

Efficient New Homes with Federal Support Will Save Money, Create Jobs, and Cut Emissions

MAY 2022

The cheapest and easiest time to avoid energy waste in a home is when the home is built. Building energy codes for new homes are set at the state or local level and vary widely. However, the federal government sets national efficiency criteria for many of the new and rehabilitated homes for which it provides financial support. These homes are primarily for low- and moderate-income homeowners and renters. Setting up-to-date energy efficiency requirements for these homes would improve home quality, reduce monthly costs, lessen vulnerability to fuel price spikes, boost the health and comfort of residents, and ensure long-term reductions in greenhouse gas emissions.

Cumulative impacts of new federally supported homes meeting model codes through 2050

- \$27 billion total net savings (present value)
- \$5,700 in net savings for the average household
- 838,000 jobs (net added job-years)
- Avoid 275 million tons of CO₂ emissions
- Slightly reduce households with high housing cost burdens
- Meeting new ENERGY STAR® levels would almost double the savings.

New homes purchased with federally backed loans such as Federal Housing Administration (FHA) mortgages, along with new homes with funding from federal programs like the HOME Investment Partnerships grants for affordable housing, make up about one-fifth of all new single-family residences and one-eighth of new units in multifamily buildings. But the efficiency requirements for these homes are badly out of date. And some homes with federal support have no efficiency requirements at all. Most notably, Fannie Mae and Freddie Mac, government-sponsored enterprises (GSEs) under the supervision of the Federal Housing Finance Agency, buy almost half of all mortgages for single-family home purchases and multifamily buildings but have not set efficiency requirements for those homes.

ANALYSIS OF IMPACTS

We analyzed the economic and environmental impacts of strong efficiency requirements for new homes that receive federal support. The analysis used Pacific Northwest National Laboratory building modeling and projections from the Energy Information Association's Annual Energy Outlook 2022. We first looked at upgrading homes from current baseline efficiency to meet the 2021 International Energy Conservation Code (IECC) (or ASHRAE Standard 90.1-2019 for mid- and high-rise multifamily buildings).

Affordability. On average this upgrade yields net positive cash flow (the time at which the energy bill savings minus the added mortgage payments pay back the initial expense of a 10% down payment) in 25 months for a single-family house and 17 months for a multifamily unit. The lifetime savings are \$5,700 and \$2,700, respectively. The savings would reduce the percentage of low- and moderate-income households with high energy burdens (i.e., with more than 6% of household income going toward energy bills) from 37% to 31% among

owners of covered single-family homes and from 39% to 35% among renters of multifamily units. After accounting for increased mortgage payments, the upgrades would reduce median total housing burdens for those groups by 0.8% and 0.5%, respectively.

Cumulative CO₂ reductions equivalent to emissions from

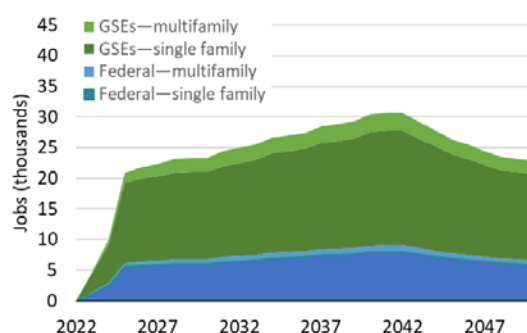
- 59 million cars and light trucks in a year
- 35 million homes in a year
- 1.5 million railcars full of coal
- Florida and Nevada for a year

Federal loan and grant programs with efficiency requirements. We estimate that 238,000 new homes constructed in 2023 will be subject to federal efficiency requirements. Upgrading these homes would—in just the first year—create about 8,600 jobs, save \$70 million in energy bills, and avoid 0.23 million metric tons of carbon dioxide emissions (MMT CO₂). The table below shows that cumulatively over 30 years, the improved efficiency of these homes alone would save \$1.2 billion net present value (NPV), including energy bill savings and other consumer benefits after the needed investment. It would also result in 17,000 added job-years (total years of employment, including jobs due to energy savings as well as initial construction) and reduce CO₂ emissions by 6.1 million metric tons, equal to the current emissions of one million cars and light trucks for a year.

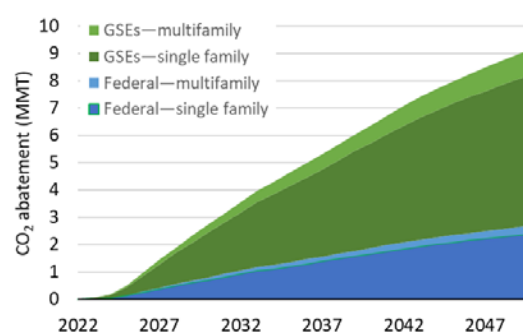
These savings would compound over years of new construction. We project federal loan and grant programs will serve about 5.8 million new homes by 2050. If we assume rapid improvements in model energy codes—such that they further cut the energy use affected by codes almost by half by 2040—but continued slow code adoption by states and less-than-perfect compliance with the codes, we estimate that updating federal efficiency requirements could save \$8 billion NPV, add 246,000 job-years, and reduce CO₂ emissions by 81 MMT, the emissions of 17 million vehicles for a year. Jobs and emissions impacts for each year appear in blue in the figures below.

GSE loans. Applying the efficiency criteria to new homes with Fannie Mae and Freddie Mac loans would have even greater impact. We estimate the two GSEs combined will buy loans for about 14 million new homes through 2050. Improving the efficiency of those homes could save an additional \$19 billion NPV, add 591,000 job-years, and reduce CO₂ emissions by 194 MMT, equivalent to the yearly emissions of 42 million vehicles. These jobs and emissions impacts appear in green in the figures below.

Combined impacts from all new homes receiving federal support through 2050 are in the call-out boxes above.



Net added jobs each year due to efficiency improvements in new homes



Reduction in CO₂ emissions each year due to efficiency improvements in new homes

Beyond codes. To see the impacts of higher efficiency levels, we looked at the new ENERGY STAR for New Homes version 3.2 (1.2 for multifamily) using the Environmental Protection Agency’s analysis. The higher efficiency levels, with at least 10% savings compared with the 2021 IECC, would nearly double the impacts for federal loan and grant programs, with nearly \$17 billion NPV savings, reductions of 154 MMT CO₂, and creation of 430,000 job-years. Switching ENERGY STAR homes from gas furnaces and water heaters to electric heat pumps would further increase CO₂ reductions, with a slight reduction in both initial cost and energy bill savings.

Cumulative financial, job, and climate impacts from efficiency improvements in new homes versus typical new homes

	One year of new homes			New homes through 2050		
	Net savings (\$billion PV)	Jobs created (thousand job-years)	CO ₂ emissions avoided (MMT)	Net savings (\$billion PV)	Jobs created (thousand job-years)	CO ₂ emissions avoided (MMT)
New homes at latest model codes						
HUD, USDA, and VA	1.2	17	6	8.0	246	81
Single-family	1.0	16	6	7.2	222	72
Multifamily	0.1	1	1	0.9	25	9
Fannie and Freddie	2.8	41	15	19.3	591	194
Single-family	2.4	36	13	16.5	511	166
Multifamily	0.4	5	2	2.8	80	28
Total	3.9	58	21	27.4	838	275
New above-code homes						
HUD, USDA, and VA	2.2	28	11	16.6	430	154
New all-electric above-code homes						
HUD, USDA, and VA	2.2	19	14	18.7	291	224

The “HUD, USDA, and VA” rows include Federal Housing Administration (FHA), Department of Veterans Affairs (VA), and Department of Agriculture (USDA) loans and Department of Housing and Urban Development (HUD) programs, all of which have current efficiency requirements. “One year of new homes” shows the impacts over 30 years from new homes built in 2023. “New homes through 2050” shows the impacts over a 30-year lifetime for new homes built through 2050, with frequently updated codes. Because of rounding, individual row entries may not add to the totals shown.