NARUC
National Association of Regulatory Utility Commissioners

Regulators' Financial Toolbox: Emerging Approaches to Building Electrification in Electric and Gas Utility Efficiency Programs

The National Association of Regulatory Utility Commissioners (NARUC) Center for Partnership and Innovation (CPI) Regulators' Financial Toolbox series explores the types of financial tools utility regulators can use to support integration of electricity system technologies that benefit the public interest. This brief was prepared by Jamie Scripps of Hunterston Consulting LLC and is based upon work supported[1] by the U.S. Department of Energy under Award Number DE-OE0000925. The speakers' presentations and recordings can be found at www.naruc.org/cpi-1/electricity-system-transition/valuation-and-ratemaking/.

On May 26, 2022, NARUC presented a Regulators' Financial Toolbox Webinar on Building Electrification. The webinar featured remarks from moderator Joan White, Vermont Public Utility Commission, and panelists Edward Yim, Director of State and Utility Policy, and Dan York, Senior Fellow, State and Utility Policy, American Council for an Energy-Efficient Economy (ACEEE); Mark Schoenheider, Manager, Customer Energy Solutions, Xcel Energy; and Anthony Fryer, Supervisor, Conservation Improvement Program, Minnesota Department of Commerce.

The webinar and this accompanying brief address:

- Building Electrification: Benefits and Trends
- State Examples Incorporating Beneficial Electrification into Utility Programs
  - Demand Side Management Programs
  - Gas Utility Regulation
  - Energy Efficiency Programs for LMI customers
- Stakeholder Engagement
- Resources for More Detailed Information

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Building Electrification: Benefits and Trends

Building electrification is a topic of increasing interest among state and local energy officials, with programs to promote the electrification of space heating, water heating, and other end uses of fossil fuels in buildings on the rise.[2] In its 2022 study titled Building Electrification: Programs and Best Practices, ACEEE found that building electrification programs in 2021 had a collective annual budget of $166 million, reflecting a significant increase over the $108 million reported in 2020.[3]

Growth in building electrification programs has been fueled, in part, by changes to state policy aimed at reducing greenhouse gas (GHG) emissions. ACEEE examined 42 examples of programs to electrify fossil fuels in buildings, finding that leading states are mostly those that set goals and mandates for building decarbonization, such as California, Colorado, Massachusetts, and New York.[4] Of the 42 programs reviewed in its report, most programs offered appliance incentives, with some programs offering incentives for more than one technology type. [5] The vast majority (90%) of electrification incentive programs served single-family homes, with 43% serving multi-family residential buildings, and 26% including commercial buildings.[6] Space heating with heat pumps was the most frequently targeted end-use for incentives, which is likely because it is typically the largest energy use in the average single-family household resulting in higher GHG emissions reductions and energy savings. [7] ACEEE found that some programs offered higher incentives for specific technologies (e.g., ground source heat pumps, cold climate heat pumps).

If enabled by state policies, Commissions have the potential to play important roles in incorporating beneficial electrification into utility programs, including through determination of program budgets and cost-effectiveness tests, weighing in on benefit-cost analysis calculations and criteria, and approving technology pilots and deployment.

Building Electrification and Decarbonization

Because of the role it plays in reducing the burning of fossil fuels, building electrification is a central piece of the decarbonization strategies in many climate action plans and comprehensive energy plans. For this reason, building electrification is receiving significant attention now, and will likely remain relevant into the future. For example, the Intergovernmental Panel on Climate Change (IPCC) Special Report, which calls for net zero emissions around 2050, states: "In energy systems, modelled global pathways … generally meet energy service demand with lower energy use, including through enhanced energy efficiency, and show faster electrification of energy end use compared to 2°C (high confidence)."[8]

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[2] Cohn, C., and N. W. Esram. 2022. Building Electrification: Programs and Best Practices. Washington, DC: American Council for an Energy-Efficient Economy, at p. 4. Available at http://aceee.org/researchreport/b2201.

[3] See Electrification Webinar, NARUC, Presentation by Dan York, ACEEE, at slide 5 (May 26, 2022). Citing Cohn, C., and N. W. Esram. 2022. Building Electrification: Programs and Best Practices. Washington, DC: American Council for an Energy-Efficient Economy. Available at: http://aceee.org/researchreport/b2201

[4] Ibid at slide 3.

[5] Electrification Webinar, NARUC, Presentation by Dan York, at slide 4 (May 26, 2022). Citing Cohn, C., and N. W. Esram. 2022.

[6] Electrification Webinar, NARUC, Presentation by Dan York, at slide 6. Citing Cohn, C., and N. W. Esram. 2022.

[7] See Electrification Webinar, NARUC, Presentation by Dan York, at slide 5. Citing Cohn, C., and N. W. Esram. 2022.

[8] IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T.

Similarly, according to the report Pathways to Deep Decarbonization in the United States: "Reductions are achieved through high levels of energy efficiency, decarbonization of electric generation, electrification of most end uses, and switching the remaining end uses to lower carbon fuels."[9] In the 2021 study titled Net-Zero America: Potential Pathways, Infrastructure, and Impacts, Princeton

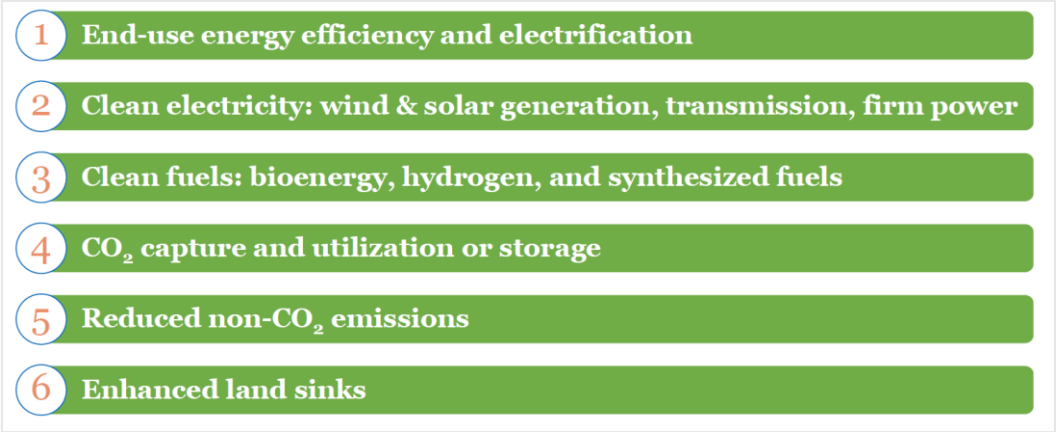

Figure 1: Six Pillars of Decarbonization. Princeton University, Net Zero America (October 2021).

University researchers listed energy efficiency and electrification as the first of six pillars of decarbonization (see Figure 1).[10]

Beneficial electrification is defined as electrification that provides net societal benefits, such as reductions in GHG emissions, primary energy use, and energy expenditures.[11] For participants in electrification programs, additional potential benefits of may include:

- Reduced utility bills
- Lower maintenance costs
- Quieter operations
- Improved control of temperature
- Increased operational precision[12]

Maycock, M. Tignor, and T. Waterfield (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3-24. Available at https://doi.org/10.1017/9781009157940.001.

[9] Williams, J.H., B. Haley, F. Kahrl, J. Moore, A.D. Jones, M.S. Torn, H. McJeon (2014). Pathways to deep decarbonization in the United States. The U.S. report of the Deep Decarbonization Pathways Project of the Sustainable Development Solutions Network and the Institute for Sustainable Development and International Relations. Nov 25, 2014. Available at http://unsdsn.org/what-we-do/deep-decarbonization-pathways/

[10] E. Larson, C. Greig, J. Jenkins, E. Mayfield, A. Pascale, C. Zhang, J. Drossman, R. Williams, S. Pacala, R. Socolow, EJ Baik, R. Birdsey, R. Duke, R. Jones, B. Haley, E. Leslie, K. Paustian, and A. Swan, Net-Zero America: Potential Pathways, Infrastructure, and Impacts, Final report, Princeton University, Princeton, NJ, 29 October 2021. Available at https://netzeroamerica.princeton.edu

[11] Electrification Webinar, NARUC, Presentation by Edward Yim, ACEEE, at slide 2 (May 26, 2022).

[12] See Pickles, David, ICF, "Why electrification benefits cities, states, and the grid—and how utilities can lead the way." 2020. Available at: https://www.icf.com/insights/energy/electrification-benefits-cities-states

Beneficial electrification technologies include, for example, electric water heating, electric space heating and cooling (e.g., heat pumps), and electric vehicle charging.[13] For electric water and space heating and cooling, electrification often occurs when it is time to replace equipment in the home or business.

There are many synergies between energy efficiency and electrification, including:

1) Building shell and other efficiency measures reduce loads, which can reduce equipment sizing and costs
2) At the system level, aggressive energy efficiency can keep electricity demand in check and can lower overall costs to meet new demand from electrification, especially in winter
3) Energy efficiency and demand response programs also provide opportunities to serve the grid as load flexibility, which becomes increasingly valuable under electrification scenarios.[14]

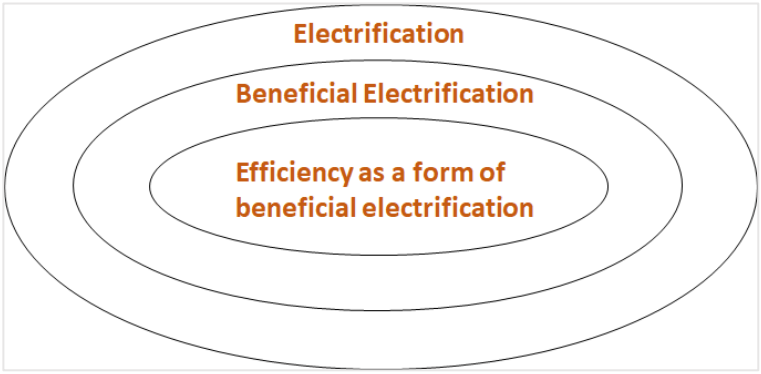

Figure 1: Beneficial Electrification Illustration. Source: Edward Yim, ACEEE.

Building electrification is viewed as a close ally to energy efficiency; when paired and designed to serve a reduced load, electrification and energy efficiency combined can reduce costs and increase comfort for the customer.[15] Figure 2 illustrates the relationships among electrification, beneficial electrification, and energy efficiency.[16]

In its study, ACEEE found that pairing electrification measures with weatherization and conventional energy efficiency is important to maximize impact.[17] The study noted that a tighter thermal envelope can reduce customer operating costs and allows a smaller system to be installed, saving on installation costs, as well.[18] Most existing electrification programs were focused on rebates to end users, but other methods may be more effective at reaching customers and reducing barriers, such as incorporating electrification measures into preexisting home energy upgrade programs or providing midstream or upstream rebates to distributors/suppliers and manufacturers.[19]

[13] See Ken Colburn, Regulatory Assistance Project, "Beneficial Electrification: A Key to Better Grid Management" (January 2017). Available at https://www.raponline.org/blog/beneficial-electrification-a-key-to-better-grid-management/.
[14] Electrification Webinar, NARUC, Presentation by Dan York, at slide 2.
[15] See Cohn, C., and N. W. Esram. 2022, at p. v.
[16] Electrification Webinar, NARUC, Presentation by Edward Yim, at slide 2.
[17] Ibid.
[18] Ibid.
[19] Ibid.

Barriers to Building Electrification

There can be difficulties in implementation of beneficial electrification, in part because state policies and utility regulation have not evolved from traditional views of energy efficiency program design to consider beneficial electrification as a supportive strategy.

A key challenge to beneficial electrification is longstanding state policies that restrict or prohibit fuel-switching, even in states with decarbonization goals.[20] In 2020, ACEEE identified 11 states that prohibited or strongly discouraged fuel switching in state policy or regulation.[21] This number has shrunk recently, with more states, such as Minnesota, amending their rules to allow policies that directly subsidize conversions of fossil fuels to electricity. However, in states where prohibitions remain (e.g., Pennsylvania, Georgia, Texas, and Washington), utility-funded electrification programs will be unable to gain much traction."[22]

Another wrinkle to deploying beneficial electrification is that there are only a limited number of opportunities to electrify through equipment replacement,[23] which typically targets equipment that is nearing the end of its useful life (because replacing equipment prior to that time is often not economically feasible).[24] For this reason, building contractors play an especially crucial role in electrification; their support is important for implementing electrification, but there is a workforce deficit when it comes to qualified installers of heat pumps in many markets. As a result, contractor bias and unfamiliarity with equipment like heat pumps can inhibit market development.[25]

Low- and moderate-income (LMI) customers face significant obstacles to enjoying the benefits of building electrification.[26] These barriers include: 1) access to funding and financing; 2) renter/owner split incentive; 3) higher electricity costs; 4) retrofit challenges in older buildings; 5) multi-unit dwellings; 6) customer/contractor confidence/unfamiliarity.[27] According to ACEEE: "While some programs specifically target the needs of these customers, this segment of the market requires increased attention."[28]

State Examples Incorporating Beneficial Electrification into Utility Programs

If enabled by state policies, Commissions have the potential to play important roles in incorporating beneficial electrification into utility programs, including through determination of program budgets and cost-effectiveness tests, weighing in on benefit-cost analysis calculations and criteria, and approving technology pilots and deployment. Colorado and Minnesota offer recent examples of beneficial electrification programs authorized by PUCs.

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[20] Ibid. at slide 7. Citing see ACEEE, State Policies and Rules to Enable Beneficial Electrification in Buildings through Fuel Switching (July 2022). Available at https://www.aceee.org/sites/default/files/pdfs/state_fuel-switching_policies_and_rules_7-21-22.pdf.

[21] Berg, W. and E. Cooper. 2020. State Policies and Rules to Enable Beneficial Electrification in Buildings through Fuel Switching. ACEEE. www.aceee.org/policybrief/2020/04/state-policies-and-rules-enable-beneficial-electrification-buildingsthrough.

[22] Cohn, C., and N. W. Esram, at pp. 60-61.

[23] Electrification Webinar, NARUC, Presentation by Edward Yim, at slide 4.

[24] See Cohn, C., and N. W. Esram, at p. 54.

[25] See Electrification Webinar, NARUC, Presentation by Dan York, at slide 5. Citing Cohn, C., and N. W. Esram. 2022.

[26] See Electrification Webinar, NARUC, Presentation by Dan York, at slide 5. Citing Cohn, C., and N. W. Esram. 2022.

[27] Ibid. at slide 9. Citing Building Electrification Programs and Best Practices at p. v.

[28] Cohn, C., and N. W. Esram, at p. v.

Colorado: Incorporating Beneficial Electrification into Electric and Gas Demand-Side Management Programs

Xcel Energy in Colorado provides an example of a combined electric and gas utility that is incorporating beneficial electrification into a combined demand-side management strategy against the backdrop of state policy that has encouraged such an approach. In 2021, the Colorado legislature passed the Beneficial Electrification Bill (SB21-246); the Gas Demand Side Management Bill (HB21-1238); and the Clean Heat Bill (SB21-264).[29] Under the Beneficial Electrification Bill, the Colorado Public Utilities Commission sets beneficial electrification targets and the utilities are required to file beneficial electrification plans, which may be combined with DSM and transportation electrification plan (TEP) filings.[30] The Gas DSM Bill requires gas revenue decoupling, incorporates the societal cost of methane, and aims to increase oversight of new gas infrastructure investments. The Clean Heat Bill requires a 4% reduction in GHG emissions by 2025 and a 22% reduction by 2030 from a 2015 baseline. The Clean Heat Bill is technology agnostic, allowing renewable natural gas (RNG), hydrogen, and recovered methane, along with DSM and beneficial electrification, with a 2.5% cost cap.[31]The approach to DSM reflected in the above-described legislative package builds upon Colorado's history with DSM dating back to 2009, when the state's gas DSM program launched and the electric program was expanded.[32]

Procedurally, the Colorado Public Utilities Commission opens a Strategic Issues Docket every 5 years, in which it sets the rules for utility DSM filings, including cost effectiveness methodology, budget caps, goals, and avoided cost methodologies. The Commission also defines the utility's incentive mechanism. Biennial plans set program details.[33]

In its 2021-2022 DSM Plan Filing in Colorado, Xcel Energy adopted the 500 GWh goal set by the Commission in the 2017 Strategic Issues Docket.[34] Xcel set a gas DSM goal, proposing a roughly 20% more aggressive target from 2020 to 0.5% retail sales, with a waiver required for the proposed budget of $18 million.[35] Additionally, in its Gas DSM Filing, Xcel Energy proposed that kWh should not count against Electric DSM goals. The hourly marginal energy price was used as a surrogate for a carbon price, reflecting a decreasing carbon intensity from the utility's electric resource plan (ERP). The social cost of carbon was incorporated into the utility's cost-benefit analyses. Proposed beneficial electrification measures were limited and voluntary due to individual customer bill impacts.[36]

In its filing, Xcel proposed limited beneficial electrification measures to total $1 million. These included: 1) heat pump water heaters; 2) dual-fuel air source heat pumps; 3) all-electric new construction; and 4) custom beneficial electrification. Heat pump participation levels are shown in Figure 3.[37]

[29] Electrification Webinar, NARUC, Presentation by Mark Schoenheider, Manager, Customer Energy Solutions, Xcel Energy, at slide 6 (May 26, 2022).
[30] Electrification Webinar, NARUC, Presentation by Mark Schoenheider, at slide 6.
[31] Ibid.
[32] Ibid. at p. 7.
[33] Ibid.
[34] Ibid.
[35] Ibid.
[36] Ibid.
[37] Ibid.

Heat pump participation

	Electrification	Non-Electrification	Total			Traditional
Mini-Split HP	71	16	87		Central AC	573
CC Mini-Split HP	64	9	73		Evap Cooler	124
HP Water Heater	1	15	16		NG Furnace	1,278
Central ASHP	13	2	15		NG Tankless Wtr Htr	149
GSHP	1	0	1		NG Storage Wtr Htr	23
CC Central ASHP	1	0	1		NG Boiler	22
Total	151	42	193			

Figure 2: Colorado Q2 2022 Heat Pump Participation. Source: Mark Schoenheider, Xcel Energy.

Going forward, Xcel Energy will continue to evaluate opportunities for beneficial electrification that align with its strategic priorities, including a goal of 100% carbon free electricity by 2050 and 1.5 million electric vehicles enabled by 2030.[38]

Minnesota: Incorporating Beneficial Electrification into Energy Efficiency and Conservation Programs

In Minnesota, a combination of energy policy goals have helped to drive both an energy transition and efforts at decarbonization. Historically, the state's Energy Efficiency Resource Standard has provided for energy-savings goals for the electric and natural gas utilities that operate in the state through the Conservation Improvement Program (CIP).[39] Under the state's Renewable Energy Standard, 25% of electric utilities' total retail sales must be met from renewable energy resources by the year 2025.[40] Additionally, the state has committed to reduce GHG emissions 30% by 2030 and 80% by 2050, relative to year 2005 emissions.[41]

Energy savings and optimization are an express goal of the Minnesota legislature, which found "that energy savings are an energy resource, and that cost-effective energy savings are preferred over all other energy resources."[42] The legislature further found "that cost-effective energy savings and load management programs should be procured systematically and aggressively."[43] Recently, the Minnesota legislature updated its approach to energy efficiency with the 2021 Energy Conservation and Optimization Act (the ECO Act), which was signed into law by Governor Walz on May 25, 2021.[44] The result of multiple years of discussion and development, the ECO Act primarily modernizes the CIP framework to provide a more holistic approach to energy efficiency programming.[45]

[38] Electrification Webinar, NARUC, Presentation by Mark Schoenheider, at slide 3.
[39] Approximately 120 electric and natural gas utilities are required to participate in Minnesota's Energy Efficiency Resource Standard, which has helped Minnesota consistently to achieve a top 10 ranking in the ACEEE state efficiency scorecard for over a decade. *See* Electrification Webinar, NARUC, Presentation by Anthony Fryer, Supervisor, Conservation Improvement Program, Minnesota Department of Commerce, at slide 3 (May 26, 2022).
[40] Electrification Webinar, NARUC, Presentation by Anthony Fryer, Supervisor, Conservation Improvement Program, Minnesota Department of Commerce, at slide 3 (May 26, 2022).
[41] Ibid.
[42] Ibid. at p. 5.
[43] Ibid. at p. 4.
[44] Ibid.
[45] Ibid.

Highlights of the ECO Act include that it provides utilities with the opportunity to optimize energy use and delivery through inclusion of load management programs and efficient fuel switching programs. It also raises the energy savings goals for the state's electric investor-owned utilities (IOUs) and more than doubles the low-income spending requirement for all IOUs. The ECO Act also includes activities to improve energy efficiency for public schools.[46]

The ECO Act permits efficient fuel switching improvements. Under the Technical Guidelines, a fuel-switching improvement is deemed efficient if ". . . the improvement, relative to the fuel being displaced: 1) reduces the amount of source energy consumed; 2) reduces statewide GHG emissions over the lifetime of the improvement; 3) is cost-effective, considering the costs and benefits from the perspective of the utility, participants, and society; and 4) is installed and operated in a manner that improves the utility's system load factor.[47]

The **ECO Act Technical Guidance** includes details on the eligibility of multi-family buildings to participate in low-income programs; development of the methodology for determining electric sales associated with electric vehicle charging; and information on whether a fuel switching program meets the criteria, based in part on the amount of energy saved due to a fuel switching improvement.

Source: Minnesota Department of Commerce, Docket No. E,G999/CIP-21-837, Decision in the Matter of Technical Guidance for the Inclusion of Efficient Fuel-Switching, Load Management, and Pre-Weatherization Measures in CIP, Issued March 15, 2022. Available at https://efiling.web.commerce.state.mn.us.

Additionally, under the ECO Act cost-effective load management programs are now allowed under the CIP. Load management programs allow a utility to manage and reduce total system demand, temporarily reduce energy use, or shift energy use to a non-peak period.[48] Following the release of the March 15, 2022 Technical Guidance (see box), modifications to incorporate efficient fuel-switching and load management programs into current triennial plans may be considered.[49] The 2024-2026 triennial plans are likely to represent the first significant introduction of efficient fuel-switching and load management programs.[50]

Next steps for the ECO Act include: 1) the release of the Technical Reference Manual v4.0; 2) cost-effectiveness assumptions; 3) low-income stakeholder meetings; and 4) further research needs.[51]

Minnesota: Enabling Beneficial Electrification and Energy Efficiency within Gas Utility Regulation

In June 2021, Minnesota passed the Natural Gas Innovation Act (NGIA).[52] The statute provides distribution gas utilities with a regulatory pathway for achieving GHG emission reductions through alternative non-natural gas resources. Eligible resources include energy efficiency, strategic electrification, renewable natural gas, power-to-hydrogen, power-to-ammonia, biogas, carbon capture, and district energy. The statute imposes overall spending limits on utility plans that increase over time.

[46] Electrification Webinar, NARUC, Presentation by Anthony Fryer, at slide 12.
[47] Electrification Webinar, NARUC, Presentation by Anthony Fryer, at slide 16.
[48] Ibid.
[49] Ibid. at slide 20.
[50] Ibid.
[51] Ibid.
[52] Ibid. at slide 22.

The Minnesota Public Utilities Commission issued GHG emissions and cost-benefit assessment frameworks on June 1, 2022. Going forward, utilities will implement eligible resources through voluntary five-year plans, with the first plans expected to be filed in late 2022 and early 2023.[53]

Additionally, as required by statute, the Minnesota PUC has also opened a broader docket to evaluate changes to natural gas utility regulatory and policy structures needed to meet or exceed the state's GHG reduction goals.[54]

ACEEE Recommendations for Incorporating Beneficial Electrification into Utility Programs

Recommendations for Regulators

- Remove barriers to fuel switching incentives
- Value climate/GHG impacts in cost effectiveness testing

Recommendations for State Legislators, Government Leaders

- Set concrete building electrification targets within climate plans
- Provide funding for programs for hard-to-reach sectors
- Adopt clean energy/net zero building codes
- Provide workforce training and incentivize heat pump adoption

Recommendations for Utilities

- Expand program offerings
- Phase out incentives for fossil fuel equipment

Recommendations for Contractors

- Receive education and training to install heat pumps

Recommendations for Homeowners and Property Managers

- Plan ahead for replacement of fossil fuel equipment
- Implement energy efficiency and weatherization alongside electrification

Recommendations to Support LMI Households

- Consider partnering with/ tailoring utility programs for affordable housing
- Electrification programs, measures, and incentives should be braided into existing energy efficiency programs

Source: Cohn, C., and N. W. Esram. 2022. Building Electrification: Programs and Best Practices (2022).

Energy Efficiency Programs for LMI customers

Keys to success in designing and implementing programs for building electrification for LMI customers include: 1) setting specific carbon reduction goals; 2) securing adequate funding and financing; 3) establishing collaborations among affordable housing stakeholders; 4) engaging with affordable housing

[53] Electrification Webinar, NARUC, Presentation by Anthony Fryer, at slide 22.
[54] Ibid.

residents; and 5) educating residents, building owners, contractors, and suppliers.[55] Six examples of state, utility and local programs aimed at supporting building electrification for LMI customers include:

California's Low Income Weatherization Program

California's Low Income Weatherization Program is one of largest building electrification programs in the U.S. Since 2016, the program has delivered more than $33 million in incentives, serving more than 8,100 low-income rental households. California's Low Income Weatherization Program is also the first state program specifically to focus on decarbonization.[56]

New York's Empire Building Challenge and Affordable Housing Decarb Pilot

New York's Empire Building Challenge and Affordable Housing Decarb Pilot leverages $50 million in public funding to develop scalable decarbonization strategies for large commercial and multifamily building retrofits, with the New York State Energy Research and Development Authority (NYSERDA) responsible for implementation. The first cohort of the challenge has committed to achieve carbon neutrality in 131 large commercial and multi-family buildings in the next 10-15 years. NYSERDA is also implementing a $24 million pilot program in partnership with the New York City Department of Housing Preservation and Development to fund electrification in affordable housing.[57]

Sacramento Municipal Utility District

To reach the Sacramento Municipal Utility District's goal of 100% carbon-free power by 2030, it offers several incentive programs to address the affordable housing sector, including low-income single family and multi-family subsidized housing and market-rate programs for electrification. The program leverages partnerships with various community organizations, including Habitat for Humanity, Sacramento Housing and Redevelopment Agency, and the Mutual Housing Fund. The program specifically focuses on low-income electrification.[58]

DC Sustainable Energy Utility's Low Income Decarbonization Pilot

DC Sustainable Energy Utility's Low Income Decarbonization Pilot concluded its initial run with 10 total units receiving partial or full conversion to all-electric heating, hot water, and cooking, with distributed solar on the single-family units and a community solar subscription for a 4-unit multi-family complex. The program was provided at no cost to income-qualified participants, with high satisfaction rates among participants. Although the onset of the COVID pandemic created unexpected challenges and complexities, DCSEU is moving forward with more building decarbonization incentives beginning in 2022, based on the success of the pilot.[59]

City of Boston

In 2020, the City of Boston announced that approximately $30 million would be available to affordable housing developers seeking financial support from the city for the construction or rehabilitation of affordable housing. New construction was required to comply with carbon neutral performance

[55] Electrification Webinar, NARUC, Presentation by Dan York, at slide 14.
[56] Ibid. at slide 11.
[57] Ibid.
[58] Ibid. at slide 12.
[59] Ibid. at slide 13.

standards to support the city's climate impact reduction goals.[60] Meeting these carbon neutrality goals will require energy efficiency and electrification, along with renewable energy use.[61]

City of Minneapolis

Minneapolis' 4D Affordable Housing Incentive and Green Cost Share program was created to preserve unsubsidized affordable housing while addressing energy efficiency, resident health, and owner's bottom line. Program elements include a 40% property tax reduction for low-income properties. Owners can receive up to $50,000 per building and 90% of project cost for energy efficiency improvements.[62] Eligible energy efficiency projects include a switch from gas to electric equipment for gas appliances, installation of a cold climate heat pump, and installation of a water heater heat pump.[63]

Supplementing Utility Funding for LMI Beneficial Electrification

Federal government and other programs can supplement utility ratepayer funding for LMI beneficial electrification.

Federal Low-income Housing Tax Credit (LIHTC)

The Federal Low-income Housing Tax Credit (LIHTC) is viewed as a long-standing, prominent tool that could be used to support building electrification for LMI households.[1] Through the LIHTC, state housing finance agencies can incorporate and incentivize green practices into O&M, construction, and rehabilitation of affordable housing properties.[1] Some states may supplement these with state tax credits.

Weatherization Assistance Program

DOE's Weatherization Assistance Program (WAP)---administered through a network of state, local, and community partners---reduces energy costs for low-income households by increasing the energy efficiency of their homes, while ensuring health and safety. WAP is the nation's single largest residential whole-house energy efficiency program. Through the Infrastructure Investment and Jobs Act of 2021, states are slated to receive over $3 billion in additional WAP funding for energy efficiency and electrification, which is enough to retrofit around 450,000 homes.

Source: U.S. Department of Housing and Urban Development, Low-Income Housing Tax Credit. Available at: https://www.huduser.gov/portal/datasets/lihtc.html; U.S. Department of Energy, Weatherization Assistance Program. Available at: https://www.energy.gov/eere/wap/weatherization-assistance-program

Stakeholder Engagement

Stakeholder engagement was important in the lead-up to the passage of Minnesota's ECO Act, with an initial small group convened to determine possible areas of change to the CIP. Once areas of agreement were established, a broader stakeholder group developed specific goals, targets, and language related

[60] Ibid. at slide 14.
[61] Ibid.
[62] Ibid.
[63] City of Minneapolis, Energy efficiency program eligibility. Available at https://www2.minneapolismn.gov/government/programs-initiatives/environmental-programs/green-cost-share/energy-efficiency/

to savings goals, low-income requirements, fuel switching and load management. The first ECO Act bill was introduced in 2019; the ECO Act passed on the third attempt in 2021.[64]

Stakeholder engagement continued after the passage of the ECO Act, with the ECO Coordinating Committee and Working Group process meeting from November 2021 through March 2022, when ECO Technical Guidance was released.[65] The ECO Act stakeholder engagement approach is shown in Figure 4.

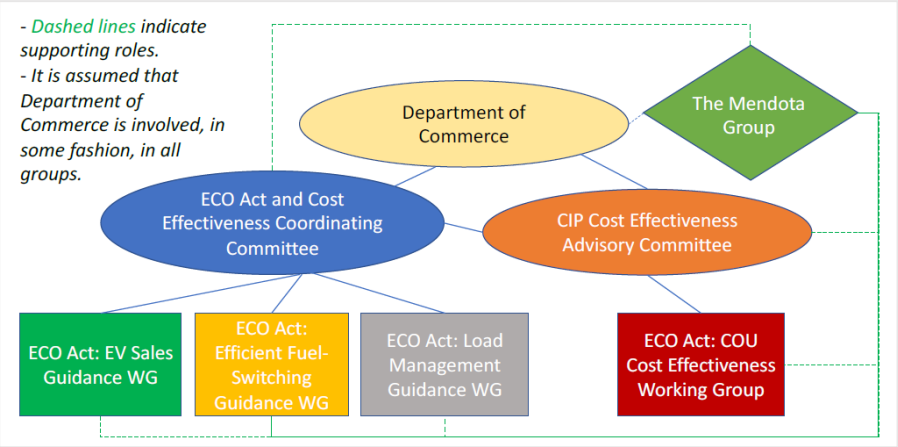

Figure 3: ECO Act Stakeholder Engagement. Source: Anthony Fryer, Minnesota Department of Commerce.

Resources for More Detailed Information

Berg, W. (2022). State Policies and Rules to Enable Beneficial Electrification in Buildings through Fuel Switching. Washington, DC: American Council for an Energy-Efficient Economy. Retrieved from https://www.aceee.org/sites/default/files/pdfs/state_fuel-switching_policies_and_rules_7-21-22.pdf

Cohn, C. and N. W. Esram. 2022. Building Electrification: Programs and Best Practices. Washington, DC: American Council for an Energy-Efficient Economy. Retrieved from http://aceee.org/researchreport/b2201

Intergovernmental Panel on Climate Change. (2018). *Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to.* Cambridge, UK and New York, NY, USA: Cambridge University Press. Retrieved from https://doi.org/10.1017/9781009157940.001

Larson, E., Greig, C., Jenkins, J., Mayfield, E., Pascale, A., Zhang, C., . . . Paustian, K. (2021). Net-Zero America: Potential Pathways, Infrastructure, and Impacts. Princeton, NJ: Princeton University. Retrieved from https://netzeroamerica.princeton.edu

[64] Electrification Webinar, NARUC, Presentation by Anthony Fryer, at slide 4.
[65] Ibid. at slide 16.

Williams, J. B. (2014). Pathways to deep decarbonization in the United States. Sustainable Development Solutions Network and the Institute for Sustainable Development and International Relations. Retrieved from http://unsdsn.org/what-we-do/deep-decarbonization-pathways/

York, D., Cohn, C., Morales, D., & Tolentino, C. (2022). Building Decarbonization Solutions for the Affordable Housing Sector. Washington, DC: American Council for an Energy-Efficient Economy. Retrieved from https://www.aceee.org/sites/default/files/pdfs/u2204.pdf