Data Quality Record for Long-Term Performance Goals

Long-Term Performance Goal Text: By September 30, 2026, prevent 2,250 lung cancer deaths annually through lower radon exposure as compared to the FY 2020 baseline of 1,684 prevented lung cancer deaths.

Corresponding Annual Performance Goal: Number of lung cancer deaths prevented through lower radon exposure.

Goal Number/Objective: Goal 4/Objective 4.2

NPM Lead: Office of Air and Radiation (OAR)

1a. Purpose of Long-Term Performance Goal:
The purpose of this long-term performance goal (LTPG) is to track the estimated number of lung cancer deaths prevented annually through lower radon exposure. A positive trend over several years will generally indicate improved indoor air quality across the country through lower radon exposure and reduced lung cancer deaths caused by radon.

1b. Performance Measure Term Definitions:
Progress towards this LTPG is measured in lung cancer deaths prevented, alternatively "lives saved." This is the health outcome that results from reducing radon exposure. Radon risk reduction (i.e., lower radon exposure) is achieved by mitigating high radon levels in existing homes and building new homes with radon reducing new construction (RRNC) features.

1c. Unit of Measure:
The number of lung cancer deaths prevented.

2a. Data Source:
EPA calculates the estimated number of lives saved from reduced radon exposure using the following data sources:

- Risk from radon exposure and risk reduction achieved: National Academy of Sciences BEIR VI Report; *EPA Assessment of Risks from Radon in Homes*
- Number of mitigations in existing homes: estimated using trends analysis
- Number of new homes built with radon reducing features: obtained from industry survey

2b. Data needed for interpretation of (calculated) Performance Result:
- EPA obtains data annually on the number of new homes built with radon-resistant features from annual surveys of homebuilding practices conducted by the Home Innovations Research Lab (HIRL); (EPA contract #EP-11-H-000962).
- EPA estimates the number of existing homes mitigated for elevated radon levels based on past trends and earlier mitigation fan sale data through voluntary reporting by the fan manufacturers. These trends are modeled and resulting estimates have been cross checked by comparing results with the limited state level data that is available on existing home mitigations to ensure the estimates are realistic.

Example Data from HIRL Report:
>   As of 2021, an estimated 3,509,484 Total Homes Built Radon Resistant. 241,945 were built in 2021.

Example Data from Mitigation Estimates:

> As of 2021, an estimated 2,138,273 Total High Radon Level Homes Mitigated. 136,502 were built in 2021.

3. Calculation Methodology:

To estimate the reduced number of lung cancer deaths resulting from lowered radon exposure, EPA applies risk reduction estimates from its 2003 radon risk assessment, based on the National Academy of Sciences BEIR VI Report, to the number of existing homes mitigated for elevated radon levels and the number of new homes built with RRNC. On average, for every 5,292 new homes built with radon-resistant new construction in the highest risk areas (classified as Zone 1 areas by EPA), one future life is saved annually. Historically, about 60% of the new homes built with RRNC in the U.S. are built in these Zone 1 areas. On average, for every 1,542 existing homes mitigated for elevated radon levels, one future life is saved annually. The goal of 2,250 future cancer deaths prevented annually by 2026 results from projected increases in both annual fan installation and new homes built with radon resistant new construction between 2019 and 2026.

4. Quality Assurance/Quality Controls:

To facilitate the risk reduction calculations and ensure accuracy, EPA created a spreadsheet-based Radon Progress Analysis Tool that utilizes EPA's existing risk model as described in *EPA Assessment of Risks from Radon in Homes* (EPA 402-R-03-003, June 2003). The tool factors in and measures uncertainty, including uncertainty regarding the discount rate, through sensitivity analyses that show the possible range of outcomes under alternative assumptions. The quality and acceptability of all project-related input data, including literature collected and cited, and model-related input data, has been documented. Data for this project was obtained exclusively from secondary sources; the tool does not utilize any primary data collection. Most of the information used in this tool is obtained from literature sources. The second type of data is collected from contractor and manufacturer reports on radon mitigation systems' usage trends, and effectiveness.

Quality Assurance/Quality Control Leads:
Thomas Bowles (OAR), Project Manager
Daniel Malashock (OAR), Indoor Environments Division's (IED) Quality Assurance (QA) Coordinator
Jennifer Mosser (OAR), Office of Radiation and Indoor Air's (ORIA) QA Manager

5. Data Limitations/Qualifications:

EPA has depended on voluntary reporting by fan manufacturers to calculate the number of existing homes mitigated for elevated radon levels based on radon mitigation. While EPA has not received this data since 2013 and has been estimating its results since that time, an analysis of the accuracy of this estimation was performed in 2019 where EPA compared the mitigation estimations with available state data and the estimations were confirmed to be accurate and defensible.

EPA assumes a program to test and mitigate homes will use active soil depressurization (ASD) and will be applied to homes nationally. EPA assumes that the average radon reduction is 3.1 pCi/L. This may be a conservative estimate since radon mitigation systems are reported by industry to achieve greater reductions in radon levels than that assumed in the EPA calculation. EPA assumes RRNC will install passive measures and will be applied only in high radon areas (Zone 1 in the radon maps). The average radon reduction from RRNC is assumed to be 0.9 pCi/L. For both ASD and RRNC, EPA assumes the intervention lasts 74 years.

To estimate the risk averted due to mitigations, the mitigations performed in the U.S. are estimated. From this information the EPA estimates the number of mitigations performed that year with the assumption that the fans installed were for mitigation purposes. The EPA model assumes that 85 percent of existing homes that test above the action level are mitigated. This conservative assumption accounts for a likely imperfect implementation scenario with any voluntary program. These interim calculations are used to estimate the number of lung cancer deaths avoided. For RRNC, EPA assumes that fans are installed in all new homes built with radon-reducing features that test above the action level. The baseline discount rate is 3 percent, but all results are reported using both a 3 percent and 7 percent discount rate. The extent of radon exposure was derived from U.S. Geological Survey data (USEPA, 1993b) and EPA analyses of residential survey data (Cohen et al., 1994; USEPA, 1992, 2003).

6. Technical Contact:
Thomas Bowles (OAR)

7. Certification Statement/Signature:

I certify the information in this DQR is complete and accurate.

DAA Signature _Original signed by Elizabeth (Betsy) Shaw_ **Date** __5/2/2024__