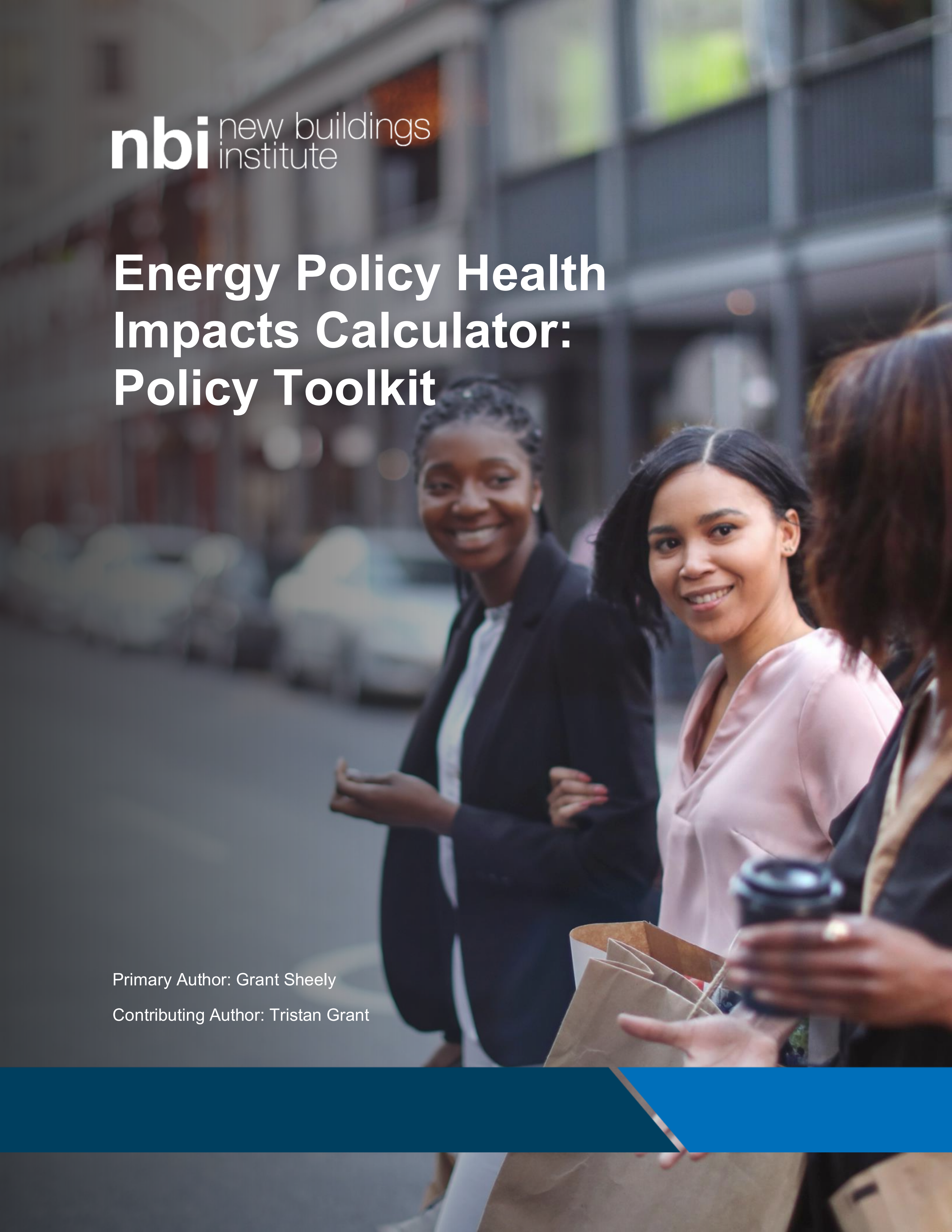

Energy Policy Health Impacts Calculator: Policy Toolkit

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Introduction

Welcome to the Policy Toolkit for the NBI Energy Policy Health Impacts Calculator. This toolkit is designed to support policymakers, public health officials, energy administrators, community organizations, and energy and decarbonization advocates in linking building energy usage to criteria pollutant emissions and, ultimately, to quantified local and regional health impacts. By translating energy use scenarios into monetized public health outcomes, the toolkit provides a structure for incorporating health considerations into building and energy policy design.

This document explains the scientific and policy foundation underlying the tool. It first outlines what criteria pollutants are and why they matter, then describes how building energy use—both on-site combustion and off-site electricity generation[1]—contributes to localized air pollution and associated health burdens. Finally, it demonstrates how the monetized health impacts generated by integrating with the EPA's Co-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA) tool can be incorporated into practical policy mechanisms, including jurisdictional health fees, building performance standards, low NOx appliance standards, and energy code cost-effectiveness analyses.

At the center of this toolkit is the Energy Policy Health Impacts Calculator (EPHIC), developed by New Buildings Institute (NBI). The tool converts user-defined building energy scenarios into changes (increases or decreases) in emissions of criteria air pollutants (CAPs) (PM2.5, SO2, NOx, and VOCs) and transmits those values through the COBRA framework via API integration to estimate avoided negative health effects and their associated economic impact. In addition to modeling discrete energy reductions, the calculator includes modules for evaluating the public health cost impacts of energy code updates, custom building energy policy scenarios, and existing building performance standards. Detailed guidance on each module is provided in the Tool section of this document.

Together, the sections that follow provide:

- An overview of criteria pollutants and their health implications.
- An explanation of how building energy usage drives localized and regional air quality impacts.
- A policy playbook outlining how quantified health benefits can strengthen the technical, fiscal, and equity case for building-sector policies.

By expanding traditional energy and carbon accounting to include localized health impacts, this toolkit advances a more comprehensive "total value" framework for evaluating building policy decisions—one that prioritizes both the climate and community health. The health impacts in this tool are limited to those from the criteria pollutants, not the health impacts from the climate impacts of greenhouse gas (GHG) emissions associated with building energy usage.

[1] Including precombustion activities.

The Problem: Buildings, Emissions, and Public Health

This section explains how building energy usage, particularly the combustion of fossil fuels in buildings and to generate the electricity used in buildings, produces criteria air pollutants that directly affect individual and community health. Readers will learn the distinction between on-site and off-site emissions, the primary CAPs tracked by EPHIC, and the specific health outcomes associated with exposure. These pollutants warrant policy attention because of their measurable localized health impacts, regional and national economic costs, and importance in establishing a more comprehensive, health-centered decision-making framework.

The Link Between Energy Usage and Criteria Pollutants

Just as carbon emissions are categorized into scopes,[2] CAP emissions associated with building energy usage have both on-site and off-site components.

- **On-Site Criteria Air Pollutants**: Occur directly at the building site through the combustion of fossil fuels (primarily natural gas, fuel oil, or propane) for space heating, water heating, and cooking.
- **Off-Site Criteria Air Pollutants:** Occur at power plants generating electricity to be delivered to buildings. As the grid transitions to cleaner sources, these off-site emissions will decline, making the localized impact of on-site combustion a more prominent factor in community health.

Source Emissions

The tool tracks the primary pollutants from fuel combustion in buildings and power plants, described below:

[2] To read more about scope 1, 2, & 3 emissions, see https://climate.mit.edu/explainers/scope-1-2-and-3-emissions.

Particulate Matter (PM2.5): Particulate matter (PM) is particles, often dust, dirt, soot, smoke, droplets of liquid, and other small floating pollutants. PM is sorted by particle size, with those <2.5 micrometers (fine PM2.5) being considered most harmful because they can penetrate deep into the lungs and enter the alveoli, the tiny air sacs responsible for gas exchange. Once deposited there, these particles can irritate and damage the alveolar walls, contributing to lung injury and the development of respiratory disease. PM2.5 are small enough to enter the bloodstream. They can worsen preexisting conditions such as asthma and chronic obstructive pulmonary disease, and are also associated with increased risks of pneumonia, cardiovascular disease, stroke, and lung cancer (American Lung Association, 2023).

Sulfur Dioxides (SO2) & Nitrogen Oxides (NOx): Sulfur dioxide (SO2) and nitrogen oxides (NOx) are harmful air pollutants that contribute to the formation of ground-level ozone (smog), fine particulate matter (PM2.5), and acid rain. Both groups of pollutants are significant respiratory irritants closely linked to adverse public health outcomes, including asthma exacerbation, chronic bronchitis, cardiovascular disease, and impaired lung development in children. Short-term exposure can trigger immediate breathing difficulties, particularly among vulnerable populations such as children, the elderly, and individuals with preexisting respiratory conditions (National Park Service, 2024; World Health Organization, 2021). For city governments, monitoring and reducing SO2 and NOx emissions is a critical component of municipal air quality management, as these pollutants directly affect public health, environmental quality, and regulatory compliance.

Volatile Organic Compounds (VOCs): VOCs comprise various organic chemicals that are released as gases from different liquids or solids. A variety of chemicals categorized as VOCs are associated with short- and long-term adverse health effects and contribute to ground-level ozone formation. VOCs can cause eye, nose, and throat irritation, headaches, and nausea. Prolonged exposure may result in kidney, liver, or central nervous system damage (Shetty, et al., 2023) (Gibb, 2013).

Localized Health Impacts

Unlike carbon dioxide, which has a global impact regardless of where it is emitted—warming the planet by accumulating in the atmosphere—CAPs cause harm primarily through direct inhalation. This means their health impacts are tied to where people are physically exposed to them, not simply where they are emitted. Particulates and other CAPs degrade air quality most significantly near their source, but they can and do travel: Wind disperses pollutants beyond their point of origin, though concentrations—and therefore health risks—diminish with distance.

It is worth noting that pollutant transport is not merely a local phenomenon. The Clean Air Act explicitly recognizes interstate pollution transport, requiring states to submit transport State Implementation Plans to address pollution that crosses state lines. Long-range transport is well-documented: Saharan dust storms regularly reach the eastern United States, and wildfire smoke from Canada and California has caused poor air quality episodes across much of the country. Ozone and PM2.5 in particular are known to travel significant distances before deposition. For this reason, “localized” is a relative term—criteria pollutants are more localized than CO2e, but less localized than hazardous air pollutants (air toxics), which tend to have more tightly bounded exposure zones near their source.

That said, proximity to major emission sources remains the dominant driver of exposure and health risk. Research consistently shows that communities near power plants and high-traffic corridors face disproportionately elevated pollution burdens—effects that can dwarf the contribution of building-level emissions when examined at the neighborhood scale. These emissions degrade air quality most significantly in the immediate vicinity of the source, making localized siting a critical public health consideration, particularly in dense urban environments where building emissions compound existing pollution loads and contribute to elevated rates of respiratory illness and cardiovascular disease.

Importantly, the burden of exposure is not distributed evenly across populations. Lower-income communities and certain racial and ethnic groups frequently experience higher levels of pollution exposure and may face heightened health vulnerability. This disparity is influenced in part by historical land use and infrastructure siting decisions, which have concentrated major pollution sources—such as power generation facilities and transportation corridors—near disadvantaged communities, thereby compounding environmental and public health inequities (American Lung Association, 2023) (Wang, 2025).

The Economic Burden of Illness

The existing burden of illness and lost productivity attributable to building emissions is significant but often ignored in traditional energy policy analysis. Monetizing these externalities—such as emergency room visits, lost workdays, and premature mortality—allows policymakers to more accurately evaluate and communicate the benefits of building energy policies, including decarbonization.

A Comprehensive Decision-Making Framework

The data provided by this tool is intended to supplement traditional energy cost, greenhouse-gas, and Social Cost of GHG (SC-GHG) metrics. By integrating localized health data, jurisdictions can move toward a “Total Value” accounting method. This broader framework provides the technical and economic justification necessary to develop, advocate for, and support building policies that protect both the climate and the community. The tool provides additional data to aid designers, developers, policymakers, advocates, and decision makers in evaluating different building and policy-level energy solutions.

The Criteria Pollutants Impact Calculator

This section describes the technical foundation of the EPHIC and how it integrates with EPA COBRA to translate energy policy decisions into quantified public health outcomes. Readers will learn how user-defined energy scenarios are converted into changes in CAP emissions, transmitted through the COBRA framework, and returned as county-, state-, or national-level incidence rates and monetized health impact estimates. The section also explains the calculator's three analytical modules—code comparison, custom scenarios, and policy modeling for existing buildings—and how they enable policymakers to evaluate the health, fiscal, and equity implications of building-sector policies with technical rigor and local specificity.

Conversion Factors for Onsite and Grid Energy Use

On-site fuel usage was converted to tons of CAP using the conversion values found in the 2020 National Emission Inventory (NEI) Wagon Wheel Database. For grid-generation emission factors, we use the U.S. EPA's Emission & Generation Resource Integrated Database (eGrid). eGrid provides recent emissions data based on past annual electricity generation. Since generation mixes vary across regions, it's important to use resources like eGrid for electricity generation CAP calculations. Together, the NEI Wagon Wheel Database and eGrid can convert energy to tons of CAP. For forward-emission projections, we use NREL/Cambium's Standard Scenarios. The scenarios are designed to capture a range of possible power system futures, specifically, the tool utilizes the 95% net CO2e decarbonization by 2050 Midcase [3] (National Laboratory of the Rockies, 2025).

Core Mechanism: COBRA API Integration

The EPHIC tool takes user-generated energy reduction scenarios and translates them into corresponding CAP emission changes in the required format for EPA COBRA. COBRA is a tool designed by the EPA that monetizes criteria pollutants by estimating the costs associated with the health outcomes of breathing them in.

COBRA provides county-level estimates of air quality changes,[4] and the monetized economic value of these impacts. Using the COBRA-integrated tool, policymakers can now evaluate the health cost impacts of relevant building policies seamlessly, without having to calculate the associated CAPs from on and offsite usage from buildings.

Input Modules

The calculator offers three distinct pathways for analysis. Each one enables the calculation to be customized to the public health impacts at the county, state, and national levels.

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[3] Midcase Scenario Notes: 95% net reduction (relative to 2005) in electricity sector combustion-only CO2 emissions by 2050 (relative to 2005). In the Mid-case, 95% net CO2 decarbonization by 2050 is achieved with less than a 1% increase in the present-value bulk electricity sector costs (relative to the current policies mid-case).

[4] COBRA calculates incidence rates for health impact events, read more here: https://www.epa.gov/cobra/users-manual-co-benefits-risk-assessment-cobra-screening-model.

Module 1: Code Comparison Module

This module allows a user to evaluate the health impact of updating the energy code in their jurisdiction. It is best for evaluating the impact and role of new construction in lowering CAPs. A user will input:

1) The location of interest: state and county.
2) Annual expected new construction square footage in their jurisdiction. Consulting a city/county construction permit office can be a good starting point for this value.
3) Current energy code and proposed energy code for adoption.
4) [Optional] Fuels currently in use: The types of fuels in a given jurisdiction vary and affect the outcome of the onsite criteria pollutant emissions. The values can be adjusted to fine-tune the analysis to local conditions.

The module provides the high and low health impacts based on COBRA's calculation of CAP changes from the energy code adoption for the specific square footage of new construction. This part of the tool uses the technical analysis portion of national model code determinations (U.S. Department of Energy, 2026). The U.S. Department of Energy (DOE) is required by the Energy Conservation and Production Act to review published editions of the national model energy codes—ANSI/ASHRAE/IES Standard 90.1 and the International Energy Conservation Code—and issue a determination on whether the updated edition will improve energy efficiency in commercial and residential buildings. These determinations—completed by Pacific Northwest National Laboratory on behalf of DOE—include energy models that represent the energy performance of prototype buildings for every climate zone in the United States. Using the results of these energy models, the energy usage differences between code changes were determined for each climate zone.

Module 2: Custom Scenario Module

This module allows a user to evaluate the health impacts of a given change in energy usage. This can help a jurisdiction that has completed an assessment of energy savings from a given policy and wants to include the policy's health impacts in the analysis.

A user will input (1) their state or region of study and (2) the amount of each fuel that is to be reduced or increased. The tool will take these inputs into their common units as provided and convert them into tons of CAPs, which are then fed to COBRA and communicated back to the tool, displaying the high and low health impacts.

Module 3: Existing Building Policy Scenario Module

The existing building policy scenario module is the most advanced module. This module allows a user to assess the health impacts of building policies for existing buildings. For each policy, the tool used ComStock data (see below) to create a baseline set of buildings for analysis. A user will input the jurisdiction of interest, the types of existing buildings they would like to analyze, and the size of buildings to be covered under a policy. ComStock data estimates of the quantity, floor area, and energy usage and GHG emissions for existing buildings in the selected jurisdiction.

Using the Existing Building Policy Scenario Module for Building Performance Standard Assessments:[5]

EPHIC can be used to assess the impacts of basic Building Performance Standard (BPS) policies. The tool has two boxes for entering common BPS goals: the targeted percent energy or percent GHG reduction. By entering one of those targets, the tool will assess baseline building performance and make assumptions about impacts to energy use and associated CAPs. For the percent energy reduction, the tool assumes equal reductions across all energy end uses to meet the policy target. For the percent GHG reduction, the policy assumes that GHG emissions from each fuel use will be reduced by the ratio of that fuel's emissions to the total fuel use. Therefore, if a building has a ratio of 6:10:4 tons of CO2e emitted from electricity, natural gas, and fuel oil usage, respectively, then the tool assumes that 30% of the emission reduction will come from electricity, 50% from natural gas, and 20% from fuel oil.

Using the Tool to Assess the Health Benefits of Electrification

ComStock estimates the types of fuels used in existing buildings, including specific fuels for each end use, particularly water and space heating. With this information, the tool can assess electrification scenarios. The tool can assess full electrification, electrification of space heating systems, and electrification of water heating systems. The electrification scenarios estimate the conversion from natural gas to electricity by multiplying usage by an assumed combustion equipment efficiency of 85% and then dividing by the annualized heat pump coefficient of performance (COP), assumed to be 3.0[6] (U.S. Energy Information Administration, 2023).

$$\text{Electricity Converted} = \frac{\text{Natural Gas} \times \text{Boiler Efficiency}}{\text{Heat Pump COP}}$$

- Full electrification assumes all combustion fuel usage is converted to electricity
- Space heating electrification assumes that all fuel used for heating is converted to electricity
- Water heating electrification assumes that all fuel used for water heating is converted to electricity.

For each policy, results are shown for the percent change in site energy and the percent change in GHG emissions, and, if electricity was added, the amount added is displayed.[7] The resulting

[5] This methodology assumes a uniform reduction effort across all energy sectors and does not account for specific fuel-switching technologies or varying decarbonization costs.

[6] Appendix A referenced estimates the average a Heat Pump COP to be 3.5. Annualized performance in colder climates is typically lower, reflecting reduced efficiency at lower ambient operating temperatures. An annualized value of 3.0 was selected as a more conservative value.

[7] Electrification policies convert fuel usage to electricity usage, adding electrical load to the area. This is captured in our policy tool, and criteria pollutants and health impacts for this change are displayed.

impact on CAPs of both decreases in on-site fuel combustion and increases in electricity generation is shown, and, finally, the health impacts of the selected policy are shown.

What is ComStock?

ComStock is a set of simulated building energy modeling data developed by the National Laboratory of the Rockies. ComStock data leverages the DOE prototype building models. The energy models in ComStock (for commercial buildings) and ResStock (for residential buildings) are physics-based simulation models developed to represent the energy use and energy saving potential of building stocks with high granularity at national, regional, and local scales. While they attempt to represent counties at large, ResStock and ComStock are not designed to generate an energy model for every building. Instead, they use a relatively large number of statistically sampled models to represent the building stock with a realistic diversity of building characteristics.

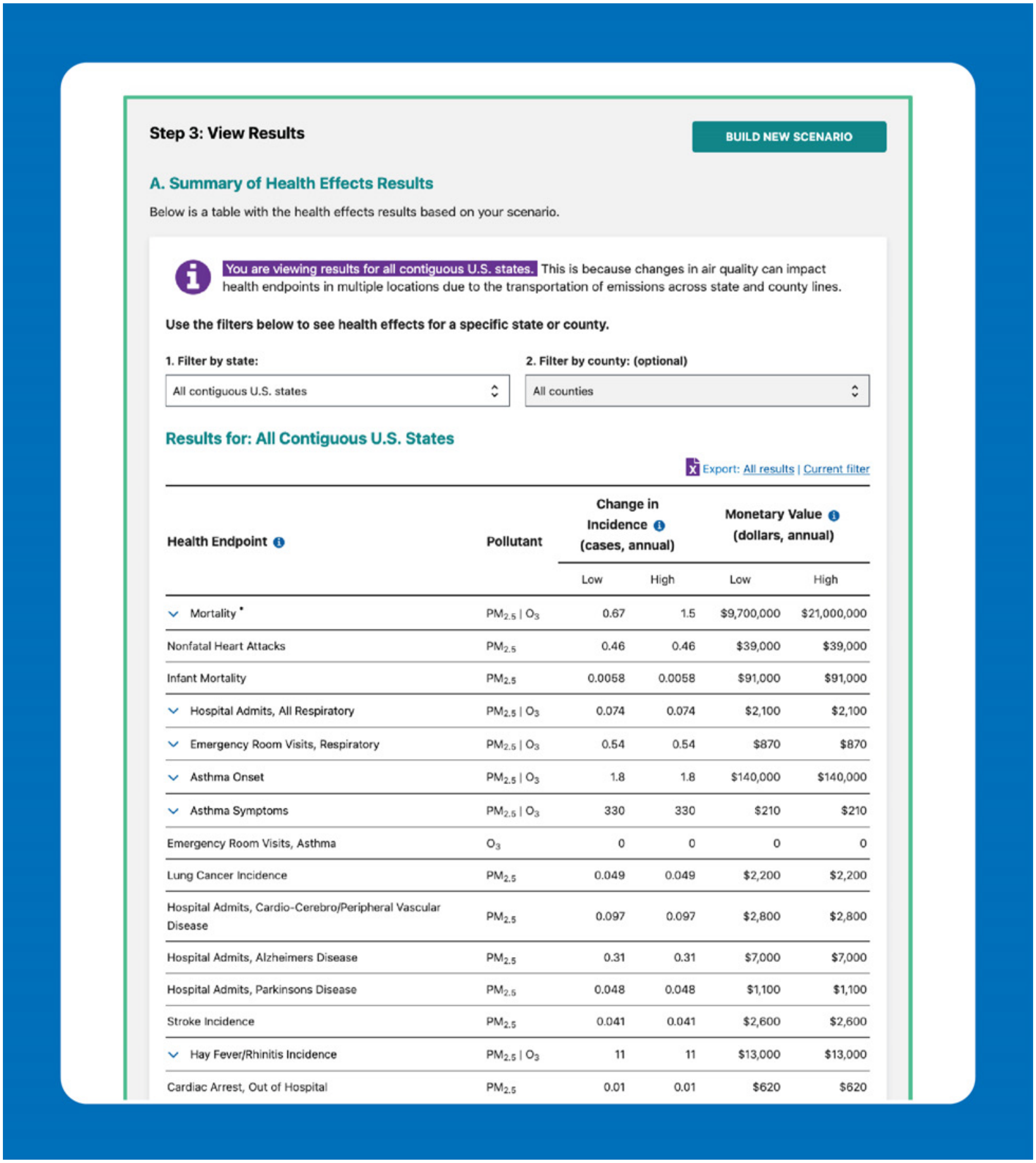
Output and Reporting

The output screen displays the health endpoints that, when combined, constitute the major endpoints of health cost estimates. Examples include heart attacks, asthma, ER visits, lung cancer, and missed work/school days. This is not a comprehensive list of all possible health effects, and the cumulative health impacts could be more significant than individual ones.

Each health endpoint has one or more associated pollutant(s) that affect the incidence rate (the rate of new cases/events for a population at risk). For example, a 0.0271 to 0.0599 increase in mortality incidence indicates that a relevant change in emissions of specific pollutants is associated with 0.0271 to 0.0599 deaths in the affected population. While the inputs are calculated as annualized CAP emissions, COBRA assumes that the changes in adult mortality and non-fatal heart attacks occur over a 20-year period. One year of emissions has a lasting public health impact.

The last detail displayed is the monetary value assigned by the COBRA tool, calculated based on the incidence rates of the health endpoints and their associated healthcare costs or the value of a statistical life.[8] These monetary values add up to the total health impacts shown on each module slide.

[8] To read more about the Value of a Statistical life: https://www.epa.gov/environmental-economics/mortality-risk-valuation#means.



Step 3: View Results

BUILD NEW SCENARIO

A. Summary of Health Effects Results

Below is a table with the health effects results based on your scenario.

You are viewing results for all contiguous U.S. states. This is because changes in air quality can impact health endpoints in multiple locations due to the transportation of emissions across state and county lines.

Use the filters below to see health effects for a specific state or county.

1. Filter by state: All contiguous U.S. states

2. Filter by county: (optional) All counties

Results for: All Contiguous U.S. States

Export: All results | Current filter

Health Endpoint	Pollutant	Change in Incidence (cases, annual)		Monetary Value (dollars, annual)	
		Low	High	Low	High
Mortality *	$PM_{2.5}$ | O_3	0.67	1.5	$9,700,000	$21,000,000
Nonfatal Heart Attacks	$PM_{2.5}$	0.46	0.46	$39,000	$39,000
Infant Mortality	$PM_{2.5}$	0.0058	0.0058	$91,000	$91,000
Hospital Admits, All Respiratory	$PM_{2.5}$ | O_3	0.074	0.074	$2,100	$2,100
Emergency Room Visits, Respiratory	$PM_{2.5}$ | O_3	0.54	0.54	$870	$870
Asthma Onset	$PM_{2.5}$ | O_3	1.8	1.8	$140,000	$140,000
Asthma Symptoms	$PM_{2.5}$ | O_3	330	330	$210	$210
Emergency Room Visits, Asthma	O_3	0	0	0	0
Lung Cancer Incidence	$PM_{2.5}$	0.049	0.049	$2,200	$2,200
Hospital Admits, Cardio-Cerebro/Peripheral Vascular Disease	$PM_{2.5}$	0.097	0.097	$2,800	$2,800
Hospital Admits, Alzheimers Disease	$PM_{2.5}$	0.31	0.31	$7,000	$7,000
Hospital Admits, Parkinsons Disease	$PM_{2.5}$	0.048	0.048	$1,100	$1,100
Stroke Incidence	$PM_{2.5}$	0.041	0.041	$2,600	$2,600
Hay Fever/Rhinitis Incidence	$PM_{2.5}$ | O_3	11	11	$13,000	$13,000
Cardiac Arrest, Out of Hospital	$PM_{2.5}$	0.01	0.01	$620	$620

Why Are There Low and High Values?

The low and high estimates are derived using two sets of assumptions about the sensitivity of adult mortality and non-fatal heart attacks to changes in ambient PM2.5 and O3 levels. Specifically, the high estimates are based on studies that estimated a larger effect of changes in ambient PM2.5 levels on the incidence of these health effects.

Policy Playbook: Mechanisms for Implementation

The following sections explore how jurisdictions might utilize air pollution and health impact modeling within their local policy frameworks. These models are a starting point for legislators, policymakers, and stakeholders to understand how data on CAPs—modeled using tools like the EPA COBRA—can inform a variety of regulatory strategies.

By examining these pathways, jurisdictions can visualize how health-based metrics might be integrated into:

- Cost-Effectiveness Analyses
- Building Performance Standards
- Zero-Emissions Heating Equipment Standards
- Pollution Health Fees

Use Guidelines

The policy mechanisms described herein are provided for informational and educational purposes only. They represent independent policy research and are not specific to any one jurisdiction. These models are intended to be viewed as a menu of options that could be customized to suit the unique legal, environmental, and economic challenges of a particular location.

These materials do not constitute legal advice. Because the scope of authority of local and state bodies varies significantly, anyone using these models should adjust their provisions to ensure compliance with applicable laws and regulations. Historically, certain building and energy policies have faced legal challenges. While shifting the focus from carbon emissions to criteria pollutants and public health costs presents a distinct and compelling argument, it does not guarantee immunity from similar legal scrutiny.

NBI strongly recommends that any party interested in adapting these strategies seek the advice of licensed attorneys experienced in drafting and enacting legislation within their jurisdiction. NBI remains available to help interested parties understand the technical data and the general policy landscape associated with these models.

Policy Mechanism 1: Code Cost Effectiveness Analysis

Energy codes (and other policies) are tested with a cost-effectiveness (CE) methodology. These CE methodologies compare first costs against life-cycle savings. Historically, lifecycle savings have focused only on energy savings, but to capture the full range of impacts of energy use, other factors should be considered, notably GHG emissions and the health costs associated with CAP emissions. When evaluating the cost-effectiveness of adopting an energy code, including health impacts alongside typical first costs, energy savings, and social cost of carbon savings can provide a more comprehensive picture of the effect a new energy code could have on a jurisdiction.

The U.S. government has at times expanded the metrics used to assess a policy's cost-effectiveness. Because of Executive Order 12866, issued in 1993, reestablished in 2009, and then again in 2021, DOE considered the estimated monetary benefits of reduced emissions of greenhouse gasses (carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O)) that are expected to result from the adoption of new energy codes (Office of Energy Efficiency & Renewable Energy, 2024). This same idea could be used to estimate the monetary benefits from reduced criteria air pollutants (including particulate matter ($PM_{2.5}$), sulfur dioxide (SO_2), nitrogen oxide (NOx), and volatile organic compounds (VOCs)) expected to result from the adoption of new energy codes.

States and jurisdictions could update their CE methodology for adopting building policies to specifically value health benefits. One approach is to use the tool we have created to calculate a per-kBtu or per-source-unit dollar ($) cost of each fuel and add that cost to the cost of each energy source in all cost-effectiveness methodologies. Code bodies such as the ICC or ASHRAE could include health benefits as a national $/per-kBtu adder to their CE methodology, as shown in the sample table below. These actions would more realistically calculate the costs and benefits of reducing fuel and energy consumption in buildings.

TABLE 1: NATIONAL HEALTH COST FUEL PRICE ADDERS

Electricity	\$0.009-0.015	\$/kBtu	\$0.03-0.05	\$/kWh
Natural Gas	\$0.004-0.006	\$/kBtu	\$0.43-0.60	\$/therm
Heating Oil (Distillate)	\$0.009-0.014	\$/kBtu	\$1.22-1.92	\$/gal

Policy Mechanism 2: Building Performance Standard (BPS) Integration—Criteria Pollutant Metrics / Health Metrics

Building Performance Standards (BPS) are a popular policy tool for cities and states seeking to improve the performance of existing buildings. These standards are state and local laws that require existing buildings to meet minimum energy or climate performance standards. Working in tandem with new construction energy codes, these policies enable state and local leaders to advance their energy and equity goals through accelerated retrofits.

Currently, BPS policies use energy intensity, GHG intensity, and EnergyStar scores (in one case) to measure, rate, and drive improved building performance. All these policies could benefit from health impact analysis data to support their adoption and justify implementing a new BPS, and to make future targets more ambitious.

However, a more novel approach, and one that could have broader reach and more impact, involves using the CAPs as the metric against which buildings are benchmarked and performance is assessed. Buildings could report their energy usage by fuel type, as they already do, but then convert that usage into emissions of the four main criteria pollutants. Each building would thus have a PM2.5 intensity, NOx intensity, SO2 intensity, and VOC intensity, which would need to reduce over time to comply with the local air quality regulations.

To illustrate the practical application of this framework, consider a hypothetical BPS implemented by the State of Rhode Island. Using the policy module of our calculator, a jurisdiction can establish baseline levels for CAPs and set tiered reduction targets.

In this scenario, the jurisdiction aims for a 50% total reduction in CAPs. The table below outlines what a set of potential Criteria Air Pollutant Intensity (CAPi) targets could look like for a large office building.

TABLE 2: EXAMPLE LARGE OFFICE BUILDING CAPI TARGETS

(To convert grams to Tons divide by 907,200)

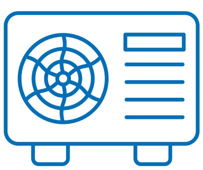
Grams of Pollutant per SF	Baseline	Interim Target 1	Final Standard Target
PM2.5	0.389	0.292	0.194
SO2	0.181	0.136	0.090
NOx	1.675	1.256	0.837
VOCs	0.141	0.106	0.071
20 Year Health Savings	-	$45,295–$80,297	$90,591–$160,593

The table below shows a tracking of CAPs toward a 50% reduction for all of Rhode Island. Across the state, our tool can also calculate the annual public health benefits associated with these air quality improvements.

TABLE 3

Statewide Tons of Pollutants	Baseline	Interim Target 1	Final Standard Target
PM2.5	34.6	26.0	17.3
SO2	12.6	9.5	6.3
NOx	491.3	368.5	245.7
VOCs	26.1	19.6	13.1
20 Year Health Savings	-	\$36,000,000–\$52,000,000	\$72,000,000–\$104,000,000

Others have also considered the link between building energy performance and health impacts, as outlined in the Health Co-Benefits of the Built Environment (CoBE),[9] created by the Harvard T.H. Chan School of Public Health. CoBE was created for individual building assessment. Using the CoBE tool, the benefit nationally from the large office building was found to be \$28,828.93 annually (or roughly \$576,578 over 20 years). Unlike our tool the CoBE v.2 presents estimates of the total health impacts from emissions at a national level, our results for the building presented above are benefits to the state of Rhode island.



Policy Mechanism 3: Zero-Emissions Heating Equipment Standards

Zero-emission heating equipment standards (ZEHES) are an emerging regulatory tool designed to address CAPs and GHG emissions from building combustion equipment (Northeast States for Coordinated Air Use Management (NESCAUM), 2024). Unlike policies that mandate the early retirement of functioning systems, ZEHES focuses on the point of sale or installation, ensuring that as fossil-fuel-fired space and water heaters reach the end of their useful life, they are replaced with zero-emission alternatives.

[9] Our tool can calculate the health benefits benefit of city-wide BPS policy. The CoBE 2.0 tool was made by the Harvard T.H. Chan School of Public Health and is specifically for building level calculations. https://healthybuildings.hsph.harvard.edu/research/climate/cobe/introduction-to-cobe/.

If focused on water or space heating equipment, the policy module in the calculator can help evaluate the health benefits of such a policy. Otherwise, if an estimate of energy reduction by fuel type can be made, the health benefits can be calculated on the custom module.

The legal foundation for ZEHES rests on the dual authority of state and federal law. While the U.S. EPA has not yet established performance standards for this equipment under Section 111(b) of the Clean Air Act, Section 116 explicitly authorizes states to adopt emission limits that are more stringent than federal requirements for various sources (excluding motor vehicles) (EPA, 2025) (42 U.S.C. 7416 - Retention of State authority, 2018). Furthermore, states that fail to meet National Ambient Air Quality Standards are required by the Clean Air Act to implement State Implementation Plans that include enforceable emission limitations to bring pollutants such as ozone and PM2.5 into compliance (EPA, 2025) (US CAA, 74 U.S.C., Section 7410(a)(2)(A)).

In December 2024, the Northeast States for Coordinated Air Use Management released its Model Rule: NOx and GHG Emissions Standards for Space and Water Heaters, which serves as a template for states to achieve these health and climate goals (Northeast States for Coordinated Air Use Management (NESCAUM), 2024). This followed pioneering work by California's Bay Area Air Quality Management District, which adopted the first ZEHES requirements in the nation in 2023 (Jennifer Elwell, 2023) (Bay Area Air Quality Managment District, 2023), and the California Air Resources Board (CARB) (Bay Area Air Quality Management District, 2023) (Bay Area Air Quality Managment District, 2023), which has been developing statewide standards since 2022.

Policy Mechanism 4: Pollution Health Fee on Combustion Fuels

A pollution health fee on combustion fuels is a locally adopted charge designed to recover the public health costs associated with air pollution and GHG emissions from on-site fuel combustion (e.g., natural gas, fuel oil, propane) in buildings or other stationary sources. The fee is structured around a documented nexus between fuel use and quantifiable health impacts, including premature mortality, respiratory and cardiovascular hospitalizations, emergency response utilization, and climate damages. These impacts are translated into a per-unit charge (e.g., $/kBtu or $/therm) of fuel combustion applied at installation, permit issuance, or based on ongoing usage.

Outputs from the EPA COBRA can be used to estimate changes in incidence rates for specific health endpoints attributable to CAPs and to monetize associated societal costs. These results could then be apportioned to relevant public-sector expenditures to inform fee/tax or proportional cost decisions, depending on the analysis conducted. By internalizing external health and climate costs, the fee generates dedicated revenue to offset public health burdens, fund mitigation programs, and manage the long-term transition away from combustion-dependent infrastructure. The fee also creates a transparent price signal that encourages the deployment of cleaner technologies and supports emissions reduction targets.

Additional Political Framing

Recent federal regulatory shifts, including the rescission of EPA's 2009 Greenhouse Gas Endangerment Finding, which underpins greenhouse gas regulation, have created uncertainty about the federal government's obligation to regulate carbon dioxide under the Clean Air Act (Brown, 2026; Federal Register, 2026). However, as of the publication of this resource, the Clean Air Act continues to explicitly regulate air pollutants that pose direct risks to public health, including nitrogen oxides (NOx) and ozone precursors, pollutants that are also evaluated by this tool (Hu, 2026).

Policies affecting energy choice have faced increased scrutiny and litigation following the 2025 executive order, Protecting American Energy from State Overreach (White House, 2025), and other recent federal interventions. There is no guarantee that basing a fee on health costs and CAPs rather than carbon will mitigate these risks.

In this evolving policy environment, arguments grounded in immediate, localized health impacts may resonate more strongly than those framed solely in terms of long-term climate risk. By quantifying the incidence and monetized costs of pollution-related health outcomes, EPHIC provides a methodologically rigorous way to evaluate building policies through a public health lens, an approach that remains firmly aligned with longstanding federal air quality mandates and public health protections.

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