

# Efficiency+

---

## Policy Recommendations for Making Energy Poverty Initiatives Work for Those Most in Need

Abhilash Kantamneni, Brendan Haley,  
and Laura Tozer



# Efficiency+: Policy Recommendations for Making Energy Poverty Initiatives Work for Those Most in Need

Abhilash Kantamneni, Brendan Haley, and Laura Tozer

## Suggested citation

Kantamneni, A., Haley, B., Tozer, L. 2024. Efficiency+: Policy Recommendations for Making Energy Poverty Initiatives Work for Those Most in Need. Efficiency Canada, Carleton University, Ottawa, ON.

© Efficiency Canada  
c/o Carleton University  
1125 Colonel By Drive  
Ottawa, ON K1S 5B6  
<https://www.energycanada.org>

**Facebook:** <https://facebook.com/EfficiencyCanada>

**LinkedIn:** <https://linkedin.com/company/efficiency-canada>

**Instagram:** <https://instagram.com/energycanada>

## Table of contents

Acknowledgements	4
Remerciements	4
About the authors	5
About Efficiency Canada	5
Executive summary	7
Introduction	11
Aims of this paper	11
Energy poverty: context and background	11
Energy poverty, housing and health: linkages	11
Energy efficiency as a solution to overlapping issues	12
Addressing energy poverty: constraints and challenges	13
Challenges defining vulnerability	13
Constraints of energy efficiency initiatives	13
Taking action: insights from our research	15
Policy recommendations for solutions to target those most in need	16
Define goals, focus on results	17
Define energy poverty	17
Measure energy poverty	18
Set national targets for energy poverty reduction	21

Enhance existing programs	22
Flexible funding to enable no-cost turnkey upgrades and buy down costs of eligible measures	23
Provide value added benefits like health and safety upgrades	24
Prioritize those most in need	25
Make homes climate-ready	26
Provide stable funding and dedicated systems of support	27
Bibliography	29
Appendix A: Promising practices targeting households most in need	35
Appendix B: Knowledge products and mobilization activities	40

## Acknowledgements

This study/research was led by Create Climate Equity (CCE) and received funding from Canada Mortgage and Housing Corporation (CMHC) under the National Housing Strategy (NHS) Research and Planning Fund.

The views, analysis, interpretations, and recommendations expressed in this study are those of the author(s) and do not necessarily reflect the views of CMHC. CMHC's financial contribution to this report does not constitute an endorsement of its contents.

## Remerciements

La présente étude/recherche a été menée par Create Climate Equity (CCE) et a reçu du financement de la Société canadienne d'hypothèques et de logement (SCHL) dans le cadre du Fonds de recherche et de planification de la Stratégie nationale sur le logement (SNL).

Les opinions, analyses, interprétations et recommandations présentées dans cette étude sont celles du ou des auteurs et ne reflètent pas nécessairement le point de vue de la SCHL. La contribution financière de la SCHL à la publication de ce rapport ne constitue nullement une approbation de son contenu.

## About the authors

**Abhilash Kantamneni** is Efficiency Canada's Director of Action Research. He specializes in energy poverty and low-income energy efficiency. He has a Master of Science in Physics, and in Computer Science from Michigan Tech, and a Bachelor of Engineering in Electrical Engineering from Anna University. Prior to joining Efficiency Canada, he worked with communities across the United States and Canada to achieve local priorities, including improved housing, increased good jobs and reduced poverty.

**Brendan Haley** is Efficiency Canada's Senior Director of Policy Strategy. He has a Ph.D. in Public Policy from Carleton University, a Master of Environmental Studies from York University, and a Bachelor of Science in Economics from Dalhousie University. Before joining Efficiency Canada on a full-time basis in September 2018, Brendan was a Banting Postdoctoral Fellow at Dalhousie University.

**Dr. Laura Tozer** is an Assistant Professor in the Department of Physical and Environmental Sciences at The University of Toronto Scarborough. She is the Director of Impact Lab, a community-based and policy engaged research group focused on climate change policy and action. She co-leads the Urban Just Transitions Cluster at the University of Toronto Scarborough. She has a Ph.D. and an M.A. in Geography from the University of Toronto, and a BSc in Environmental Sciences from the University of Guelph. Dr. Tozer was a Postdoctoral Researcher at Durham University.

## About Efficiency Canada

Efficiency Canada is the national voice for an energy-efficient economy. Our mission is to create a sustainable environment and better life for all Canadians by making our country a global leader in energy efficiency policy, technology, and jobs. Efficiency Canada is housed at Carleton University's Sustainable Energy Research Centre, which is located on the traditional unceded territories of the Algonquin nation. The views expressed, as well as any errors or omissions, are the sole responsibility of the authors.

## About Create Climate Equity

Create Climate Equity is a not-for-profit that advocates for energy and climate policies and programs that are equitable, just, and effective for all. It achieves this through the delivery of energy efficiency programs and the incubation of innovative energy research and projects.



## Executive summary

Energy poverty and housing vulnerability are critical issues affecting many Canadians. The lack of access to affordable, reliable, and modern energy services, coupled with inadequate housing conditions, can have severe consequences for individuals, families, and communities across the country. Eliminating energy poverty helps these Canadians while contributing to national net-zero and housing affordability priorities.

Energy poverty is a significant issue in Canada, yet it lacks a formal or consistent definition. This gap, coupled with scarce research on energy poverty in the Canadian context makes it difficult to fully understand its causes, effects, and consequences for Canadians. These limitations also make it challenging to identify effective strategies to address and alleviate energy poverty, particularly for those most vulnerable.

This report is part of a research series that examines how energy poverty is linked to and compounds housing vulnerability for Canadians.

Energy Poverty, Housing and Vulnerability in Canada: a Literature Review highlights how energy poverty is caused by an interplay between unaffordability (low incomes and/or high energy costs), poor quality homes (such as inefficient, leaky homes) and systemic marginalization (such as being excluded from energy efficiency programs) and the importance of expanding the limited available evidence-base of lived experiences with energy poverty in Canada.

Archetypes of Experiences with Energy Poverty in Canada draws insights on social vulnerability from successful international strategies, emerging Canadian research, and stakeholder feedback. It outlines that seniors, renters, newcomers, and single-parent families are more likely to struggle with stable housing and health. Challenges in keeping their homes warm or cool can make these problems worse.

In this third and final report, we focus on the role that the federal government and national institutions can play in leveraging existing low-income energy efficiency programs to deliver affordable, comfortable, and healthy homes that meet the needs of the most vulnerable Canadians.

These reports are complemented by our interactive energy poverty database and user guide that map the risks of high energy cost burdens and identifies households that would benefit most from effective measures with data and insights available at both



national and provincial levels. A full list of reports and knowledge products from this research series is provided in Appendix B.

This collection of research connects energy poverty to health and housing vulnerability in Canada, illustrates its impact on vulnerable Canadians, and offers guidelines for effective policies. We aim to build capacity among key stakeholders to understand and address energy poverty more effectively.

## Résumé

La précarité énergétique et la vulnérabilité en matière de logement sont des enjeux cruciaux qui touchent de nombreuses personnes au Canada. Le manque d'accès à des services énergétiques abordables, fiables et modernes, combiné à un logement de qualité non convenable, peut avoir de graves conséquences pour les personnes, les familles et les collectivités partout au pays. L'élimination de la précarité énergétique aidera la population tout en contribuant aux priorités nationales en matière de consommation énergétique nette zéro et d'abordabilité du logement.

La précarité énergétique est un problème important au Canada, mais il n'existe aucune définition officielle ou uniforme de cet enjeu. Cette lacune, ainsi que la rareté des recherches sur la précarité énergétique dans le contexte canadien, fait qu'il est difficile de bien comprendre ses causes et ses effets, notamment sur les gens. Ces limites compliquent aussi la recherche de stratégies efficaces pour s'attaquer à la précarité énergétique et la réduire, en particulier pour les personnes les plus vulnérables.

Le rapport en question s'inscrit dans une série de recherches qui portent sur la relation entre la précarité énergétique et la vulnérabilité en matière de logement. On y étudie aussi la manière dont ce premier facteur aggrave le deuxième au Canada.

Le rapport *Energy Poverty, Housing and Vulnerability in Canada: a Literature Review* (en anglais seulement) souligne les causes de la précarité énergétique : une interaction entre le manque d'abordabilité (faibles revenus et coûts énergétiques élevés), les logements de mauvaise qualité (comme les logements inefficaces et non étanches) et la marginalisation systémique (comme le fait d'être exclu des programmes d'efficacité énergétique). On y démontre aussi l'importance d'élargir la base limitée de données

probantes disponibles sur les expériences vécues de la pauvreté énergétique au Canada.

Le rapport *Archetypes of Experiences with Energy Poverty in Canada* (en anglais seulement) s'appuie sur des renseignements sur la vulnérabilité sociale. Ils sont tirés de stratégies internationales porteuses de succès, de la recherche canadienne émergente et des commentaires de parties prenantes.

Ce rapport indique que les personnes âgées, les locataires, les nouveaux arrivants et les familles monoparentales sont plus susceptibles que d'autres personnes d'éprouver des difficultés en matière de stabilité du logement et de santé. Le défi de garder leur logement au chaud ou au frais peut aggraver ces problèmes.

Dans ce troisième et dernier rapport, nous nous concentrons sur le rôle que le gouvernement fédéral et les institutions nationales peuvent jouer dans la mise à profit des programmes existants d'efficacité énergétique pour les personnes à faible revenu. Ces programmes permettent d'offrir des logements abordables, confortables et sains qui répondent aux besoins des personnes les plus vulnérables au Canada.

Aux rapports en question viennent s'ajouter notre base de données interactive sur la précarité énergétique (en anglais seulement) et le guide de l'utilisateur associé (en anglais seulement). Ces outils cartographient les risques liés au fardeau des coûts énergétiques élevés et montrent les ménages qui bénéficieraient le plus de mesures efficaces. Ils sont fondés sur des données et des renseignements disponibles à l'échelle nationale et provinciale. Une liste complète des rapports et des produits d'information de cette série de recherches se trouve à l'annexe B.

Les recherches susmentionnées associent la précarité énergétique à la vulnérabilité en matière de santé et de logement au Canada. Elles illustrent ses répercussions sur les personnes vulnérables et offrent des lignes directrices pour des politiques efficaces. Nous visons à renforcer la capacité des principales parties prenantes à comprendre la précarité énergétique et à la combattre efficacement.

Notre projet comporte certaines limites. On n'a pas de définition commune de la précarité énergétique, et les données probantes tirées des expériences vécues au Canada sont toujours en cours d'élaboration. C'est pourquoi il est difficile de déterminer les ménages les plus touchés ainsi que les mesures les plus efficaces pour lutter contre

la pauvreté énergétique. Les résultats de notre projet, éclairés par ce qui s'est avéré efficace dans d'autres régions, préparent le terrain pour l'action. Les recherches futures pourront viser l'élargissement de la base de données probantes sur la précarité énergétique dans le contexte canadien. Elles porteront notamment sur les expériences vécues de la précarité énergétique au sein de collectivités vulnérables. On y trouvera aussi une évaluation empirique et systématique de l'efficacité des mesures de modernisation dans la réduction de la pauvreté énergétique.

La lutte contre la précarité énergétique nécessite la participation d'un large éventail de parties prenantes. Chacune est différente par son niveau de compréhension du problème, ses objectifs immédiats, ses besoins et ses ressources disponibles. Elles ont aussi des capacités différentes pour mettre les solutions en pratique – solutions qui ne sont souvent pas claires. Nos activités de mobilisation des connaissances dans le cadre du projet ont impliqué diverses parties prenantes clés liées à la précarité énergétique.<sup>1</sup>

L'adaptation de la diffusion des connaissances à un aussi vaste public peut être difficile et nécessiter beaucoup de ressources. Dans le cadre de projets futurs, on pourrait envisager de se concentrer sur la mobilisation à long terme, soutenue et accrue des parties prenantes. Cette approche aiderait à renforcer et à maintenir la capacité d'un éventail diversifié de parties prenantes à s'attaquer efficacement à la précarité énergétique.

---

<sup>1</sup> La liste complète des activités de mobilisation des connaissances entreprises dans le cadre du projet de recherche se trouve à l'annexe B.

# Introduction

## Aims of this paper

Energy poverty and housing vulnerability are critical issues affecting many Canadians. The lack of access to affordable, reliable, and modern energy services coupled with inadequate housing conditions can have severe consequences for individuals, families, and communities across the country. Improving energy efficiency will benefit these Canadians.

This paper provides policy and program recommendations to unlock Canada's capacity to alleviate energy poverty, reduce emissions, improve housing quality and achieve better health outcomes for all Canadians through energy efficiency, with an emphasis on targeting programs for those who need them the most.

## Energy poverty: context and background

Energy poverty is a complex multifaceted phenomenon commonly understood to describe the situation where a household is unable to access adequate energy to maintain wellbeing at home. Energy poverty is typically considered to be caused by an interplay between unaffordability (low incomes and/or high energy costs) and poor housing conditions (such as inefficient, leaky homes).

## Energy poverty, housing and health: linkages

Energy poverty and poor housing conditions also interact in complex ways to act as social determinants of health (Canada 2018; Raphael et al. 2020, Riva et al. 2023). Households experiencing energy poverty are more susceptible to health risk factors such as excess winter and/or summer mortality if they live in low-quality housing (El Ansari and El-Silimy 2008; Ormandy and Ezratty 2012). Energy poverty is responsible for the increased risk of poor respiratory and cardiovascular health in individuals with pre-existing conditions (Baudu, Charlier, and Legendre 2020; Charlier and Legendre 2022; El Ansari and El-Silimy 2008). Energy poverty is documented to create emotional distress,

frustration, fear and social isolation, particularly among renters (Middlemiss et al. 2018, Longhurst and Hargreaves 2019).

Energy use is often the first component of overall housing costs to be self-rationed by households facing material difficulties (Karpinska and Śmiech 2020). Several studies find that coping mechanisms and occupant behaviour in responding to energy poverty through self-rationing of energy use results in worsening housing conditions such as mould and cold homes, which can lead to negative health outcomes (Chen and Feng 2022; El Ansari and El-Silimy 2008; Sharpe et al. 2015). Energy-poor households living in uninsulated rental homes tend to underheat their indoor environments in winter due to concerns about energy costs, reducing their quality of life and standard of living (Brunner, Spitzer, and Christanell 2012).

### Energy efficiency as a solution to overlapping issues

There are synergies between reducing energy poverty and improving housing quality and the health of occupants. There are several ways to combat energy poverty, such as boosting household incomes through social policy or lowering energy prices through utility rate design or providing households with fuel subsidies. However, such measures may only be palliative – offering temporary relief (Charlier, Legendre, and Risch 2019).

Energy efficiency, however, is a long-term solution. Improving the energy efficiency of homes can alleviate energy poverty while achieving broader societal goals – such as reduced emissions and costs, improvised quality of homes and better health outcomes – which have lasting benefits (Czerwinska 2021; Kahouli 2020). These recommendations are echoed by (Hilary Thomson et al. 2013; Shortt and Rugkåsa 2007; Ige et al. 2019; Howden-Chapman et al. 2012; Czerwinska 2021; C. Wang, Wang, and Norbäck 2022) who find that improvements in housing conditions and provision of affordable warmth leads to reduced absences from school or work, increased levels of privacy and usable space at home, and improved social relationships at home.

Taken together, these papers point to the potential overlapping benefits of energy efficiency upgrades in improving housing conditions and health for occupants, while alleviating energy poverty.

## Addressing energy poverty: constraints and challenges

Despite synergies between efficiency improvements, housing conditions and health, their overlapping benefits may prove challenging to realize in practice, particularly for groups regarded as vulnerable.

### Challenges defining vulnerability

Identifying the simple classification of “vulnerable households” as a category tends to over-simplify the lived experiences with and the causal links between energy poverty, housing vulnerabilities and health outcomes (Wright 2004; Mould and Baker 2017; Ormandy and Ezratty 2012). This theme is also reflected in the literature on housing vulnerability. While Canada’s National Housing Strategy identifies 12 groups as “vulnerable people for priority policy action” (CMHC 2018), authors (Zhu et al. 2021) note that “people who experience housing vulnerability are more than the statistical and demographic categories they are grouped into. Such a categorization shines a spotlight on caricatures which is an insufficient and often inappropriate way to conceive of vulnerability.”

Determinants of vulnerability may differ from household to household depending on how these characteristics intersect. For instance, underheated homes can lead to decreased mobility in seniors, increasing the risk of falls, which can lead to serious injuries or even fatalities (García-Esquinas et al. 2016). Additionally, excess indoor temperatures due to lack of adequate access to cooling, particularly during extreme heat events, can reduce mobility and increase the risk of falls and injury (Lindemann et al. 2017). For a newcomer household, the risks of underheated homes may manifest as respiratory illness in young children. Because the intersections are key, it can be difficult to paint vulnerable communities with a broad stroke.

### Constraints of energy efficiency initiatives

Next, some authors caution that institutions responsible for implementing energy poverty initiatives may not consistently design, optimize, or prioritize these measures to guarantee health and safety outcomes. This oversight could lead to programs that

inadequately address the critical health and housing needs of vulnerable populations (Jenkins, Middlemiss, and Pharoah 2011; Vilches, Barrios Padura, and Molina Huelva 2017, Tozer et al, 2024). For instance, a policy primarily focused on improving tenant rights to access cooling may improve health outcomes but might drive up energy and housing costs for renters. Conversely, policies focused on reducing energy poverty through deep retrofits may backfire on housing vulnerability without adequate protections against tenant displacements (Kantamneni and Haley 2023). Reviews of Canadian energy efficiency programs draw attention to the multifaceted challenges faced by low-income energy retrofit programs in achieving energy poverty, health, and housing objectives due to limitations such as inadequate funding, a narrow focus on energy efficiency gains, administrative and intergovernmental silos, constraints of cost-effective measures, and lack of emphasis on equity, climate, and health-oriented outcomes (Kantamneni and Haley 2022, Tozer et. al 2024).

## Project limitations

Our project has some limitations. The absence of a common definition of energy poverty and a still-developing evidence base from Canadian lived experiences, makes it difficult to identify households most affected and to determine measures most effective for addressing energy poverty. Our project outputs, informed by what has proven effective in other regions, lay the groundwork for action. Future research can focus on expanding the evidence-base of energy poverty in the Canadian context. This will include research with vulnerable communities on their lived experiences with energy poverty and empirical and systematic evaluation of retrofit measures for their effectiveness in reducing energy poverty.

Addressing energy poverty involves a wide array of stakeholders, each with different levels of understanding of the issue, immediate objectives, necessities, available resources, and abilities to put solutions into practice, which are frequently unclear. While our knowledge mobilization activities through this project have engaged with a diverse range of key stakeholders related to energy poverty,<sup>2</sup> adapting knowledge

---

<sup>2</sup> A full list of knowledge mobilization activities undertaken by this research project is available in Appendix B.

dissemination to such a broad audience can be challenging and resource extensive. Future projects may consider focusing on prioritizing long-term, sustained, and enhanced engagement with stakeholders. This approach will help build and maintain the capacity of a diverse range of stakeholders to effectively address energy poverty.

## Taking action: insights from our research

Addressing the contradictions, constraints and challenges discussed above would require a mix of policies that can successfully integrate housing, health, and equity outcomes into energy efficiency programs, with an emphasis on delivering positive outcomes for vulnerable communities.

To respond to this need, we produced the following research products:

- Our literature review (Kantamneni 2024a) develops a better understanding of vulnerability as it relates to overlapping objectives of mitigating energy poverty, enhancing housing conditions, and promoting better health outcomes. The paper accomplishes this by conceptualizing energy poverty as the vulnerability to future housing and health-related harms, amplified by energy-related risk factors and conditioned by a household's (in)ability to adequately respond. The framework draws on international and Canadian literature and practices linking energy poverty with housing vulnerabilities and health inequalities.
- Building on this vulnerability framework, Archetypes of Energy Poverty in Canada (Kantamneni and Haley 2024) develops a more nuanced understanding of the varied personal experiences with energy poverty, along with how its determinants interact and overlap to have distinct effects across different key Canadian demographics. Using evidence from literature and Canadian Census data, the report explicates specific instances under each category: underlying conditions, risk factors, inadequate responses, as well as impacts leading to future harm. This approach is then used to construct archetypes or user profiles. These profiles unpack the diversity and heterogeneity of experiences with energy poverty in Canada while drawing attention to the risk of future harms and vulnerabilities experienced by vulnerable groups.
- Building on this vulnerability framework and user profiles, we collaborated with an academic research team led by Dr. Laura Tozer to explore the extent to which



energy retrofit programs designed for low-income households comprehensively account for determinants that shape energy poverty experiences. The study (Tozer et al. 2024) finds several key issues limiting the capacity of existing low-income programs in Canada to address the overlapping determinants of energy poverty. The study also shows key opportunities to expand and deepen the current ecosystem of low-income retrofit programs through policy innovations, offering suggestions for widening the policy arena to address energy poverty, housing, and health. The paper is currently undergoing academic peer-review.

The next section builds on these research outputs to make policy recommendations for solutions targeting those most in need, to achieve overlapping objectives of mitigating energy poverty, enhancing housing conditions, and promoting better health outcomes for all Canadians. A database of promising practices for effectively targeting households most in need is available in Appendix A.

## Policy recommendations for solutions to target those most in need

As noted earlier, combatting energy poverty through home energy efficiency has lasting benefits. Nearly every province in Canada has an energy efficiency program that delivers no-cost, turnkey upgrades to income-qualified households. However, these programs are limited in scope and reach due to policy objectives of provincial governance systems. The federal government is uniquely positioned to play a leadership role in enhancing the scale and scope of these programs, while achieving broader societal goals such as reduced emissions and costs, improvised quality of homes and better health outcomes, particularly for those most in need. The recommendations in this section will focus largely on the role that the federal government and national institutions can play in developing supports that are fair, effective and aligned with people's daily lives.

## Define goals, focus on results

Federal policy must consider defining the problem area, setting targets and prioritizing results that will alleviate energy poverty, enhance housing conditions, promote better health outcomes and reduce emissions, while allowing provincial and territorial programs to develop interventions most relevant to their individual contexts.<sup>3</sup>

The federal government may consider the following enabling mechanisms.

### Define energy poverty

Energy poverty, while a significant concern, is not officially or uniformly defined in Canada. A clear definition of energy poverty helps policymakers create targeted and effective policies to address the issue, ensuring that resources are allocated efficiently to those in need.

Canada has various options to define energy poverty. For example, in the United Kingdom<sup>4</sup> and France,<sup>5</sup> energy poverty was defined by legislative acts, while in Ireland<sup>6</sup> and New Zealand<sup>7</sup> energy poverty was defined through public consultation conducted by specific ministries.

---

<sup>3</sup> Extent of energy poverty and profiles of vulnerability differ between provinces. See Efficiency Canada Low-Income Data Hub: <https://www.energycanada.org/energy-poverty-in-canada/>.

<sup>4</sup> Energy poverty in United Kingdom defined by Warm Homes and Energy Conservation Act 2000: <https://www.legislation.gov.uk/ukpga/2000/31/contents>.

<sup>5</sup> Energy poverty in France defined by Grenelle 2 Law in 2020: <https://ec.europa.eu/social/BlobServlet?docId=25972&langId=en>.

<sup>6</sup> Energy poverty in Ireland defined by Department of Environment, Climate and Communications in the Energy Poverty Action Plan: <https://assets.gov.ie/242876/dc4744fb-d2cd-4ba1-b4e1-170cbd77816a.pdf>.

<sup>7</sup> Energy poverty in New Zealand defined by Ministry of Business, Innovation and Employment <https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-hardship/defining-energy-hardship/>.

**Promising practice:** Canada can follow the flexible approach of the European Union (EU), setting a broad conceptual definition of energy poverty<sup>8</sup> and allowing each member state (or provinces, in Canada’s case) to develop locally specific policy responses based on a set of suggested energy poverty indicators.

### Measure energy poverty

Regular measurement of energy poverty allows for tracking progress and outcomes of policy interventions over time. Measuring energy poverty also helps policymakers identify and prioritize those most in need and allocate resources more effectively to programs aimed at addressing their needs. Table 1 provides a mini-review of common approaches to measuring energy poverty, along with specific indicators, and the relative (de)merits of each approach.

**Promising practice:** The United Kingdom uses Low-Income Low Energy Efficiency (LILEE) as the measure of energy poverty.<sup>9</sup> The LILEE measure helps the UK government target policies and supports towards households that stand to gain the most from energy efficiency upgrades – lowest income homes living in the least efficient homes. The LILEE measure is enabled by a national Energy Performance Certificate system that summarizes and grades the energy efficiency of a dwelling on a scale of A (very efficient) to G (least efficient). This measure also helps the UK

---

<sup>8</sup> Energy poverty in EU is defined as ‘a household's lack of access to essential energy services that provide basic levels and decent standards of living and health, including adequate heating, hot water, cooling, lighting, and energy to power appliances, in the relevant national context, existing social policy and other relevant policies, caused by a combination of factors, including but not limited to non-affordability, insufficient disposable income, high energy expenditure and poor energy efficiency of homes’ in 2023 Climate Fund Regulation.

[https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/733583/EPRS\\_BRI\(2022\)733583\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/733583/EPRS_BRI(2022)733583_EN.pdf).

<sup>9</sup> UK Fuel Poverty Methodology Handbook

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1138926/fuel-poverty-methodology-handbook-lilee-2023.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1138926/fuel-poverty-methodology-handbook-lilee-2023.pdf).

government align energy poverty reduction with and track progress towards other national goals such as improving housing stock, prioritizing the well-being of vulnerable communities, and ensuring modest-income households are not left behind in the transition to a net-zero future.

Measurement approach	Example indicators	Advantages	Disadvantages
As a measure of income.	Household incomes below a certain threshold, as used by provincial energy efficiency programs in Canada.	Easy to measure at the household level to establish program support qualification; links in with eligibility for other anti-poverty and social assistance programs.	Does not account for differing energy needs based on climate, health, culture, or regional variations; does not account for other determinants such as energy costs or housing quality, energy efficiency, or vulnerabilities.
As a measure of energy expenditure – total household energy costs as an absolute or relative threshold of income or its proxies.	Energy prices; energy expenditure; energy costs as a percentage of income (energy cost burden); energy costs as a percentage of disposable income after accounting for housing costs; energy cost burden is twice national median; energy cost burden is above a certain threshold (6%, 10%, etc).	Quantifiable at different scales, allowing for standardization, benchmarking, and comparisons across regions; directly tied to affordability.	Difficult to collect at the household level, prone to exclusion errors due to households self-rationing energy use; may not be sensitive to near-term fluctuations in energy prices or housing expenditures due to inflation; relative measures prone to inclusion errors – high-income households with high energy expenditures may technically fall within energy cost burden threshold.

As a measure of indoor housing conditions – self-reported (in)ability to attain necessities relative to recommended thresholds.	Dwelling comfort in winters and summers; presence of leaking, mould and rot; ability to keep home adequately warm or cool; arrears on utility bills.	Captures lived experiences and a broader range of issues such as indoor comfort, health and well-being.	Requires population surveys – a large undertaking; measure subject to individual perceptions and expectations.
As a measure of general housing quality relative to standards.	Energy performance rating of dwelling below a certain threshold; share of dwellings equipped with heating; share of dwellings equipped with cooling; overcrowded housing.	Links housing issues with energy and climate policies.	Does not address other determinants such as income or energy expenditures.
As a measure of risks of negative outcomes and impacts to well-being and health.	Excess winter or summer mortality; people at risk of social exclusion; households at risk of poverty.	Focuses attention on those “who need supports the most” and vulnerable communities.	Causally linking health outcomes to specific energy poverty measures may be empirically challenging. Health outcomes may lag intervention by several decades.

Table 1: A review of common approaches to measuring energy poverty

### Set national targets for energy poverty reduction

The federal government may consider setting and committing to national energy poverty reduction targets. This will ensure energy poverty remains high on the policy

agenda for current and future governments. Clear targets create a benchmark against which progress can be measured, holding governments and stakeholders accountable for their actions and commitments. Targets can also help in prioritizing resources where they are needed the most.

**Promising practice:** The United Kingdom has binding statutory targets “to ensure that as many fuel poor homes as is reasonably practicable achieve a minimum energy efficiency rating of Band C,<sup>10</sup> by 2030.” Progress towards these targets is monitored by an advisory public body.<sup>11</sup> Canada can build on this promising practice and set a national energy poverty reduction target such as “by 2030, no vulnerable<sup>12</sup> Canadian will live in a house that is less energy efficient than a similar house built to modern building standards and codes.”

## Enhance existing programs

The federal government can focus on acting as an enabler that enhances the scale and scope of existing capabilities of provincial programs. Provinces have long-running programs that have earned market recognition, scaled up outreach infrastructure, developed mature relationships with delivery agents, built relationships and earned the

---

<sup>10</sup> Band C refers to the Energy Performance Certificate rating, which runs along a sliding scale of A (being most efficient) and G being least efficient. <https://nexusenergysolutions.co.uk/how-is-an-epc-band-calculated/>.

<sup>11</sup> Committee on Fuel Poverty is an advisory non-departmental public body sponsored by the UK Department for Business, Energy and Industrial Strategy that monitors and reports on progress towards interim milestones and 2030 fuel poverty target. <https://www.gov.uk/government/organisations/committee-on-fuel-poverty/about/terms-of-reference>.

<sup>12</sup> ‘Vulnerable Canadians’ can be defined as households experiencing elevated risks to future housing and health related harms due to energy poverty, for instance – seniors, renters, low-income households, single parent families etc., as outlined in the ‘Archetypes of Experiences with Energy Poverty’ report. Alternatively, vulnerable communities can be defined by other means, such as through Canada National Housing Strategy’s definition of ‘housing for those greatest in need’ <https://www.cmhc-schl.gc.ca/nhs/guidepage-strategy/priority-areas-for-action>.

trust of vulnerable communities. A one-size-fits-all federal program could disrupt existing infrastructure of provincial programs and create confusion in the marketplace.

To avoid these mishaps, the federal government may consider the following approaches.

### Flexible funding to enable no-cost turnkey upgrades and buy down costs of eligible measures

Not all provincial programs currently offer upgrades at no-cost to vulnerable households, but upfront cost is a major barrier to low-income households (Tozer et al, 2024, Fernández et al. 2022). A low-to-moderate income energy efficiency program will be ineffective if it does not centre a no-cost, turnkey approach.

Most provincial programs are subject to guidelines on cost-effectiveness standards at the project or program or portfolio level, which limits the number of households they can reach and/or the depth of retrofits they can perform. This approach incentivizes shallow retrofits in homes that are the easiest to reach, often excluding rentals, and neglecting vulnerable groups, thereby missing broader equity and health goals and potentially excluding deeper retrofit measures more likely to address household-level affordability. Federal funding can reduce the costs of these materials, enabling existing provincial programs to leverage these funds to reach more households and achieve deeper savings per household.

**Promising practices:** The Weatherization Assistance Program in the United States has provided stable core program funding to states, territories and Indigenous communities for energy efficiency upgrades on low-income households for close to 50 years. The funding directly flows to a national network of over 700 local implementers and community action agencies that do the work. The program sets high-level guidelines, such as requiring taking a whole-home approach to retrofits, establishing income-eligibility criteria or the performance of quality assurance sampling and requiring homeowner/occupant education. Within these broad guidelines, the program offers



implementers flexibility in choice of eligible upgrades<sup>13</sup> and offers a wide latitude in how the funding can be used in line with their own local circumstances and priorities of the communities they serve. As an example, in program year 2023, the US federal funding amounted to an average adjusted cost per home of \$8,250 US but states like Illinois leverage this funding to invest up to a maximum of \$16,000 US in energy-related repairs and upgrades per eligible household. Reporting requirements are streamlined, and program timelines are flexible.<sup>14</sup>

Canada must consider adopting this approach. Rather than limit federal funding to a limited list of pre-determined and prescriptive measures, the federal government can provide existing programs the flexibility to prioritize whatever measures are necessary to ensure deeper energy savings and/or reach more households. Federal funding could also support ancillary energy-savings-related services such as Energuide audits or client education.

### Provide value added benefits like health and safety upgrades

Provincial programs target measures that reduce energy use and often do not have the mandate to perform health and safety upgrades. In some instances, it can lead to situations where households living in the poorest quality homes are disqualified from participating in efficiency programs because more work is needed to enable efficiency improvements. This could include homes with moisture, mouldy walls, electrical issues, or structural deficiencies. Non-energy improvements make more homes eligible for energy savings programs while helping improve health and housing conditions for the most vulnerable. Without these accompanying measures, the poorest quality homes will have no route to escape cycles of housing vulnerability and energy poverty.

**Promising practices:** Several states in the US offer “pre-weatherization” programs<sup>15</sup> to address conditions in a home that would render the home to be ineligible for energy

---

<sup>13</sup> Weatherization Assistance Program Standards for Weatherization Materials  
<https://www.ecfr.gov/current/title-10/chapter-II/subchapter-D/part-440/appendix-Appendix%20A%20to%20Part%20440>.

<sup>14</sup> Weatherization Assistance Program Briefing Book.

<sup>15</sup> Illustrative examples of select pre-weatherization programs.  
<https://nascsp.org/wp-content/uploads/2019/08/Pre-WAP-Programs.pdf>.

efficiency upgrades. Example measures include mould remediation, moisture control, electrical panel upgrades, upgrades from knob and tube wiring, roof repair, pest control, and installation of carbon monoxide detectors. In addition to helping more homes qualify for efficiency upgrades, pre-weatherization programs also reduce administrative costs of efficiency programs by reducing the resources spent on homes that were deemed ineligible due to health and safety issues after site visits are scheduled or energy audits have been performed. In Canada, some programs like Efficiency Manitoba offer decluttering services to prepare homes for efficiency upgrades. More information on specific programs and measures offered is available in Appendix A.

**Promising practice:** The US Department of Energy’s Weatherization Plus Health initiative takes steps beyond “pre-weatherization” and coordinates resources to improve health and safety for vulnerable households alongside performing energy efficiency upgrades. These upgrades address additional health and safety issues that are not necessarily related to energy efficiency but provide more holistic outcomes for participants. These measures can include lead-based paint hazard removal, asbestos remediation, incorporating injury prevention home modifications to reduce the risk of falls and injuries for seniors, integrating home repairs or accessibility improvements for those experiencing disabilities, improving indoor air quality or carpet removal for households with children experiencing asthma. Specific examples of programs supporting those most in need with non-energy upgrades are featured in Table 2.

A federal program can adopt these approaches to integrate health and well-being into the delivery capacity of ongoing provincial energy efficiency initiatives and deliver healthy, comfortable homes that meet the needs of vulnerable Canadians.

### Prioritize those most in need

Most existing programs in Canada prioritize households where programs can maximize energy and cost savings from the perspective of the utility across their whole portfolio. This approach incentivizes shallow retrofits in homes that are the easiest to reach.

Rental households are also excluded.<sup>16</sup> Such an approach may potentially leave vulnerable populations without essential upgrades, and not align with broader societal goals of advancing equity, housing affordability, housing conditions and occupant health for vulnerable communities.

**Promising practice:** The US Weatherization Assistance Program works with implementation partners to prioritize seniors, families with young children, individuals with disabilities or chronic conditions, and households spending a disproportionate portion of their income on energy use. The program also works with rental housing. Participating landlords sign an affordability covenant to ensure benefits of energy efficiency primarily accrue to renters in the form of housing affordability and energy bill reductions. A federal program could supplement existing programs and find new opportunities for providing overlapping benefits of efficiency upgrades for those most in need. More information on specific programs and measures offered is available in Appendix A.

### Make homes climate-ready

Most homes participate in energy upgrade programs once in a lifetime. Federal funding can help make these homes climate-ready through supplemental measures. Upgrades in this decade can strive to put Canada on track to eliminate emissions from buildings to meet federal climate targets. This could include measures to improve building envelopes to higher standards to shield homes from extreme weather events, improving access to indoor cooling systems, upgrading electrical systems to enable opportunities for future electrification and where appropriate, switching space and water heating to more efficient and lower-carbon choices such as heat pumps.

---

<sup>16</sup> For an in-depth discussion on how federal government can improve energy efficiency of private rental housing in Canada, see Kantamneni, A., Haley, B. 2023. "Energy Efficiency in Rental Housing: Policy Mixes for Efficient, Affordable and Secure Housing" Efficiency Canada, Carleton University, Ottawa, ON. <https://www.energycanada.org/tenant-report/>.

**Promising practices:** The US Weatherization Assistance Program allows local implementers to develop their own policies for fuel-switching<sup>17</sup> and installing on-site renewable energy systems.<sup>18</sup> The fuel-switching must be paired with envelope improvement measures and must demonstrate cost reductions for each site, however, fuel-switching may be permitted in cases where there is demonstrable value to the health and safety of occupants. The program also permits installation of air conditioning systems and appliances such as energy efficient refrigerators.

A federal program in Canada can build on these approaches and allow local implementers the flexibility to switch fuels to more efficient and low-carbon sources as relevant in their own local contexts and meets program goals of reducing energy costs, and improving the health and well-being of occupants. It is important to note that incentivizing fossil gas heating through retrofit programs runs the risk of “locking [poor households] into expensive gas heating” since costs for gas heating could rise when investments in gas networks are recovered from a decreasing number of customers as more households decarbonize.<sup>19</sup>

## Provide stable funding and dedicated systems of support

Long-term funding is required to ground program priorities in broader objectives of energy poverty, housing and health outcomes, long-term and multi-year goals. Multi-year funding commitments avoid boom-bust dynamics that have previously disrupted energy efficiency supply chains and broken participant trust. The need for stable funding support is another reason for a multi-level governance approach: a federal program that encourages provincial-specific program designs will institutionalize these programs within provincial policy systems and thus provide an added layer of resilience.

---

<sup>17</sup> Weatherization Assistance Program Fuel Switching Policy Template [https://www.energy.gov/sites/default/files/2023-03/OPTIONAL\\_Fuel%20Switching%20Policy%20Template.docx](https://www.energy.gov/sites/default/files/2023-03/OPTIONAL_Fuel%20Switching%20Policy%20Template.docx).

<sup>18</sup> Weatherization Assistance Program Solar PV Policy Template. [https://www.energy.gov/sites/default/files/2023-03/OPTIONAL\\_Solar%20PV%20Initial%20Request%20Form.docx](https://www.energy.gov/sites/default/files/2023-03/OPTIONAL_Solar%20PV%20Initial%20Request%20Form.docx).

<sup>19</sup> IEA. 2022. “The Future of Heat Pumps – Analysis.” <https://www.iea.org/reports/the-future-of-heat-pumps>.

By enabling funding rather than administering programs, the federal government can direct its capacities to make provincial programs more effective through dedicated resources for capacity building, encouraging learning across borders and helping provinces explore policy mixes that complement energy poverty reduction with housing and health outcomes. Examples include detailed data on energy poverty prevalence and patterning, enhancing training and workforce development, decision support tools on retrofit standards, and business supports for contractors undertaking whole-home retrofits.

**Promising practice:** As noted earlier, the Weatherization Assistance Program in the United States has provided stable core program funding to states, territories and Indigenous communities for energy efficiency upgrades on low-income households for close to 50 years. The program is widely regarded as the longest running and most successful US energy efficiency program for its consistent investments in improving the energy performance of homes. In the 48 years since inception, the program has delivered no-cost energy savings upgrades to approximately seven million homes, cutting more than two million metric tons of CO<sub>2</sub> every year and supporting more than 8,500 jobs in communities across the country. The funding flows directly to local implementation partners, who leverage the funding to supplement ongoing programs in line with local circumstances while adhering to high-level program guidelines. The program also allocates a portion of its budget to capacity building<sup>20</sup> in the sector through annual conferences and learning opportunities for the workforce, technical modules on approaching retrofits of all building typologies, energy modeling tools, administrative assistance, best practice recommendations on procurement, program design and delivery, guidance on targeting households most in need, enhancing supports through additional sources of funding, coordinating interventions with other institutions such as health and senior care, and so on.

---

<sup>20</sup> Weatherization Assistance Program Resource Hub: <https://www.energy.gov/scep/wap/weatherization-assistance-program-resource-hub>.

## Bibliography

- Baudu, Charlier, and Legendre 2020. "Fuel Poverty and Health: A Panel Data Analysis." *FAERE Working Paper*, (April 2020)  
[https://faere.fr/pub/WorkingPapers/Baudu\\_Charlier\\_Legendre\\_FAERE\\_WP2020.04.pdf](https://faere.fr/pub/WorkingPapers/Baudu_Charlier_Legendre_FAERE_WP2020.04.pdf).
- Brunner, Spitzer, and Christanell 2012. "Experiencing Fuel Poverty. Coping Strategies of Low-Income Households in Vienna/Austria." *Energy Policy*, Special Section: Fuel Poverty Comes of Age: Commemorating 21 Years of Research and Policy, vol 49 (October 2012): 53–59. <https://doi.org/10.1016/j.enpol.2011.11.076>.
- Charlier and Legendre 2022. "Fuel Poverty and Health: A Shared Agenda for Policy." *Revue d'économie politique* vol 132, no. 2 (2022): 245–72.  
<https://doi.org/10.3917/redp.322.0245>.
- Charlier, Legendre, and Risch 2019. "Fuel Poverty in Residential Housing: Providing Financial Support versus Combatting Substandard Housing." *Applied Economics* vol 51, no. 49 (October 2019): 5369–87. <https://doi.org/10.1080/00036846.2019.1613501>.
- Chen and Feng 2022. "Linking Housing Conditions and Energy Poverty: From a Perspective of Household Energy Self-Restriction." *International Journal of Environmental Research and Public Health* vol 19, no. 14 (July 2022): 8254.  
<https://doi.org/10.3390/ijerph19148254>.
- Committee on Fuel Poverty is an advisory non-departmental public body sponsored by the UK Department for Business, Energy and Industrial Strategy that monitors and reports on progress towards interim milestones and 2030 fuel poverty target.
- Czerwinska 2021. "Fuel Poverty: Retrofitting as a Policy Solution." Ph.D., Ulster University, 2021. <https://pure.ulster.ac.uk/en/studentTheses/3be603d2-486c-40e9-9239-7846fda6c2fc>.
- El Ansari and El-Silimy 2008. "Are Fuel Poverty Reduction Schemes Associated with Decreased Excess Winter Mortality in Elders? A Case Study from London, UK." *Chronic*

*Illness* vol 4, no. 4 (December 2008): 289–94.  
<https://doi.org/10.1177/1742395308090620>.

Energy poverty in United Kingdom defined by Warm Homes and Energy Conservation Act 2000: <https://www.legislation.gov.uk/ukpga/2000/31/contents>.

Energy poverty in France defined by Grenelle 2 Law in 2020:  
<https://ec.europa.eu/social/BlobServlet?docId=25972&langId=en>.

Energy poverty in Ireland defined by Department of Environment, Climate and Communications in the Energy Poverty Action Plan:  
<https://assets.gov.ie/242876/dc4744fb-d2cd-4ba1-b4e1-170cbd77816a.pdf>.

Energy poverty in New Zealand defined by Ministry of Business, Innovation and Employment  
<https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-hardship/defining-energy-hardship/>.

Energy poverty in EU by 2023 Climate Fund Regulation  
[https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/733583/EPRS\\_BRI\(2022\)733583\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/733583/EPRS_BRI(2022)733583_EN.pdf).

Extent of energy poverty and profiles of vulnerability differ between provinces. See Efficiency Canada Low-Income Data Hub: <https://www.energycanada.org/energy-poverty-in-canada/>.

Fernández, et al. (2022). Comparing the financial impact of housing retrofit policies on Dutch homeowners. *IOP Conference Series: Earth and Environmental Science*, 1085(1), 012044.

García-Esquinas, et al. 2016. "Housing conditions and limitations in physical function among older adults." *J Epidemiol Community Health* 70.10 (2016): 954-960

Howden-Chapman et al. 2012. "Tackling Cold Housing and Fuel Poverty in New Zealand: A Review of Policies, Research, and Health Impacts." *Energy Policy*, Special Section: Fuel

Poverty Comes of Age: Commemorating 21 Years of Research and Policy, vol 49 (October 2012): 134–42. <https://doi.org/10.1016/j.enpol.2011.09.044>.

IEA. 2022. “The Future of Heat Pumps – Analysis.” <https://www.iea.org/reports/the-future-of-heat-pumps>.

Kahouli 2020. “An Economic Approach to the Study of the Relationship between Housing Hazards and Health: The Case of Residential Fuel Poverty in France.” *Energy Economics* vol 85 (January 2020): 104592. <https://doi.org/10.1016/j.eneco.2019.104592>.

Kantamneni and Haley 2022. “Efficiency for All: A review of provincial and territorial low-income energy efficiency programs with lessons for federal policy.” Efficiency Canada, Carleton University, Ottawa, ON. <https://www.energycanada.org/low-income-report/>.

Kantamneni and Haley 2023. “Energy Efficiency in Rental Housing: Policy Mixes for Efficient, Affordable and Secure Housing.” Efficiency Canada, Carleton University, Ottawa, ON. <https://www.energycanada.org/tenant-report/>.

Kantamneni, 2024. “Energy Poverty, Housing and Vulnerability in Canada.” Efficiency Canada, Carleton University, Ottawa, ON. <https://www.energycanada.org/energy-poverty-report/>.

Kantamneni and Haley 2024. “Archetypes of Experiences with Energy Poverty in Canada.” Efficiency Canada, Carleton University, Ottawa, ON. <https://www.energycanada.org/archetypes-report/>.

Karpinska and Śmiech 2020. “Invisible Energy Poverty? Analysing Housing Costs in Central and Eastern Europe.” *Energy Research & Social Science* vol 70 (December 2020): 101670. <https://doi.org/10.1016/j.erss.2020.101670>.

Jenkins, Middlemiss, and Pharoah 2011. “A Study of Fuel Poverty and Low-Carbon Synergies in Social Housing.” Monograph, 2011. <https://www.hw.ac.uk/uk/schools/doc/egis/FuelPovertyReport220711.pdf>.



- Lindemann, et al. 2017. "Effect of indoor temperature on physical performance in older adults during days with normal temperature and heat waves." *International journal of environmental research and public health* 14.2 (2017): 186.
- Longhurst and Hargreaves 2019. "Emotions and Fuel Poverty: The Lived Experience of Social Housing Tenants in the United Kingdom." *Energy Research & Social Science* vol 56 (October 2019): 101207. <https://doi.org/10.1016/j.erss.2019.05.017>.
- Ormandy and Ezratty 2012. "Health and Thermal Comfort: From WHO Guidance to Housing Strategies." *Energy Policy*, Special Section: Fuel Poverty Comes of Age: Commemorating 21 Years of Research and Policy, vol 49 (October 2012): 116–21. <https://doi.org/10.1016/j.enpol.2011.09.003>.
- Middlemiss et al. 2018. "Plugging the Gap Between Energy Policy and the Lived Experience of Energy Poverty: Five Principles for a Multidisciplinary Approach." In *Advancing Energy Policy*, edited by Chris Foulds and Rosie Robison, 15–29. Cham: Springer International Publishing, 2018. [http://link.springer.com/10.1007/978-3-319-99097-2\\_2](http://link.springer.com/10.1007/978-3-319-99097-2_2).
- Mould and Baker 2017. "Documenting Fuel Poverty from the Householders' Perspective." *Energy Research & Social Science*, Narratives and Storytelling in Energy and Climate Change Research, vol 31 (September 2017): 21–31. <https://doi.org/10.1016/j.erss.2017.06.004>.
- Raphael et al. 2020. "Social Determinants of Health: The Canadian Facts, 2nd Edition," (October 2020). [https://thecanadianfacts.org/The\\_Canadian\\_Facts-2nd\\_ed.pdf](https://thecanadianfacts.org/The_Canadian_Facts-2nd_ed.pdf).
- Riva et al. 2023. "Energy Poverty: An Overlooked Determinant of Health and Climate Resilience in Canada." *Canadian Journal of Public Health* vol 114, no. 3 (June 2023): 422–31. <https://doi.org/10.17269/s41997-023-00741-0>.
- Sharpe et al. 2015. "Fuel Poverty Increases Risk of Mould Contamination, Regardless of Adult Risk Perception & Ventilation in Social Housing Properties." *Environment International* vol 79 (June 2015): 115–29. <https://doi.org/10.1016/j.envint.2015.03.009>.

Shortt and Rugkåsa 2007. “‘The Walls Were so Damp and Cold’ Fuel Poverty and Ill Health in Northern Ireland: Results from a Housing Intervention.” *Health & Place*, Part Special Issue: Environmental Justice, Population Health, Critical Theory and GIS, vol 13, no. 1 (March 2007): 99–110. <https://doi.org/10.1016/j.healthplace.2005.10.004>.

Thomson et al. 2013. “Housing Improvements for Health and Associated Socio-economic Outcomes.” *Cochrane Database of Systematic Reviews*, no. 2 (2013). <https://doi.org/10.1002/14651858.CD008657.pub2>

Tozer et al. (2024). Equity-Based Energy Retrofits to Address Energy Poverty in Canada.

UK Fuel Poverty Methodology Handbook.

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1138926/fuel-poverty-methodology-handbook-lilee-2023.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1138926/fuel-poverty-methodology-handbook-lilee-2023.pdf).

Vilches, Barrios Padura, and Huelva 2017. “Retrofitting of Homes for People in Fuel Poverty: Approach Based on Household Thermal Comfort.” *Energy Policy* vol 100 (January 2017): 283–91. <https://doi.org/10.1016/j.enpol.2016.10.016>.

Vulnerable Canadians as outlined in the ‘Archetypes of Experiences with Energy Poverty report.

<https://www.cmhc-schl.gc.ca/nhs/guidepage-strategy/priority-areas-for-action>.

Wang, Wang, and Norbäck 2022. “A Systematic Review of Associations between Energy Use, Fuel Poverty, Energy Efficiency Improvements and Health.” *International Journal of Environmental Research and Public Health* vol 19, no. 12 (January 2022): 7393. <https://doi.org/10.3390/ijerph19127393>.

Weatherization Assistance Program Fuel Switching Policy Template.

[https://www.energy.gov/sites/default/files/2023-03/OPTIONAL\\_Fuel%20Switching%20Policy%20Template.docx](https://www.energy.gov/sites/default/files/2023-03/OPTIONAL_Fuel%20Switching%20Policy%20Template.docx).

Weatherization Assistance Program Resource Hub.

<https://www.energy.gov/scep/wap/weatherization-assistance-program-resource-hub>.

Weatherization Assistance Program Solar PV Policy Template.  
[https://www.energy.gov/sites/default/files/2023-03/OPTIONAL\\_Solar%20PV%20Initial%20Request%20Form.docx](https://www.energy.gov/sites/default/files/2023-03/OPTIONAL_Solar%20PV%20Initial%20Request%20Form.docx).

Wright 2004. "Old and Cold: Older People and Policies Failing to Address Fuel Poverty."  
*Social Policy & Administration* 38, no. 5 (2004): 488–503.  
<https://doi.org/10.1111/j.1467-9515.2004.00403.x>.

Zhu et al. 2021. "Toward a Better Understanding of Housing Vulnerability." Simon Fraser University. <https://summit.sfu.ca/item/31641>.

## Appendix A: Promising practices targeting households most in need

An illustrative (but not exhaustive) list of active programs integrating health, housing and wellbeing into energy efficiency programs targeted at those most in need.

Demographic indicator	Underlying vulnerabilities	Program name	Program description	Location
Seniors	Seniors are more susceptible to injuries and falls, and this is exacerbated by cold homes which decreases their mobility.	Connecticut Injury Prevention Weatherization	The program demonstrated significant reductions in falls and injuries for seniors by incorporating injury prevention home modifications alongside energy efficiency improvements.	Connecticut
Seniors	Seniors are more likely to live in older inefficient homes. While several Canadian provinces offer home renovation grants for eligible seniors, they do not typically include efficiency upgrades, making it harder for them to age in place.	Aging in Place Efficiently	For qualifying seniors, a licensed energy auditor, an occupational therapist, and a social worker will help determine the best options for your home within the available budget.	Ann Arbor, Michigan
Seniors	Seniors may not be able to respond adequately to inefficient homes, and may face challenges navigating complex systems of support due to barriers such as complicated online application processes.	Wake County Weatherization Assistance Program	Eligibility and enrollment via direct contact through phone and assistance with filling out forms.	Wake County, North Carolina

Seniors	Seniors may not be able to respond adequately to inefficient homes, and may face challenges navigating complex systems of support due to barriers such as complicated online application processes.	Weatherization Referral and Packaging Program	WRAP is a program designed to bring together many different but complementary services to provide an individualized, comprehensive, long-term solution to the energy problems of frail, low income elderly.	New York
Long-term illness or disability	Canadians with disabilities are disproportionately unemployed or underemployed. People with chronic illness or long-term disabilities may have limited savings or may have additional medical expenses, making it difficult to allocate funds for home improvements.	Civic Works Elder Services	Integrating accessibility improvements and home repairs for the elderly and those with disabilities.	Baltimore, Maryland
Long-term illness or disability	Canadians with disabilities are disproportionately unemployed or underemployed. People with chronic illness or long-term disabilities may have limited savings or may have additional medical expenses, making it difficult to allocate funds for home improvements.	Orange County Master Aging Plan	Unified intake and installation of accessibility modifications such as ramps alongside weatherization improvements for homeowners with disabilities.	Orange County, North Carolina
Long-term illness or disability	Canadians with disabilities are disproportionately unemployed or underemployed. People with chronic illness or long-term disabilities may have limited savings or may have additional	Safe At Home Program	Weatherization and disability upgrades for seniors and individuals with disabilities at any age, based on assessment of mobility issues and trouble navigating indoor and outdoor areas of a home.	Indianapolis, Indiana

medical expenses, making it difficult to allocate funds for home improvements.

Newcomers and minorities	Newcomers to Canada may have negative attitudes towards government programs and be less trusting of authority if they've had harmful experiences with such groups in their home country. Newcomers may also not understand how to read their energy bills, how to manage costs and how to access programs that can help reduce energy use.	emPowerMe	Hires and trains members of underserved communities to deliver multilingual energy efficiency and home safety education.	British Columbia
Newcomers and minorities	A small percentage of newcomers (one in twelve) have no knowledge of either English or French, which poses challenges for accessing conventional support programs.	WA Weatherization	Provides client education guides and information for households in Spanish and English.	Washington
Rural households	Rural Canadian households are more likely to experience (seasonal) unemployment and live in older draftier homes. Rural families who are off electricity or gas distribution networks have to pay up-front for bulk purchase of heating fuels like oil or propane. Remote distances also makes it challenging to access networks of expertise such as heat-pump installers.	Maine Rural Heat Pump Program	Install heat-pumps as secondary heating source to fossil fuel heating alongside weatherization assistance.	Maine

Rural households	Rural Canadian households are more likely to experience (seasonal) unemployment and live in older draftier homes. Rural families who are off electricity or gas distribution networks have to pay up-front for bulk purchase of heating fuels like oil or propane. Remote distances also makes it challenging to access networks of expertise such as heat-pump installers.	Rural Heat Pump Rebates Program	Enhanced rebates on heat pumps and heat-pump water heaters for those heating with oil or propane alongside free energy efficiency upgrades.	Massachusetts
Single parent households	Single-parent households in Canada are more likely to live in older housing and 3 times as likely to experience low income and underemployment. Canadian single parents experience depleted resilience due to significant amount of their time and resources dedicated to caregiving. Canadian single parents are also more likely to self-ration energy use.	Weatherization Assistance Program	Weatherization assistance program requires that local program administrators prioritize vulnerable households, specifically high energy users, households with high energy burden, elderly, disabled and families with children. WAP gives local program administrators flexibility to determine how to prioritize these vulnerable groups.	USA (federal program)
Emergency upgrade	An overwhelming number of heating (and cooling) systems in homes are replaced under the duress of an emergency system failure during the coldest (or warmest) weeks of the year. Low-income households may not have the budget or resources to repair or replace such systems when they abruptly break down -	HEARTWAP	The Heating System Repair and Replacement Program provides emergency heating system repair and replacement services to low-income households.	Massachusetts

missing the opportunity to upgrade to more efficient and/or clean sources of heat.

Emergency upgrade	An overwhelming number of heating (and cooling) systems in homes are replaced under the duress of an emergency system failure during the coldest (or warmest) weeks of the year. Low-income households may not have the budget or resources to repair or replace such systems when they abruptly break down - missing the opportunity to upgrade to more efficient and/or clean sources of heat.	Chicago EHRP	The Emergency Heating Repair Program (EHRP) provides service grants to assist income eligible, owner-occupants of 1-to-4-unit properties with emergency heating system replacements or repairs during the winter season.	Chicago, Illinois
Renters	Renters, regardless of income, have little to no control over making energy efficient upgrades such as envelope improvements. Without adequate protections, renters also face the double jeopardy of risks to housing security from landlords undertaking energy efficiency renovations and passing the costs down, or from renovation.	Weatherization Assistance Program	The Weatherization Assistance Program has covenants in place to ensure benefits of energy efficiency upgrades accrue primarily to tenants, including requiring landlords to freeze rent for a period of time, placing limits on increased value of rental units due to measures installed, and requiring landlords to pay for costs of measures that are not otherwise eligible.	USA (federal program)
Persons with physical limitations	Some households face barriers preparing their homes for energy efficiency upgrades, because they may be unable to	Efficiency Manitoba Site	Assists homeowners in moving belongings to prepare home for energy efficiency upgrades, enabling more homes to participate in the	Manitoba



move belongings and create a clear path for contractors to work safely.

Preparation Service

program, eliminates 'lost jobs' from eligible homeowners that may otherwise decline energy upgrades due to prep work required.

## Appendix B: Knowledge products and mobilization activities

Knowledge products and outputs from this research project.

Knowledge product	Description	Reference/Link
Efficiency Canada Energy Poverty Data Mapping Dashboard	An interactive map and data dashboard to visualize energy poverty and vulnerability across different parts of Canada at different geographic scales.	<a href="https://www.energycanada.org/energy-poverty-in-canada/">https://www.energycanada.org/energy-poverty-in-canada/</a>
Efficiency Canada Energy Poverty Data Map: User Guide	The user guide accompanies the data mapping dashboard, provides an overview of energy poverty and vulnerability, and illustrates how the mapping tool can be used through a use case.	Kantamneni, A. 2024. Efficiency Canada Energy Poverty Data Map: User Guide. Efficiency Canada, Carleton University, Ottawa, ON.
Energy Poverty, Housing, and Vulnerability: A Literature Review	A comprehensive literature review on energy poverty, including an overview of the issue with insights from Canadian contexts, effective methods for defining and measuring energy poverty, the interplay between energy poverty and housing, and an exploration of the	Kantamneni, A. 2024. Energy Poverty, Housing and Vulnerability in Canada. Efficiency Canada, Carleton University, Ottawa, ON.

vulnerability approach to connect housing challenges with energy poverty.

<https://www.energycanada.org/energy-poverty-report/>

Archetypes of Experiences with Energy Poverty

This report synthesizes global strategies, emerging Canadian research on social vulnerability, and feedback from stakeholders working with vulnerable Canadian groups. It highlights energy poverty should be seen as a household's vulnerability to health and housing harms, exacerbated by factors like high energy bills and compounded by barriers such as exclusion from energy efficiency support. This report describes archetypes reflecting the varied experiences of energy poverty, which guide targeted and effective interventions.

Kantamneni and Haley 2024. Archetypes of Experiences with Energy Poverty in Canada. Efficiency Canada, Carleton University, Ottawa, ON.

<https://www.energycanada.org/archetypes-report/>

Efficiency+: Policy Recommendations for Making Energy Poverty Initiatives Work for those Most in Need report

This report makes recommendations for the leadership role that the federal government and national institutions can play in leveraging existing low-income energy efficiency programs to deliver affordable, comfortable, and healthy homes that meet the needs of the most vulnerable Canadians.

Kantamneni, Haley, and Tozer, 2024. Efficiency+: Policy Recommendations for Making Energy Poverty Initiatives Work for those Most in Need. Efficiency Canada, Carleton University, Ottawa, ON.

Knowledge mobilization activities undertaken by this research project.

Product/activity	Type of primary audience
Presentations	
Provinces and Territories Working Group on Climate Change presentation	Provincial employees with primary responsibility for working on climate change in the context of provincial programs
Efficiency Canada DiscoverEE presentation	Energy efficiency sector professionals, policy makers and energy efficiency and housing advocates
Haliburton Enviro-Café presentation	Emergency heating assistance, heat banks and local community groups
AFCAS Congress presentation (French)	Academics, francophonie community
ONWAA Fall Assembly presentation	First nation community leaders, social services administrators, provincial and national Indigenous affairs public sector employees

Workshops

ONWAA Fall Assembly workshop

First nation communities, social services administrators

Efficiency Canada Low-Income Utility Professionals Community of Practice - Energy Poverty Workshops

Utility program administrators in each province with primary responsibility for implementing low-income energy efficiency programs

Co-operative Housing Federation of Canada

Co-operative housing providers, members and staff

PEI Climate Change Coordinators Workshop

Climate change professionals embedded in every provincial department, along with net-zero advisory committee members and efficiency program administrators in the province of PEI