

## Electrify for Peace

### Replacing 5.3 million American households' oil-fired appliances with electric heat pumps

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Description	Cost	Impacts
Invest to replace oil-fired equipment of 5.3 million American households with electric heat pumps.	\$40B	<ul style="list-style-type: none"><li>- Eliminate consumption of 71 million barrels of oil.</li><li>- Reduce annual GHG emissions by 31 million metric tonnes.</li></ul>

#### Key Facts on Oil Use in Homes:

- Approximately 5.3-5.7 million households across the country use fuel oil as their *primary* space heating fuel, and 7.3 million households use it for *some portion* of their space heating needs.<sup>1</sup> In addition, 3.5 million households use fuel oil as their primary water heating fuel. The average household consumption of fuel oil for space heating is about 440 gallons per year, and for water heating about 150 gallons per year.<sup>2</sup>
- This means **we can eliminate consumption of 71 million barrels per year if we electrify all oil-burning households.**<sup>3</sup> After on-highway and farm uses (aka diesel fuel), the residential sector is the largest consumer of distillate fuel oil, consuming just over 3 billion gallons of fuel oil for space and water heating every year.
- These households are overwhelmingly located in the New England and Middle Atlantic regions,<sup>4</sup> and oil is used predominantly in homes built before 1950.<sup>5</sup> Figure 1a shows a county-level distribution of oil consumption by households.
- Fuel oil represents a significant expense for these households, with an average heating season expenditure of \$1,200-1,800.<sup>6</sup>

<sup>1</sup> <https://www.eia.gov/outlooks/steo/pdf/wf01.pdf>,

[https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html?s\\_areas=00000&s\\_year=2019&s\\_tablename=TABLE3&s\\_bygroup1=1&s\\_bygroup2=1&s\\_filtergroup1=1&s\\_filtergroup2=1](https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html?s_areas=00000&s_year=2019&s_tablename=TABLE3&s_bygroup1=1&s_bygroup2=1&s_filtergroup1=1&s_filtergroup2=1)

<sup>2</sup> <https://www.eia.gov/consumption/residential/data/2015/c&e/pdf/ce4.6.pdf>

<sup>3</sup> <https://www.eia.gov/petroleum/fueloilkerosene/pdf/foks.pdf>

<sup>4</sup> [https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html?s\\_areas=00000&s\\_year=2019&s\\_tablename=TABLE3&s\\_bygroup1=16&s\\_bygroup2=1&s\\_filtergroup1=1&s\\_filtergroup2=1](https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html?s_areas=00000&s_year=2019&s_tablename=TABLE3&s_bygroup1=16&s_bygroup2=1&s_filtergroup1=1&s_filtergroup2=1)

<sup>5</sup> [https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html?s\\_areas=00000&s\\_year=2019&s\\_tablename=TABLE3&s\\_bygroup1=4&s\\_bygroup2=1&s\\_filtergroup1=1&s\\_filtergroup2=1](https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html?s_areas=00000&s_year=2019&s_tablename=TABLE3&s_bygroup1=4&s_bygroup2=1&s_filtergroup1=1&s_filtergroup2=1)

<sup>6</sup> <https://www.eia.gov/outlooks/steo/pdf/wf01.pdf>

### Benefits of Replacing Oil Use in Homes:

- Electric heat pumps are now a viable option for space and water heating across all regions where oil is currently used in homes. This is driven by the superior performance of this electric equipment and the significant energy bill savings realized by these households.
- Even in the coldest parts of New England, Efficiency Maine has been rolling out heat pump programs with great success.<sup>7</sup> In Maine, the average household replacing fuel oil equipment can expect to save \$540 per year on their space heating bills and another \$166 on their water heating bills.<sup>8</sup>
- Electric heating also brings stability to household energy bills, as the recent price spikes in oil<sup>9</sup> reflect the volatility inherent in fossil fuel markets.<sup>10</sup>

### Cost and Financing Strategies to Replace Oil Use in Homes:

- To electrify all homes using oil would require approximately \$160B in capital, but luckily nowhere close to this amount must be supplied by the federal government. We assume an average total cost per household of \$30,000, sufficient to cover installation of a whole-home cold-climate heat pump, in addition to any necessary electrical improvements and weatherization work.
- First, there are already many incentive programs in place at the state level that can supplement this effort.<sup>11</sup> These programs could contribute approximately \$20B to the effort to electrify these households—assuming these programs do not run out of funds.
- Second, because oil-burning households don't currently get their heat from a utility grid, electrifying them would grow utilities' revenue substantially. If all 5.3M households using oil as their main fuel converted their appliances to electric heat pumps, this new electricity demand would increase utilities' annual sales revenue by roughly \$5B. This recurring revenue would quickly add up: over 20 years with a 0.25% discount rate, utilities would bring in approximately \$98B in new revenue. This opportunity would bring utilities to the table as a cost sharing partner to the federal government; if they supplied 75% of the capital (\$74B), they would still see \$25B in new revenue over the next 20 years.
- Finally, federal investments could also be conditioned on rate-based financing of capital improvements. In this way, some of the significant ongoing energy bill savings can be

<sup>7</sup> <https://www.efficiencymaine.com/at-home/ductless-heat-pumps/>

<sup>8</sup> <https://www.rewiringamerica.org/policy/bringing-infrastructure-home-report>

<sup>9</sup> <https://www.pressherald.com/2022/03/08/home-heating-oil-prices-in-southern-maine-break-the-5-per-gallon-mark/>

<sup>10</sup> <https://www.rewiringamerica.org/policy/energy-bill-security>

<sup>11</sup> Including <https://www.efficiencymaine.com/at-home/ductless-heat-pumps/>, <https://www.masssave.com/saving/residential-rebates/heat-pump>, <https://www.nhec.com/heat-pumps/>, <https://www.efficiencyvermont.com/rebates/list/heat-pump-heating-cooling-system>, <https://www.nationalgridus.com/Services-Rebates.aspx>,

used to defray the upfront investments for electrification. Based on average fuel prices over the five years, the annual savings in household bills is estimated at \$3.1B if all oil-burning households are electrified. Based on current U.S. average prices of \$5/gallon for heating oil,<sup>12</sup> that savings grows to approximately \$5.6B per year. In Figure 1b, we show total savings by county for upgrading oil burning equipment to electric heat pumps. Assuming the 5-year average prices, if half of the savings are retained by the homeowner, over a 10 year financing period approximately \$15B is available.

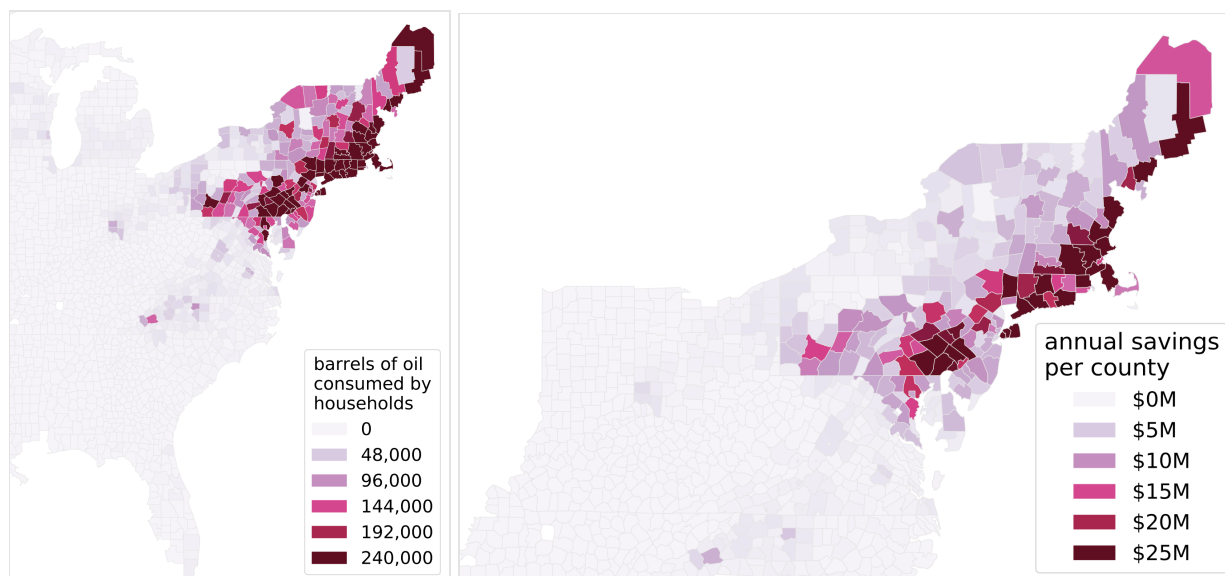
- This leaves a shortfall of roughly \$40B which could be supplied by the U.S. government at a leverage ratio of approximately 4:1. This investment could take the form of a conditioned payment to utilities. Alternatively, it could directly cover the heat pump cost, while allowing other parties to cover electrical upgrades or required weatherization work.
- If this program were limited to **low-income households**<sup>13</sup> burning fuel oil, the number of households reached would be approximately 1.9 million. The distribution of these households is shown in Figure 2. The federal share of a program to electrify the appliances of these households is approximately \$13B, the reduced oil demand is 23 million barrels per year, and the emissions avoided is approximately 10MMT.
- If this program were limited to **very low-income households**<sup>14</sup> burning fuel oil, the number of households reached would be approximately 1.2 million. The distribution of these households is shown in Figure 2. The federal share of a program to electrify the appliances of these households is approximately \$9B, the reduced oil demand is 16 million barrels per year, and the emissions avoided is approximately 7MMT.
- If instead we limit this program based on total funding levels, the impacts are shown in the remaining rows of the table below:

Cost	Households reached	Annual demand reduced	Annual emissions reduction (MMT)
\$40B	5.3M	71 million barrels of oil	31 MMT
\$10B	1.3M	18 million barrels of oil	8 MMT
\$4B	500k	7 million barrels of oil	3 MMT
\$1B	130k	1.8 million barrels of oil	0.8 MMT
\$13B	1.9M low-income HHs	23 million barrels of oil	10 MMT
\$9B	1.2M very-low-income HHs	16 million barrels of oil	7 MMT

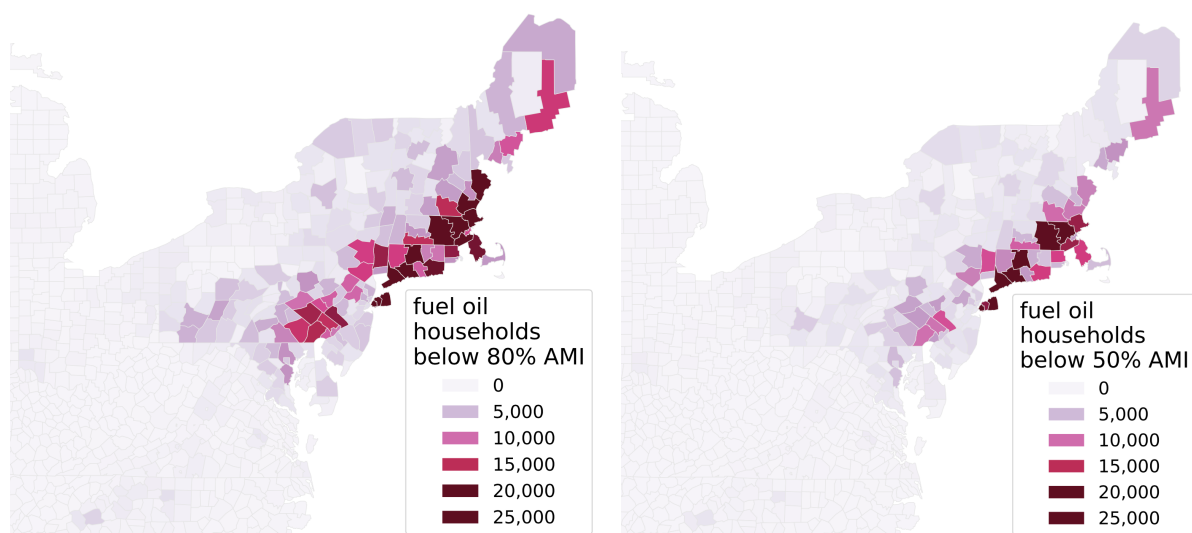
<sup>12</sup> <https://www.eia.gov/petroleum/heatingoilpropane/#itn-tabs-2>

<sup>13</sup> Defined as a household earning less than 80% of the area median income.

<sup>14</sup> Defined as a household earning less than 50% of the area median income.



**Figure 1:** a) Barrels of heating oil consumed by households, broken by county. b) Estimated total bill savings by county after converting all oil-burning households in each county to electric heat pumps.



**Figure 2:** a) Estimated number of fuel oil households qualifying as low-income (below 80% of area median income). b) Estimated number of fuel oil households qualifying as very-low-income (below 50% of area median income).