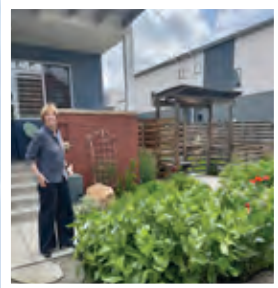

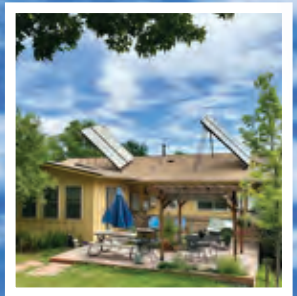

2025 GREEN HOMES TOUR

Metro Denver

NECO • New Energy Colorado

Beautiful, Comfortable, Healthy Homes

Saturday, October 4, 2025

14350 W. 32nd Ave • Golden, CO 80401

Tour 9am–4pm • $15/adult $25/couple
Electric Vehicle Roundup 3pm–5pm
Reception and Green Expo 4:30–6:30pm

AMERICAN SOLAR ENERGY SOCIETY

CRES Colorado Renewable Energy Society

NECO New Energy Colorado

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- **Quiet**
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Welcome to the 2025 Metro Denver Green Homes Tour!

Greetings, and welcome to the 2025 Metro Denver Green Homes Tour!

Thank you for joining us for the 30th year! We hope you will enjoy visiting stunning energy-efficient homes that will help you learn how your neighbors are saving energy and water while increasing the comfort of their homes. We know you will get ideas for improving your own home to make the air cleaner and the utility bills lower.

We are pleased that homeowners across metro Denver have been willing to open their houses to help you learn about technologies including electric-vehicle charging, solar energy and storage, heat pumps and water-wise landscaping. Please take this once-a-year opportunity to talk with these folks to learn what it is like to live with technologies you have probably read about. Learn how to harness free energy with dependable solar power and battery systems that shield you from brownouts and blackouts while taking advantage of utility time-of-use rates. And you'll see that beautiful yards don't have to waste water.

The tour features a variety of homes, showing that all housing types can go green. You can explore post-Marshall-fire homes rebuilt with unique sustainable and energy efficient designs; a small 1940s suburban home with a ground-source heat pump, solar power, and raised-bed gardens; a modern energy-efficient all-electric townhome, an updated 1970s home with both solar PV and hot water solar panels; and more.

After the tour, plan to attend the free Reception & Green Expo: 4:30-6:30pm at Jefferson Unitarian Church (JUC), 14350 W 32nd Ave, Golden CO. Enjoy free appetizers, local beverages and live music while networking with others seeking a more sustainable lifestyle. See renewable energy and sustainable-living exhibits, an electrified home demo trailer, and electric bicycles. From 3pm-5pm you can also check out a variety of smooth, powerful electric cars that let you say goodbye to gas stations forever.

This is a critical time to consider making investments in your home's energy future. Federal clean energy tax credits that have been so beneficial in last few years expire at the end of this year. The federal electric vehicle credit expired at the end of September. However, a number of incentives from local and state governments and utility providers remain. These credits can help cover the costs of appliances such as heat pumps, improvements to your building envelope, and renewable energy such as solar electric and battery storage systems.

The importance of being part of the solution continues to grow as the climate crisis gets worse. The earth's record heat continues to increase and so does misery around the globe.

Sponsored by New Energy Colorado and the Colorado Renewable Energy Society, the tour is also part of the American Solar Energy Society's National Solar Tour.

Don't forget that our virtual tour of sustainable homes continues at NewEnergyColorado.org anytime you want to visit. While you're there, check out our newsletters and other information about sustainable living.

Thanks to the people who have opened their homes to showcase energy smart improvements, the Jefferson Unitarian Church for hosting our event, and the countless volunteers who have made this day possible.

And thanks again to you for choosing to spend your Saturday with us!

John Avenson
New Energy Colorado

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President of the Board,
New Energy Colorado

Rebecca Cantwell
Vice President of the Board,
New Energy Colorado

Sheila Townsend
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Martin Voelker
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ASES NATIONAL SOLAR TOUR

Photo by Dennis Schroeder, NREL 60073

New Energy Colorado is an educational non-profit with deep roots in Colorado's solar and environmental communities. The Metro Denver Green Homes Tour is our signature event, and we are working to educate Coloradans in a variety of other ways as well.

We believe renewable energy and energy efficiency have a future in Colorado as unlimited as our blue skies and sunshine. Hundreds of thousands of Coloradans have installed solar on their homes and businesses. Making improvements to houses and other buildings to save energy is easier and more cost-effective by the day. Driving electric cars is growing more affordable.

With the climate crisis now upon us and wreaking havoc around the world, more action is needed. We need to band together and educate ourselves, then take action to encourage a rapid transformation to a clean energy economy. We are building what we call Climate CitiSuns into a powerful grass-roots movement.

It's easy and free to join us as a Climate CitiSun! Just sign up here: newenergycolorado.com/solarcitisuns

Climate CitiSuns are engaged in the following activities:

1. Educate our fellow Coloradans about how we can all save energy. Our biggest annual event is the Metro Denver Tour of Green Homes, which for now 30 years has been showcasing homes that incorporate innovative energy and water- saving measures. We have added the Ark Valley Green Homes Tour, which just celebrated its seventh year, and with your help, we hope to spread the tours to other communities.

2. Amplify the voice of Coloradans who support renewables and energy efficiency and help deliver their message directly to lawmakers. There is no time to waste to stem the worst effects of climate change. We let Climate CitiSuns know about key opportunities to make their voices heard through our informative monthly newsletter (posted on our website at newenergycolorado.com).

3. Invite broad participation at events and public forums that support clean energy and oppose polluting fossil fuels. We work with a variety of organizations including the Colorado Solar and Storage Association and the Colorado Renewable Energy Society. We seek to make clean energy accessible to all Coloradans, particularly those with limited incomes who have often borne the brunt of fossil fuel pollution.

4. Spread information about renewable energy and energy efficiency through media channels and public events. We have expert speakers who share their knowledge both virtually and in-person, and we publicize other educational events.

For more information, contact us: **newenergycolorado.org**

Please help fund our work with a tax-deductible donation at link above or send checks to:

New Energy Colorado
P.O. Box 1154 Golden, CO 80402-1154

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TOUR PARTICIPANTS

TOUR ETIQUETTE

1. The residences on the Metro Denver Green Homes Tour are open Saturday, October 5, 9am–4pm ONLY.
2. Masks will be available and to be worn at the discretion of the homeowner.
3. Be mindful of your time in each home so as many people as possible can visit. Please join existing tours at the home to reduce confusion and congestion.
4. Respect the homeowners' boundaries for tour visitors.
5. Avoid handling homeowners' personal items.
6. Be aware of, and avoid, areas still under construction.
7. Follow all parking directions.
8. Please, no pets on the tour.
9. Bathrooms in the homes are not available for visitors' use on the tour – please plan accordingly.
10. Unless a homeowner requests otherwise, you may take a few photos for your own reference, but please ask permission before shooting video or taking extensive photos.

TOUR SPONSORS

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CRES
Colorado Renewable Energy Society

For A Carbon Neutral Colorado Powered By 100% Renewable Energy

The **Colorado Renewable Energy Society (CRES)** drives environmental, social, and economic benefits for Colorado by promoting renewable energy and energy efficiency.

NREL's Sika Gandzaku presenting at Renewable Powering Forward CRES conference in 2022.

CRES is a statewide, non-partisan, non-profit, 501(c)3 membership organization. CRES and its local chapters provide education, policy advocacy, and community engagement that accelerate the adoption of all forms of renewable energy, energy efficiency, high-performance building, energy storage, and emerging technologies that will help Colorado achieve 100% renewable energy.

Founded in 1996, CRES reaches thousands of Coloradoans with local education, networking events and webinars through our chapters in Denver, Golden, Boulder, Fort Collins, and Colorado Springs. The CRES Policy Committee leads our statewide policy advocacy efforts by providing input and testimony on relevant bills and advising state policy makers. The Policy Committee regularly intervenes at the Public Utilities Commission (PUC) on issues such as the Clean Heat Plan, Just Transition, Virtual Power Plants, and more.

Visit **cres-energy.org** to learn more about upcoming events, how to become a member, and other ways to stay connected and get involved. Recordings of past CRES events can be viewed on the CRES YouTube channel: @COrenewable

Contact: info@cres-energy.org, 430 North College Ave, Ste 400, Ft.Collins, CO 80524

www.cres-energy.org

Glossary

Accessory Dwelling Unit (ADU) – Small dwelling on the same grounds as a single-family house (e.g., in backyard, over garage, or in basement).

Air Change (ACH) – Exchange of the total volume of air in a house with outside air in a specific amount of time (measured in air changes per hour).

Air Stratification – Heated air rises so that the warmest air is at the top and cooler air is at the bottom.

Alternative Building Blocks – Like concrete blocks, but with recycled polystyrene, recycled wood fiber, or extra air to make them lighter.

Backup System – Provides heating for several consecutive cloudy days or when temperatures are exceptionally cold. Battery-backup solar PV systems also can run a house during power outages.

Berm – Earth mounded against walls or roof to help moderate temperature, redirect winds, reduce snow and ice buildup on the north side of buildings, or even dampen noise. Requires proper structural engineering.

BTU – British Thermal Unit is a measure of the quantity of energy, specifically, the heat required to raise one pound of water 1° F. It is equal to 252 calories (approximately the same as the heat emitted by a match). Example: A 9000 BTU heat pump.

Chimney Effect – Air rises when heated and sinks when cooled, thus a house can be cooled by opening windows at the top of the house, causing warm air to rise and creating a negative pressure that brings in cooler air from the bottom floors.

Clerestory – Windows placed high to let in light and heat. The earliest example of this is in the Ancient Egyptian temple complex of Luxor.

Conduction – Heat transfer between objects by direct contact (passed from molecule to molecule by rapid vibration).

Conductive Heat Loss – Heat passing through building materials from the inside to the outside.

Construction Waste Reduction – Using construction materials to create very little waste by efficient dimensioning and use of scrap materials. This practice also uses recycled materials.

Convection – Heat transmitted from a warmer surface to a cooler surface by air or liquid movement.

Daylighting – Using natural light wherever possible to reduce the use of electrical lighting.

Direct Gain – The basis of passive solar heating, with sunlight entering the building from a (usually) south-facing window and striking a high-density mass. Heat absorbed by the mass is released when the air temperature drops below the temperature of the mass.

Earth Sheltering – Use of earthen berms to the tops of walls, or even on the roof, to help moderate outside temperatures against the walls or the roof of habitable spaces.

Efficient Lighting – More cost-effective LED (light emitting diode) lighting has made CFL (compact fluorescent) technology obsolete. LED "color" is rated in Kelvins: 2800K = very warm white; 3000K = warm white, better color rendition; 5000K = blue-white/daylight. LEDs are available in lighting strips for under cabinet lighting. LEDs use 1/8 or less electricity than incandescent lights and are still improving.

Embodied Energy – Embodied energy is energy used by a building material from acquisition of the natural resource, to manufacturing and production, to product transportation and delivery. Indigenous building products like rock or wood harvested onsite have almost no additional energy costs in fuels, manufacturing, or building.

Engineered Composite Wood – Manufactured wood made from recycled or reconstituted wood that is laminated or "finger-jointed", creating a stronger, more consistent product. Also includes laminated veneer lumber (LVL), oriented strand board (OSB), and manufactured joists.

ERV, HRV, CERV – Energy recovery ventilator, heat recovery ventilator, conditioned energy recovery ventilator. Instead of opening a window in winter, fresh cold incoming air is warmed by extracting heat from the expelled stale air and adding that heat to the cold incoming air. A CERV can work both ways and also cools the fresh air in the summer.

Heat Pump Mini-Split – Electric heat pumps both heat and cool a house very efficiently. In cooling mode, heat pumps act like an air conditioner, moving heat from inside the home to outside; in heating mode, they pump heat from outside the home to inside. Heat is just energy, and there's energy

in the air all the way down to absolute zero (-465°F); therefore, heat pumps designed for cold climates can keep a home warm without backup even when outside temperatures are below -20°F. A heat pump's source can be air (more common, less expensive) or geothermal (more efficient, but more expensive) and they can take the form of either ductless "mini-split" or ducted systems. Ducted heat pumps use existing ductwork (or new ducts) to disperse heated or cooled air throughout the home. Mini-split ductless heat pumps are easier to install where there is no existing ductwork. A mini-split is named for its small form factor compared to a central air system. Mini-split systems have two main components: an outdoor compressor/condenser and an indoor air-handling unit(s) (evaporator), therefore a "split" in the hardware. Mini-splits have high SEER values from 33 to 42 (compared to air-conditioners at only 16). Heat transfer technology also is applied in heat pump water heaters (HPWHs). Similar to heat pumps for space heating, HPWHs produce hot water instead of hot air, using electricity to pull heat from the surrounding air and transfer it into a hot water tank. Like heat pumps, HPWHs are energy efficient because they transfer heat instead of creating it.

HERS Ratings – The Home Energy Rating System (HERS) index is the industry standard that measures a home's energy efficiency.

House Wrap – Material wrapped around the walls of a house to prevent air from passing through, thereby preventing a drafty house.

Indirect Gain System – Placing dense heat-absorbing material between a heat source and a space that needs heat is called indirect heating.

Indirect Mass – Materials like concrete, water, brick, stone, adobe, sheetrock, etc. absorb and store heat from warm air and release heat when the air temperature is cooler than the mass temperature.

Infiltration Heat Loss – Cracks around doors, windows, and outlets (among other places) allow cold outside air in and warm inside air to escape in winter, or the reverse in summer.

Insulation – Prevents heat loss or gain by using small air pockets or materials that don't conduct heat. Insulation conducts heat poorly and reduces heat loss by retarding the heat movement from warm to cold.

Insulating Concrete Forms (ICFs) – Lightweight blocks of concrete with polystyrene added for higher insulation values.

Internal Heat Gain – Heat generated by people, cooking, lights, hot water, etc. A person at rest produces 200 BTU or 130W.

Low-E glass windows – A thin metal coating lets in short wave solar energy but blocks long wave thermal energy, improving thermal performance by reducing the flow of heat from inside to outside or outside to inside. The "E" stands for emissivity.

Low Flow Toilets – A toilet using roughly 1½ gallons of water, or a dual-flush system using less water to flush liquid waste than solid waste.

Mass Wall – Generally a south-facing wall, and one made of a high-density material to store heat from the sun or surrounding air. When the air temperature drops below the wall temperature, the wall radiates heat back into the space.

Natural Convection – Movement of heat through the movement of air or water is called convection.

Net Zero Energy Home – A home that produces as much energy as it consumes.

Optimum Value Engineering (OVE) – Many homes are "overbuilt" with too much lumber. OVE techniques use less lumber without compromising structural elements of the house, saving material and labor costs, and providing more insulation because there is less wood and more insulation.

Passive Cooling – Using a "thermal chimney" to draw air from the lowest (generally cooler) point of a house to the highest point (generally warmer). Windows often are placed at the top of the thermal chimney to expel hot air, thereby pulling cool air up. An attic fan forces this action.

Passive Solar – Passive solar uses the sun to help heat the building. True passive solar heating requires a reasonable amount of thermal mass within the building, both indirect mass and sun-struck mass. No mechanical systems are used and the building itself is the heating system. Building orientation, site selection, materials, and design affect collection, storage and distribution of the sun's heat.

Payback – Time required to recoup the cost of an energy-saving improvement. If you spend $3,000 on insulation, weather stripping and caulking that reduces your energy bills by $600 a year, it will take five years to pay off your $3,000 investment.

Photovoltaics – Also known as PV or solar cells wherein light is converted to electricity to be used in the house, stored in a battery, or sold back to the utility company. PV systems can be "off-grid", meaning that they are not hooked up to a company that supplies electricity, or "grid-tied" where excess electricity can be sold back to the utility through net-metering.

R-Value vs. U-Value – "R" stands for resistance to heat loss. When referring to insulation, the HIGHER the value the better. Example: A typical 2x4 wall with fiberglass insulation = R9. A Passive-House building code wall may be R60 with an R100 ceiling/ attic to slow movement of heat from one side to the other. Windows (glass and frame) are rated as U-Value, where the "U" stands for unit value of many parts and is the inverse of R-value. The LOWER the U number the better. High-performance windows keep improving and range from U 0.17 down to U 0.045 (R21.7).

SEER – Seasonal Energy Efficiency Ratio is used to measure the efficiency of a heat pump when it is in cooling mode. The higher the SEER, the higher the efficiency rating.

Smart Home – A home with multiple sensors on walls and appliances to measure lumens, temperature, weather, humidity, watts used, motion, etc. The sensors create an active IF/THEN method of triggering energy conservation actions, such as motorized shades up/down, lights on/off, fans on/off etc.

Solar Thermal Heating System – Works similarly to domestic hot water with collector panels and a storage tank. The hot liquid can be sent directly through a hot-water baseboard in each room. A backup system for solar thermal would be a boiler.

South Orientation – The longest side of a house faces anywhere from 15° east to 15° west of true south, optimizing use of the sun's energy.

Straw Bale Construction – Straw bales made from waste products of harvested crops have an R-value of at least 45. Straw bale houses need very little backup heating. They are stuccoed on the outside, plastered on the inside, are fire resistant, and have very deep windowsills.

Structural Insulated Panel System (SIPS) – Sheets of OSB are the 'bread' of a sandwich of extruded or expanded polystyrene and are delivered on site in 4' x 8' pieces. The pieces are assembled in a factory and are labeled so that the house fits together in the style of "tab A goes into slot A". The house walls can typically be raised in under three days depending on the complexity of the floor plan.

Thermal Break – Foam or insulation between materials to stop the heat transmittance. The most common example is a foam panel layer between stick walls and house siding.

Thermal Mass – Use of very dense materials with high specific gravity, such as concrete, water, brick, stone, adobe, etc., that when struck by sunlight, absorb heat and later release heat when the air temperature is cooler than the temperature of the mass. In general, the more thermal mass in a house, the more stable the interior temperature.

Thermal Radiation – Heat transfer between objects by electromagnetic radiation. Example: Wearing a white shirt vs black. Infrared Cameras show Thermal Radiation in pictures.

Trombe-Michel Wall – Popularized by Felix Trombe and Pierre Michel, this type of wall consists of a wall of glass, an airspace of a few inches, and then a mass wall of concrete or filled concrete block. The wall can be vented, or non-vented. The 'outside' of this wall is painted a very dark color to help force the temperatures higher. Heat is absorbed into the thermal mass during daylight and released when the air temperature is lower than the wall temperature.

Vapor Barrier – In Colorado, this is usually a 6-mil layer of plastic attached by staples (minimum code) and tape (phius.org code DOE) to wall studs to prevent moisture from migrating from the interior to the exterior.

Xeriscaping – Landscaping with drought-tolerant native plants and vegetation which need very little water (though it might take a year or more of regular watering to establish the plants).

Erik Mathys and Debra Gander Home

HIGHLIGHTS

- Passive House Certification in progress
- Double-studded exterior wall construction
- Extremely air-tight envelope includes attic and crawlspace
- PV system with battery storage (planned) and smart electrical panel
- Air-source heat pump for heating, cooling and hot water

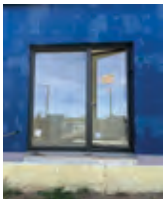
This amazing home in south Golden is nearing completion. When finished it will meet Passive House Institute (PHI) Certification (the only internationally recognized, performance-based energy standard).

At 2,152-square feet, the house consists of a main floor plus a conditioned attic and crawlspace for storage and mechanical/plumbing systems. The footprint is a simple rectangle with the long dimension on an east-west axis and ample shading of large glass exposure to the south.

The home's envelope consists of 12" double-studded walls with an interior service cavity, providing R-56 performance. Roof construction is 20" parallel chord vaulted truss (which creates a spacious and airy feel) with an insulated service cavity and R-85 performance. Windows and lift-and-slide doors are triple-pane, low-E/argon with wood-aluminum frames, manufactured by ENERsign GmbH, Germany. The windows have a relatively high solar heat gain coefficient (SHGC) to optimize the winter solar gain. A critical component of PHI Certification is air tightness and the home's preliminary blower-door test projects an ACH-50 measured tightness of 0.33 ACH.

Mechanical systems consist of a single-zone Mitsubishi HyperHeat air-source heat-pump, a Zehnder energy recovery ventilator, and a SANCO2 water heater with remote air-source heat-pump and interior storage tank. A SPAN programmable electrical distribution panel is installed in preparation for planned photovoltaic panels and ENPHASE battery storage units.

Appliances include an induction stovetop, SUBZERO refrigerator, and MIELE washer and heat-pump laundry dryer. Outside, an existing well on the homesite will be incorporated with a cistern for landscape and garden irrigation.



Jayne Aaron and Mike White Home

HIGHLIGHTS

- New build on former home site
- All electric, solar-powered energy efficient design
- Super insulated
- EV charging stations
- Low maintenance, eco-friendly landscaping

Ewers Architecture and DT Construct have helped make Jayne Aaron and Mike White's vision of an energy efficient home in Golden's Pleasant View neighborhood into a beautiful reality. The original poorly built 1940s ranch house was removed (with much of the material salvaged and diverted from the landfill) to make way for a highly-sustainable mid-century modern style home.

The new house features extensive insulation: 2-inch R-10 rigid panels plus R-13 batts in the foundation, R-32 walls, R-77 roof, and R-25 floor over a conditioned crawl space. AeroSeal technology minimizes air leakage, lowering energy use, improving air quality, and maintaining consistent temperatures. An Energy Recovery Ventilator (ERV) circulates filtered fresh air with minimal heat loss, and low-VOC paints further enhance indoor air quality.

The house was designed and constructed to incorporate sustainable design standards, water efficiency, green energy, and livability. Sovco Hydronics installed an air-source heat pump that supplies hot or chilled water for in-floor heating and air conditioning. Buglet Solar added a 9.88 kW PV system with a 10-kW battery backup, complemented by an EPA-rated wood-burning fireplace for outages and off-peak energy use. Additional features include Alpen double-pane windows, low-flow fixtures, and Energy Star appliances.

Landscape architect Susan Saarinen designed eco-friendly landscaping installed by Amazing Lawn & Landscape. It manages runoff, uses native pollinator plants, incorporates drip irrigation, and features pervious surfaces. Highlights include a goldfish pond, outdoor kitchen, and space for a model train.

Jayne and Mike moved in November 2023, shortly after the home appeared on the Metro Denver Green Homes Tour. Come and see the final product!

Don and Mary Parker Home

Don and Mary are steadily improving the sustainability of this 1952 home. They have one of Colorado's older roof-mounted PV systems: a 4.2 kW system with a central inverter installed in 2006. A second 1.5 kW array with microinverters was installed in 2011, giving them a total of 5.6 kW grid-tied PV with battery storage, which meets most of their electricity needs. The Parkers have not observed any noticeable drop in production over the life of these systems. The solar PV arrays face southwest and southeast and are mounted on stone-coated steel shingles that look like terracotta tile. Don has been an expert solar PV installer for decades and easily explains how all his electrical systems work.

The Parkers have two electric vehicles running on the sun's power via their home's solar PV system.

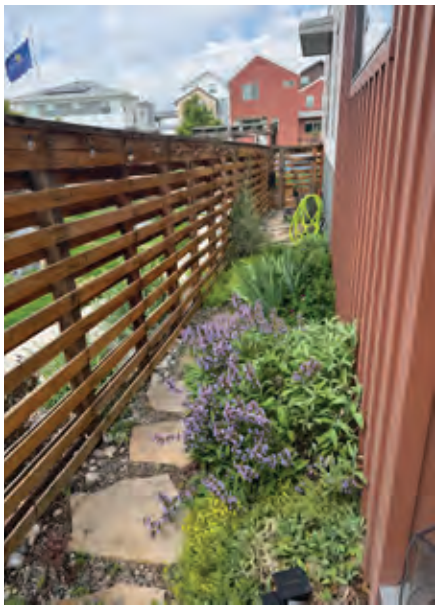
Their home is currently heated with a 90%-efficient gas furnace plus a central air-source heat pump (both ducted). Ceiling fans assist for room comfort. A Rinnai tankless water heater rather than a standard hot water tank helps reduce their natural gas use.

HIGHLIGHTS

- 5.6 kW rooftop solar PV
- Tesla Powerwall 3 reduces time-of-use charges and maximizes net metering credits
- Two EVs
- Central air-source heat pump plus 90% efficient gas furnace
- Tankless hot water heater
- Vegetable gardens, xeriscape, and pollinator habitat

The Parkers have two raised gardens plus ground level gardens providing plenty of fresh vegetables (you might get a home-grown tomato when you tour this home!). Recently, they began collecting coffee grounds from a local coffee house to spread around their yard. Except for the garden, their yard is fully xeriscaped and a pollinator habitat.

Rainer and Karen Gerbatsch Home



HIGHLIGHTS

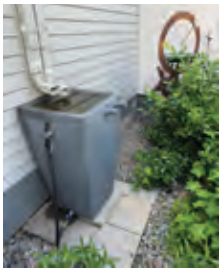
- Net-zero decarbonized community
- All electric, solar-powered energy efficient design
- Ground-source heat pump
- Excellent indoor air quality with smart ERV
- EVs and EV charging station
- Eco-friendly, low-maintenance landscaping

When Karen and Rainer were looking for housing in metro Denver, Karen discovered the net-zero sustainably-powered Geos Neighborhood in Arvada. A retired building contractor, Rainer has a strong appreciation for well-insulated, air-tight buildings. Rainer and Karen believe our society must change how we think about energy. Homeowners pay more up front to build a new, net-zero home, but then have much lower utility expenses. The Gerbatschs have no gas connection and essentially no electric bill (other than a connection fee).

Built with passive solar construction in 2019, the minimal additional heating and cooling for this 2,700-square-foot, three-story townhouse is provided by a Bosch ground source heat pump. An energy recovery ventilator and whole-house fan complete the HVAC system. The home also has a heat pump hot water heater and heat pump clothes dryer. On the roof is a 7.68 kW solar PV system which combines with two Tesla batteries, a Span smart electrical panel, circuit monitoring, energy use tracking, and load shedding to provide all the electricity their home needs, including enough to charge their two electric vehicles.

The home's envelope consists of ZIP sheeting (R-6) over wood framing and a stucco exterior for a total wall R-value of R-20. The ceiling is R-55 and foundation insulation is just under R-10. Windows are low-e triple-pane Alpen. Vestibules on east and west entries reduce winter heat loss and summer heat gain as do auto-controlled window shades. Additional indoor features include an induction stovetop and low water-use fixtures. Their yard has no turf grass, just xeriscape planting, pollinator habitat, rainwater collection, permeable paving, vegetable gardens, composting, and automated drip irrigation. Diligent recycling and composting result in very little household waste ending up in landfills.

On street parking. Remove shoes in house if wet weather.



Kevin and Casey Lombardo "Sunflower Sanctuary" House

Wildfire smoke encroaching on this Louisville home didn't seem like a big deal at first, but Kevin and Casey quickly realized they had to evacuate. Shortly thereafter, their home was fully engulfed in the flames of the December 30, 2021, Marshall Fire. Afterwards, nothing remained.

Kevin was familiar with good building practices as an NREL employee, but the fire's aftershock left everyone wondering how to rebuild. A passive home webinar and Xcel Energy's rebate program for improving home energy helped the family resolve to build back stronger and to a passive house standard.

Dubbed Sunflower Sanctuary, the Lombardos' new home is durable, high performance, healthy, and comfortable. An interior smart vapor retarder (Pro Clima's INTELLO Plus) and vapor-open exterior weather resistive barrier (SOLITEX MENTO Plus) help this home achieve a 0.67 ACH50 rating, exceeding Passive House Institute airtightness standards. The whole house is air sealed and all vents are ember-resistant. The exterior is corrugated steel over 12" double-studded walls.

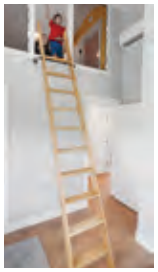
The home has maximum exposure to winter sun and metal awnings to provide summer shade. It has an air-source heat pump for active heating and cooling and a 5.9kW solar PV system covers all the home's electricity use (which is one-third that of an average home). Multiple sensors and home automation control and monitor energy usage, air quality, and mechanical systems. An energy recovery ventilation (ERV) system provides continuous fresh, filtered outdoor air 24 hours a day and transfers more than 90% of the heat energy of the outgoing stale air to the incoming fresh air, so the home always has high air quality with almost no loss of energy.

The Lombardos used recycled denim and cellulose insulation, a concrete-free "slab" under the ground floor, and laundry-to-landscape gray water to boost irrigation of their native and waterwise perennials and trees (with minimal lawn).

Please remove shoes in the house if it is wet weather.

HIGHLIGHTS

- Passive House Certified
- Double-stud exterior wall construction
- Triple-pane Alpen windows
- Steel siding and ember-resistant vents
- Rooftop solar PV system and monitored electrical panel
- Air-source heat pump for heating, cooling and hot water
- High-efficiency ERV



Susan Nedell and Malcolm Fleming Home

Susan and Malcolm's residence, re-built in 2024 after their home was destroyed in the Marshall Fire in 2021, consists of a main living floor and partial basement totaling 3,743 square feet with a partially conditioned crawlspace. The home is oriented with a stepped roofline creating two tiers of south-facing clerestory windows. All south- and west-facing windows have overhangs positioned to maximize solar heat gain in the winter and minimize it in the summer.

The house envelope consists of pre-fabricated insulated wall and roof panel, manufactured by B.Public Prefab, with R-52 walls and R-59 roof performance. Windows and lift-and-slide doors are triple-pane, high-performance systems from Viking Window AS.

The home's mechanical systems consist of a single Mitsubishi air-source heat-pump and central air-hander with modulating control dampers serving three thermostatic zones. Supplemental electric-resistance heat was considered during design, but not installed, as the home's performance during extreme cold has not shown a need for it.

The home also features a Brink energy recovery ventilator, and a Rheem ProTerra hybrid heat-pump water heater.

Electrical systems include 8 kW of photovoltaic panels installed by Buglet with Solar Edge inverter and battery storage unit.

HIGHLIGHTS

- Passive House Certified
- Pre-fabricated panel exterior wall and roof construction
- Extremely air-tight envelope construction includes crawlspace
- PV system with battery storage
- Air-source heat pump for heating / air-handler for heating and cooling

Melanie Glover and Matteo Rebeschini Home

What appears to be a run-of-the-mill stucco-sided home is basically made of dirt. And dirt doesn't burn! This Marshall Fire rebuild is made of sustainable, high thermal mass earthen masonry called EcoBlox created by the company coloradoEARTH (now Nova Terra) from waste or "overburden" sand and clay fines from local quarries. The earthen block construction and triple-pane Alpen windows create an almost sound-proof home, providing much-needed peace and quiet in howling winds. The EcoBlox construction also prevents mold and helps maintain healthy and consistent indoor humidity levels.

Two walls of block separated by a three-inch cavity form each side of the structure and are reinforced by vertical rebar grouted with concrete. The cavity in between provides space for electrical conduit and is insulated with hemp and perlite. The lime plaster exterior finish looks very much like stucco but grows stronger over time and also absorbs carbon.

Matteo and Mel became their own general contractors to build this all-electric, sustainable, resilient, healthy home. The finished product is truly incredible.

** Please park on West Coal Creek Drive, not in front of neighboring homes on Mohawk.

HIGHLIGHTS

- Earthen block "EcoBlox" exterior wall construction
- Entry vestibule
- Tempered, triple-pane Alpen high-performance windows
- Panasonic Whisper-Smart ductless heat pump with multiple zone cassettes and an ERV
- ~10 kW rooftop solar PV
- Built to passive home standards, including air sealing
- Native plant xeriscaping
- Two EV chargers
- Induction stovetop and electric oven
- Non-toxic, eco-friendly ECOS paint helps maintain indoor air quality
- Eco-friendly insulation, flooring and cabinet materials
- Lime plaster exterior walls and and lime slurry painted interior walls (Earthhaus plaster)

Neil and Melody Preister's "Millennium Falcon" Home

"It doesn't look like much but she's got it where it counts, kid. I've made a lot of special modifications myself." (Hans Solo, Star Wars: Episode IV A New Hope, 1977). Like the Millennium Falcon, Neil and Melody's 1941 zero net-energy, zero carbon home definitely has "got it where it counts." Much of the work to make this home sustainable has been done by Neil himself. It is actually a lovely "new house in an old shell" and a superb example of how efficient an older home can be with the right upgrades. Neil has worked to keep the hi-tech renovations essentially invisible, and has carefully tracked all costs, incentives, and rebates.

In 2011 the home's top was popped and walls gutted to the studs. House walls were insulated to R25 with foam and cellulose, with R49 in the ceiling. Windows have a 0.3 u-factor and 0.4 SHGC. A second upgrade in 2024 brought ceiling insulation to R60 and some walls to R30. The crawl space was dug to a 5' 6" height for a mechanical space and is encapsulated and conditioned. Solar PV was added in three stages, and the current 7.28 kW fully powers this all-electric home with its ducted, modulating geothermal heat pump, heat pump water heater, and level 2 EV charger. Achieving zero net energy and zero emissions home and transportation, the Preisters consider their adoption of energy efficient technologies helping pave the way for the next generations.

HIGHLIGHTS

- 10 + 10 + 6 solar PV panels (7.28 kW)
- Ground-source heat pump
- Heat pump hot water heater
- Two Tesla Powerwall III backup batteries
- 2 Nissan Leaf EVs, 2 E-bikes
- Solatubes for additional light
- Raised bed garden

Bonnie Sen and Tom Milavec Home

HIGHLIGHTS

- 10 kW rooftop solar PV with two 13.5 kWh batteries
- Detached office with air-source heat pump
- Extremely air-tight envelope includes attic and crawlspace
- Induction stove
- EV charging, Tesla, and two electric RAD bikes
- Walkable neighborhood

Architects Bonnie and Tom have a passion for beautiful, sustainable design. They believe sustainability can be made more accessible, attractive, and achievable—even on a modest budget—and are working to retrofit their lovely 1953 bungalow to passive house standards with this in mind.

They began with a home energy audit and blower door test. A 10kW rooftop solar PV system with two 13.5 kWh batteries has significantly reduced their summer electric bill and provides "free" charging for an EV and two electric bikes. Double brick plaster and lath walls give the home fire resistance and thermal mass. Triple pane windows, air-sealing, and insulating the attic and crawlspace improved the home envelope. They converted the detached garage to an office and installed an air-source heat pump for heating and cooling. Future plans include more air sealing and insulation, converting the home's gas furnace and traditional air conditioning to an air-source heat pump, and getting a heat pump hot water heater. They are wisely lining up quotes and vendors to help make the swaps happen quickly when the time comes.

The home has LED lighting with a remote app for lighting control. Energy efficient appliances include a GE Cafe induction range and high-efficiency front-loading washer.

Native-plant xeriscaping and shade trees create inviting and sustainable outdoor spaces. Lawn cover is limited and bordered by driveways, permeable gravel, patios, and large mulched and planted areas. Lush raised backyard garden beds produce tomatoes, culinary herbs, and corn. Bonnie sources additional produce from nearby farmer's markets and eggs from a neighbor. Yard and food waste go to their composting bin and a municipal composting service.

HIGHLIGHTS

- Fully electric conversion over several years
- 22-panel 6.71 kW rooftop solar PV
- 62-gallon hybrid heat pump water heater operates exclusively in heat pump mode
- 4-ton Mitsubishi Hyper-Heat air-source heat pump (17kW electric heat strip backup has proved to be unnecessary)
- 4" MERV 12 air filter and humidifier; whole-house air quality monitoring
- Gas fireplace replaced with electric insert (consumes less energy than a big screen TV)
- Gas cooktop replaced with induction and ceiling ventilation, all done as a DIY project
- Smart sprinkler control with moisture sensors and drip irrigation minimizes water use
- Eight years of hour-by-hour energy use data for about 25 electrical appliances including EV charging
- Electric lawnmower, snowblower, and leaf blower

Robert and Barbara Youngberg Home

The Youngbergs began making this lovely 1995 2-story Lakewood home more sustainable by replacing more than 50 incandescent bulbs with LED lights when they moved in ten years ago. Since then, they've done comprehensive insulation and air sealing upgrades, installed a heat pump water heater, a cold climate heat pump, a rooftop solar PV system, and an induction cooktop. Now fully electrified, their monthly electric expense is $100 less annually than their previous gas and electric bills combined (including EV charging).

They have no electric bill from May through September thanks to 'On-Peak' solar production credits, Smart Meter, and Time of Use (TOU) monitoring.

These homeowners have carefully considered each project, completing some on their own and hiring professional contractors where needed. Barbara beautifully and precisely re-caulked each of the home's windows, saving $35K over the cost of window replacement.

Barbara Mills-Bria Home

HIGHLIGHTS

- Solar hot water with mini tankless booster
- 8 + 12-panel rooftop solar PV
- 4-ton ducted Mitsubishi Hyper-Heat air-source heat pump
- Whole-house air quality monitoring
- Abundant herbs from a mid-patio kitchen garden just steps from the back door
- KitchenAid induction stove with double oven
- Heat pump clothes dryer (supplements line drying)

Colorado's abundant sunshine provides both hot water and electricity for Barbara's appropriately sunny-yellow home. Focused on reducing fossil fuel use and emissions, Barbara has worked to steadily improve her home's sustainability over three decades. South-facing rooftop solar thermal panels and a ~375-gallon hot water storage tank were in place when Barbara bought her home. She replaced these thermal panels once and also replaced a back-up gas Rinnai tankless water heater with a small (8kW) Eemax auto booster tankless water heater.

In 2014, Barbara leased (and later purchased) a ~2.5kW east-facing 8-panel rooftop solar PV system. Go Green Electric and Solar added 12 more solar panels (4.8kW) to the east-facing roof in 2023. Her home now generates all the electricity she needs except in the coldest 2-3 months of the year. Also in 2023, she replaced the gas furnace with a Mitsubishi ducted air-source heat pump, eliminating her natural gas use (and meter) and adding air conditioning for the continually warming summer months. The air conditioner supplements a whole-house fan which cools the house at night with fresh outside air.

Barbara has improved her home's envelope along the way with double-pane vinyl clad windows; "warm window" covers and cellular shades that retain heat in winter and block it in summer; improved insulation; and air sealing. Skylights in the added dining/sunroom provide extra

winter light, but are partially shaded in summer. The hardwood floors in this room and the kitchen are artfully crafted of "leftovers" from contractors' larger jobs.

Barbara's beautifully wild-scaped front yard is a pollinator heaven. Backyard gardens include a perfectly placed kitchen garden growing herbs right outside her back door.

Electric Vehicle Roundup

October 4, 2025 • 3:00–5:00pm
14350 W. 32nd Ave.
Golden, CO 80401

The next step after powering your home from the sun is to power the electric vehicles in your garage. You just can't beat "driving on sunshine" with enough solar panels on your home to power your lighting, heating, cooling, other home needs, AND your electric car(s).

Think of your car like your smartphone – plug it in when you get home, and you'll leave every morning with a full charge. Or, if you're lucky enough to have workplace charging, you can plug in at work and maybe not need to plug in at home. Those with a home solar PV system who are home during daylight hours can charge their electric vehicle(s) while the sun is shining.

From 3pm to 5pm pm on Saturday, October 4th, in the JUC parking lot, we'll have a display of electric vehicles (including some you may not have seen yet). Their owners look forward to sharing their EV experiences and answering your questions about their particular car.

If you already own an electric car, plan on parking it with the others at the JUC parking lot.

Patty Roberts with her Tesla, and sun ovens, at the 2024 EV Roundup. She will be making cookies in the sun ovens in the morning hours again this year!

Chevy Bolt motor with inverter to power house appliances.

Rebates and Tax Incentives for Sustainable Living

Electric Vehicles (EV)

Federal

- 7,500 tax credit
- Ended September 30, 2025

State

- Tax credit of $5,000 for EV< $80,000, additional $2,500 for EV < $35,000 in 2024
- Rebate of $6,000 for trade-in on new EV: Income qualified (80% of median)

Solar PV

Federal

- 30% tax credit Installation expires December 31, 2025

State

- 2.9% sales tax exemption
- EnergySmart Colorado: Depending on your location, you could be eligible for a rebate of anywhere from $400 to $2,500.

Xcel

- Solar•Rewards Program Income qualified
- Solar•Rewards Community income qualified for Solar Gardens
- $500 per kW for shared battery storage

Heat Pumps

Federal

- Inflation Reduction Act (IRA), heat pumps and heat pump water heaters (HPWHs) are eligible for a 30% tax credit, Expires December 31, 2025.
- Up to a limit of $2,000 per taxpayer

State Tax Incentives

- 12.9% state tax credit
- Exempt from the state sales tax, which is 2.9%.

Utility Rebates

- Xcel and Tri State (up to $5,000 to $15,000)
- Rebates for all utilities: https://loveelectric.org/rebates/

New Homes

- 12.9% state tax credit
- Some local government and utility credits https://loveelectric.org/new-homes/ scroll to "Tax Credits and Rebates"

Energy Efficiency

Federal

- Tax credits for Heat Pump water heaters and clothes dryers, electric stoves, electric wiring and service, and insulation, air sealing and ventilation
- Tax credits higher for household incomes < 80% of median
- Expires December 31, 2025

State

- Similar to federal tax credits. Includes electric bikes and electric lawn equipment in 2024

Xcel and Denver

- Rebates and discounts

Web Sources

Electric Vehicles

- irs.gov/credits-deductions/credits-for-new-clean-vehicles-purchased-in-2023-or-after
- energyoffice.colorado.gov/transportation/grants-incentives/electric-vehicle-tax-credits
- energyoffice.colorado.gov/vehicle-exchange-colorado

Solar PV

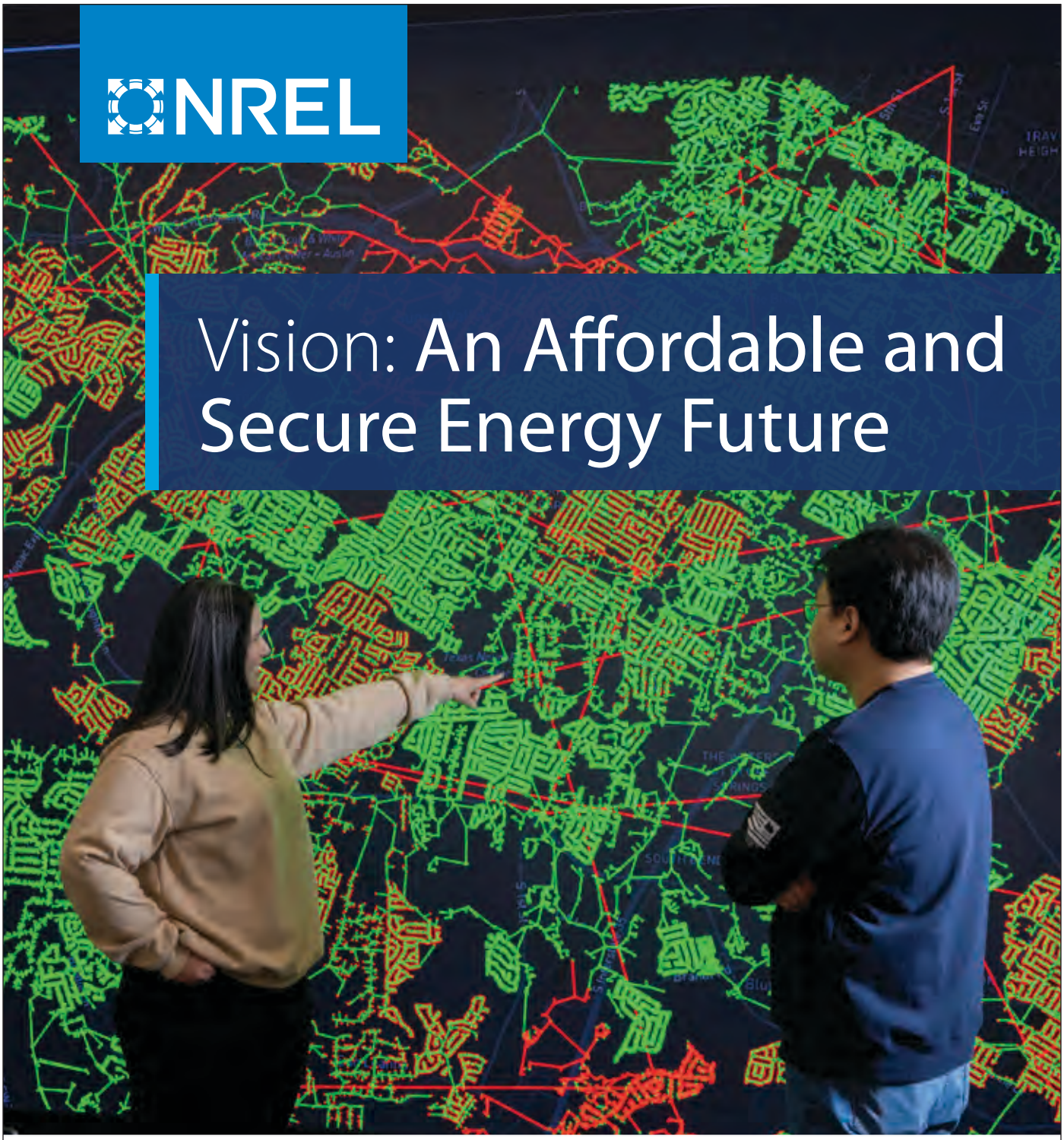
- irs.gov/credits-deductions/residential-clean-energy-credit#:~:text=The%20Residential%20Clean%20Energy%20Credit,placed%20in%20service%20in%202034.
- energysmartcolorado.org/rebates-for-your-home/
- co.my.xcelenergy.com/s/renewable/solar-rewards
- co.my.xcelenergy.com/s/renewable/solar-rewards-community
- https://co.my.xcelenergy.com/s/renewable/battery-connect

Heat Pumps

- loveelectric.org/news/building-electrification-rebates-for-2023/
- energystar.gov/about/federal_tax_credits/air_source_heat_pumps

Energy Efficiency

- irs.gov/credits-deductions/energy-efficient-home-improvement-credit
- irs.gov/pub/taxpros/fs-2022-40.pdf
- energysmartcolorado.org/tax-credits-incentives/#:~:text=A%20new%20Colorado%20State%20tax,equipment%2C%20not%20including%20installation%20charges.
- co.my.xcelenergy.com/s/residential/home-rebates



Learn more at nrel.gov

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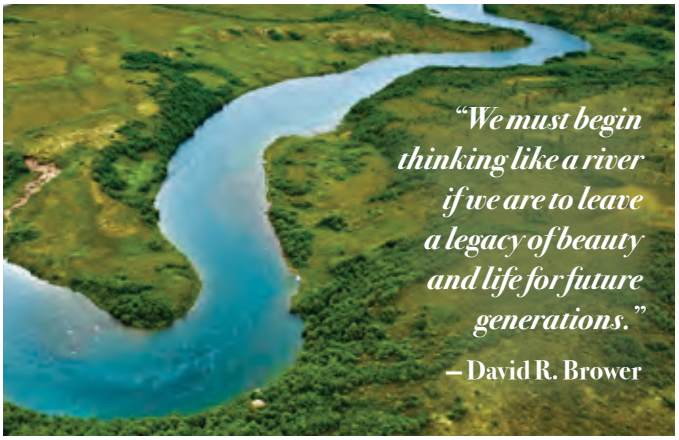
- ☑ **Step 1: Energy Audit**
- ☑ **Step 2: Optimize Air-tightness**
- ☑ **Step 3: Optimize Insulation**
- ☑ **Step 4: Evaluate Windows and Doors**
- ☑ **Step 5: Install Electric Water Heating Equipment**
- ☑ **Step 6: Install Electric Space Heating Equipment**
- ☑ **Step 7: Install Solar**
- ☑ **BONUS: Smart Home Technology**

Paul Kriescher, John Avenson and The Crew

Watch the episode trailer by scanning here



Appreciating John Avenson

Longtime Green Homes Tour Volunteer

Educating the world on:

De-Carbonizing our Housing and Life – Home Energy Efficiency and Smart Home Ideas

"Obtain comfortable homes in extreme temperatures, paying attention to the powerful forces of Mother Nature in home design and the logic of simple physics to reduce our usage of fossil fuels."

"I especially love to show: 'Out of Box' thinking/engineering which is opposite of the lazy way that requires NO QUESTIONING or thinking something through."

— John E. Avenson

See John's YouTube Channel:
www.youtube.com/@JohnEAvenson/featured

Remembering Johnny Weiss

NECO mourns the loss of solar education pioneer Johnny Weiss, cofounder of Solar Energy International (SEI) in Paonia, Colorado: **www.solarenergy.org**. Johnny was a leader not only in solar building in the 80's and 90's, but for over 40 years blazed a shining path in sustainable technology training, co-founding SEI in 1991 and serving as its Executive Director for over 20 years.

Johnny's progressive ideals contributed to the organization's remarkable success: training 100,000+ people, wholehearted support of anyone interested in solar and sustainable practices, a deep belief in social and energy justice, and a love for connecting people of like mind and spirit.

Feeling solar technology offered the largest gains for people without reliable access to electricity, Johnny was dedicated to programs supporting solar NGOs around the world.

And recognizing the needs of underserved Native Americans, Johnny collaborated with Red Cloud Renewables of Pine Ridge, SD, enabling tribes to foster their own energy and economic independence.

As a longtime member of CRES, ASES, and ISES, Johnny was a lively presence and participant in various conferences: leading sessions, staffing the SEI booth, and bringing his infectious humor and positivity to every public and private event.

To honor his worldwide commitment to solar, SEI has established a free set of courses in his name for anyone wishing to solarize their home or village.

Johnny's spirit will live on in the work and people of SEI, and all who came in contact with his perpetual optimism that renewable energy and sustainable practices can improve human lives around the world. He left a unique and wonderful legacy to the solar community and will be greatly missed.

When we contemplate the whole globe as one great dewdrop, striped and dotted with continents and islands, flying through space with other stars all singing and shining together as one, the whole universe appears as an infinite storm of beauty.'

– John Muir

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