

Commentary: Greening our Northern California home and cars cut our energy bills by \$11,000 a year, but it wasn't easy

January 11 2024, by Evan Mills, Los Angeles Times



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As global carbon emissions from human activity hit an all-time high last year, my family zeroed out emissions from our home and cars while getting an 11% tax-free return on the investment. That's more than twice the yield of municipal bonds. And it's an auspicious time to hit this target, weeks after an oil executive running the recent United Nations climate summit in Dubai rehashed the trope that eliminating fossil fuels would "take the world back into caves."

Our cave in Northern California has five bedrooms, big picture windows, two cars in the garage and a hot tub. We've been fortunate to afford the investments to green it. But the process was harder and slower than it should be.

I spent my career in the Department of Energy's National Laboratory system researching how to reduce greenhouse-gas emissions. I know that a third of U.S. energy-related emissions come from homes and personal vehicles. Moving to a late-1970s house presented a grand opportunity for me to walk the talk.

The process seemed straightforward. During routine replacements and remodeling, we maximized the efficiency of our appliances and lighting, sealed air leaks, insulated floors and ceilings, upgraded windows, installed heat pumps to warm the house and make hot water, and switched to [electric cars](#). These improvements lowered our energy use by a stunning 88%. Converting the remaining fuel used to electricity dropped our [carbon emissions](#) to only 3% of the original levels.

Since our property is shaded by grand, carbon-storing redwoods, on-site solar wasn't an option. Instead, we got to zero by switching to a mix of utility-provided solar and geothermal electricity. No dodgy carbon offsets were required, and virtually no sacrifice was involved. Quite the contrary: Our energy bills for home and cars fell by about \$11,000 per year.

But, as Kermit said, it's not easy being green. Although ample off-the-shelf technology existed, decidedly human challenges stymied our use of them.

In the 15 years we spent greening our home, the first challenge was the often insufficient, inscrutable or inaccurate information from product manufacturers, sales reps and energy providers, particularly about how much energy we could save. It was also difficult to find available incentives and organize the applications.

The projects required a lot of oversight, because ambitious green projects demand extra care, curiosity and communication. Had I not "commando-crawled" under the house and risked vertigo on the roof, I never would have discovered that the new floor insulation was nowhere near the thickness we had paid for or that roofers had omitted insulation and left giant air gaps where heat loss is greatest.

Heating companies recommended oversized equipment. Window vendors made recommendations that would have seriously undercut our energy savings. The list goes on.

Electrification brought new bugaboos. Most of the electricians I spoke with favored panel "upgrades" costing \$5,000 or more to accommodate the switch from fossil fuel to electricity over helping us more cost-effectively trim and shift power needs to reduce or avoid the expense altogether.

Then we had to deal with our cars, which produced about a third of our carbon footprint. After reporting lower-than-advertised driving range in our first electric vehicle, I was ghosted by [customer support](#), later learning that I may have been among the thousands shunted to a secret "diversion team" to deflect such complaints. It turned out the user interface hid that the heating and cooling were often unintentionally on,

along with other invisible sources of energy leakage.

Hassles aside, the real question was: Do all these improvements pay? The math isn't always straightforward, so consumers could use some guidance. Sadly, I didn't encounter a single tradesperson who offered these calculations. Most were skeptical, ignoring juicy rebates and tax credits; sometimes their errors or lack of skill increased project costs.

Car dealers knew about [tax incentives](#) but were speechless when I asked about operating expenses. So, I crunched the numbers and found that our package of improvements would pay back in nine years, a return that could motivate many homeowners and help sellers close deals.

Green measures don't always cost more than traditional ones. For example, insulation and improved windows reduced our heating needs and thus the size and cost of the required heating system. Thanks to such factors, alongside incentives under President Joe Biden's Inflation Reduction Act, it would actually have cost more to install a conventional gas furnace and water heater than the high-performance and climate-friendly electric heat pump system that does both jobs. Most heat pumps provide air conditioning, too. There is also evidence that greening a home increases resale value.

After incentives, our EV purchase costs were on par with those of comparable gas cars. Even better, with a shift to EV-specific electric rates from our utility, we were paying the equivalent gas price of only \$1.50 a gallon. Thanks to the lower rates, our home's total electricity bills didn't go up at all. As the visionary physicist Amory Lovins has long said, energy efficiency is not only a free lunch, but one you're paid to eat.

A broader cost-benefit analysis reveals other perks. EVs are quiet and convenient to charge overnight at home once you have that

infrastructure, and they accelerate faster than gas cars. Single-driver access to the carpool lane isn't bad either. Similarly, our home is more comfortable. The induction cooktop looks slicker, cooks faster and is easier to use and clean than gas models; plus we're spared the indoor pollution from burning gas.

We've also reduced the pollution we're imposing on others and the planet. Eliminating our 27-ton annual carbon-dioxide footprint—equal to the yearly emissions of around 15 high-performing hybrid cars— is another welcome return on investment.

Fortunately, the U.S. government and NGOs are stepping up green workforce development, a pressing need if our nation is to meet decarbonization targets. Under the specter of climate change, we can—and must— quit carbon far sooner than the messy mid-century goal set by world leaders in Dubai. If consumers don't literally take control of their power, and policymakers, product manufacturers and the trades don't make it easier for them to do so, climate change could indeed send us back into caves.

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Citation: Commentary: Greening our Northern California home and cars cut our energy bills by \$11,000 a year, but it wasn't easy (2024, January 11) retrieved 30 May 2024 from <https://techxplore.com/news/2024-01-commentary-greening-northern-california-home.html>

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