Heat Pumps

Clean Heat Cool Savings

STOP *MAKING* HEAT

START *MOVING* HEAT

Part 1:
Heat Pump Overview

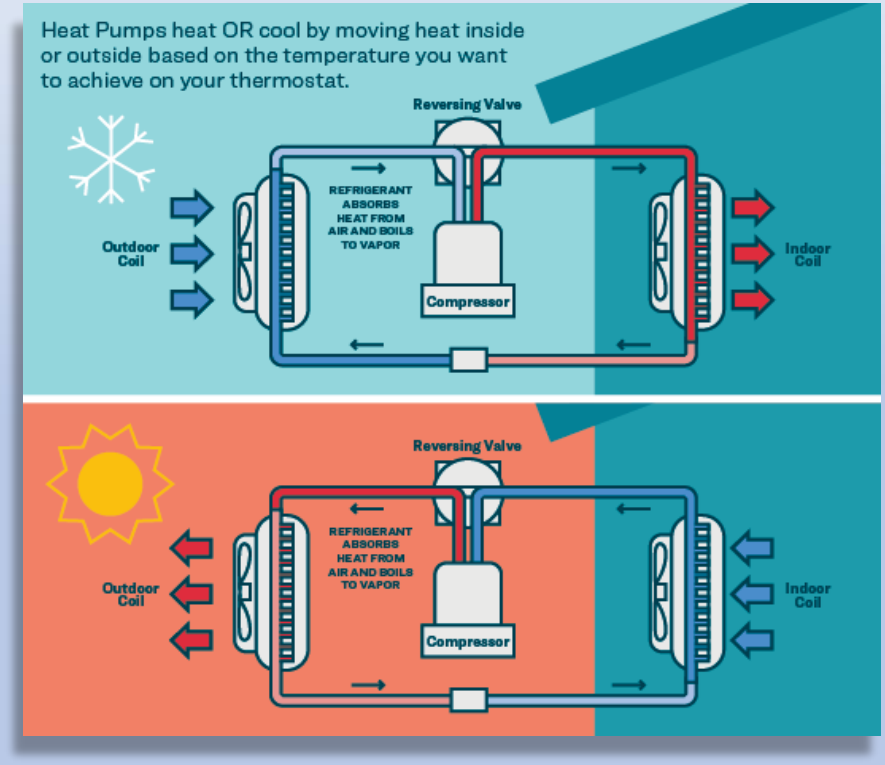
What is a Heat Pump? How Does it Work?

https://cleanheat.ny.gov/how-they-work/

https://cleanheat.ny.gov/assets/pdf/CHC-SFR-HP-buyingguide-br-1-v4_acc.pdf

Heat pumps move heat between the ground or air outside and the air in your home.

- During cold months, heat is pulled from outside and moved into your home.
- During warm months, heat from your home is pulled out and moved outside.



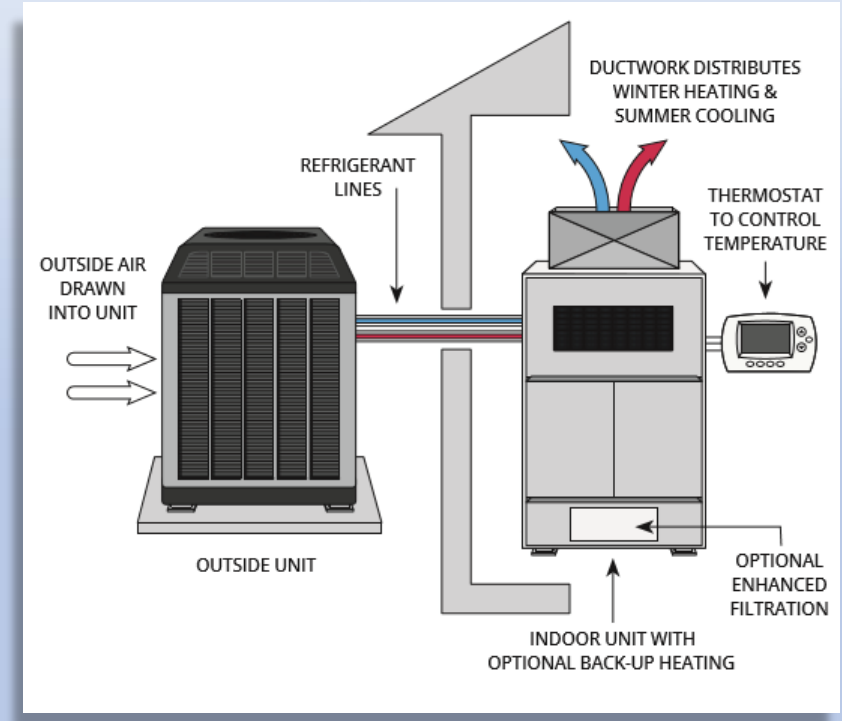
Types of Heat Pumps

https://cleanheat.ny.gov/compare-your-options/

Air Source

Ducted

- Most common type
- Outdoor unit connected to central indoor unit
- Indoor unit spreads heated or cooled air throughout your home using air ducts



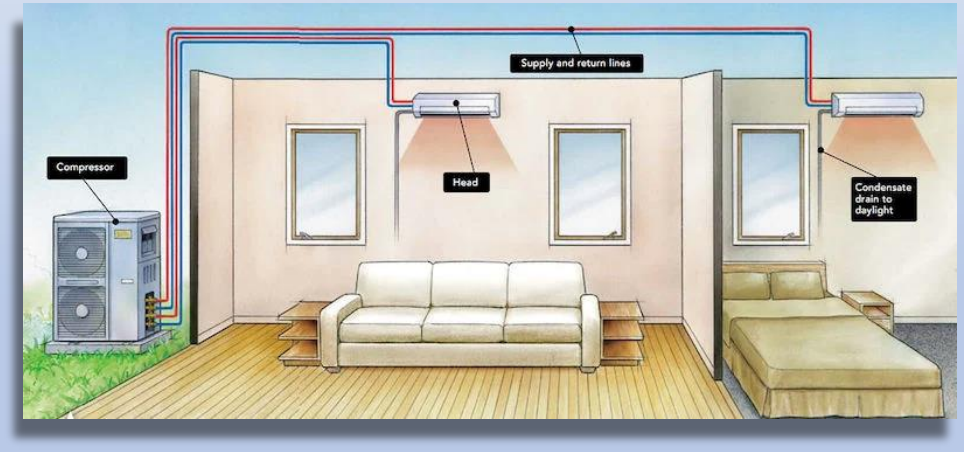
Types of Heat Pumps

https://cleanheat.ny.gov/compare-your-options/

Air Source

Ductless (Mini-split)

- For homes without ducts
- Each exterior unit serves 2-4 rooms
- Great when zonal temperatures are desired
- Can be used for supplemental heating or cooling

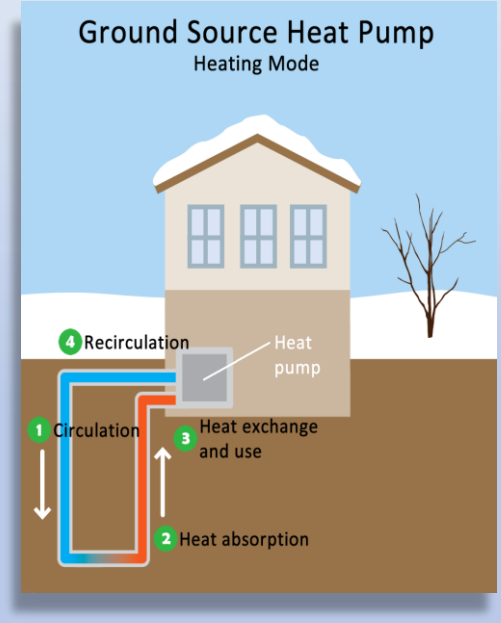


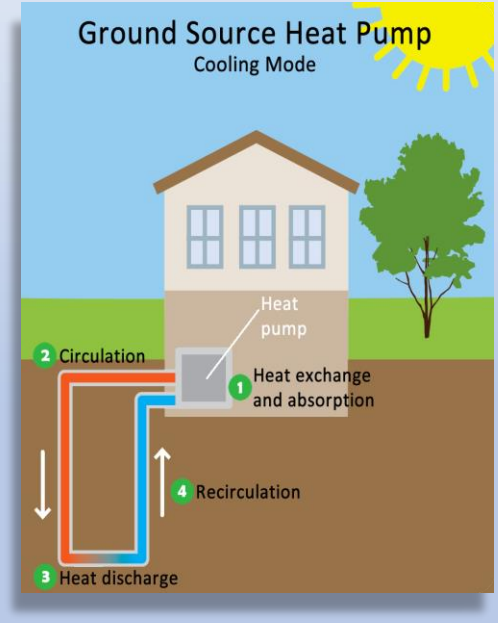
Types of Heat Pumps

https://cleanheat.ny.gov/compare-your-options/

Ground source

- Highest efficiency
- Lower operating and maintenance costs
- Requires either wells or a trench
- May require auxiliary heating elements as backup



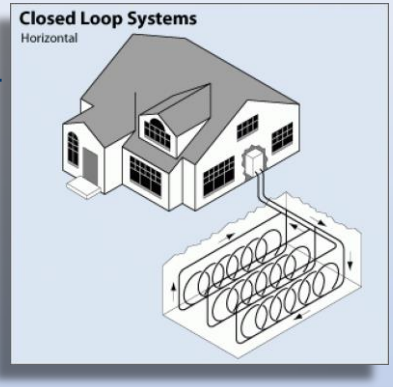


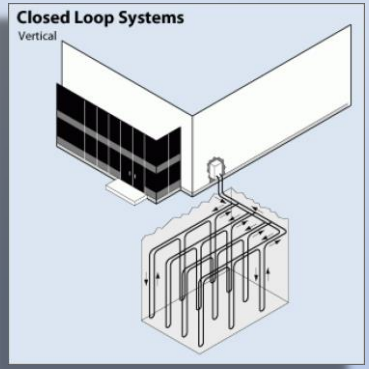
Types of Heat Pumps

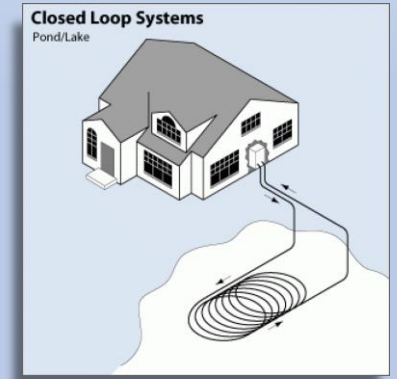
https://www.energy.gov/energysaver/geothermal-heat-pumps#:

Ground source

- Types of ground source heat pump systems
  - Closed Loop Horizontal
  - Closed Loop Vertical
  - Closed Loop Pond/Lake
  - Open Loop
  - Hybrid







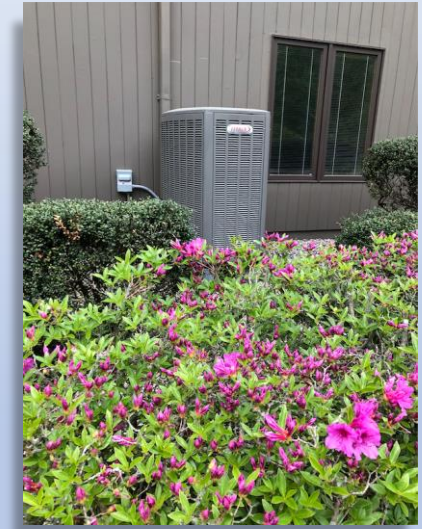
Heat Pump Water Heater

- One-to-one replacement of original water heater
- Traditional water heaters are a large source of energy consumption in a home.
- Heat pump water heaters are 2-3X more efficient

Part 2:
Case Studies

Case Study: Becky

- Air source heat pump - hybrid system
- Outside unit is basically the same size as AC unit - 17 SEER/9.50 HSPF
- Inside unit is a dual-fuel furnace that switches to using natural gas when the outside temperature is freezing
- Smart thermostat communicates with both units



Outside Unit

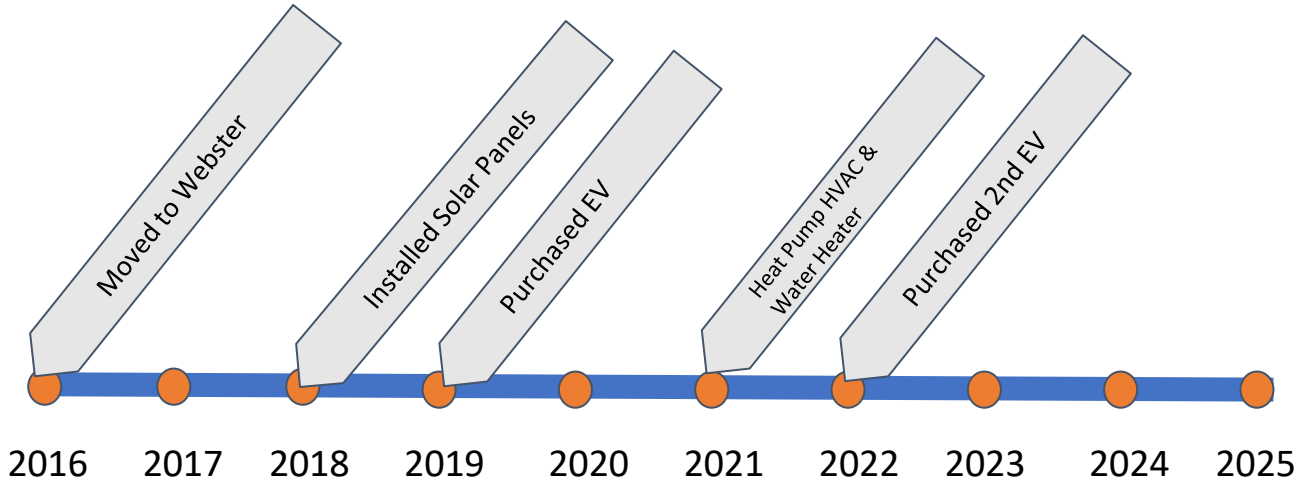
Inside Unit

Case Study: Becky (cont'd)

- Also have an air source water heater
  - Replaced gas water heater
  - Extremely efficient
  - Can program remotely
  - Can set to vacation mode

Benefits/Savings

- Upfront cost was basically the same as replacing with a traditional AC and furnace HVAC system
- Too many variables to directly measure energy cost savings



Benefits/Savings

- Most months of the year we only pay for delivery

Electricity Service - *PSC19 SC1 - Residential*
Electricity Rate - *RGE Supply Service*

Service from: 07/13/24 - 08/14/24
PoD ID: R01000035801208

Meter Number	Current Meter Read Date	Current Meter Read Reading	Previous Meter Read Date	Previous Meter Read Reading	Reading Difference	Billed Usage	Billing Period
0350055678/Use	08/14/24	6364 A	07/13/24	5570 A	794	794 kwh	33 days
0350055678/Gen	08/14/24	5492 A	07/13/24	4320 A	1172	1172 kwh	33 days

Type of read: A - Actual, E - Estimate, C - Customer, R - Remote and N - No read

Meter Number	Period End Date	Prior Excess Generation	Current Generation	Current Usage	Net Usage Billed	Remaining Excess Generation
50055678	08/14/24	593 kwh	1172 kwh	794 kwh	0 kwh	971 kwh

Electricity Delivery Charges

Customer charge	23.00
Subtotal Electricity Delivery	$23.00

Electricity Taxes and Surcharges

Taxes on delivery charges	@	2.0408%	0.47
Subtotal Electricity Taxes and Surcharges			$0.47
Total Electricity Cost			**$23.47**

Gas Service - *PSC16 SC1 - Residential*
Gas Rate - *RG&E Supply*

Service from: 07/13/24 - 08/14/24
PoD ID: R02000035801216

Meter Number	Current Meter Read Date	Current Meter Read Reading	Previous Meter Read Date	Previous Meter Read Reading	Reading Difference	Billed Usage	Billing Period
0000423393	08/14/24	9951 A	07/13/24	9951 A	0	0 ccf	33 days

Type of read: A - Actual, E - Estimate, C - Customer, R - Remote and N - No read

Natural Gas Delivery Charges

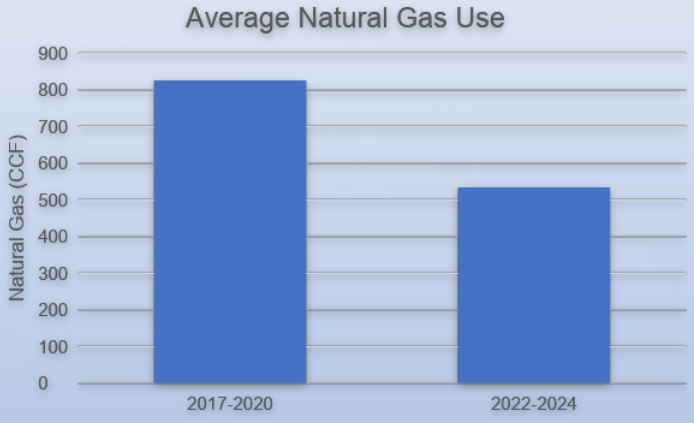
Customer charge	20.30
Subtotal Natural Gas Delivery	$20.30

Natural Gas Taxes and Surcharges

Taxes on delivery charges	@	2.0408%	0.41
Subtotal Natural Gas Taxes and Surcharges			$0.41
Total Natural Gas Cost			**$20.71**
Total Energy Charges			**$44.18**

Benefits/Savings

- Main goal was to reduce our carbon footprint
- We still use natural gas during sub-freezing temperatures
- Average natural gas use dropped ~35%
- Still figuring out the “smart” thermostat in hopes of further reducing natural gas usage



Reflections/Comments

- Air conditioner died in the summer of 2021 - knew I wanted to replace it with a heat pump
- Had at least four HVAC companies provide quotes
  - None of these companies initially provided a heat pump option
  - I had to ask specifically for heat pump quotes
- Also looked into a geothermal system
  - Concerns about the drilling and possible damage to my property and my neighbor's yard
  - Concerns about the auxiliary heating

Reflections/Comments

- The heat pump system works very well
  - My house is MUCH more comfortable in both the summer and winter
- Not sure how smart my ‘smart thermostat’ is
  - Had it replaced with a new model Spring of 2024
  - Original thermostat did weird things
  - Still not satisfied with thermostat settings so that heat pump system is prioritized over natural gas system for heating (this is not an issue with cooling)
- Feel that if I would have had more information about heat pumps, I could have pushed harder to get a heat pump installed that does not require natural gas auxiliary during sub-freezing weather.

Case Study: Jon

Heat and cool your home without fossil fuels!

Modern heat pump technology can provide quiet, efficient, heating and cooling with one system that runs solely on electricity.

✓ *One heat pump unit replaces both your gas/oil furnace and air conditioner.*

What is a heat pump?

- ✓ A heat pump transfers heat energy from one place to another. Your refrigerator is a heat pump: it moves heat from the air inside the refrigerator to the air outside the refrigerator.
- ✓ *A geothermal heat pump uses the Earth to either absorb or provide heat energy, depending on whether you need to cool or heat your home.*

How does it work?

- ✓ A heat-conducting fluid is circulated in a loop which includes the well and the heat pump furnace. The heat pump circulates the air in the house through a heat exchanger which can either heat or cool the air.

Why and when should I consider it?

•You should choose it because it will:

- lower your greenhouse gas emissions.
- reduce local air pollution around your home.
- eliminate the risk of gas leaks and explosions.
- lower your energy bill.

✓ *If your existing furnace is near the end of its service life you are a good candidate to replace it with a heat pump.*

• Even though the initial cost is slightly greater, you rapidly recoup that with energy savings, which you will enjoy for years to come.

✓ *There are substantial incentives available under Federal and State programs.*

•Our installer took care of applying for all the direct incentives for us. We will file the tax incentives as part of our tax filing this year.

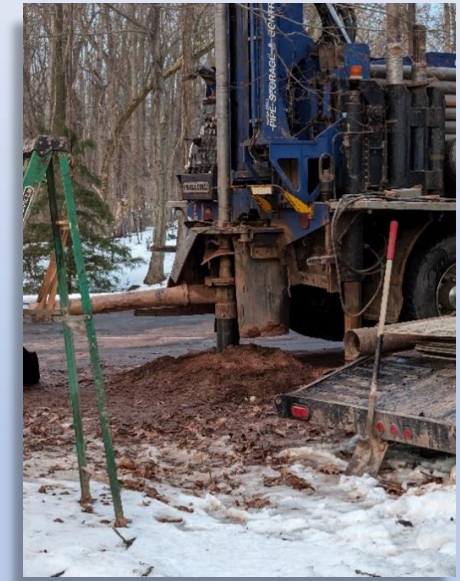
What happens during installation? (steps 1 and 2)

Survey (2 hours)

- A technician first surveys your home and property to find a suitable site for the well(s).

Drill well(s) (3 days)

•A drilling team arrives and drills the well(s) per the heating/cooling requirements of your home. Our home required two 500’ wells, which reached well down into the shale formation underneath us. This process is messy, but they do capture and carry away most of the tailings.



What happens during installation? (Step 3)

Dig trench (1 day)
•An excavation team arrives and digs a trench to carry the loop pipes to the basement wall of your home.

What happens during installation? (Step 4)

Install equipment (3 days)
•An equipment installation team installs the electrical circuits, the loop plumbing, the furnace(s), and connects the air ducts to your existing ductwork.

Is our home just as comfortable?

Even temperatures

•We notice that the house seems warmer when set at the same temperature as before. The air temperature is more uniform.

•In the summer we kept the house cooler than we used to, since it cost very little to operate and was quiet.

Less dryness

•There is less of a problem with dryness in the winter. This is because the air is warmed just to where we want it, not beyond. We have not needed to replace the humidifier we had with our old gas furnace. It is an option, should we feel a need for it.

Quieter

•We still hear air circulating, but the noises and fumes from combustion are gone. In summer there were none of the sounds of A/C units running, as the geothermal unit takes care of cooling as well as heating.

✓ *All in all, our home is more comfortable, and our energy bills are lower.*

What about hot water?

- ✓ We decided to install a heat pump (hybrid) hot water heater at the same time. Unlike the furnaces, it does not use the geothermal loop, but instead uses air inside our home. When it runs, it blows cold air out a vent. I attached a duct to direct the cold air outside, so the furnace room stays warmer.
- ✓ It is called “hybrid” because it can use electricity to heat the water, if required. I find that if I want to fill our Jacuzzi tub I need to set it to the “Energy Saver” setting, which will engage the auxiliary heat as needed.

What are the downsides of geothermal?

Expense

The expense of drilling. There are incentives to help, but there's no avoiding the fact that it's difficult and requires specialized equipment and technicians. (This is avoided with an air source heat pump, but then you have the fan noise and it's less efficient.)

Mess

The drilling and heavy equipment make a mess of the affected lawn areas. We picked an area we wanted to landscape anyway.

Risk of what you might hit

It is possible to hit either water or gas deposits in the rock below. One of our wells bubbled for a few days and seems to be quiet now. As the drillers gain more experience in our area, they are better able to predict when there might be an issue.

What are the upsides of geothermal?

Efficient operation – it is 3-4 times more efficient to move heat around that to make it. (In terms of how many joules are required to raise the temperature in the house one degree)

Low maintenance – because there are no high temperatures or pressures involved, geothermal systems typically operate for decades with no maintenance. The air filter must be changed periodically, as with all furnaces.

Quiet operation – the loop fluid is circulated at a relative low speed and makes no noticeable sound. The heat pump compressor is very quiet. The air circulating fan is variable speed and runs at the lowest speed that provides the needed airflow.

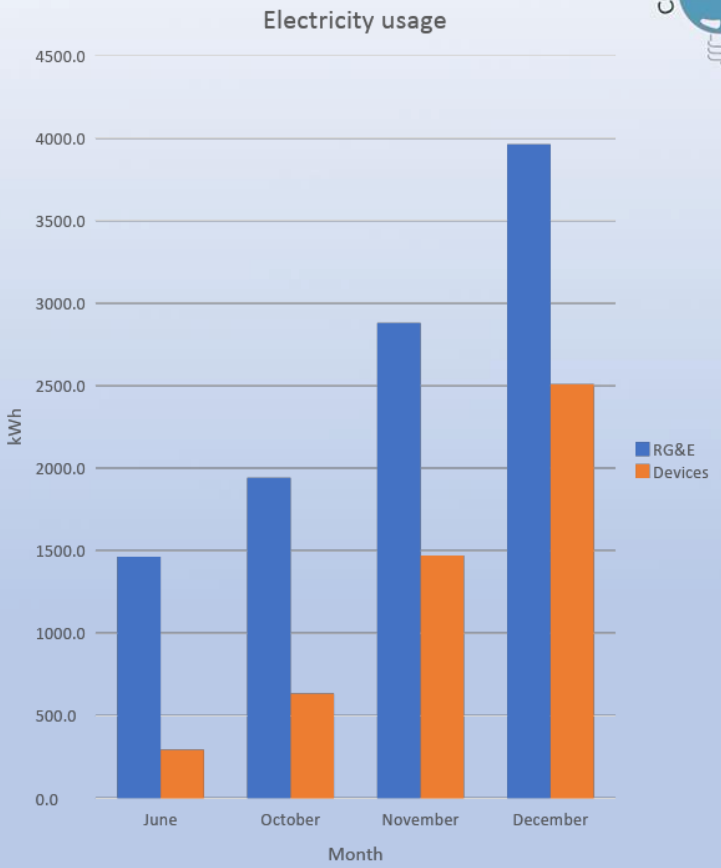
Safety – there are no exhaust fumes or risk of fire/explosion.

Energy Cost Comparison

- This shows Oct-Dec costs for 2023 and 2024 (electric + gas)
- This does not include pre-EV gasoline expenses
- This includes: 2 heat pumps, water heater, induction cooktop, and EV
- I cannot get historical data for summer months

New device usage vs total usage

- This shows the energy used as reported by the devices vs. the amount reported by RG&E.
- This reveals that we have room for improvement in other areas. (roughly 1500kWh per month)
- We have identified some leaky doors and are waiting to see the results of improved insulation.



Part 3:
Incentives / Next Steps

NOTE: ***We Recommend That You Check Directly With Your Financial Advisor, Lawyer or Tax Accountant to Verify Which NYS & Federal Energy Tax Credits, Incentives & Rebates You Qualify For In Your Own Household.***

Considering a heat pump?

- ★ Any home can become **heat pump ready**, but many homes require additional air sealing and insulation to keep the heat pump running at peak efficiency
- ★ Potential electrical upgrade required if home is less than 200 amps

Energy Audit Process

- ★ Every NY home has access to a **free energy audit**
  - how much energy your home uses
  - how energy efficient it is
  - how to improve savings and comfort

https://www.nyserda.ny.gov/All-Programs/Residential-Energy-Assessment-Programs

Part 3:
NYS Incentives

Comfort Home

For Homeowners

NEW YORK STATE | NYSERDA

visit:
nyserda.ny.gov/comforthome

call:
1-888-406-4009

Three tiers of load reduction packages*

Package	Description	Incentive
★ ☆ ☆ Good	Seal and insulate attic + seal and insulate rim joists	$1,600
★ ★ ☆ Better	Seal and insulate attic + seal and insulate rim joists + insulate walls + insulate floors	$3,000**
★ ★ ★ Best	Seal and insulate attic + seal and insulate rim joists + insulate walls + insulate floors + install ENERGY STAR® windows	$4,000**

**Dollar amounts shown reflect incentive amounts, total package costs to be discussed with contractor*

***Additional incentives available for homeowners located in Westchester County*

Available Incentives

Heat Pump Incentives

- ★ **NY Clean Heat Rebate**
  - off the top, handled by contractor
  - available for all heat pump installations, including ground source and water heaters

https://cleanheat.ny.gov/find-available-rebates/

Available Incentives

Geothermal & Solar Energy System Equipment Credits

★ **NYS Offers Tax Credits for These Systems:**

- **Geothermal** – 25% Non-Refundable Tax Credit Up To $5,000. Excess Can Be Carried Forward for 5 Years. **NYS Form IT-267**
- **Solar** – 25% Non-Refundable Tax Credit Up To $5,000. Excess Can Be Carried Forward for 5 Years. **NYS Form IT-255**

https://cleanheat.ny.gov/find-available-rebates/

Available Incentives

EmPower + Low Income Tier

★ Provides low/no-cost energy efficiency solutions to income eligible New Yorkers

- Up to $10,000 grant for insulation, air sealing, furnace replacement, appliances, LED lighting
- Available for families below 60% state median income
- Can be used every year

https://www.nyserda.ny.gov/All-Programs/EmPower-New-York-Program

Available Incentives

EmPower+ Moderate Income Tier

- ★ Available to households below 80% area median income
  - $63,000 limit for 2-person household
- ★ Provides a grant for improvements up to $5,000 per project for single-family homes

https://www.nyserda.ny.gov/All-Programs/EmPower-New-York-Program

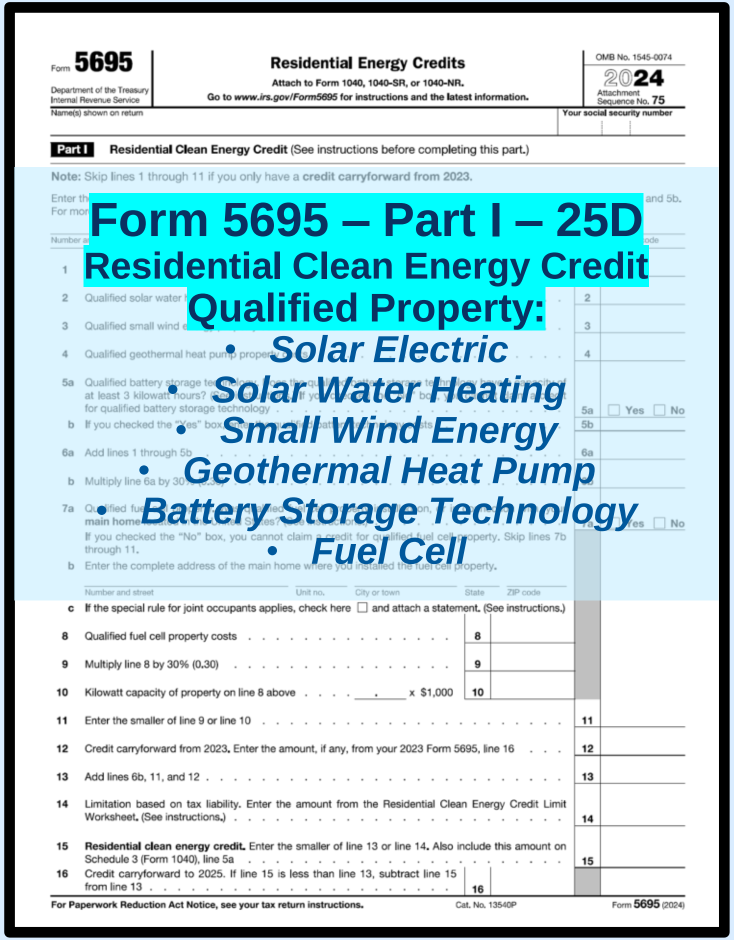
NYSERDA Financing

- ★ **Smart Energy Loan - Up to $25,000**
  - 5, 10, 15-year payback periods
  - rate based on Area Median Income
- ★ **On Bill Recovery Financing - Up to $25,000**
  - paid through utility bill savings
  - better suited for large scale projects such as geothermal or solar

https://www.nyserda.ny.gov/All-Programs/Residential-Financing-Programs

Part 3:
Federal Incentives
(Inflation Reduction Act - 2022)

The Inflation Reduction Act: Claiming Residential Energy Credits - Form 5695



Residential Clean Energy Credit

These expenses may qualify if they meet requirements detailed on energy.gov

https://www.energy.gov/policy/articles/making-our-homes-more-efficient-clean-energy-tax-credits-consumers

- Solar, wind and geothermal power generation
- Solar water heaters
- Fuel cells
- Battery storage (beginning in 2023)

The amount of the credit you can take is a percentage of the total improvement expenses in the year of installation:

- 2022 to 2032: 30%, no annual maximum or lifetime limit
- 2033: 26%, no annual maximum or lifetime limit
- 2034: 22%, no annual maximum or lifetime limit

The Inflation Reduction Act: Claiming Residential Energy Credits - Form 5695

Energy Efficient Home Improvement Credit:

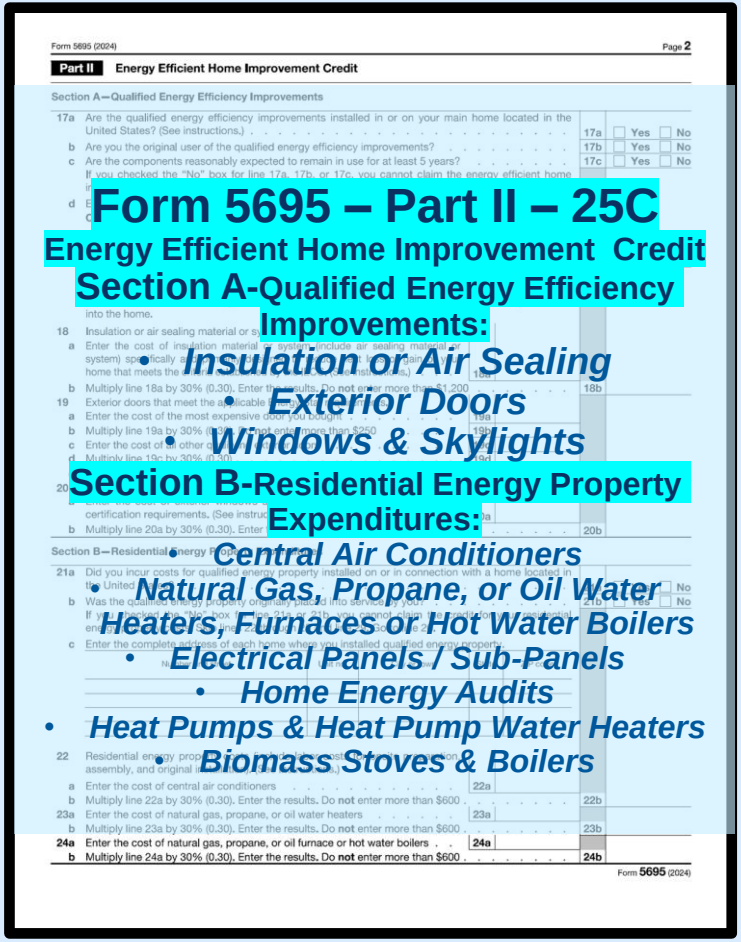
These expenses may qualify if they meet requirements detailed on energy.gov

https://www.energy.gov/policy/articles/making-our-homes-more-efficient-clean-energy-tax-credits-consumers

- Exterior doors, windows, skylights and insulation materials
- Central air conditioners, water heaters, furnaces, boilers and heat pumps
- Biomass stoves and boilers
- Home energy audits

The amount of the credit you can take is a percentage of the total improvement expenses in the year of installation:

- 2022: 30%, up to a lifetime maximum of $500
- 2023 through 2032: 30%, up to a maximum of *$1,200* (heat pumps, biomass stoves and boilers have a separate annual credit limit of *$2,000*), no lifetime limit. Max of *$3,200* can be taken every year to 2032



Part 3:
Next Steps

Local Energy Advisors

AMPED
GO ALL ELECTRIC.

COLOR WEBSTER GREEN

- ★ Supporting our transition to vehicles and buildings powered by carbon-free electricity across the nine county Genesee/Finger Lakes regional area
- ★ Offer free and impartial support to local households and businesses
- ★ Connect people to state and federal programs that can help subsidize their electrification costs

https://www.ampedproject.org/

How do I get started?

- Schedule a free appointment with an Energy Advisor
  - 7am-4:30pm, weekdays
- Schedule a free home energy audit
- Meet with one of our vetted contractors

  https://www.ampedproject.org/installers-and-contractors
- Plan your home decarbonization journey, utilizing rebates and tax credits as they become available

Questions?

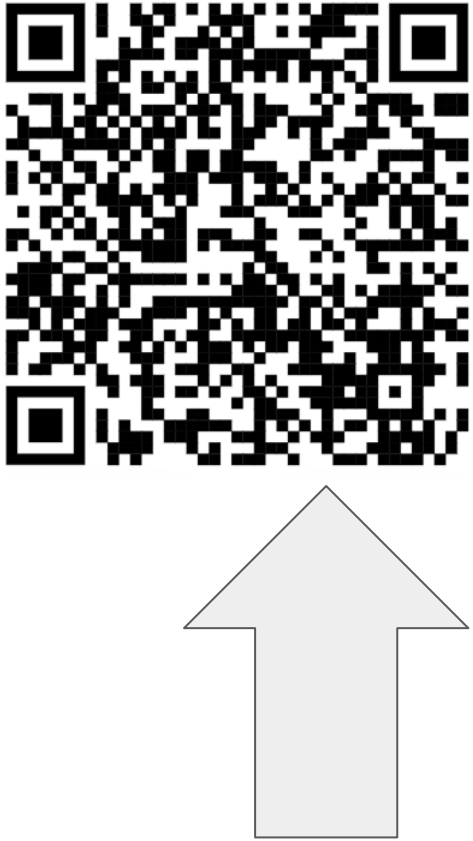
Contact the Finger Lakes Clean Energy Hub (a.k.a. AMPED)

hub@climategfl.org

585-419-6218

Schedule a call with an Energy Advisor HERE:
https://www.ampedproject.org/book

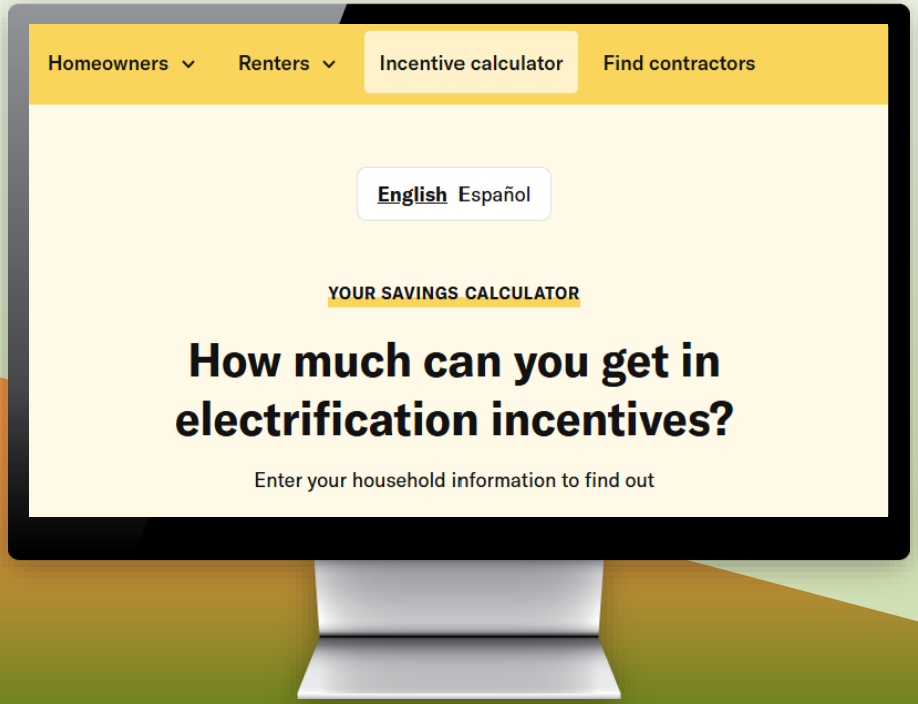
AMPED
GO ALL ELECTRIC.



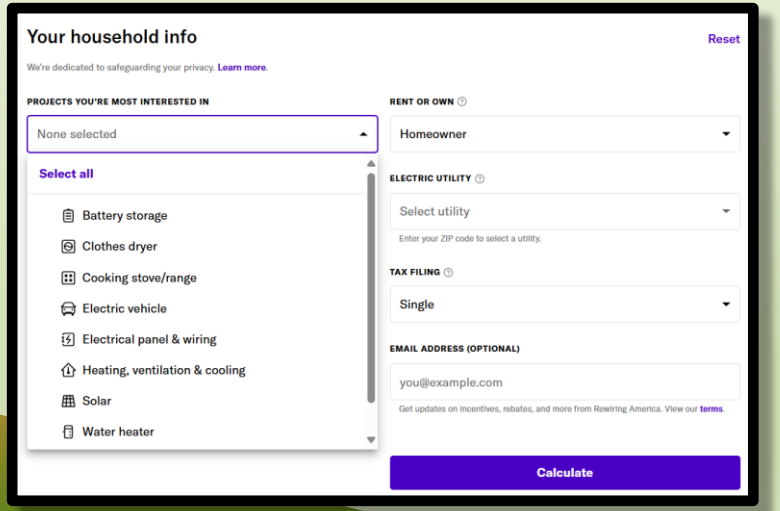
Scan to schedule an energy advisor call!


50%
2030!
Next Steps?
ELECTRIFY
EVERYTHING
REWIRING
AMERICA
GOOD
NEWS!

Incentive Calculator

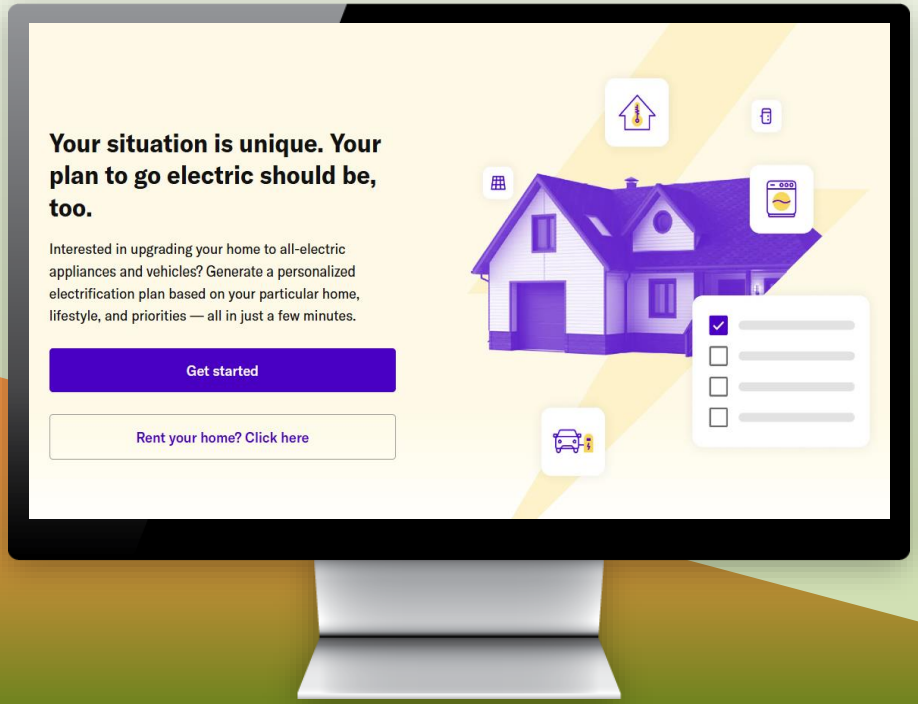


https://homes.rewiringamerica.org/



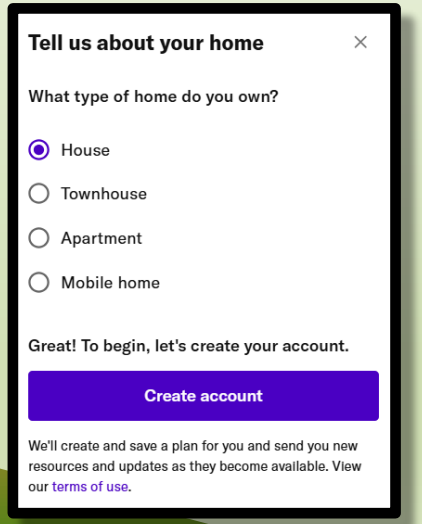
https://homes.rewiringamerica.org/calculator

Personal Electrification Planner



REWIRING AMERICA

https://homes.rewiringamerica.org/



https://homes.rewiringamerica.org/personal-electrification-planner

STOP *MAKING* HEAT

START *MOVING* HEAT

Color Webster Green

Part of the Color Your Community Green network

Join Our Group!

Incentives links added to 'What Can I Do' page

Home | Our Projects | Meetings | What Can I Do | Explore Further