



**BC LUNG**  
**FOUNDATION**

## Executive Summary

Radon is a colourless odourless and radioactive gas that emanates from the ground. When dispersed to the outside it is diluted and is relatively harmless, but it can accumulate in buildings to levels that pose significant health risks. While over 3300 Canadians a year die from radon induced lung cancer, these numbers can be significantly reduced through ensuring homes and workplaces are tested, and radon prevention systems put in place.

Our project on Energy Efficiency and Radon highlights how efficiency measures can make radon worse without due care and attention. Radon can accumulate in buildings which are made more airtight, or which have reduced air pressure, but measures can be taken to test for radon and take steps to prevent it building up. In ***Energy Efficiency and Radon: Making the Connection*** we review academic literature on the links between efficiency measures and radon. In a further legal analysis, titled ***Energy Efficiency and Radon: Recognizing Legal Liabilities*** we emphasize that there is a duty of care on personnel in the energy efficiency industry to ensure they do not put clients at elevated health risk. In ***Energy Efficiency and Radon: Gaps in the System*** we analyze the current energy efficiency system in Canada, how newer homes are made increasingly efficient, and efforts to support energy upgrades in older homes. We reviewed building codes, green building standards, Natural Resources Canada training and certification for energy advisors and key grant programs. We found that in Canada there is very little recognition of the problem of how energy efficiency can increase radon levels, nor of the implications given legal duties of care. Alternatively, other countries, such as the United States, have produced clear guidance on the issue.

Radon is easy to test and to fix— it just requires homeowners, landlords and employers to understand the problem and have incentives or requirements to attend to the issue. We think energy advisors and contractors can be better educated on the matter,. Efficiency guides and manuals need to be updated. Clear warnings about the dangers of radon from energy efficiency upgrades need to be provided to consumers of energy efficiency products, energy assessments and retrofit services, and steps taken to ensure retrofits do not cause unnecessary harm. Programs that provide grants, subsidies, or financing for energy efficiency upgrades need to include radon mitigation as an eligible expense.

## Energy Efficiency and Radon: Solutions Moving Forward

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To find project documents, visit BC Lung's website on Radon and Energy Efficiency, at <https://bclung.ca/programs-initiatives/healthy-indoor-environments-program/current-projects/radon-and-energy>

**About our program.** The BC Lung Foundation's Healthy Indoor Environments program is focused on providing education, resources, and policy options for addressing priority indoor air pollutants in British Columbia. Canadians spend 90% of their day indoors, with about 70% at home and 20% at work or school. The air we breathe indoors can contain particulates, gases, allergens and fumes that can significantly affect our health in both the short and long term. Knowing the main indoor air pollutants, their sources, and how to reduce them are key to reducing harm to our health. Radon has been identified as the leading environmental carcinogen in Canada. For more information visit our website at <https://bclung.ca/programs-initiatives/healthy-indoor-environments-program>

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### 1. Introduction

Energy efficiency measures (also sometimes called ‘winterization’ and ‘weatherization’) aim to reduce the amount of energy homes and other buildings use. While an important way to conserve energy resources and to reduce greenhouse gas emissions, if not done right they can increase levels in homes of radon gas, Radon is a radioactive gas that seeps up from the ground and can accumulate in buildings and is the second leading cause of lung cancer, after smoking.

In a companion document, *Energy Efficiency and Radon: Making the Connection* we review research that shows energy efficiency measures, whether in new homes or upgrades in older homes, can increase radon levels unless further steps are taken to test for and mitigate radon.<sup>1</sup> When efforts are made to make a home more airtight, the result can be less airflow and less chance to dilute radon. Renovations may also change how air pressures work. Radon is sucked into a home because lower parts of the home often have lower air pressure relative to the air outside and below the home. In an airtight home, exhaust fans in kitchens and bathrooms can lower air pressures throughout the building. In *Energy Efficiency and Radon: Recognizing Legal Liabilities* we provide an analysis of Canadian law which suggests ignoring radon creates significant legal liabilities for persons who build homes, produce energy efficient products that make homes more air tight, and who advise on, and conduct energy retrofits. Energy efficiency personnel need to ensure that homeowners, landlords and employers know the risks of radon from efficiency improvements, and we suggest an informed consent process familiar from products and process which increase health risks. Contractors, grantors and lenders should see radon mitigation as an essential part of the retrofit process. In *Energy Efficiency and Radon: Gaps in the System* we show how there is a widespread lack of communication and action in Canada to address the problem, with energy advisors failing to warn consumers or otherwise act on the problem.

Here, we suggest solutions moving forward that can reduce risks of liability, empower consumers, and save lives through spreading education, awareness on radon, ensuring radon mitigation is financed, and radon mitigation included in the retrofit process.

### 2. Radon and IAQ in Building Codes and Building Certification Standards

In *Energy Efficiency and Radon: Gaps in the System* we reviewed building codes across Canada and select green and energy efficiency certification standards for new buildings. There continue to be serious shortcomings in building code provisions in many provinces. Fortunately, the Canadian Standards Board’s *Radon control options for new construction in low-rise residential buildings* offers up to date technical specifications for new construction.<sup>2</sup> There is also good evidence that some efficiency features, such as sub-slab insulation and membranes and heat recovery ventilators (HRVs) can work synergistically with radon systems for further improvement.<sup>3</sup> Currently, Codes Canada has a task group underway that is working on updating the radon provisions in the National Building Code (for 2024) and it is expected to align with the CGSB standards for passive systems (or “Level 2”).<sup>4</sup> Provincial governments (and where possible, municipal governments) should require passive radon systems in new construction, built to the CGSB standard for Level 2, in areas where there is evidence of radon over the Canadian Guideline in buildings. There is also an important role for home warranty systems to ensure radon is

covered, which can help remind homeowners to test after occupancy and allow homeowners redress if radon systems installed by builders are not working sufficiently.

There are many voluntary green certification standards in Canada. We found that a majority of those reviewed did include provisions for radon. However, there was clearly a distinction between holistic standards which were concerned with a variety of environmental and health concerns, and others narrowly focused on reducing energy use and greenhouse gas emissions. Of the standards we found that focused exclusively on energy efficiency, 3 out of 4 had no provisions for radon. Scientific research makes clear that efficiency measures that ignore ventilation or radon resistant construction techniques can create significant health risks. A reductionist ‘energy only’ approach is an irresponsible strategy and needs to be supplanted by one that ensures new buildings improve, rather than make worse, health outcomes.

### 3. Radon and IAQ in Retrofit Codes

There are now efforts by many governments in Canada to introduce renovation codes for buildings, such as the Natural Resources Canada (NRCan) Joint CCBFC/PTPACC Task Group on Alterations to Existing Buildings, and the British Columbia Government’s Existing Building Strategy. New retrofit codes will be an important step for climate action, but should also ensure that building retrofits improve, rather than make worse, indoor air quality and health outcomes. Retrofit Codes should provide for advisors and contractors to explain indoor air quality and radon risks, leave educational materials with clients, and for ventilation and radon testing and mitigation as part of minimum standards in retrofits.

### 4. Education and Training

In *Energy Efficiency and Radon: Gaps in the System* we reported on interviews with 14 energy advisors and found most did not understand radon, and did not communicate or share information with clients about it. This suggests the message about radon risks is not getting through. At the same time, most of the advisors were open to new training and thought the issue was important. NRCan has a central role in designing, administering, and regulating energy advisors, and is well positioned to make changes.

We think its important that energy advisors understand radon, how it enters buildings, and the ways that energy efficiency can contribute to elevated radon levels. There are many opportunities for this to happen, ranging from special information sessions and webinars by building or energy efficiency associations to mandating training.

We heard from advisors, especially some who worked in training, that there is a lot of information for them to understand. However, its extremely important for advisors to be aware of potential negative effects of energy efficiency. It is not asking too much for advisors to spend a few hours of training to understand indoor air quality and radon as part of ensuring that their work is not creating unnecessary risks or even contributing to death.

We recommend:



## Energy Efficiency and Radon: Solutions Moving Forward

- NRCan ensure trainees have up-to-date materials on indoor air quality and radon and make clear that this is part of exams.
- Radon be included in ongoing training for advisors who are already trained, such as through a two-hour session taught by the Canadian National Radon Proficiency Program (C-NRPP), Health Canada or lung and cancer non-profit organizations.
- NRCan should send a clear message, e.g. through a memorandum and updated policies, to existing advisors on the need to understand radon and act on it.

In what follows we give specific directions for what should be included in NRCan materials, and what NRCan should instruct advisors to do.

### 5. Clear Messaging in Guides and Manuals

The current guidance on radon and energy efficiency from NRCan— *Keeping the Heat In and Renovating for Energy Efficiency* —is insufficient and out of date. NRCan should work with C-NRPP, Health Canada, and/or lung and cancer non-profit organizations to update these materials to make clear that radon is the leading cause of lung cancer after smoking, killing over 3300 persons a year in Canada, that Health Canada recommends testing all homes and specifically identifies retrofits as a reason to make a new test, and that energy efficiency measures may increase radon levels through making the space more air tight or effecting building pressure.

### 6. Clear Warnings to Clients

Energy advisors and contractors need to ensure that clients receive warnings about radon, so at minimum clients can make an educated choice. Some advisors we talked to felt it was beyond their professional training and responsibility to discuss radon. It is true that advisors should not try to substitute for professional radon testers or mitigators. However, they can and should tell clients about local radon levels (by reference to publicly available radon maps), that radon is a significant health issue, and that it is important to test for radon in a new home or after an energy upgrade. They should advise clients that in some cases energy retrofits can increase radon levels, but that this problem can be fixed through testing and mitigation. Advisors can easily have on hand and deliver prepared materials on radon, prepared by NRCan, Health Canada, and/or lung and cancer non-profit organizations.

NRCan currently oversees software used by energy advisors, called HOT2000. This automatically attaches warnings to Renovation Upgrades Report which is sent to advisors' clients. The current language and process in the Renovation Upgrade Report needs to be replaced. Our research found that most energy advisors did not know about these materials, and we can assume individual clients are not seeing them. Even if homeowners' attention were driven to these paragraphs, the contents remain vague. This language is insufficient to ensure energy advisors are protected from any liability and for homeowners to be properly warned. Energy advisors now currently advise installation of ventilation systems if a building reaches a threshold of airtightness—

they should now routinely advise clients to test for radon and if levels are over the Canadian Guideline, to hire radon mitigators.

The current Health and Safety Information attached to reports claims that it is “the sole responsibility of the homeowner to consult a qualified professional to determine potential hazards”. This being stated in a report sent out days or weeks after an energy advisors’ consultation does not make it so. As we spelled out in *Energy Efficiency and Radon: Recognizing Legal Liabilities* there are common law duties of care on energy efficiency industry personnel not to increase risks or cause lung cancer, including through ensuring adequate warnings to clients.

Currently, advisors are instructed to take special steps to inform clients and offer advice when they see signs of problems with ventilation (e.g. the building is too tight), vermiculite (which can contain asbestos), and carbon monoxide. NRCan thus already recognizes that there is an important role for advisors to give warnings on some health and safety concerns. NRCan needs to give specific directions to advisors to discuss radon, and can build this into the HOT2000 software— for instance, with triggers where buildings are made more air tight, or there are signs of depressurization in the building.

By giving clear talking points to advisors, NRCan can also avoid potential conflicts of interest advisors may find themselves in. Two energy advisors we spoke to highlighted this problem. Advisors may feel that raising the issue of radon will decrease the likelihood of persons wanting energy retrofits. Clear instructions from NRCan can remove decision-making on this issue from advisors—making clear that it is important to discuss the problem and that there are readily available solutions. Some energy advisors are also radon mitigators. If they are repeating language that comes from NRCan, there is less chance that clients would see them as promoting their radon business.

We suggest NRCan work with Health Canada and/or other health organizations to create specific materials on radon to leave with clients. We suggest that this includes long term radon test kits. Health Canada recommends long-term tests during the heating season. Suitable devices are available from lung health organizations for as little as 30 dollars, and reduced prices may be available for purchases in bulk.

## 7. Informed Consent

It is normal practice in medical contexts for patients to sign forms indicating awareness of health and safety risks. This follows from common law duties of informed consent for medical interventions. In *Energy Efficiency and Radon: Gaps in the System*, we note that in the US the Weatherization Assistance Program (WAP) has adopted a similar procedure for energy upgrades— clients sign off as to knowledge of radon risks before contractors begin work. As spelt out in *Energy Efficiency and Radon: Recognizing Legal Liabilities* we think energy efficiency upgrades should be viewed as valid intervention, but one for which the health risks require informed consent.

One advisor we spoke with felt there might be some logistical challenges for advisors to obtain consent— that this would slow down the advising process and so cost advisors money. However, this challenge also affects the medical community. Ensuring that clients are informed as to the risks they are taking on—especially when informing them can help remove the risks— is more than worth any inconvenience. Ideally, a well coordinated efficiency industry would be able to allocate the informed consent procedure to one key player—the final contractor who does the



work. However, in Canada's relatively uncoordinated system in which many participants have little specific training, or regulatory oversight, informed consent will need to be done by advisors, or made into a requirement of subsidy and incentive programs (as it is under WAP). A low-income (or simply cash-strapped) homeowner might acknowledge the problem and consent but still be unable to pay for radon mitigation— we thus stress below the further point that grants for energy upgrades and renovations need to include radon mitigation.

### 8. Avoid Harm

Contractors need, above all, to do what they can to avoid harm. This means taking steps to ensure retrofits do not raise radon levels at the outset, such as ensuring proper air sealing of the foundation and installing mechanical ventilation systems, and to test for and install radon mitigation systems if radon levels after upgrades are over the guideline. This is the approach taken in the EPAs' *Energy Savings Plus Health: Indoor Air Quality Guidelines*.<sup>5</sup> Similar reasoning should apply in Canada, but with one caveat. Because Canadian standards do not support short term radon tests, it is unlikely that a particular home will be able to have both pre-renovation and post-renovation radon tests. We suggest, instead, a post-renovation test: A precautionary approach suggests treating elevated radon found after upgrades as partially the result of the upgrades.

When contractors take on project management for home upgrades (overseeing multiple interventions such as insulation, new windows and doors, or heating system replacement) they should include radon testing and mitigation as part of the process. This will mean following up later and being available to oversee mitigation (which should be performed by CNRPP certified radon mitigators). Independent contractors who do small pieces of work— such as install windows which are known to increase indoor air quality and radon risks<sup>6</sup>— should ensure clients sign forms showing informed consent as to these health risks.

### 9. Radon in Grants and Incentive Programs

One of the main outcomes of the principle that upgrades should not create harm is that the scope of work needs to be reformed. An energy upgrade should include health and safety measures that address any risks created by that upgrade. Put simply, doing the job properly means doing what it takes to not increase risks. It follows from this that financial incentives and grants for energy retrofits need to cover the whole process. Homeowners will need to ensure there is a long term test taken and then, if necessary, a home visit from a radon mitigator, and this may take six months to happen. But the mere fact that the process takes time does not mean it should not be seen as a continuous process.

Financial incentives and grants for energy retrofits need to cover cost of radon mitigation. In *Energy Efficiency and Radon: Gaps in the System* we identified many programs that need to broaden the scope of grant coverage, including Canada Greener Homes, CMHC Green Homes, Ontario's Energy Affordability Program, Enbridge's Home Winterization Program, and Clean BC's various programs (including the Better Homes and Home Renovate Rebate Program, the Low Interest Financing Program, and the Income Qualified Program). We know this list is not complete —all programs that finance energy efficiency need to see testing and mitigation of radon as an essential part of the process.

## 10. Product Warnings

As we explain in detail in *Energy Efficiency and Radon: Recognizing Legal Liabilities* the duty to warn is an important principle found in common law, and enshrined in the regular practice of health professionals, and consumer products which bear health risks. Specific wording as to warnings are provided for many products, and required in regulations enacted under the *Canada Consumer Product Safety Act*, and the *Food and Drugs Act*. We think the time has come for product warnings on energy efficiency products such as windows, doors that can make homes more airtight, and extraction fans that can depressurize a house (and so draw radon in from the soil under the home). This process can be started now by manufacturers (recognizing that the common law principles may apply and taking due precautions) or by Health Canada.

## 11. Conclusion

Radon continues to a major cause of lung cancer in Canada, causing over 3300 deaths a year. Many of these are easily avoided through systematic attention to radon testing and mitigation in homes and workplaces. Energy efficiency improvements are a central and vital response to reducing greenhouse gas emissions and tackling the climate emergency. There does not need to be a conflict between efficiency and GHG reduction goals and human health and in fact they can go together— but only if some important changes are needed to current programs in Canada.

In new homes, improved energy efficiency is part of overall system design, and radon protection should be included in that design. We have good technologies and design to ensure radon is kept out, even when a building is constructed to high efficiency standards. Protections from new homes can be provided by updating Building Codes, green and energy efficient building standards, and home warranty for new homeowners.

Energy upgrades pose a distinct challenge, especially because homeowners, landlords and employers are asked to coordinate what can be a complicated process. However, energy efficiency initiatives in Canada are now significantly centralized, with Natural Resources Canada handling federal programs, and the NRCan energy advisor certification standardizing retrofit advice across the country. Some provinces, such as BC have also created central clearing houses for efficiency programs. This introduces the possibility of coordinated and strategic change to improve health outcomes. By including radon in the advising and retrofitting process, including making expenses for radon eligible in efficiency grants and financial support systems, significant headway can be made on reducing radon exposure.

The changes we propose are simple, easily accomplished and will have benefits in protecting the energy efficiency industry from legal risks, and providing clear health benefits to the general public over time.

### References

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