

CLEAN POWER GUIDE



IT'S YOUR HOME. TAKE CHARGE!

BY MELISSA EVERETT, PHD

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Home matters. These days, our lives revolve around our dwellings more than ever. So it's timely to take action on the energy upgrades we

know will benefit our economics as well as the planet. Those of us who are working from home, especially, have time to notice the drafts, ruminate on the age of the heating system, and take action on the energy improvements we've been considering for years.

The **Clean Power Guide** is your support system for informed action to improve energy efficiency and shift to renewable sources in your home or small business. It guides you on the most basic step to take, slashing waste and maxxing out efficiency in your energy use. It is a portal to information on solar power, heat pumps, electric vehicles and more.

Sustainable Hudson Valley and Chronogram Media bring you this publication. It's written by trusted experts, and backed by the sponsorship of some of the premier businesses and public agencies working to bring clean energy technologies to the marketplace. Available all

year, online and in print, the **Clean Power Guide** provides the basic, unbiased information you need to get moving off fossil fuels at home and work.

In terms of technology and economics, this is an excellent time to invest in renewables. The price of solar keeps falling. Energy storage is more affordable and standardized, maximizing the benefits of your solar system. Electric vehicles are dropping in price as they increase in range, and the used EV market is making these cars even more accessible. All these options are getting close to competitive in up-front costs as well as yielding savings throughout their life cycles. Read on and imagine being part of this revolution.



Melissa Everett, PhD, is executive director of Sustainable Hudson Valley, a regional organization whose mission is to speed up, scale up, jazz up, and leverage progress against climate change, creating communities where people and nature thrive.

Get Retrofit

A Fossil Fuel-Free Building Future

BY MELINDA MCKNIGHT

Solar panels, heat pumps, and EV charging stations are signs of the shift toward clean power technologies—and the underlying electrification that makes the system more efficient. This is heartening. But to get us all off fossil fuels, the importance of reducing building energy usage through efficiency upgrades cannot be overstated. Does your building need a retrofit? Here are some of the signs that it might: rooms that are too hot or too cold; high utility bills; Unpleasant odors, stale air, or poor air quality; bubbling or peeling paint; rodents, insects, spiders, or snakes; mildew or mold; heating with dirty energy; icicles or ice dams; frequent illness of the occupants; noise (trains, traffic, or room to room).

WHAT'S A BUILDING SCIENCE-BASED RETROFIT AND WHY DOES IT MATTER?

Building scientists are experts who are accredited by the Building Performance Institute. They apply the laws of physics to understand how air flow, moisture, and systems within a building function together. They can see the signs of an underlying problem in order to treat more than the symptom. They also perform diagnostic testing to implement lasting solutions for healthy, safe, efficient, comfortable, durable, and fossil fuel-free buildings. Without following their guidance to improve efficiency first, building owners can fall prey to bad decision-making like installing heat pumps that are larger, more costly, and less effective at heating and cooling your home; or purchasing solar arrays that are larger and cost more to provide for your electric needs.

WHAT DOES A BUILDING RETROFIT ENTAIL?

A building retrofit begins with an examination of the building, including a visual inspection and diagnostic testing. An essential part of the process is dialog with the property owner to understand any concerns about the indoor environment and to become clear on their goals. Based on the information collected, a scope of work proposal is created that generally includes: removal of old,

damaged insulation; ventilation—passive and mechanical; air sealing (top plates, plumbing and electrical penetrations, drywall seams, vent hoses); vapor barrier; new insulation (cellulose, rockwool, closed cell spray foam, or extruded SPF polyisocyanurate) in attics, under floors, walls, and kneewall attics; duct sealing and insulation; and air purification

I ALREADY HAVE INSULATION IN MY ATTIC AND BASEMENT. ISN'T THAT GOOD ENOUGH?

The truth is that it depends on the type of insulation, its condition, and if air sealing was performed. Air sealing reduces the ways that air enters or leaves the building. It is important to have some fresh air come into the building, but not so much that you experience drafts and high utility bills. Allowing just the right amount of air to enter and leave your building is key in order to maintain the health of the occupants. Building scientists know how to calculate the Building Airflow Standard for buildings to ensure you maintain proper ventilation.

Most buildings were insulated with fiberglass—pink, yellow, or white. Fiberglass works well inside wall cavities, where it is enclosed between framing, sheathing, and drywall. When fiberglass is used in attics, crawlspaces, or basements, it does not work nearly as well because air passes right through it. This is why it becomes so dirty. The fiberglass filters the air as it enters or leaves your heated living space. Fiberglass is often improperly installed, which can create conditions leading to mold growth or off-gassing due to wood decay. Fiberglass is also an excellent nesting material for rodents and insects as well as the source of dust indoors. These factors can contribute to respiratory issues in children and adults.

IS SPRAY FOAM THE BEST INSULATION MATERIAL?

If you are talking about R-value (how much the insulation material resists heat transfer), yes, but only if it is closed-cell spray foam. Closed-

cell spray foam has the highest R-Value (R-7 per inch) but it is also the most expensive and not best for all situations. Open-cell spray foam is much less costly than closed-cell spray foam; however, more material is needed for it to perform well. We recommend that open-cell spray foam be used only in commercial buildings, as it can have a long period of off-gassing chemical fumes. This type of foam is also attractive to rodents for nesting material. There are other very effective insulation materials available and choosing the best one for you can only be accomplished by understanding your particular situation, goals, and budget.

DO I NEED TO DO IT "ALL-AT-ONCE" OR CAN I STAGE THE PROJECT?

It is possible to accomplish your project any way that best matches your needs and your budget. There are advantages to each. It makes sense to do what works best for you.

HOW DO I ACHIEVE A FOSSIL FUEL-FREE, NET ZERO HOME?

The first step is to reduce energy consumption. The ways to reduce energy usage include: 1. Switch to LED light bulbs. 2. Install professional air sealing techniques. 3. Upgrade your insulation. 4. Upgrade your hot water heater. 5. Install continuous, professional grade hot water pipe insulation. 6. Invest in Energy Smart appliances.

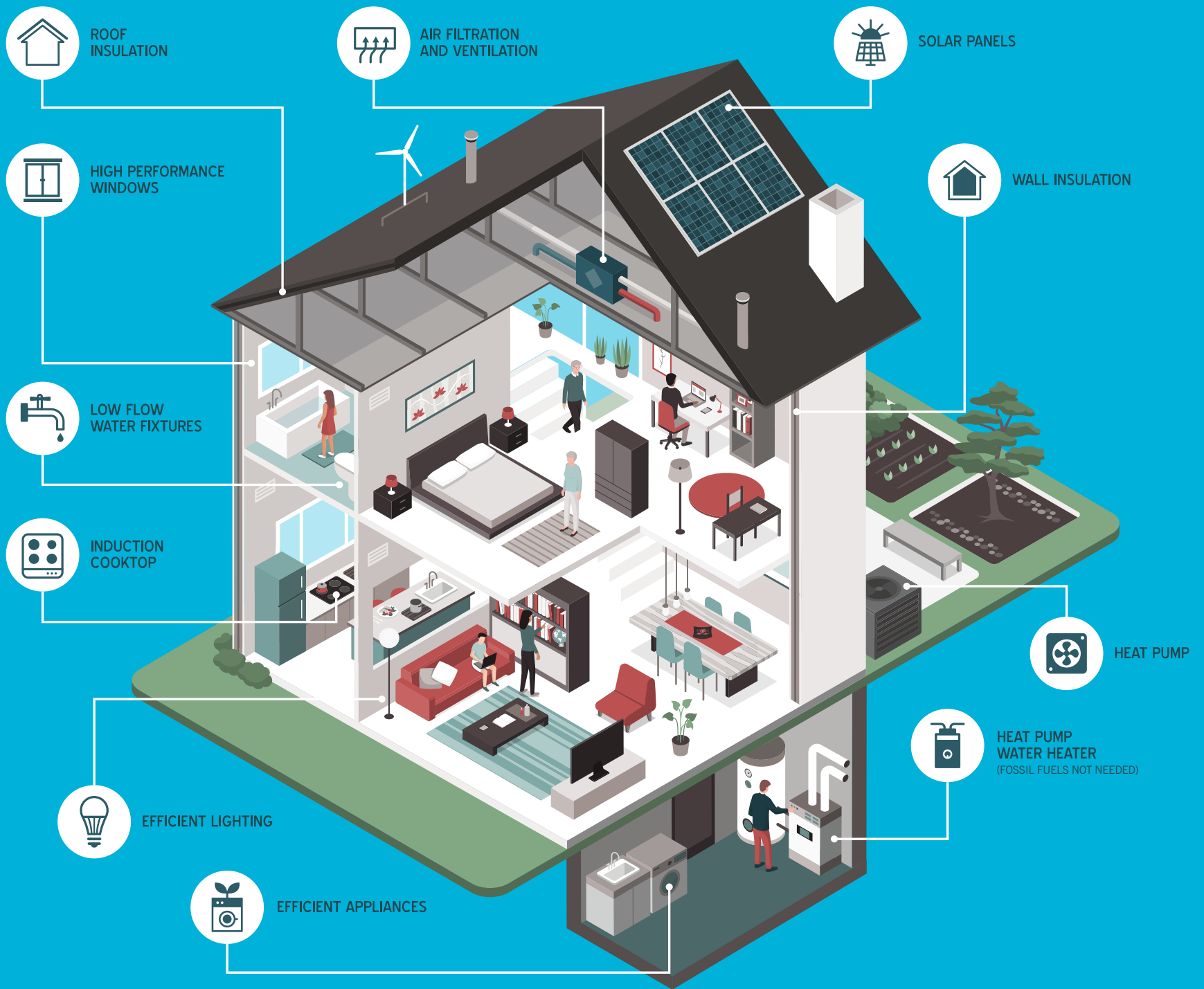
Once energy consumption is reduced, the next step is to install solar panels (if you can) or to buy solar energy. If you decide to install solar panels, it would be worth considering a back-up storage system to become energy independent. The last step on the journey is to install air source or ground source heat pumps to provide clean comfort all year long.



Melinda McKnight is the EVP at Energy Conservation Services, a Kingston-based home performance contracting firm.

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SEVEN SOLAR STRENGTHS FOR 2021

BY DAVE CONOVER

THE SUN IS ABUNDANT

Former Vice President Al Gore often notes that there is enough solar energy reaching the Earth in one hour to meet the world's energy needs for a year. Photovoltaic panels already power 2.3 million US households and the solar industry is bigger than coal or steel. The International Energy Agency recently declared that solar offers the cheapest form of electricity in history. According to the Solar Energy Industries Association, solar has an annual growth rate of 49 percent over the last decade.

THE PRICE OF SOLAR IS DROPPING FAST

According to EnergySage, the average cost of solar power has dropped from \$3.69 per watt in 2015 to \$2.09 today. A 6 kW system in New York (enough for a modest house) costs \$15,900 to \$21,300 before state incentives and tax credits.

THE SUN HAS A WARRANTY

Well, solar (PV) panels do! They are a long-term investment that can last up to 30 years. Panels generally have warranties that cover equipment (defects, premature wear) and also performance. Equipment warranties last from 10 to 25 years, and should guarantee no more than a 10 to 20 percent loss of performance over the life of the panel. Read the fine print.

YOU DON'T NEED PANELS

If your place isn't properly oriented to the sun, or is shaded, or if you rent, you may want to consider a community solar subscription service where customers gain access to energy savings from electricity produced at a solar farm. They'll save you money too. Through a larger-scale variation, Community Choice Aggregation, entire towns and communities can source their power from the sun (though by law individuals can opt out). Central Hudson's Clean Energy Marketplace offers incentives and allows you to compare and estimate savings when choosing community solar. Check if your energy provider offers something similar.

YOUR METER CAN RUN BACKWARD

If your PV system is connected to the grid (as most are), you have access to "net metering." Whenever your panels produce more electricity than you're using, the surplus gets put back into the grid, making the economics of solar even better. Current regulations in New York on net metering are in transition but your installation contractor will be on top of them.

YOU CAN PUT THE SUN IN A BOX

If the box is a battery, that is. Battery storage is fast dropping in price thanks to standard models like Tesla's Powerwall, but storage can also be customized for your needs.

NEW YORK LOVES THE SUN

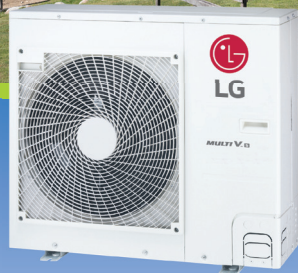
The Climate Leadership and Community Protection Act was passed last year and provides a template for New York State to transition off of fossil fuels, starting with the ambitious target of 70 percent carbon-free electricity by 2030. A major focus is on making sure renewables are affordable and accessible for people without a ton of money, so watch for solar energy to be even more visible going forward.



Dave Conover is the program coordinator for Sustainable Hudson Valley.



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GOING GEOTHERMAL A HOME MAKEOVER IN SAUGERTIES

BY WAYNE DEDERICK



Wayne Dederick's Saugerties home with geothermal field, solar array, and electric vehicle charging station.

I grew up on a farm in Saugerties. I worked in house repair and construction while in college and became comfortable with both plumbing and electricity. I became a chemistry teacher at Red Hook High School, hence I had a solid understanding of electricity, phase changes, photovoltaic (PV) technology, and more. My wife and I designed and built our house in 1978 using plans from the University of Illinois at Urbana-Champaign. We were serious about energy performance; it was built with nine-inch walls and passive solar technology.

I became an avid reader on solar and geothermal systems. After retiring in 2002, I installed the plumbing and electrical systems, as well as several bathrooms and a kitchen in the house my daughter and her husband were building. By 2008, I was very interested in actually installing a PV system at my own house. My son-in-law, who is a mechanical engineer, convinced me to install geothermal first. That made sense, because my central air conditioning was getting old and would soon need to be replaced. He found us a company that would drill the wells, install the plastic pipes in the ground, and fill the wells around the pipes with sand and bituminous clay. He told me, "You figure out the rest!"

I considered hiring a contractor, but they were pricey. I calculated the heating and cooling loads. I chose a water-source heat pump, which is very efficient because the temperature of groundwater is relatively constant, and water is a much better conductor of heat than air is.

I selected a Water Furnace Envision 049, which helps to heat our domestic hot water when it is running. It has a dual-capacity compressor (to accommodate the heating and cooling functions) and a backup resistance heater capable of 32,700 BTU/hr. That backup heater has only turned on once—when I tested it! The temperature in our house is perfect and you cannot hear or feel that the system is running.

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Top: Dederick's geothermal system, which he estimates cut his heating costs in half after he switched from an oil-fired furnace.
Bottom: Evacuated tube collectors convert sunlight into photovoltaic energy.

The system required two wells, each 300 feet deep, spaced 20 feet apart. The piping was connected in parallel to reduce the resistance to the water flow. This allows the use of a smaller circulating pump. I used a 15-percent ethanol solution to protect from freezing. The duct work in our house did not need to be increased in size, because we already had a central air conditioning system.

I was fortunate to have started with geothermal, because the price of solar panels dropped dramatically between 2008 and 2012, when I actually installed the PV system. That solar system supplies enough electricity to run everything in the house, which includes the geothermal system, and also charges our electric vehicle, a Tesla 3.

I estimate that switching from an oil-fired furnace to a geothermal system cut my heating costs in half and lowered my air conditioning cost considerably. Also, I knew I could "make" my own electricity but I could not "make" my own oil.

In my opinion, building codes should be modified to encourage PV and heat pumps in all new construction. Owners of older homes should consider geothermal when their old air conditioning or heating systems need replacement.

Our geothermal system has been installed for 12 years and has been maintenance free except for changing air filters. Three of my neighbors have now installed geothermal systems and they all love them. During a recent heat wave, I commented to one of my neighbors, "The best thing I ever did was install the PV system." He quickly corrected me: "No, the best thing you ever did was to install geothermal!"



Wayne Dederick is a retired chemistry teacher with three daughters and six grandchildren, hence his care about the future of our planet.

WARM FEELING WHAT KIND OF HEAT PUMP MAKES SENSE FOR ME?

BY MICHAELA CIOVACCO

A heat pump uses electricity to run the same kind of refrigeration cycle that a refrigerator or air conditioner uses—except that a heat pump can transfer heat into or out of an entire building, making it possible to heat, cool, and dehumidify your space. Because they are electric, heat pumps provide more efficient heating and cooling than burning fossil fuels, making them good for the planet as well as for your building’s comfort.

There are two main types of heat pumps: ones that source their energy from the air, air source heat pumps (ASHPs); and ones that source their energy from the ground, ground source heat pumps (GSHPs). For example, in the winter, cold-climate ASHPs placed outside of the building will absorb heat from the air (yes, even though it feels cold to us there is still heat to absorb, down to about -15 degrees Fahrenheit). They transfer that heat (amplified by a compressor) to be distributed inside the building, either by another AC-looking unit (called a ductless mini split head), or central ductwork system.

Also known as geothermal, GSHPs are installed inside the building and concentrate the heat transferred from water circulating pipes in the ground. Most commonly, GSHPs distribute conditioned air via a central ductwork system but there are models that can produce hot and cold water too. The water-based GSHP systems don’t make very hot water but can be effective in radiant floors or when sent to a ductless hydronic fan coil, which is like a mini-split head but receives water rather than refrigerant.

Which one makes sense for you?

Generally speaking, the ideal candidates for a GSHP system have at least one of the following:

- Expensive heating costs from heating oil and/or propane, electric baseboard—

basically anything other than natural gas, since natural gas heating costs are subsidized by utility ratepayers and it makes less financial sense to switch to any electric heat pump system.

- The owners have and/or want central air.
- The building is under renovation or is new construction.
- The owners want to be carbon net zero.
- The owners don’t want to hear or see any outdoor equipment.
- There’s a larger budget for installation (although financing is available, retrofit systems—not new construction—average around \$30,000 after utility and state incentives).
- Ideal candidates for ductless ASHP systems have at least one of the following:
- The owners want to supplement an existing heating system to reduce energy consumption, fossil fuel use and/or heating costs.
- The building has an open layout (few walls) and/or the owners do not mind that heating and cooling from the mini split head only spreads to one space (similar to a traditional window air conditioner).
- There is a lower budget for installation.

Here are some additional questions to keep in mind:

What is your current heating method? And what kind of coverage do you want?

In pure financial terms, anyone with a heating system other than natural gas is a good candidate for a heat pump, since the savings over time will

compare favorably. If you’re replacing a natural gas system, the savings will take longer to capture but will still be there. GSHP have the capability to deliver heating and cooling throughout the building whereas ASHP systems generally only provide heating and cooling to designated open areas.

How recently constructed, and how well insulated is the building?

Heat pumps are sized depending on how much energy is required to heat and cool a building. A building without insulation needs much more energy to control the temperature, so insulation first is worth the investment. Your heat pump installer should be able to guide you to an energy efficiency provider.

What is your motivation for adopting heat pumps? Going totally net zero or simply reducing your carbon footprint?

Going net zero? Geothermal has the advantage of using less electricity to power. Air source systems are great to offset the majority of your heating costs and fossil fuel use in the winter, and serve as your air conditioning unit during the summer.

What is your budget?

Geothermal systems are more expensive than air source systems. That’s mainly because they cover the whole building and become a part of the structure itself, whereas ASHP systems involve a smaller, simpler installation. GSHPs are about \$30,000, post-incentives. ASHPs mini-split systems typically cost around \$4,000 per unit, and an average house may use two to four distribution units.



Michaela Ciavocco is program coordinator for New Yorkers for Clean Power. She can be reached at nyforcleanpower@gmail.com for more information and recommendations.

HEAT PUMP INCENTIVES

Description	Central Hudson	Con Edison	National Grid	NYSEG/RGE	Orange & Rockland
Cold Climate ASHP: Partial Load Heating	\$800 per outdoor condenser unit	\$500 per outdoor condenser unit	\$500 per outdoor condenser unit	\$500 per outdoor condenser unit	\$500 per outdoor condenser unit
Cold Climate ASHP: Full Load Heating	\$1600 per 10,000 Btu/h of maximum heating capacity at NEEP 5 degrees F	\$2000 per 10,000 Btu/h of maximum heating capacity at NEEP 5 degrees F	\$1000 per 10,000 Btu/h of maximum heating capacity at NEEP 5 degrees F	\$1000 per 10,000 Btu/h of maximum heating capacity at NEEP 5 degrees F	\$1600 per 10,000 Btu/h of maximum heating capacity at NEEP 5 degrees F
GSHP	\$2000 per 10,000 Btu/h of maximum heating capacity a certified by AHRI	\$2850 per 10,000 Btu/h of maximum heating capacity a certified by AHRI	\$1500 per 10,000 Btu/h of maximum heating capacity a certified by AHRI	\$1500 per 10,000 Btu/h of maximum heating capacity a certified by AHRI	\$2000 per 10,000 Btu/h of maximum heating capacity a certified by AHRI
Custom	\$80 per MMBTU of annual energy savings	\$150 per MMBTU of annual energy savings	\$80 per MMBTU of annual energy savings	\$80 per MMBTU of annual energy savings	\$80 per MMBTU of annual energy savings

This table shows the current incentives offered for air-sourced heat pump (ASHP) and ground-sourced heat pump (GSHP) by each utility in New York. Contact your regional installer or reach out to NYCP at info@nyforcleanpower.org for more information.

State of New York

Actual data from WaterFurnace owners

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ENERGY NAVIGATION GOOD HELP IS EASY TO FIND BY COLLIN D. ADKINS

With all the options available in today's market for heating, cooling, home energy efficiency, smart energy gadgets, battery storage, solar generation, community solar, and more, you might be asking yourself, "Where do I start?"

Cornell Cooperative Extension (CCE) is here for you. Energy advisors with CCE Dutchess and Sullivan Counties are available to assist renters, homeowners, small businesses, and nonprofits throughout the Mid-Hudson region with energy improvements—especially anyone facing financial hardship or with limited income.

Bob and Michelle of Clinton Corners had known for some time that their aging heating and cooling system was in need of replacement. Though their insulation was good, it felt like any year could be the one where the heating system finally gives up. On a fixed budget, the prospect of being able to make the most efficient and sustainable choice felt out of reach.

Before meeting an energy advisor at a regular volunteer gathering, Bob and Michelle were unaware of the energy efficiency programs available. Over meetings, phone calls, and emails, they worked with their energy advisor to understand their estimates, prepare their application for financial assistance, and arrive at an affordable package which included a cold climate heat pump for their first and second floors, a 50-gallon hybrid water heater, and piping insulation to keep the whole system operating efficiently.

Once they learned that they could receive guidance throughout the entire process, the entire project felt less overwhelming and finally achievable. They commented, "For some people, talking to contractors is like speaking in a foreign language. We were thrilled to death to find out that there were energy advisors to keep us organized and inform us of funds available for people like us—funds that people don't often know about."

Our resources continue to grow with the expansion of the Energy Navigator program. Local, knowledgeable volunteers are learning a wide array of energy topics and how to use a neighbor-to-neighbor approach to help people in their communities understand and lower their energy use and switch from fossil fuels to renewables. With all the incentive programs and supports available in New York State, now is a great time to take a fresh look at your home energy use.

Connect with your local energy advisor at Midhudsonenergychoices.org and learn about cost-saving programs. For more information on volunteering as an Energy Navigator, contact Hazel Robin at dr598@cornell.edu.



Collin D. Adkins is the environment and energy resource educator and energy advisor with Cornell Cooperative Extension of Dutchess County.



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EVolution

THE RISE OF ELECTRIC VEHICLES

BY SETH LEITMAN



Electric vehicles are mainstreaming fast. All those chargers appearing on the highways, and the EV ads broadcast during major sports events—they are a sign of a transformative change in technology in the works. There are over 40 makes and models in the US marketplace now—but more importantly, automakers are shifting their R & D and engineering investments, their supply chain efforts, and strategic alliances, toward EVs.

What's new with EV technology?

There is more standardization of basic EV design by companies seeking an advantage in creating diverse models within a single make. Underneath some of this is a flexible platform known as a skateboard. Rivian, a Massachusetts startup, won \$500 million in investment from Ford to use this platform in multiple Ford EVs.

What's new in the marketplace?

Everything is evolving fast. We're seeing lots of changes in car companies' strategies. In sales, Tesla Model 3 is still the go-to. Behind that is the Chevy Bolt—one of the most reliable EVs I've test driven. There are more plug-in hybrids and smaller-range electric vehicles than ever; in the 150- to 200-mile range. Whatever kind of car you are in the habit of driving and like, there is an electric version or soon will be.

Electric cars come with all the bells and whistles you have to pay extra for in a gas car—the sensors, the safety features, so you get more for your dollar. Worldwide, the market grew 40 percent from 2018 to 2019; although EVs were back then only one percent of the global fleet, that kind of growth won't take long to be visible around us.



A big trend is electric trucks and SUVs like Rivian; Bollinger, which almost looks like a 1950s Range Rover; the Ford Mustang Mach E; the VW ID4; the Nissan Ariya. As Elon Musk has said, we have to make the best vehicle to meet the needs that drivers see, ergo the Tesla cybertruck which has more than 600,000 deposits before it has hit the market. These are more cost competitive across their life cycles—especially with Tesla and VW offering dedicated charger networks for their vehicles.

Who's driving EVs now?

It's the most diverse array of people I've seen, from stay-at-home moms to police. I know a guy who works at Sing-Sing who bought a Model S, had an accident, walked out of it and had the car refurbished because it was so safe. People also buy them for speed, and they are showing up more and more in the racing world. I know a guy who bought a Tesla Model X for \$80,000 and bragged that he could blow past a \$250,000 Porsche. On the other end of the spectrum, people are buying the EVs like the Hyundai Kona because they are so affordable to own and operate.

How do you shop for a car and a dealership?

Picking the car: That's for you to decide. What features and capabilities do you want? Pretty much every size and style and set of features is available as a plug-in hybrid or EV. Check out Driveelectricus.com, a website created by a consortium of automakers and Northeastern states, for an in-depth, unbiased look at the vehicles.

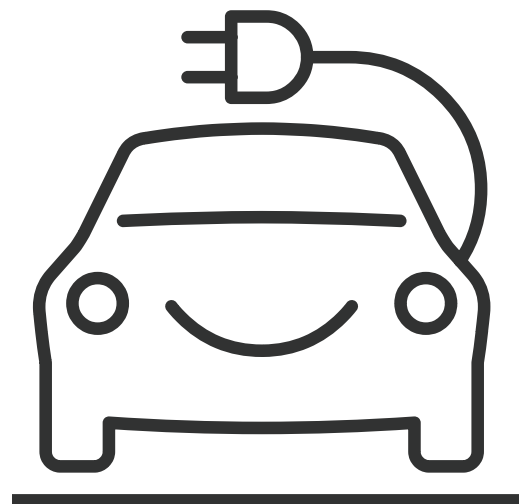
Shopping for a dealer is the trickier part. Check websites. Are there EVs onsite? Visit. Is there a car there charged and ready to test drive? Is there a knowledgeable person who can describe not just the features but the benefits, the financial case, the technology—who can talk to you as an informed enthusiast? Dealers can help you get all possible discounts and rebates, and steer you to the car that fits your lifestyle. So work with them, and educate them too.



Seth Leitman, aka the Green Living Guy, directs EV programming for Sustainable Westchester and Sustainable Hudson Valley. Email him at greenlivingguy@gmail.com or visit Sustainhv.org to get more info on electric cars.

WHAT'S COMPLICATED ABOUT CHARGING YOUR ELECTRIC CAR?

BY STEVE WEHR



For most people, the answer to this question is: “Nothing, really.” Charging your electric car is easier and much less costly than going to the gas station. It’s just that it’s so *different* from what we have always done. There is new terminology to learn, new habits to form, and maybe new equipment to buy. Feeling comfortable that you can easily and conveniently *charge* your electric car is one of the keys to feeling comfortable enough to *purchase* an electric car.

You will mostly charge at home, but may also charge at certain destinations, or while travelling. Home charging can take 8 to 40 hours to get a full charge from near empty, depending on the equipment in your home. Destination charging can take several hours for a full charge, while travel chargers can charge your car in less than an hour, often less than 30 minutes.



Home Charging

For most Electric Vehicle (EV) owners, charging at home is how you will charge 90 to 95 percent of the time. When you get home at the end of the day, you can plug in your car and you will have a full “tank” the next morning.

You have several options for how to plug in at home:

- 120V outlet. Almost all EVs include a “Level 1” charger that can be used in a 120V outlet. You can expect to get about 40-60 miles of range charging for 12 hours.
- 240V outlet. You can have an electrician install one of these in your garage or parking space for about \$250. Your car’s included charger may include a plug to use this type of outlet, or you may be able to buy one from your dealer. You can expect to get about 80 to 140 miles of range charging for 12 hours.
- Dedicated EV charger. Many companies sell home chargers that are wired directly into your service panel. These will add 20 to 40 miles of range per hour. You will pay about \$500 for the charger hardware, and \$500 to install it. You can lower this cost by taking advantage of incentives from the federal and state governments, or from your utility.

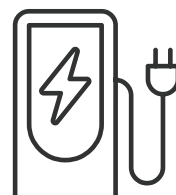
Destination Charging

As the name implies, this type of charging is used when you are stopping at a “destination” for an hour or more—a hotel, restaurant, or shopping mall. These are “Level 2” chargers that will add 20 to 40 miles of range per hour. All electric cars have sockets that accept the plugs

from these chargers, or if you have a Tesla you can use an inexpensive adapter. Expect to set up an account with each company in order to use these chargers.

ChargePoint is by far the largest provider of these chargers, with hundreds of them in the Hudson Valley alone. Many of these are provided by municipalities for free.

Travel Charging



All of these charging stations will charge you for a rapid charge. You will need to setup an account ahead of time to use most of these chargers, but some do offer credit card payment options, so no account needed.

For Tesla cars, you can take advantage of the Tesla Supercharger network, with over 1,000 charging stations in the US. Cost is typically about \$13 for a full charge. Tesla cars use their own proprietary charging socket, but can also use all the networks below with a \$500 adapter.

For all other cars, they typically use the “CCS Combo” socket in order to use travel chargers, or if you have a Nissan Leaf, then you will use a socket named CHAdeMO. You have your choice of many charging networks that have both plugs. Prices can vary widely by network and location. As of September of this year, you can use networks such as Electrify America, EVgo, Chargepoint, and Greenlots; New York State is installing fast chargers on major state highways. In the Hudson Valley region, these chargers cost about \$14 to \$20 for a full charge.

To find a charger, use the PlugShare app to list chargers from all companies. Also, your car’s GPS may tell you if you need a charge before you arrive at your final destination, and route you to a compatible charger.

Bye-Bye Gas Stations

The charging infrastructure is growing rapidly throughout the country, and especially in New York State and the Hudson Valley. Talk to owners, ask them about their experiences. You’ll find that charging really is much less complicated than you may think. New habits are pretty easy to form. And you really won’t miss gas stations.



Steve Wehr is a retired engineer and EV enthusiast.

WHO'S IN THE GREEN WORK FORCE?

Working Toward a Bright Future for the Hudson Valley

BY CHRISTOPHER MARX

Well over a decade ago, SUNY Ulster began to build training programs for installers of solar, geothermal, and wind technologies as well as green building methods. We saw exciting new career pathways for our students. However, when we rolled out these programs, there were very few traditional college students. Instead, they were seasoned building and trades professionals including contractors and electricians, architects and engineers, and even real estate agents. They weren't taking the classes to get a green job, they were evolving existing jobs to make them greener and building the movement.

At the same time, industry organizations were just starting to develop standards of best practice for clean energy system installation and energy efficient building. The SUNY Community Colleges have been working with professional instructors and with national industry groups to create curriculum that meets these standards. Training programs fall into three categories: green building design, green building construction, and green building maintenance. Today, we have courses and programs addressing the three main categories

of green building careers—design, construction, and maintenance—SUNY Ulster focuses primarily on construction and maintenance. This includes the installation of clean energy systems, like photovoltaic panels, geothermal systems, and energy efficient building practices. Students can earn multiple certifications from industry groups such as the Building Performance Institute and the North American Board of Certified Energy Practitioners—credentials that are recognized nationally and in some foreign countries. Programs in this area include Energy Auditor, Heating and Heat Pump Professionals, and Building Automation. These certifications prepare the green building professional to assess the energy system upgrades and renovations for older buildings—useful, since the Hudson Valley has some of the oldest housing stock in the country. Many of the courses offered at SUNY Ulster offer credits toward an Associate Degree in Green Building. Our students are trained in a state-of-the-art building science lab and test house, the Kelder Center, where they can work on the integrated solar photovoltaic and solar thermal panels, perform field tests on heating and cooling systems, and study the effects of various insulation

materials. Instructors can even open leaks in the structure for students to find as part of their energy auditor exam.

These days, the young people are on board, too. Last year, the Ulster County Executive and the Ulster Career Center partnered with SUNY Ulster to create the Green Careers Academy, a career pathway training program that starts with basic courses to prepare students for technical training. Grants and donations even provide scholarships. Local companies—especially those with employees who have taken our classes—have accepted interns and hired students. In a new program with Citizens for Local Power, Kingston apprentices actually start with a paid work experience to gain hands-on knowledge before they ever take a class.

The science of green building continues to evolve with new methods and materials and higher standards. It is an exciting time to be a practitioner.



Christopher Marx is associate vice president for Workforce, Economic Development, and Community Partnerships at SUNY Ulster.

Learning to Succeed in an Evolving Field

BY JUDITH KARPOVA

Imoved to the Hudson Valley in 2001, about a month before the attacks on the World Trade Center. I was concerned about the invasion of Iraq as a resource war and vowed to do my part to overcome the need for oil. I started thinking about energy in the home I had bought. It became my guinea pig.

In 2004, I installed solar. In 2005, I added geothermal. I took the Building Performance Institute's Building Analyst and Building Envelope courses in 2006. Then I studied to become a certified geothermal installer. With this combination of experience, I was hired by the person who installed my geothermal system to do site visits and energy efficiency audits.

I was laid off in 2010 after the economy collapsed. I took the time to get involved in citizen activism. I also got active in the US Green Building Council. I discovered the Ulster County Office of Employment and Training and the Ulster County Career Center. Through their funding, I took the Sustainable Building Advisor training for another certification through the US Green Building Council.

I got the opportunity to work for a startup, Higher Value Insulation, for over a year. Ironically, the business was so successful that the founder closed it down and jumped into his next passion, building new passive houses. I went on to work for Global Dwelling for a few years, then moved to Northern Windows doing energy audits. I joined Energy Conservation

Specialists in 2018, working until they closed during the COVID crisis.

Five years had passed, making me eligible for another funded course through the county. Last year, I took a four-month course on air conditioning and refrigeration at BOCES. So here I am, stuffed to the gills with certifications and looking forward to what's next.

I've learned that you have to really like your career; not just think you should do it. I found this calling late in life. It's mentally and physically arduous. But it's the work that energizes me. I love the inner Sherlock that comes out when I walk into someone's home to figure out where their energy is being wasted, where their money is going. You have to keep yourself educated and current, take classes, go to conferences, keep your antennae out. Even though I've been laid off a number of times, work keeps coming in because of my credibility. Right now, the home energy efficiency field is under stress. How it unfolds will depend on how the word spreads about these services to people who need them. In sticking with this, I've gotten a solid grasp on my profession and earned respect. That's what brings the real rewards.



Judith Karpova is a certified home energy efficiency auditor, sustainable building advisor, and clean energy advocate.

Diversity in the Clean Energy Workforce

If we're going to build back better *for all*, we have to pay attention to equal access to training, employment and advancement. According to industry sources, in 2019, the solar work force was composed of 7.6 percent African Americans, 17 percent Latinos and 26.3 percent women; only 21 percent of the wind industry's work force is women. Diversity is even more limited at top levels, with men holding 88 percent of solar industry leadership jobs and 80% of senior employees being white. The better news is that the number of companies with a racial diversity plan in place has risen from 7 percent in 2017 to 22 percent today.