Section 2: Making the Case for Energy-Plus-Health Programs

For readers who are considering starting an Energy-Plus-Health program and want to understand the benefits that Energy-Plus-Health programs can offer – and how best to make the case for healthy homes programming to utility decision-makers, regulators, ratepayers, and other stakeholders.

2.1 Introduction

Understanding the drivers of the dynamic changes and challenges affecting the energy efficiency and health industries is essential to exploring the opportunities for coordinated program approaches. This section reviews these trends and how to respond to them through integrated Energy-Plus-Health programming. It offers rationales for both efficiency PAs and health care providers to make a defensible pitch to internal stakeholders, decision-makers, regulators, and health care partners for an Energy-Plus-Health program.

2.2 Health Industry Drivers for Energy-Plus-Health

2.2.1 Growing Evidence that Indoor Environments Affect Health

The U.S. Environmental Protection Agency (EPA) and U.S. Department of Energy (DOE) emphasize the importance of improving indoor air quality. People spend approximately 69% of their time inside a home, where the concentrations of some pollutants are often two to five times higher than typical outdoor concentrations."[1]

According to the U.S. Department of Housing and Urban Development (HUD) and its federal agency partners, the U.S. Environmental Protection Agency (EPA) and the Centers for Disease Control and Prevention (CDC), there are eight core ***healthy home*** principles (see Figure 1).

A growing body of research in line with these principles demonstrates that energy efficiency retrofits help to achieve these principles, and how improving indoor air quality improves health outcomes, such as asthma, chronic obstructive pulmonary disorder (COPD), and other chronic respiratory conditions. Figure 2, on the next page, shows how different efficiency improvements affect health.

Figure 1: Eight healthy home principles.

[1] E4TheFuture, 2016. "Occupant Health Benefits of Residential Energy Efficiency." https://e4thefuture.org/wp-content/uploads/2016/11/Occupant-Health-Benefits-Residential-EE.pdf. Prepared by: Tohn Environmental Strategies, National Center for Healthy Housing, & Three[3], Inc.

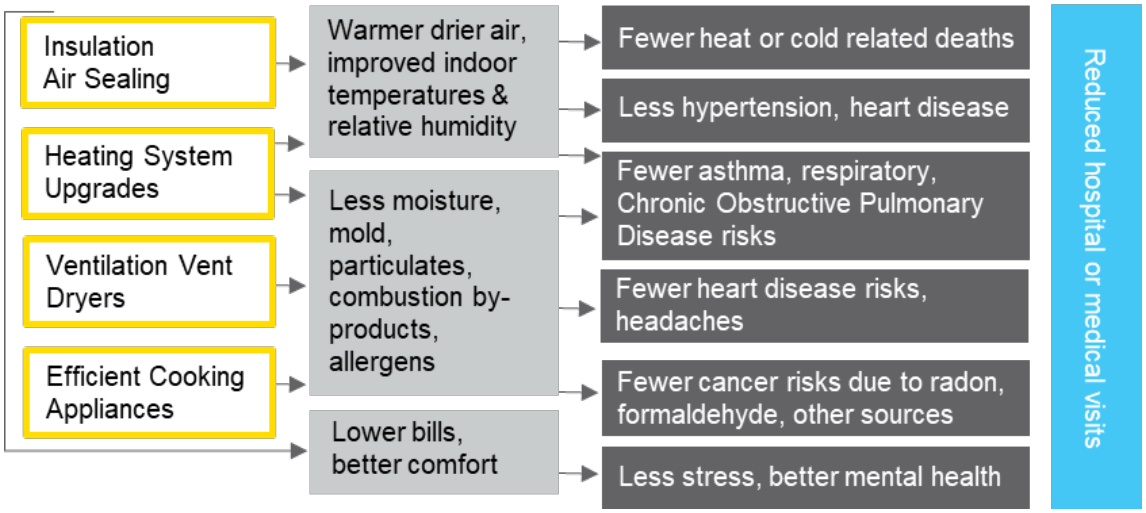

Figure 2: Occupant health and indoor environmental benefits of residential energy efficiency.[2]

DOE and the National Center for Healthy Housing (NCHH) published "Home Rx: The Health Benefits of Home Performance" after undertaking "an exhaustive literature review." The review led authors to conclude that when weatherization projects include ventilation that is compliant with ASHRAE 62.2, researchers see improved respiratory health (especially among people who have existing illnesses like asthma), as well as improved indoor air quality from:[3]

- Reduced particulate matter from combustion by-products from cooking, heating (especially wood), environmental tobacco smoke, and candles.
- Reduced volatile organic compounds (VOCs; especially formaldehyde): chemicals off-gassing from building materials and household products.
- Reduced CO2: by-product of breathing, often an indicator in poor air quality and inadequate fresh-air ventilation; in high concentrations, causes drowsiness and productivity losses.
- Reduced radon: naturally occurring radioactive gas that can enter homes from the ground and water supply.

These positive outcomes "complement the energy cost savings and comfort improvements (temperature and humidity) frequently produced by home performance upgrades. In some studies, the health benefits…were shown to reduce both health-care utilization and costs."[4]

Drawing on this body of research, training programs such as the Building Performance Institute's Healthy Homes Evaluator

Poor indoor environmental conditions are associated specifically with asthma and chronic obstructive pulmonary disease (COPD), which combined are one of the five most costly medical conditions.

"*Asthma and Chronic Obstructive Pulmonary Disease Natural History, Phenotypes, and Biomarkers.*" Stefano Guerra. Centre for Research in Environmental Epidemiology (CREAL), IMIM-Hospital del Mar, CIBERESP, Barcelona, Spain; and Arizona Respiratory Center, University of Arizona, Tucson, AZ, USA. October 2010. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2832909/

[2] Ibid.
[3] Wilson, Jonathan, David Jacobs, Amanda Reddy, Ellen Tohn, Jonathan Cohen, and Ely Jacobsohn, 2016. *"Home Rx: The Health Benefits of Home Performance—A Review of the Current Evidence."* Washington, DC: U. S. Department of Energy. https://www.energy.gov/eere/buildings/downloads/home-rx-health-benefits-home-performance-review-current-evidence.
[4] Ibid.

certification[5] and guidance from Weatherization Assistance Program's health and safety requirements[6] are now giving weatherization and home energy contractors the tools to assess homes more holistically. In addition to conducting traditional energy audits, these trained and certified contractors can now comprehensively assess homes based on the eight healthy homes principles.

2.2.2 Increased Focus on Social Determinants of Health

The health care industry is undergoing a dramatic transformation from a fee-for-service model to a value-based reimbursement structure. Health care policy professionals and providers acknowledge that the existing fee-for-service payment and delivery infrastructure is not sustainable. "Health care will change more in this decade than it did in the past 50 years"[7] is a generally accepted observation that relates to both treatment and payment approaches.

Managing rising costs is a central goal for hospitals and health partners. The United States has the second-highest per-capita annual spending on health care of $9,536, and "a small portion of the population is responsible for a very large percentage of total health spending."[8] As shown in Figure 3, 5% of the U.S. population accounted for half of total health spending in 2016.[9]

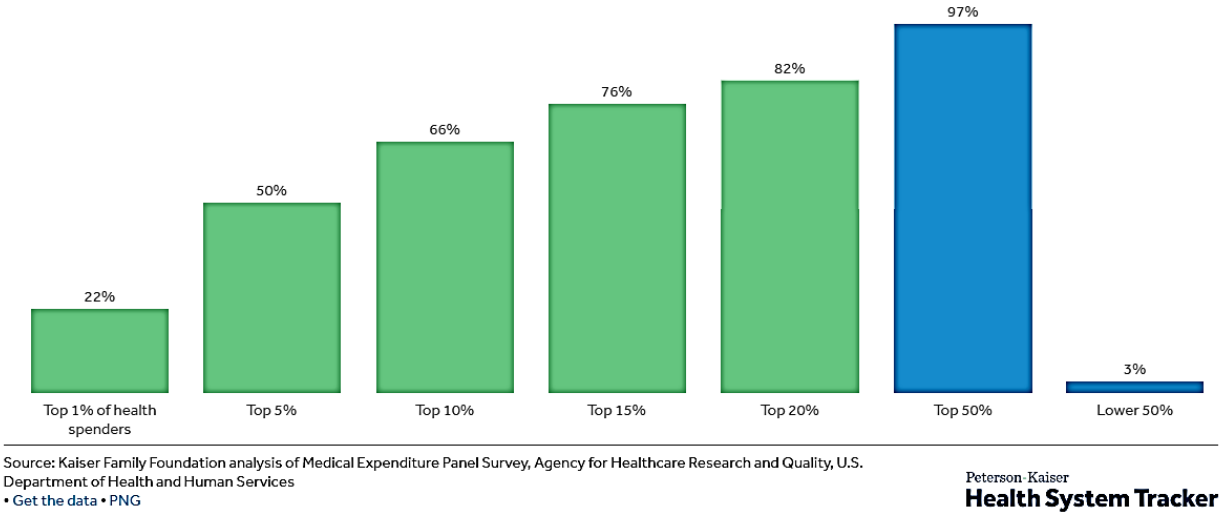

Figure 3: Health care spending by proportion of population.

[5] BPI Healthy Home Evaluator, http://www.bpi.org/certified-professionals/healthy-home-evaluator
[6] DOE, Weatherization Health and Safety Guidance, https://www.energy.gov/eere/wipo/downloads/wpn-17-7-weatherization-health-and-safety-guidance
[7] Bauer, Jeffrey, 2018. "Innovation and Health Reform: Wave of the Future?" 2018 VAHHS Annual Meeting. Montpelier, Vt.: 2018 Vermont Association of Hospitals and Health Systems. https://vahhs.org/client_media/files/Annual%20Meeting/2018/Bauer.VAHHS.091418.PresentationSlides.pdf.
[8] Peterson-Kaiser Health System Tracker, "How do health expenditures vary across the population." https://www.healthsystemtracker.org/chart-collection/health-expenditures-vary-across-population/#item-medicare-spending-inpatient-care-peaks-age-92-hospice-peaks-age-100
[9] Kaiser Family Foundation, "How Do Health Expenditures Vary Across the Population?" January 16, 2019. https://www.kff.org/slideshow/how-health-expenditures-vary-across-the-population-slideshow/

Moreover, Figure 4 shows respiratory illnesses as the fourth highest expenditure category.[10]

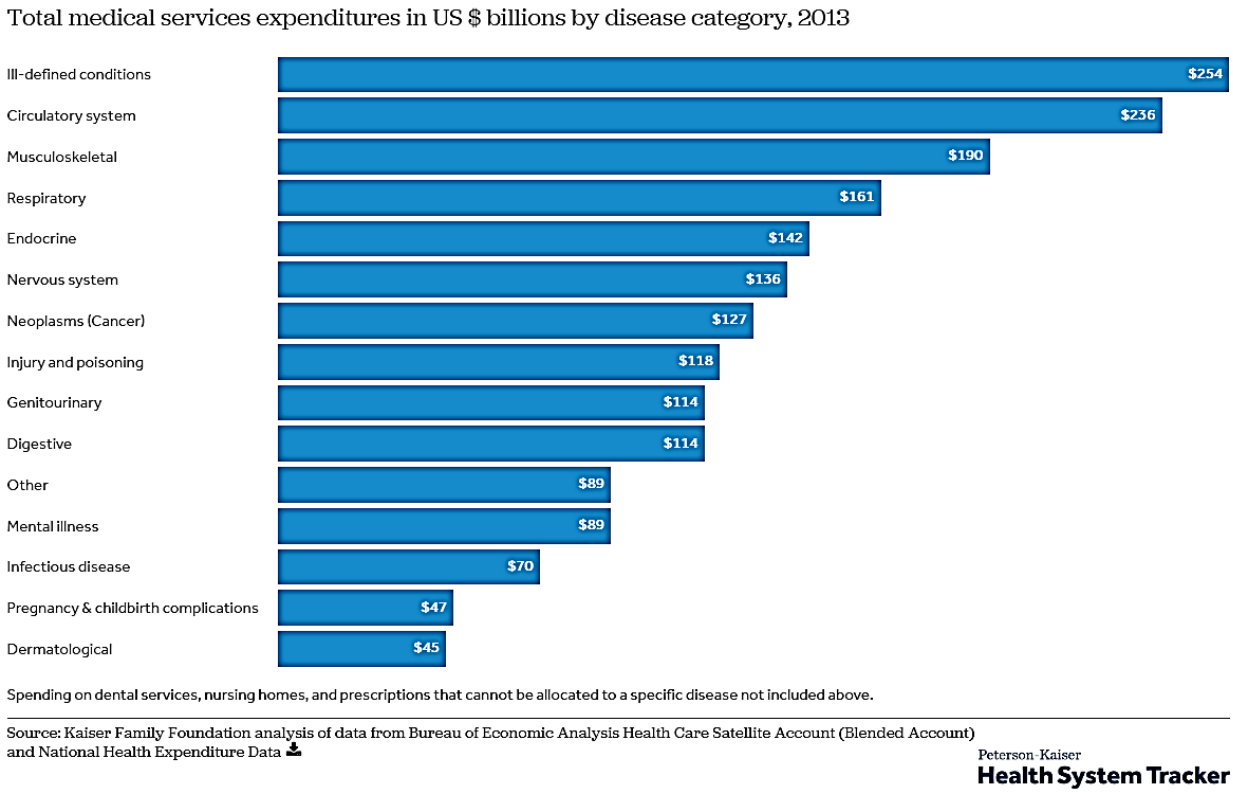

Figure 4: Health care spending by disease category.

The diminishing cost-effectiveness of in-hospital and in-office treatment for resolving chronic respiratory illnesses gives providers an incentive to consider new preventive care approaches. There is increasing understanding that social determinants of health (SDOH) present barriers to some patients' wellness when their social, economic and physical environments work against health care treatment plans.[11] To this end, health partners and practitioners are increasingly seeking to determine what factors in a patient's home may be contributing to the patient's illness, particularly in the area of respiratory illnesses such as asthma and COPD. With the growing understanding of medical conditions and treatments has come a revolution in care delivery infrastructure, with an expansion to home-based care models. Increasing the effectiveness of in-home patient care often relies on collaborations for cross-sector patient engagement, prevention, and treatment.

Energy efficiency programs can help to address health care challenges by:

- Providing knowledge and workforce capacity through networks of certified weatherization and home performance contractors, who can deliver in-home assessments and interventions through systematic delivery models supported by back-end quality assurance.

[10] Peterson-Kaiser Health System Tracker, "How much does the U.S. spend to treat different diseases?" https://www.healthsystemtracker.org/chart-collection/much-u-s-spend-treat-different-diseases/#item-circulatory-ill-defined-conditions-check-ups-largest-category-spending

[11] Housing and the built environment are one of the five social determinants of health, which also encompass economic stability, education, social and community context, and health.

- Conducting home assessments that generate insights on how the patient's home environment may be exacerbating poor health conditions, such as respiratory illnesses and fall hazards.
- Managing health care costs by supporting preventive care through home improvement scopes of work that leverage funding streams from the energy efficiency industry.

Section 5 provides more information on how cost and reimbursement models are changing in the health care sector, opening new opportunities for Energy-Plus-Health collaborations.

2.3 Energy Efficiency Industry Drivers for Energy-Plus-Health

Whole-house energy upgrade programs are a longstanding component of energy efficiency portfolios.[12] In residential markets, energy audit and retrofit programs are often delivered under the banner of the U.S. Department of Energy (DOE) Home Performance with ENERGY STAR® program. Low-income households[13] typically receive federal Weatherization Assistance Program (WAP) services from community action agencies and other providers. Utilities and energy efficiency PAs also directly deliver non-federally funded weatherization services to the residential market, and / or partner with WAP providers to enhance free weatherization services with electrical efficiency measures. Some efficiency PAs, such as those in Massachusetts and New York offer whole-house energy upgrade programs with enhanced incentives for moderate-income customers.[14]

Efficiency programs face a range of pressures that make it challenging to deliver residential retrofit programs. Energy-Plus-Health programs can help efficiency program administrators respond to these challenges by:

- Increasing participation in weatherization and residential retrofit programs, which helps PAs achieve their goals for energy savings, customer satisfaction, and low-income program participation.
- Enabling new health-related funding streams to stretch limited ratepayer dollars.
- Improving cost-effectiveness of residential retrofit programs by enabling fuller accounting of benefits.

2.3.1 Increasing Participation in Retrofit Programs

Whole-house energy upgrades are frequently a core part of residential energy efficiency portfolios, but they are challenging to deliver. Common customer barriers include:

- High project costs,
- Out-of-reach financing options,
- Lack of time or "hassle factor," and
- Lack of qualified contractors trained in building science, including health and safety.

[12] Third-party administrators are non-utility energy efficiency program administrators charged with delivering efficiency programs on behalf of states, cities, or provinces. Well-known examples are Efficiency Vermont, Efficiency Nova Scotia, Energy Trust of Oregon, and Focus on Energy (Wisconsin).
[13] Depending on the jurisdiction, the low-income market segment is typically defined as households earning (1) less than 150 percent or 200 percent of the Federal Poverty Level, (2) less than 60 or 80 percent of the U.S. Department of Housing and Urban Development Area Median Income (HUD AMI), or (3) less than 60 percent or 80 percent of the U.S. Census Area Median Income (AMI).
[14] The moderate-income market segment is typically defined as households earning between 60 percent and 120 percent of HUD AMI.

- The need to complete basic home repairs, remediate hazards, or replace knob-and-tube wiring before weatherizing the home.

Comfort and health messaging can be an effective way to motivate customers to participate in efficiency programs. Recent research shows that customers care more about the comfort and health of their home than they do about saving energy; when the Shelton Energy Pulse study asked to choose one home improvement between comfort, beauty, health, and value, comfort was consistently the top choice.[15] A recent Shelton survey found that 60% of respondents believe telling someone that an energy efficient home is a healthier home is an effective way to get people to spend $1,500 on efficient home features.

At the same time, many states are increasingly focused on reaching underserved customers and markets, such as low-and-moderate-income households. To address these barriers and achieve goals for energy savings and low-income participation, efficiency PAs are increasingly seeking new ways to engage their customers through collaboration with health and housing community-based organizations (CBOs) that act as trusted messengers.

Exploring Mutual Benefits for Health Care and Energy Industries

National Grid of Rhode Island's (NGRI) 2019 Annual Energy Efficiency Plan describes the utility's intention to "engage with local and national stakeholders and thought-leaders to discuss the interplay of benefits between the health care and energy industries …with a special emphasis on opportunities within the income-eligible population." National Grid is committed to working with partners to consider, "issues such as, the monetary value of health benefits from energy efficiency measures, delivery models for measures that drive both health and energy savings, and possible co-funding opportunities where appropriate."

The Narragansett Electric Company d/b/a National Grid RIPUC Docket No. 4888 2019 Energy Efficiency Program Plan. Attachment 1, page 19 of 43

Collaboration models for Energy-Plus-Health programs are described further in Section 3 and 4.

[15] Head, Lee Ann. Feb. 18, 2015. "Comfort is in the Eye of the Beholder". Shelton Group. https://sheltongrp.com/posts/comfort-is-in-the-eye-of-the-beholder/

2.3.2 Enabling New Health-Related Funding Streams for Efficiency Programs

Utilities and energy efficiency programs face a range of pressures to the conventional funding model, in which energy efficiency programs are funded using ratepayer dollars. As load growth flattens due to widespread adoption of energy efficiency and, in some regions, distributed renewable energy generation, utilities are challenged to spread costs across a smaller amount of retail sales. This leads to rising rates, and often concerns among utilities, regulators, and consumer advocates about the cost to ratepayers of energy efficiency programs. At the same time, many states face broader budget pressures, tempting legislatures to "raid" funds that were earmarked for energy efficiency programs. For example, in 2017, Connecticut legislators used $175 million "from ratepayer-funded energy conservation programs to help solve the state's massive budget deficit."[16]

Residential efficiency programs face additional cost pressure due to rapid transformation of the lighting market. Energy-efficient lightbulbs have traditionally been a cornerstone of residential energy efficiency programs, but many efficiency programs plan to stop incentivizing LED bulbs by 2020 or 2021 because they have become widely adopted in the market. This has the effect of making residential programs even more expensive and less cost-effective because lightbulbs are low-cost relative to the savings delivered. This pressure on energy efficiency program budgets is at odds with the desire of many states to expand programming to low-income and hard-to-reach customers.

> Missouri Medicaid Code of State Regulations (CSR) establishes the rules governing Medicaid reimbursement. In 2018, the State began allowing in-home assessments in connection with asthma education and training of patients. The CSR contains the criteria for in-home assessments as a "thorough assessment of the home including, but not limited to, rodent excrement, mites, animal dander, insects, dust, mold …structure deficiencies, ventilation and moisture conditions, conducting and recording basic air sampling procedures, and examination of the external environment of the home to identify and support the reduction of disease-causing agents leading to medical complications of asthma…with recommendations for remedial actions. In-home assessments for asthma triggers do not include remediation of issues identified in the home."

Energy-Plus-Health programs can address pressures on efficiency program budgets by tapping new funding streams from the health care sector, such as Medicaid payment contracts and community health benefit resources. Several states are now advancing changes to Medicaid rules to enable Medicaid payments for in-home assessments, providing models for replication.

[16] Hartford Courant, "Federal Lawsuit Filed to Block State from Using Energy Conservation Funds to Solve Budget Deficit, May 16, 2018. https://www.courant.com/politics/hc-news-energy-fund-raid-lawsuit-20180515-story.html

Missouri changed its Medicaid rules and created new Medicaid billing codes to allow Medicaid to pay for in-home assessments for asthma patients by BPI Healthy Homes Evaluators.[17]

New York is currently undertaking a Healthy Homes Value-Based Payment Pilot, with the goal of developing a replicable model for implementing a healthy home[18] approach to residential building treatments under the Medicaid Value-Based Payment (VBP)[19] framework. By validating impacts such as health care cost savings and benefits to residents, as well as providing market development support such as specification of services and VBP contracting guidance for these interventions, the Pilot will facilitate the adoption of healthy homes treatments by Medicaid managed care organizations (MCO) as part of their Medicaid VBP Arrangements that incorporate social determinants of health. This pilot is described further in Section 6.

With the health care industry opening opportunities for payment reform through innovation that delivers replicable, evidence-based programs, it is an opportune time for efficiency PAs to explore new funding streams in partnership with the health sector.[20] Section 5 provides more information on how the cost and reimbursement models are changing in the health care sector, opening new opportunities for Energy-Plus-Health collaborations.

2.3.3 Improving Cost-Effectiveness of Efficiency Programs

Whole-house retrofit programs are expensive because they offer generous customer incentives, and involve complex, whole-home upgrades. Under cost-effectiveness tests that are commonly applied to energy efficiency programs, whole-house energy upgrade programs may not meet sufficient energy-savings-per-dollar-invested criteria to "screen."

Challenges passing cost-effectiveness tests can sometimes limit the scope of whole-house retrofit programs that PAs can offer, such as incentive amounts or eligible energy efficiency measures. Documenting the non-energy impacts of programs is key to modifying cost-effectiveness tests. As stated by the American Council for an Energy-Efficient Economy (ACEEE), "Although efficiency has multiple benefits, states fail to include or undervalue many of the non-energy benefits that accrue to utilities, program participants, and society when evaluating cost effectiveness. Some of the most significant omissions are the health and environmental benefits that energy efficiency generates."[21]

While a few jurisdictions currently account for occupant health benefits, particularly for low-income customers, most states do not, according to the Database of State Efficiency Screening

[17] Missouri Rules of Department of Social Services Division 70, HealthNet Division. Chapter 3, Conditions of Provider Participation, Reimbursement and Procedure of General Applicability. Title 13—DEPARTMENT OF SOCIAL SERVICES. April 2018.
[18] A residential healthy homes intervention combines energy efficiency and weatherization measures (e.g., insulation and air sealing) with measures that address persistent respiratory health conditions such as asthma (e.g., ventilation, moisture/mold mitigation, carpet removal), and includes additional measures aimed at home injury prevention (smoke and carbon monoxide alarms, stair repair, electrical outlet covers). When implemented together, these interventions can improve occupant health, reduce energy bills and health care costs, and improve the comfort and safety of a home.
[19] New York State Medicaid is transitioning the managed care health care delivery system from a fee-for-service to a VBP model that links health care provider performance and reimbursement through a pre-determined set of value metrics related to both health outcomes and health care cost savings. To support local reinvestment, two of three VBP arrangement levels require incorporation of a community-based organization (CBO) engaging in work focused on the social determinants of health (SDH) Substandard housing is included among the recognized social determinants of health. The substandard housing determinant places energy efficiency and weatherization measures, when incorporated within a healthy home intervention, within the DOH value-based payment model.
[20] See NYSERDA Tier 3 case study, Section 6.
[21] "Cost-Effectiveness Tests: Overview of State Approaches to Account for Health and Environmental Benefits of Energy Efficiency." ACEEE Topic Brief. December 2018. p.1.

Practices (DSESP).[22] Cost-effectiveness testing guidance provided by the National Standard Practice Manual (NSPM) recommends that, to the extent a state's policies require accounting for program participant costs, there should be symmetrical treatment in the accounting of participant benefits. Therefore, benefits such as improved health and comfort should be quantified, and even hard-to-quantify impacts should be accounted for to the extent possible. According to the NSPM, "using best-available information, proxies, alternative thresholds, or qualitative considerations to approximate hard-to-monetize impacts is preferable to assuming those costs and benefits do not exist or have no value."[23]

The cost-effectiveness test used most commonly by efficiency PAs and regulators is the Total Resource Cost (TRC) test. The TRC test weighs the costs of customer contributions and program incentives and administration costs against the value of avoided supply costs and non-resource impacts resulting from an efficiency program over the lifetime of the installed measures. When non-energy impacts are quantified in the TRC test, the benefit side of the calculation more fully captures the impacts of efficiency that benefit participants and society.

An increasing number of states are updating their cost-effectiveness tests to more fully value health-related indirect benefits, such as those associated with asthma and other COPD illnesses. The inclusion of these non-energy benefit values in cost-benefit analyses ensures that participant costs and benefits are treated symmetrically, consistent with the fundamental principles of the NSPM. As discussed in this Playbook, a number of studies are being conducted to quantify these health-related impacts. In some cases, inclusion of health benefits can allow programs to offer additional energy efficiency measures and capture additional savings that would not otherwise screen.

[22] Database of State Efficiency Screening Practices, https://nationalefficiencyscreening.org/state-database-dsesp/
[23] "National Standard Practice Manual for Assessing Cost-Effectiveness of Energy Efficiency Resources." Prepared by The National Efficiency Screening Project. Edition 1 Spring 2017. https://nationalefficiencyscreening.org/

In Illinois, the state's major utility, Commonwealth Edison (ComEd) has identified the need for new program designs as a driver due to declining avoided costs, and to align with the state's policy goals. The Illinois Future Energy Jobs Act (FEJA 2017) recognizes a full range of benefits of energy efficiency and other clean energy resources, including health benefits. ComEd is actively researching how to integrate health impacts into new program designs and partnerships.[24] The utility is collaborating with healthy homes partners and evaluators to document health outcomes of energy efficiency improvements for multifamily residents with asthma (see callout).

For PAs that are positioned to propose cost-benefit analysis modifications, there is now a robust body of primary research available that documents the value of health and safety benefits from low-income weatherization and efficiency.

ACEEE recently published an "Overview of State Approaches to Account for Health and Environmental Benefits of Energy Efficiency," which identifies eighteen states and the District of Columbia as jurisdictions that either monetize or use a proxy to attribute value to the "societal environmental and/or public health, or the participant health benefits of energy efficiency."[25]

ComEd Illinois is currently experimenting with models to develop and validate scalable approaches to collaborate with the health care industry for the purpose of informing the IL cost-effectiveness test. With partners such as Green & Healthy Homes Initiative and Presence Health System, ComEd is designing and conducting joint health-energy assessments and upgrades in income-eligible multifamily buildings focused on asthma triggers and efficiency opportunities. In partnership with the Illinois Institute of Technology and Elevate Energy, ComEd is also comparing the effectiveness of three approaches to upgrading residential mechanical ventilation systems in existing homes to reduce indoor pollutants.

Jim Fay, Energy Efficiency Planning & Measurement, ComEd, presentation at the "Illinois Non-Energy Impacts" workshop, Home Performance Conference 2019

Because of the Washington State Weatherization Plus Health program findings (see Section 6), the State of Washington adopted a cost-benefit test that recognizes the participant health benefits of "measures identified through the Weatherization Manual priority list" and considers them cost-effective. The cost-benefit framework allows utilities to "fully fund repairs, administrative costs, and health and safety improvements associated with cost-effective low-income conservation measures…utilities may [also] exclude low-income conservation from portfolio-level cost-effectiveness calculations."[26]

For the jurisdictions that recognize the indirect impacts of efficiency in cost-benefit calculations, most are using non-energy impact proxies that include consideration of health and/or safety, among others. Nine states currently recognize health benefits specifically, including:[27]

[24] "Non-Energy Impacts (NEI) Research: The Utility Perspective." Jim Fay, Energy Efficiency Planning & Measurement, ComEd. 2019 National Home Performance Conference. April 2, 2019.
[25] *"Cost-Effectiveness Tests: Overview of State Approaches to Account for Health and Environmental Benefits of Energy Efficiency."* Cassandra Kubes, 2018. Washington, DC: American Council for an Energy-Efficient Economy (ACEEE): 4. https://aceee.org/topic-brief/he-in-ce-testing.
[26] Ibid. p. 6
[27] Ibid. p.4

Rhode Island	Vermont	Connecticut
National Grid's 2019 Resource Plan proposes that, "Other quantifiable non-resource or non-energy impacts may be created as a direct result of Least Cost Procurement efforts and, are therefore appropriate for inclusion in the RI Test. Non-energy impacts may include—but are not limited to—labor, material, facility use, health and safety..."[28]	A 15% non-energy impacts "adder" to avoided-cost calculations is included in the state's societal cost-effectiveness screening tool. This NEB adder supports the implementation of comprehensive programs, such as Home Performance with ENERGY STAR® and the Heat Saver Loan which include measures beyond only energy-saving technologies.	The *2019-2021 Conservation & Load Management Plan* contains 2018 Evaluation Recommendations supporting investment in original research to estimate medical and health impacts,[29] which supports the CT healthy homes partnership work described in the Tier 2 case study.

In Massachusetts, program administrators focused on monetizing NEIs that include health and safety. This was achieved in 2016 through groundbreaking research from efficiency program evaluators, NMR, Inc. and Three[3], Inc., which quantified health improvement values associated with air sealing, insulation, HVAC system servicing and replacements, duct sealing, and pipe wrap.[30] Along with the measures monetized by Three[3], NMR also assigned a health value for programmable thermostats in the Massachusetts *Technical Reference Manual* (TRM) for the health impacts of thermally regulated home environments.

Using a pre-and post-project survey approach, comprehensive findings show a statistically valid pattern of improvements in health, financial stability, higher attendance at work and school, and other positive outcomes, like a reduction in hospital and physician visits.[31] Three[3]'s 2016 report contains three levels of specific monetized values for multiple outcomes. Table 1. presents the first level, which estimate NEI values of health benefits based on "observed monetizable outcomes attributable to weatherization and highly reliable cost data."[32]

[28] "Rhode Island 2019 Energy Efficiency Resource Plan, Attachment 4, Rhode Island Test, Draft." The Narragansett Electric Company d/b/a National Grid. p.11.
[29] "2019-2021 Conservation & Load Management Plan." 2018. Eversource Energy, United Illuminating, Connecticut Natural Gas Corporation, and Southern Connecticut Gas: 228. https://www.ct.gov/deep/lib/deep/energy/conserloadmgmt/final-2019-2021-clm-plan-11-19-18.pdf.
[30] "Massachusetts Special and Cross-Cutting Research Area: Low-Income Single-Family Health- and Safety-Related Non-Energy Impacts (NEIs) Study." Prepared by: Beth A. Hawkins, Dr. Bruce E. Tonn, and Erin M. Rose, Three[3], Inc.; Greg Clendenning, and Lauren Abraham, NMR Group. Prepared for: Massachusetts Program Administrators. August 5, 2016. p. 17.
[31] Ibid, p.xii.
[32] Ibid, p.xi.

Table 1: Value of benefits per unit.

Annual Per Unit Benefit*			
	Household Annual NEI Value	Societal NEI Value	Total NEI Value
Reduced asthma symptoms	$9.99	$322.01	$332.00
Reduced cold-related thermal stress	$463.21	$33.73	$496.94
Reduced heat-related thermal stress	$145.93	$27.00	$172.93
Fewer missed days at work	$149.45	$37.36	$186.81

These health value data required access to state-specific health and cost data for a well-defined population receiving services in order to monetize health NEIs at the measure level. Jurisdictions with cost-benefit analyses applied at the program or portfolio levels may require different methods to quantify health NEIs. The acceptance by Massachusetts and Rhode Island regulators of these values signals an opportunity for PAs, evaluators, and regulators to recognize value for indirect health benefits. Three[3] recently replicated this study in Knoxville, Tennessee and is conducting similar research in multifamily housing.

Using Three[3]'s methodology, the Vermont Department of Health assessed Medicaid trends to predict the impacts on health care utilization of whole-building retrofits for low-income Vermont households. The Department concluded that the value of reduced health care utilization and energy costs for Vermont outweighs the initial, one-time investment in weatherization (Wx). "Wx also benefits public health by reducing fine particulate emissions from heating systems. The estimated 10-year value of energy and health benefits is at least $24,757 per household, or about three times the initial cost. Larger benefits are expected if Weatherization Plus Health (Wx+H) services are offered to people with existing chronic health conditions."[33]

While Vermont Department of Health's predictive data may not have an immediate impact on the cost-effectiveness test methodology used by regulators for Efficiency Vermont's energy efficiency portfolio, it might inform policy and program design opportunities for the state's Energy-Plus-Health collaborations. Going forward, this could lead to future cost-benefit adjustments that create opportunities to serve more low-and-moderate-income households.

[33] Vermont Department of Health, Weatherization + Health: Health and Climate Change Co-Benefits of Home Weatherization in Vermont, December 2018. http://www.healthvermont.gov/sites/default/files/documents/pdf/ENV_CH_WxHealthReport.pdf