Adapting Canada's National Radon Program to emerging technologies

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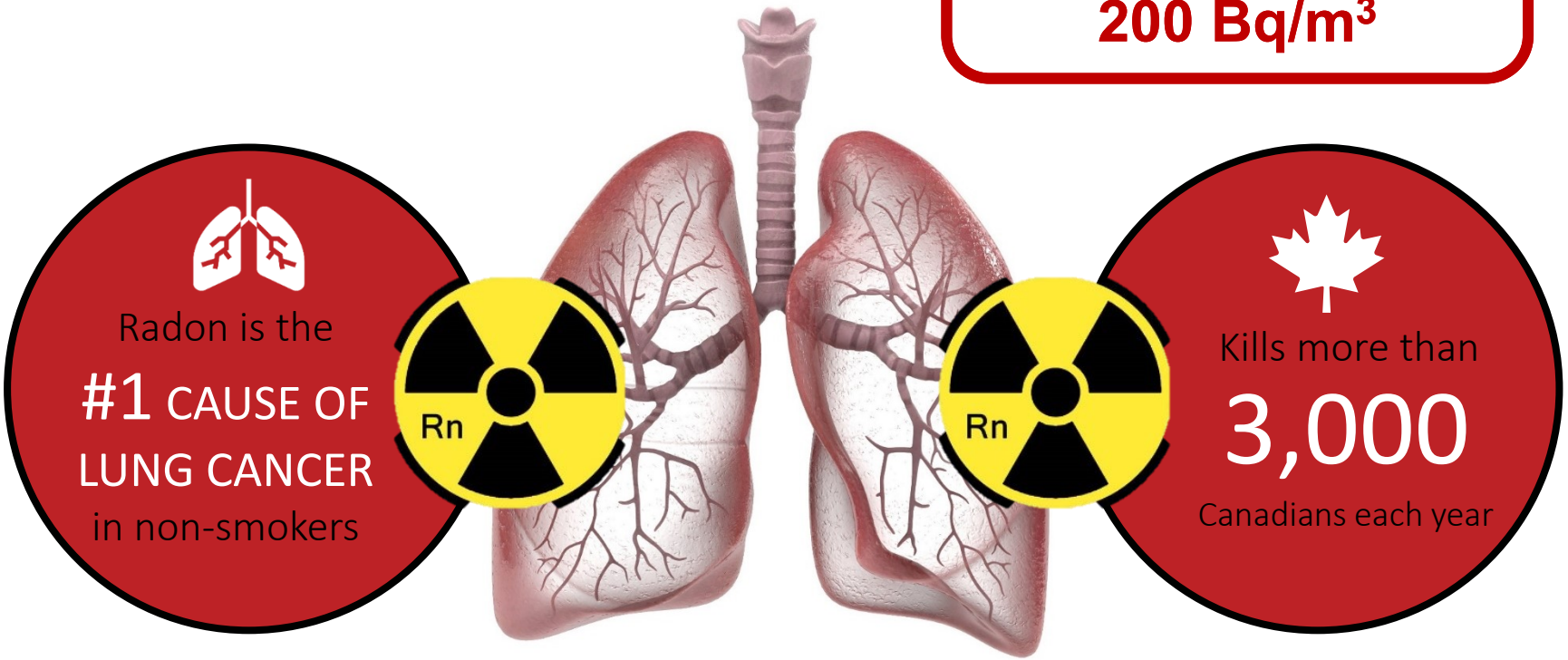
SNOLAB Users Meeting

June 26 – 27, 2024

BACKGROUND:

RADON HEALTH RISKS

Health Canada guideline level: 200 Bq/m^3



Radon is a known carcinogen (Group 1)

STATISTICS:

RADON AWARENESS AND TESTING

Voluntary Approach Is Not Effective

Knowledge of radon and testing. Stats Canada Table: 38-10-0086-01

*2023 not yet available

	2011	2013	2015	2017	2019	2021
Households that had heard of radon (percentage)	40	45	55	49	54	56
→ Gave correct description of radon	37	53	59	63	63	69
→ Gave incorrect description of radon	39	37	31	28	18	13
→ Could not describe radon (had only heard of it)	24	10	10	8	19	17
Had not heard of radon	59	53	44	50	46	44
Households which had heard of and also tested for radon	5	5	6	7	6	9

STATISTICS:

RADON AWARENESS AND TESTING

Many Canadians still haven't heard of radon…

Even fewer have tested…

Volun

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Stats Canada
Table: 38-10-0086-01

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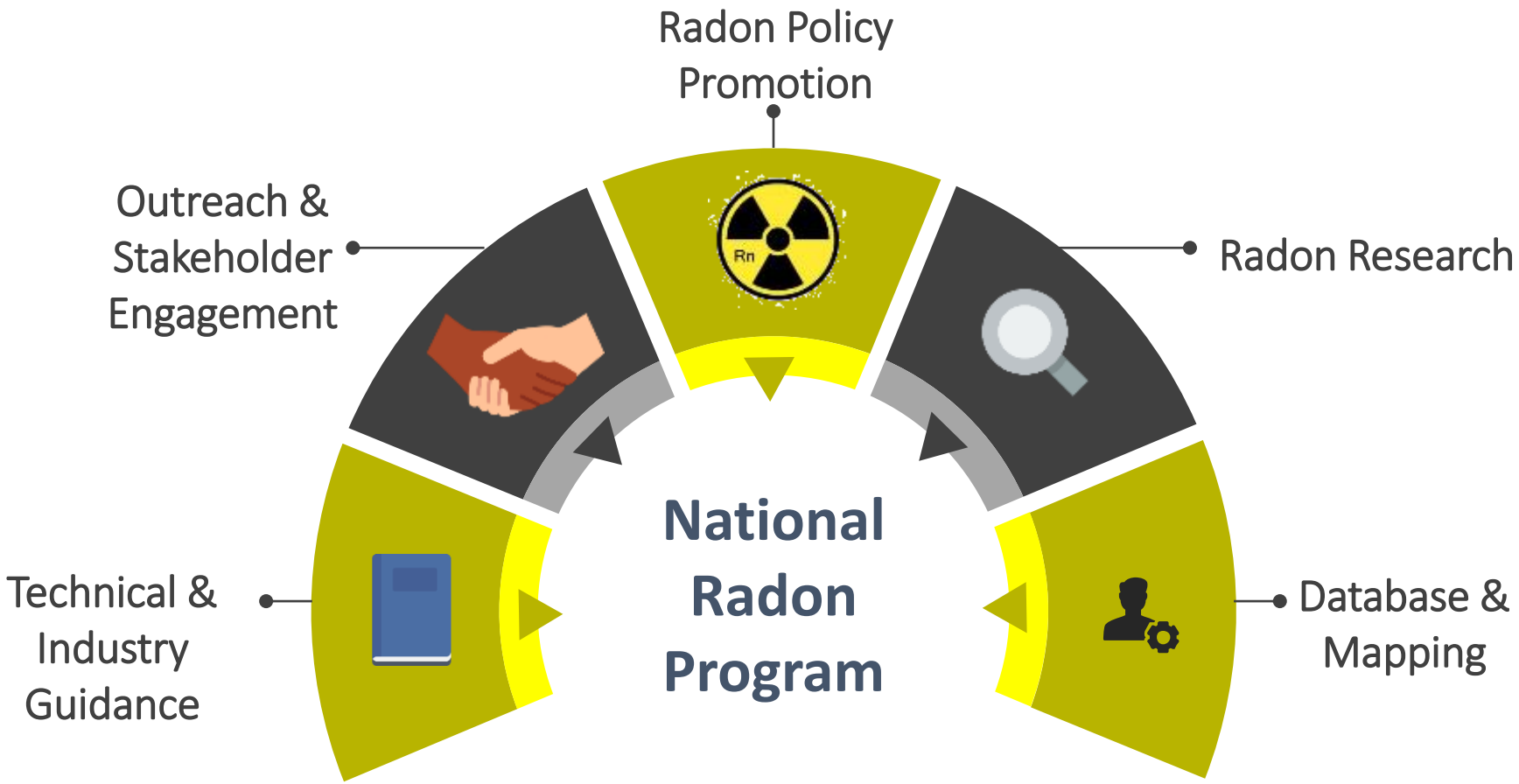
NATIONAL RADON PROGRAM:
OVERVIEW



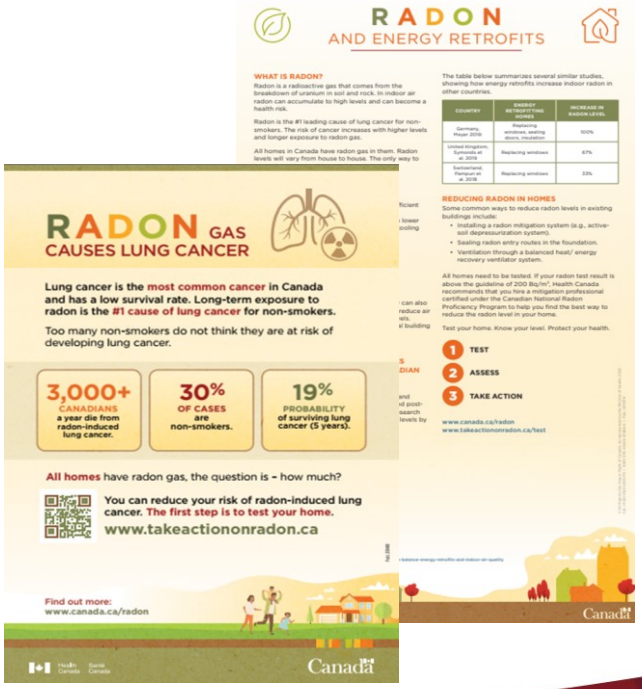
NATIONAL RADON PROGRAM: OUTREACH PROGRESS

HC Outreach Efforts	2008-2023
Outreach materials distributed	16,000,000
Web page views	2,500,000
Public inquiries	21,500
Outreach & Media events	3500

- PT / Municipal Radon Action Guides (RAG)
- Radon Gas Causes Lung Cancer postcard
- Radon and Energy Retrofits factsheet
- Radon Outreach Contribution Program

Take Action on Radon (TAoR) Network and Campaign

- 100 Test Kit Challenge and Mitigation rebate programs
- White Ribbon Program: Focused on families with lung cancer.
- TAoR Smoker's Helpline Radon Program



TAKE ACTION ON RADON

NATIONAL RADON PROGRAM:

TARGETED PROJECTS AND PROGRAMS

Home Safety for Kids

Radon Health Professional Education Program

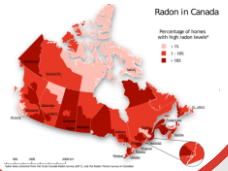
Community Testing Program

Radon Action Month Proclamation

TAKE ACTION ON RADON

Efficient Home Healthy Home

Spatial Analysis & Data Sharing



Library Lending Program

Radon Gas: It's in Your Home

NATIONAL RADON PROGRAM:
TECHNICAL PRIORITIES

Technical & Industry Guidance:

- Updating **Canadian Building Codes** to reduce radon in new construction
- Response to 2019 Integrated Regulatory Review Service Report re: **Radionuclides in Building Materials**
- Updating HC guidance for radon measurements in **Residential Dwellings**

Database and Mapping:

- Working towards the eventual publication of the **Federal Buildings Survey** dataset on the Open Government platform
- Bidirectional data sharing agreements with provincial/territorial governments and universities
- Supporting database and mapping initiatives (ex. **B.C. Radon Repository**)

NATIONAL RADON PROGRAM: TECHNICAL PRIORITIES

Work to inform Guidance/Policy:

- Assessing the **Seasonal Variation** of radon throughout Canada
- Evaluating the performance of consumer-grade **Electronic Radon Monitors**
- Collecting evidence to support strengthening of **2010 National Building Code** measures
- Supporting various research activities through the **National Research Council (NRC)**
- Investigating **Screening Capacity** of short-term measurements (<3 months)

UPDATING GUIDANCE

Current guidance on testing provides a conservative estimate of an individual's annual average radon exposure

Feedback: testing instructions are too restrictive

Re-evaluating the assumptions in this guidance has the potential to make protocols less restrictive and testing more accessible to Canadians

Currently updating Health Canada's residential testing guide and providing supplementary guidance on:

- Detector placement
- Mitigation timeline post-test
- Electronic radon monitors
- Reporting & Interpretation of results

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RADON TESTING:
EMERGING OPTIONS

Health Canada currently recommends a long-term test (>90 days) during the heating season

Known: Many electronic radon monitors are available to consumers on the market and Canadians have been using them to test for radon

New technology is **increasingly popular** with consumers because it is intuitive and provides almost real-time feedback

ELECTRONIC RADON MONITORS

Key concerns:

- Recent examples of products being withdrawn/recalled for not being reliable
- Lack of 3rd party testing
- No official guidance on their use and interpretation of data for consumers

Response:

- Implementation of Health Canada testing program
- Improvements to testing protocol to adhere to international best practice
- Increasing testing capacity

ELECTRONIC RADON MONITORS

Electronic Radon Monitor Testing Program:

- Short-term (~14 days) testing of all commercially available devices
- Long-term (>3 months) testing through a partnership with SNOLAB
- Product recalls, where applicable
- Complementary to performance testing under Canadian – National Radon Proficiency Program (C-NRPP)
- Preparation of guidance relating to the use of ERMs
- Ongoing dialogue with industry
- Factors affecting performance

SNOLAB:

ELECTRONIC RADON MONITORS

Current testing in the National Radon Laboratory limited to 2 weeks at a time

Taking advantage of the well-monitored underground environment at SNOLAB enables long-term (>3 months testing)

Fills in a crucial knowledge gap needed to issue updated guidance in time for the upcoming radon testing season

Thanks to:
Kishan Chaudhary
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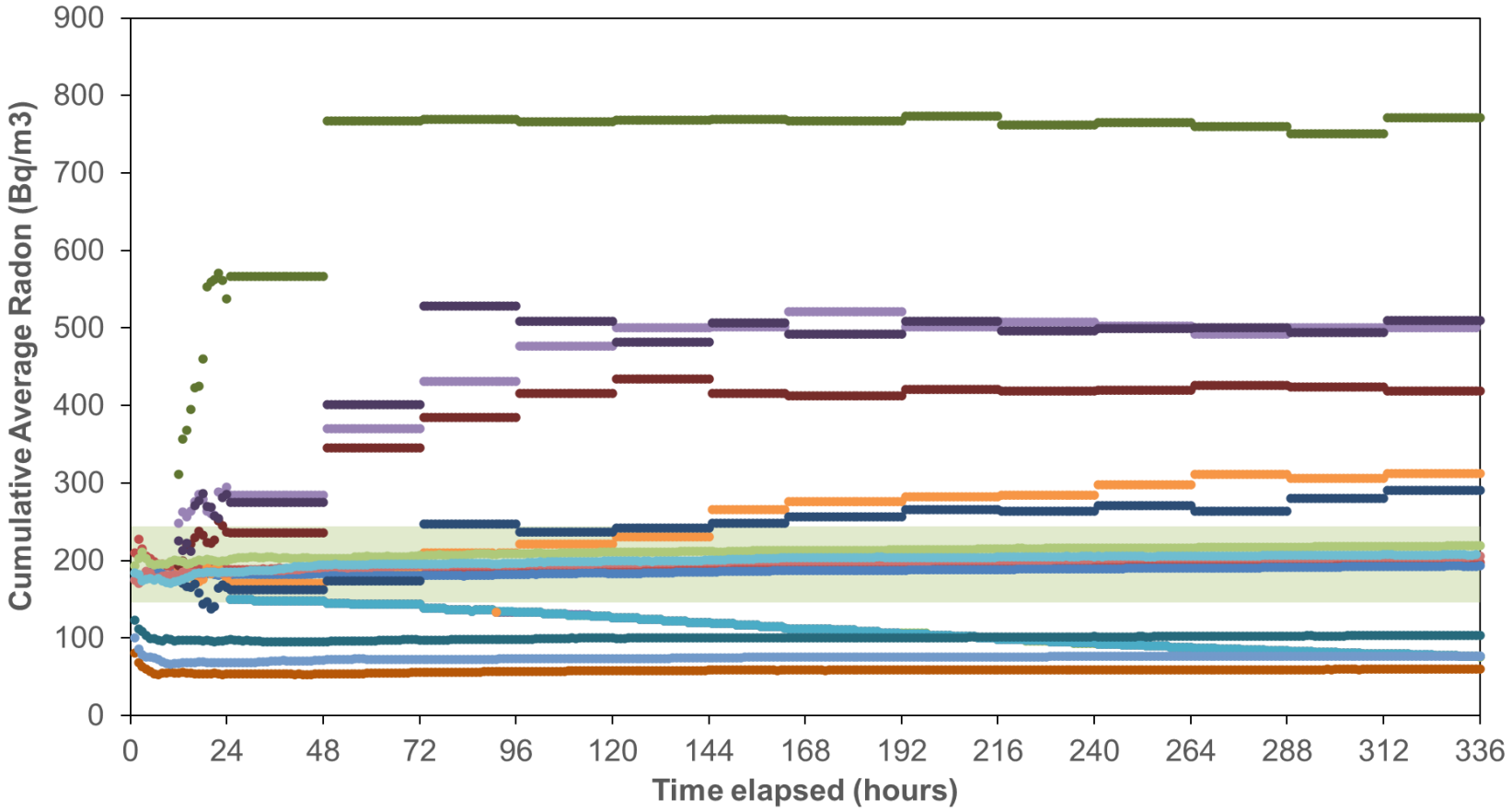
Ian Lawson
Rishi Patni
Alexander Vicol

RADON TESTING:
PERFORMANCE CRITERIA

Parameter	Canadian Standards Association (CSA)	Canadian National Radon Proficiency Program (C-NRPP)	American National Standards Institute (ANSI)	International Electrotechnical Commission (IEC)	Internation Organization for Standardization (ISO)
Standard	C.22 No. 205-17, Signal Equipment	Radon Device Listing Process	ANSI/AARST MS-PC-2022	IEC-61577-2:2014	ISO-11665:2020
Accuracy	**±25%**	**±20%**	**±25%**	Varies based on local regulatory regime/standards	Outlines general testing methodology and principles – specifics left to regulatory agencies or standards groups
Precision/ Total Error	N/A	**±20%**	N/A		
Proportionality	N/A	N/A	**<15%**	**<10%** (after correction for random error in radioactivity)	
Linearity	N/A	N/A	N/A	**<0.15**	
Response time	N/A	N/A	N/A	Testing methodology outlined	

RADON TESTING:
RESULTS - HEALTH CANADA

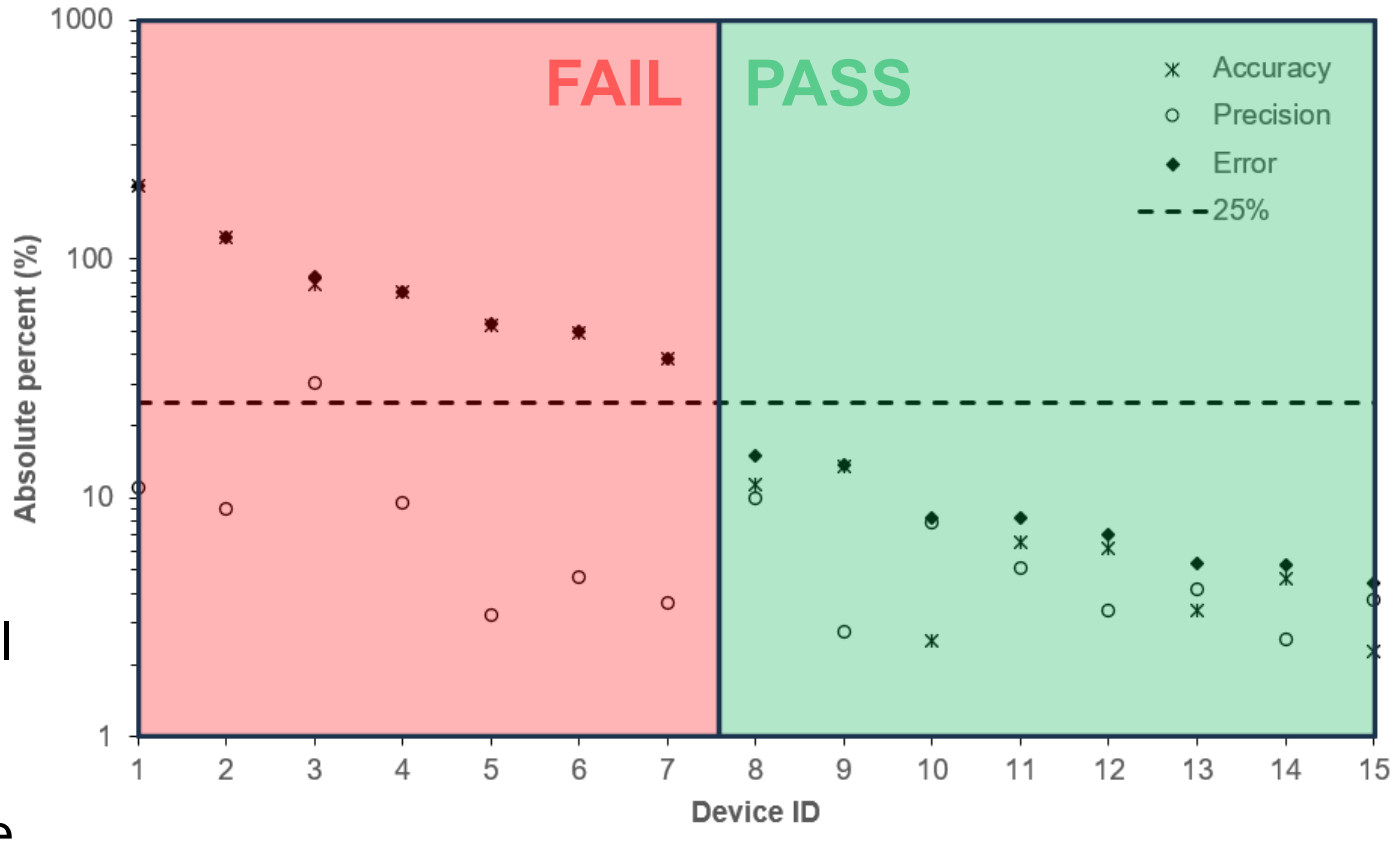
14-day test of
7 devices
at 200 Bq/m^3



RESULTS - HEALTH CANADA

Clear distinction between devices that measure the radon level with reasonable accuracy that those that fail to do so

Concerningly, **roughly half** of all devices tested thus far failed to meet performance criteria



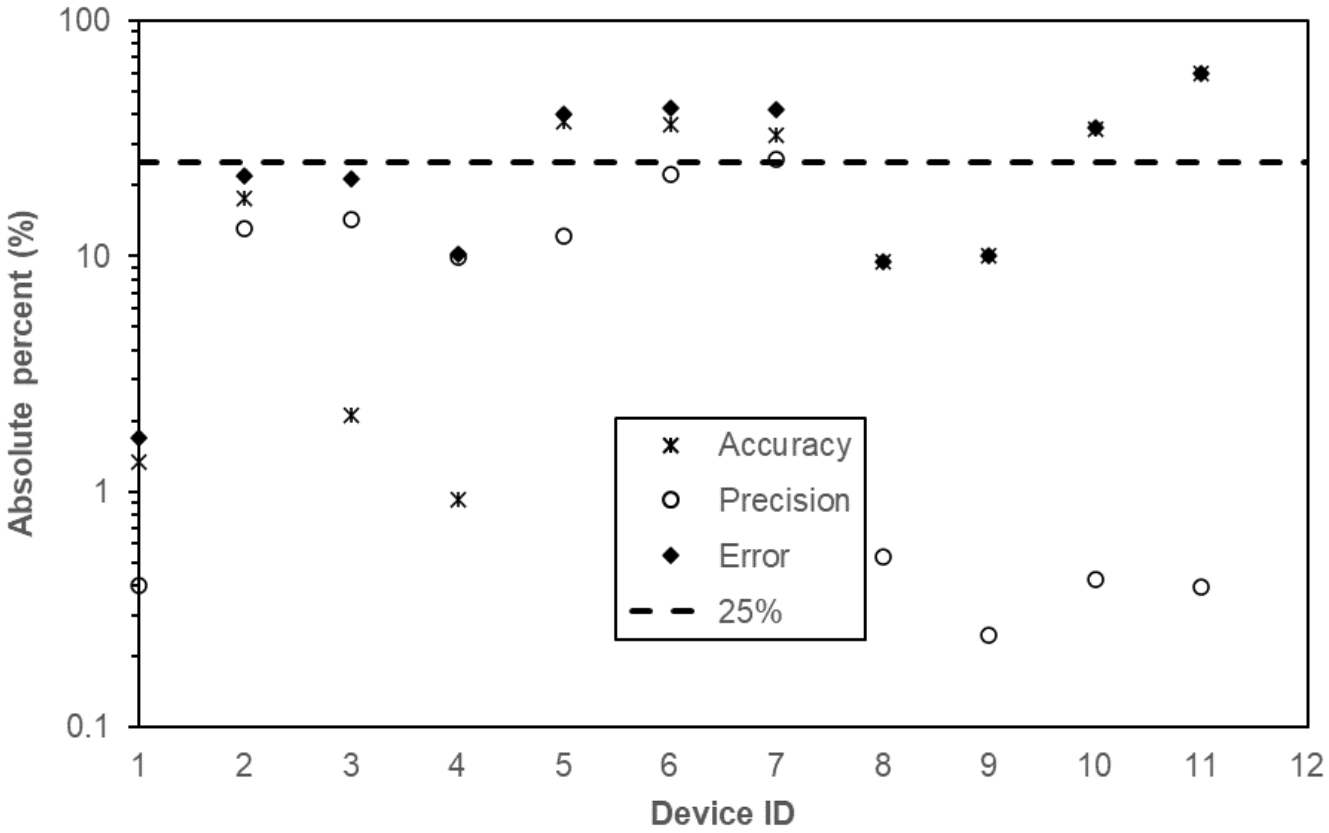
RADON TESTING:
RESULTS - SNOLAB

6-week test of
12 devices
at ~110 Bq/m^3

Testing done **concurrently** with long term testing at SNOLAB

Average radon level of ~110 Bq/m^3, varies throughout the test

Important **cross-check** of testing performed at Health Canada



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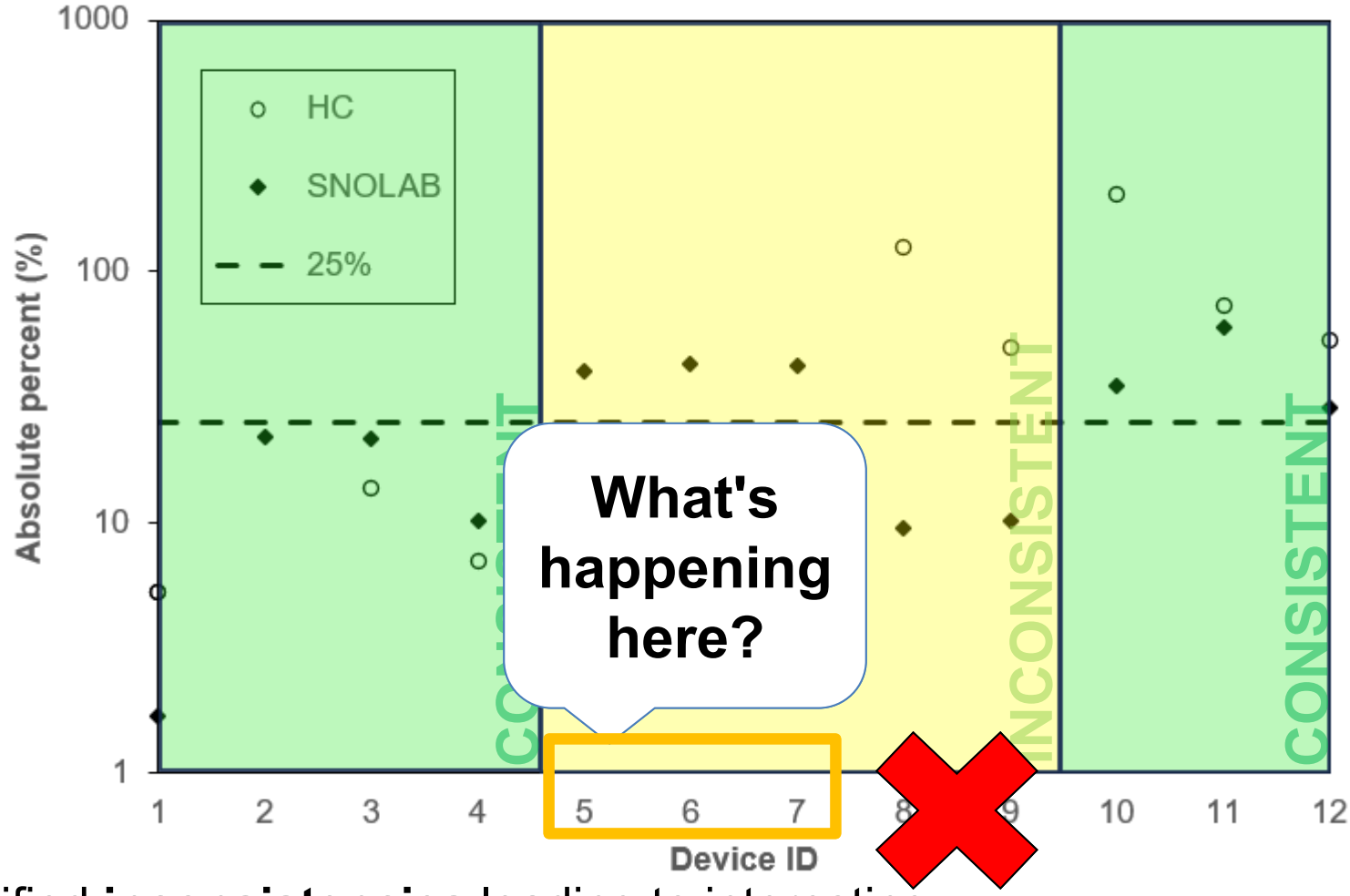
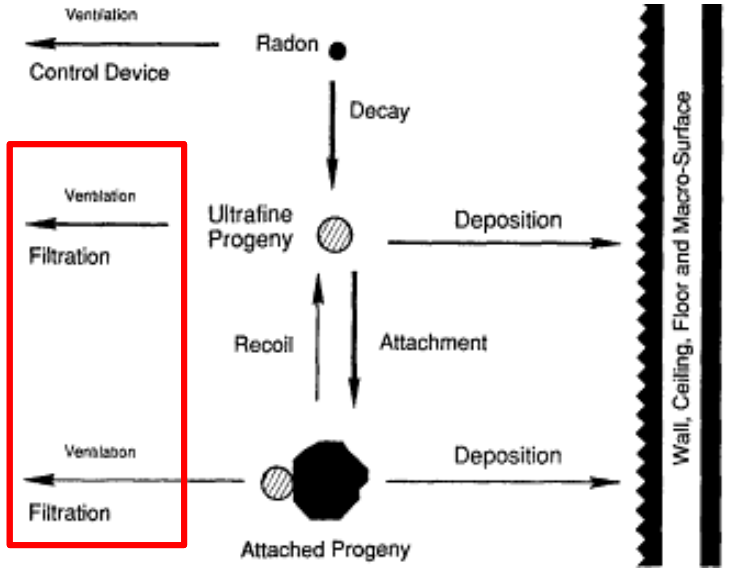


Identified **inconsistencies** leading to interesting findings and informing future work

RADON TESTING: INCONSISTENCIES

- Devices which showed aberrant performance at SNOLAB (low readings) all from the same manufacturer
- High ventilation rate (>10 ACH) and air filtration (on-line HEPA filters) removing airborne progeny the likely cause
- Rely on inadequate filtration – original calibration may include existing radon progeny in air (F ~ 0.4 in homes)
- Room for future development, testing, collaboration



RADON TESTING:
CURRENT STATUS

- 17 monitors tested total (2 recalls issued)
- 8 new monitors tested since Sept 2023
  - 7 additional recalls currently underway (total of 9 recalls)
- HC → Recalls
- C-NRPP → Approvals

7 new monitors found on Amazon in the past 2 months!

- potentially leading to 7 more recalls

Canadian National Radon Proficiency Program

2023 Intercomparison Report

		Manufacturers stated Accuracy	Frequency of Reading	Digital Display or cell-phone app	Battery or Plug-in	Passed C-NRPP Performance Test For more details click here.
	Airthings Corentium Home	±10% (after 7 days at 200 Bq/m³), ±5% after 2 months of monitoring	12 hours 24 hours 7 days (first reading will take 24 hrs)	Short-term and long-term average shown on monitor display.	Battery	✓
	Airthings Wave Plus	±10% (after 7 days at 200 Bq/m³), ±5% after 2 months of monitoring	Hourly	Long-term average shown on cell phone app. Color-coded indication of levels on monitor.	Battery	✓
	Airthings View Plus	After 30 days at 200 Bq/m³, ±10% on the 7 day average and +/- 5% on the 2 month average	Hourly	Short-term average shown on monitor display; long-term average shown on app.	Battery or plug in (USB-C)	✓
	EcoSense EcoQube	+/-10% at 370 Bq/m³ after 10 hours	Measures every 10 minutes and displays an hourly rolling average.	Hourly level shown on display, long term average available on the app.	Plug in	✓
	EcoSense EcoQube Blue	+/-14% at 370Bq/m³	10 mins	Device displays 1 hour, 1 day, 1 week and 1 month rolling averages.	Plug in	✓
	EcoSense Radon Eye RD200	±10% at 370 Bq/m³ after 10 hours	10 mins	Displays 1 hour rolling average; long-term display on app.	Plug-in	✓
	SunRadon Luft	±10% (after 7 days at 200 Bq/m³)	Initial reading takes 90 mins, hourly.	Long-term and short-term averages shown on the app. Color coded indication of levels on monitor display.	Plug-in	✓

SUMMARY:

UPDATED GUIDANCE

Based on results to date, Health Canada will be updating its guidance to include the **use of ERMs** as an options for Canadians for radon testing

Guidance is complete and going through review by Health Canada communications with an expected publication date **early Fall 2024**

SUMMARY:

ONGOING/FUTURE WORK

- Performance of some ERMs was found to be impacted by **external particulates** (ex. wildfire smoke)
- Testing influence of **environmental conditions** (humidity, temperature, pressure)
- **Cross-interference** from thoron (up to 40% in literature)
- **Linearity** at levels most often observed in Canadian homes (30 - 2,000 Bq/m^3)
- **Temporal response** (diurnal variation of radon in homes)
- **Degradation** of calibration/performance over time

THANK YOU!

Health Canada Santé Canada

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