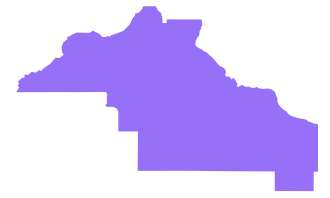


# Minnesota 02

## Benefits of Household Electrification



Electrifying the U.S. economy is the foundation for how we get to a clean grid by 2035, zero emissions by 2050 and have a shot at keeping climate warming within 1.5 °C.

**The household is the keystone of American infrastructure:** 42 percent of our energy-related carbon emissions are the result of decisions we make around our kitchen table: what cars we drive, how we power and heat our homes, how we warm our water, cook our food, and dry our laundry. There are 121 million households in the U.S., which each have a handful of machines that run on oil, gas, or antiquated “electric resistance” technology that will need to be replaced at the end of their useful life: furnaces, baseboard heaters, stoves/ovens, water heaters, clothes dryers, and fossil-fuel vehicles.

To power their new electric replacements, like **induction cooktop stoves, heat pump space heaters, and heat pump water heaters**, we will need **upgraded breaker boxes** that increase the energy capacity of our homes. This would prepare households for the next step: electric vehicles (EVs), EV chargers, solar roofs and battery storage to power it all. Every time we miss an opportunity to replace an appliance with a clean, electric alternative, we extend the life of our fossil fuel infrastructure by the useful life of that machine – for at least a decade, and maybe two. Altogether, these electrified and solar households will become an extension of the grid, capable of generating a third of our national energy needs.

**How do we get there?** We have all the technology we need now – no moonshots required. We just need to lower upfront purchase and installation costs so that household decisions and contractor recommendations are based on benefits, not price tags.

### OTHER BENEFITS OF U.S. HOUSEHOLD ELECTRIFICATION



Monthly utility bills will be lower for at least 103.0 million out of 121 million households, in every U.S. county, as a result of more efficient heat pump space heating and water heating units.



Millions of new jobs will be created, across every zip code – jobs that cannot be automated or offshored – as electricians, plumbers, and solar installers, as well as in manufacturing, finance, and other indirect sectors.



The savings are particularly meaningful for low- and moderate-income (LMI) households. LMI households have 3x the energy burden (the portion of their income spent on home energy) as other households.

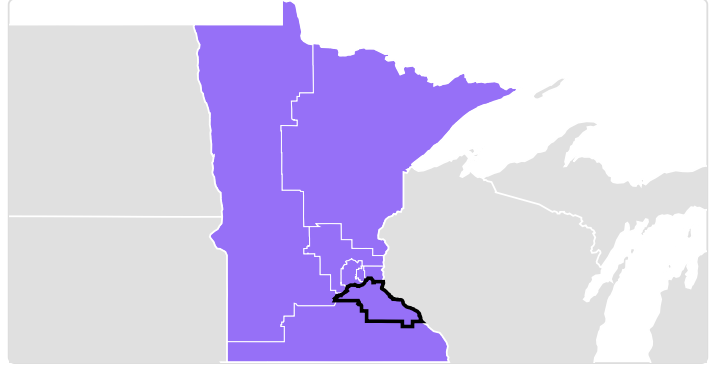


Cleaner air indoors and out; studies show children in homes with gas stoves are 42% more likely to experience asthma symptoms than children in homes with electric stoves, and outdoor air pollution from residential buildings is now responsible for ~15,500 premature deaths annually<sup>1</sup>.

# Minnesota 02 Household Savings

## LOWER BILLS

At least **43% of households in Minnesota 02** – 112 thousand – could **save \$41 million a year** on energy bills if they were using modern, electrified furnaces and water heaters instead of their current machines.



## LARGE SAVINGS

These households – which currently use electric resistance, fuel oil, or propane for heating – will **save an average of \$369 per year**

	# of Furnaces	Avg. savings if electrified	# of Water Heaters	Avg. savings if electrified
Electric Resistance	28.1K	<b>\$349 / yr</b>	95.5K	<b>\$264 / yr</b>
Fuel Oil	1.1K	<b>\$347 / yr</b>	62	<b>\$210 / yr</b>
Propane	14.2K	<b>\$231 / yr</b>	16.6K	<b>\$164 / yr</b>

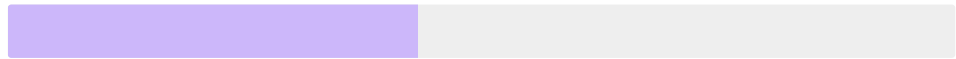
\* Minnesota 02 is one of the districts where the ratio of natural gas to electricity prices is such that electrified heating is not yet cheaper. We expect this to change, given the trajectory of heat pump technology improvements.

## EVERYONE BENEFITS

Of the households that save, **43% are low- and moderate-income**. Each year, they would **save an average of \$365**.

Low- and moderate-income households are those making up to 80% of local area median income

43% of households that save in Minnesota 02 are LMI



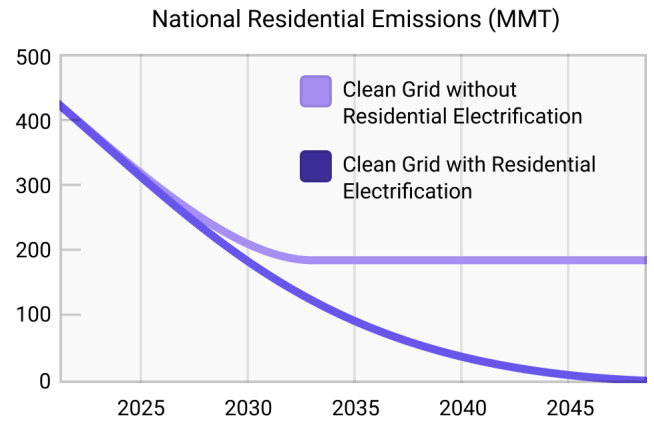
**4 in 10 adults would have difficulty covering an unexpected \$400 expense.**

Source: Federal Reserve

## Minnesota 02 Additional Benefits





### REDUCE EMISSIONS

Furnaces, water heaters, dryers, and stoves account for at least **95% of residential building emissions** but are replaced just once every **10-25 years**. Unless we choose modern, electrified replacements for these machines, we will continue to need dirty infrastructure to power our homes, never getting to zero emissions.



### CREATE JOBS

Electrification would create **500 installation jobs** in Minnesota 02. Nationwide, it would further generate **230,800 additional installation jobs**, **80,000 manufacturing jobs** that Minnesota 02 can compete for, and **800,000 indirect and induced jobs**, including in Minnesota 02.

	<b>Installation</b>	Electricians, plumbers, contractors...
	<b>Manufacturing</b>	Factory, assembly line, and supply chain workers...
	<b>Indirect</b>	Truck drivers, welders, mine engineers, accountants...
	<b>Induced</b>	Service, retail, food & beverage workers, teachers...

### IMPROVE HEALTH

Electrifying these appliances would address the **42% increased risk of children experiencing asthma symptoms** associated with gas stove use. Such indoor pollution disproportionately affects low-income households with smaller homes.

Furthermore, outdoor air pollution from residential buildings currently accounts for **852 premature deaths in Minnesota (state-wide)** per year<sup>1</sup>.

Sources: Utrecht University, UCLA, Harvard University

Indoor Pollutants Emitted By Gas Stoves	
<b>NO<sub>2</sub></b>	Nitrogen Dioxide
<b>PM<sub>2.5</sub></b>	Particulate Matter (2.5 microns)
<b>CO</b>	Carbon Monoxide
<b>HCHO</b>	Formaldehyde

<sup>1</sup>These values are based on additional analysis from Jonathan Buonocore, Sc.D, the study's lead author, RMI used median estimates from the results of 3 reduced complexity models used in: Jonathan J Buonocore (Harvard T.H. Chan School of Public Health) et al, "A decade of the U.S. energy mix transitioning away from coal: historical reconstruction of the reductions in the public health burden of energy", 2021 Environ. Res. Lett. 16 054030, <https://doi.org/10.1088/1748-9326/abe74c>