Applied Economics Clinic
Economic and Policy Analysis of Energy, Environment and Equity

POLICY BRIEF

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# Paying for Clean Energy, 25 Cents at a Time

**This Applied Economics Clinic policy brief addresses a hypothetical question: What could a 25-cent per month electrification surcharge on Massachusetts consumers' electric bills buy? We present a menu of investment options that the Commonwealth could pursue using the revenue from one year and from ten years of a new 25-cent electrification surcharge, such as: installing high-speed electric vehicle chargers; installing electric air-source heat pumps; providing used-electric vehicle rebates; and providing zero-interest loans on used electric vehicle purchases. These kinds of investments would make clean technologies more broadly accessible to Massachusetts households—especially those with moderate to low income.**

## What is electrification?

Electrification is the replacement of heating fuels and gasoline with electricity, by switching from oil boilers and gas furnaces to modern electric air-source or ground-source heat pumps and from gasoline-powered to electric vehicles. Electrification increases electric sales and can reduce harmful emissions when paired with adding renewables to the electric grid.

Massachusetts law requires that 20 percent of electric supply come from renewables in 2020, and 2 percentage points more in each year thereafter (reaching 80 percent in 2050), offering a path to greener energy while helping the state reach its clean energy and climate goals. As of 2019, residents of 47 Massachusetts towns choose to receive electricity with an even larger share of renewable sources than mandated by state law, and therefore gain even more environmental benefits from electrification measures.

At present, all electric customers in Massachusetts pay a 50-cent per megawatt-hour (MWh) surcharge on their electric bills to fund renewable energy development in the Commonwealth. However, the average residential customer in Massachusetts only uses about a half a MWh per month, meaning the average household pays about 25 cents per bill. Another $4.40 (on average) on each monthly bill pays for the share of renewables that currently supply power to the Commonwealth, via the purchase of renewable energy credits (RECs).

## What an extra 25 cents buys

In 2018, Massachusetts collected more than $26 million from its existing renewable energy surcharge on electric bills and another $422 million from the sale of RECs. What could an additional 25-cent electrification surcharge on customers' monthly bill buy? (That is, another $24 million per year in revenue, after administrative costs.[1]) Table 1 provides a menu of some of the electrification options that the Commonwealth could pursue with $24 million per year.

**Table 1. 25-cent surcharge options for Massachusetts**

| Menu of 25-Cent Electrification Options |
|---|
| **With 1 year of electrification surcharge revenue:** |
| Install 490 quick-charge electric vehicle chargers; or |
| Install 2,400 electric air-source heat pumps; or |
| Provide 16,000 $1,500 used electric vehicle rebates; or |
| Provide 28,000 zero-interest electric vehicle loans. |
| **With 10 years of electrification surcharge revenue:** |
| Install one quick-charge electric vehicle charger per 7 miles of road; or |
| Switch 1.2% of households heating with oil and gas to electric air-source heat pumps; or |
| Provide used electric vehicle rebates for 17% of low-income households; or |
| Provide zero-interest electric vehicle loans for 31% of low-income households. |

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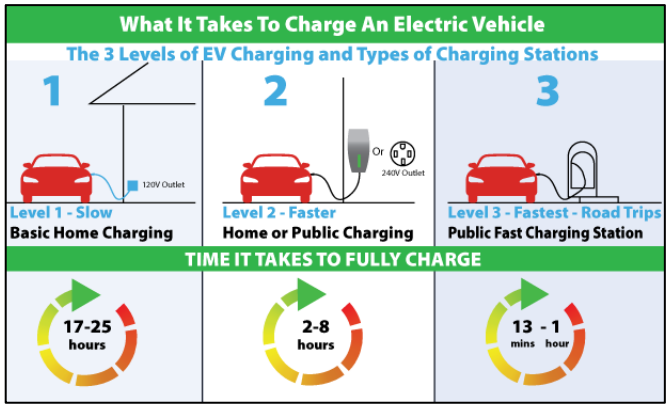
## Electric vehicle charging stations

For one year's worth of a 25-cent electrification surcharge revenue ($24 million), the Commonwealth could purchase and install nearly 490 Level 3 ("quick charge") electric vehicle chargers, at approximately $50,000 per charger. (The cost of connecting electric vehicle chargers to the grid is already funded by National Grid and Eversource.)

Currently, there are about 1,800 slower (Level 1 and 2) electric vehicle charging stations and 270 fast charge (Level 3) charging stations in the Commonwealth. Charging an electric vehicle from empty to full can take up to 25 hours with Level 1 or 2 chargers—limiting their use in a large-scale transition to electric vehicles. Fast Level 3 chargers, on the other hand, can charge a car 80 percent in as little as 13 minutes (see Figure 1).

**Figure 1. Electric vehicle charger levels**




*Source: Reproduced from Terry White's Tech Blog. July 1, 2019. Available at: [https://terrywhite.com/is-it-finally-time-to-get-an-electric-vehicle/](https://terrywhite.com/is-it-finally-time-to-get-an-electric-vehicle/).*

With 36,000 miles of roadway in Massachusetts, that means there is currently one Level 3 charger for every 133 miles of road. If the Commonwealth were to install 490 new quick chargers—there would then be a Level 3 electric vehicle charger for every 48 miles of road.

Ten years of 25-cent surcharge revenue could purchase and install nearly 5,000 Level 3 chargers—or one for every 7 miles of roadway in the Commonwealth.

## Used electric vehicle rebates

From 2014 through September 2019, the "Massachusetts Offers Rebates for Electric Vehicles" (MOR-EV) program offered $2,500 rebates on purchases of new electric vehicles. The $2,500 rebate was reestablished in January 2020, and the MORE-EV program now also offers a $1,500 rebate on purchases of new hybrid electric vehicles. By only offering this rebate for the purchase of new vehicles, the MORE-EV program has the unfortunate effect of primarily benefitting the middle and high-income households that can afford to purchase and/or finance a new vehicle. Extending this rebate to include the purchase of used vehicles, would make this benefit available to more low- and moderate-income households.

With one year of 25-cent surcharge revenue, the Commonwealth could provide additional rebates dedicated to used electric vehicles: 16,000 $1,500 rebates, or 9,600 $2,500 rebates.

With ten years of revenue, Massachusetts could provide a $1,500 rebate to 17 percent of the 915,000 low-income households in the Commonwealth (those earning less than $48,000 per year). This would go a long way to reducing financial barriers to electric vehicle purchases and lowering the operating costs of vehicle ownership for low- and moderate-income households. (Electric vehicles are more expensive to purchase but less expensive to operate than their gasoline-powered counterparts.)

## Electric vehicle zero-interest loans

The average price of a used electric vehicle in the United States ($15,000) is already about $5,000 less than that of a used gasoline-powered vehicle. This discount is the result of subsidies to new electric vehicles (a federal tax credit and a Massachusetts state rebate reduce the amount paid for a new electric vehicle, savings that get passed along in the used car's sales price) and also because electric vehicles are assumed to depreciate more quickly than gas vehicles do.[2]

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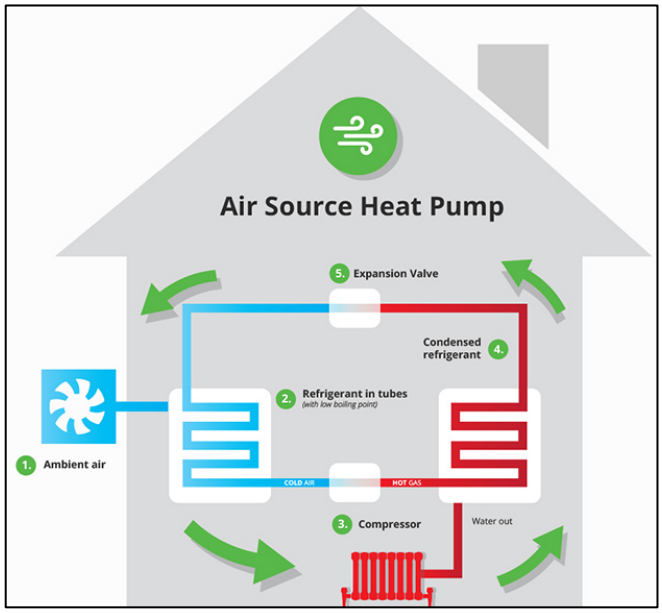
Massachusetts' existing MassSave HEAT Loan program offers interest-free loans (up to $25,000) for households to switch from oil or gas heating to electric air source heat pumps. Like the existing electric vehicle rebate for new vehicle purchases, the HEAT Loan program primarily benefits middle and high-income households (that are disproportionately White) because only homeowners (and not renters) are eligible. Offering a similar zero-interest loan for the purchase of used electric vehicles could benefit low- and moderate-income households (that are disproportionately Black, Latinx and/or Indigenous in Massachusetts).

One year's worth of 25-cent surcharge revenue would pay for 28,000 zero interest loans for used vehicles costing $15,000 (at deferred interest costs of approximately $850 each). Ten years' worth of revenue could pay for 280,000 zero-interest loans—or loans to almost one-third of all low-income households in the Commonwealth.

**Figure 2. Air source heat pump illustration**



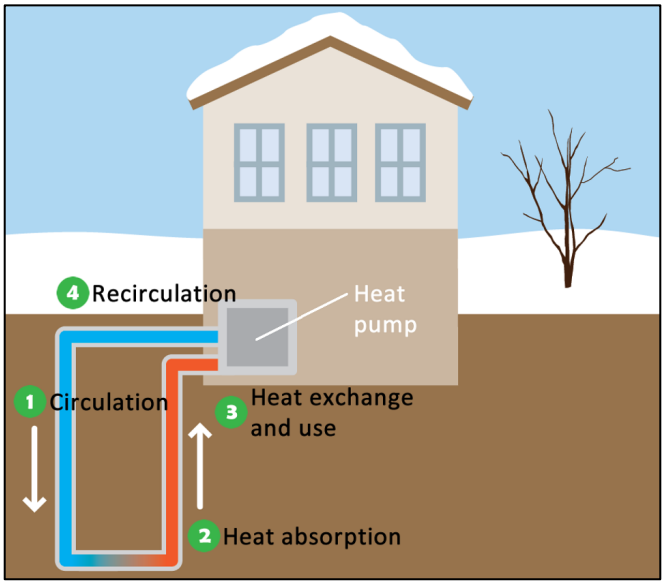

*Source: Reproduced from Ways 2 Go Green. 2018. A Brief Introduction to Air Source Heat Pumps. Available at: https://www.ways2gogreenblog.com/2017/10/18/a-brief-introduction-to-air-source-heat-pumps/.*

## Heat pump subsidies

The average[3] price to purchase and install a heat pump in Massachusetts (accounting for the rebates provided by MassSave) is $10,000 for an air-source heat pump (see Figure 2 for an illustration) and $47,000 for a ground-source heat pump (see Figure 3).

In Metro Boston, the median low-income household pays almost 7 percent of their monthly income in energy costs, while the median across all income levels is less than 3 percent. By switching from less efficient oil and gas heating to more efficient electric heating/cooling, such a program could help alleviate the higher energy burden faced by low-income households if administrated to achieve this goal.

**Figure 3. Ground source heat pump illustration**




*Source: Reproduced from Koones, S. 2019. Geothermal Systems For Energy Efficiency, Comfort And Cost Savings. Forbes. Available at: https://www.forbes.com/sites/sherikoones/2019/10/31/geothermal-systems-for-energy-efficiency-comfort-and-cost-savings/#34a6a4aa187a.*

One year of the 25-cent surcharge revenue would pay the entire post-rebate cost to switch 2,400 homes from oil and gas heating to an air-source heat pump or 500 homes to a ground-source heat pump.

Ten years of revenue could switch 1.2 percent (24,000 homes) of the 2 million Massachusetts homes heating with oil and gas to an air-source heat pump, or more than 5,000 homes heating with oil and gas to a ground-source heat pump.

## Notes

[1] We assume that 10 percent of collected revenue (or $2.6 million) goes towards administrative costs.

[2] Source: Montoya, R. March 5, 2018. "The Pros and Cons of Buying a Used EV". Edmunds. Available at: https://www.edmunds.com/car-buying/the-pros-and-cons-of-buying-a-used-ev.html.

[3] The average price is weighted by total system size (capacity), which varies widely from one home to the next and impacts the total system cost.

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