

Green Remodeling: Make Your Home More Energy-Efficient

You can retrofit your current home for cheaper energy bills and a more beautiful, livable space — without having to move. Five energy experts and architects explain how to make your home more energy-efficient.

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Imagine you live in your green dream home. It's extremely energy-efficient, but also beautiful, comfortable and perfectly suited to your needs. Are you picturing a brand new house? Think again — you can likely turn your current house into your dream home with smart green remodeling.

Plus, the amount of money you can save with energy upgrades is often more than you might think. Russ Rudy, a builder and energy-efficiency expert who has done numerous gut rehabs of homes in the Midwest, says he helps homeowners get energy savings of up to 75 percent when he's able to rework a house from top to bottom. Even with less intensive work, significantly cheaper energy bills are possible.

The nonprofit organization Historic Green, based in Kansas City, Mo., has been doing a series of energy retrofits in one of the city's neighborhoods. The organization reports it has been able to cut some homes' energy use in half, resulting in an average cost savings of \$100 per month on energy bills.

Those are substantial energy savings, but why stop there? If you're doing a major home overhaul, you can go one step further and add passive solar design features to optimize your home's natural heating, cooling and daylighting. And you can just as easily add renewable energy features — such as solar electric panels or a solar water heater — to an old home as you can to a new one. Many green remodeling projects can be done on a tight budget — you just have to start thinking through what's possible.

Big-Picture Planning

If you're undertaking a major remodeling project, you probably have other goals in addition to energy efficiency. You might want to add square footage or reconfigure the space to work better for you — for example, by adding an extra bedroom or a bathroom. Your budget will be a major factor, and you'll want your home to be even more comfortable and enjoyable.

Almost everyone on our panel of five energy experts — including architects and specialists in energy efficiency who together have numerous successful remodels behind them — suggested the same starting point: Get a thorough home energy rating, which will illuminate what's possible for your home and help you set priorities.

“A certified home-energy rating is worth every penny, and it's rarely more than \$500,” says Jeremy Knoll, an architect and co-founder of Historic Green. “It gives you a priority list based not on your gut feeling, but on measured data of what's going to make the most difference in your home in terms of energy repair work.”

You can find a certified home-energy rater in your area through RESNET, the [Residential Energy Services Network](#). Be sure you talk to the rater before scheduling the audit and pick someone who is good at answering your questions and explaining the details. A home energy rater should be able to recommend reliable people who can do the energy upgrade work. Getting an energy rating can also help you qualify for different financing options, such as an energy-efficient mortgage, if that interests you.

If you have a more extensive remodeling project in mind, consult with an architect early on. If you're interested in passive solar design, you'll want to look for an architect who

has at least some experience with this type of building — the details get pretty technical, and its very climate-specific.

Kelly Lerner, an architect in Spokane, Wash., and co-author of the informative book [Natural Remodeling for the Not-So-Green House](#), says her first suggestion is to clearly define your priorities. “Are you trying primarily to lower your energy bills? Are you trying to get more space? Sometimes your priorities will be at odds with each other, and it’s good to see that from the very beginning.”

Lerner also says that green remodeling has many advantages over building new. A remodel can be accomplished on a smaller budget, and a remodeled home is also inherently sustainable because you’re minimizing your use of new materials and taking advantage of existing infrastructure. “I think one of the most wonderful things is that it’s like recycling on some huge scale. You’re not just recycling an item — you’re recycling a house,” Lerner says.

Holistic Approach

With home energy, you can’t tackle any one project in isolation. Anything you do will affect the rest of the house.

“One of the things people don’t understand very well is the concept of a holistic approach,” Rudy says. “The house is an interconnected collection of systems.” In some ways, that’s great: By looking at the house as a whole system, you can greatly increase your energy efficiency. But you can also create unanticipated problems for yourself if you’re not careful.

When doing a retrofit, the major tasks are usually air sealing, adding insulation, and upgrading your heating and cooling systems, Rudy says, and what you do first matters. Air sealing has to come before insulating, because you’re going to have to install insulation on top of things you want to seal up. And there’s not much point to adding a new heating system without tightening up the building first so all that added heat stays in the house instead of leaking right back outside.

Fortunately, many of these projects are fairly inexpensive. Air sealing is especially affordable — a homeowner can do a lot with caulking and weatherstripping for \$100. Adding attic insulation is also frequently recommended by home energy raters. In many cases, homeowners can install their own insulation in the attic for about \$300. To learn more about your options for adding insulation to your home — and which pieces of the job you can do yourself — check out [Adding Insulation Can Save You Money!](#).

While energy efficiency is terrific, you don't want retrofits to accidentally create major problems. One of those potential problems is an issue with air quality — especially carbon monoxide, which is not uncommon in houses with older heating equipment. A carbon monoxide alarm is a good idea for any home that uses a vented heating system.

Sealing up your home can also create problems with moisture. Ken Riead, an experienced home energy rater and board member of Historic Green, puts it bluntly: “If you're not careful, you will trap moisture and it will rot your walls.” Interior moisture issues — such as moisture accumulating in the kitchen and bathroom — are usually taken care of through ventilation, Riead says, and mechanical ventilation is best.

Knoll says that issues also frequently crop up when adding wall insulation, or when adding a radiant barrier to an attic or a roof. Be aware that trapping moisture is a big issue, and ask questions, because even energy experts can make mistakes. For some homes in humid climates, he says, the safest decision is to skip the wall insulation to avoid creating moisture problems, and concentrate instead on air tightness and equipment efficiency. To learn more about moisture issues, check out the Builder's Guide books recommended in "Home Energy Resources" later in this article.

If you're tackling DIY projects, you'll need to be alert for pitfalls, such as anything that can potentially create a fire hazard. In the process of doing home retrofits, unexpected things come up all the time, Knoll says. For example, at one home he worked on, the homeowners were ready to add insulation to the attic when a quick visual inspection revealed dangerous wiring that needed to be dealt with first. You can also get into trouble adding insulation around heat sources. Just be cautious, Knoll says. If you're a beginning DIYer, seek advice from experts on how to make your home more energy-efficient, and be especially cautious when you're dealing with electricity.

Don't Rush to Replace Windows

When retrofitting or replacing your windows, you shouldn't get your advice from anyone selling windows. Be guided by your energy audit, and if you're adding passive solar design features, get guidance from an architect.

“It's rarely cost-effective to replace windows,” Lerner says, explaining that while new windows do help increase energy efficiency, they simply take too long to pay for themselves in lower energy bills, compared with other upgrades. “With older windows I would suggest adding some sort of storm windows rather than replacing the windows themselves, unless the windows are failing, such as if the wood's rotting out,” Lerner says.

Plus, new windows tend to be less durable. Vinyl and aluminum window frames simply don't hold up as well as older wood-framed windows, Knoll says. And if you do have original wood windows in an older home, you can do a lot to make those wood windows more efficient rather than replacing them. In particular, Knoll recommends focusing on air sealing weight pockets. For easy and inexpensive air-sealing methods, see [Save Loads of Energy With Caulking and Weatherstripping](#).

In some situations, however, putting in new windows makes sense. David Wright, a California-based architect and author of [The Passive Solar Primer](#), puts a high value on windows as part of a passive solar home. He suggests homeowners consider installing new or larger windows on the south side of the home to gain valuable heat in the winter.

Many Options for Heating and Cooling

The last major type of energy retrofit to consider is improving your home's heating and cooling. In many cases, there's not only one right choice — you'll find a range of options and will have to spend some time figuring out which works best for your climate, budget and preferences.

One way to help heat and cool your home is by incorporating passive solar design principles. For example, Wright suggests you can bring both pleasant living space and heat to your home by adding a sunroom. This strategy neatly packages many passive solar features into one addition. Read more at [Plan the Perfection Sunroom Addition](#).

Similarly, cooling issues can be addressed by using passive solar design principles to improve natural ventilation. Wright suggests careful placement of windows and operable skylights as one option. Skylights are terrific because they're located at a high point in the room, which allows warm air to rise out while drawing in cooler outdoor air through an open window. Ceiling fans are another low-tech solution.

You could also heat with solar energy, which can be done by heating the air with solar collectors, or by heating water and then running it through your house using radiant floor heat. To learn more, see [Solar Heating Plan for Any Home](#).

Rudy also spells out the options that are available for more conventional heating systems. "The lowest-efficiency gas-burning furnace that's legally allowed right now is an 80 percent efficient unit," he says. "You can get a 90 percent efficient furnace that takes so much heat out of the combustion gases that you can vent it through a PVC plastic pipe to the side of the house." From there, the next step up is an air-source heat pump, and from there, a ground-source heat pump. "So there are some ideas about efficiency. We're talking about an 80 percent efficient furnace, a 90 percent efficient

PVC-vented furnace, a 250 percent efficient air-source heat pump, and a 450 percent efficient ground-source heat pump.”

But don't fixate on the efficiency numbers, because the most efficient option isn't necessarily the right one for your home. Rudy says that if you can make your home efficient enough, even a relatively inefficient heating option — such as electric baseboard heating — could make sense for your home.

Rudy says green remodeling for extremely efficient homes is the wave of the future. “I believe that within the next three or four decades we will no longer be able to do combustion inside our houses, simply because we're going to be running out of cost-effective or environmentally safe ways of attaining those fuels. Realistically, we need to be planning for that now.”

Indeed, if green remodeling can make our homes work better, lower our energy bills and help us achieve a higher level of comfort, what are we waiting for?

Home Energy Resources

Online

[American Institute of Architects](#): Get advice on how to choose and work with an architect.

[Build It Green's Home Remodeling Green Building Guidelines](#): Includes extensive information on green remodeling, including a handy checklist.

[RESNET](#): Find certified home-energy raters and learn about energy-efficient mortgages.

[Retrofit Techniques & Technologies: Air Sealing, A Guide](#): Full of information on air sealing and written for consumers working with contractors.

Books

Builder's Guide Series by Joseph Lstiburek: Includes *The Builder's Guide to Cold Climates*, *The Builder's Guide to Hot-Humid Climates* and more editions of specific, practical information for builders in different climates. The series is available at [EEBA](#).

[Green Home Improvement](#) by Dan Chiras: Outlines 65 projects, big and small, with projected costs and savings.

[Green Remodeling: Changing the World One Room at a Time](#) by David Johnston: A comprehensive guide to green remodeling that contains information on how to avoid unintended consequences when renovating for efficiency.

[The Sun-Inspired House](#) by Debra Rucker Coleman: Find more information about passive solar building, including specific design ideas.

Energy Experts

Jeremy Knoll, LEED AP BD+C, project manager with BNIM Architects, Kansas City, Mo., and chair of the board of [Historic Green](#), a nonprofit organization that has been active in post-Katrina New Orleans. Historic Green hosts service learning events, which bring skilled labor, volunteers and community partners together to restore and retrofit local historic buildings.

Kelly Lerner, principal of [One World Design Architecture](#) in Spokane, Wa. and co-author of [Natural Remodeling for the Not So Green Home](#). Read what Lerner has to say about natural cooling in [Forget AC! Cool Your Home Naturally](#).

Ken Riead, Senior CEM/CDSM, senior consultant at Hathmore Technologies, Kansas City, Mo. and board member of Historic Green. Read more on what Riead has to say on home energy audits in [Energy Audits: What Homeowners Need to Know](#) and [Home Energy Audits: Measure Your Energy Costs and Add Up the Savings!](#).

Russ Rudy, building science consultant. Rudy's long career in energy efficiency has included founding and directing the Kansas Energy Raters Association, serving as training director for the Kansas Weatherization Assistance Program, and serving as buildings team manager of the Kansas State Energy Office.

David Wright, AIA, [David Wright Architecture Group](#) in Grass Valley, Calif. and author of [The Passive Solar Primer](#). Wright was first featured in MOTHER EARTH NEWS back in 1977, and has written for the magazine ever since. Read a few related articles written by Wright: [Passive Solar Design Basics](#), [Plan the Perfect Sunroom Addition](#), and [Build With SIPs](#).

Megan E. Phelps is a freelance writer based in Kansas. She enjoys reading and writing about all things related to sustainable living including homesteading skills, green building and renewable energy.