



March 3, 2023

Submitted via Email (IRAHomeRebates@hq.doe.gov)

Henry McKoy, Director
Office of State and Community Energy Programs (SCEP)
U.S. Department of Energy
1000 Independence Ave., SW
Washington DC 20585

Re: Request for Information (RFI) on the Inflation Reduction Act Home Energy Rebate Programs, Docket No. DE-FOA-0002981 (Jan. 18, 2022)

Dear Director McKoy:

Thank you for the opportunity to respond to the Request for Information (RFI) published by the U.S. Department of Energy's (DOE) Office of State and Community Energy Programs (SCEP) on January 18, 2023. We understand responses to the RFI will be considered as the DOE drafts guidance to state, territorial, and tribal governments on the implementation of residential electrification and efficiency rebate programs (home energy rebate programs) established by the Inflation Reduction Act of 2022 (IRA).¹ As requested, this document only responds to questions that are relevant to our associations, member companies, and their employees and consumers. We stand ready to discuss our responses further or provide additional information upon request.

- 1. Please provide your contact information, including your name, organization, type of organization (state government, non-profit/community organization, individual, etc.), phone number, and email address.**

These responses are respectfully submitted by the National Propane Gas Association (NPGA) and the National Energy & Fuels Institute (NEFI) (together, the Group). The Group thanks the DOE for supporting the deployment of efficient home appliances and for seeking public input on matters that are crucial to providing consumers with accurate information about the cost, efficiency, and associated emissions of those appliances. Thoughtful, targeted, and cost-conscious deployment of these rebates can result in higher efficiencies and, in turn, considerable energy savings and emissions reductions for heating oil and propane gas (together, delivered heating fuel) consumers. This is particularly true for older homes, rural areas, and less affluent households that more commonly utilize these fuels.

NPGA is the national trade association of the propane industry with a membership of about 2,500 companies, and 36 state and regional associations that represent members in all 50 states. Membership in NPGA includes retail marketers of propane gas who deliver the fuel to the end user, propane producers, transporters and wholesalers, and manufacturers and distributors of equipment, containers, and appliances. Propane gas fuels millions of installations nationwide for home and commercial heating and cooking, in agriculture, industrial processing, and as a clean air alternative engine fuel for both over-the-road

vehicles and industrial lift trucks. Roughly 75% of NPGA’s members have fewer than 100 employees and are considered small businesses. More information can be found at www.npga.org. Inquiries may be directed to Vice President of Regulatory and Industry Affairs and General Counsel Benjamin Nussdorf at (202) 355-1321 or bnussdorf@npga.org.

NEFI represents wholesale and retail distributors of liquid heating fuels, including conventional and renewable-fuel blended home heating oil. Most of our retailer members, often referred to as “fuel dealers,” are small family businesses that deliver warmth and comfort to more than five million American homes. 85% of our consumers reside in the Northeast, from Maryland to Maine.² Many fuel dealers are also full-service companies that sell, install, and service residential and commercial heating, ventilation, and air conditioning (HVAC) systems, including liquid fuel (i.e., oil- and biofuel-fired) furnaces, boilers, and water heaters, as well as air-conditioners and heat pumps. Inquiries may be directed to Vice President James Collura at (202) 441-8857 or jim.collura@nefi.com.

2. What best practices can program administrators and other relevant stakeholders (e.g., retailers, contractors, or community-based organizations) use to ensure that disadvantaged communities and low-income households are aware of and have easy access to the Home Energy Rebate programs?

The Group recommends program administrators utilize the Low-Income Home Energy Assistance Program (LIHEAP) to disseminate information on the availability of IRA home energy rebates. To qualify for the LIHEAP benefit, federal law establishes a cap on household income of (1) no more than the greater of 150% of the Federal Poverty Guidelines (FPG) or 60% of the State Median Income, and (2) no less than 110% of FPG.³ It is reasonable to assume that a household that qualifies for LIHEAP also meets the low-income criteria set forth in the IRA. Utilities and delivered heating fuel businesses that serve LIHEAP-eligible households retain information on LIHEAP customers and should be leveraged to assist with outreach to these households through direct mail, bill-stuffers, and emails. We recommend that rebate program administrators reimburse energy providers for costs associated with these communications, perhaps at a rate of \$10.00 per household. This outreach can be done through the LIHEAP program in all states.

5. How can the Home Energy Rebate programs help to minimize energy burden and costs, particularly in low- and moderate-income (LMI) and high energy burden households?

The Home Energy Rebate programs can minimize burdens on low-to-moderate income (LMI) households by prioritizing appliance upgrades and retrofits that yield the highest energy savings for the lowest possible cost. In other words, these programs should take a “highest impact, lowest cost” approach to each home served by considering efficiency based on the full-fuel cycle, showing the overall cost and efficiency of an appliance. These programs must avoid burdening LMI households with high recovery costs, and so the payback period must be considered, especially for heat pump installations.

A 2021 analysis of the 2014-2019 Massachusetts Whole-Home Air-Source Heat Pump Pilot Program found the cost for installing a heat pump system in a home with a conditioned square footage of about 1,500 sq. ft. was often well over \$20,000.⁴ Note, however, this

amount has not been adjusted for inflation, increased labor costs, and supply constraints in the HVAC sector. It is therefore likely the total cost will approach \$25,000 or even \$30,000. Costs continue to rise due to several factors will take years to resolve, including the national shortfall qualified professionals.⁵ Even if a homeowner is eligible for the maximum rebate of \$14,000, he or she will be left with a remaining cost that approaches or exceeds five figures – a *significant* cost burden for low-income households.

Homes that install electric heat pumps often require the legacy furnace or boiler be retained as a backup system, particularly in regions that regularly experience prolonged cold periods.⁶ This is widely considered industry best practice, as the backup liquid or gas heating system will be needed to alleviate a potential shortfall of the available low ambient temperature due to inefficiencies of the heat pump system.⁷ Retaining such systems will ensure families have sufficient heat during the coldest parts of the winter, thereby securing their health and safety. It is therefore recommended that state electrification rebate programs permit the contractor to leave the existing furnace or boiler in the home.

To further reduce homeowner costs, the IRA allows rebates to be combined with relevant tax incentives, such as the newly expanded federal home efficiency improvement credit offering up to 30% for qualified installations and retrofits (subject to certain limits).⁸ It is important to note that federal and many state tax credits for residential efficiency improvements are non-refundable, meaning the homeowner or renter must have tax liability to claim all or part of the credit. Many low-income households do not carry tax liability and therefore will not benefit from these tax credits, which increases the share of project costs for which they are personally responsible. State Home Energy rebate programs should therefore encourage contractors to market other non-governmental incentives including rebates offered by manufacturers and non-profit organizations. For example, the National Oilheat Research Alliance (NORA) offers rebates for replacement of less efficient boilers and furnaces, aging storage tanks, and certain other system modifications and equipment installations that have been shown to significantly improve system performance, reduce GHG emissions, and lower costs.⁹ Financing programs, particularly those that do not require significant collateral, should also be promoted along with IRA rebates, such as those provided by the National Energy Improvement Fund.¹⁰

6. What types of program design approaches, guidelines, tools, savings analyses, policies or reviews can help discourage contractors from using rebates for upgrades that will likely result in higher annual household energy bills, particularly for low-income households?

To avoid upgrades that result in higher annual household energy bills, particularly for low-income households, it is essential that program designs be modeled on a “highest impact, lowest cost” approach, as per the Group’s answer to Question #5 (above). As noted, whole-home conversions from liquid and gas fuels to electric heat pumps will result in much higher costs than upgrades to the existing system. Project considerations should include both the increase or decrease in annual energy costs *and* total amortized costs of the project for which the rebates are being applied. For the performance-based, whole-home efficiency rebates, state implementation plans should adhere strictly to Building Performance Institute

(BPI) 2400 standards as required by the IRA.¹¹ This will ensure that energy audits prioritize improvements to yield the highest possible savings for a home.

9. What are best practices for implementing successful ‘point of sale’ rebates, including when considering contractor needs?

The RFI defines “point of sale” as “[t]he point at which the recipient of the rebate pays (or authorizes an entity to access a rebate on their behalf) for the covered equipment, improvement, and/or service (e.g., when purchasing in-store, through a distributor, at wholesale on-site, or online, or when entering into a contract with a contractor).”¹² We believe one of the best ways to implement a point of sale rebate is for wholesalers to serve as rebate aggregators, and deduct the value of the rebate from appliance purchases in-store, through a distributor, or online. Unfortunately, the IRA Home Energy rebates are structured in such a way that this may not be possible. Given the complexities of these programs, particularly the need for income verification and energy savings calculations, it is preferable that recipients apply for the rebates directly. Alternately, they may authorize contractors to do so on their behalf, so rebates values may be included in their invoice.

The Group believes it is vital that the DOE’s guidance document and state implementation plans recognize that delivered heating fuel providers are often small businesses with around two-dozen full-time employees, most of which are technicians, delivery drivers, and customer service or sales representatives.¹³ Many are plagued with the same workforce shortages and employee retention issues affecting other sectors of the U.S. economy. As a result, not all of our members have back offices large enough to verify eligibility and process large numbers of rebates on behalf of their customers. Failure to support small HVAC service providers that wish to participate in IRA Home Energy rebate programs will result in millions of underserved households. This is particularly true for rural and less affluent communities more likely to be served by these smaller providers.

18. How should DOE, states, tribes, and territories measure success? Examples may include high customer satisfaction, measured or estimated benefits (e.g., impacts on energy, bills, emissions, health, or peak demand), quality job creation, valuation of home upgrades or overall efficiency, etc. What specific data is needed to evaluate progress toward these recommended metrics of success?

The Group strongly recommends the DOE and state program administrators gauge success by calculating the real efficiencies achieved and resulting cost savings to the homeowner. When assessing these savings, states should include not only the resulting increase or decrease in energy costs, but also the amortized costs related to a project, after rebates. Amortization should be calculated over a five-year average due to price volatility and variability. This focus on reducing consumer costs is in keeping not only with the intent of Congress in establishing these programs, but also the overall goal of reducing inflation as stated in the name of the underlying law. As mentioned previously, great care must be taken to not increase energy burdens on rebate recipients, especially for LMI households. Other beneficial outcomes including emissions reductions and related health benefits are certainly worth noting but are secondary to reduced energy cost burdens for the purpose of measuring the success of these programs. However, if states decide to measure greenhouse

gas emissions (GHGs) in the context of measuring relative program efficacy, they must be required to (1) conduct a full accounting of lifecycle GHG emissions for both the appliance and source heating fuel, including emissions from baseload, intermediate, and peak power generation; and (2) consider the significant and low-cost emissions reductions from renewable fuels that can be utilized seamlessly in today's modern and efficient oilheat and propane systems, such as biodiesel and renewable propane, and other next-generation biofuels being developed for these markets.¹⁴

20. How should these programs be designed to spur durable market demand for efficient and electrified homes? How can program designs best assure continued funding and financing for home efficiency and electrification improvements even after these funds have been depleted?

During the Home Energy Rebates Program Public Engagement Presentation in December 2022, the agency listed an objective of the IRA's Home Energy Rebate programs as "[h]elp[ing] households across the US enjoy lower energy bills and more comfortable homes." We encourage the agency to consider appliance efficiency on the basis of the full-fuel cycle, showing the overall cost and efficiency of the appliance. For instance, on average, rural locations or areas where large local distribution systems are lacking, delivered heating fuels are often better choices for consumers who prioritize energy efficiency and overall cost considerations.¹⁵ It is vital that consumers be provided information that accurately reflects these regional differences, and studies show that consumers do care about energy efficiency when it comes to household appliances.

Market research suggests that consumers have a strong desire to select appliances that are more cost-effective, and consumers have expressed an interest in energy equity.¹⁶ Cost-effectiveness is a key driver of consumer choice for household appliances.¹⁷ In a 2018 study conducted by the Propane Education & Research Council (PERC), a large majority of residential audiences said it is a very or somewhat high priority for their home to be energy efficient, with cost savings and environmental considerations regarded as the most important reasons for wanting to be energy efficient.¹⁸ A 2022 survey of Northeast heating fuel consumers found support for electrification drops significantly when they learn the facts about installation costs and questionable cold weather performance of heat pumps, and utility rate increases and potential for blackouts likely to result from substantial new demand on the region's electric grid.¹⁹ Warnings of widespread blackouts are not hyperbole. Both ISO New England and PJM recently report that anticipated increases in demand due to widespread electrification will result in grid "imbalances" because policy-driven fossil fuel plant retirements are outpacing plans for replacement generation resources and demand response.²⁰ The Group urges that consumers be made aware of potentially adverse outcomes of widespread electric appliance adoption to avoid negative backlash, programmatic failure, and abandonment of these programs in the future.

22. Should program administrators establish set-asides or limits concerning the distribution of the rebates (e.g., bundled packages, disadvantaged communities, income or other definitions, incumbent heating fuel in the home, high-impact measures)?

Except for targeting rebates to low-income households and vulnerable communities as required under the IRA, the Group believes government rebate programs should maximize consumer choice and not obstruct or impede fair market competition. In fact, the IRA's performance-based, whole-home efficiency rebate program was specifically designed by Congress to be fuel agnostic and technology-neutral, allowing for maximum flexibility in choosing home improvements that yield the highest possible energy savings. Further, the electrification and efficiency rebate programs should not discriminate based on "incumbent heating fuels." Rather, rebates should be offered on an equitable basis to all homeowners and renters based on income eligibility, consistent with the IRA's focus on lower-income households, irrespective of what heating fuels they are currently using or plan to use.

27. While the electrification rebates allow for application in both new construction and existing buildings, are certain uses more likely to deliver greater benefits? For example, should electrification rebates focus primarily on existing buildings where such improvements are less likely to happen without additional funds? Are there important other applications (e.g., new construction of affordable housing, other?)

Limited funds for the IRA's electrification rebates will have the greatest impact if they are deployed in support low-income Americans seeking to retrofit smaller housing units that can be conditioned more efficiently by heat pumps, such as urban apartments and condos. The electrification rebates should also support construction of affordable housing, as higher costs associated with the installation of all-electric appliances and heating systems are more likely to be subsidized. These policies would be consistent with the President's Justice40 initiative and the IRA's emphasis on prioritizing funds for low-income households and vulnerable communities.

37. What types of documentation should be considered sufficient for rebate applicants to demonstrate that they meet income eligibility requirements (e.g., prior year tax return, verification of other federal benefit program eligibility, or recent paystubs)?

- (a) What are common barriers to effective income verification for LMI households and what industry practices are less effective or should be avoided?**
- (b) How long should a household's determination of eligibility last?**
- (c) Are there examples of programs that have demonstrated high levels of compliance while allowing self-attestation to establish income eligibility? Some programs determine income eligibility by address, such as if 80 percent of more of the census tract has a certain income. What are the benefits and drawbacks of this approach?**

As mentioned in the Group's response to Question #2, large numbers of low-income populations already participate in LIHEAP, which is administered by states, territories, and tribal governments. Because criteria for LIHEAP eligibility meets or exceeds that of the IRA, households that receive this benefit should automatically qualify for the Home Energy Rebate programs without having to go through a lengthy approval process. For households not enrolled in the LIHEAP program, the DOE should establish an online portal for

individuals to verify income eligibility privately and securely. It is imperative that these rebate programs do not burden contractors with responsibility for income verification.

40. For the Home Efficiency Rebates, how should DOE support program implementers in selecting, developing, and implementing the modeled and/or measured energy efficiency path? What factors will drive decisions to implement a modeled program, a measured program or both programs?

Some states and industry groups already utilize programs for the modeling and/or measuring of residential energy efficiency that are consistent with BPI 2400, which as previously noted is required by the IRA. It is important that the DOE and state, territorial, and tribal governments allow for flexibility in the implementation of the efficiency rebate programs so HVAC software platforms can be adopted that meet requirements of a particular state's climate, consumer preferences, or traditional energy marketplace.

42. What recommended methodologies or standards could be used by states/programs to calculate energy savings and associated impacts, such as greenhouse gas emissions reductions? What software is used to implement that methodology? What are the key inputs and features?

As mentioned in the Group's response to Question #18, states that measure GHG emissions in the context of the rebate programs be required to (1) conduct a full accounting of lifecycle emissions for both the appliance and source heating fuel, including emissions from baseload, intermediate, and peak power generation; and (2) consider the significant and low-cost emissions reductions from renewable heating fuels that can be utilized seamlessly in today's modern and efficient oilheat and propane systems, such as biodiesel and renewable propane, and other next-generation biofuels being developed for use in these markets. The DOE has repeatedly recognized the Argonne National Laboratory's *Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET)* as the preferred model for measuring lifecycle emissions for various fuels, products, and energy systems, and it should be applied consistently by the states.²¹

In a recent study, the National Oilheat Research Alliance (NORA) completed an evaluation of the energy, cost, and GHG emissions reductions associated with their equipment replacement rebate program.²² Recognizing that this equipment is dominated by combined heat and domestic hot water systems, the Annual Fuel Utilization Efficiency (AFUE) was not used to estimate fuel use reduction. Instead, prior work on combination systems and some basic system characteristics were used to estimate potential energy savings. This was validated through an examination of actual fuel use reduction in a subset of the 6,400 home sites included. The average savings were found to be 20%. It is therefore recommended that states adopt this fuel use reduction methodology to estimate savings that more accurately reflect field results than AFUE alone.

43. What software tools provide any of the following capabilities?

- (i) Energy usage calibration consistent with BPI 2400**
- (ii) Open-source advanced measurement and verification**
- (iii) Savings valuation based on time, location, or greenhouse gas emissions**

- (iv) Third-party certified documentation of the work scope and predicted impacts**
- (v) Other capabilities of interest, including but not limited to use of standard data schemas (e.g., HPXML), application programming interfaces (API) integrability, etc.**

Proprietary BPI 2400 compliant software applications currently in use by contractors and utilities to measure home energy performance are not designed to estimate potential GHG reductions, nor is it reasonable to assume they can be retooled for this purpose. To calculate the value of an IRA efficiency rebate for which a consumer is eligible, the home's efficiency gains alone should be calculated. At a state's option, estimates of GHG reductions could be calculated in determining overall program efficacy, however this should be conducted in a manner consistent with recommendations found in the Group's responses to Questions 18 and 42.

45. The Home Efficiency Rebates refer to savings based on “time, location, or greenhouse gas emissions.” Please provide input on best practices for calculating savings based on these factors. How should program administrators value these savings in comparison to homeowner energy usage and bill reductions?

The Group believes cost-effective building efficiency improvements are the quickest means to achieve federal and state climate-related commitments. The International Energy Agency (IEA) agrees, noting that “if the world was to implement all of the cost-effective energy efficiency measures, based on existing technology, it would lead to a peak in energy-related GHG emissions before 2020 and by 2040.”²³ As previously stated, for homeowners that use delivered fuels, energy efficiency improvements combined with renewable heating fuels such as biodiesel and renewable propane are the fastest and least costly means to realizing significant reductions to GHG emissions, especially when compared to whole home conversion to an electric heat pump system. End-use emissions alone do not account for total GHG emissions from a given appliance. Electric appliances and equipment produce nearly no emissions at the site of use, but the mix of U.S. electricity generation that powers them does. Externalities of energy use should be included in customer information and can be accurately achieved by including such emissions over the full fuel cycle.²⁴

47. The Home Electrification Rebates specifies that qualified electrification projects must include the purchase and installation of certain equipment or materials. Should other related improvements (e.g., smart thermostats, sensors and controls, LEDs) be allowable as part of a qualified electrification project for the purposes of calculating total project costs which can in turn affect the final rebate amount?

Yes. Installation of required equipment or materials including smart thermostats, thermal sensors, electronic controls, and other improvements are important for the safe and successful installation and operation of heating appliances, and therefore should be included in the final rebate amount. Any and all associated costs should be included when calculating the rebate (up to \$8,000 under the IRA) for the installation of a qualified heat pump.

However, it is worth noting that additional electrical system improvements may be necessary for any home electrification project. The DOE should take a similarly expansive approach when defining “required equipment and materials” for the calculation of rebates for electric load service center upgrades (up to \$4,000) and electrical wiring (up to \$2,500).

55. What practices are needed to ensure quality installations? Please provide examples of how existing efficiency or electrification programs track quality installations by contractor.

The Group suggests that appropriate state or local building permits be obtained, where required, before a contractor begins qualified work. Adequate contractor training will be essential to developing an established pool of contractors that are BPI-certified.

59. Is there anything else DOE should be aware of as it develops program design guidance and support for these rebate programs?

The delivered heating fuels industries are making significant advancements in offering low-carbon fuels to consumers. The National Oilheat Research Alliance (NORA), which was established by Congress in 2000, has advanced this change with programs and research to decarbonize the liquid fuel that is providing energy to our homes, businesses, and commercial industries.²⁵ The Propane Education and Research Council (PERC), which was established by Congress in 1998, has also advanced Renewable Propane, as a seamless pathway to reduce GHG emissions.²⁶

Currently, NORA is testing 100% renewable fuels for liquid heating at its Research Center. PERC has coordinated research in Renewable Propane for GHG emission reductions. [footnote] Powering heating appliances with low-carbon renewable fuels will drastically reduce carbon emissions while allowing consumers to benefit from the opportunities provided through the Inflation Reduction Act of 2022. Almost all of the current liquid heating fuel equipment manufacturers have approved 20-percent (B20) blends of renewable fuels in their equipment today, and with the recent approvals of the 100-percent (B100) burner standard from Underwriters Laboratories (UL), B100-certified equipment is available in the market this year. Similarly, Renewable Propane is fully compatible with existing and higher efficiency propane gas heating equipment.

As part of its 2023 education curriculum, NORA will be providing BPI certification programs to support the home energy rebate provisions of the IRA.

Respectfully submitted,



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1 Pub. L. 117-169, Sections 50121 and 50122

2 U.S. Census Bureau, *American Community Survey (ACS)*, liquid heating fuel (i.e., fuel oil, kerosene, etc.) use by Occupied Housing Units, Five-Year Avg. (2017-2021), calculated as a percentage of total state occupied housing units.

3 42 U.S.C. § 8624(b)(2)(B)

4 Uglietto, Joe, *Cost of Residential Air Source Heat Pumps*, Diversified Energy Specialists, September 24, 2021.

5 Ramukar, Amrith, *America is trying to electrify. There aren't enough electricians.*, Wall Street Journal, February 28, 2023. <https://www.wsj.com/articles/america-is-trying-to-electrify-there-arent-enough-electricians-4260d05b> (visited March 1, 2023).

6 622 out of 16,572 applications for retrofit rebates under the Massachusetts pilot program, or less than 4%, were whole-home conversions to heat pump systems that had capacity to supply 100% of the annual heat load of the home. "Based on the application data, Diversified Energy Specialists estimated that 92.8% of the 622 retrofit installations retained their existing central heating system as a supplemental heat source." (Uglietto, pp.1-2).

7 Islam, Neehad, et al., *Development of a Best Practices for Integrated Hydronic and Ductless, Air-source Heat Pump Systems*, National Oilheat Research Alliance Research and Education Center, Plainview, NY, May 2021.

8 I.R.C. § 25C

9 Butcher, Dr. Thomas, et al., *Report on Equipment Upgrade Incentive Project*, National Oilheat Research Alliance, Research and Education Center, Plainview, NY, December 2021.

10 <https://www.neifund.org>

11 42 U.S.C. § 18795(b)(1)

12 See the RFI at Page 3.

13 2022 *Oilheat and Propane Survey Reports*, Gray Gray & Gray, August 22, 2022, Page 11. Survey reports may be requested online at <https://www.gggllp.com/energy-survey-results-2022>.

14 For information on renewable fuels being used today to significantly reduce greenhouse gas emissions in the heating oil and propane markets, such as biodiesel and renewable propane, visit <https://mybioheat.com> and <https://propane.com/environment/stories/renewable-propane-a-cleaner-energy-source>.

15 See GTI Energy, Energy Planning Analysis Tool, Residential State Level Comparison, <https://cmicepatcalc.gti.energy/> (the tool calculates and compares annual energy cost, source energy consumption, and greenhouse gas emissions, as well as criteria pollutant emissions, associated with site energy consumption by purchased energy form for alternative technologies providing the same energy services) (last visited Dec. 19, 2022).

16 ACUPOLL, Project #210606, *Final Report, Testing Messaging Statements to Determine What is Most Impactful to Consumers* (June 2021) (the top ranked message among respondents in this Project was "Propane equipment generally lasts much longer than electric appliances, and usually costs 40-60% less to operate, making propane a much more cost-effective solution").

17 Deloitte, *Energy Management: Navigating the Headwinds*, Deloitte Resources 2016 Study, <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/energy-resources/us-er-deloitte-resources-2016-study.pdf> ("keeping my energy bills affordable" noted as the most important energy issue).

18 The Harris Poll, *ZNE Home Survey*, Propane Education & Research Council (Dec. 4, 2018).

19 Survey conducted by Warm Thoughts Communications, March-April 2022. Questions, sample sizes, and methodologies differ for each Northeast state. Contact Rich Carrione at rcarrione@warmthoughts.com for details.

20 See *New England clean energy goals slam into oil reality*, E&E News, January 18, 2023; and *Energy Transition in PJM: Resource Retirements, Replacements, & Risks*, February 24, 2023.

21 <https://www.energy.gov/eere/bioenergy/articles/greet-greenhouse-gases-regulated-emissions-and-energy-use-transportation>

22 <https://f542d7.p3cdn1.secureserver.net/wp-content/uploads/2021/11/NORA-Rebate-Report-Nov-2021-1.pdf>

23 <https://www.iea.org/reports/multiple-benefits-of-energy-efficiency/emissions-savings>

24 PERC, *Understanding Carbon Intensity Regional Collection*, <https://propane.com/resource-catalog/resources/understanding-carbon-intensity-regional-collection/> (last visited Dec. 19, 2022) (finding that measuring a fuel's carbon intensity helps to capture emissions across the full life cycle of an energy carrier — and reveals the truth that conventional propane is often a cleaner residential energy choice than grid electricity).

25 For more information on renewable liquid heating fuels, visit <https://noraweb.org/category/biofuels>.

26 For more information on renewable propane, visit <https://propane.com/about-propane/renewable-propane> and <https://propane.com/environment/stories/renewable-propane-to-zero-carbon-and-below>.