Coordinating and Accessing Low-Income Energy Efficiency Programs

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About the Center for Energy Law and Policy

Penn State's Center for Energy Law and Policy (CELP) was founded in 2018 with a mission to harness interdisciplinary research strengths at Penn State and beyond to bring emerging science and scholarship to complex problems in energy law and policy. A major part of CELP's mission is to engage with stakeholders around energy policy issues in ways that drive and define interdisciplinary academic research problems and encourage ongoing interactions between researchers and practitioners. The Center for Energy Law and Policy is collaborative effort across Penn State's many disciplines, research centers and campuses, which makes it the only energy research center in the country that can fully harness the strengths of a leading land grant research university to assemble collaborative and interdisciplinary teams, providing Penn State with a unique opportunity to have a major impact. The University and its faculty also have a deep commitment to the kind of engaged and practitioner-informed scholarship that makes the Center for Energy Law and Policy a unique organization to serve the Commonwealth, the nation and the world.

About the Hamer Center for Community Design

The Hamer Center for Community Design (Hamer Center), endowed in Penn State's College of Arts and Architecture in 1998, seeks to utilize the expertise of faculty and students in the Stuckeman School of Architecture and Landscape Architecture to address a range of issues impacting the quality of communities, with a focus on issues with relevance to the Commonwealth of Pennsylvania. The Mission of the Hamer Center for Community Design is to encourage building community through building knowledge. It fulfills its mission through engagement in three inter-related activities: Teaching, Research and Service. Hamer Center activities entail two distinct but related types of undertakings: 1) applied research; and 2) theoretical investigations on issues related to community design/planning. The Hamer Center's work addresses public issues such as, but not limited to, community-based design/planning, affordable housing, development of design guidelines, sustainability, park and recreation planning, environmental and ecological analysis.

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This work was supported by the Center for Energy Law and Policy (CELP) and the Hamer Center of Community Design at Penn State. CELP is an interdisciplinary research initiative funded by multiple Colleges, Campuses and Institutes at Penn State. More information on the Center's funding structure can be found at https://celp.psu.edu. The Hamer Center serves as a laboratory for community partnerships that integrate socio-economic and environmental conscious resolution to design and planning problems focused around a series of research and outreach arms, including the Energy Efficient Housing Research group (EEHR). Information about the Hamer Center is at https://arts.psu.edu/research/hamer-center-for-community-design/.The researchers involved with this study would like to thank the participants in our expert insights workshop held in May 2022. A summary of this workshop is included as an appendix to this White Paper.

Executive Summary[1]

Energy efficiency—the practice of reducing the amount of energy typically required to perform a particular task or achieve a result, such as heating or cooling a home[2]—has well-recognized societal benefits, both from a socioeconomic and environmental perspective. Energy efficiency measures such as weatherizing living spaces and installing energy-efficient appliances lower both greenhouse gas emissions and individuals' electricity bills, and they are one of the most cost-effective ways of achieving these end results.[3] From a socioeconomic standpoint, energy efficiency is particularly important for low-income individuals, who shoulder higher energy burdens, meaning that a larger proportion of their income goes to electricity bills as compared to other segments of the population.[4] In the more extreme cases of energy burdens, individuals have to choose between heating or cooling their living space or purchasing food and medicine.[5] Beyond environmental and socioeconomic benefits, there is growing recognition of the health benefits of energy efficiency programs. Energy efficiency programs such as weatherization of living spaces combined with other interventions can reduce the incidence of asthma and prevent deaths from exposure

[1] The Penn State Center for Energy Law and Policy convened the authors and supported the research project that led to this white paper. Thanks to Catherine Zhou and Soumita Mukherjee for research support.

[2] U.S. DEPT. OF ENERGY, OFFICE OF RENEWABLE ENERGY & ENERGY EFFICIENCY, https://www.energy.gov/eere/energy-efficiency (last visited Apr. 10, 2023).

[3] The cost of lowering greenhouse gas emissions through certain energy efficiency measures is *negative* by some estimates. For example, Gillingham and Stock estimate behavioral energy efficiency changes (e.g., conserving electricity by turning off appliances when they are not needed) to cost negative 190 in 2017 dollars per ton of carbon dioxide emissions reductions. In contrast, unlike estimates by firms such as McKinsey that also identify weatherization as having negative costs, Gillingham and Stock estimate that the Weatherization Assistance Program costs 350 in 2017 dollars per ton of carbon dioxide emissions reductions. Kenneth Gillingham & James H. Stock, *The Cost of Reducing Greenhouse Gas Emissions*, 32 J. ECON. PERSPECTIVES 53, 59 (2018), doi=10.1257/jep.32.4.53.

[4] Ariel Drehobl, Laruen Ross, and Roxana Ayala, How High are Household Energy Burdens? (American Council for an Energy-Efficiency Economy Report: 2020), https://www.aceee.org/research-report/u2006; Erin Rose & Beth Hawkins, Background Data and Statistics on Low-Income Energy Use and Burden for the Weatherization Assistance Program: Update for Fiscal Year 2020 (Oak Ridge Natl. Lab. Report: 2020), https://weatherization.ornl.gov/wp-content/uploads/2021/01/ORNL_TM-2020_1566.pdf.

[5] U.S. DEPT. OF ENERGY, Low-Income Household Energy Burden Varies Among States – Efficiency Can Help in All of Them 1 (2018), https://www.energy.gov/sites/prod/files/2019/01/f58/WIP-Energy-Burden_final.pdf.

to extreme heat and cold, among other positive health outcomes.[6] An additional socioeconomic benefit of energy efficiency is its high job creation rate compared to many other energy technologies.[7]

There are numerous governmental and non-profit programs aimed at capturing the benefits of energy efficiency for low-income individuals. Indeed, energy efficiency is a crowded policy space, with programs offered at the federal, state, and local levels, or a hybrid of these levels. Many public utilities also offer energy efficiency programs, often under a state mandate, as do non-profit organizations. The number of governmental and private energy efficiency programs varies geographically and by building type, with more programs tending to be offered in urban areas and applying to single family rather than multi-unit buildings.

Despite the promise of energy efficiency programs and their relative abundance in some U.S. regions, there appear to be substantial challenges to realizing their full potential—challenges that could be addressed through improved policies. To explore these challenges, we performed a literature review and convened an expert workshop to explore obstacles that hinder the effectiveness of energy efficiency programs.

The expert workshop ("May 2022 Expert Workshop") was convened by the Center for Energy Law and Policy (CELP), the Hamer Center for Community Design and researchers of the Pennsylvania State University[8] on May 18, 2022. Individuals representing utility agencies, community organizations, and governmental entities that provide energy efficiency and health services to low-income residents in Pennsylvania participated in the workshop to discuss challenges faced by programs that work to help individuals obtain benefits from these programs. The aim was to identify and address research questions in this topic area and to ultimately address these questions, exploring potential solutions within this space.

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[6] Jill Breysse et al., *Effect of Weatherization Combined With Community Health Worker In-Home Education on Asthma Control*, 104 AM. J. PUB. HEALTH e57, e63 (2014); James Krieger, *Home Is Where the Triggers Are: Increasing Asthma Control by Improving the Home Environment*, 23 PEDIATR. ALLERGY IMMUNOL. PULMONOL. 139 (2010) (summarizing the efficacy of programs that reduce multiple home-based triggers of asthma, including changing environmental conditions in the home through, for example moisture reduction; educate clients; and provide "trigger reduction resources" such as vacuums and cleaning supplies). *But see* Koen F. Tieskens et al., *The impact of energy retrofits on pediatric asthma exacerbation in a Boston multi-family housing complex: a systems science approach*, 20 ENVTL. HEALTH 1, 7 (2021) (energy retrofits, some of which seal buildings to allow less infiltration or escape of air, can also cause increased asthma incidents in households "where occupants smoke tobacco and/or use gas stoves intensively," in which case exhaust fans and other measures are important.

[7] Howard Geller et al., Energy Efficiency and Job Creation: The Employment and Income Benefits from Investing in Energy Conserving Technologies at III (Economic Research Associates Report: 1992), https://www.aceee.org/sites/default/files/publications/researchreports/ED922.pdf; Max Wei, Shana Patadia, and Daniel M. Kammen, *Putting Renewables and Energy Efficiency to Work: How Many Jobs Can the Clean Energy Industry Generate in the U.S.*?, 38 ENERGY POLICY 919, 928 (2010) ("Energy efficiency investment offers a high payoff in induced jobs [jobs induced due to cost savings from lower energy use] and is generally the least cost and often the most readily implementable approach").

[8] The components of Penn State University that helped to organize the May 2022 Expert Workshop included the Center for Energy Law and Policy, the Hamer Center for Community Design, the Global Building Network, the College of Arts and Architecture, the College of Earth and Mineral Sciences, the College of Engineering, the College of Health and Human Development, Penn State Law, and the School of Public Affairs.

Findings from the May 2022 Expert Workshop were summarized in a report that is appended to this paper.[9]

Our research revealed program limitations that fall into several categories. First, the disparate quantity and quality of programs in different geographic settings and building types poses challenges for individuals in areas with limited program availability. Further, even in areas with broad program coverage, several factors limit the reach and potential of these programs. Our preliminary research, described in detail in this paper, suggests three impediments to access, which we identify as follows:

1) Individuals' awareness of the availability of energy efficiency programs;
2) Program navigability and access, including individuals' ability to determine whether they qualify for energy efficiency programs and their ability to obtain program services if they do qualify; and
3) Program acceptance, including individuals' decisions to participate in energy efficiency programs for which they are eligible.

Residents' limited knowledge about the availability of programs and eligibility criteria for these programs seems to be a key barrier. This access-based challenge is likely particularly acute in areas with limited or no broadband internet connectivity. Secondly, even when individuals are aware of energy efficiency programs and eligibility criteria, it is sometimes difficult for them to navigate the process of applying for and receiving program benefits, particularly when multiple programs offer different services, all of which could benefit a home or multi-family dwelling unit.[10] Finally, even when individuals are aware of programs and can navigate the process required to sign up for these programs, they may be unwilling to participate based on concerns about program benefits, motivation, or individual obligations or expense..[11]

Related to these access challenges in the low-income energy efficiency space is a coordination problem: in areas where there are multiple programs that could enhance energy efficiency and other residential issues, such as building rehabilitation, weatherization, health and aging-in-place programs, and opportunities for energy-efficient appliances, there is often limited aggregation or coordination of these programs. In the absence of an organization that plays a coordinating role—creating a centralized

[9] Pennsylvania State University, *Coordinating and Enhancing Access to Low-income Energy Efficiency Programs Expert Insight Workshop* 16 (May 18, 2022), appended to this document as Appendix A.

[10] For a description of opportunities for "stacking" energy efficiency programs, *see, e.g.,* Greg Leventis, Chris Kramer, & Lisa Schwartz, Energy Efficiency Financing for Low- and Moderate-Income Households: Current State of the Market, Issues and Opportunities at 7 (State and Local Energy Efficiency Action Network Report: 2017), https://emp.lbl.gov/sites/default/files/news/lmi-final0811.pdf (noting that low-income energy efficiency financing "[p]rograms may be able to collaborate with organizations that could provide full or partial *direct funding* of projects (e.g., community development financial institutions, or healthcare providers that might fund audits); *buy down project costs* (e.g., utility rebate programs); or *cross-fund* projects that might not otherwise be possible (e.g., community action agencies or nonprofit organizations that have funds to make health and safety repairs that must be done before efficiency work can begin")).

[11] Expert participants in our workshop noted that some individuals believe that energy efficiency programs are a "scam" or "too good to be true," in part because some invalid organizations have attempted to obtain money from individuals by posing as utilities or similar organizations.

platform for determining recipients' eligibility for multiple programs, for example, and harmonizing some eligibility standards—many of these programs may be underused.

An additional barrier that appears relevant in all contexts—areas with abundant and relatively scarce energy efficiency programs—is insufficiently tapped energy efficiency funding from healthcare dollars, such as state Medicaid plan amendments or waivers as well as funds from the Children's Health Insurance Program (CHIP). Adding energy efficiency programs funded with healthcare dollars could fill important gaps in the energy efficiency-health context but is likely to exacerbate existing coordination and aggregation challenges associated with energy efficiency programs.

In this white paper, we begin to flesh out the contours of these policy challenges and set an agenda for the most relevant research questions that should be formulated and answered in the low-income energy efficiency space. Specifically, we rely upon a literature review, a qualitative empirical review of state programs that use health funding for energy efficiency-related projects, and lessons learned from community-engaged research, to identify the most relevant questions and suggest possible answers to these questions.

Part I of this paper introduces the concept of energy efficiency and connections between energy efficiency and health, examining all energy efficiency factors (and projects that sometimes must precede energy efficiency improvements, such as living space renovation) that affect energy consumption and health in residential buildings.

Part II of the paper introduces policies and programs that support energy efficiency and the mechanics of these programs, focusing specifically on Programs tailored toward low-income housing. It also explores health programs and state programs that use healthcare dollars, such as Medicaid and funding from the Children's Health Insurance Program to both reduce energy use and improve health outcomes.

Part III then explores two challenges in the energy efficiency policy space, including individuals' access to energy efficiency-health programs and barriers to coordinating energy efficiency and health programs that operate within the same geographic area. This Part includes lessons learned from the expert workshop introduced above, a literature review of coordination challenges in governance, and a literature review of access challenges in the energy efficiency space. It then goes on to introduce the concept of collaborative governance and examine the performance of collaborative governance in energy efficiency and conservation (EE&C) practices. It reviews the theoretical framework of collaborative governance. After explaining the key concepts and activities involved in the collaborative process, it discusses several factors that determine the success of collaborative governance. The section then goes on to identify the obstacles confronting EE&C programs in Pennsylvania. To help practitioners develop metrics that evaluate collaborative performance, the section next summarizes several emerging approaches that have been used in empirical literature to measure collaborative outcomes. The review concludes with lessons on the opportunities and challenges that collaborative governance offers for EE&C programs in Pennsylvania, and with policy recommendations for public managers as well as policy practitioners.

Finally, Part IV identifies research questions that we deem to be most important for low-income energy efficiency policy, explores initial lessons learned that inform these questions, and suggests pathways for future research.

I. Understanding the Connections Between Energy Efficiency and Health

Residential buildings in the United States, which include more than 120.92 million households, account for 21% of the primary energy use in the country.[12] Primary energy use is the direct use of energy to perform a task, such as to heat a residence or cook. When one analyzes both primary and secondary energy use (the use of energy in the form of electricity) in households, an average household is reported to consume 85 million British Thermal Units (BTU) and spend $2,069 on energy every year.[13] More than half of this energy (i.e., 51%) is used for heating and air conditioning.[14]

Because of the energy burden of low-income households, weatherization programs such as the Weatherization Assistance Program (WAP) aim to reduce energy use and related cost burden while improving the health and safety of the occupants. In weatherization programs an energy audit is first conducted to evaluate the building envelope and systems (such as mechanical and electrical) with regard to their energy use and efficiency (particularly as related to heating and cooling) as well as their potential impacts on the occupant health and safety. The purpose of the energy audit is also to identify cost-effective energy efficiency strategies suitable for a particular building. Based on the audit results, potential energy conservation measures such as insulation, air-sealing, or heating system improvement are recommended to reduce the energy uses and related utility costs of the home.[15]

Improvements in energy efficiency can be attributed to significant mental and physical health outcomes such as reduced respiratory and cardiovascular conditions, arthritis, or allergies.[16] European data suggest that cold indoor temperatures cause 12.8 excess deaths per 100,000 people per year,[17] and mold causes

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[12] U.S. DEPARTMENT OF ENERGY, OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY, Energy Data Facts, https://rpsc.energy.gov/energy-data-facts (last visited Apr. 10, 2023).

[13] U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, LOW INCOME HOME ENERGY DATA FOR FISCAL YEAR 2017 at 2 (2018), *available at* https://www.acf.hhs.gov/sites/default/files/documents/ocs/RPT_LIHEAP_HEN01HEData_FY2017_0.pdf.

[14] U.S. ENERGY INFORMATION ADMINISTRATION (EIA), *Use of Energy Explained: Energy Use in Homes*, https://www.eia.gov/energyexplained/use-of-energy/homes.php#:~:text=More%20than%20half%20of%20energy,space%20heating%20and%20air%20conditioning (last visited Apr. 10, 2023).

[15] PENNSYLVANIA DEPARTMENT OF COMMUNITY AND ECONOMIC DEVELOPMENT, WEATHERIZATION ASSISTANCE PROGRAM GUIDELINES at 3 (2022), *available at* https://dced.pa.gov/download/weatherization-assistance-program-guidelines/?wpdmdl=115898.

[16] INTERNATIONAL ENERGY AGENCY (IEA), *Multiple Benefits of Energy Efficiency: Health and Well-being*, https://www.iea.org/reports/multiple-benefits-of-energy-efficiency/health-and-wellbeing (last visited: Apr. 10, 2023).

[17] JANET RUDGE, *Indoor Cold and Mortality, in* MATTHIAS BRAUBACH, DAVID E. JACOBS & DAVID ORMANDY, ENVIRONMENTAL BURDEN OF DISEASE ASSOCIATED WITH INADEQUATE HOUSING 93 (2011).

83 deaths per year.[18] In the United States, a 2021 study published in Science Advances suggests that intensive building energy efficiency could lead to 3,700-7,800 fewer lives lost to premature mortality in 2050.[19] In fact, the health and well-being of occupants can be affected by a range of building-related variables such as indoor air quality, thermal comfort, lighting quality, view quality, sound quality, and spatial quality.[20] Indoor air quality is especially important because a typical person spends 90% of their time indoors, and the concentration of air pollutants inside buildings could be two to five times greater than the concentration of the outdoor air pollutants.[21] Sick Building Syndrome (SBS) is an example of health issues experienced in buildings with poor indoor air quality, characterized by coughing, runny nose, itchy skin and other symptoms while being in a building. SBS can be addressed by improvement of ventilation in buildings.

Improvement of residential buildings through energy efficiency retrofits could reduce indoor dampness and mold and improve asthma symptoms, non-asthma respiratory symptoms, general health, mental health, and thermal comfort.[22] Ahrentzen, et al (2016)[23] studied 53 affordable apartment housing units for older adults in Phoenix, Arizona, before and after energy efficiency retrofitting including roof upgrades (insulation), replacement of windows and building mechanical systems, replacement of indoor materials with low-or no-VOC emitting materials. Their studies showed a 19% reduction in post-retrofit energy consumption, improvement of the occupants' quality of health/life, reduced emotional distress, and increased sleeping hours. In the context of UK, Gilbertson et al (2006)[24] also report improved physical health and comfort, mental health and emotional well-being, and reduced symptoms of chronic illness in residential buildings with energy retrofitting. In a study of multi-family residential buildings in Boston, MA, Underhill (2018)[25] found that weatherization and ventilation retrofits could lead to energy savings and indoor air quality benefits. This study also found that weatherization without upgrades in ventilation could lead to increased concentration of indoor $PM_{2.5}$ levels and negatively affect health benefits of energy-efficient buildings.

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[18] MARITTA S. JAAKKOLA ET AL., *Indoor Dampness and Mould Problems in Homes and Asthma Onset in Children, in* MATTHIAS BRAUBACH, DAVID E. JACOBS & DAVID ORMANDY, ENVIRONMENTAL BURDEN OF DISEASE ASSOCIATED WITH INADEQUATE HOUSING 23 (2011).

[19] Kenneth T. Gillingham et al., *The Climate and Health Benefits from Intensive Energy Efficiency Improvement*, 7 SCIENCE ADVANCES (2021), doi: 10.1126/sciadv.abg0947.

[20] MING HU, SMART TECHNOLOGIES AND DESIGN FOR HEALTHY BUILT ENVIRONMENTS, Springer Nature EBook (2021), *available at* https://doi.org/10.1007/978-3-030-51292-7.

[21] ENVTL. PROT. AGENCY, REPORT ON THE ENVIRONMENT: INDOOR AIR QUALITY (2021), *available at* https://www.epa.gov/report-environment/indoor-air-quality.

[22] Chengju Wang, Juan Wang & Dan Norbäck, *A Systematic Review of Associations between Energy Use, Fuel Poverty, Energy Efficiency Improvements and Health*, 19 INT J ENVIRON RES PUBLIC HEALTH 7393 (2022), doi: 10.3390/ijerph19127393.

[23] S. Ahrentzen, J. Erickson & E. Fonseca, *Thermal and Health Outcomes of Energy Efficiency Retrofits of Homes of Older Adults*, 26 INDOOR AIR 582 (2016), doi: 10.1111/ina.12239.

[24] Jan Gilbertson et al., *Home Is Where the Hearth Is: Grant Recipients' Views of England's Home Energy Efficiency Scheme (Warm Front)*, 63 SOCIAL SCIENCE & MEDICINE 946 (2006), doi:10.1016/j.socscimed.2006.02.021.

[25] Lindsay Jeanne Underhill, Energy Efficiency, Indoor Air Quality, & Health: A Simulation Study of Multifamily Housing in Boston, Massachusetts (2018) (PhD Thesis, Boston University School of Public Health), *available at* https://open.bu.edu/bitstream/handle/2144/33047/Underhill_bu_0017E_13666.pdf?sequence=5&isAllowed=y.

Reductions in greenhouse gas (GHG) emissions resulting from energy efficiency also positively affect health and climate change outcomes. By shrinking energy use, energy efficiency lowers conventional air pollutants from electricity generation and primary energy use, such as small particulate matter ($PM_{2.5}$) emissions that negatively impact health. The projected conventional pollutant reductions include a projected 6-11% reduction in energy-related carbon dioxide emissions and 18-25% reduction in $PM_{2.5}$ emissions from "intensive" energy efficiency measures through 2050.[26] These connections, ranging from direct health impacts within homes to reduced emissions of greenhouse gases and conventional pollutants, demonstrate the importance of energy efficiency measures to public health policy.

II. Energy Efficiency-Health Policy in the United States

Energy efficiency policy for low-income communities involves a diverse suite of measures originating at the federal, state, and local levels. These policies come in two main forms. First, they include statutes and regulations that directly address energy efficiency by, for example, providing funds for weatherization or requiring electric utilities to implement energy efficiency programs for low-income customers. They also include health policies, such as Medicaid, that some states have amended to address health issues at the source—namely, within the home—by changing housing conditions in low-income living spaces that contribute to medical problems such as asthma. This Part introduces both of these types of programs.

A. Direct Energy Efficiency Policies

Most direct funding for energy efficiency programs in the United States comes from the federal government, through the Weatherization Assistance Program. But as discussed here, additional federal programs administered by agencies such as the U.S. Department of Agriculture also directly support energy efficiency in specific parts of the United States.

1. The Weatherization Assistance Program

The largest low-income energy efficiency program at the federal level in the United States is the Weatherization Assistance Program (WAP), created by Congress in 1976 and overseen by the U.S. Department of Energy (DOE).[27] Individuals eligible for WAP are those in "households at or below 200% of the poverty income guidelines," or, in states that so elect, individuals in households that earn 60% of median state income or less or 80% or less of the local area median income.[28] Households that receive

[26] Gillingham et al., *supra* n.19. $PM_{2.5}$ emissions are "fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller." U.S. ENVIRONMENTAL PROTECTION AGENCY, *Particulate Matter (PM) Basics*, https://www.epa.gov/pm-pollution/particulate-matter-pm-basics (last visited: Apr. 10, 2023).

[27] Rose & Hawkins, *supra* n.4, at viii ("The U.S. Department of Energy (DOE) Weatherization Assistance Program (WAP) is the largest single national residential energy efficiency program operating within the United States."); *id*. (noting the creation of WAP in the Energy Conservation and Production Act in 1976).

[28] U.S. DEPT. OF ENERGY, OFFICE OF RENEWABLE ENERGY & ENERGY EFFICIENCY, *How to Apply for Weatherization Assistance*, https://www.energy.gov/eere/wap/how-apply-weatherization-assistance (last visited Apr. 10, 2023); Rose & Hawkins, *supra* n.4, at 3 (explaining that the 80% of local area median income eligibility criterion used by some subgrantees comes from Housing and Urban Development programs).

Supplemental Securities Income or Aid to Families With Dependent Children are also WAP eligible.[29] Pursuant to the statute requiring the creation of a weatherization program by the DOE, low-income individuals who are "elderly" and "handicapped" must receive priority funding under WAP.[30]

Although DOE distributes federal WAP funds and writes and administers WAP regulations, WAP is primarily a state program—"administered at the state and local level."[31] DOE distributes money to state weatherization agencies, which in turn fund "nearly 800 local agencies nationwide."[32] These local agencies include "[c]ommunity action agencies, other nonprofits, and local governments" who rely on their own employees and contractors to complete weatherization work using WAP dollars. Beyond going to weatherization agencies in all fifty states and all five U.S. territories, WAP also funds low-income weatherization in Native American tribal communities.[33] WAP supports weatherization of nearly 35,000 homes annually[34] using funds appropriated by Congress annually and distributed by DOE. A maximum of 20 percent of these appropriated funds may be used for federal, state, and local training and technical assistance that help all grantees. Annual "base" allocations to all WAP grantees total $171,858,000, and additional funds allocated by Congress are distributed by DOE based characteristics within the WAP grantee's area, including climate, residential energy expenditures, and low-income households.[35]

2. Other Federal Funding

Other direct federal funding for energy efficiency comes from acts such as the Agriculture Act of 2014, under which the U.S. Department of Agriculture supports energy audits of rural small businesses in designated rural areas and agricultural producers. These audits are designed to lower "the demand for energy through energy efficiency improvements."[36]

More recently, the Infrastructure Investment and Jobs Act of 2021 (IIJA) created several new energy efficiency programs and provided additional funding for existing programs. Much of funding is through formula grants, which are "predetermined and noncompetitive," but for which recipients still must apply.[37] The IIJA appropriated $550 million to the existing Energy Efficiency and Conservation Block Grant

[29] *Id*.

[30] 42 U.S.C. § 6863.

[31] U.S. Dept. of Energy, *supra* n. 28.

[32] U.S. DEPT. OF ENERGY, OFFICE OF RENEWABLE ENERGY & ENERGY EFFICIENCY, *Weatherization Assistance Program* at 1, https://www.energy.gov/sites/default/files/2022-06/wap-fact-sheet_0622.pdf.

[33] *Id*.

[34] *Id*.

[35] U.S. DEPT. OF ENERGY, OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, *Weatherization Assistance Program Allocation Formula*, https://www.energy.gov/eere/wap/weatherization-management-resources/weatherization-assistance-program-updates-0 (last visited Apr. 10, 2023).

[36] U.S. DEPT. OF AGRICULTURE, RURAL DEVELOPMENT, *Rural Energy for America Program Energy Audit & Renewable Energy Development Assistance Grants* at "Overview" https://www.rd.usda.gov/programs-services/energy-programs/rural-energy-america-program-energy-audit-renewable-energy-development-assistance-grants (last visited: Apr. 10, 2023).

[37] PA. DEPT. OF ENVTL. PROT., ENERGY PROGRAMS OFFICE, *Infrastructure Investment and Jobs Act Funding for Energy*, https://www.dep.pa.gov/Business/Energy/OfficeofPollutionPrevention/Pages/Infrastructure-Investment-and-Jobs-Act-(IIJA).aspx (last visited: Apr. 10, 2023).

Program, through which the Department of Energy will allocate funds to states, local governments, and tribes. These funding recipients, in turn, may use the funds for "[d]evelopment and implementation of an energy efficiency and conservation strategy," "conducting residential . . . building energy audits," establishing "financial incentive programs for energy efficiency improvements," providing "grants to nonprofit organizations and governmental agencies for the purpose of performing energy efficiency retrofits," and developing and implementing "energy efficiency and conservation programs for buildings" within the jurisdiction of the grant recipient, among other uses of funds.[38] Pennsylvania's Energy Programs Office expects that it will receive $4.7 million under the Block Grant Program.[39]

Beyond expanding the existing block grants program, the IIJA creates a new Energy Efficiency Revolving Loan Fund Capitalization Grant Program with $250 million in funding. This is also a formula grant provided to the state, and states are directed to use the money for "loans and grants for energy efficiency audits, upgrades, and retrofits to increase energy efficiency and improve the comfort of buildings."[40] Pennsylvania expects to receive $3.7 million under this program.[41]

The Inflation Reduction Act of 2022 also contains provisions to support energy efficiency projects that can benefit low-income residents. For example, a retrofit program within the Act appropriates more $837.5 million for loans and grants to "projects that improve energy or water efficiency," among other projects, in federal Housing and Urban Development (HUD)-supported affordable housing.[42] The Act also appropriates $4.5 billion for rebates for retrofits that improve whole-home energy efficiency. This program is to be administered by the states, and the Act provides that states may "increase rebate amounts for low- or moderate-income households."[43] The rebates are available for multi-family building owners.[44]

Additional sources of federal funding from healthcare programs are discussed in section II.B. below.

3. State Programs

At the state level, several states have statutes and regulations (or previously had policies) that require investor-owned electric utilities within the state to implement energy efficiency strategies that reduce annual energy use within the utility's footprint. Often, these statutes and regulations include "carve-outs" requiring that certain percentage of the annual energy use reductions be achieved within low-income

[38] U.S. DEPT. OF ENERGY, *Energy Efficiency and Conservation Block Grant Program*, at Eligible Uses, https://www.energy.gov/bil/energy-efficiency-and-conservation-block-grant-program (last visited: Apr. 10, 2023).
[39] Pa. Dept. of Envtl. Prot., *supra* n.37.
[40] U.S. DEPARTMENT OF ENERGY, *Energy Efficiency Revolving Loan Fund Capitalization Program*, https://www.energy.gov/bil/energy-efficiency-revolving-loan-fund-capitalization-grant-program (last visited: Apr. 10, 2023).
[41] Pa. Dept. of Envtl. Prot., *supra* n.37.
[42] Inflation Reduction Act § 30001.
[43] Inflation Reduction Act § 50121.
[44] *Id*.

customers' living spaces, or that some energy efficiency technologies be allocated to low-income customers.[45] States and utilities also supplement WAP dollars.[46]

An example of a state program supporting some low-income energy efficiency improvements is Pennsylvania's Act 129, enacted in 2008. This Act requires the state's large utilities (called electric distribution companies, or EDCs, which serve at least 100,000 customers) to "adopt and implement cost-effective energy efficiency and conservation [EE&C] plans to reduce energy demand and consumption within the service territory of each electric distribution company."[47] In Phase I of Act 129, through the EE&C plans, EDCs had to reduce customers' annual retail consumption by 1% below 2009-2010 levels by 2011, and by 3% below 2009-2010 levels by 2013.[48] The Act further required EDCs' EE&C plans to "include specific energy efficiency measures for households at or below 150% of the Federal poverty income guidelines."[49] Additionally, in a provision directly relevant to this paper, the Act further required EDCs to coordinate measures targeted to these low-income individuals "with other programs administered by the commission or another Federal or State agency."

Phase II of the program, written by the Pennsylvania Public Utility Commission, required EDCs to reduce retail energy usage by 1.6 to 2.9 percent below 2009-2010 levels.[50] For each utility, 4.5% of this energy reduction had to come from households at or below 150% of the Federal poverty income guidelines.[51]

Pennsylvania residents with a household income below 150% of the federally established poverty level may also qualify for weatherization assistance through the Low-Income Usage Reduction Program (LIURP). LIURP is established by Pennsylvania Public Utility Commission regulations and requires electric and gas providers to contribute to projects that will reduce energy use and reduce utility bills for lower-income residents.[52]

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[45] *See, e.g.*, Ariz. Corporation Commission Decision 71819 at R14-2-2403(C)(2) (2010), https://images.edocket.azcc.gov/docketpdf/0000116125.pdf (providing that "[a]n affected utility shall: . . . Allocate a portion of DSM resources specifically to low-income customers"); Am. Council for an Energy-Efficient Economy, State and Local Policy Database, Guidelines for Low-Income Energy Efficiency Programs, https://database.aceee.org/state/guidelines-low-income-programs.

[46] U.S. Dept. of Energy, *supra* n.32, at 1 ("In 2019, utilities and states supplemented DOE funding by providing an additional $844 million or $3.04 for every dollar invested by DOE.").

[47] 66 Pa. Cons. Stat. Ann. § 2806.1 (a).

[48] 66 Pa. Cons. Stat. Ann. § 2806.1 (c).

[49] 66 Pa. Cons. Stat. Ann. § 2806.1 (b)(1)(i)(G).

[50] PENNSYLVANIA PUBLIC UTILITY COMMISSION, IMPLEMENTATION ORDER, Docket Nos. M-2012-2289411 & M-2008-2069887, at 85 (Aug. 3, 2012).

[51] *Id*. at 53.

[52] Penn State College of Agricultural Sciences, Department of Agricultural Economics, Sociology, and Education, *Pennsylvania Low-Income Usage Reduction Program*, https://aese.psu.edu/research/centers/csis/liurp (last visited: August 4, 2023).

Another important program for energy efficiency in Pennsylvania is the State Energy Program, which is a revolving loan capitalization grant program funded by the U.S. Department of Energy.[53]

More recently, Pennsylvania implemented the Whole-Home Repairs Program using funding from the American Rescue Plan Act.[54] The program provides up to $50,000 per unit of funding for home improvement projects to address concerns about energy and water efficiency, among other things.[55] Homeowners with income below 80 percent of the area's median income are eligible for up to $50,000 in grant funding, and small landlords that rent affordable units are eligible for up to a $50,000 loan per rental unit.[56]

B. Indirect Funding Through Healthcare Programs

In addition to the direct government funding from energy efficiency programs, in some situations, there is funding for energy efficiency improvements available through government health programs such as Medicaid and the Children's Health Insurance Program. These funds are available in areas where administrators have recognized the connection between energy efficiency in residences and health outcomes.

1. The Medicaid and CHIP Programs

Medicaid is public health insurance for low-income individuals. Medicaid was created by Congress in 1965[57] and now provides health insurance to 81 million people.[58] Originally, Medicaid only covered certain categories of low-income people, specifically low-income elderly people, individuals with certain disabilities, pregnant women, children, and some parents of young children.[59] The Patient Protection and Affordable Care Act (ACA) passed in 2010 expanded eligibility to all low-income adults making under 138% of the federal poverty line regardless of whether they fell into a category initially covered by the Medicaid Act.[60] After a lawsuit challenging the constitutionality of Medicaid expansion, the United States Supreme

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[53] PA. DEPT. OF ENVTL. PROT., *PA State Energy Program: Linking Energy and the Environment, Penn. Dept. Of Envtl. Protection*, https://www.dep.pa.gov/Citizens/GrantsLoansRebates/Pages/PA-State-Energy-Program.aspx#:~:text=The%20Pennsylvania%20State%20Energy%20Program,reducing%20our%20overall%20energy%20usage (last visited Apr. 10, 2023).

[54] PA. DEPT. OF COMMUNITY AND ECON. DEVELOPMENT, COVID-19 ARPA Whole-Home Repairs Program, https://dced.pa.gov/programs/covid-19-arpa-whole-home-repairs-program/ (last visited: Aug. 2, 2023).

[55] *Id.*

[56] *Id.*

[57] U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, CENTERS FOR MEDICARE AND MEDICAID SERVICES, *History*, https://www.cms.gov/About-CMS/Agency-Information/History (last visited Apr. 10, 2023).

[58] U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, CENTERS FOR MEDICARE AND MEDICAID SERVICES, CENTER FOR MEDICAID AND CHIP SERVICES, *May 2022 Medicaid and CHIP Enrollment Trends Snapshot* at 3, https://www.medicaid.gov/medicaid/national-medicaid-chip-program-information/downloads/may-2022-medicaid-chip-enrollment-trend-snapshot.pdf.

[59] MEDICAID AND CHIP PAYMENT AND ACCESS COMMISSION, *Medicaid 101: Eligibility*, https://www.macpac.gov/medicaid-101/eligibility/ (last visited Apr. 10, 2023).

[60] *Id.* The federal poverty guideline changes each year. As of 2021, it was $12,880 for a single individual and $26,500 for a family of four. U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, OFFICE OF THE ASSISTANT SECRETARY FOR PLANNING AND

court determined that expanding Medicaid to include all low-income adults was optional but not mandatory for the states.[61] As of early 2023, all but 10 states have expanded Medicaid eligibility,[62] and now almost a fifth of Medicaid beneficiaries are low-income adults who otherwise would not have qualified for Medicaid because they did not meet the original categorical eligibility requirements.[63]

Medicaid is jointly funded and administered by the federal government and the government of each state.[64] Federal statute determines how much the federal government will match state Medicaid spending. This statutory spending formula accounts for a state's average income relative to other states with poorer states receiving a higher federal match.[65] The federal government will pay for at least 50% of a state's Medicaid costs for higher-income states and up to 83% of a state's costs for lower-income states, and there may be an increased federal match for certain healthcare services.[66] There is no cap on the funds the federal government will match; whatever states spend on Medicaid will receive the federal match.[67] Medicaid spending thus makes up a large part of state and federal budgets.[68]

Over half of individuals insured through Medicaid are children,[69] and many more children receive health insurance through the Children's Health Insurance Program (CHIP). CHIP is health insurance for low-income children whose family's income may exceed the Medicaid income threshold.[70] Unlike Medicaid which has no federal funding limits, CHIP is financed through block grants to the states.[71] CHIP covers

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EVALUATION, 2021 POVERTY GUIDELINES, https://aspe.hhs.gov/topics/poverty-economic-mobility/poverty-guidelines/prior-hhs-poverty-guidelines-federal-register-references/2021-poverty-guidelines (last visited Apr. 10, 2023). This means that in 2021, a single adult could make up to $17,774.40 and qualify for Medicaid. KAISER FAMILY FOUNDATION, *Status of State Medicaid Expansion Decisions: Interactive Map*, https://www.kff.org/medicaid/issue-brief/status-of-state-medicaid-expansion-decisions-interactive-map/ (last visited Apr. 10, 2023).

[61] National Federation of Independent Business v. Sebelius, 567 U.S. 519 (2012).

[62] KAISER FAMILY FOUNDATION, *Status of State Medicaid Expansion Decisions: Interactive Map*, https://www.kff.org/medicaid/issue-brief/status-of-state-medicaid-expansion-decisions-interactive-map/ (last visited Apr. 10, 2023). The states that did not expand Medicaid are largely in the South and Great Plains and include: Alabama, Florida, Georgia, Kansas, Mississippi, South Carolina, Tennessee, Texas, Wisconsin, and Wyoming. *Id*. In these states, in order to receive Medicaid benefits, residents must fit into the original categories of eligibility.

[63] U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, CENTERS FOR MEDICARE & MEDICAID SERVICES, *Who Enrolls in Medicaid & CHIP?*, https://www.medicaid.gov/state-overviews/scorecard/who-enrolls-medicaid-chip/index.html (last visited Apr. 10, 2023).

[64] *See generally* 42 U.S.C.A. Ch. 7, Subchap. XIX.

[65] MEDICAID AND CHIP PAYMENT AND ACCESS COMMISSION*, Matching Rates*, https://www.macpac.gov/subtopic/matching-rates/ (last visited Apr. 10, 2023); Laura Snyder & Robin Rudowitz, *Medicaid Financing: How Does It Work and What are the Implications?*, KAISER FAMILY FOUNDATION (MAY 20, 2015), https://www.kff.org/medicaid/issue-brief/medicaid-financing-how-does-it-work-and-what-are-the-implications/ (last visited Nov. 29, 2022); Christie Provost Peters, *Medicaid Financing: How the FMAP Formula Works and Why It Falls Short*, NATIONAL HEALTH POLICY FORUM ISSUE BRIEF – NO. 828 (Dec. 11, 2008).

[66] *Id.*

[67] Snyder & Rudowitz, *supra* n.65; Peters, *supra* n.65.

[68] Snyder & Rudowitz, *supra* n.65 (noting that "Medicaid … [is] the largest source of federal revenue in state budgets" and is third in costs to the federal budget).

[69] U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, *supra* n. .63

[70] U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, CENTERS FOR MEDICARE & MEDICAID SERVICES, *CHIP Eligibility*, https://www.medicaid.gov/chip/eligibility/index.html (last visited Apr. 10, 2023).

[71] U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, CENTERS FOR MEDICARE & MEDICAID SERVICES, *CHIP Financing*, https://www.medicaid.gov/chip/financing/index.html (last visited Apr. 10, 2023).

almost 10 million children.[72] States have significant flexibility in designing CHIP, and some states choose to include low-income pregnant women who do not qualify for Medicaid.[73]

The Medicaid Act specifies the mandatory services state Medicaid plans must include and also notes categories of optional services states may choose to provide.[74] Within the income threshold and mandatory benefit parameters set by the federal government, states have significant flexibility in how they design their Medicaid plan benefits.[75]

2. Using Medicaid and CHIP Funding to Improve Housing Quality and Energy Efficiency

The federal government provides a process to apply for Medicaid waivers so that states can experiment with different ways of providing health insurance to their Medicaid eligible population.[76] There are several types of Medicaid waivers,[77] but of particular note are section 1115 demonstration waivers, which typically last for five years.[78] In these waivers, states may request permission from CMS to offer new Medicaid benefits, change Medicaid financing, or expand Medicaid benefits to new populations, among other experiments.[79] Under the Trump administration, several states used section 1115 waivers to impose work requirements on Medicaid beneficiaries, for example.[80] Other states use section 1115 waivers to address the social determinants of health,[81] including requesting permission to use Medicaid funding to pay for nonclinical services, such as directing funds to improve the quality of housing for Medicaid

[72] U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, CENTERS FOR MEDICARE & MEDICAID SERVICES, *Children's Health Insurance Program (CHIP)*, https://www.medicaid.gov/chip/index.html (last visited Apr. 10, 2023).

[73] BENEFITS.GOV, *State Children's Health Insurance Program*, https://www.benefits.gov/benefit/607 (last visited Apr. 10, 2023).

[74] 42 U.S.C.A. § 1396a (2022).

[75] The details of state Medicaid plans can be found in State Plan Amendments, approved waiver applications, and agreements with managed care entities with which a state contracts to administer its Medicaid program.

[76] U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, CENTERS FOR MEDICARE & MEDICAID SERVICES, *About Section 1115 Demonstrations*, MEDICAID.GOV, https://www.medicaid.gov/medicaid/section-1115-demonstrations/about-section-1115-demonstrations/index.html (last visited Apr. 10, 2023).

[77] U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, CENTERS FOR MEDICARE & MEDICAID SERVICES, *State Medicaid Plans and Waivers*, https://www.cms.gov/Outreach-and-Education/American-Indian-Alaska-Native/AIAN/LTSS-TA-Center/info/state-medicaid-policies (last visited Apr. 10, 2023) (describing section 1915 waivers).

[78] U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, *supra* n. 76.

[79] U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, CENTERS FOR MEDICARE & MEDICAID SERVICES, *About Section 1115 Demonstrations*, https://www.medicaid.gov/medicaid/section-1115-demonstrations/about-section-1115-demonstrations/index.html (last visited May 3, 2023).

[80] Madeline Guth, Elizabeth Hinton, MaryBeth Musumeci, & Robin Rudowitz, *The Landscape of Medicaid Demonstration Waivers Ahead of the 2020 Election*, KAISER FAMILY FOUNDATION (Oct. 30, 2020), https://www.kff.org/medicaid/issue-brief/the-landscape-of-medicaid-demonstration-waivers-ahead-of-the-2020-election/ (last visited Apr. 10, 2023). Some of these work requirements were struck down by courts, however, because they were considered inconsistent with the purposes of the Medicaid Act. *Id*.

[81] Elizabeth Hinton & Lina Stolyar, *Medicaid Authorities and Options to Address Social Determinants of Health (SDOH)*, KAISER FAMILY FOUNDATION (AUG. 5, 2021), https://www.kff.org/medicaid/issue-brief/medicaid-authorities-and-options-to-address-social-determinants-of-health-sdoh/ (last visited Apr. 10, 2023).

beneficiaries, which is not permitted without use of a waiver.[82] There are 103 active or pending section 1115 waivers.[83]

Many have argued that Medicaid/CHIP funding should be used to prevent health problems from occurring rather than just paying for medical care once a person experiences a decline in health status. In particular, there is a push to address the social determinants of health, which can be defined as "the conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks."[84]

One social determinant of health is access (or lack thereof) to high quality, safe housing, which can affect health status. For example, asthma symptoms may be triggered by the presence of mold or pests, and if an individual cannot afford to remove these environmental triggers in their home, they may not be able to manage their asthma and need to seek emergency medical care. But if the individual's housing quality improved through removal of asthma triggers, then their health may also improve, and there may be economic savings as well. Also, many medical conditions may be exacerbated by excessive heat, and individuals may not be able to afford to pay for cooling if energy costs are high, and their health status then suffers. Improving energy efficiency will not only reduce energy costs but should also reduce medical problems and healthcare spending as well. There have been specific proposals to use healthcare funding to improve the energy efficiency of residential homes.[85]

Using healthcare funding to address non-medical needs in this manner could occur through federally funded health insurance programs such as Medicaid (through the use of Medicaid State Plan Amendments, section 1115 waivers, or managed care contracts) or delivery care mechanisms such as Accountable Care Organizations.[86, 87] Healthcare funding could also come from other federal programs, state departments of health, or private organizations such as health insurance companies or hospitals.

3. Review of Existing State Initiatives to Address Energy Efficiency through Medicaid and CHIP

[82] Misha Sharp, Ian Ramdeen, & Nathan Myers, *Healthier Homes, Healthier Childhoods: How Medicaid Can Address the Housing Conditions Contributing to Pediatric Asthma*, UNITED HOSPITAL FUND HEALTH WATCH (Oct. 2019), https://static1.squarespace.com/static/5a2021c5e5dd5b3a4dda00d4/t/5db99a5a47f95045e051c4a0/1572444767543/hw-housing-asthma-20191022.pdf.

[83] U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, CENTERS FOR MEDICARE & MEDICAID SERVICES, *State Waivers List*, https://www.medicaid.gov/medicaid/section-1115-demo/demonstration-and-waiver-list/index.html (last visited May 3, 2023) (

[84] U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES OFFICE OF DISEASE PREVENTION AND HEALTH PROMOTION, *Social Determinants of Health*, https://health.gov/healthypeople/priority-areas/social-determinants-health (last visited Apr. 10, 2023).

[85] Sara Hayes & Christine Gerbode, Braiding Energy and Health Funding for In-Home Programs: Federal Funding Opportunities (American Council for an Energy-Efficient Economy Report: 2020), https://www.aceee.org/sites/default/files/pdfs/h2002.pdf.

[86] *Id.*; Hinton & Stolyar, *supra* n. 81.

[87] The research for this white paper did not extend to specific state Medicaid ACOs created through waivers but focused instead on the text of the waivers and state plans.

Our research explores whether states are addressing the connection between energy efficient homes and health through their Medicaid/CHIP programs.

a. Research Methods

Prior research has focused on the legality of using of Medicaid/CHIP funds to improve the energy efficiency of Medicaid recipients' homes,[88] but our research assesses which states are actually doing so.

To determine whether any states are currently using Medicaid/CHIP funding to modify homes to increase energy efficiency, we examined every state's pending or approved section 1115 waivers, Medicaid State Plan Amendments, and CHIP programs (specifically CHIP Health Services Initiatives). We then identified any state Medicaid/CHIP program that explicitly funds energy efficiency through, for example, paying for weatherizing beneficiaries' homes or covering the cost of energy efficient appliances.[89] States with energy efficiency programs that are designed to promote health through modifying homes, but are not funded through healthcare dollars, are excluded from our analysis.[90]

This review identified only two states that are clearly using Medicaid/CHIP funding to improve energy efficiency in beneficiaries' homes. Below, we report on these initiatives in New York and North Carolina, and we briefly highlight Vermont's use of state or private healthcare funds (but not Medicaid/CHIP funding) to improve energy efficiency.

b. Research Findings[91]

Our research of state CHIP programs and Medicaid State Plan Amendments returned no information relevant to energy efficiency. We identified two states with approved section 1115 waivers that explicitly permit the use of Medicaid funds to remediate beneficiaries' homes to improve energy efficiency. We also identified some states that have section 1115 waivers that could, in theory, be used to weatherize and improve the energy efficiency of beneficiaries' homes if deemed medically necessary for specific

[88] Hayes & Gerbode, *supra* n. 85.

[89] Prior research has highlighted examples where Medicaid funds paid for in-home services "complementary" to weatherization or other energy efficiency programs, such as the IMPACT DC Asthma Clinic which targets environmental asthma triggers, such as pests, for low-income residents. Service providers were paid from Medicaid funds to assess the beneficiaries' homes for asthma triggers and make referrals for home repair/modifications to reduce the environmental triggers. In theory, some of the changes could relate to weatherization or energy efficiency, although this is not the primary purpose of this clinic. Hayes & Gerbode, *supra* n. 85. Other states may have similar programs. If they are not directly related to energy efficiency/weatherization, however, they are not included in this analysis.

[90] States with similar programs, funded by non-healthcare dollars, are excluded from this analysis. Such states include Washington, which had a Weatherization plus health pilot designed to improve its low-income housing stock through weatherization. The state hopes to fund this program with Medicaid dollars through the section 1115 waiver process, but has not yet done so. Vince Schueler, *The Washington State Weatherization Plus Health Pilot: Implementation and Lessons Learned*, WASHINGTON DEPT. OF COMMERCE (July 23, 2018) https://www.commerce.wa.gov/wp-content/uploads/2018/08/WxHSummaryReport1.pdf.

[91] The research discussed in this section was done in fall 2022 and was current as of that time.

subsets of the state's Medicaid population.[92] Because there is no evidence that these waivers have been applied in this way, they are not the focus of this study. This section focuses on New York and North Carolina's innovative use of section 1115 waivers to address energy efficiency.

i. New York

New York State Energy Research and Development Authority partnered with the New York State Department of Health in creating a Healthy Homes Value-Based Payment Pilot program.[93] This pilot focuses on the connection between quality of housing and residents' health and attempts to demonstrate that improving housing quality will decrease illness and healthcare costs.[94] In this two year pilot, 500 homes will be modified to improve energy efficiency/weatherization, reduce environmental triggers of

[92] *See, e.g.*, New Mexico, which has a waiver that permits Medicaid to pay for "fire safety adaptations; air filtering devices; heating/cooling adaptations" as long as they "address[] targeted medical, safety or functional concerns that incorporate the person's specific clinical and functional strengths and needs" for developmentally disabled or medically fragile Medicaid beneficiaries. NEW MEXICO DEPARTMENT OF HEALTH, DEVELOPMENTAL DISABILITIES SUPPORTS DIVISION MEDICALLY FRAGILE WAIVER (MFW): ENVIRONMENTAL MODIFICATION SERVICES (effective July 1, 2019), https://www.nmhealth.org/publication/view/general/5225/. The maximum benefit is currently $5,000 every five years, but the state is trying to increase this to $6,000. New Mexico Human Services Department, Letter to "interested parties" (Apr. 29, 2022), https://www.hsd.state.nm.us/wp-content/uploads/WAIVER-NOTICE-OF-OPPORTUNITY-TO-COMMENT.-1915c-ARPA.pdf. *See also* North Carolina, which has a waiver that permits Medicaid to pay for "weather protective modifications" for disabled beneficiaries, and Wisconsin, which has a waiver that permits Medicaid to pay for "medically necessary heating, cooling or ventilation systems" for disabled beneficiaries. U.S. DEPT. OF HEALTH AND HUMAN SERVICES, OFFICE OF THE ASSISTANT SECRETARY FOR PLANNING AND EVALUATION, COMPENDIUM OF HOME MODIFICATION AND ASSISTIVE TECHNOLOGY POLICY AND PRACTICE ACROSS THE STATES: STATE PROFILES (Oct. 27, 2006), https://aspe.hhs.gov/reports/compendium-home-modification-assistive-technology-policy-practice-across-states-state-profiles-0; WISCONSIN DEPARTMENT OF HEALTH SERVICES, MEDICAID HOME AND COMMUNITY-BASED SERVICES (HCBS) WAIVER MANUAL FOR THE CLTS WAIVER PROGRAM 103 (April 2023), https://www.dhs.wisconsin.gov/publications/p02256.pdf. Some states will also pay for "specially designed appliances" for disabled beneficiaries who need modified appliances. In theory, these appliances could be energy efficient, but accommodating disability—not improving energy efficiency—is the purpose of this benefit, and so these Medicaid benefits are also excluded from analysis. *See* PENNSYLVANIA DEPT. OF HUMAN SERVICES, PENNSYLVANIA PROMISE™ PROVIDER HANDBOOK: 837 PROFESSIONAL/CMS-1500 CLAIM FORM (March 2023) at 62, https://www.dhs.pa.gov/providers/PROMISe_Guides/Documents/837%20Professional%20CMS%201500%20Claim%20Form.pdf; DELAWARE HEALTH AND SOCIAL SERVICES, DIVISION OF MEDICAID & MEDICAL ASSISTANCE, DURABLE MEDICAL EQUIPMENT PROVIDER SPECIFIC POLICY MANUAL, https://medicaidpublications.dhss.delaware.gov/docs/DesktopModules/Bring2mind/DMX/API/Entries/Download?Command=Core_Download&EntryId=909&language=en-US&PortalId=0&TabId=94.

[93] This program was initially funded by the energy department rather than Medicaid, but is now paid for in part through the contracted Medicaid managed care organization. Hayes & Gerbode, *supra* n. 85; NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY, NEW YORK STATE HEALTHY HOMES VALUE-BASED PAYMENT PILOT RESIDENTIAL SERVICE PROVIDERS REQUEST FOR QUALIFICATIONS, https://portal.nyserda.ny.gov/servlet/servlet.FileDownload?file=00Pt000000ZnkDVEAZ.

[94] The pilot aims to "improve occupant health, reduce energy bills, [and] improve the comfort and safety of the home" and perhaps "result in healthcare cost savings for New York State." New York State Energy Research and Development Authority, *supra* n. 93, at 1.

asthma, and decrease the likelihood of preventable injuries. The pilot is Medicaid-funded through use of a section 1115 waiver.[95]

The 500 homes that will be modified are selected from areas with a high incidence of low-income children with severe asthma.[96] The energy efficiency measures the pilot will pay for include: "insulation, air sealing, heating unit clean and tune, repairs, and replacement, replacement of air filters in HVAC system, installation of programmable thermostat, refrigerator/freezer replacement, installation of LED lightbulbs, installation of low flow showerheads."[97] The pilot also pays for other extensive home modifications, such as pest management, carpet removal, and plumbing repairs, to mitigate the environmental triggers of asthma.[98] The goal of the pilot is to reduce hospitalizations and emergency department visits.[99] This pilot is ongoing, and there are no outcome data yet.

ii. North Carolina

North Carolina is using a section 1115 waiver to begin a program called Healthy Opportunities.[100] As part of the state's Medicaid transition from fee-for-service to managed care,[101] North Carolina also is taking the opportunity to target the social determinants of health by using Medicaid funds to address non-clinical needs of some Medicaid beneficiaries.[102] The Medicaid funds will be directed to nonprofits that will address Medicaid beneficiaries' needs for food, transportation, and housing, among other social services.[103] Unlike other states that may focus only on educating or referring Medicaid beneficiaries to services, Healthy Opportunities will actually fund the needed services (e.g., paying for food, paying for rent, etc.).

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[95] New York State Energy Research and Development Authority, *supra* n. 93, at 3; Misha Sharp, Ian Ramdeen, & Nathan Myers, *Healthier Homes, Healthier Childhoods: How Medicaid Can Address the Housing Conditions Contributing to Pediatric Asthma*, UNITED HOSPITAL FUND HEALTH WATCH 9-10 (Oct. 2019), https://static1.squarespace.com/static/5a2021c5e5dd5b3a4dda00d4/t/5db99a5a47f95045e051c4a0/1572444767543/hw-housing-asthma-20191022.pdf.

[96] Misha Sharp, Ian Ramdeen, & Nathan Myers, *Healthier Homes, Healthier Childhoods: How Medicaid Can Address the Housing Conditions Contributing to Pediatric Asthma*, UNITED HOSPITAL FUND HEALTH WATCH (Oct. 2019), https://static1.squarespace.com/static/5a2021c5e5dd5b3a4dda00d4/t/5db99a5a47f95045e051c4a0/1572444767543/hw-housing-asthma-20191022.pdf.

[97] New York State Energy Research and Development Authority, *supra* n. 93, at 4.

[98] New York State Energy Research and Development Authority, *supra* n. 93; Sharp, Ramdeen & Myers, *supra* n. 95.

[99] Sharp, Ramdeen & Myers, *supra* n. 95.

[100] A copy of the approved waiver can be found online. Letter from Angela D. Garner, Director of the Division of System Reform Demonstration, Centers for Medicare & Medicaid Services, to Dave Richard, North Carolina Department of Health and Human Services (April 25, 2019), https://www.medicaid.gov/Medicaid-CHIP-Program-Information/By-Topics/Waivers/1115/downloads/nc/nc-medicaid-reform-ca.pdf.

[101] NORTH CAROLINA MEDICAID, *Fact Sheet: Healthy Opportunities Pilots*, https://www.ncdhhs.gov/media/14772/download?attachment.

[102] *Id.*

[103] There is an online directory that contains a list of participating nonprofits. *See* Impact Health, *HSO Network Directory*, https://impacthealthatdogwoodhealth.my.site.com/partner/s/hso-network-directory (last visited: May 3, 2023).

Healthy Opportunities will fund various services related to accessing and maintaining safe, high quality housing,[104] and will pay for the following services: "housing navigation, support and sustaining services," "inspection for housing safety and quality" (including inspecting for weatherization, pests, air quality, etc.), "housing move-in support," "essential utility set-up," "home remediation services" (up to $5,000/year), "home accessibility and safety modifications" (up to $10,000 over the waiver period), "healthy home goods," "one-time payment for security deposit and first month's rent," and "short-term post hospitalization housing."[105]

Notably, the Medicaid-funded home inspection will assess "indoor air quality and ventilation," "adequate electricity and thermal environment," "dust, mold, pests," and "condition of equipment for heating, cooling/ventilation and plumbing," among other measures of housing quality.[106] After the safety inspection is complete, referrals must be made "to appropriate organizations for additional home remediation and/or modifications, if necessary."[107] The description of home remediation includes: "Evidence-based home remediation services are coordinated and furnished to eliminate known home-based health and safety risks to ensure living environment is not adversely affecting occupants' health and safety. Home remediation services may include for example pest eradication, carpet or mold removal, installation of washable curtains or synthetic blinds to prevent allergens, or lead abatement."[108] This list is illustrative rather than exhaustive and thus could be interpreted to cover improvements to the home related to energy efficiency or weatherization, especially when read in combination with the description of the home inspection for safety and quality.[109]

Healthy Opportunities only began enrolling beneficiaries in the spring of 2022, and so there are not yet any process or outcome data, although the state will be assessing the program.[110]

The study design does not allow us to identify all residential energy efficiency and weatherization programs that are funded by other federal healthcare programs, state healthcare budgets, or other

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[104] The state justifies including housing as a social determinant of health through a review of the relevant health services research. NORTH CAROLINA DEPARTMENT OF HEALTH AND HUMAN SERVICES, *Healthy Opportunities Pilots: Standard Plan Roundtable on the Evidence Base* (Apr. 29, 2022), https://www.ncdhhs.gov/media/16509/download?attachment.

[105] NORTH CAROLINA DEPARTMENT OF HEALTH AND HUMAN SERVICES, *Updated Healthy Opportunities Pilots Fee Schedule [Guidance Version]* 1-2 (Mar. 31, 2022), https://www.ncdhhs.gov/media/14071/download?attachment.

[106] *Id.*

[107] *Id.*

[108] *Id.*

[109] Other housing services covered through this program may also related to energy efficiency, such as home safety/accessibility (although this is more about accommodating disabilities) and "healthy home goods," which includes air filters. *Id.* ("Home-related goods that may be covered include, for example, discrete items related to reducing environmental triggers in the home (e.g., a "Breathe Easy at Home Kit" with EPA-vacuum, air filter, green cleaning supplies, hypoallergenic mattress or pillow covers and non-toxic pest control supplies). Healthy Home Goods do not alter the physical structure of an enrollee's housing unit.").

[110] NORTH CAROLINA DEPARTMENT OF HEALTH & HUMAN SERVICES, *Healthy Opportunities Pilots*, https://www.ncdhhs.gov/about/department-initiatives/healthy-opportunities/healthy-opportunities-pilots#pilot-evidence-base (last visited Apr. 10, 2023).

healthcare sources such as health insurers or hospitals.[111] But such programs do exist. We highlight Vermont because its energy efficiency program, funded in part by healthcare dollars, has existed for several years and has some outcome data to report.

iii. Vermont

We selected Vermont as a case study because Vermont has multiple weatherization plus health programs that have operated long enough to analyze program feasibility and participant health outcomes.[112] At present, none of Vermont's weatherization plus health programs is funded by Medicaid or CHIP.[113] These weatherization plus health programs are instead funded by WAP, LEEP, the state department of health through a Centers for Disease Control grant, local nonprofit housing organizations and other community-based organizations, energy utilities, and local hospitals.[114]

Efficiency Vermont, the state energy efficiency utility, conducted the Healthy Homes pilots during 2017-2020.[115] In two pilot programs targeting different regions in the state, Efficiency Vermont assessed whether modifying the homes of low-income residents with severe respiratory disease to make the homes "healthy" (i.e., "dry, clean, safe, well ventilated, pest free, contaminant free, maintained, and thermally controlled"[116]) and improved health outcomes.[117] These pilots began because of stakeholder advocacy, which coalesced around improving housing quality, including weatherization and energy efficiency, for low-income residents of Vermont.

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[111] As described above, we examined state's Medicaid/CHIP programs only. In order to identify all energy efficiency initiatives funded by healthcare dollars, the study would have been much larger in scope and done an in-depth case analysis of every energy efficiency program in every state, tracing the funding source to determine whether healthcare funds were used.

[112] VERMONT DEPARTMENT OF HEALTH, WEATHERIZATION + HEALTH: HEALTH AND CLIMATE CHANGE CO-BENEFITS OF HOME WEATHERIZATION IN VERMONT iii, 18-20 (Dec. 2018) (describing three different programs).

[113] It appears that there is the possibility that Medicaid/CHIP funds could be used as a funding source, however. Vermont has received CMS funding to create an Accountable Care Organization. Vermont also has an 1115 waiver that permits the state Medicaid program to participate in the ACO. Phoebe Howe & Laura Capps, HEALTHY HOMES VERMONT 2019: EFFICIENCY VERMONT PROGRESS REPORT 6-7 (Apr. 3, 2020).

[114] VERMONT DEPARTMENT OF HEALTH, WEATHERIZATION + HEALTH: HEALTH AND CLIMATE CHANGE CO-BENEFITS OF HOME WEATHERIZATION IN VERMONT iii, 18-20 (Dec. 2018). It appears that the state may also be using funding from Community Development Block Grants, USDA, HUD, and LIHEAP. EFFICIENCY VERMONT, HEALTHY HOMES VERMONT: EFFICIENCY VERMONT PROGRESS REPORT 3-4 (Oct. 4, 2019). A new partner for 2022-23 is Vermont's Department of Public Service. Laura Capps, HEALTHY HOMES VERMONT 2021: EFFICIENCY VERMONT R&D PROJECT: HEALTHCARE PARTNERSHIPS 4 (Apr. 2022). The Vermont Asthma Program was funded, in part, by a grant to the state department of health from the Centers for Disease Control. See JSI, *Vermont Asthma Program*, https://publications.jsi.com/JSIInternet/Inc/Common/_download_pub.cfm?id=15818&lid=3.

[115] Efficiency Vermont's vision for Healthy Homes is: "Through energy efficiency, Vermont homes are safe, affordable, comfortable, durable, and resilient. These attributes result in improved population health and a reduction in greenhouse gases." EFFICIENCY VERMONT, HEALTHY HOMES VERMONT: EFFICIENCY VERMONT PROGRESS REPORT 5 (Oct. 4, 2019). Services continued into 2022, however, and a new partner is joining for 2022-23. Capps, *supra* n. 114, at 4, 7.

[116] EFFICIENCY VERMONT, HEALTHY HOMES VERMONT: EFFICIENCY VERMONT PROGRESS REPORT 6 (Oct. 4, 2019) (quoting Centers for Disease Control and Prevention definition).

[117] A third pilot focused on modifying residents' homes to reduce falls and injuries from falls.

The Healthy Homes pilots aimed to enroll 20 low-income households where a resident had severe asthma or chronic obstructive pulmonary disease (COPD). Healthy Homes was willing to pay for necessary home repairs and modifications to meet the specific housing and health needs of its residents, so there was not uniformity with respect to the modifications that occurred in the pilot. Examples of what Healthy Homes paid for "include[d] whole-home weatherization and electrical efficiency upgrades, active radon mitigation, expanded moisture management, advanced ventilation, smooth-flooring replacements of carpeting, spot HEPA room air cleaners, and appliance replacements."[118] The program also provided education and cleaning supplies in order to "mitigate respiratory triggers at home."[119]

The pilot struggled to recruit a sufficient number of households to participate because many households did not meet all three enrollment criteria: low-income, severe/uncontrolled asthma or COPD, and property owner/permission of property owner.[120] There were additional recruitment problems. Some prospective participants had financial concerns about the effect of home improvements on property taxes, aesthetic concerns about a new ventilation system, preferences for maintaining gas stoves, or an unwillingness to remove personal property from home so that renovations could be conducted.[121] Finally, the pilot occurred during the COVID-19 pandemic, which meant that there were supply and worker shortages to contend with, in the healthcare, nonprofit, and construction contexts.[122]

The health outcomes data included both improvements and declines in health status after homes were modified. Some, but not all, participants demonstrated improvements on medical tests assessing severity of asthma and COPD, and some, but not all, participants reported improved quality of life.[123] Given that only a few homes were included in the pilots and that the pilots only recently concluded, it is premature to draw conclusions about the health effects of improving housing quality. Instead, the pilots should be understood as proving program feasibility and highlighting ways to improve the process.

III. Challenges to Effective Provision of Energy Efficiency and Health Benefits

The programs discussed in Part II promise energy efficiency and health benefits to their participants. But those benefits cannot be fully realized unless individuals are able to access and participate in them. In this part, we explore some of the barriers that prevent full utilization of these programs.

A. Access Challenges

Although the past 50 years have witnessed the growth of federal energy assistance programs designed to assist low-income households reduce high energy burdens, one in three households (~37 million) still

[118] Capps, *supra* n. 114, at 7.
[119] *Id.*
[120] *Id.* at 7, 14. Because the intervention involved changing the home, the residents had to own their residence or the property owner had to agree to the home modifications.
[121] *Id.* at 11.
[122] *Id.* at 8-9; *see also* Phoebe Howe & Laura Capps, HEALTHY HOMES VERMONT 2020: EFFICIENCY VERMONT R&D PROJECT: HEALTHCARE PARTNERSHIPS (Mar. 30, 2021), https://www.efficiencyvermont.com/Media/Default/docs/white-papers/efficiency-vermont-whitepaper-healthy-homes-vermont-2020.pdf.
[123] *Id.* at 15.

experience energy poverty in the U.S.[124] Several studies have found that many energy efficiency programs only serve a relatively small percentage of income-eligible customers as access limitations prohibit their use among a wider, low-income population. In their review of the literature, Brown and colleagues (2020) found that low-income energy burden remains high for racial/ethnic minority households (particularly those residing in rental properties); those residing in multi-family low-income housing or manufactured and mobile homes; and low-income households in rural communities.[125] Currently, the percentage of residential low-income utility customers remains higher than the share of low-income households benefiting from energy-efficiency funding. This disproportion is especially troublesome given that clean energy programs are paid for in part by low-income communities.[126]

Extant literature also demonstrates a number of unique access-based challenges faced by low-income households – households that pay a larger portion of their total household income to paying utility bills than middle- or high-income households.[127,128] These challenges include high upfront costs of energy efficiency investments (e.g., replacing old, oversized, and inefficient heating, ventilation, air conditioning systems; improving wall insulation) and innovative products (e.g., smart grid technologies); lack of access to information about energy-efficiency programs; split incentives between owners and renters; aging housing stock; and lack of ability to pay for property improvements, especially for those who do not own their dwelling.[129,130,131] As a result, widespread participation among low-income households is limited. Participation in typical residential efficiency programs that can provide the greatest savings, such as

[124] Dominic J. Bednar & Tony G. Reames, *Recognition of and response to energy poverty in the United States*, 5 NATURE ENERGY 432-439 (2020), doi: 10.1038/s41560-020-0582-0.

[125] Marilyn A. Brown, Anmol Soni, Melissa V. Lapsa, Katie Southworth, & Matt Cox, *High energy burden and low-income energy affordability: Conclusions from a literature review*, 2 PROGRESS IN ENERGY 042003 (2020), doi: 10.1088/2516-1083/abb954.

[126] *Id.*

[127] Low-income households spend between 6-30% of their household income on electricity, while their middle- and high-income counterparts spend only 1-5%. On average, low-income households expend about 27% more on energy costs per square foot. *See, e.g.*, Elizabeth Beatty & Abbey Hawthorne, *Empowered: Bringing Energy Efficiency into Low-Income Homes*, 5 ONE J: OIL AND GAS, NATURAL RESOURCES, AND ENERGY JOURNAL 341-374 (2019).

[128] In 2016, over 300,000 of Pennsylvania's poorest households (those with incomes at or below 50% of the federal poverty level (FPL)) paid an average of 28% of their income on home energy bills. An additional 350,000 Pennsylvania households between 50-100% FPL paid an average of 15% of their income on home energy bills. *See, e.g.*, Jim Grevatt, Elizabeth Marx, Sarah Ralich & Levana Layendecker, *Small Steps in Coordination Equal Leaps and Bounds for Pennsylvania's Underserved Families: Driving Policy Improvements through Collaborative Advocacy*, 2018 ACEEE Summer Study on Energy Efficiency in Buildings: Making Efficiency Easy and Enticing 13-1 (2018), *available at* https://energyfuturesgroup.com/wp-content/uploads/2019/05/Small-Steps-in-Coordination-Equal-Leaps-and-Bounds-for-Pennsylvania%E2%80%99s-Underserved-Families-Driving-Policy-Improvements-through-Collaborative-Advocacy.pdf (last visited Apr. 11, 2023).

[129] Annie Gilleo, Seth Nowak & Ariel Drehobl, Making a difference: strategies for successful low-income energy efficiency programs, (American Council for an Energy-Efficiency Economy Report: 2017), https://www.aceee.org/research-report/u1713 (last visited Apr. 11, 2023).

[130] Amanda Aweh, Malcolm Friday & Brooke Scanlon, *Limited-Income Customers: How Utilities Can Bridge the Energy Affordability Gap and Build a Financially Stable Customer Base*, 36 NATURAL GAS & ELECTRICITY 8-17 (2020), doi: 10.1002/gas.22165.

[131] Xiaojing Xu & Chien-fei Chen, *Energy Efficiency and Energy Justice for US Low-income Households: An Analysis of Multifaceted Challenges and Potential*, 128 ENERGY POLICY 763-774 (2019), doi: 10.1016/j.enpol.2019.01.020.

incentives to purchase new, energy-efficient appliances and whole-home retrofits, is especially limited among low-income households because of lack of affordability.[132,133] For racial/ethnic low-income households, which have disproportionately higher energy burdens than the national median household,[134] systemic, race-based exclusions such as neighborhood segregation, redlining, lack of access to mortgages and home improvement loans, and discriminatory lending practices, further compounds access to energy-efficient housing,[135] and may engender distrust towards energy-efficient programs (e.g., LIHEAP, WAP, etc.).

As a fundamental resource, access to affordable energy is essential to achieving racial, social, and economic equity; however the energy system is regressive in that costs accrue disproportionately to low-income households.[136] Moreover, higher energy burden has been found to be associated with higher rates of eviction,[137] which leads to residential instability and poor health outcomes.[138] And, because low-income energy efficiency programs can also achieve objectives beyond energy savings, such as improving the health and safety of occupants, improving quality of life, reducing material deprivation, etc.,[139,140] the lack of participation in these programs may further exacerbate health disparities among low-income communities.

Per the conversations emerging from the May 2022 Expert Workshop,[141] we note that several of the access-based challenges examined in the extant literature correspond to many of the challenges customers experience in Pennsylvania, particularly barriers related to accessing information. For example, experts emphasized that ineffective and inconsistent outreach generates an overall lack of awareness and leads to customer confusion about varying program offerings and affordability – challenges also identified

[132] Gilleo et al., *supra* n.129.

[133] Although financial incentives to offset high upfront costs related to certain types of improvements (e.g., purchasing energy-efficient appliances) are offered by some states to low-income homeowners, these incentives are not sufficient to induce participation among low-income households. *See, e.g.*, Brown et al., *supra* n. 125.

[134] Drehobl, Ross & Ayala, *supra* n.4.

[135] Jamal Lewis, Diana Hernández & Arline Geronimus, *Energy Efficiency as Energy Justice: Addressing Racial Inequalities through Investments in People and Places*, 13 ENERGY EFFICIENCY 419–32 (2019), doi: 10.1007/s12053-019-09820-z.

[136] Eric Scheier & Noah Kittner, *A Measurement Strategy to Address Disparities across Household Energy Burdens*, 13 NATURE COMMUNICATIONS 1-11 (2022), doi: 0.1038/s41467-021-27673-y.

[137] Paichen Li, Correlational analysis of energy burden and eviction rate (Apr. 22, 2019) (M.E.M. project, Duke University), *available at* https://dukespace.lib.duke.edu/dspace/handle/10161/18390.

[138] Matthew Desmond & Carl Gershenson, *Who Gets Evicted? Assessing Individual, Neighborhood, and Network Factors*, 62 SOCIAL SCIENCE RESEARCH 362-377 (2017), doi: 10.1016/j.ssresearch.2016.08.017.

[139] Ian M. Hoffman, et al., The Cost of Saving Electricity through Energy Efficiency Programs Funded by Utility Customers: 2009–2015 (Lawrence Berkeley National Lab) (2018), *available at* https://emp.lbl.gov/publications/cost-saving-electricity-through (last visited Apr. 11, 2023).

[140] Bruce Tonn, Beth Hawkins, Erin Rose & Michaela Marincic, *Income, Housing and Health: Poverty in the United States through the Prism of Residential Energy Efficiency Programs*, 73 ENERGY RESEARCH & SOCIAL SCIENCE 101945 (2021), doi: 10.1016/j.erss.2021.101945.

[141] *See* Appendix A.

in prior studies.[142,143,144] Experts noted that this lack of information, coupled with a 'piecemeal' programmatic approach to resolving distinct energy-efficiency concerns,[145] not only dampens customer interest, but also escalates customer uncertainty about the credibility and utility of energy-efficiency programs. For those low-income households that may constantly be seeking immediate, short-term solutions to economic burdens, the long-term benefits of participating in energy-efficiency programs might prove too difficult to recognize.

The dearth of customer-oriented information and its ineffective dissemination significantly fuels mistrust of energy-efficiency programs. Negative characterizations of and understandings about energy-efficiency programs (e.g., *'disruptive'*, *'too good to be true'*, *'a scam'*), as well as confusion around eligibility guidelines, may also increase customer wariness and/or prevent customers from positively responding to outreach efforts when they are conducted. When potential participants *are* reached, they might not agree to enroll in programs not only because of these unfavorable views (i.e., *'weatherization is a disruption to household privacy'*), but also because they may be apprehensive about unknown individuals entering their homes during the weatherization process (e.g., energy auditors, contractors, work crews, inspectors, etc.). Experts stated that hesitancy among qualifying households can also be associated with their experiences with – and eventual distrust towards – utility companies and government programs *in general*, especially with programs that require information pertaining to their household income or their prior participation in other governmental assistance programs.

Previous studies have examined the need for targeted outreach strategies to reach racial/ethnic and low-income households.[146] Recognizing the lack of information as a key barrier to accessing energy-efficiency programs, experts recommended increased funding to expand and train the workforce necessary to conduct effective outreach. While increasing the availability of culturally tailored information could help to ease skepticism towards energy-efficiency programs, investment in more concerted efforts may be required to motivate program participation.[147] For example, experts considered the potential to recruit community members to serve as program liaisons. Enlisting the insights and expertise of trusted and reliable community sources to improve the promotion of energy efficiency programs may also serve to address factors that impede participation, such as streamlining program application processes, simplifying

[142] Aweh et al., *supra* n.130.
[143] Xu et al., *supra* n.131.
[144] Christopher Guo, Craig A. Bond & Anu Narayanan, RAND Corp., The Adoption of New Smart-grid Technologies: Incentives, Outcomes, and Opportunities (2015), *available at* https://www.rand.org/content/dam/rand/pubs/research_reports/RR700/RR717/RAND_RR717.pdf (last accessed Apr. 11, 2023).
[145] For example, while participation in weatherization programs can be effective in addressing certain energy-efficiency concerns, it does not address other tangible areas of concern, such as repairing a damaged roof or performing mold removal or mold remediation.
[146] Chien-fei Chen, et al., *Beyond Technology Adoption: Examining Home Energy Management Systems, Energy Burdens and Climate Change Perceptions during COVID-19 Pandemic*, 145 RENEWABLE AND SUSTAINABLE ENERGY REVIEWS 111066 (2021), doi:10.1016/j.rser.2021.111066.
[147] JENNIE PEREY SAXE, *A Light Bulb Moment for Cities: Opportunities to Improve Residential Energy Efficiency Outreach*, *in* HANDBOOK OF CLIMATE CHANGE MITIGATION AND ADAPTATION (Maximilian Lackner, Baharak Sajjadi & Wei-Yin Chen, eds., 3d ed., 2022) 2169-2212.

program applications, and allowing for multi-modal application submission. Other possible, yet less apparent factors could also be identified and confronted. These insights, in addition to more robust funding, could contribute to improving and strengthening referral systems to ensure that eligible households have accurate information about and timely access to multiple service offerings.

Finally, experts pointed to split/misaligned incentives between landlords and renters as a key access challenge, as the party responsible for paying the energy costs would be most incentivized to improve weatherization to reduce heating or cooling costs. If the tenant is responsible for covering energy costs, the landlord may not be incentivized to authorize work, especially if the landlord would be required to pay for the work upfront. The landlord may also be concerned that, a professional entering the rental units may identify code violations that the landlord would be required to address. This 'landlord-tenant dilemma', [148] whereby investments in energy-efficient retrofits in rental properties yield proximal benefits to tenants as opposed to landlords,[149] prohibits low-income households from participating in energy efficiency programs in Pennsylvania. Conversely, if the landlord is paying energy bills, the tenant may be disinclined to tolerate the inconvenience of having work done on the unit during their lease term, and the tenant almost certainly would not be incentivized to seek out programs that would reduce energy consumption. One expert suggested that one remedy that has worked in certain situations is for representatives of energy efficiency programs to develop relationships with landlords. Under those circumstances, the landlord may be willing to participate in energy efficiency programs and even cooperate with the representatives in helping to recruit tenants.

B. Collaborative Governance and Coordination Challenges

In addition to the access challenges discussed in Section III.A., effectiveness of benefits programs is also impeded by governance and coordination challenges among the various government and private entities that participate in the programs' administration.

As discussed above, energy efficiency and conservation (EE&C) has multifaceted benefits including lower energy bills, reduced greenhouse gas emissions, energy security, and improved infrastructure conditions.[150] However, due to the complexity of energy markets and the presence of asymmetric information, private consumers tend to systematically ignore opportunities for energy efficiency investment that would acquire more benefits than costs, a phenomenon which economists refer to as the

[148] Stephen Bird & Diana Hernández, Policy Options for the Split Incentive: Increasing Energy Efficiency for Low-Income Renters, 48 ENERGY POLICY 506-514 (2012), doi: 10.1016/j.enpol.2012.05.053.
[149] Steven März, Ines Stelk & Franziska Stelzer, *Are Tenants Willing to Pay for Energy Efficiency? Evidence from a Small-scale Spatial Analysis in Germany* 161 ENERGY POLICY 112753 (2022), doi: 10.1016/j.enpol.2021.112753.
[150] ELIZABETH DORIS, JAQUELIN COCHRAN & MARTIN VORUM, NAT'L RENEWABLE ENERGY LABORATORY, ENERGY EFFICIENCY POLICY IN THE UNITED STATES: OVERVIEW OF TRENDS AT DIFFERENT LEVELS OF GOVERNMENT 63 (2009), *available at* https://www.nrel.gov/docs/fy10osti/46532.pdf (last visited Apr. 11, 2023).

"energy efficiency gap".[151] The report from Granade et al. vividly described the energy loss: the ground is littered with $20 bills that energy consumers have failed to pick up.[152]

Beyond consumer behavior, energy efficiency programming in the United States reflects the features of interorganizational participation and interjurisdictional governance. The implementation of government policies not only relies on the coordination of federal, state, and local jurisdictional levels, but also requires participation of private companies, non-profit organizations, and consumers. Take the Weatherization Assistance Program (WAP), discussed in Section II.A.1. above, for example. WAP was enacted by Congress in 1976 under the Energy Conservation and Production Act. The initial purpose of the program was to provide small-scale, temporary means to conserve heat, therefore improving energy efficiency and reducing energy costs for low-income households. Subsequently, the program has expanded to include a variety of large-scale, more permanent measures that support efficient heating, cooling, and energy conservation. WAP is overseen by the Weatherization and Intergovernmental Programs Office (WIP), which is part of the U.S. Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE). The responsibility of WIP is to enable energy efficiency investments and facilitate innovative practices with advanced technologies in partnership with a wide range of stakeholders.[153]

But while the federal government provides a core set of WAP funds, it is state and local governments that administer the program. Further states and private utilities supplement its funding on a scale of $3.04 for every federal dollar.[154] Taking Pennsylvania as an example, the networks that facilitate WAP projects are managed by the Pennsylvania Department of Community & Economic Development (DCED) in a decentralized manner. Participants in the networks include units of government that oversee utility companies (Pennsylvania Public Utility Commission), local agencies who are eligible to provide weatherization services (Action Housing, Inc., Energy Coordinating Agency, Philadelphia Housing Development Corporation), as well as third-party organizations who have the expertise to deliver weatherization trainings and certifications (National Sustainable Structures Center, Clean Energy Center at Penn College, Energy Coordinating Agency).

To deal with the fragmentated structure of the energy efficiency systems, public managers often use collaboration as a strategy to connect the widely dispersed stakeholders and enhance the capacity of problem solving.[155] However, the existence of interorganizational networks simultaneously imposes

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[151] Meredith Fowlie, Michael Greenstone & Catherine Wolfram, *Do Energy Efficiency Investments Deliver? Evidence from the Weatherization Assistance Program*, 133 THE QUARTERLY JOURNAL OF ECONOMICS 1597 (2018), doi: 10.1093/qje/qjy005.

[152] HANNAH CHOI GRANADE ET AL., MCKINSEY & COMPANY, UNLOCKING ENERGY EFFICIENCY IN THE US ECONOMY, MCKINSEY & COMPANY (2009), *available at* https://www.sallan.org/pdf-docs/MCKINSEY_US_energy_efficiency.pdf (last visited Apr. 11, 2023).

[153] PENNSYLVANIA PUBLIC UTILITY COMMISSION, SWE ANNUAL REPORT ACT 129 PHASE III AND PROGRAM YEAR 12 (2022), *available at* https://www.puc.pa.gov/pcdocs/1746475.pdf (last visited Apr. 11, 2023).

[154] NATIONAL ASSOCIATION OF STATE COMMUNITY SERVICE PROGRAMS, WEATHERIZATION ASSISTANCE PROGRAM: FUNDING REPORT - PY 2019 4 (2019), *available at* https://nascsp.org/wp-content/uploads/2021/01/NASCSP-2019-WAP-Funding-Survey_Final.pdf (last visited Apr. 11, 2023).

[155] Mark T. Imperial, *Using Collaboration as a Governance Strategy: Lessons From Six Watershed Management Programs*, 37 ADMINISTRATION & SOCIETY 281 (2005), doi: 10.1177/0095399705276111.

constraints that limit the effectiveness of collaboration. These constraints are manifested in competing goals, conflicting values, distrust, asymmetric power, ambiguous responsibilities, and lack of transparency. Therefore, it is important for policy practitioners to understand the opportunities and barriers for using a collaborative governance framework to address problems in energy efficiency programs, as well as to identify potential instruments for evaluating the performance of an EE&C collaboration.

The purpose of this section of the report is to introduce the concept of collaborative governance and to provide an initial examination of the performance of collaborative governance in EE&C practices. It first reviews the theoretical framework of collaborative governance. After explaining the key concepts and activities involved in the collaborative process, it discusses several factors that determine the success of collaborative governance. The section then goes on to identify the obstacles confronting EE&C programs in Pennsylvania. To help practitioners develop metrics that evaluate collaborative performance, the section next summarizes several emerging approaches that have been used in empirical literature to measure collaborative outcomes. The review concludes with lessons on the opportunities and challenges that collaborative governance offers for EE&C programs in Pennsylvania, and with policy recommendations for public managers as well as policy practitioners.

1. The Collaborative Governance Framework

The trend of contracting out public services to third parties, usually private and nonprofit organizations, has led to increasing fragmentation of policy systems.[156] How to manage these "unstructured, cross-cutting, relentless" wicked problems poses a challenge for scholars and practitioners in public administration.[157] A growing literature, therefore, has demonstrated the importance of collaborative governance and its potential to deal with the complexity of policymaking and policy implementation.

According to Bressers et al., the prevalent challenge for public managers is that no single actor has sufficient authority, resources, or knowledge to completely deliver a public project.[158] More often, multiple stakeholders are involved in the same project, each with different responsibilities but relying on shared platforms and interdependencies to achieve the key policy objectives. Collaborative governance is thus introduced to describe the phenomenon where people across the boundaries of public agencies, levels of government, and the public, private and civic spheres are constructively engaged in the processes and structures of public policy decision-making and public management.[159] Advocates of collaborative governance consider it an encompassing, flexible, and innovative model to analyze the dynamics of policy

[156] H. Brinton Milward & Keith G. Provan, *Governing the Hollow State*, 10 JOURNAL OF PUBLIC ADMINISTRATION RESEARCH AND THEORY 359 (2000), doi: 10.1093/oxfordjournals.jpart.a024273.
[157] Edward P. Weber & Anne M. Khademian, *Wicked Problems, Knowledge Challenges, and Collaborative Capacity Builders in Network Settings*, 68 PUBLIC ADMINISTRATION REVIEW 334 (2008), doi: 10.1111/j.1540-6210.2007.00866.x.
[158] Hans Bressers, Laurence J. O'Toole, Jr. & Jeremy Richardson, *Networks as Models of Analysis: Water Policy in Comparative Perspective*, 3 ENVIRONMENTAL POLITICS 1 (1994), doi: 10.1080/09644019408414165.
[159] Kirk Emerson & Tina Nabatchi, *Evaluating the Productivity of Collaborative Governance Regimes: A Performance Matrix*, 38 PUBLIC PERFORMANCE & MANAGEMENT REVIEW 717 (2015), doi: 10.1080/15309576.2015.1031016.

development, and tout its adherent values in consensus, transparency, and deliberation.[160] As the concept of collaborative governance becomes popular, the application of this framework has covered a wide range of policy topics, including watershed management, [161] abandoned gas well mitigation,[162] environmental regulations,[163] sharing economy,[164] smart home technology,[165] energy savings,[166] and more. Across these studies, the effectiveness of collaborative governance is highly dependent on the issue contexts and interorganizational networks. There is no one-size-fits-all answer to solve heterogeneous problems, but the collaborative governance framework offers a structure for approaching them.

a. What is collaborative governance?

Given the context of the increasingly complex, interdependent, networked, and decentralized nature of governing, governance theory is devoted to explaining interjurisdictional relations and how those relations reconstruct power structures, resource conditions, accountability, and policy outcomes.[167] It declares several facts in current administrative practices. First, there are blurred boundaries and responsibilities between public and private sectors, as well as between social and economic issues. Second, networks within governing systems are spontaneously formed and self-managed.[168] Third, institutional arrangements shape the behaviors of organizational actors, as well as the relationships between organizations and the external environment.[169] Considering these governance issues, the collaborative aspect emphasizes the consensus-oriented nature of the deliberative governing process that is characterized by a range of collective decision-making activities that include both public and private actors with diverse capacities and interests.[170] In sum, Ansell and Gash define collaborative governance

[160] ALISON GASH, *Chapter 43: Collaborative Governance*, *in* HANDBOOK ON THEORIES OF GOVERNANCE (Christopher Anseli & Jacob Torfing eds., 2022), 497–509, doi: 10.4337/9781800371972.00053.

[161] J. M. Fliervoet et al., *Analyzing Collaborative Governance Through Social Network Analysis: A Case Study of River Management Along the Waal River in The Netherlands*, 57 ENVIRONMENTAL MANAGEMENT 355-67 (2016), doi: 10.1007/s00267-015-0606-x; Imperial, *supra*, n.155.

[162] Daniel J. Mallinson et al., *The Scourge of Orphaned and Abandoned Wells: Leveraging Public-Private-Citizen Collaboration to Solve a Big Problem*, PUBLIC WORKS MANAGEMENT & POLICY (2022), 1087724X221112958, doi: 10.1177/1087724X221112958.

[163] Nicola Ulibarri, *Tracing Process to Performance of Collaborative Governance: A Comparative Case Study of Federal Hydropower Licensing*, 43 POLICY STUDIES JOURNAL 283-308 (2015), doi: 10.1111/psj.12096.

[164] Yuge Ma et al., *Challenges of Collaborative Governance in the Sharing Economy: The Case of Free-Floating Bike Sharing in Shanghai*, 197 JOURNAL OF CLEANER PRODUCTION 356-65 (2018): doi: 10.1016/j.jclepro.2018.06.213.

[165] Daniel J. Mallinson & Saahir Shafi, *Smart Home Technology: Challenges and Opportunities for Collaborative Governance and Policy Research*, 39 REVIEW OF POLICY RESEARCH 330-52 (2022), doi: 10.1111/ropr.12470.

[166] Minwoo Ahn & Elizabeth Baldwin, *Who Benefits from Collaborative Governance? An Empirical Study from the Energy Sector*, PUBLIC MANAGEMENT REVIEW 1-25 (2022), doi: 10.1080/14719037.2022.2044505.

[167] H. GEORGE FREDERICKSON*, Chapter 12: Whatever Happened to Public Administration? Governance, Governance Everywhere*, *in* THE OXFORD HANDBOOK OF PUBLIC MANAGEMENT (Ewan Ferlie et al. eds., 2007) 282–304.

[168] Gerry Stoker, *Governance as Theory: Five Propositions*, 50 INTERNATIONAL SOCIAL SCIENCE JOURNAL 17-28 (1998), doi: 10.1111/1468-2451.00106.

[169] Laurence E. Lynn Jr, Carolyn J. Heinrich & Carolyn J. Hill, *Studying Governance and Public Management: Challenges and Prospects*, 10 JOURNAL OF PUBLIC ADMINISTRATION RESEARCH AND THEORY 233-62 (2000), *available at* https://www.jstor.org/stable/3525644 (last visited Apr. 11, 2023).

[170] Chris Ansell & Alison Gash, *Collaborative Governance in Theory and Practice*, 18 JOURNAL OF PUBLIC ADMINISTRATION RESEARCH AND THEORY 543-71 (2008), doi: 10.1093/jopart/mum032; Alexander Conley & Margaret A. Moote,

as "a governing arrangement where one or more public agencies directly engage non-state stakeholders in a collective decision-making process that is formal, consensus-oriented, and deliberative and that aims to make or implement public policy or manage public programs or assets".[171]

The definition of collaborative governance provides two ways to think about the new administrative method. On the one hand, a branch of studies focuses on the description and explanation of the necessary conditions, mechanisms, and key factors that facilitate collective decision-making. In the collaborative governance framework proposed by, Emerson et al., an iterative process is built upon three nested dimensions: the general system context, the collaborative governance regime (CGR), and the collaborative dynamics and actions.[172] Under the system context, as well as triggered by elements categorized as "drivers", interactions between the concepts of principled engagement, shared motivation, and capacity for joint action, jointly form the collaboration dynamics that lead to collective actions. The result of collaborative processes is not prescriptive, it rather renders "potential transformative change as adaptation to impacts fostered by CGRs".[173] On the other hand, collaborative governance is composed of interdependent networks confined to a set of stakeholders. The process is about how these stakeholders reconcile conflicts, build consensus, and achieve common goals. In Ansell and Gash's model of collaborative governance, the inherent elements of stakeholder networks not only determine the capacity to initiate collaborative governance, but also play an essential part in the collaborative process.[174] One prominent advantage of collaborative governance, as well as the main challenge in studying these networks, is the prevalence of informal, sometimes invisible relationships. Collaborative governance in general does not have any specific characteristics. The collaborative process is described as flexible, adaptive, and improvised, with the engagement of multiple stakeholders who are able to leverage resources, employ expertise, and craft strategies that meet the problem-specific needs.

b. How does collaborative governance work?

First and foremost, activities inside the collaborative process must be understood in the context in which collaboration occurs. Some of the contextual components include power relations and resource conditions of stakeholders, the regulatory, normative, and cultural environments, the initial level of trust and conflict, as well as distance between participants in social networks.[175] The system context (see Figure 1) not only constitutes the basis of the legitimacy of collaborative activities but also implies conditions of participation inclusion. Legitimacy arises when the system context speaks to the existence of a common problem, and participants in collaborative governance believe that the system addresses the collective problem in a meaningful way.[176] In Imperial's case of watershed management, the legitimacy of

Evaluating Collaborative Natural Resource Management, 16 SOCIETY & NATURAL RESOURCES 371-86 (2003), doi: 10.1080/08941920309181.

[171] *Id.* at 544.

[172] Kirk Emerson, Tina Nabatchi & Stephen Balogh, *An Integrative Framework for Collaborative Governance*, 22 JOURNAL OF PUBLIC ADMINISTRATION RESEARCH AND THEORY 1-29 (2012): 1–29, doi:10.1093/jopart/mur011.

[173] *Id.* at 19.

[174] Ansell & Gash, *supra* n.170.

[175] Ansell & Gash, *supra* n.170; Emerson, Nabatchi & Balogh, *supra* n.172.

[176] Ansell & Gash, *supra* n. 170; W. RICHARD SCOTT, INSTITUTIONS AND ORGANIZATIONS: IDEAS, INTERESTS, AND IDENTITIES 71 (4th ed. 2013).

collaborative governance comes from the geographically, politically, and ideologically spanning boundaries of watersheds as well as the limited capacity of any single organizations to accomplish the joint mission.[177] As to the inclusion in collaborative governance, the system context is essential to understand who should be included in the collaborative networks. Ansell et al. suggest that strategic inclusion is more likely to lead to successful collaboration since it avoids unwieldy, fuzzy, unstable, and uncooperative issues that arise from larger groups.[178] And in the propositions Ansell and Gash gave, the initial stage of power/resource imbalance, the level of trust and conflict, as well as the perceived interdependencies among stakeholders, jointly determine the degree of participatory willingness.[179]

Connecting the system context and the collaborative process, drivers act as the impetus to trigger collaboration (see Figure 1). Important drivers include formal or informal leaders, consequential incentives, interdependence, and uncertainty.[180] Leadership provides the source of authority, impartiality, and long-term commitment to collaboration.[181] Besides, the primary function of leaders is to steer the collaborative network by facilitating communication, reconciling divergence, building trust, and establishing joint purpose.[182] Consequential incentives indicate the perceived urgency of collective action. These incentives can be positive, including funding opportunities or supportive policies that create conditions and resources for collaborative actions, or negative, referring to salient problems that, without proper attention, would have negative consequences.[183] Interdependence among stakeholders and policy issues gives rise to the complexity of societal problems.[184] Such complexity implies the importance of collaborative, without which individuals or organizations cannot achieve certain goals on their own. Another driving factor, uncertainty, is often introduced by the changing environment that collective problems face. Stakeholders express their willingness to participate in collaborative governance because it serves to diversify and share risks.[185]

The most critical aspect of collaborative governance lies in the collaborative process[186], also known as collaborative dynamics.[187] The process is usually iterative and cyclical, consisting of a series of consensus-

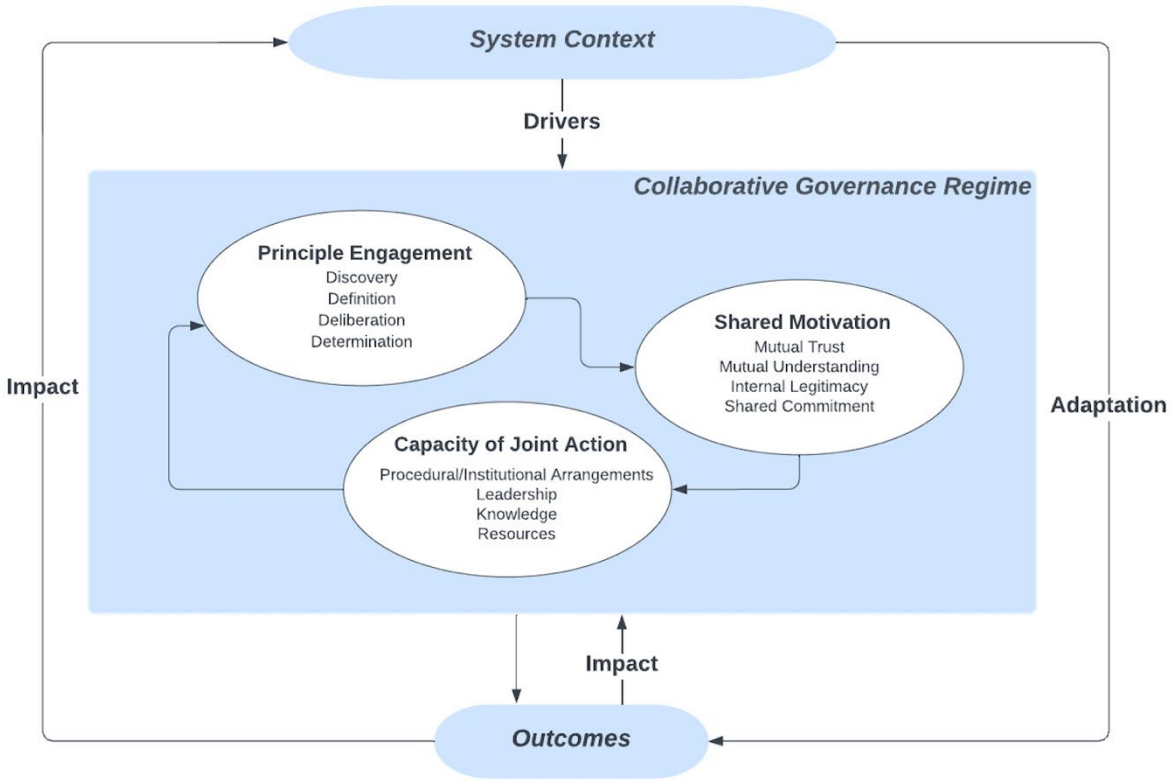
[177] Imperial, *supra* n.155.
[178] Christopher Ansell et al., *Understanding Inclusion in Collaborative Governance: A Mixed Methods Approach*, 39 *Policy and Society* 570-91 (2020), doi: 10.1080/14494035.2020.1785726.
[179] Ansell & Gash, *supra* n.170.
[180] Emerson, Nabatchi & Balogh, *supra* n.172.
[181] John M. Bryson, Barbara C. Crosby & Melissa Middleton Stone, *The Design and Implementation of Cross-Sector Collaborations: Propositions from the Literature*, 66 PUBLIC ADMINISTRATION REVIEW 44-55 (2006), doi: 10.1111/j.1540-6210.2006.00665.x.
[182] Ansell & Gash, *supra* n.170; Tyler A. Scott & Craig W. Thomas, *Unpacking the Collaborative Toolbox: Why and When Do Public Managers Choose Collaborative Governance Strategies?: Unpacking the Collaborative Toolbox*, 45 POLICY STUDIES JOURNAL 191-214 (2017), doi: 10.1111/psj.12162; Siv Vangen & Chris Huxham, *Enacting Leadership for Collaborative Advantage: Dilemmas of Ideology and Pragmatism in the Activities of Partnership Managers*, 14 BRITISH JOURNAL OF MANAGEMENT S61-76 (2003), doi: 10.1111/j.1467-8551.2003.00393.x.
[183] Emerson, Nabatchi & Balogh, *supra* n.172.
[184] Johanna Hedlund, Örjan Bodin & Daniel Nohrstedt, *Policy Issue Interdependency and the Formation of Collaborative Networks*, 3 PEOPLE AND NATURE 236-50 (2021), doi: 10.1002/pan3.10170.
[185] Emerson, Nabatchi & Balogh, *supra* n.172.
[186] Ansell & Gash, *supra* n.170.
[187] Emerson, Nabatchi & Balogh, *supra* n.172.

oriented activities, including face-to-face discourse, interorganizational communications, division of responsibility supported by institutions and autonomy, as well as mutuality-oriented learning and understanding. The first component of collaborative dynamics is principled engagement (see collaborative governance regime in Figure 1). Principled engagement incorporates four domains that summarize the interactions among collaborative members. In the discovery domain, people are interested in identifying shared interests and mutual goals. In the definition domain, the primary goal is to establish a unified system of concepts, terminology, and criteria to fortify the legitimacy of collaborative actions. The deliberation domain often involves conflicts of interest, which require participants to advance through constructive negotiation or compromise for the collective good. The determination domain generally incorporates the intermediate outcomes of principled engagement, such as agreements about agenda setting and assignments of task. The second component of collaborative dynamics, shared motivation, emphasizes an interpersonal, value-oriented dynamic (see Figure 1). It refers to unobserved factors that measure the proximity of collaboration members to each other and the centrality of social networks, including trust, shared understanding, common identity, and common values.[188] The last component, capacity for joint action (see Figure 1), represents resource-related elements that are necessary to sustain the functioning of collaborative frameworks, including consistent organizational structures, coherent protocols and rules, supporting institutional arrangements, sufficient leadership, professional knowledge, and material resources like staff, equipment and budgets.[189]

[188] Ansell & Gash, *supra* n.170; Örjan Bodin et al., *The Impacts of Trust, Cost and Risk on Collaboration in Environmental Governance*, 2 PEOPLE AND NATURE 734-49 (2020), doi: 10.1002/pan3.10097; Bryson, Crosby & Stone, *supra* n.177; Emerson, Nabatchi & Balogh, *supra* n.172.

[189] Emerson, Nabatchi & Balogh, *supra* n.172; Ann Marie Thomson & James L. Perry, *Collaboration Processes: Inside the Black Box*, 66 PUBLIC ADMINISTRATION REVIEW 20-32 (2006), doi:10.1111/j.1540-6210.2006.00663.x; Ulibarri, *supra* n.163.

Figure 1. Collaborative Governance Framework



Reproduced based on Emerson, Nabatchi, and Balogh, "An Integrative Framework for Collaborative Governance." (2012)

c. What determines the success of collaborative governance?

Because the general narratives of public issues tend to stress the public nature of social affairs and the significance of creating public value, collaboration is a prevalent paradigm in public administration. However, collaborative governance is not a panacea for delivering all public projects, and its effectiveness depends on multiple conditions.

The first commonality of collaborative governance is the existence of multiple stakeholders and the resulting ambiguity of interjurisdictional boundaries. Unlike the traditional principal-agent problem where the authority-subordinate relationship is prescriptive, collaborative governance is open and flexible. It contributes to democratic principles by allowing any stakeholders with interest or authority to initiate collaborative actions. The administrative model is characterized by hybrid organizational structures resulting from the dynamics of power and resources.[190] This leads to what Vangen and Huxham call the

[190] Gash, *supra* n.160.

"congruence-diversity paradox".[191] Advantages of this hybridity include the leverage of scarce resources and the complementarities between collaborative units.[192] However, collaborative governance tends to stagnate when stakeholders in collaborative networks are underrepresented or conflicts among stakeholders are irreconcilable.[193] Therefore, a critical determinant of the success of collaborative governance is its ability to represent diverse interests, describe conflicts, and translate them into common goals.

Strategies that could be applied in the consensus-oriented dimension are contextual. For homogeneous organizations with similar preferences, functions, or customer bases, collaboration can occur when it brings reciprocal benefits for individual organizations to participate in integrative systems, such as risk diversification, resource complementation, and stability from long-term contracts.[194] For organizations that share great differences, it is preferable to reconcile diversity by establishing either a set of goals based on shared social beliefs and moral imperatives,[195] or pseudo goals that portray themselves as having similarities or going beyond individual organizations' missions.[196] Ideally, collaborative networks should "adapt a collective consciousness" that is developed from "a hodgepodge of diverse identities, preferences and motivations".[197] The hybrid organizational structure also determines the dynamics in conflicts. Therefore, collaborative governance requires effective mechanisms for stakeholders to "increase understanding of conflict drivers", "improve capacity to mitigate conflicts", and "increase participation and communication related to conflicts".[198]

Another factor that distinguishes collaborative governance systems is the inclusion process. Who should be included in the collaborative network and how they will be included are essential questions for the effectiveness and legitimacy of collaborative governance.[199] On the one hand, the absence of critical stakeholders is seen as weakening the representativeness of the collaborative network, thus threatening the legitimacy of collaborative outcomes.[200] On the other hand, broad inclusion as an alternative strategy could result in fuzzy network structures, which have potentials to increase procedural or transactional

[191] Siv Vangen and Chris Huxham, *The Tangled Web: Unraveling the Principle of Common Goals in Collaborations*, 22 JOURNAL OF PUBLIC ADMINISTRATION RESEARCH AND THEORY 731-60 (2012), doi: 10.1093/jopart/mur065.
[192] Ansell & Gash, *supra* n.170; Thomson & Perry, *supra* n.189; Walter W. Powell, Neither Market nor Hierarchy: Network Forms of Organization, 12 RESEARCH IN ORGANIZATIONAL BEHAVIOR 295-336 (1990), *available at* https://web.stanford.edu/~woodyp/powell_neither.pdf (last visited: Apr. 11, 2023).
[193] Robert Agranoff & Michael McGuire, *Big Questions in Public Network Management Research*, 11 JOURNAL OF PUBLIC ADMINISTRATION RESEARCH AND THEORY 295-326 (2001), doi: 10.1093/oxfordjournals.jpart.a003504; Ansell & Gash, *supra* n.170.
[194] Thomson & Perry, *supra* n.189.
[195] Nigel D. Caldwell, Jens K. Roehrich & Gerard George, *Social Value Creation and Relational Coordination in Public-Private Collaborations*, 54 JOURNAL OF MANAGEMENT STUDIES 906-28 (2017), doi:10.1111/joms.12268; Thomson & Perry, *supra* n.189.
[196] Vangen & Huxham, *supra* n.191.
[197] Gash, *supra* n.160.
[198] Joshua Fisher et al., *Collaborative Governance and Conflict Management: Lessons Learned and Good Practices from a Case Study in the Amazon Basin*, 33 SOCIETY & NATURAL RESOURCES 538-53 (2020), doi: 10.1080/08941920.2019.1620389.
[199] Ansell et al., *supra* n.178.
[200] Ansell & Gash, *supra* n.170.

costs and create distrust and conflicts among diverse stakeholders. Therefore, a key issue in collaborative governance is to navigate the trade-offs of greater inclusion.[201]

The following patterns of inclusion strategies are commonly seen in the practice of collaborative governance. First, for policy systems that already exist, the selection of network participants and the development of collaborative networks are often path dependent.[202] Path dependence can be attributed to former institutional arrangements that produce positive feedbacks. With a set of rules and shared understanding as a basis of collaboration, involved stakeholders can develop mutual trust and interdependencies. Positive feedback, therefore, has to do with a series of benefits derived from the collaboration systems, including the compatibility gain generated by the mutual relation between software and hardware, the coordination gain created by the complementary standards and resource sharing, as well as the cost reduction gain produced by the economies of scale and risk sharing.[203]

Second, for new systems, the selection of stakeholders is contingent upon the purpose of participation and should be differentiated based on the needs for resources and professional knowledge. For example, experts who have relevant tools to solve a particular problem can make important contributions to initiate the learning process and diffuse knowledge. Similarly, involving stakeholders who possess a great share of relevant resources and information will increase representation and support policy implementation.[204] Beyond that, the inclusion process can be determined by the preferences of leaders if they have predominant power. Aside from objective purposes, leaders have the inclination to select members that directly relate to them. These participants, either being trusted or easily controlled, contribute to lower costs of negotiation and communication.

Third, while many scholars are skeptical about the feasibility of evaluation and assessment of collaborative performance due to the fluid procedural landscape for collaborative governance,[205] establishing certain performance metrics remains a critical public management task in order to justify the legitimacy of collaborative initiatives.[206] The measurements are often mixed given a variety of factors involved in collaborative performance. For instance, Emerson and Nabatchi produce a 3×3 performance matrix, evaluating actions, outcomes and adaptation under each unit of analysis (participant organization, collaborative governance regime, and target goals).[207] From the multi-stakeholder perspective, Provan and Milward establish the criteria for evaluation of network effectiveness.[208] There also exists another

[201] Tyler A Scott, Craig W. Thomas & José Manuel Magallanes, *Convening for Consensus: Simulating Stakeholder Agreement in Collaborative Governance Processes Under Different Network Conditions*, 29 JOURNAL OF PUBLIC ADMINISTRATION RESEARCH AND THEORY 32-49 (2019), doi: 10.1093/jopart/muy053.
[202] Ansell et al., *supra* n.178.
[203] Jacob Torfing, *Rethinking Path Dependence in Public Policy Research*, 3 CRITICAL POLICY STUDIES 70-83 (2009), doi: 10.1080/19460170903158149.
[204] John M. Bryson et al., *Designing Public Participation Processes*, 73 PUBLIC ADMINISTRATION REVIEW 23-34 (2013), doi: 10.1111/j.1540-6210.2012.02678.x.
[205] Agranoff and McGuire, *supra* n.193; Gash, *supra* n.160; Keith G. Provan & H. Brinton Milward, *Do Networks Really Work? A Framework for Evaluating Public-Sector Organizational Networks*, 61 PUBLIC ADMINISTRATION REVIEW 414-23 (2001), doi: 10.1111/0033-3352.00045.
[206] Emerson & Nabatchi, *supra* n.159.
[207] *Id.*
[208] Provan & Milward, *supra* n.205.

branch of empirical studies that focus on explaining causal relationships between collaborative processes and outcomes.[209] More details are discussed in Section III.B.3 below. Afterall, given the distinct source of policy-making authority for collaborative governance that exists outside the traditional administrative system, a positive evaluation would demonstrate the advantages of collaborative actions, thus supporting the sustainability of those voluntary and autonomous governing networks.

2. Barriers to Collaboration in EE&C Projects

Having established the theoretical foundation for collaborative governance and the broad outlines of how it functions, we now turn to evaluating the specific barriers to collaboration in EE&C projects. This evaluation is based in part on our assessment of current policy and practice and in part from the May 2022 Expert Workshop.

a. System Context

The system context refers to a set of economic, political, social, and legal factors that not just affect the starting conditions of collaborative actions, but their impact permeates the entire process of collaborative governance. EE&C in Pennsylvania is primarily regulated under Act 129. The program is administrated by the Pennsylvania Public Utility Commission (PAPUC) that requires seven major electric distribution companies (EDCs) to achieve targeted levels of energy consumption and demand savings annually and over successive phases.[210] Through a PAPUC-led cost-benefit analysis of the EE&C Program implemented by EDCs, the Commission is required to set additional incremental reductions in consumption and peak demand if the benefits exceed the costs.[211] And EDCs should renew their reduction plans over time to be in line with the updated targets.

The procedural design, however, creates the first collaborative obstacles in the mutual distrust of PAPUC and EDCs. EDCs are reluctant to implement additional saving rates because reduced consumption as a result of energy efficiency would erode their revenues.[212] Act 129, therefore, provides procedural latitude for EDCs to leverage their information advantage by hiring their preferred assessment companies to file cost and benefit data to PAPUC. Due to the lack of primary information, the accuracy of the statewide evaluation report published by the Commission highly depends on the measurement and calculation methods applied by EDCs. Besides, prior to Phase IV, the Commission only asked utilities to voluntarily develop cost-effective demand reduction programs due to a lack of first-hand data and appropriate evaluation metrics. It was not until the development of the energy efficiency and peak demand reduction

[209] Jens Newig et al., *The Environmental Performance of Participatory and Collaborative Governance: A Framework of Causal Mechanisms*, 46 POLICY STUDIES JOURNAL 269-97 (2018), doi: 10.1111/psj.12209; Ellen Rogers & Edward P. Weber, *Thinking Harder About Outcomes for Collaborative Governance Arrangements*, 40 THE AMERICAN REVIEW OF PUBLIC ADMINISTRATION 546-67 (2010), doi: 10.1177/0275074009359024; ANN MARIE THOMSON, JAMES L. PERRY & THEODORE K. MILLER, *Linking Collaboration Processes and Outcomes: Foundations for Advancing Empirical Theory*, *in* BIG IDEAS IN COLLABORATIVE PUBLIC MANAGEMENT (Lisa Blomgren Bingham & Rosemary O'Leary, eds. 2008).
[210] 66 Pa. CONS. STAT. § 2806.1.
[211] 66 Pa. CONS. STAT. § 2806.1(c)(3); CONS. STAT. § 2806.1(d)(2)
[212] Elizabeth Baldwin, *Exploring How Institutional Arrangements Shape Stakeholder Influence on Policy Decisions: A Comparative Analysis in the Energy Sector*, 79 PUBLIC ADMINISTRATION REVIEW 246-55 (2019), doi: 10.1111/puar.12953.

(EEPDR) potential study, as well as a dispatchable demand response (DDR) potential study during Phase III that the peak demand targets have been prescribed for Phase IV.[213]

In addition, PAPUC's administrative proceedings allow relevant stakeholders to comment and respond to rate modification and protocols before the Commission issues final decisions. However, there is no statutory provision that clearly defines the link between stakeholders' comments and final decision-making.[214] Often, dialogues among PAPUC, EDCs and other advocacy coalitions have limited effect on the final EE&C target. It is also worth noting that Act 129 only imposes statutory obligations on seven EDCs with at least 100,000 customers. Small EDCs with limited distribution capacity, therefore, do not confront mandatory constraints on energy efficiency, which means that their actions and decisions are missing in the system context of collaborative governance. Further, their customers may not pay for EE&C programming, but they do not benefit from it either.

b. Shared Motivation

The benefits of EE&C programming include reducing customers' energy costs, mitigating demand spikes, ensuring energy security, as well as delivering a wide range of health and environmental benefits. However, those benefits are not equally distributed or well perceived by all stakeholders in the collaborative process. To understand the collaborative barriers, it is important to address the different incentives that bring each stakeholder into the collaborative network.

Considering the administrative structure of EE&C programming in Pennsylvania, utilities are the primary implementer of energy saving targets. Utilities often view energy efficiency programs as opportunities to improve reliability and efficiency of electricity delivery, an important factor affecting the number of users and user satisfaction. For some utilities with technical capacities, EE&C programs also expand their business scope by facilitating diverse customer services. However, financial disincentives account for the major obstacles that prevent utilities from actively promoting EE&C programs.[215] As energy savings have potential to shrink their volumetric sales of electricity, utilities usually strategies that balance the benefits and costs of EE&C. Once energy saving tariffs or customer surcharges are not sufficient to recover costs, one should expect negative collaboration from utilities.

Small businesses, non-profits, and policy advocacy coalitions are also necessary, but disadvantaged, stakeholders. Their disadvantages are characterized as weak market power, lack of sufficient political and economic resources, asymmetric information, as well as technical incapacities. Those factors often put them into the subordinate position in a collaborative governance regime. Meanwhile, since most of them are voluntarily participating in the EE&C programs, they tend to have limited opportunities to interact with policymakers and to get access to EE&C related knowledge and trainings. Such institutional and technical barriers implicitly increase the participatory costs, in terms of the time and money that

[213] Pa. Pub. Util. Comm'n, *The Act 129 Phase III EE&C Program Final Implementation Order*, Docket No. M-2014-2424864 (June 11, 2015), *available at* https://www.puc.pa.gov/pcdocs/1367313.doc (last visited: Apr. 11, 2023).
[214] Baldwin, *supra* n.212.
[215] Carl Blumstein, Charles Goldman & Galen Barbose, *Who Should Administer Energy-Efficiency Programs?*, 33 ENERGY POLICY 1053-67 (2005), doi: 10.1016/j.enpol.2003.11.006.

stakeholders need to invest in understanding the administrative structure as well as hiring qualified technical personnel. More realistically, it is the mutual benefits (either economic or political) that pull those stakeholders with different motivations into the collaborative networks of EE&C programs. But the extent to which a mutual understanding and a consistent interpretation of shared goals has emerged is questionable.

Citizen and environmental groups are described as lay stakeholders in EE&C programs because they have fewer resources to devote to the programs and are not always taken as seriously by policymakers.[216] Environmental groups are marginalized due to their difficulty in providing convincing metrics for measuring environmental benefits. As a result, environmental advocacy groups turn to translating their arguments into economic and social benefits that are visible to most audiences. However, this action undermines their legitimacy to participate in EE&C programs as representatives of environmental issues. Another reason for environmental groups having less impact on EE&C programs is that their demand for environmental conservation is mostly driven by altruism.[217] However, from the motivating factors reported for interviewees receiving energy efficiency services from WAP agencies, most responses are categorized as driven by self-interest, especially out of considerations of comfort and affordability.[218] As for the low participation rate of individuals in either EE&C programs or WAP, a lot of literature gives explanations from different perspectives: uncertain climate risk and future energy savings perceived by end-users;[219] hidden costs not accounted for by public managers, including reaching out to potential providers and waiting; split-incentive problem between landlords and tenants, owners and purchasers;[220] financial constraints and limited credit tools, especially for low-income households; lack of interest, knowledge, or trust in energy efficiency products;[221] and inertia of individuals' behavior that favors the status quo.[222] To sum up, imperfect information, budget constraints and bounded rationality result in short-sighted, biased decision-making by consumers in ways that they forgo private energy efficiency investment. These forces, which economists refer to as "investment inefficiencies," create an "energy efficiency gap", a gap that exists if individuals systematically ignored energy efficiency investment that would acquire more benefits than costs.[223]

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[216] Ahn & Baldwin, *supra* n.166.

[217] Thomas Dietz, *Altruism, Self-Interest, and Energy Consumption*, 112 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES 1654-55 (2015), doi:10.1073/pnas.1423686112.

[218] Erin M. Rose & Beth A. Hawkins, U.S. DEP'T OF ENERGY, OFFICE OF SCIENTIFIC AND TECHNICAL INFORMATION, *Assessing the Potential of Social Networks as a Means for Information Diffusion the Weatherization Experiences (WE) Project*, (2015), doi: 10.2172/1354643.

[219] Timothy J. Brennan & Karen L. Palmer, *Energy Efficiency Resource Standards: Economics and Policy*, 25 UTILITIES POLICY 58-68 (2013), doi: 10.1016/j.jup.2013.02.001.

[220] Kenneth Gillingham, Richard G. Newell & Karen Palmer, *Energy Efficiency Economics and Policy, Working Paper 15031* (National Bureau of Economic Research: 2009), doi: 10.3386/w15031; Granade et al., *supra* n.152.

[221] Bruce Tonn & Jean H. Peretz, *State-Level Benefits of Energy Efficiency*, 35 ENERGY POLICY 3665-74 (2007), doi: 10.1016/j.enpol.2007.01.009.

[222] E. Cagno et al., *A Novel Approach for Barriers to Industrial Energy Efficiency*, 19 RENEWABLE AND SUSTAINABLE ENERGY REVIEWS 290-308 (2013), doi: 10.1016/j.rser.2012.11.007.

[223] Fowlie, Greenstone & Wolfram, *supra* n. 151.

c. Capacity of Joint Action

Capacity of joint action refers to four factors, including procedural or institutional arrangements, leadership, knowledge, and resources.[224]

A major challenge of effective collaboration in EE&C programs is rooted in the nature of interjurisdictional administration. While government agencies take the primary responsibility for monitoring compliance, the presence of numerous programs as well as the dominant strategy of outsourcing have resulted in a complex network of EE&C collaboration in which stakeholders find it difficult to establish shared targets, standards, and compliance requirements. For instance, different weatherization assistance programs in Pennsylvania have different eligibility criteria. The status quo not only increases the difficulty for applicants to acquire and discern appropriate information, but also poses challenges for regulators in building a consistent application platform. Due to the lack of general procedures, administrators express their concerns about program overlap, preventing already limited resources from reaching those in greater need, especially low-income households. Besides, the state of Pennsylvania does not have an institutional arrangement to meaningfully engage stakeholders in a regular decision-making process regarding reduction targets and rate setting. While in many states with advanced energy efficiency performance, a regular use of deliberative processes has proven to be effective in reducing participation costs, mitigating conflicts of interest, and enhancing accountability.[225]

Leadership plays an important role in initiating collaboration and facilitating collaborative actions. The answer for who should administer EE&C programs varies from state to state. Blumstein et al. have conducted an analytical review of the administrative structure for energy efficiency programs in the United States and summarized four criteria for selecting public managers: compatibility with public policy goals, effectiveness of the incentive structure, ability to realize economies of scale and scope, and contribution to the development of energy-efficiency infrastructure.[226] While they did not provide an optimal administrative model, their strategies are useful for identifying leadership gaps in existing EE&C programs. In the case of Pennsylvania, interviews with participants in EE&C programs revealed concerns about the lack of centralized administrative authority.[227] If that is the case, who should take the lead in EE&C programs, the public sector, or the private sector? And given the personnel, technical and resource requirements, will a centralized administrative system efficiently solve the leadership deficit? These issues need to be analyzed in the context of EE&C programs in Pennsylvania.

The third dimension of the capacity of joint action refers to "the aggregation, separation, and reassembly of data and information, as well as the generation of new, shared knowledge."[228] Database issues and information sharing have always plagued the collaboration of EE&C programs. There is no unified software

[224] Emerson, Nabatchi & Balogh, *supra* n. 172.
[225] Elizabeth Baldwin, Valerie Rountree & Janet Jock, *Distributed Resources and Distributed Governance: Stakeholder Participation in Demand Side Management Governance*, 39 ENERGY RESEARCH & SOCIAL SCIENCE 37-45 (2018), doi: 10.1016/j.erss.2017.10.013.
[226] Blumstein, Goldman & Barbose, *supra* n.215.
[227] Appendix A.
[228] Emerson, Nabatchi & Balogh, *supra* n.172.

or central administrator with responsibility for collecting, managing, and maintaining data. This problem is mainly caused by several factors. First, there are no widely accepted metrics for reviewing and evaluating EE&C programs. Although industrial and public interest stakeholders have urged the formation of an information sharing platform, the various data entry guidelines and data cleaning algorithms increase the difficulty of data aggregation.[229] Second, privacy is a major consideration that hinders transparency and data sharing. Stakeholders join in the collaboration with different identities and motivations. In particular, some sensitive information related to contractors and end-users cannot be disclosed to all participants in the collaborative network. Third, information of EE&C programs has certain technical thresholds. While program reports drafted by independent consultants often exist for stakeholders to communicate and deliberate,[230] it is uncommon for untrained staff and individuals to easily access and digest the meaning of each indicator. As a result, the imperfect information will lead to many obstacles, including eligible individuals being unaware of the existence of EE&C programs, end-users not trusting project managers, administrators having difficulty reaching qualified contractors, and difficulties in resource aggregation and distribution.[231]

Finally, resources in the capacity of joint action refer to financial, technical, and personnel supports that facilitate successful collaboration.[232] Sufficient funding and appropriate financial incentives are necessary to sustain the development of EE&C programs and to encourage wide participation. Here, the increase in the participation rate of low-income households is especially important for the success of EE&C programs because a well-organized energy system should equally distribute benefits and costs across different groups of people.[233] In reality, however, the lack of access to subsidies and the tight budget constraints that low-income households face often prevent them from actively participating in EE&C programs. For example, the WAP funds could only compensate for inspection and weatherization services. Other essential pre-weatherization work, such as home renovation, roof repair and electricity upgrades, would add additional costs and increase the short-term energy burden for the already poor. For the supply-side engagement, Pennsylvania offers several special funds for different entities to motivate EE&C improvements. However, there is no policy in place that rewards successful EE&C programs with performance incentives.[234]

The lack of technical resources is usually described as the difficulty in gathering external technical skills. Regulators with insufficient technical expertise can face high additional costs to identify suitable vendors that can effectively implement policies.[235] The lack of technical resources in industry imposes barriers to

[229] Jennifer Bratburd, *Increasing Access to Energy Efficiency: Options for Improving Weatherization Assistance*, (MOST Policy Initiative Report: 2021).
[230] Baldwin, *supra* n.212.
[231] Granade et al., *supra* n.152; A. Trianni & E. Cagno, *Dealing with Barriers to Energy Efficiency and SMEs: Some Empirical Evidences*, 37 ENERGY 494-504 (2012), doi: 10.1016/j.energy.2011.11.005.
[232] Emerson, Nabatchi & Balogh, *supra* n.172.
[233] Xiaojing Xu & Chien-fei Chen, *Energy Efficiency and Energy Justice for U.S. Low-Income Households: An Analysis of Multifaceted Challenges and Potential*, 128 ENERGY POLICY 763-74 (2019), doi: 10.1016/j.enpol.2019.01.020.
[234] American Council for an Energy-Efficient Economy State and Local Policy Database, *Pennsylvania*, https://database.aceee.org/state/pennsylvania (last visited Apr. 11, 2023).
[235] Baldwin, *supra* n.212; Trianni & Cagno, *supra* n.231.

selecting efficient technologies [236] and increases the risks of improper installation and operation. The fear of technology failure among risk averse suppliers can bring energy efficiency improvements to a standstill. A shortage of skilled personnel is another factor that hinders the competence of collaboration.[237] These trained staff not only refer to workers who provide technical expertise, but also include administrators with management and coordination skills, as well as analysts who deliver audit and program evaluation services.

3. Measuring and Improving Collaboration

While collaborative governance has been widely accepted as an important framework for designing and delivering public services, it suffers from a lack of evidence that such collaboration in fact produces desired outcomes. A growing number of scholars, therefore, have urged more attention on studying the performance, outcomes, or impacts of collaborative governance, especially when the purpose is to decide whether collaborative governance should be adopted.[238]

For an empirical study, measuring the performance of collaborative governance is quite challenging. The difficulty primarily arises from conceptual and methodological controversies. For example, there is no consensus among scholars on the concept of performance. Performance may contain multidimensional interpretations, including the achievement of goals, the quantity and/or quality of service outputs, the effectiveness and equity in allocation of resources, the satisfaction of various stakeholders, as well as intermediate outcomes during the collaborative process.[239] Besides, traditional performance assessment does not fit the complex and fluid nature of collaborative governance.[240] The hybrid management model involves the deliberative ins and outs of actors and resources over time, which requires a long-time horizon for accommodating the performance dynamics.[241] At the operational level, many outputs produced by collaborative regimes do not have clear measurements. Taking shared objectives as an example, the concept is socially constructed, and its perception varies from actor to actor. Therefore, participants' understanding may be biased because they tend to exaggerate the benefits of their efforts to justify their participation.[242]

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[236] J. P. Painuly & B. Sudhakara Reddy, *Electricity Conservation Programs: Barriers to Their Implementation*, 18 ENERGY SOURCES 257-67 (1996), doi: 10.1080/00908319608908765.

[237] Marilyn A. Brown, *Market Failures and Barriers as a Basis for Clean Energy Policies*, 29 ENERGY POLICY 1197-1207 (2001), doi: 10.1016/S0301-4215(01)00067-2; Granade et al., supra n.152.

[238] Tomas M. Koontz & Craig W. Thomas, *What Do We Know and Need to Know about the Environmental Outcomes of Collaborative Management?*, 66 PUBLIC ADMINISTRATION REVIEW 111-21 (2006), doi: 10.1111/j.1540-6210.2006.00671.x; PROMISE AND PERFORMANCE OF ENVIRONMENTAL CONFLICT RESOLUTION (Rosemary O'Leary & Lisa B. Bingham, eds., 1st ed. 2003); Rogers and Weber, *supra* n.209.

[239] Valeria Guarneros-Meza, James Downe, & Steve Martin, *Defining, Achieving, and Evaluating Collaborative Outcomes: A Theory of Change Approach*, 20 PUBLIC MANAGEMENT REVIEW 1562-80 (2018), doi:10.1080/14719037.2017.1383782.

[240] Agranoff & McGuire, *supra* n.193.

[241] Emerson & Nabatchi, *supra* n.159.

[242] Koontz & Thomas, *supra* n.238; WILLIAM D. LEACH & PAUL A. SABATIER, *Are Trust and Social Capital the Keys to Success? Watershed Partnerships in California and Washington*, *in* SWIMMING UPSTREAM: COLLABORATIVE APPROACHES TO WATERSHED MANAGEMENT 233-258 (Paul A. Sabatier et al. eds., 2015).

Despite these challenges, a handful of collaborative governance studies have advanced the evaluation of collaboration in two distinct ways. The first strain of research seeks to establish a range of metrics to evaluate performance characteristics. These studies typically focus on different stages of collaborative governance and, accordingly, measure its performance based on the needs of different stages.[243] The second strain of research attempts to link organizational characteristics and their impacts on outputs and outcomes, and to examine how network structures shape the opportunities and constraints of collaborative practices.[244] The review presented in this section will summarize methodology used to evaluate the performance of collaborative governance in terms of outcome metrics and network analysis, as well as discuss its applications in EE&C programs.

a. Outcome Metrics

A common way to look at the performance of collaborative governance is to examine the realization of the final objective(s) proposed by project initiatives. This indicator is frequently used in the literature of collaborative environmental management, especially in watershed management.[245] Measures of environmental outcomes include improvement of environmental quality and changes in the conditions of environment-related resources. Following the same logic, final outcomes of EE&C programs can be measured by the completeness of reduction targets required for each phase of Act 129, or even in changes in the State Energy Efficiency Scorecard published by the American Council for an Energy-Efficient Economy. Although easy to implement, the main drawback of measuring collaborative performance in terms of final outcomes is the difficulty of demonstrating a direct causal relationship between the adoption of collaborative strategies and the resulting changes in outcomes. Not to mention that not every collaborative organization has set clear and concrete goals.

The second approach is to create a series of performance targets that reflect the quality of collaborative governance in different dimensions. Emerson and Nabatchi, for example, evaluate productivity performance, which encompasses "the actions, outcomes, and adaptation resulting from collaboration."[246] Key measures include efficiency, efficacy, equity, effectiveness, external legitimacy, equilibrium, viability, and sustainability. While these abstract metrics provide a complete and general framework of performance assessment, they are conceptually vague and hard for policy practitioners to implement in real evaluation questions.

[243] Emerson & Nabatchi, *supra* n.155; Rogers & Weber, *supra* n.209.
[244] Fliervoet et al., *supra* n.161; Provan & Milward, *supra* n.205; Alex Turrini et al., *Networking Literature About Determinants of Network Effectiveness*, 88 PUBLIC ADMINISTRATION 528-50 (2010), doi: 10.1111/j.1467-9299.2009.01791.x.
[245] Jennifer C. Biddle & Tomas M. Koontz, *Goal Specificity: A Proxy Measure for Improvements in Environmental Outcomes in Collaborative Governance*, 145 JOURNAL OF ENVIRONMENTAL MANAGEMENT 268-74 (2014), doi: 10.1016/j.jenvman.2014.06.029; Koontz & Thomas, *supra* n.238; Tyler Scott, *Does Collaboration Make Any Difference? Linking Collaborative Governance to Environmental Outcomes*, 34 JOURNAL OF POLICY ANALYSIS AND MANAGEMENT 537-66 (2015), doi: 10.1002/pam.21836.
[246] Emerson & Nabatchi, *supra* n.159, at 5.

Alternatively, Rogers and Weber propose a distinctive set of outcome categories that emphasize the problem-solving capacity of collaborative governance.[247] Better practice of collaborative governance is believed to enhance public agencies' effectiveness in achieving existing mandates, inducing technology innovations and transfers, as well as taking advantage of collaborative arrangements to collectively solve problems beyond organizational boundaries. Likewise, EE&C programs can be measured by the following questions: Did collaboration leverage additional resources that meet the staffing requirements and monitoring demands? Did collaborative networks bring in key stakeholders to reduce interest conflicts that cannot be reconciled externally? Did collaboration integrate information from public agencies, utilities and customers that makes the project more transparent and visible? Did collaboration encourage and promote new energy-saving technologies? Did collaboration create sustainable communities that continuously cooperate on other energy-related issues? For energy efficiency programs targeting low-income households, the performance metrics should also include program accessibility and adequate eligibility rules.

The last assessment model emphasizes intermediate outputs that pave the way for final outcomes. These outputs are often tangible and comparable, and featured by their close associations with activities necessary to achieve final targets. Such outputs in EE&C programs may include funding and responsibility agreement reached among stakeholders, number of phase projects completed, number of outreach campaign and public hearings held, training and education programs conducted, and changes in legislation, in policy standards, as well as in management strategies.[248] However, the downside of the approach is prominent in democratic governance because it says little about *citizens'* improvements and satisfaction.[249] The advantages of collaborative governance cannot be justified if these intermediate outputs do not ultimately lead to perceived improvements in public services or personal benefits for citizens.

b. Network Analysis

The organizational structure of collaborative governance can be represented as a network. To describe the network and evaluate its performance, empirical researchers have developed a series of measures and network-analysis techniques. On this basis, studies analyzing the performance of collaborative networks have addressed the following questions:[250]

- Who are the actors and what are their collaborative relationships?
- How do the structure and composition of the networks affect the effectiveness of collaboration?
- What network characteristics would motivate better collaborative outcomes?

[247] Rogers & Weber, *supra* n.209.
[248] Koontz & Thomas, *supra* n.238; Ulibarri, *supra* n.163.
[249] Guarneros-Meza, Downe & Martin, supra n.239.
[250] Can Cui & Hongtao Yi, *What Drives the Performance of Collaboration Networks: A Qualitative Comparative Analysis of Local Water Governance in China*, 17 INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH 1819 (2020), doi: 10.3390/ijerph17061819; Fliervoet et al., *supra* n.161; Michael D. Siciliano, Jered B. Carr & Victor G. Hugg, *Analyzing the Effectiveness of Networks for Addressing Public Problems: Evidence from a Longitudinal Study*, 81 PUBLIC ADMINISTRATION REVIEW 895-910 (2021), doi: 10.1111/puar.13336.

The basic unit of a network is referred to as a node and the linkages among nodes are referred as ties. Nodes and ties provide an insight in the role and position of any organization or individual actor in a network.[251] The following table (see Table 1) presents some useful measures in social network analysis and their impacts on collaborative performance

Table 1. Network Metrics

Measures	Definition	Arguments
Density	Density describes the extent to which all actors in a network are connected with each other.[252] It is measured by the number of ties in the network divided by the maximum number of possible ties.[253]	While higher network density is more likely to trigger collaborative behavior, a very high network density might signal excessive fragmentation or potential redundancy of organizational functions, which reduce network efficiency.[254]
Centralization	Centralization shows how "star-like" the network is, meaning to what extent the network is dominated by a single actor.[255] It is measured by the ratio of the actual sum of differences between the centrality of the most central node and the centrality of each node to the maximum possible sum of differences that a star graph would have.[256] The centralization rate is equal to 1 if one person stays at the center of the network and is connected with all other actors.	Network centralization is positively associated with network performance by facilitating leadership, reducing coordination costs, and allocating resources more effectively through unified mandates or economies of scale.[257]
Clustering	Clustering analyzes how well actors in a network are connected.	Clustering has a positive effect on network performance. High clustering usually happens

[251] W. Richard Scott & Gerald F. Davis, Organizations and Organizing: Rational, Natural and Open Systems Perspectives (2015).
[252] *Id.*
[253] Stephen P. Borgatti, Martin G. Everett, Jeffrey C. Johnson, Analyzing Social Networks (2013).
[254] Örjan Bodin & Jon Norberg, *Information Network Topologies for Enhanced Local Adaptive Management*, 35 Environmental Management 175-93 (2005), doi: 10.1007/s00267-004-0036-7; Cui & Yi, *supra* n.250.
[255] Borgatti, Everett & Johnson, *supra* n.253.
[256] Linton C. Freeman, *Centrality in Social Networks Conceptual Clarification*, 1 Social Networks 215-39 (1979), doi: 10.1016/0378-8733(78)90021-7; Borgatti, Everett & Johnson, *supra* n.255, at 160.
[257] Fliervoet et al., *supra* n.161; Keith G. Provan & H. Brinton Milward, *A Preliminary Theory of Interorganizational Network Effectiveness: A Comparative Study of Four Community Mental Health Systems*, 40 Administrative Science Quarterly 1-33 (1995), doi: 10.2307/2393698; Siciliano, Carr, & Hugg, *supra* n.250.

		among people with shared identity and belonging. The so-called "bonding relations" would therefore stimulate trust and norms among participants and increase actors' willingness to share information and resources.[258]
Degree of centrality	The degree of centrality measures the number of connections an actor has. It reveals the power relations in collaborative networks. The higher the degree of centrality an actor shows, the more powerful the actor will be in the network.[259]	Scholars have conflicting views on the impact of centrality. On the one hand, a high centrality implies the existence of a coordinator who is responsible for communicating with all network participants, delegating tasks to appropriate members, managing progress and deadlines, as well as monitoring project quality. The role of coordinator is particularly important in voluntarily formed, loosely connected organizations, or in emergency response networks, where there lacks a priori, mandatory regulation that forces participants to act in an orderly manner.[260] On the other hand, a high centrality may prevent the network from seeking new opportunities in a changing environment, because the powerful actors are reluctant to share power and overcome inertia in existing relationships.[261]
Betweenness centrality	Betweenness centrality measures the positional importance of actors.[262] It shows the probability of a given node falling along the shortest path between two other nodes.[263]	Actors with high betweenness centrality usually act as brokers between two subgroups that are not directly connected. Their mediatory role is important for establishing smooth information channels and facilitating successful coordination, especially when a

[258] Cui & Yi, *supra* n.250; Siciliano, Carr & Hugg, *supra* n.250; Hongtao Yi, *Network Structure and Governance Performance: What Makes a Difference?*, 78 PUBLIC ADMINISTRATION REVIEW 195-205 (2018), doi: 10.1111/puar.12886.
[259] William Resh, Saba Siddiki & Will R. McConnell, *Does the Network Centrality of Government Actors Matter? Examining the Role of Government Organizations in Aquaculture Partnerships*, 31 REVIEW OF POLICY RESEARCH 584-609 (2014), doi: 10.1111/ropr.12101.
[260] Naim Kapucu & Fatih Demiroz, *Measuring Performance for Collaborative Public Management Using Network Analysis Methods and Tools*, 34 PUBLIC PERFORMANCE & MANAGEMENT REVIEW 549-79 (2011), doi: 10.2753/PMR1530-9576340406.
[261] Bindu Arya & Zhiang Lin, *Understanding Collaboration Outcomes From an Extended Resource-Based View Perspective: The Roles of Organizational Characteristics, Partner Attributes, and Network Structures*, 33 JOURNAL OF MANAGEMENT 697-723 (2007), doi: 10.1177/0149206307305561.
[262] Kapucu & Demiroz, *supra* n.260.
[263] Borgatti, Everett & Johnson, *supra* n.253.

		network consists of unfamiliar stakeholders with diverse interests.[264]
Tie strength	Tie strength describes the extent to which the tie between two actors serves multiple purposes.[265]	A high tie strength implies that linked actors are involved in a variety of common activities. Their frequent interactions are more likely to build trust and consensus, which would positively affect collaborative outcomes.[266] Besides, the higher the tie strength, the more resilient and sustainable a network would be. The overlapping connectedness between two actors guarantees that even if one tie is broken, it does not affect the other ties.[267]

4. Policy Recommendations

In the US, EE&C programs are administrated at different jurisdictional levels. Yet, no single administrative arrangement has yielded superiority over the others as the issues faced by regulators vary across places. Beyond that, the success of EE&C programs relies heavily on the compliance and coordination from both the supply side (utilities or other energy service providers) and the demand side (customers), each of which may hold different identities and preference priorities. The diverse stakeholders of EE&C programs build up a complex network where disputes of interests cannot be effectively solved without a collaborative platform that extends beyond organizational and jurisdictional boundaries.

In this section, we introduced the theoretical framework of collaborative governance and provided an insight into the elements and dynamics inside the "black box" of collaboration. Proponents of collaborative governance find the administrative model attractive because it offers a general approach to addressing policy problems that are neither caused by a single actor nor can be solved by public agencies alone.[268] From this perspective, the application of collaborative governance in EE&C programs is promising. Unlike traditional administration systems that emphasize centralization and hierarchy, collaborative governance is valued for its promotion of democratic principles, and the flexibility and broad inclusion achieved through hybrid organizational structures.[269] These characteristics are important for the success of EE&C programs to bring in a variety of resources and to reconcile conflicting interests among different stakeholders. Ideally, a collaborative platform would reduce communication and transaction

[264] Kaitlyn J. Rathwell & Garry D. Peterson, *Connecting Social Networks with Ecosystem Services for Watershed Governance: A Social-Ecological Network Perspective Highlights the Critical Role of Bridging Organizations*, 17 ECOLOGY AND SOCIETY art. 24 (2012), doi: 10.5751/ES-04810-170224; Resh, Siddiki & McConnell, *supra* n.259.
[265] Siciliano, Carr & Hugg, *supra* n.250.
[266] *Id*.
[267] Provan & Milward, *supra* n.205.
[268] Gash, *supra* n.160.
[269] ANDREA K. GERLAK, TANYA HEIKKILA & MARK LUBELL, *The Promise and Performance of Collaborative Governance*, *in* THE OXFORD HANDBOOK OF U.S. ENVIRONMENTAL POLICY (Michael E. Kraft & Sheldon Kamieniecki eds., 2012), doi: 10.1093/oxfordhb/9780199744671.013.0019.

costs across jurisdictions and sectors, strengthen trust and understanding among network members, and enable the sustainability and long-term development of a policy system.

The theoretical model alone, however, is not sufficient to solve all collaboration problems in practice. Significant groundwork must be laid in the subsequent phases of this project not only to demonstrate the feasibility and competence of collaborative governance, but also to establish reasonable metrics for evaluating collaborative performance. Research opportunities remain vast in answering the following questions: Who is involved in the EE&C networks in Pennsylvania and what do their relationships look like? Do members in the network know about the existence of each other and by what means do they know? Are the relationships between pairs of network members formalized by law and agreement or are they purely linked by informal reciprocity? Do government agencies arrange routine meetings for network members so that they can interact occasionally? How do different stakeholders describe their motivations for participating in EE&C projects? Do they feel their goals are being met from the collaboration activities? How do we evaluate collaborative performance? What marks the success of collaboration? Is it reaching higher energy reduction targets in the short term? Is it covering more low-income households to sustain social equality? Or is it improving environmental conditions and securing energy security in the long term? What methods and metrics should be used to evaluate collaborative performance? How can reports be made more accessible to a broader audience given the technical barriers of EE&C programs? We believe that by answering these questions, public managers would better understand the circumstances under which collaborative governance should be adopted as a necessary management strategy.

Finally, we propose the following policy recommendations in response to the barriers EE&C programs in Pennsylvania face in achieving effective administration and reaching low-income households:

- *Leadership is necessary at each administrative level*. The implementation of EE&C programs is carried out by different organizations in a decentralized manner. Although PAPUC plays a central role in coordinating with utilities and facilitating leadership, the government agency itself does not have the capacity to oversee all collaborative activities at the same time. Leadership should come from each administrative level and be carried out by different stakeholders, including utility companies, nonprofit organizations, advocacy coalitions, and citizen engagement groups, to compensate for leadership deficiencies in launching collaborative initiatives and ensuring accountability.

- *Better collaboration requires centralized data management and data sharing platforms.* Separate databases are not conducive to integrating EE&C and WAP programs that suffer from overlap and redundancy. Practices in some leading states in the US have demonstrated the advantage of integrating data management.[270] Having a unified data platform would not just support a long-term evaluation of EE&C programs. By analyzing and comparing program performance within different regions and different communities, policymakers may also develop differentiated rules that improve the efficiency of resource allocation.

[270] Jason Ye, Center for Climate and Energy Solutions, *Strengthening Energy Efficiency Programs for Low-Income Communities* 3 (July 2017), https://www.c2es.org/document/strengthening-energy-efficiency-programs-for-low-income-communities/ (last visited: Apr. 11, 2023).

- *Evaluation metrics and reports are needed to justify collaborative strategies.* Collaborative governance does not naturally produce desirable results. On the contrary, collaboration strategies need to be continuously improved to adapt to a changing environment as well as to reflect the most salient policy issue(s). Failures in adaptation may exacerbate conflicts and mistrust among stakeholders and impede the progress of existing programs. To determine if the current collaborative strategy is viable, scholars and practitioners need to develop evaluation metrics that reflect different dimensions of collaborative performance, including the impacts on social, economic, environmental, and health outcomes. A desirable evaluation method should also allow different voices from stakeholders, as only inclusive and responsive networks could ensure the sustainability of collaboration in EE&C programs.

- *Well-designed education can lower the barriers for low-income households to participate in EE&C programs.* The lack of awareness of energy-saving benefits and incomplete knowledge of the existence of EE&C programs are the main obstacles to the participation of low-income households. Government agencies should establish connections with local communities and arrange education activities that help low-income households understand their eligibility of different programs, the application process and required documents, available funding options, and the long-term benefits of energy saving. Educational programs should be designed to ensure that materials are easily understood by individuals with little technical knowledge and those whose native language is not English. These initiatives may extend beyond existing programs and common modes of consumer outreach to include, among other things, advertisements in traditional and social media. Moreover, advertisements and brochures can be used to introduce and promote EE&C programs and qualified service providers, which may reduce distrust among low-income households.

IV. Formulating a Research Agenda for Low-Income Energy Efficiency and Health

The interrelations between income, health, and building energy efficiency are complex and context-specific, and further research is needed to quantify and assess these interrelations in various contexts. Understanding these interrelations will assist in developing and tailoring building energy efficiency policies that help reduce energy use and greenhouse gas emissions, improve occupant health in residential and non-residential buildings, and also are suitable for economically disadvantaged communities.

As a starting point, we recommend that future research measure the effectiveness of the current weatherization programs and energy efficiency policies with respect to energy efficiency, health, and energy burden outcomes. This research should also focus on the extent of program participation and should attempt to analyze available funds that were spent or remained unused. Additionally, further research exploring specific challenges and successes in administering the programs, including coordination among different agencies administering programs, is important. By examining and quantifying, where possible, the successes and failures of current programs, we will be able to better design future energy efficiency programs to more meaningfully impact both public health and the environment.

Research is also necessary to gather information about the extent and efficacy of programs that use healthcare funding to address energy efficiency in housing. Such research should begin with a comprehensive survey of the many uses of healthcare funds to improve housing and energy efficiency, including state-only funding, municipal programs, and private funding.

In the context of Medicaid funds specifically, future research should seek to obtain outcome data (health outcomes, costs, etc.) for existing programs, such as the programs discussed in Section II.B, *supra*, that use Medicaid funds to improve the energy efficiency of homes. Further research should assess state responses to recent CMS guidance supporting the use of Medicaid managed care to address social determinants of health and to evaluate any resulting new programs for patient access, process, and outcomes.

Potentially using the information gathered from studies suggested in the paragraph above, it is important for future studies to critically evaluate whether it is socially beneficial to use healthcare funds to fund energy efficiency improvements. That is, is it better to more directly address energy efficiency for low-income residents instead of indirectly addressing energy efficiency using healthcare funds that may not have been intended for this purpose when the program began in 1965? Some commentators have noted that, aside from policy considerations, medicalizing the issues of energy efficiency and housing quality may have unintended consequences.[271]

Energy efficiency is an important factor in determining both health and environmental outcomes. Numerous programs exist to help realize improvements in those areas by incentivizing energy efficiency improvements in homes and businesses, but many of those programs fail to reach their full potential, especially in the low-income populations that could most benefit. Reasons for the programs' shortcomings are complex and wide-ranging, encompassing challenges faced by potential program beneficiaries as well as limitations in program implementation by government agencies and non-profit organizations. The policy proposals and research suggestions put forth in this paper can help to unlock the potential of energy efficiency programs to provide positive benefits far beyond the efficiency context.

[271] Elizabeth Tobin-Tyler & Benjamin Ahmad, Marrying Value-Based Payment and the Social Determinants of Health through Medicaid ACOs 15-17 (Milbank Memorial Fund Report: 2020), https://www.milbank.org/wp-content/uploads/2020/05/Medicaid-AC0s-and-SD0H.ver5_.pdf (last visited Apr. 11, 2023).

Appendix

Report from May 2022 Expert Workshop

Coordinating and Enhancing Access to Low-Income Energy Efficiency Programs
Expert Insight Workshop

Coordinating and Enhancing Access to Low-Income Energy Efficiency Programs
Expert Insight Workshop

Pennsylvania State University—University Park (Virtual)
Date: 18 May 2022
Time: 1:00-3:00 PM

Individuals representing utility agencies, community organizations, and governmental entities that provide energy efficiency and health services to low-income residents in Pennsylvania participated in a workshop, "Coordinating and Enhancing Access to Low-Income Energy Efficiency Programs in Pennsylvania." The 2-hour workshop was held virtually in May 2022. The aim of the expert workshop was to identify and address research questions in this topic area and to ultimately address these questions, exploring potential solutions within this space. This expert workshop was held as part of a broader community-engaged research project led by the Penn State Center for Energy Law and Policy ("CELP"), "Residential Energy Efficiency and Health: Coordinating Government Programs to Amplify Benefits" (hereinafter "the Project"). This Project is also being conducted in partnership with the Hamer Center for Community Design, Global Building Network, and the Colleges of Arts and Architecture; Earth and Mineral Sciences; Engineering; Health and Human Development; Penn State Law; and School of Public Affairs.

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I. Executive Summary

On May 18, 2022, the Penn State Center for Energy Law and Policy and its research collaborators convened a group of expert advisors to provide input on *Coordinating and Enhancing Access to*

Low-Income Energy Efficiency Programs in Pennsylvania. The objective of this workshop was to obtain expert knowledge to refine and enrich the following three research questions:

- What are the energy efficiency factors that provide both energy efficiency and health benefits, and what programs are available to help people achieve benefits in these areas?

- What are coordination challenges associated with energy efficiency-health programs that operate within a geographically- or politically-defined area, such as a county or region of Pennsylvania?

- What are access-based challenges associated with programs in this space?

The relationship between energy efficiency/weatherization programs and resident physical and mental health was acknowledged during the workshop and several examples identified. However, there is a risk of a "piecemeal approach" to improvements in these areas since program goals and processes are program-specific and may not simultaneously address weatherization improvements and necessary repairs (i.e., leaking roof or mold problems). Follow-up research is needed to determine specific relationships between program providers and recipients of services, relationships among providers, and programs addressing improved energy efficiency and occupant health.

The workshop reinforced that there are both coordination challenges and access challenges associated with enhancing access to low-income energy efficiency programs in Pennsylvania and beyond.

Identification of Coordination Challenges: Experts indicated a **lack of coordination across local community-based organizations and regulatory bodies** and entities that address different aspects of energy efficiency improvements (weatherization, appliance replacement, health & safety, bill assistance). Timing of work for residential improvement projects must be coordinated. Moreover, **a lack of shared requirements, targets, goals, and compliance measures** was identified. Programs have different priorities/focus for target audience and improvements. Different programs are administered by different organizations, which need different types of data/paperwork. Eligibility guidelines are different for different organizations. State law may also have compliance targets and standards for controlling expenditures that must be met; this can hinder organizations' efforts to harmonize eligibility requirements.

Energy efficiency and health programs' lack of access to resources was another coordination challenge identified. Lack of coordination among energy efficiency providers can lead to **challenges with budget**. In addition to challenges associated with different program priorities, there is potential for increases in pricing and travel costs if work is not coordinated. Current supply chain issues also lead to increased costs. Some experts identified **labor shortages or a lack of skilled and qualified workers** as a challenge to enhancing access to low-income energy efficiency programs. This may be due to limitations in trained workforce and job training or availability of alternative lucrative jobs. Access to information was another resource identified. Weatherization and programs for energy efficiency may only be available within certain geographical boundaries; participants identified a need for better communication of this information. **Sharing of data**, such

as customer preferences, by county offices or other organizations (adult services, health department, etc.) is desirable but has challenges including privacy issues.

A secondary challenge identified during discussion was **identifying all the 'players,'** including those who pay or can offer incentives, those who perform the work, and those who connect with the homeowners.

Two additional coordination challenges related to **obtaining landlord agreement** to energy efficiency improvements and **varying homeowner needs**. These challenges were also raised during discussions addressing program access.

Access-based challenges: Access-based challenges associated with programs in the energy-efficiency and health space focused on **lack of customer trust**. Issues identified included overall distrust of programs and were linked to distrust of energy efficiency providers (utilities, government), especially among qualifying households and particularly for programs with income requirements. Customers might not agree to participate in programs because of negative views of weatherization as disruption of household privacy. Relatedly, potential participants might not trust contractors to go into their homes. Programs, especially those available to low-income participants, may be viewed as too good to be true (a scam)—and scams are indeed common in this area, thus producing confusion. **Lack of awareness** of programs and lack of knowledge of program details and eligibility criteria were other cited access challenges. Additional marketing could help to address these challenges, but there is a limit to funding and capacity to handle the work required. **Customer confusion** about varying program offerings and getting participants to respond to outreach were other challenges to program access. Moreover, those potential participants with very low incomes are often addressing multiple crises that require short-term solutions; energy efficiency solutions, perceived as a longer-term solution, are therefore not a priority.

Administrative challenges raised during discussion of access centered mostly on the **application process.** There are multiple applications for different programs, even those programs intended to solve intertwined problems. Applications are lengthy, cumbersome and difficult to understand. Many are online-only, posing access challenges for those without internet services, especially those in rural areas. Disabilities or language barriers may also keep people from applying for programs. Applications may ask for significant and sensitive information (i.e., W2 forms) that potential participants are unwilling to share. Other access challenges related to data sharing include bills and financial information in another person's name, such as a child of an elderly homeowner paying the homeowner's bills. Additionally, participants may be reluctant to ask for assistance out of shame or embarrassment.

Rental housing has unique and difficult challenges due to a split in incentives for landlords and tenants.

II. Participants identified communication and coordination, sharing of resources and marketing across organizations and between agencies as a solution to many of the challenges posed. Issues with trust could be addressed by connecting with trusted community members (such as home health providers and housing non-profits) and documenting testimonials to provide information about program availability and benefits. Finally, workforce development training was identified as a solution to find qualified workers. PSE&G training program that includes childcare and job placement services was raised as an example.

Background

CELP sponsors interdisciplinary research on modern energy opportunities and challenges relevant to policymakers, nonprofit organizations, industrial actors, and members of the general public. The overall goal of the Project is to examine the layering of programs in three areas: (1) building rehabilitation, (2) home health, and (3) energy efficiency programs. To conduct this work, CELP has convened an interdisciplinary team of scholars and students to identify overall policy and program design challenges that impede coordination; conduct case studies in two counties or municipalities and, building from stakeholder input, analyze challenges and opportunities associated with program coordination; suggest best practices for the aggregation and coordination of programs; and examine the potential co-benefits of enhanced coordination among programs. The Project research team is led by Professors Seth Blumsack and Hannah Wiseman, Co-directors of CELP, and is supported by a group of practitioners active in the energy efficiency and building policy spaces as an external advisory group.

Below is a list of participating individuals and their associated Penn State University Colleges/Schools:

Project Research Team

Rahman Azari, Associate Professor
Department of Architecture, Penn State, University Park

Seth Blumsack, Professor
College of Earth and Mineral Sciences; Co-Director, Center for Energy Law and Policy

Lisa Domenica Iulo, Associate Professor
Penn State College of Arts and Architecture, University Park

Sarah Klinetob Lowe
Operations Director, Global Building Network at Penn State, University Park

Dan Mallinson, Assistant Professor
School of Public Affairs, Penn State Harrisburg

Selena E. Ortiz, Associate Professor

Penn State College of Health and Human Development, University Park

Hannah Wiseman, Professor
Penn State Law; Co-Director, Center for Energy Law and Policy

Megan Wright, Associate Professor
Penn State Law, University Park and Penn State College of Medicine

Advisory Board

William Bryan, Built Environment Project Manager,
Southeast Energy Efficiency Alliance

Alison Diehl, Director
Clean Energy Center, Pennsylvania College of Technology

David Vanness, Professor
Penn State College of Health and Human Development

Supporting Team

Erica Cooper, Administrative Coordinator
Penn State Department of Energy and Mineral Engineering

Jingyu Guo, Ph.D. candidate in Public Policy, Penn State Harrisburg

Farzad Hashemi, Ph.D. candidate in Architecture, Penn State

Soumita Mukherjee, LL.M. student, Penn State Law

Courtney Robinson, Marketing and Communications Specialist
Penn State Department of Energy and Mineral Engineering, University Park

Tasneem Tariq, Ph.D. student in Architecture, Penn State
Assistant Professor in Bangladesh University of Engineering and Technology

Logan Vonada, second-year law student, Penn State Law

Chris Wright, third-year law student, Penn State Law

Project Phases

To achieve the overall goals, this Project consists of varying phases – each designed to inform subsequent ones. The initial phase consists of identifying and refining relevant research questions in the topic areas in collaboration with energy efficiency experts. The discussion and observations

emerging from these efforts are the primary focus of this report and will be integral for the work to be conducted in the second phase – developing and publishing a white paper on core topics pertaining to energy efficiency coordination, access, and policies. The white paper will also identify the methods that have been used to develop and refine research questions and suggest important focus areas for research moving forward. In future phases of the project, recipients and potential recipients of energy efficiency and health services will be engaged to improve understanding of the challenges faced by communities that may struggle in accessing these essential services.

III. Phase 1 Activity: Expert Workshop

The overall aim of the Expert Workshop was to gather information from energy efficiency experts on the challenges and opportunities associated with low-income energy efficiency programs in Pennsylvania that also benefit health, and to identify and refine the most relevant research questions in the following key areas:

- Improved understanding of the low-income energy efficiency services that are linked to health outcomes, and programs that deliver these energy efficiency services
- Challenges associated with coordinating energy efficiency programs, particularly within geographically or politically defined boundaries, such as counties or regions
- Challenges associated with ensuring that eligible recipients of energy efficiency programs have access to these programs and receive services offered by these programs.

More specifically, the objective of the workshop was to apply expert knowledge to refine the following three research questions:[1]

1. What energy efficiency factors provide both energy efficiency and health benefits, and what programs operate within this space?
2. What coordination challenges are associated with energy efficiency-health programs that operate within a geographically- or politically-defined area, such as a county or region of Pennsylvania?
3. What access-based challenges are associated with programs in this space?

Phase 1 Expert Workshop Participants

Individuals with substantive expertise in the topics of interest were first identified by Project research team members. These individuals then received an invitation (and a reminder) to register for the workshop via email (Appendices 1 and 2). A snowball technique was also used to identify additional expert participants per recommendations by experts in this initial group. Through this

[1] Research questions 2 and 3 address energy efficiency-health programs and home repairs/renovations that are prerequisites to such programs.

exercise, 38 individuals or organizations were identified and invited to participate in the workshop.[2]

In total, 16 energy efficiency experts participated in the workshop, including:

- Pam Adams, Sustainability Planner, Centre Region Council of Governments
- Christina Bowen, Senior Program Manager, CLEAResult
- Kristen Carmean, Program Manager, Residential Programs, Philadelphia Energy Authority
- Regina Carter, Policy Analyst, Pennsylvania Utility Commission Bureau of Consumer Services
- Deborah Davis, Manager, Universal Services at Columbia Gas of PA and MD
- David Defide, Senior Manager, Customer Programs at Duquesne Light
- Andrew Dieck, Director, Existing Building Programs, Performance Systems Development
- Mandy Fox, Chief, Weatherization, SEDA-Council of Governments
- Stephanie Fost, Executive Director, Habitat for Humanity of Greater Centre County
- Rich Kisner, Executive Director, Community Strategies Group
- Elizabeth Marx, Executive Director, Pennsylvania Utility Law Project
- Nganie Ndimbie, Western Region Coordinator, Office of Environmental Justice, Pennsylvania Department of Environmental Protection
- Nicole Pollock, Senior Planner, Centre Region Council of Governments
- Sean Pressman, Manager, Low Income and Demand Response Program, PPL Electric
- Denise Remillard, Special Assistant, Executive Office, Pennsylvania Department of Community & Economic Development
- Kathyrn Rulli, Chief, Pennsylvania Department of Community and Economic Development

Workshop Procedures and Agenda

To maximize and efficiently use participants' time, workshop organizers adopted various protocols and strategies, including the following:

Virtual format. To ensure that individuals from agencies/organizations throughout Pennsylvania could participate, the expert workshop was conducted virtually via Zoom.

Chatham House rules. No personal observation, finding, or opinion was attributed to any specific individual participating in the workshop.

Recording of workshop. Access to the workshop recording remained available to the Project research team to refresh memories pertaining to both large group and breakout discussions and workshop conclusions.

Large group exercise. All expert workshop participants collectively discussed research question 1. A "Fishbowl" exercise was conducted to help minimize the challenges of

[2] Of the 38 contacts we made, one contact was made via voicemail to a nonprofit organization office because we did not have the name of specific experts from that nonprofit to contact.

orchestrating a large discussion via Zoom. Because there are fewer people conversing at one time, such an exercise could help reduce Zoom fatigue. This technique works well for large and small groups, for a variety of discussion scenarios, and across all disciplines. It also mitigates the problem of participants directing all comments to the facilitator. For example, when the facilitator's video disappears, participants could talk with those who are visible.

Breakout rooms with small group exercise. Participants were grouped in alphabetical order of surnames to join smaller Zoom breakout rooms to discuss research question 2 and were regrouped for research question 3 to attempt to place participants with other participants they had not yet engaged with in group discussion. The "Take 5" technique was used to assist breakout room participants brainstorm and organize their responses to prompts individually, which were then shared with the rest of the breakout group. The technique works by first "setting the scene" in which participants respond to a particular prompt. They then take "5" minutes to jot down "5" responses to that prompt. At the end of 5 minutes, participants share their responses. Because they don't just list their responses, participants build off what had been previously shared to add richer context. The Project research team selected this technique as a way to also reach saturation about emerging issues/concerns. Breakout room discussions were facilitated by a member of the Project research team.

Report-outs. Breakout groups pre-identified a notetaker who was responsible for transcribing discussion and they, or another representative from the discussion group, provided a summary of this discussion to the entire group following the breakout discussions.

Workshop Agenda

1:00-1:10	**Welcome and Workshop Overview (*Hannah Wiseman, Facilitator*)**
1:10-1:30	Participant introductions: Organization, scale/region in which you work, what you hope to take away from the workshop, and in what specific ways you would like to see your interests integrated throughout the discussion (*Seth Blumsack, Facilitator*)
1:30-2:00	Group discussion, Research Area 1: What energy efficiency factors provide both energy efficiency and health benefits, and what programs operate within this space? *(Selena Ortiz, Facilitator)*
2:00-2:20	Breakout room discussion, Research Area 2: What are the coordination challenges associated with programs in the energy efficiency and health space—particularly programs that operate within a geographically- or politically-defined area, such as a county or region of Pennsylvania? *(Seth Blumsack, Lisa Iulo, and Selena Ortiz, Facilitators)*
2:20-2:40	Breakout room discussion, Research Area 3: What are the access-based challenges associated with programs in the energy efficiency and health space? *(Facilitated by Seth Blumsack, Lisa Iulo, and Selena Ortiz)*
2:40-2:50	Report Outs from Breakout rooms (*Full group discussion*)
2:50-3:00	Discussion of next steps; meeting adjournment (*Full group discussion*)

Workshop Results: Large Group Exercise

Participants were divided into the following two groups (by alphabetical order of surnames) for the Fishbowl exercise in the main Zoom meeting.

Table 1. Fishbowl Participants[3]

Group 1	Group 2
Pam Adams	Rich Kisner
Christina Bowen	Heidi Kunsch
Kristen Carmean	Gladys Malone
Gina Carter	Elizabeth Marx
Deb Davis	Ngani Ndimbie
Dave Defide	Nicole Pollock
Andrew Dieck	Sean Pressman
Mandy Fox	Denise Remillard
Stephanie Fost	Kathy Rulli

The discussion was recapped with all participants, with the bulk of the discussion focusing on participants' reflections posted on the Jamboard (Figure 1). Several actions, such as, upgrading furnaces, ventilation systems, heating, cooling, and plumbing systems; replacing roofs and refrigerators; replacing bulbs with LED lights; addressing issues such as, gas leakage, moisture control, accessibility and fire safety, etc., can be helpful to improve both the building efficiency and the physical and mental health of the people inside. The importance of replacing large old homes with smaller-sized homes and multi-unit structures for older adults and younger single people and the need for better building envelopes with better functioning windows and heating systems were highlighted. Service programs availability, coordination issues and importance of energy education were also discussed. An interesting conclusion from the discussion was: if the energy burden on the people can be reduced by energy efficiency, the mental and physical health of the people can be improved since residents can spend more money on food, medicines, rents, healthcare, etc.

[3] **Please note:** Group 1 served as the discussants in the fishbowl and kept their cameras on for 10 minutes (1:30-1:40). Group 2 turned off their cameras to hide themselves, and served as listeners, posting their reflections in the Jamboard. Afterwards, Group 2 served as the discussants for 10 minutes (1:40-1:50). Group 1 (then the listening group) turned cameras off to hide themselves and also posted their reflections in the Jamboard.

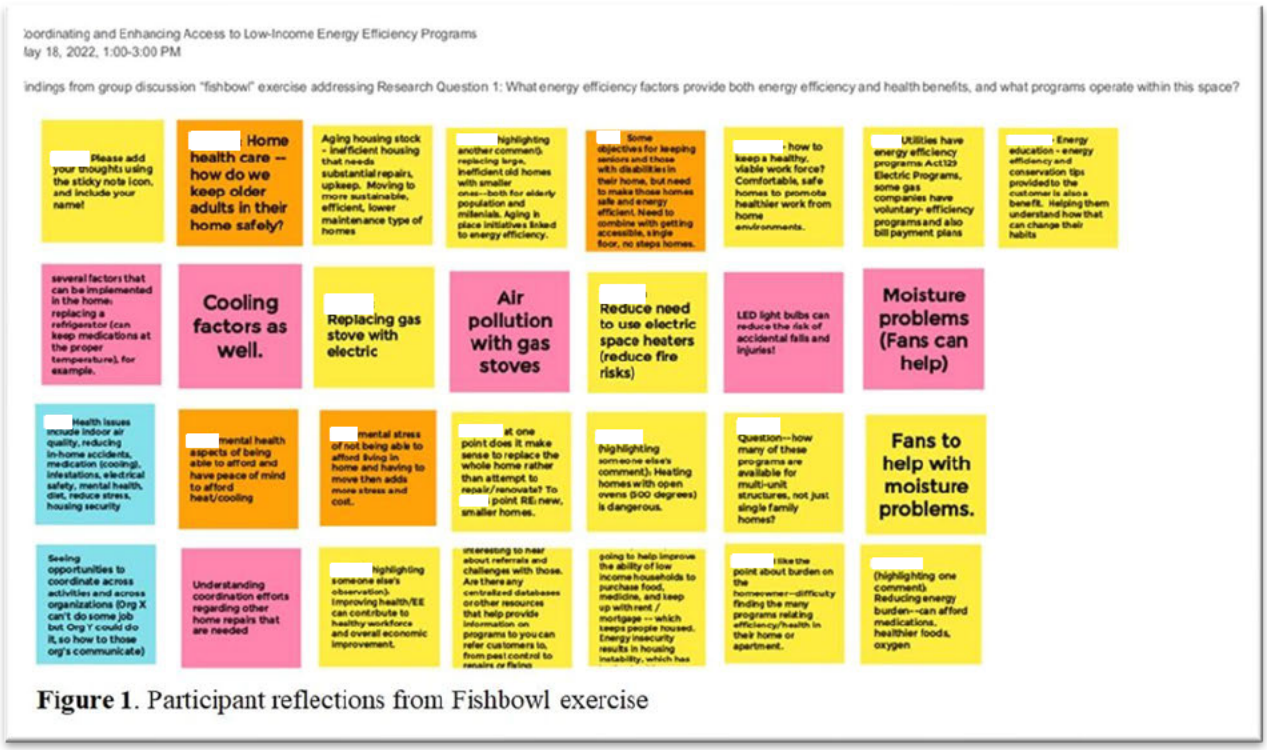

Figure 1. Participant reflections from Fishbowl exercise

Workshop Results: Breakout Room Discussions

Each workshop participant was randomly assigned to one of three breakout rooms, with assignments made in an effort to place many participants with other participants not previously in the same breakout room.

Table 2. Breakout Room Assignments[4]

Room 1	**Room 2**	**Room 3**
Lisa Iulo (*Facilitator*)	Selena Ortiz (*Facilitator*)	Seth Blumsack (*Facilitator*)
Tasneem Tariq (*Notetaker*)	Farzad Hashemi and Soumita Mukherjee (*Notetakers*)	Logan Vonada (*Notetaker*)
Pam Adams	Christina Bowen	Will Bryan
Dave Defide	Regina Carter	Kristen Carmean
Andrew Dieck	Mandy Fox	Deb Davis
Ngani Ndimbie	Sarah Klinetob Lowe	Stephanie Fost
Rich Kisner	Elizabeth Marx	Michael Helbing
Sean Pressman	Kathryn Rulli	Nicole Pollock

[4] Some members of the Project research team and Advisory Board listened in on these discussions. Chris Wright and Erica Cooper also helped to coordinate this exercise.

The first "Take 5" discussion exercise aimed to solicit responses to the following question (Research Area 2): "What are the coordination challenges associated with programs in the energy efficiency-health space—particularly programs that operate within a geographically- or politically-defined area, such as a county or region of Pennsylvania?" Specifically, participants were asked to consider 3 coordination challenges and **2** possible solutions to address these coordination challenges (Figure 2). Separate notes were taken for each breakout room and organized in a shared Google drive document.

Tables 3 and 4 below include examples of the types of *coordinating* challenges raised throughout the small group discussions, as well as the possible solutions to address those challenges per breakout room. Please see Appendix 1 for a detailed documentation of each point made among de-identified participants for Research Area 2.

Table 3. Challenges for Research Area 2 per Breakout Room

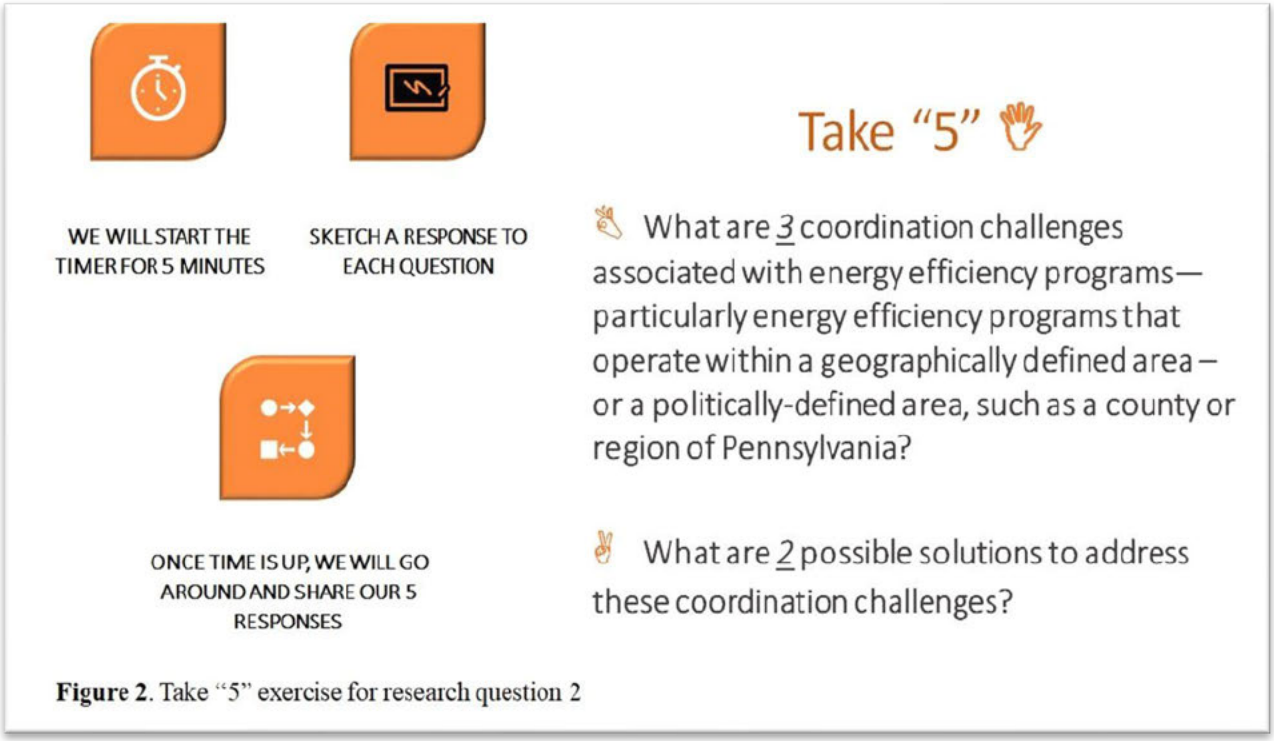

Figure 2. Take "5" exercise for research question 2

Research Area 2	Room 1	Room 2	Room 3
Challenge 1	Missing coordination among different organizations, lack of shared goals, and differences in perspectives	Competing priorities	Increasing landlord participation and program buy-in)

Research Area 2	Room 1	Room 2	Room 3
Challenge 2	Labor shortage with expertise, staffing issues, certification, market rate	Competing goals	
Challenge 3	Addressing supply chain issues, compliance issues, cannot partner with lots of agencies	Competing for financial resources (i.e., constrained budgets) within utility agencies	

Table 4. Solutions to Challenges for Research Area 2 per Breakout Room

Research Area 2	Room 1	Room 2	Room 3
Solution 1	Begin the conversation to come up with a solution	Increase the energy efficiency and weatherization workforce by creating career paths	Have a single application / single software for database sharing
Solution 2	Provide training in workforce development	Integrate lessons related to energy efficiency and weatherization within vocational and trade school curricula; confer associate degrees in these areas	Develop stronger regulatory language on coordination efforts (e.g., align how audits are being conducted and how measures are prioritized)

The second "Take 5" discussion exercise aimed to solicit responses to the following question (Research Area 3): "What are the access-based challenges associated with programs in the energy efficiency-health space?" As in the prior exercise, participants were asked to consider 3 access challenges and 2 possible solutions to address these access challenges (Figure 3). Once again, separate notes were taken and organized in a shared Google drive document.

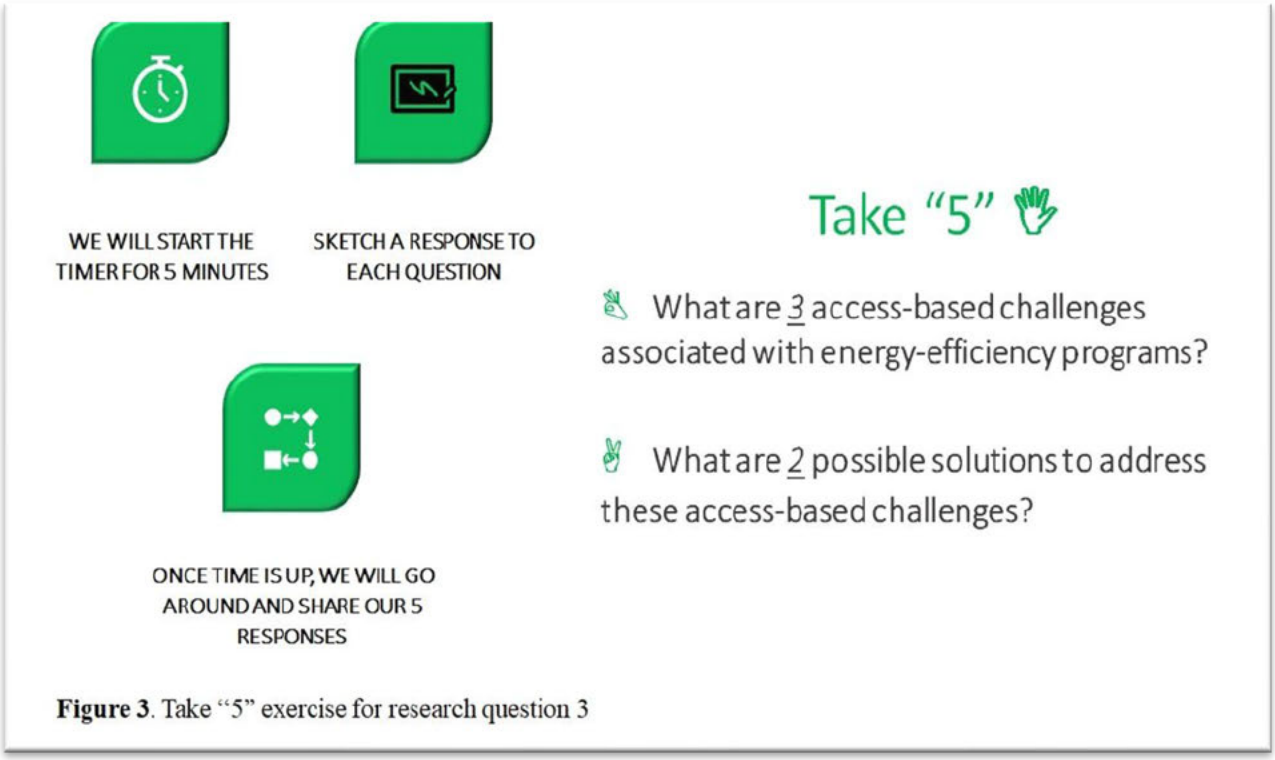

Figure 3. Take "5" exercise for research question 3

Tables 5 and 6 below include examples of the types of challenges raised throughout the discussion regarding *access* challenges, as well as possible solutions to address those challenges per breakout room. Please see Appendix 2 for a detailed documentation of each point made among de-identified participants for Research Area 3.

Table 5. Challenges for Research Area 3 per Breakout Room

Research Area 3	Room 1	Room 2	Room 3
Challenge 1	Lack of knowledge	Knowledge base of customers' hesitancy that "this is too good to be true" and having trust in people to come to their home (there are low-income customers that have been scammed)	Don't have enough resources in terms of staffing (trained people) to do the work. Funds are not the constraint, people are the constraint. Difficulty finding people to work nights/weekends
Challenge 2	Trust issues	Timing issues, the programs run during the week/day (people who work during the day and don't have a lot of flexibility and energy at the end of the day)	Getting customers to agree - they have some negative views of weatherization as disruptive.
Challenge 3	Administrative challenges	Very low-income people are dealing with crisis after crisis after crisis (short-term solutions), so energy efficiency solution may	Getting agencies to be willing to refer people to the program, plus adjusting their process

Research Area 3	Room 1	Room 2	Room 3
		seem like longer-term solution (e.g., "It's like talking to someone that got a gaping wound about how they could really improve their health if they walked more").	to train their employees to explain it and do the participant release form

Table 6. Solutions to Challenges for Research Area 3 per Breakout Room

Research Area 3	Room 1	Room 2	Room 3
Solution 1	Coordinated joint marketing strategies	Use stronger marketing strategies to help communities understand the benefit; that is not a scam, there's no catch, we're really here to help them.	Getting info directly from other programs where possible instead of through the homeowner to reduce the burden
Solution 2	Sharing resources about what is available and creating awareness about trusted resources	Getting people (clients) to buy in that they do qualify and program benefits are actually free to them (because of their usage or income guidelines).	Getting things onsite instead of over phone/email, building a personal relationship at their home

IV. Report Outs & Summary of Findings

At the conclusion of the breakout rooms, all participants returned to the Zoom lobby. A review of breakout room discussions was presented by a representative from each room to the full group. Below is an organized summary of the shared areas of concern that were raised among the breakout groups for research questions 2 and 3.

Research Question 2*. What are the coordination challenges associated with programs in the energy efficiency-health space—particularly programs that operate within a geographically- or politically-defined area, such as a county or region of Pennsylvania?*

The following issues were discussed among all three groups:

1. LACK OF COORDINATION

   - Lack of coordination among local community-based organizations and regulatory bodies that address multiple aspects of energy efficiency that take place across different entities (weatherization, appliance replacement, health & safety, bill assistance).
   - Eligibility guidelines are different for different organizations. For example, there is a wide range of eligibility for each of these programs, where a slight change of

eligibility affects the ability to coordinate jobs. Therefore, coordination is needed across eligibility and customer lists.

- Quality assurance processes are program-specific and not as well coordinated across programs as front-end services.
- To coordinate the timing correctly with which programs are available at the same time and which homes qualify for which programs.
- Agencies do not adequately communicate about the programs they administer or about the possibility of coordinating resources to enhance work capacity.

2. LACK OF SHARED REQUIREMENTS/TARGETS/GOALS/COMPLIANCE

- Different prioritization and goals in programs. Differences in perspectives create differing priorities.
- Different programs are administered by different organizations, which need different types of data/paperwork.
- Each program has a different focus on the people it is looking for and prioritizing. In some cases, state law establishes compliance targets or standards, which can be used to determine expenditures. These standards and expenditures are not always coordinated between programs that have related end goals. For example, weatherization programs have their goals; utilities have their own goals and requirements, etc.

3. CHALLENGES WITH BUDGET

- Lack of coordination can increase the pricing and travel cost.
- Challenging to decide which funding source covers what part of the work and under which scenarios.
- Supply chain issues and related cost increases.

These issues were discussed by at least two groups:

4. LABOR SHORTAGES OR LACK OF SKILLED WORKERS

- Lack of enough trained workers and job training.
- Due to qualifications/perceptions of qualifications, there are not enough people to take on the level of work (audits).
- There are scopes of lucrative alternative jobs. Finding workers/people with expertise/ certification to do work is challenging.

5. LACK OF ACCESS TO RESOURCES

- There is a recognized lack of access to resources.
- Work is not always coordinated where it may be possible to do so. For example, measurements may be taken multiple times under different programs instead of

having a single contractor take measurements and share them to support work done under other programs.

- Sometimes, many programs are only available within certain geographical boundaries. People need to know this information.
- Connecting with trusted resources, particularly for those who need the improvements.

6. CHALLENGES TO SHARING DATA

    - Customer's preferences about information sharing are challenging.
    - Sharing people's data is difficult, even though data sharing could make providing services easier.
    - Lack of available information in county offices or other available organizations (e.g., Adult Services, Health Department, etc.) that serve as a central resource.

The remaining issues were discussed in any single groups:

7. GETTING LANDLORD AGREEMENTS
   It is highly challenging to obtain landlord buy-in and participation for the program.

8. VARYING HOMEOWNER NEEDS
   Need for customizations due to varying needs of language, disabilities, etc.

9. IDENTIFYING ALL STAKEHOLDERS
   There are diverse interests and priorities among stakeholders (e.g., those who pay or have incentives, those who do the work, and those who connect with the homeowner) and it is challenging to identify and address them accordingly.

Research Question 3*. What are the access-based challenges associated with programs in the energy efficiency-health space?*

These challenges were discussed among all three groups:

1. LACK OF CUSTOMER TRUST

    - There is distrust of energy efficiency providers (i.e., utility companies, government, etc.) among qualifying households, particularly for programs with income requirements.
    - Overall distrust compromises service delivery (e.g., allowing contractors into customer's home).
    - Need to increase customer buy-in and improve efforts to minimize negative perceptions (e.g., weatherization services are disruptive).
    - Need to connect with trusted resources, particularly among those who need improvements to their home.
    - Need to identify and work with trusted intermediaries to increase participation.

2. LACK OF AWARENESS ABOUT THE PROGRAM

- Lack of customers' general awareness of the program. People do not know the types of programs available (e.g., the crisis program) as well as program details.
- People are unsure which programs they may be eligible for or may even be already participating in.
- Lack of knowledge of these programs results from ineffective outreach to communities.
- Targeted marketing of the availability of the programs is needed, however limited funds and understaffing minimize the capacity to conduct required outreach.

3. CUSTOMERS' CONFUSION

- Customers are confused by varying program offerings.
- People think some programs (such as the low-income programs) are "too good to be true." For example, if there is no out-of-pocket cost to the customer then maybe the program is not trustworthy.
- Homeowners do not always respond to initial outreach.
- Very low-income people are dealing with crisis after crisis, which requires them to expend resources and energy looking for short-term solutions to those crises. As a result, they often do not have the time or resources to meaningfully address energy efficiency solutions, which may seem like a longer-term solution.

Finally, the remaining issues were discussed in any one of the groups:

4. ADMINISTRATIVE CHALLENGES

- There is a fragmented approach to addressing critical needs. For example, weatherization can improve specific concerns, but is unable to address a leaking roof or mold problem.
- There is a lack of willingness among agencies to refer people to energy efficiency programs, which may stem from their resource and workplace constraints (e.g., adjusting processes and training employees to explain programs and complete required paperwork).

5. APPLICATION PROCESS

- Requires multiple applications to access different programs to help solve complex problems; there is no all-inclusive application.
- Applications are lengthy, cumbersome, or difficult to understand; significant information is required (e.g., multiple W2 forms, etc.).
- Applications are only available online. Therefore, people without email or internet service, especially for those in rural areas, find it difficult to complete and submit the necessary paperwork.

- Sometimes people are not able to apply due to disabilities and/or limited English proficiency.

6. AGREEMENT OF THE OWNER

   - Renters are required to obtain property owners' agreement to weatherize rental units.
   - There are misaligned incentives between landlords and renters. For example, the party paying the energy costs would have an incentive to improve weatherization to bring down heating or cooling costs. But generally, both the landlord and tenant will be involved in decisions regarding discretionary improvements done on the property during the lease term. If the tenant is paying energy bills, the landlord may not be incentivized to authorize work, especially if the landlord would be required to pay for any work up front. Alternatively, if the landlord is paying energy bills, the tenant may not be inclined to tolerate the inconvenience of having work done on the unit during her lease term, and the tenant almost certainly would not be incentivized to seek out programs that would reduce energy consumption.

7. CHALLENGES IN DATA SHARING

   - People may be reluctant to share personal information.
   - They may feel shame and/or embarrassment about needing the help or about certain situations (for example, if utility bills are paid by other individuals). Or they may be reluctant to ask.

V. Next Steps & Meeting Adjournment

At the conclusion of the recap, participants were thanked for their invaluable contributions. Participants commented that they would like to continue the dialogue to more fully understand the breadth and extent of the issue at hand. Participants were informed that summarized findings and outcomes of the workshop would be provided to them to ensure that their reflections have been included. The results from this summary would then be used for the development of a white paper, which would be made accessible to all interested stakeholders.

The meeting was adjourned at 3:00 PM.

Appendices begin on the following page.

APPENDICES

Appendix 1. Coordination Challenges

Detailed documentation of each point made among de-identified participants for Research Area 2.

What are the coordination challenges associated with programs in the energy efficiency-health space—particularly programs that operate within a geographically - or politically-defined area, such as a county or region of Pennsylvania?		
Breakout Room 1	Breakout Room 2	Breakout Room 3
Facilitator: Lisa Iulo Discussants: Pam Adams, Dave Defide, Andrew Dieck, Rich Kisner, Ngani Ndimbie, and Sean Pressman	Facilitator: Selena Ortiz Discussants: Regina Carter, Mandy Fox, Liz Marx, and Kathryn Rulli	Facilitator: Seth Blumsack Discussants: Kristen Carmean, Deb Davis, Stephanie Fost, Nicole Pollock

Participant 1
• Access based challenges
• Lack of coordination, pricing and travel cost
• Labor shortage and staffing issue due to market rate
• Job training is needed
 	
Participant 2
• Lack of coordination
• Difference in perspectives
• Many employers can't hire people due to lack of labor
• Competition over folks
• Cannot partner with a lot of agencies due to compliance issues
• Not only coordination issue. The opening conversation is needed to reduce the misunderstanding
• Necessity if sharing resources with all
	Participant 4
	• Patchwork administration here in PA, where different programs are administered by lots of different organizations:
	  ○ Two possible solutions: a common application and a common software
	• Varied eligibility; there is a wide range of eligibility for each of these programs (changing eligibility just a little bit affects the ability to coordinate jobs!)
	  ○ The best solution; centralized program administration (in case of varying eligibility, it is possible to serve whoever came through with whatever funds that can be streamlined.)
	• Different prioritization in programs (each program has kind of a different focus on who they're looking for and who they're prioritizing.
		Participant 8
		• Duplication of data/paperwork to meet each program's individual requirements
		• Figuring out what work needs to get done and which funding source covers what part of the work under which scenarios
		• Varying homeowner needs (language, disabilities, etc.) that require customizations
		
		Participant 9
		• Lack of knowledge of resources
		• Programs no longer in existence
		• Referrals to organizations that do not provide those resources
		• Availability of programs within certain geographical boundaries
		• Funding to support such programming
		• Access to resources

What are the coordination challenges associated with programs in the energy efficiency-health space—particularly programs that operate within a geographically - or politically-defined area, such as a county or region of Pennsylvania?

Participant 3

- Issue of certifications
- Scope of lucrative alternative jobs

Additional Challenges

- Coordination with local community-based organizations
- Partnership with State Weatherization Programs
- Quality assurance processes are program-specific and not as well coordinated across programs as front-end services
- Connecting with trusted resources - for those who need the improvements
- Differing priorities
- Identifying who all the 'players' are (those who pay or have incentives, those who do the work, and those who connect with the homeowner)
- Connect utility and money with people
- Lack of shared requirements/targets/goals/compliance (limitation for partnership/coordination)
    - State law compliance targets/standards controlling expenditures
    - Weatherization programs have their goals, utilities have goals and requirements, etc.
- Labor shortages or lack of skilled workers
    - Finding workers people with expertise/certification to do work
    - Qualifications/perceptions of qualifications
    - Enough people to take on the level of work (audits)
    - Solution: creating additional basis points to skip the line when there's a coordinated job (within building programs)
- Lack of regulatory requirements
    - Solution: need a stronger language requiring coordination (coordinate your job, we are seeing that in New Jersey somehow)

Participant 5

- Timing issue: being able to coordinate the timing correctly with which programs are available at the same time and which home you are trying to work on! These lead to another issue: the coordination of eligibility factors
    - Solution: coordinating the efforts a little bit more that requires something at the federal level; the money is federal, and the rules are federally enforced as well
- Lack of enough workers (trained workers) between utilities and agencies, also between agencies and state agencies (everybody is trying to get those same trained workers to do the job)
    - Solution 1: having a single application (getting one agency to be able to coordinate or know enough about all the programs that are out there to lead people that need the services to the right place). Community action agencies are a start!

Participant 10

- Addressing health/safety hazards that may bar otherwise eligible households from accessing energy efficiency assistance
- Coordinating programs that address multiple aspects of energy efficiency and take place across different entities (weatherization, appliance replacement, health & safety, bill assistance)
- Valuing energy efficiency for more than energy savings at a regulatory level

Participant 11

- Eligibility guidelines are different, so priorities may be different
- Coordination across eligibility and customer lists
- Customer preferences about information sharing

Solutions

Participant 8

- Information provided to county offices or other broadly available organizations (Adult Services, Health Department, etc.) to serve as a central resource

Participant 9

- Central/shared process and systems with program partners
- Incremental requests for simplifications
- Deferrals from some programs get into other programs, and those deferrals are a potential solution if they can be aggregated.

What are the coordination challenges associated with programs in the energy efficiency-health space—particularly programs that operate within a geographically - or politically-defined area, such as a county or region of Pennsylvania?		
• Supply chain issues and related cost increases *Coordination Solutions* • Conversation for sharing resources between agencies. Opening doors to conversations (understanding each agency's programs) to share the capacity to get work done. • Common requirements/targets/goals/compliance standards • Cost of coordination *Workforce Solutions* • Workforce development training (i.e. PSE&G training + child care and job placement)	○ Solution 2: coordinating the work requirement • Sharing data is so difficult! Sharing people's data without permission (It should be easier to share the data to be able to help people) *Participant 6* • Mirror what has already been said; a general application! Many efforts are needed to coordinate works and workers that are able to do the measures and perform the work for qualified clients. • Trying to work together with different agencies that have different requirements. How do those finding agencies work together to get into the house all at the same time? It is inconvenient for the client to have several people (like five contractors) in their homes at different times. *Participant 7* • The lack of a common application between programs (having one to align) • The eligibility requirement (lack of communication and education) • Programs can have a slightly different end goal but have to still align with rules of regulations federally or within the state ○ Solutions: having a central administrator or a central administrator program, trying to streamline the application process, encouraging having stronger language, encouraging the coordination between the	*Participant 10* • Loosen guidelines on eligibility to improve coordination • Confidentiality means that the most you can do sometimes is make a referral, then the customer needs to take action

What are the coordination challenges associated with programs in the energy efficiency-health space—particularly programs that operate within a geographically - or politically-defined area, such as a county or region of Pennsylvania?		
	programs, having communication (maybe setting up meetings within the service territory to try to set up some type of process) o Having cost-sharing metrics (cost savings to be calculated and shared between programs in a standardized way) could cut down the feeling of competition between the programs o Instead of having different (like five contractors), one contractor could come and do all the measures for programs and then share! *Participant discussion* • First come, first serve programs (timing issues) with agencies that have state funding, it puts clients on a long waiting list (for months, and they may even run out of funding for clients on the list) o Solution: bring utility overlap and territory those more in line with each other. • Competing priorities, goals, and budgets in programs (processed saving for the same works are completely different between different programs) • Landlord agreement and getting them to sign off the agreement is incredibly challenging (connecting with landlords is challenging), electric-related modifications like replacing light bulbs don't need the landlord agreement, but gas-related works like air sealing and attic insulation needs	

Appendix 2. Access-Based Challenges

Detailed documentation of each point made among de-identified participants for Research Area 3.

What are the access-based challenges associated with programs in the energy efficiency-health space?		
Breakout Room 1	Breakout Room 2	Breakout Room 3
Facilitator: Lisa Iulo Discussants: Pam Adams, Dave Defide, Andrew Dieck, Rich Kisner, Ngani Ndimbie, and Sean Pressman	Facilitator: Selena Ortiz Discussants: Regina Carter, Mandy Fox, Liz Marx, and Kathryn Rulli	Facilitator: Seth Blumsack Discussants: Kristen Carmean, Deb Davis, Stephanie Fost, Nicole Pollock
Challenges • Trust • Connecting with trusted resources - for those who need the improvements • Customer awareness of the program • Customer confusion with varying program offerings • Piecemeal approach to fixes needed - weatherization can do certain projects, but maybe can't address a leaking roof, mold problem) *Solutions* • Coordinated and joint marketing within the service territory • Comprehensive outreach with clear messaging • Connecting with trusted resources (home health, housing non-profits) to learn about program availability and benefits	*Challenges and Solutions (coupled)* • Challenge: Programs (such as the low-income programs) are too good to be true, people think! There is no out-of-pocket cost to the customer then; there is no a catch to it! o Solution: figure out better marketing ways to help them understand the benefit; that is not a scam, there's no a catch, we're really here to help them • Challenge: Customer trust! Letting contractors go into their house, trusting the program overall. Accepting that program is going to help not do something, for example, making their usage go up to benefit from the money (it is not a scam). o Solution: All the solutions like advertising, testimonies, and public meetings within the area to hear other people's success stories • Challenge: The educatedness of people and what's out there for them! They don't	*Challenges* • Renters - require property owners to agree to weatherization • Don't have enough resources in terms of staffing (trained people) to do the work. • Funds are not the constraint, people are the constraint. Difficulty finding people to work nights/weekends • Getting customers to agree - they have some negative views of weatherization as disruptive • Getting agencies to be willing to refer people to the program, plus adjusting their process to train their employees to explain it and do the participant release form • Homeowners not always responding to our initial outreach • Home-bound homeowners or those with other disabilities • People without email or internet to complete various applications • Language barriers • Feeling of shame/embarrassment about needing the help, reluctance to ask

What are the access-based challenges associated with programs in the energy efficiency-health space?		
	know the programs are available (such as the crisis program, details of the program too) ○ Solution: The first step to promoting the contracts, promoting the services. Getting people (clients) to buy in that they do qualify and actually program is free to them (because of their usage or income guidelines). This is difficult, of course, because of the income guideline barrier, like your assistance is 150% of the poverty, whereas the state weatherization is 200% of the poverty. Trying to explain this to the clients who are unfamiliar with our line is difficult. • Challenge: marketing of the availability of the programs (but marketing can overdo this as well because there is a limited fund and capacity to handle all of the work). ○ Solution: We have enough agencies to do the weatherization here in PA, but we need more workers to work within agencies, to get the work done better to say!	• People who aren't sure what programs they are eligible for or participating in • Not wanting to share info, perhaps having bills in family members' names, etc. • Programs that are available but not in the consumer's area • Applications (lengthy, cumbersome, or difficult to understand, online-only, significant information required i.e. multiple W2 forms required) • Language barriers • Qualifications for each program are different • Distrust of EE providers (utilities, government) among qualifying households, particularly for programs with income requirements • Lack of knowledge of these programs/ineffective outreach to communities • Lack of broadband access, esp. in rural areas • Requires multiple applications to access different programs/solve intertwined problems; no one-stop application • Split incentive between landlords and renters • Who is trusted as an intermediary to get the consumers in the door for the programs? • Understanding which programs you may qualify for and know to apply for • Not only have to pay for internet/WIFI but need to be in a reliable service area to apply for services

What are the access-based challenges associated with programs in the energy efficiency-health space?		
		Solutions • Getting info directly from other programs where possible instead of through the homeowner to reduce the burden • Getting things onsite instead of over phone/email, building a personal relationship at their home • Working through community organizations, referrals from other participants, and little groups of neighbors all going through the programs together • Simplified applications • Universal applications • Make referrals part of the enrollment process – have people who have gone through programs "mentor" those who might be hesitant • If someone is being helped, then can the consumer be paired with someone in the future who is skeptical of the program and reassure/help the skeptical consumer about the program – even if the consumer is not paired immediately i.e. mentoring program

Appendix 3. Initial Workshop Invitation E-mail

One sample provided, with invitee names redacted.

Dear _____,

My name is Hannah Wiseman, and I am a law professor at Penn State University at University Park. _____ of the [organization] suggested that I reach out to you.

I'm writing to let you know about a project supported by the Penn State Center for Energy Law and Policy entitled "Coordinating and Enhancing Access to Low-Income Energy Efficiency Programs." I am a member of the research team. As part of this effort, the research team is organizing a virtual workshop of individuals from energy efficiency and housing programs in Pennsylvania that serve low-income individuals. This virtual workshop will be held on **May 18, 2022, from 1:00 to 3:00 PM**, and we hope that you or a representative from your organization will participate. We provide more details below and in the attached document.

"Coordinating and Enhancing Access to Low-Income Energy Efficiency Programs" is a community-engaged research project that aims to identify and address research questions in the following three areas:

1. Improved understanding of the low-income energy efficiency services that are linked to health outcomes, and programs that deliver these energy efficiency services.
2. Challenges associated with coordinating energy efficiency programs, particularly within geographically or politically defined boundaries, such as counties or regions.
3. Challenges associated with ensuring that eligible recipients of energy efficiency programs have access to these programs and receive services offered by these programs.

We are currently in Phase I of this research project, which engages the three issues identified above and focuses on energy efficiency programs in Pennsylvania that serve low-income populations. We define low-income populations broadly to include those with relatively high energy burdens. Within this phase, we are working to refine and expand our research questions to better understand the relevant issues in this space. We are accordingly organizing a workshop with individuals who work for or lead energy efficiency programs or provide housing services in Pennsylvania, including individuals from non-profit organizations, government agencies, and utilities, among other organizations. **During this workshop we will lead a semi-structured discussion where participants will share their views on the three preliminary questions identified above; suggest sub-topics within these questions; and suggest how we should change, further refine, or expand this set of questions.**

Your involvement would be very helpful to this effort, and we hope that you will be able to participate. Please also let us know of other individuals whom you believe would be valuable

participants. Please confirm your availability to participate, and suggest others to be invited, by e-mailing me by April 22, 2022, at 5 PM.

Many thanks for your time. Please let me know if you have any questions.

Best wishes,

Hannah

Hannah Wiseman (she/her/hers)
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https://papers.ssrn.com/sol3/cf_dev/AbsByAuth.cfm?per_id=1331806

Appendix 4. Reminder Follow-Up E-mail

One sample provided, with invitee names redacted.

Greetings! Recently you received an email inviting you to attend a two-hour, virtual workshop of individuals from energy efficiency programs and similar organizations in Pennsylvania that serve low-income individuals. The workshop, which will be held on **May 18, 2022, from 1:00 to 3:00 PM** through Zoom, is an integral part of a project supported by the Penn State Center for Energy Law and Policy entitled "Coordinating and Enhancing Access to Low-Income Energy Efficiency Programs." This aim of this community-engaged research project is to identify and address research questions in the following three areas:

1. Improved understanding of the low-income energy efficiency services that are linked to health outcomes, and programs that deliver these energy efficiency services.
2. Challenges associated with coordinating energy efficiency programs, particularly within geographically or politically defined boundaries, such as counties or regions.
3. Challenges associated with ensuring that eligible recipients of energy efficiency programs have access to these programs and receive services offered by these programs.

We wanted to let you know that **there is still time to RSVP for this event.** We are looking forward to speaking with a variety of individuals from non-profit organizations, government agencies, and utilities, among other organizations, and in hearing their views about the three issues listed above.

Your involvement would be very helpful to this effort, and we hope that you will be able to participate. Please confirm your availability to participate by e-mailing Hannah Wiseman, hwiseman@psu.edu by May 11th at 5:00 PM. I apologize if you have already RSVPed and we missed it.

Best wishes,

Hannah

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