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Position Statement
Public Health Risk and Public Policy Concerning Radon Gas

We must protect the public from lung cancer caused by indoor radon.
Protracted radon exposure increases the risk of all types of lung cancer.

Radon-222 (hereafter called radon) is a colorless, odorless, tasteless, radioactive gas, produced naturally in rocks and soil by the decay of uranium-238 and subsequently radium-226. Radon, with a radioactive half-life of about four days, enters homes and other buildings through cracks and penetrations in the building foundation. Radon gas usually exists at lower concentrations outdoors, but radon is typically present at a higher concentration indoors. A high radon gas concentration in a home or workplace increases the risk of radon-related lung cancer. Radon is the number one cause of lung cancer among individuals who have never smoked, and the second leading cause of lung cancer overall.

Radon is one of the most extensively studied environmental carcinogens, and the diversity and consistency of findings provide overwhelming evidence that protracted radon exposure is the leading environmental cause of cancer mortality in the United States:

- The National Academy of Science's National Research Council estimated that 66% of radon-induced lung cancers occur below the U.S. Environmental Protection Agency's (EPA's) radon action level of 4 picocuries per liter (pCi/L) of air (148 Bq/m^3).
- EPA estimated, in 1995, that protracted residential radon exposure to 1.3 pCi/L (48 Bq/m^3), the U.S. mean residential radon concentration, results in 21,000 radon-related lung cancer deaths each year in the U.S. Additional deaths are likely due to exposures in schools, workplaces, and other non- residential buildings, plus increases since 1995 in population and the number of new homes with high levels of radon that were added to the housing stock.
- In some states, such as Iowa, test results from over 70% of all measured homes exceed the EPA's radon action level.
- On an annual basis, if considered its own disease category, radon-induced lung cancer would be the eighth leading cause of cancer mortality in the U. S.

The 21,000 annual lung cancer deaths were projected from studies of underground miners exposed to radon. However, recent research has focused on measuring the effect of residential radon exposure on lung cancer risk by comparing radon levels in the homes of people who have lung cancer with radon in homes where no one has developed lung cancer. The findings of these case-control epidemiologic studies, which directly examined the risk of lung cancer in the residential setting, were in close agreement with the projections from miners.

Testing is the only way to know if a person's home has elevated radon levels. Indoor radon levels are affected by the soil composition under and around the home, and the pathways through which radon and other soil gas may enter the home. Homes that are next door to each other can have different indoor radon levels, making a neighbor's test result an imprecise predictor of radon risk. Elevated indoor radon levels can be mitigated by a properly certified professional, and the risk of radon entry can be reduced when a home builder uses up-to-date consensus standards, for radon resistant new construction, approved by the American National Standards Institute (ANSI).

The U.S. EPA and the U.S. Surgeon General recommend taking action to reduce indoor radon levels in homes that have a radon level at or above 4 pCi/L. This action level is not health-based; indeed, there is no known safe level of radon. In 1988, the U.S. Congress set a long-term goal that indoor radon levels be no more than the outdoor level (i.e., 0.4 pCi/L or 15 Bq/m^3). The President's Cancer Panel recommended in 2009 that EPA consider lowering the action level, based on current radon-related cancer risk data. While the goal of reducing radon in homes to

0.4 pCi/L or below is not yet technologically achievable, the radon concentrations in most homes today can be reduced to 2 pCi/L or below (74 Bq/m^3). The World Health Organization (WHO) has set a recommended radon reference level of 100 Bq/m^3 (2.7 pCi/L) for WHO member countries. U.S. implementation of the WHO recommendation would eventually prevent about 5,500 radon-related lung cancer deaths annually.

Data from a nationwide radon study performed by state radon programs and EPA over 25 years ago suggested that 1 in 15 U.S. homes have radon levels at or above EPA's action level. More recent state radon program data indicate that in some states, the proportion of homes exceeding EPA's action level is much greater. At the 2015 International Radon Symposium in September 2015, a radon scientist presented a preliminary analysis of 2 million radon measurements estimating that 18% of all occupied housing units have radon levels greater than 4.0 pCi/L.

The American Association of Radon Scientists and Technologists (AARST) declares that indoor radon exposure will only be substantially reduced through the following actions:

- EPA must issue regulations requiring notification of radon risk for home buyers and renters.
- EPA must adopt a health-based action level no higher than 100 Bq/m^3 (2.7 pCi/L) - the radon reference level adopted by the World Health Organization in 2009.
- HUD must require that all federally assisted and insured housing units be mitigated if tested higher than EPA's action level.
- State and local building codes must incorporate an ANSI-approved Radon-Resistant New Construction standard or the applicable International Code Council Appendix to require that homes, schools, and other regularly occupied buildings in high radon-prone areas be built to substantially prevent radon entry.
- State and local laws must require that a rental property be mitigated if tested higher than EPA's action level.
- OSHA must update and clarify its regulatory standard for offices and other workplaces to be consistent with EPA's action level.

Radon Equivalents		
Measure	**pCi/L**	**Bq/m^3**
Outdoor Air (mean)	0.4	15
Indoor Air (mean)	1.3	48
Achievable Indoor Air through Mitigation	2.0	74
World Health Organization Reference Level[a]	2.7	100
EPA Action Level	4.0	148

pCi/L - picoCuries per liter of air
Bq/m^3 - Becquerels per cubic meter of air
[a]*maximum accepted average annual radon concentration in a residential dwelling*