada Survey) in 2012 (11% of population exceeded 200 Bq/m³).
- In 2013, the online radon risk map of Nova Scotia map was published. It divides the province into three risk areas: high risk (40% of homes exceed 200 Bq/m³), medium risk (14% of homes exceed 200 Bq/m³), and low risk (5% of homes exceed 200 Bq/m³). The map can be found here: <https://fletcher.novascotia.ca/DNRViewer/?viewer=Radon>
- Exposure to radon can occur through indoor air inhalation and ingestion of drinking water. However, inhalation is the most important exposure route. The World Health Organization states that ninety-five percent of radon exposure is from indoor air, with 1% coming from the ingestion of drinking water. However, radon in water can be released to air and cause an increase in indoor air radon levels. If radon levels in water are high enough they can cause a significant increase in the indoor air radon level and action may be required. There is no drinking water guideline for radon in Canada, but Health Canada recommends action be taken to prevent radon release from water if levels exceed 2,000 Bq/L.
- Private water wells are more likely to have high radon levels than other types of water supplies, such as municipal water supplies. The two largest surveys of radon in well water in Nova Scotia were completed in the 1970s. In total, 1,600 wells were tested. The results show that drilled wells in granite have the highest radon levels, averaging 930 Bq/L. The maximum level reported was 22,000 Bq/L.

2.7 Experiences From Housing Nova Scotia's Radon Testing and Mitigation Program

Frederick Drebot, Housing Nova Scotia

- Housing Nova Scotia has performed over 8,000 radon tests. Building types tested include single family homes, 1/2/3 storey multi-unit residential buildings (MURBS), and

tall multi-unit buildings (>3 storeys).

- After initial testing comes follow-up testing and mitigation. The main types of mitigation are sub-slab depressurization and suction combined with crawl-space sealing (with plastic sheeting and construction tape).
- Typical mitigation costs are \$1,800 for side wall venting and \$2,500 for attic venting.
- Radon problems are usually found only on the lower storeys, and no problems have been found in upper floors. However, there have been concerns about possible radon migration to upper floors through elevator shafts.

2.8 Radon and Home Inspections

Lawrence Englehart, Global Property Inspections

- It is important to educate the public about radon using simplified messages and plain language. Radon science is complicated and it can be confusing to the public to have different action levels from different jurisdictions (i.e., 200 Bq/m³ in Canada, 148 Bq/m³ in US, 100 Bq/m³ WHO).
- Radon is challenging in real estate transactions due to timelines around purchase (commonly 7 to 12 days) and the conditions required for short-term testing (i.e., “closed house conditions”).
- The “closed house conditions” test is a 3-day test in which windows and exterior doors are kept closed and exhaust fans are not used. It can be challenging to do this test during the summer because the house gets hot, which is uncomfortable for residents. A long-term radon test (90 days) is still recommended after the house sale.
- It is not uncommon to see high radon levels in homes that have been mapped as “low risk areas”, so all homes should be tested. In addition, even newly constructed homes that meet current building codes can have radon problems. Sometimes the radon rough-in pipe in the basement is placed in a location that makes it un-useable.

2.9 C-NRPP Certification Program and Canadian Radon Standards

Pam Warkentin, CARST and C-NRPP

- The Canadian Association of Radon Scientists and Technologists (CARST) represents

radon professionals and supports and assists them working in the industry. The goals of CARST include raising public awareness, offering professional development/education for radon professionals, developing partnerships with public and private organizations, and developing standards for radon measurement, mitigation, and new construction techniques.

- The Canadian National Radon Proficiency Program (C-NRPP) provides professional certifications and establishes standards of excellence and best practices. C-NRPP works in cooperation with CARST, Health Canada, and NRPP (i.e., the US National Radon Proficiency Program) to ensure radon professionals are appropriately trained and follow guidelines.
- C-NRPP provides certification for measurement and mitigation professionals, Controlling Radon in New Canadian Homes (CRNCH) certification, and radon measurement devices and analytical laboratories. As of 2014, C-NRPP had 139 certified measurement and 77 certified mitigation professionals across Canada.
- C-NRPP recently worked with its partners to advocate for a homeowner loan program in Manitoba for radon mitigation. In 2015, Manitoba Hydro became the first utility in Canada to provide a loan program to help finance radon mitigation work for its customers.

2.10 Does Radon Pose a Risk to Nova Scotia Workers?

Helen Mersereau, Cape Breton University

- In 2008, a study was carried out to test radon levels in indoor air at workplaces in Nova Scotia. Two hundred radon measurements were completed at 21 different workplaces.
- The testing was done because Nova Scotia is known to have higher residential radon levels than the national average, higher lung cancer rates than the national average (78 cases per 100,000 people in Nova Scotia vs. 56 cases per 100,000 people nationally), and higher smoking rates than the national average. There was also a lack of information about workplace exposure to radon in the province.
- The results showed that none of the workplaces exceeded the residential radon guideline of 200 Bq/m³, although two workplaces had levels above 150 Bq/m³. Smaller offices had higher radon levels than large industrial workplaces. The low radon results

were possibly due to good natural and mechanical ventilation, and the lack of radon impacted soil and water at the locations that were tested.

- More information about the project can be found here:
<http://www.worksafebc.com/en/resources/about-us/research/breaking-new-ground-does-radon-present-a-health-risk-to-nova-scotia-workers?lang=en>

2.11 Radon Education and Outreach: The Take Action on Radon Campaign and the Timberlea Radon Pilot Project

Roshini Kassie, NB Lung Association & Robert MacDonald, NS Lung Association

- The Lung Association's radon work focuses on awareness, education, and promotion of radon testing and mitigation.
- [Take Action on Radon](#) is an education/awareness initiative that brings together a wide variety of stakeholders and provides nationally-branded educational and marketing materials. It also coordinates the national Radon Action Month in November.
- In New Brunswick, activities include community testing programs (200 tests in Tracadie and 400 in Bathurst), training sessions with the NB Real Estate Association, development of a new radon disclosure statement for property transactions, as well as media/social media initiatives.
- In Nova Scotia, a pilot radon testing program was launched in November 2015 in the Tantallon area. Two hundred test kits were distributed. Preliminary results show that 62% of the tests exceeded 200 Bq/m³ (i.e., 41 of the 66 test results received to date). The highest result was 1,332 Bq/m³ and the average was 409 Bq/m³. Word of mouth and social media spread awareness about radon testing during the project, resulting in additional residents deciding to test. The NS Lung Association sold 500 radon test kits in November and December 2015. Local radon contractors said that this survey resulted in several new mitigation projects.
- In 2015 a white paper was prepared on options to reduce radon mitigation costs for Canadians. Recommended options included integrating radon testing into residential energy efficiency programs, making changes to the building code, and offering property tax loan and financing programs as well as income tax rebates.

2.12 Panel Discussion: Challenges and Solutions for Reducing Radon Exposure

- Radon database – It was suggested that a database be developed to accept radon test results from various sources, including government surveys and data collected by homeowners and contractors. This would provide a clearer picture of the high risk radon areas in the province.
- Radon in well water – There is need for greater knowledge and guidance on radon in well water.
- Radon awareness – Radon testing should be promoted with more radon awareness initiatives. It was noted that community Facebook pages were an effective way to spread awareness and increase testing during the NS Lung Association project in the Tantallon area. Once one person tested and found high radon levels in a neighbourhood, the news spread and other homeowners decided to test.
- Coordination of organizations – There is a need for greater coordination between mortgage and insurance companies to address radon issues.
- Warrantees – Ontario has voluntary warranty clause for homes that includes the testing and mitigation of radon within the past 7 years. There is a need for more programs similar to Ontario's that can add a warranty for radon testing and mitigation.
- Short-term testing – There was a discussion regarding short-term versus long-term testing and which one is better. Given the time constraints during a property transaction, short-term tests are necessary to provide a preliminary indication of potential radon problems. Long-term testing is always recommended as follow-up work.

3.0 SUMMARY & PATH FORWARD

Results from the workshop indicate that radon exposure is an important public health issue in Nova Scotia and that additional work is needed to reduce this exposure and associated lung cancer cases. Nova Scotia has higher residential radon levels than the national average and it is estimated that radon exposure causes more than 100 lung cancer deaths per year in the province.

It is clear that radon exposure is preventable using proven and widely available testing and mitigation methods. The Province has made excellent progress with its program to test and mitigate radon in public buildings. However, more work is needed to ensure homeowners are aware of radon and that all homes are tested and then mitigated, if required. Survey results show that only a small percentage of Nova Scotians have tested their homes for radon.

The recommendations discussed at the workshop to reduce radon exposure included:

- Offer additional radon education and outreach programs;
- Work with financial institutions, the insurance industry, and the CMHC to make radon testing and mitigation a requirement during property transactions;
- Integrate radon testing and mitigation into residential energy efficiency programs;
- Improve building codes to proactively prevent radon exposure in newly constructed homes;
- Consider property tax loan and financing programs for radon mitigation;
- Consider income tax rebates for radon mitigation;
- Offer free radon testing programs for homeowners;
- Regulate mandatory radon testing; and
- Determine the health risk of radon in Nova Scotia and associated medical costs.

These recommendations may be addressed by a range of stakeholders including all levels of government, non-government organizations, and existing radon groups, such as the Atlantic Radon Task Force and Take Action on Radon.

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