

Home Energy Playbook: Take Action Today, Prepare for Tomorrow

•>> **slipstream**

Any good game plan starts with the fundamentals.

Upgrading your home can be a game-changer, and you can't win if you don't join in.

This Home Energy Playbook lays out the basics of how to prepare your home to reduce its use of fossil fuels. As you make your way through these pages, you will learn steps to make your home safer, more comfortable, and more efficient for seasons to come.

When your home is more efficient, it's also more affordable. Some of these steps may save you money right away. Some may save you money down the line. The improvements you make to your home now are expected to lower your energy costs in the long run.

Slipstream has 45 years of experience running energy efficiency programs in the Midwest. For this playbook, we've scouted intel from Slipstream's experts in HVAC and emerging technologies as well as building science technicians who have dedicated their careers to making improvements in real homes just like yours. We're confident you'll find this information helpful as you plan to upgrade your home.

Visit our webpage at slipstreaminc.org/playbook for additional resources and updates.



Ready, set, go!

Sandra Henry
President & CEO, Slipstream

Reducing your home's carbon emissions can have significant benefits for you and your family, including a healthier and more comfortable living space, improved control over heating and cooling, and reduced energy costs in the long term.

As you'll see in this playbook, a typical single-family home has only a few appliances that have a significant impact on carbon emissions. Luckily, that means there are a few places to focus on to lower your home's carbon footprint. The first and most important step is to weatherize your home with better air sealing and insulation to reduce the amount of heating and

cooling needed to maintain comfortable temperatures. After that, the basic plan involves replacing your fuel-fired heating system, water heater,

cooking stove, and dryer with all-electric alternatives.

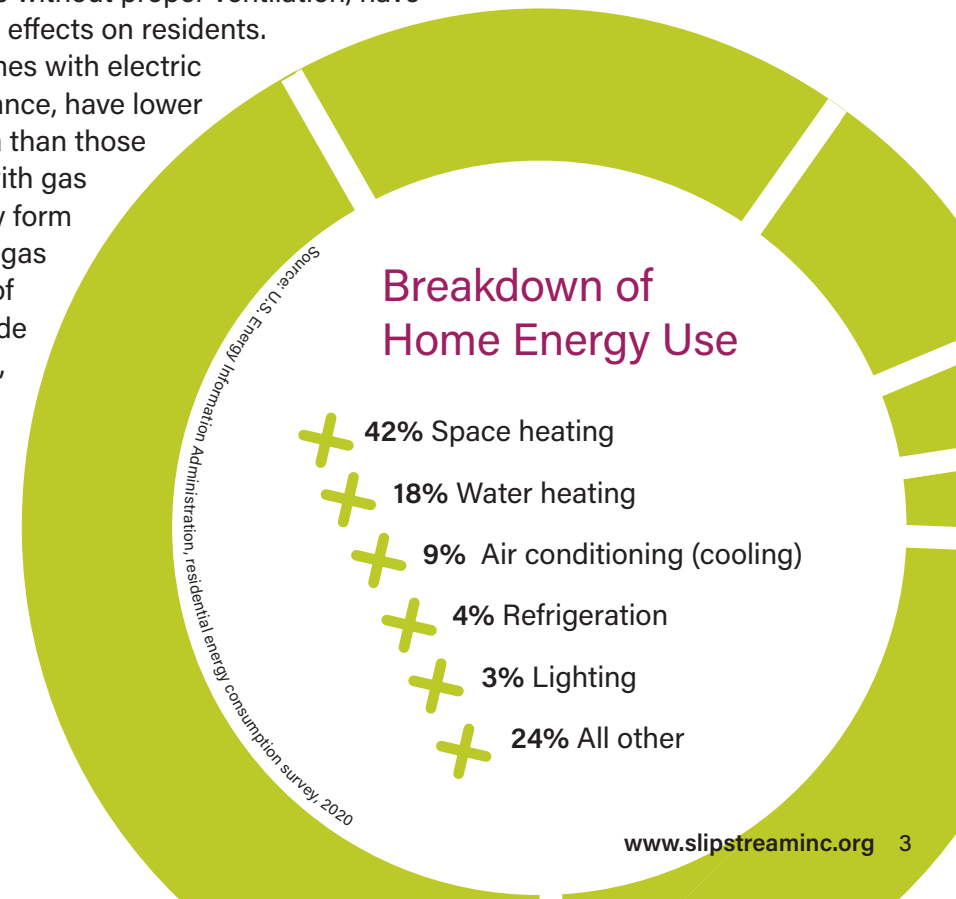
Since these actions cost money, the average homeowner typically can't take all of them at once—and that's fine. Everyone's journey will be a little different, and your overall goals and timeline are unique to you. This playbook intends to meet you where you are, providing information on how to get started transforming your home into one that is healthier, more comfortable, more resilient, and more sustainable.

Moving away from fossil fuels isn't just about greener living.

The Biggest Benefits of Reducing Carbon

As you can see in the chart below, space heating and water heating make up more than half of the energy used in most homes. By switching to more efficient, all-electric alternatives, you won't only get rid of pollutants that cause negative health effects, but you'll also lower your home's overall energy use. With the price of fossil fuel energy expected to increase faster than electricity over time, this transition should save you money over the long term. After eliminating gas-fired equipment, some homeowners also find they have new options for their home's floorplans since they don't have to worry about gas connections or vents.

By electrifying your home, you're making it into a safer living environment. Studies have shown that gas stoves, especially those without proper ventilation, have negative health effects on residents. Children in homes with electric stoves, for instance, have lower rates of asthma than those who grow up with gas stoves. And any form of combustible gas poses the risk of carbon monoxide poisoning, fires, or explosions. A carbon-free home is a safer home, period.





Energy Audits and Preparing Your Home

Action Items

- ✓ Hire an energy auditor certified by BPI, the Building Performance Institute
- ✓ Weatherize, starting with air sealing and attic insulation
- ✓ Identify any equipment or appliances that will need to be replaced soon
- ✓ If your home has existing ductwork, identify areas where airflow could be improved
- ✓ Find out if an electrical panel upgrade is needed

Before you even consider which equipment to replace, your first step should be to hire a building science expert to conduct an energy audit. The audit process will help you understand how to improve your home based on the latest building science, showing you where you can reduce energy use and save money on energy bills.

Your auditor will likely focus their attention on how to reduce energy loads for space heating, cooling, and water heating. Recommended actions will vary based on the age of your home and the equipment in it, and the auditor should tell you which upgrades to consider before you do anything else. Make sure your auditors—as well as electricians or other contractors you hire—know your intent to reduce your home's carbon emissions so they can identify priorities and help you put together a plan.

While the market rate cost for an energy audit is likely in the range of \$500, check with your utility company to see if they offer a program that reduces the cost. Some states offer home energy rebate programs that can help you identify a qualified energy auditor and offset the upfront cost of electric equipment. Contact your state energy office or electricity provider for program details.

“An energy audit helps you understand where your home is at. That helps guide you in what investments are going to make the most sense first, and how those are sequenced.”

—Justin Margolies

Weatherization


An energy audit can also help you understand how well your home holds conditioned air inside. If your home is leaky, air sealing and insulation will reduce energy loss and do a better job of maintaining the indoor temperature. **To avoid buying a larger, more expensive heating and cooling system than you would otherwise need, be sure to weatherize, air seal and insulate your home first.**

Weatherization typically starts with air sealing to close gaps where heated or cooled air can escape. If your home is leaky—as most older homes are—you'll want to air seal any gaps in the ceiling and walls, including joints around windows and doors and service penetrations for electric, gas, and telecommunications. You'll also want to do the same for hidden leaks in dropped ceilings, chimney or plumbing chases, and recessed light fixtures. By starting with air sealing, you'll both improve the airflow in your home and allow your HVAC system to work less while still keeping you comfortable.

Next, consider your insulation needs. Adding attic insulation is more cost-effective than wall insulation because heat rises, and your attic is usually the easiest place to add insulation. But adding insulation to your walls is still worth considering, especially if the home was built

Does Your Energy Auditor Have the Right Stuff?

Many energy auditors specialize in energy efficiency. Electrification and carbon reduction are newer strategies, and it may be more challenging to find a specialist. That's OK: energy efficiency is the foundation of these newer approaches, and any energy auditor will give you valuable information about where to start. If you can find a more specialized auditor who has experience guiding customers through a comprehensive electrification approach, that's the best-case scenario.



before modern insulation became commonplace. In fact, a home built in the 1940s or earlier might not have any wall insulation at all! In that case, your decision should be easy.

Replacing Appliances and More

Once you've weatherized, look back at the energy audit to find out about the age and condition of your appliances and other equipment. Decide what it would make sense to replace and in what order, so you can plan for comprehensive, thoughtful investments over time.

The audit should tell you where you're going to get the biggest bang for the buck: this may be called your "savings-to-investment ratio," or SIR. Today's ENERGY STAR®-rated appliances like refrigerators or washers and dryers are as much as 30% to 40% more energy efficient than in the past, so replacing them can save you considerable money over time.

You may also want to think about whether your ductwork heats or cools certain areas of the home more than you find comfortable; replacing your HVAC is the perfect opportunity to address this. Even if you don't decide to replace your HVAC system right away, consider getting a tune-up to make it run more efficiently.

Will You Need an Electrical Upgrade?

Adding new all-electric appliances might mean you might need to upgrade your electrical panel to handle the extra load. Your energy auditor should be able to tell you whether to consult an electrician about upgrading your panel.

An electrician can calculate how many amps you will need based on what's in each circuit on your electrical panel, and then tell you if it's necessary to upgrade—or whether you can avoid an upgrade with emerging technologies like "smart" breakers.

Since so much of your home will run on electricity, once you make the switch, what do you do if the power goes out? A generator is always an option, but you can also install a battery backup system for short-term power outages. If you combine this with solar panels, which can recharge the battery when it's not needed, you might even be able to run your whole home without buying any power from the electric company.



Electrifying Your Home

Once you're past these initial steps, it's time to think about electrification. As we saw on page 3, space heating and cooling—a.k.a. your HVAC system—is the biggest opportunity to reduce your home's carbon emissions. Electrifying your HVAC starts with a simple question: whether a heat pump makes sense for your home, and if so, what type of heat pump you need.

What's a heat pump? It is as simple as it sounds. A heat pump pumps heat. It mechanically transfers heat from outside and moves it indoors to heat your home—or in reverse to pull heat from your home to cool it down. Heat pumps are common—so common, in fact, you have lived with one your entire life: your refrigerator! Refrigerators use the same basic process, extracting heat from inside the refrigerator and expelling it to keep your food cold.

Our online [Resources Page](#) has a video about how a heat pump works.

Why Get a Heat Pump?

There are a few cases where a heat pump is almost certainly going to save you money on energy costs. If your home is heated with an electric furnace, electric baseboards, propane, or fuel oil, switching to a heat pump is a great choice due to its greater efficiency. It's also bound to be the best option if you're looking to add space heating or air conditioning to a new addition.

For homes heated with natural gas, the situation is a little more complicated. But a heat pump is still something you should think about.

Several manufacturers offer “cold climate” models of air-source heat pumps (also called ASHPs) that are effective even in the northern regions of the United States. Still, many heat pumps require a backup system to handle

the rare days with extremely low temperatures (colder than -5°F). If you're keeping your furnace or boiler as a backup system for the coldest days, make sure the thermostat that controls the backup system is set several degrees below the setpoint for the heat pump. That way your backup will only kick in when it's absolutely needed. Generally speaking, heat pumps last 15 to 20 years.

Almost any home could benefit from a heat pump, especially if it is well-insulated and airtight. Heat pumps can provide zonal control, improving your ability to manage temperatures from room to room. Some can be controlled through an app on your phone. Homes that don't already have air conditioning will benefit from the highly efficient cooling that heat pump units provide, and if your cooling system was installed 20-plus years ago, you will find a heat pump to be a lot more efficient—providing significant cost savings in the warmer months.

Heat pump units are quieter than traditional furnaces and boilers because they run for longer periods at lower speeds. You can “set and forget” the temperature on your thermostat because heat pumps maintain a very steady heat level. (Heat pumps actually perform less efficiently if you lower the thermostat at night.) They're better for your home's indoor air quality due to included air filtration and dehumidification that reduces mold and mildew—not to mention the cleaner air you'll enjoy thanks to zero onsite emissions.



Choosing the Right Heat Pump

What Are the Costs?

The cost of transitioning to a heat pump varies greatly depending on the size, condition, and needs of your home. Ductless units cost less than central systems, but you may need multiple ductless units to heat and cool your entire home. The typical range is \$10,000 to \$20,000 for meeting the needs of an entire home.

Many utilities and some state energy offices offer rebates for heat pumps.

Choosing the Right Contractor

When you're choosing a contractor for your heat pump installation, ask about their experience with the technology you want. If they seem unsure or skeptical, move on to somebody else.

Heat pump technology has vastly improved in the past 10 years, particularly for use in cold climates, and not all contractors are up to date on the benefits and flexibility that heat pumps can provide. Your utility company or state energy office may be able to provide you with a list of contractors that have received training and proven their ability to install heat pumps correctly and meet customers' needs.

Action Items

- ✓ Purchase an air-source heat pump, but only when the time is right
- ✓ Carefully consider what type and size you need, based on the graphic
- ✓ Find an experienced contractor, possibly with help from your utility company



The following scenarios can help you choose the right heat pump. Talk to your contractor to be sure you get the heat pump that matches your goals and needs.

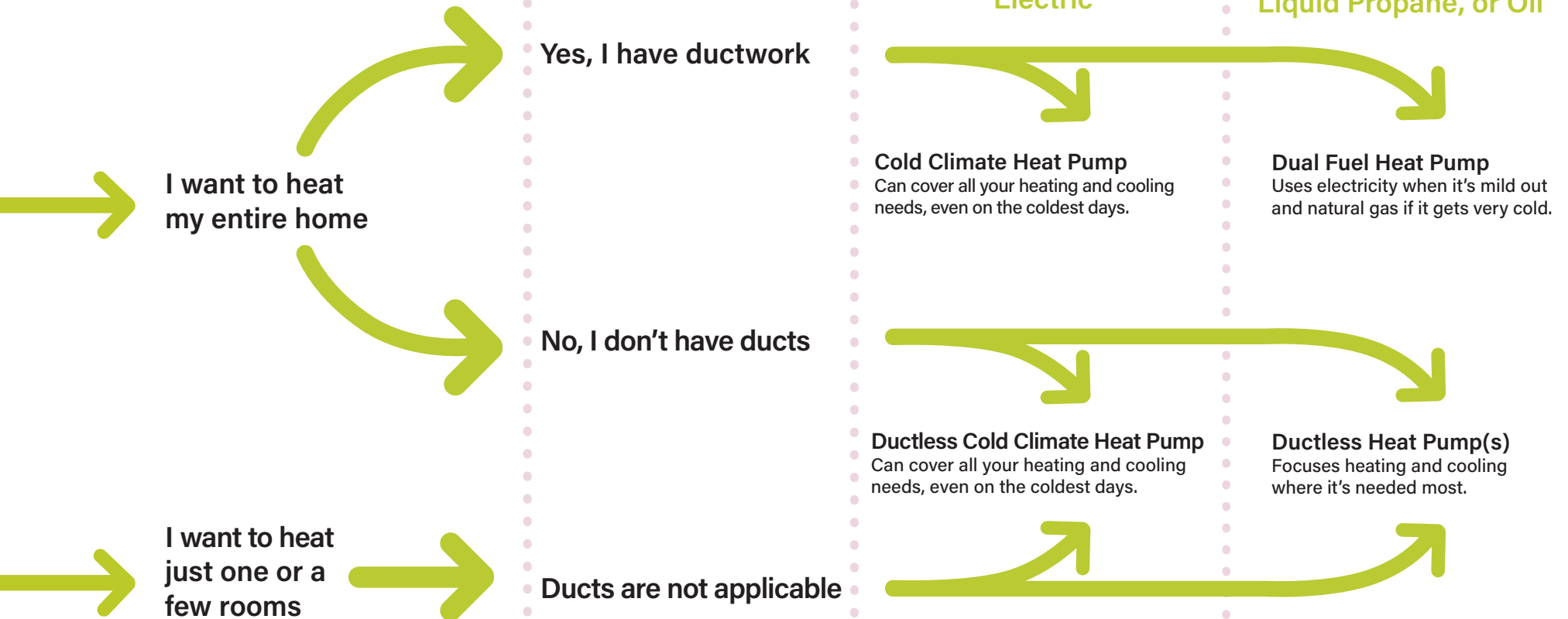
1. How much of your home needs heating and cooling?

2. Does your home have ductwork?

3. What type of fuel do you use to heat your home?

If you have grates or registers that deliver warm air, you have ductwork

The heat pump configuration listed under your fuel is likely the best option for your home





Electrifying Your Other Appliances

Don't let your HVAC have all the glory. Many of the other appliances in your home have efficient, all-electric alternatives that could lower your home's carbon emissions, as well.

Water Heaters



Heat pump water heaters (HPWHs) can save substantially on energy costs compared to water heaters powered by electric resistance, propane, or fuel oil. (The operating costs are about the same compared to natural gas water heaters.)

Heat pump water heaters pull air from the space around them, filtering and dehumidifying as they heat the water. This process also makes the air surrounding the HPWH slightly cooler, which could be a welcome bonus in the summer months.

What Are the Options?

Typical HPWHs are "hybrid" units that have both a heat pump and an electric resistance element. They are 220 volts and may require a new circuit. Most of the water heating comes from the heat pump, which draws its heat from the air around it. When an additional boost is needed, the electric resistance element kicks in and speeds up reheat time.

New "plug-in" HPWHs are compatible with a standard wall outlet, which means you won't need to install a new circuit. However, these units have a smaller or nonexistent backup element, and therefore heat water more slowly than a 220-volt HPWH. That said, if you choose a plug-in HPWH

with a larger capacity than your previous unit, you should be able to get the same amount of hot water while also benefiting from the added efficiency.

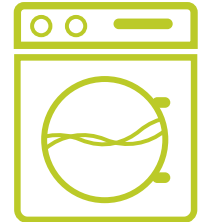
What Are the Costs?

A new HPWH runs around \$3,000 to \$6,000, depending on the model and size. If a new circuit is required, it may cost an additional \$200 to \$600, depending on how far from the home's electrical box the water heater is located.

Clothes Dryers

Clothes dryers can also use heat pump technology to run more efficiently than traditional dryers. Heat pump clothes dryers can typically save up to 60% in energy costs from doing your laundry, depending on how often you use the dryer. A family running multiple loads a day will see greater savings than a single person, who might not see the same benefits from the investment.

Along with being more efficient, heat pump clothes dryers are also ventless, which means you can install them anywhere you want. You may have one additional maintenance task, though: the excess moisture collects in a removable tray that needs to be dumped out or drained into a sink.



Why Buy One?

Heat pump dryers make the most sense if you've either bought a new home, plan to add

onto your house, or build an accessory dwelling unit. They can also be a good option for in-unit laundry for a condo or apartment. If your current dryer is gas-powered, you will immediately reduce your carbon emissions from laundry—and if it's at least 10 years old, it's probably a good time to upgrade anyway. Prepare your home, as needed, by upgrading electrical service and/or choosing a new location, while sealing your dryer vent and capping and sealing your gas line.

What Are the Options?

Heat pump clothes dryers range in size from 4 to 6 cubic feet of capacity. Some require your electric outlet to be upgraded to 240 volts, while other brands offer 120-volt options. They can come in combo units with a washer that handles both cycles at once.

In Slipstream's field studies of heat pump clothes dryers, we've found that people tend to love using them, in part because they tend to be gentler on clothes. On the other hand, your clothes may take longer to dry and won't come out as toasty as you're used to. Maybe throw a dollar bill in with every load to remind yourself of the added savings.

What Are the Costs?

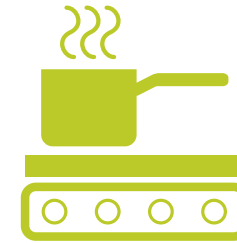
While the sticker price may be \$1,000 to \$1,500 higher than a traditional dryer, the difference may decrease to \$400 to \$600 after government or utility incentives. Upgrading to 240-volt wiring could cost another \$300. But remember: the better efficiency means your operating costs for laundry will be lower than they were before, especially if you're switching from a gas dryer.

Induction Cooktops

These aren't your grandma's electric stove. Induction cooktops are a newer, more efficient technology than the electric ranges you may have seen in the past, with

those electric resistance coils that glow red when they get hot.

If you're replacing a traditional electric stove, induction will save you about \$50 per year. However, if you currently use a gas stove, you may not see much cost savings. Don't overlook the other benefits, though, which include better indoor air quality, a cooking experience that is faster and more precise, and best of all, no dangerous open flames in your kitchen.



What Are the Options?

Types of induction cooktops include a range combined with an oven or a built-in cooktop installed in the counter. There are also cheaper portable cooktop units that will let you try induction cooking before adopting a more permanent solution. (Ask your local library if they have units available to borrow.) If replacing a gas range, this is another scenario where you might need to install a 240-volt electric connection.

What Are the Costs?

A new induction cooktop will cost around \$1,000 more than a conventional stove. Built-in countertop units may be cheaper. Installation will cost the same as a conventional cooktop, though you may need that 240-volt outlet (~\$300) and to cap your now-defunct gas line (~\$150).

One other important cost is related to the science behind induction technology, which uses a magnetic field to heat the material of your pots and pans directly, rather than heating it indirectly from below. To test if your current cookware will work, see if a magnet sticks to it. That means it's compatible with induction. If you do have to upgrade your pots and pans, your utility may offer rebates to help you with the added cost.



Affordability: Factors That Affect Costs and Benefits

Action Items

- ✓ Consider carefully what your budget is and how to sequence and time your upgrades
- ✓ Find reliable vendors and contractors to purchase equipment and get work done
- ✓ See what rebates and incentives are available to you

When your home is more efficient, it's also more affordable. Some of these steps may save you money right away. Some may cost you more upfront but help you save money down the line. Your actual costs will depend on factors such as the type of equipment needed for your situation, the availability and knowledge of contractors in your area, and what types of subsidies or rebates are available from your local utility and/or government.

Your operating costs may go up in the short term if you're switching from natural gas heating to an all-electric heat pump. While a heat pump may be safer, more comfortable, and more efficient, it might not be cheaper to use than your gas furnace—at least in the near term.

In any case, the improvements you make to your home now are expected to lower your energy costs in the long run. Keep in mind that your energy audit will help you know what to prioritize and plan for implementation over time.

The graphic below lays out typical cost ranges, including equipment costs and installation labor.

What will impact my operating costs?

- Extent of weatherization
- Current energy prices (electricity, natural gas, fuel oil, propane)
- Whether you are retaining a fossil-fuel backup system
- If you fully electrify, removal of monthly gas connection fees or delivered fuel service fees

Rebates and Incentives

Plenty of rebates and incentives are available to make the costs of reducing your home's carbon emissions easier to bear. The Home Energy Rebate programs through the federal Inflation Reduction Act of 2022 included money specifically to help homeowners looking to make these sorts of switchovers. Many states are now administering these funds.

Your utility also may provide some funding to help homeowners looking to electrify, and many local utilities offer a variety of incentives for different appliances and other electrification-related purchases. Income-qualified homeowners can often receive higher rebates.



Air-Source Heat Pump
\$10,000 to \$20,000



Heat Pump Water Heater
\$3,000 to \$4,000



Induction Cooktop
\$2,000



Solar Panels
\$20,000
(if you're feeling that ambitious)

Other Opportunities

Homeowners have several more options to further reduce carbon emissions:

Electric vehicles – If you're planning to buy an electric vehicle, plan ahead. Your garage or driveway will need a dedicated EV charging outlet that might require upgrading your electrical service. Some technologies allow the EV to share a circuit with the dryer in your garage, which may be the lowest-cost option.

Electric lawn and snow equipment – The motors in electric lawnmowers and snowblowers are more efficient, plus they're quieter—so no need for headphones, and more pleasant for your neighbors—and you can enjoy the smell of fresh-cut grass without breathing in fumes. There are lots of benefits to electric lawn and snow equipment, and many utilities offer rebates.

Renewable energy via solar – We haven't talked much about solar panels, and going in-depth would require another playbook. We recommend making your home as efficient as possible first through the weatherization and electrification strategies described above, and then install solar when you know how much energy your upgraded home needs. Once you're ready, look for local contractors who have experience and can show you projects they have done. Be leery of unsolicited proposals. Solar panels are a major upfront investment, but sized properly, they can lead to a lifetime of lower electricity bills.



Future-Proofing Your Home

To make the most of your carbon reduction projects in the years and decades to come, remember to include any future upgrades in your upfront plan.

As you make your way through the steps in this playbook, consider the triggers that would cause you to take the next step. Plan in advance how you want to upgrade the various elements of your HVAC system rather than having to make a fast decision when your furnace or air conditioner unexpectedly dies. To map this out, ask your energy auditor how

many years your existing heating system and water heater are expected to last, and plan accordingly.

Also, decide if you would prefer to heat and cool entirely with electricity, or if you would prefer to retain a fossil-fueled backup. You can always be proactive and replace old (but still functioning) equipment near the end of its life. This will give you the best opportunity to do the research and find a good contractor.

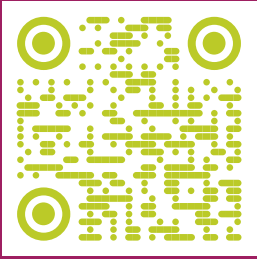
Finally, although you may not need it now, an electrical panel upgrade can prepare you

for your home's future energy load. And even if you don't plan to get an EV in the near future, adding a charging station can get you ready for whenever the winds of change blow through your newly upgraded, safer, more comfortable home.

“ The fact that we can produce electricity with solar and wind—that is the cheapest form of production and will continue that way—gives us huge opportunity with advances in heat pump technology to push the ball forward. That’s the most exciting thing I’ve seen in 27 years of being in this business. ”

—Greg Nahn





More Resources

To help you put the Home Energy Playbook into action
slipstreaminc.org/playbook

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This Playbook is intended as a free resource for single-family homeowners. Please share it widely.

Visit our **Resources page** at slipstreaminc.org/playbook for a digital version of this guide, plus videos, links to educational content from our partners, and up-to-date information on rebates for home energy upgrades.



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