New York State Public Health Impacts of Energy Action Calculator

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The New York State Public Health Impacts of Energy Action (PHIEA) calculator estimates the monetary value of the public health impacts of changes in energy consumption across multiple sectors and fuel types. The health benefits derive from reductions in fine particulate matter ($PM_{2.5}$) concentrations due to reductions in air pollutant emissions associated with changes in energy use. These estimates are calculated using marginal health benefit rates (dollars of benefits per unit of reduced energy consumption) developed using health analysis modeling results from the 2025 New York State Energy Plan.[1]

This document provides a brief introduction to the tool and its methodology, as well as several example use cases.

To report bugs or questions, please contact: phiea.info@nyserda.ny.gov.

Introduction to the Tool

PHIEA can be used to provide first-order estimates of the public health benefits of programs or policies in New York State that reduce fossil fuel or electricity consumption. The tool provides different marginal health benefit rates by region (Figure 1), sector and fuel (Table 1), and year (2025-2070).[2] The tool also provides estimates of the benefits that accrue within Disadvantaged Community (DAC) areas, as defined by the Climate Justice Working Group.[3]

To use the tool, the user can select the analysis years, the region(s) where changes in energy consumption will occur and the sector(s) and fuel(s) (including electricity) driving the changes in energy consumption. In addition, if the region is unknown, the user can estimate health benefits

[1] New York State Energy Planning Board. December 2025. "2025 New York State Energy Plan." https://energyplan.ny.gov/.

[2] Marginal health benefit rates are calculated for 2025-2050. Benefits for changes in energy consumption after 2050 are calculated in the tool using the 2050 marginal health benefit rates.

[3] Climate Justice Working Group (CJWG), Disadvantaged Communities Criteria (Department of Environmental Conservation, New York State Energy Research and Development Authority, 2025), https://climate.ny.gov/Resources/Disadvantaged-Communities-Criteria. Geographic disadvantaged communities (DACs) areas based on the criteria developed by the CJWG and the 2020 census tract definitions from the U.S. Census.

based on statewide averages. The user then enters changes in energy consumption (e.g., fuel quantity, vehicle-miles traveled, electricity use), which are combined with the marginal health benefit rates built into the tool to estimate public health benefits.

The outputs of the tool for each year, region, sector, and fuel combination are the annual societal monetary value of health benefits associated with the change in fuel or electricity consumption, annual benefits accrued in DAC areas, and the discounted health benefits using a user-supplied discount rate. Societal value is provided as low and high values based on different methods for calculating certain health outcomes, such as avoided mortality. The Results Summary tabs of the tool summarize the benefits by sector, fuel, and region. There are separate Results Summary tabs for total benefits and DAC benefits.

PHIEA is best suited for simple, fast estimates of public health benefits from existing or future energy policies or programs in New York State. For a thorough analysis of large-scale economywide changes in the energy system, a separate modeling analysis would be needed. This tool is also not suitable for estimating public health benefits from changes in electricity generation (e.g., from a large renewable energy project) in New York State.

Figure 1. Regions used in the New York State Public Health Impacts of Energy Action Calculator.

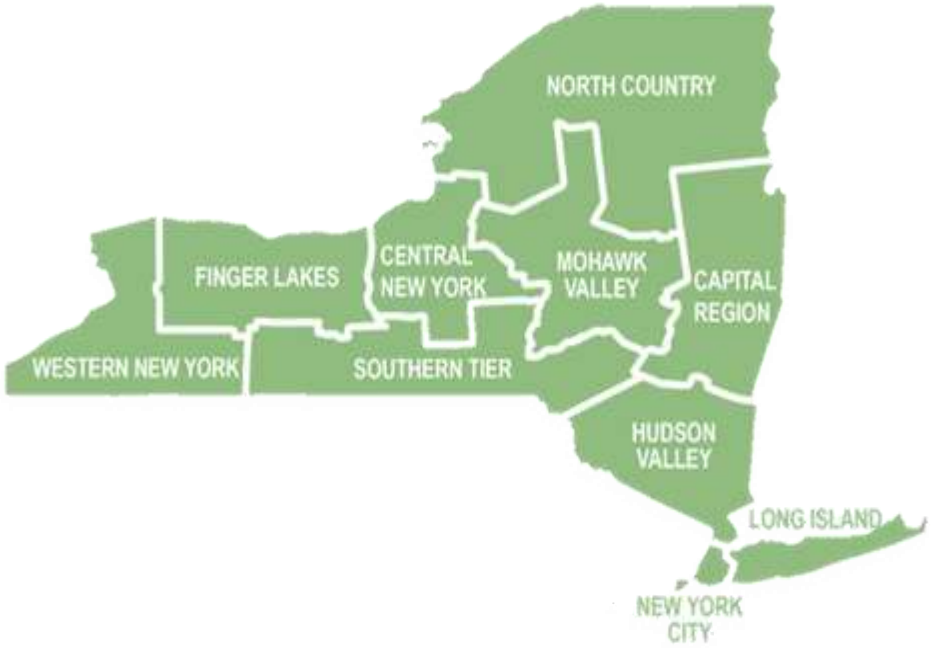


Table 1. Possible sector and fuel combinations in PHIEA.

Sector	Fuel
Residential Buildings	Natural Gas
	Distillate/Diesel
	Wood
	Electricity
Commercial Buildings	Natural Gas
	Distillate/Diesel
	Electricity
Industrial	Natural Gas
	Distillate/Diesel
	Wood
	Coal
	Electricity
Non-road Transportation	Distillate/Diesel
	Sustainable Aviation Fuel[a]
	Electricity
On-road Transportation	Heavy Duty Diesel[b]
	Heavy Duty Gasoline[b]
	Light Duty Diesel
	Light Duty Gasoline
	Electricity

[a.] Marginal health benefit rates for sustainable aviation fuel (SAF) represent benefits from the use of SAF to displace fossil jet fuel, not the reduction in use of SAF.

[b.] The "Heavy Duty" fuel categories include Class 2b – 8 vehicles, which includes medium and heavy duty vehicles.

Methodology

This section provides a brief overview of the tool's methodology. More detailed information is available in the "Methodology" tab of the tool itself.

The marginal health benefit rates in the tool were estimated based on modeling using the New York Community-Scale Health and Air Pollution Policy Analysis (NY-CHAPPA) tool, as described in the Health Impacts Analysis chapter of the 2025 New York State Energy Plan (Plan).[1] This chapter details the health analysis framework, including the approach for estimating changes in air pollutant emissions from changes in fuel consumption, and how NY-CHAPPA models the impacts on $PM_{2.5}$ concentrations and public health benefits at the census tract scale in New York

State. The marginal health benefit rates were developed using health analysis modeling results from the Additional Action scenario relative to the No Action scenario of the Plan.[1]

The results of the Plan included public health benefits by sector, fuel, region, and year. The basic approach for developing the marginal health benefit rates was to divide the monetary value of the benefits from each sector, fuel, region, and year from the Plan by the total change in fuel consumption between the Additional Action and No Action scenarios.

For example, to estimate the marginal health benefit rate for reduced natural gas consumption in the commercial buildings sector in 2030 in the Capital Region, the monetary value of the benefits from the Additional Action scenario for that year, region, sector, and fuel ($134,509, high value) were divided by the modeled change in commercial natural gas consumption in the Capital Region in 2030 under the Additional Action scenario, relative to the No Action scenario (407,347 MMBtu). The result is a marginal health benefit rate per unit of avoided energy consumption ($0.33/MMBtu). The rates were also converted to physical units (e.g., $346.71/MMcf natural gas), and users have the option to input energy changes in MMBtu or physical units.

The marginal rates for the electricity sector were calculated using a different approach. Separate NY-CHAPPA modeling was completed to isolate the health benefits from reduced emissions from only electricity generation. The marginal health benefit rates were calculated by dividing the estimated health benefits by the total generation from the Additional Action scenario (GWh), providing the total benefits of avoiding one GWh of electricity generation in each region. Marginal health benefit rates for the electricity sector were then adjusted to represent the benefits of avoiding one GWh of electricity *consumption* (rather than generation) based on modeling of the fraction of electricity consumption in each NY Independent System Operator (NYISO) zone that came from generation in other zones or out-of-state regions. The Calculator tab shows electricity benefits attributed to the region where the change in consumption occurs, and the Results Summary tabs show the distribution of electricity benefits by region based on estimates of where changes in generation would occur.

Example Use Cases

The following are example use cases meant illustrate how the tool could be used to estimate public health benefits from energy programs or policies. These examples use basic assumptions for the energy inputs and are not meant to be representative of any specific policy or program.

Example 1: Commercial Buildings

In this example, a portfolio manager of college campus buildings at a university in the Western New York region is considering two options to upgrade their buildings and wants to understand the public health benefits associated with each scenario. The campus buildings are mostly on a gas district heat system with some satellite buildings on heating oil. The portfolio manager is considering two scenarios:

- Scenario A: Retrofit building envelopes for 10 natural gas buildings and 4 heating oil buildings to reduce infiltration and improve thermal performance, resulting in a 40% reduction in energy consumption for heating in each building (a total reduction of approximately 325,000 MMBtu of natural gas and 130,000 MMBtu of heating oil per year). The retrofit also resulted in a total electricity savings of 3.8 GWh per year from reduced cooling demand.

- Scenario B: Targeted fuel switching of 4 buildings on heating oil to natural gas, resulting in a total reduction of 325,000 MMBtu per year from heating oil consumption and a corresponding increase of same amount in natural gas consumption.

To estimate public health benefits associated with each scenario using the tool, the user selects the following inputs: Western New York region, Commercial sector, Distillate/Diesel and Natural Gas fuel types, and "Energy Units (MMBtu)" as the input units.[4] For this example, we use 2027 – 2047 as the start and end years for the analysis to account for an assumed 20-year system lifetime. Then the user enters the energy changes for each scenario into the calculator. To account for the increase in natural gas consumption in Scenario B, the inputs are entered as negative values. An example of input options selected and fuel consumption inputs for Scenario A are presented in Figure 2 and Figure 3, respectively.

[4] In this and other examples presented here, the default real discount rate of 5.03% is used, and values are presented in 2025$.

Figure 2. Example of Calculator Input Options (Scenario A).

Scenario Name:					
Start Year	2027	Input Units for Fuels	Energy Units (MMBtu)	Line Loss Rate	2.5%
End Year	2047			al Discount Rate	5.03%
Dollar Year	2025	Input Units for Electricity	GWh	Results Units	dollars

Region	Selected
Capital Region	☐
Western New York	☑
Finger Lakes	☐
Hudson Valley	☐
Southern Tier	☐
Mohawk Valley	☐
North Country	☐
New York City	☐
Long Island	☐
Central New York	☐
Statewide	☐

Select All | Clear All

Sector	Selected
Residential	☐
Commercial	☑
Industrial	☐
Nonroad	☐
Onroad	☐

Select All | Clear All

Fuel	Selected
Natural Gas	☑
Distillate/Diesel	☑
Wood	☐
Coal	☐
Onroad Heavy Duty Diesel	☐
Onroad Heavy Duty Gasoline	☐
Onroad Light Duty Diesel	☐
Onroad Light Duty Gasoline	☐
Sustainable Aviation Fuel	☐
Electricity	☑

Select All | Clear All

Figure 3. Example of Calculator Input Data for Reduced Consumption (Scenario A; note figure is only showing the first seven years of the 20-year timeframe).

Input Data for Reduced Consumption					
Year	Region	Sector	Fuel	Reduced Consumption	Units
2027	Western New York	Commercial	Natural Gas	325,000.00	MMBtu
2027	Western New York	Commercial	Distillate/Diesel	130,000.00	MMBtu
2027	Western New York	Commercial	Electricity	3.80	GWh
2028	Western New York	Commercial	Natural Gas	325,000.00	MMBtu
2028	Western New York	Commercial	Distillate/Diesel	130,000.00	MMBtu
2028	Western New York	Commercial	Electricity	3.80	GWh
2029	Western New York	Commercial	Natural Gas	325,000.00	MMBtu
2029	Western New York	Commercial	Distillate/Diesel	130,000.00	MMBtu
2029	Western New York	Commercial	Electricity	3.80	GWh
2030	Western New York	Commercial	Natural Gas	325,000.00	MMBtu
2030	Western New York	Commercial	Distillate/Diesel	130,000.00	MMBtu
2030	Western New York	Commercial	Electricity	3.80	GWh
2031	Western New York	Commercial	Natural Gas	325,000.00	MMBtu
2031	Western New York	Commercial	Distillate/Diesel	130,000.00	MMBtu
2031	Western New York	Commercial	Electricity	3.80	GWh
2032	Western New York	Commercial	Natural Gas	325,000.00	MMBtu
2032	Western New York	Commercial	Distillate/Diesel	130,000.00	MMBtu
2032	Western New York	Commercial	Electricity	3.80	GWh
2033	Western New York	Commercial	Natural Gas	325,000.00	MMBtu
2033	Western New York	Commercial	Distillate/Diesel	130,000.00	MMBtu
2033	Western New York	Commercial	Electricity	3.80	GWh

Scenario A results in a net present value of $10.3 million (high)[5] in public health benefits from 2027-2047, of which $2.8 million are estimated to accrue to DAC areas. Note that for small scale

[5] The high value is reported here. The monetary value of benefits are provided as low and high values, based on different methods for calculating certain health outcomes, such as avoided mortality.

projects such as this, DAC estimates may be inaccurate given the geographic variations within some regions. Although heating oil accounts for a minority of the energy reductions, it accounts for 67 percent of the total benefits, due to the higher air pollutant emissions associated with heating oil relative to natural gas (Figure 4). Natural gas accounts for 20 percent of the benefits, and electricity accounts for 13 percent. About 89 percent of the benefits occur in Western New York. Benefits from the electricity sector account for the fact that benefits from reduced electricity consumption also occur in other regions where the electricity is generated. Therefore, Scenario A would also result in health benefits in other regions (Figure 5).

Scenario B results in a net present value of $15.2 million (high)[5] in public health benefits over the same period, of which $4.1 million would accrue to DAC areas. While there is no net change in energy consumption, the switch from a higher polluting fuel (heating oil) to a relatively lower polluting fuel (natural gas), results in significant public health benefits.

Figure 4. Estimated Health Benefits by Fuel, from the Results Summary - Total tab of the tool, Scenario A.

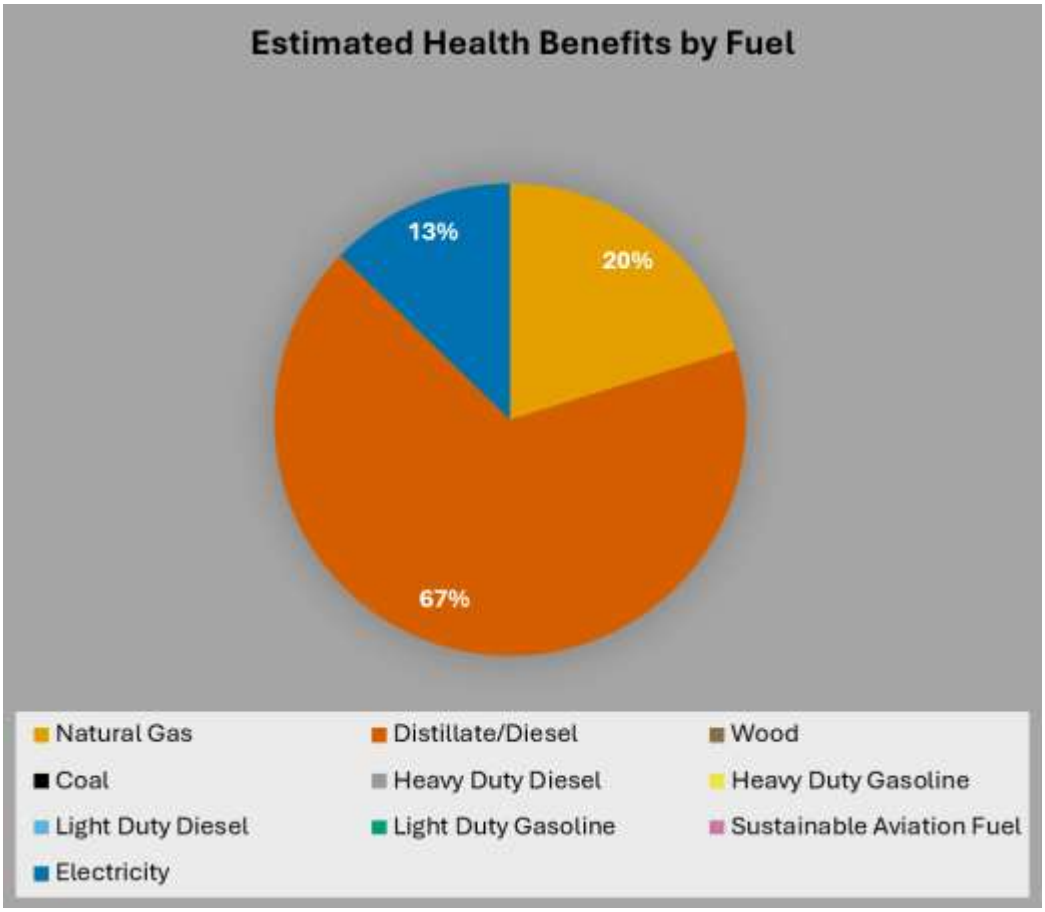
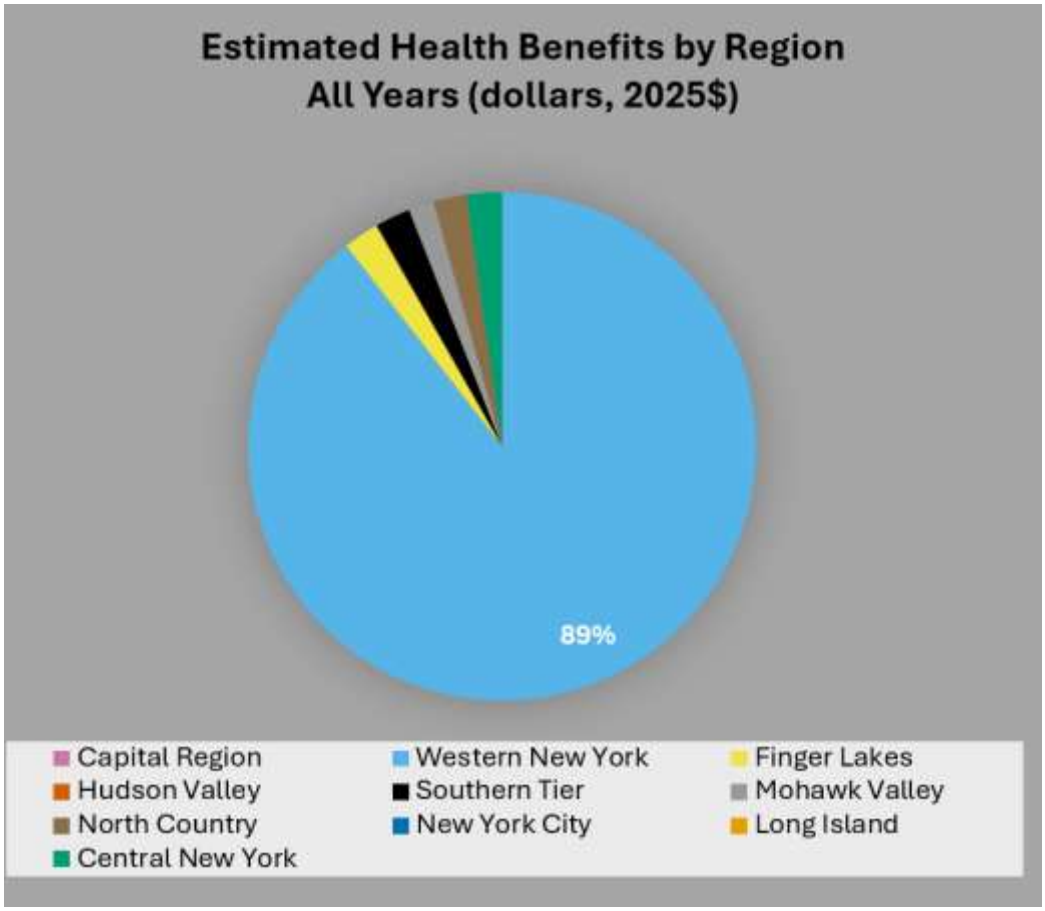


Figure 5. Estimated Health Benefits by Region, from the Results Summary – Total tab of the tool, Scenario A.



Example 2: Industry

This example considers health benefits associated with potential annual energy savings in the manufacturing sector in Long Island. We estimate annual natural gas savings of 720,000 MMBtu in 2027, rising to 4.5 million MMBtu by 2050. We estimate annual electricity savings of 23.4 GWh in 2027, rising to 146.5 GWh in 2050.

To estimate the health benefits of reduced industrial natural gas and electricity consumption in the Long Island region over this time period, the user selects the following inputs: Long Island region, Industrial sector, Natural Gas and Electricity fuel types, and "Energy Savings (MMBtu)" as the input units. For this example, we use 2027 – 2050 as the start and end years of the analysis. The user then enters the energy changes into the calculator. We interpolated the natural gas and electricity changes between 2027 and 2050 to estimate annual values.

The results of this scenario are a net present value of $119 million in public health benefits between 2027 and 2050 in Long Island. Of these benefits, approximately $26 million would accrue to DAC areas. Approximately 90 percent of the benefits are from reduced natural gas consumption and 10 percent from reduced electricity consumption. Nearly 96 percent of the benefits occur in Long Island, with approximately 4 percent of benefits occurring in other regions due to changes in electricity generation in those regions.

Example 3: On-road Vehicles

In this example, a company operating in New York City is planning to replace a fleet of 300 diesel Class 5/6 delivery vans with battery electric vehicles. The vans each drive an average of 12,000 miles per year.[6] Replacing the diesel vans with electric vehicles would reduce diesel consumption and increase electricity consumption by approximately 2 kWh per mile.

To estimate the health benefits of this scenario, the user selects the following inputs: New York City region, Onroad sector, Onroad Heavy Duty Diesel[7] and Electricity fuel types, "Physical Units" as the input units,[8] "VMT" as the input units for the on-road sector, and "kWh" as the inputs units for electricity. For this example, we use 2027 – 2042 as the start and end years for the analysis, based on an estimated 15-year lifespan of the electric vehicles. Then the user enters the changes in diesel VMT and electricity consumption into the calculator. To account for the increase in electricity consumption, those inputs are entered as negative values.

The results of this scenario are a net present value of $45 million in public health benefits between 2027 and 2042 in New York City, of which approximately $24 million would occur in DAC areas. Of those total benefits, reductions in diesel consumption account for approximately $46.1 million in benefits, while the increases in electricity consumption account for approximately $1.1 million in disbenefits.

[6] U.S. Department of Energy. "Average Annual Vehicle Miles Traveled by Major Vehicle Category." https://afdc.energy.gov/data/10309.

[7] Note that the Heavy Duty fuel categories in the tool include class 2b-8 vehicles, which includes medium and heavy duty vehicles.

[8] Note that the "Physical Units" option must be selected to then enter input units for the on-road sector as either VMT or gallons.