



U.S. DEPARTMENT OF
ENERGY

Office of
Policy

Investing in American Energy

Significant Impacts of the Inflation
Reduction Act and Bipartisan Infrastructure
Law on the U.S. Energy Economy and
Emissions Reductions



Investing in American Energy:

Impacts of the Inflation Reduction Act and Bipartisan Infrastructure Law on the U.S. Energy Economy and Emissions Reductions

The *Inflation Reduction Act of 2022 (IRA)* and *Bipartisan Infrastructure Law of 2021 (BIL)* together represent a historic investment of more than \$430 billion toward modernizing the American energy system.^{1,2} The provisions in these two laws will enhance the nation's energy security, lower energy costs for American households and businesses, drive clean energy innovation, improve human health, and mitigate climate change. The laws will create high-quality jobs and new economic opportunities through investments in and incentives for domestic clean energy manufacturing. IRA and BIL go a long way toward injecting the public investment that is needed to build a clean energy economy. In this report, DOE presents results of a new analysis on the economy-wide impacts of IRA and BIL, including impacts on the energy system and progress toward climate targets.

Updated DOE economy-wide analysis now represents IRA and BIL impacts

This analysis developed three scenarios representing potential impacts of IRA and BIL in OP-NEMS, [a customized version of the National Energy Modeling System \(NEMS\)](#). NEMS is the model used by the Energy Information Administration (EIA) to produce the Annual Energy Outlook (AEO).¹ The three policy scenarios evaluate economy-wide emissions and energy impacts of IRA and BIL. The scenarios include the most comprehensive representations of these policies in NEMS to date. The scenarios are as follows:

1. **No BIL/IRA:** A scenario of emissions and energy consumption without impacts from BIL/IRA. This scenario is based on the EIA's Annual Energy Outlook 2022.
2. **Advanced BIL/IRA Implementation (Advanced Scenario):** A scenario that models what would happen with high uptake of selected IRA and BIL provisions. This scenario assumes fewer deployment constraints and more aggressive bonus credit usage.
3. **Moderate BIL/IRA Implementation (Moderate Scenario):** A scenario that models lower levels of BIL and IRA uptake, including more stringent constraints on investments, less bonus credit usage, and fewer qualifying electric vehicles.

¹ In AEO 2023, the EIA found that moderate and high uptake of IRA policies would result in a 33%-34% reduction in energy related CO₂ relative to a 2005 baseline (Reference and High Uptake scenarios, respectively). EIA notes in AEO 2023, however, that not all IRA provisions were modeled due to a lack of policy guidance and the need for model modifications to address more complex policy mechanisms.

More detail on the Moderate and Advanced Scenarios can be found in the Technical Documentation.²

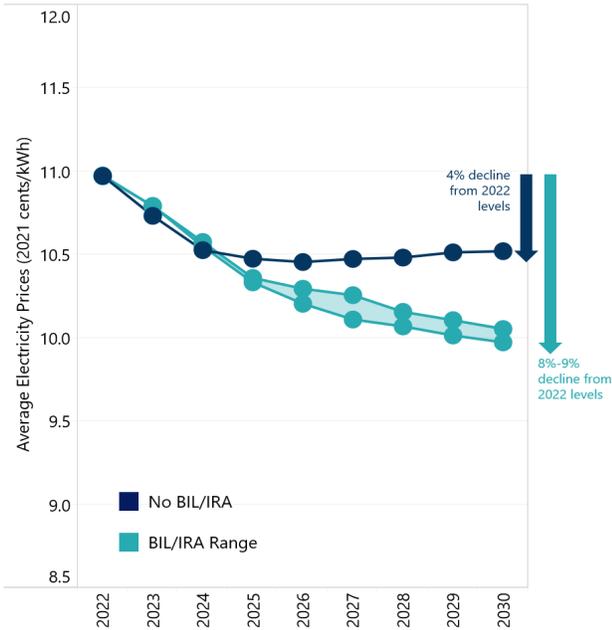
The Moderate and Advanced scenarios represent ranges in the projected impacts of these two policies but are not necessarily the bounds of these impacts. Because of modeling constraints, not all IRA and BIL provisions are modeled in this analysis (see the accompanying Technical Documentation for more information). Furthermore, the modeled IRA and BIL provisions may have a greater impact than shown due to systemic shifts that are not captured in the NEMS model.

IRA and BIL can save billions of dollars on energy bills and secure key American industries

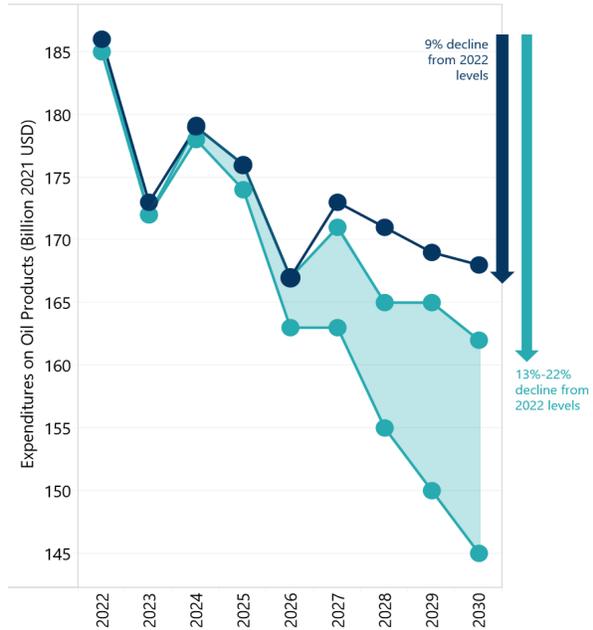
IRA and BIL are poised to save American families \$27 billion - \$38 billion on their electricity bills from 2022-2030, relative to a No BIL/IRA scenario. American businesses are also projected to save on their electricity bills, with a 13%-15% reduction in commercial electricity spending between 2022 and 2030. Electricity rates across sectors decline 8%-9% during this period. These reductions are driven in part by IRA's production and investment tax credits, which increase clean electricity generation that has significantly lower operational costs (zero fuel costs) than their fossil fuel counterparts. Grid electricity demand for these sectors is also projected to decline thanks to efficiency improvements and distributed generation enabled by IRA and BIL. These factors combine to increase disposable income for Americans families and businesses.

² Investing in American Energy: Impacts of the Inflation Reduction Act and Bipartisan Infrastructure Law on the U.S. Energy Economy and Emissions Reductions – Technical Documentation. U.S. Department of Energy Office of Policy. <https://www.energy.gov/media/302873>

Average electricity prices across sectors



Expenditures on Oil and Petroleum Products



Average electricity prices and oil expenditures across sectors (2022-2030). Values represent a No BIL/IRA scenario (dark blue) and the range between the Moderate and Advanced scenarios (light blue). Electricity prices are averaged across residential, commercial, industrial, and transportation sectors. Prices are shown in 2021 dollars.

IRA and BIL strengthen energy security by reducing net petroleum imports. Notably, net crude oil imports decline 44%-59% between 2022 and 2030, relative to a 35% decline in a No BIL/IRA scenario. This translates to a 13%-22% reduction in total expenditures for imported crude oil and petroleum products with IRA and BIL, relative to a 9% decline in a No BIL/IRA scenario. These reductions in expenditures are driven by the electrification of the transport fleet and increased efficiency and electrification in buildings. All else equal, this drives an 11%-13% reduction in gasoline prices over this period for American households and businesses. As the American economy electrifies and becomes more energy-efficient, demand for petroleum imports goes down, allowing for increased energy security at the national and consumer level.

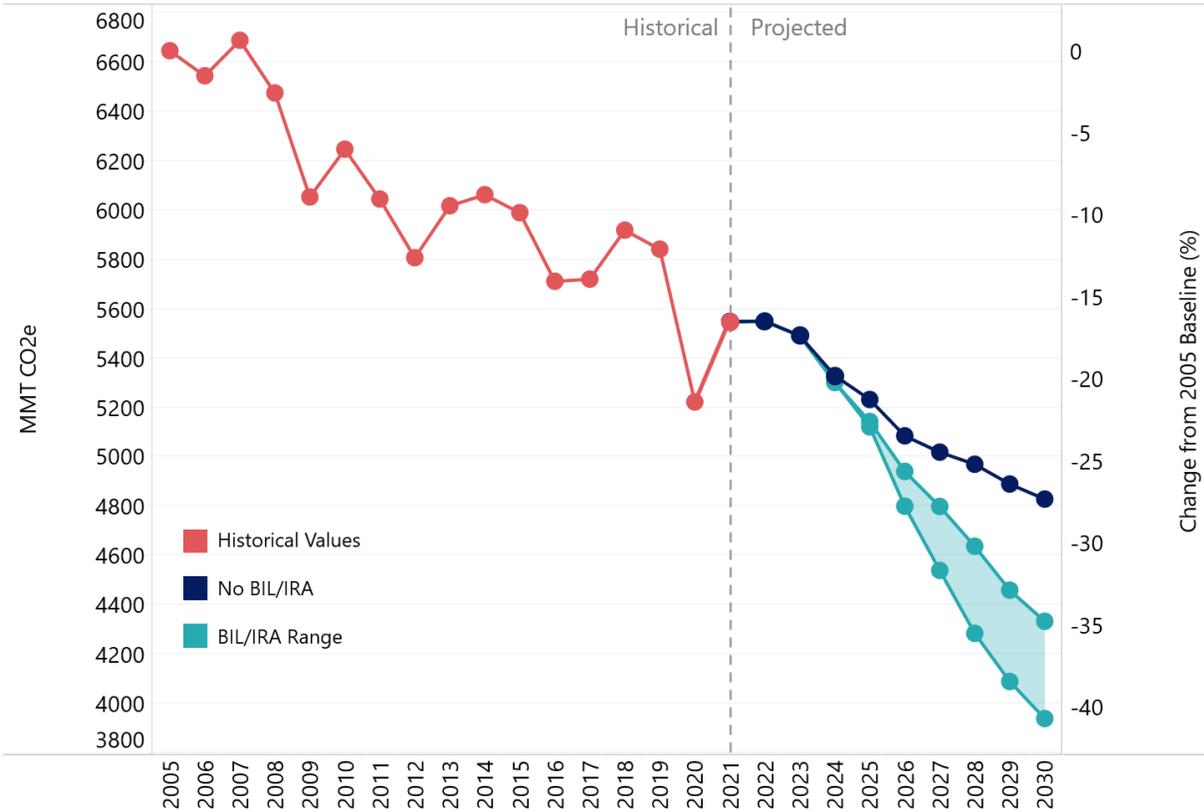
IRA and BIL include provisions that catalyze domestic clean energy supply chains that are not modeled for this report or the EIA Annual Energy Outlook 2023. OP-NEMS results suggest that IRA and BIL will enable the deployment of roughly up to 250GW of new wind, up to 475GW of new solar, and the manufacture of up to 14 million new light-duty electric vehicles between 2022-2030. These results are despite not being able to model additional provisions that will further bolster domestic clean energy supply chains. For example, manufacturing tax credits in IRA, including the 45X Advanced Manufacturing Production Credit and the 48C Qualified Advanced Energy Credit, are already driving investment in domestic supply chains. In addition,

billions of dollars in clean domestic manufacturing are provided under BIL, including for hydrogen hubs and battery manufacturing conversion grant programs. A separate DOE analysis suggests that the 45X credit, combined with recently published domestic content guidance, could allow American manufacturers to meet 50% of 2030 demand for solar PV cells, nearly 100% of 2030 demand for solar PV modules, and more than 50% of 2030 demand for wind turbine blades and towers.³ This demand pull of clean energy deployment and the supply push of IRA and BIL manufacturing incentives could onshore industries that are worth billions of dollars and employ thousands of American workers.

IRA and BIL enable the U.S. to make significant headway toward climate targets

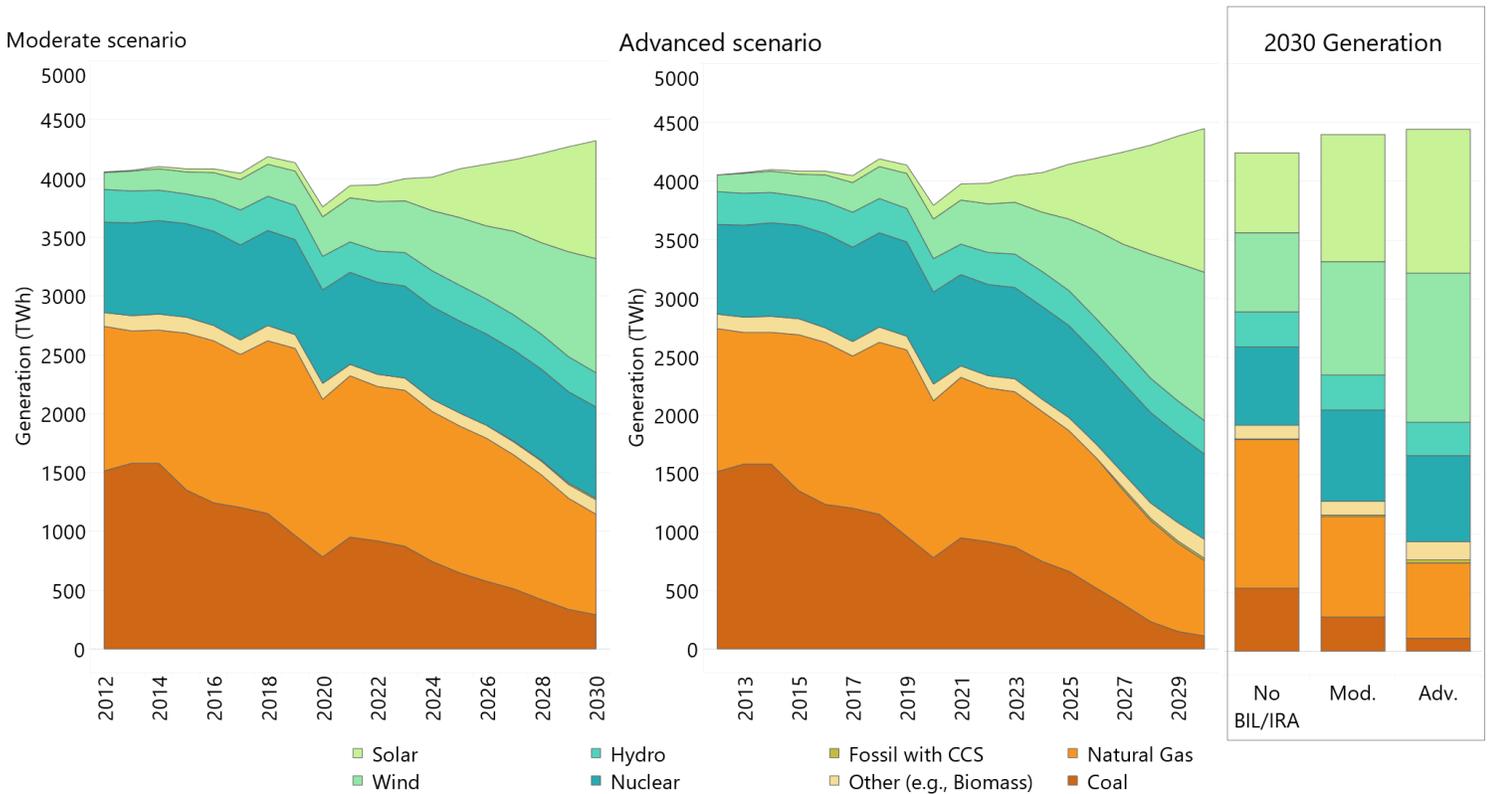
DOE's analysis shows net U.S. greenhouse gas emissions declining to 35%-41% below 2005 levels in 2030. This is in contrast to the No BIL/IRA scenario, which shows net U.S. greenhouse gas emissions declining to 27% below 2005 levels. Collectively, IRA and BIL provisions lead to accelerated deployment of clean electricity, resulting in a rapid reduction in electricity emissions, greater electrification in the transportation sector, improved efficiencies and electrification in buildings and industry, deployment of carbon capture and storage (CCS) for industrial facilities and power plants, and greater clean hydrogen supply and use. This is consistent with recently published findings from other leading analyses on these policies.⁴ This analysis does not include any further policy changes since the passage of BIL and IRA.

Net Greenhouse Gas Emissions



Net Greenhouse Gas Emissions (2005-2030). Historical values of energy-related CO₂ emissions are from the [U.S. Energy Information Administration \(EIA\), U.S. Energy-Related Carbon Dioxide Emissions, 2021](#), Figure 8. Net greenhouse gas emissions are estimated by first adding non-energy CO₂ emissions and non-CO₂ emissions to energy-related CO₂ emissions (either historical from the EIA or projected in OP-NEMS). Non-energy CO₂ emissions and emissions of methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF₆), nitrogen trifluoride (NF₃) are derived from the [Eighth National Communication and Fifth Biennial Report of the United States of America to the United Nations Framework Convention on Climate Change \(BR5\)](#). Sequestration from land use, land use change, and forestry (LULUCF) are also based on BR5. The IRA range represents the range between the Moderate IRA scenario and Advanced IRA scenario.

The U.S. power sector drives the greatest emissions reductions through 2030. The share of electricity generated from clean sources increases from 42% in 2022 to 72%-81% in 2030.³ The highest growth is in solar generation, which increases 7-8x 2022 levels, and wind generation, which increases 2-3x 2022 levels. This is driven in large part by IRA tax credits for clean electricity. The shift toward clean electricity under both the Moderate and Advanced scenarios allows the power sector to achieve energy-related CO₂ emissions reductions that are 73%-82% below 2005 levels. Power sector contributions to total U.S. energy-related CO₂ emissions declines to 13%-18% in 2030, from 31% in 2022.

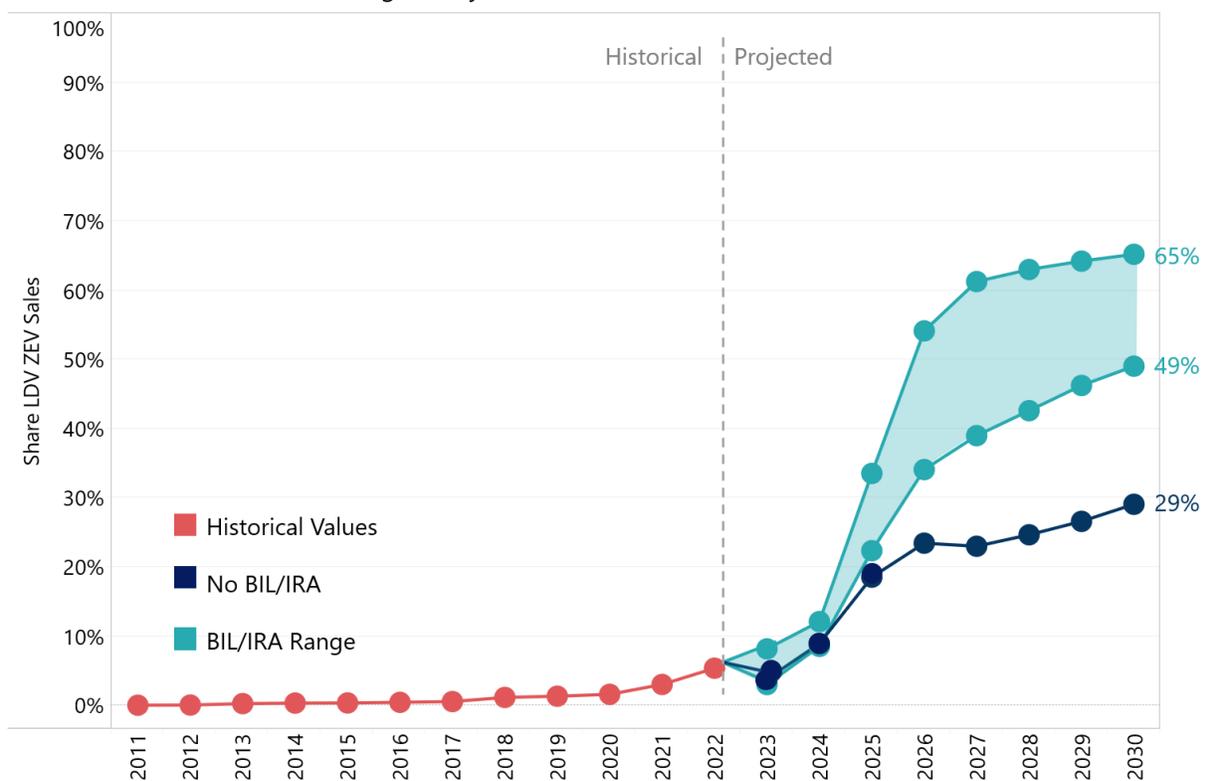


Generation by Plant Type under the Moderate and Advanced Scenarios (2012-2030). Historical values are based on the EIA [Electric Power Annual \(2022\)](#), Table 3.1.A. Net Generation by Energy Source: Total (All Sectors), 2011-2021. Solar includes solar thermal and photovoltaic technologies and includes distributed solar generation. Wind includes offshore wind and land-based wind. Hydro includes conventional hydropower. Nuclear includes light water reactors and small modular reactors. Fossil with CCS includes coal plants and combined cycle plants with sequestration. Natural gas includes combined cycle plants without sequestration as well as distributed natural gas fuel cells. Other includes oil and natural gas steam, combustion turbines, geothermal, municipal waste, wood and biomass, and geothermal. Storage is not included in this figure.

³ Clean generation includes generation from nuclear, fossil with carbon capture and storage (CCS), and renewables including wind, solar, geothermal, hydroelectric, and biomass.

Energy-related transportation CO₂ emissions decline 19%-24% below 2005 levels in 2030 as the fleet of cars and trucks transitions to zero emission vehicles. In 2030, the percentage of zero-emission light-duty vehicle (LDV) sales reaches 49%-65% percent, up from about 8% today.⁴ Gasoline demand declines to about 12 quads (roughly 2200 million barrels of oil equivalent), a drop of 21% below 2022 levels. This is driven by electrification, as well as fuel economy and greenhouse gas emissions standards that ensure that new conventional gasoline- and diesel-powered vehicles become more efficient. Transportation continues to represent the largest share of direct energy-related emissions in the United States through 2030.

Market share of zero-emission light-duty vehicles



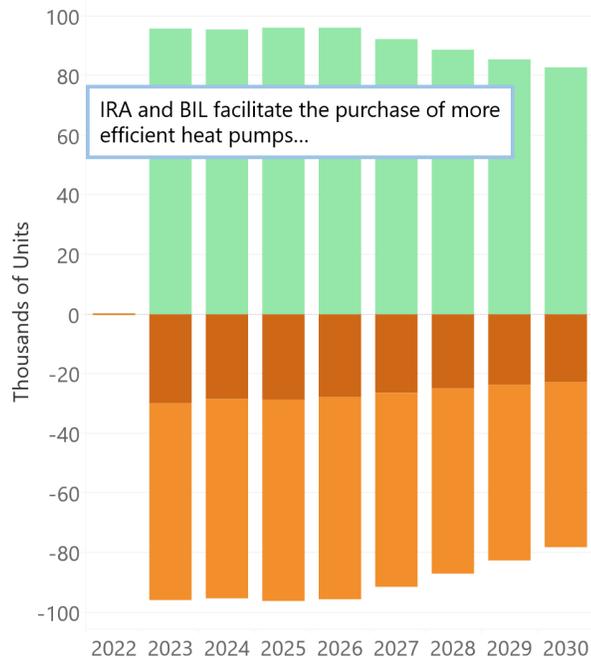
Market Share of Zero-Emission Light-Duty Vehicles (2011-2030). Historical values are derived from Argonne National Laboratory [LDV Total Sales of PEV and HEV by Month](#). LDV sales include the sales of cars and light trucks. The IRA range represents the range between the Moderate IRA scenario and the Advanced IRA scenario. 2023 LDV sales share in the Moderate IRA scenario is lower than that of the No BIL/IRA scenario due to enhanced sourcing requirements that limit the purchase of electric vehicles in the model.

⁴ The average monthly EV sales share was 7% for the first three months of 2023, according to Argonne National Lab (ANL) ([Light Duty Electric Drive Vehicles Monthly Sales Updates | Argonne National Laboratory \(anl.gov\)](#))

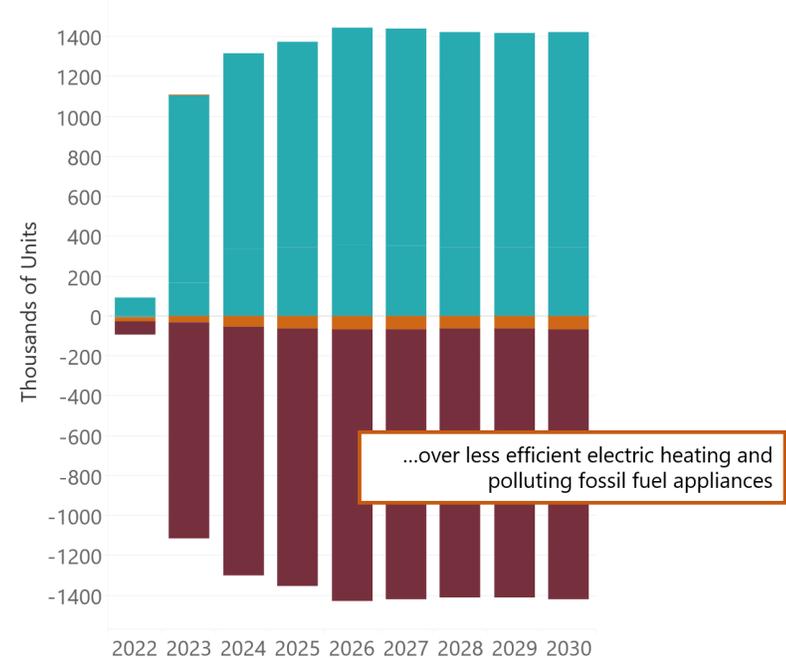
Energy-related building emissions decline even as the stock of homes and commercial buildings is slated to increase. This is driven by increased building envelope efficiency and equipment electrification, both of which ultimately save energy for homes and businesses. OP-NEMS indicates that IRA and BIL programs enable many American families to replace inefficient electric and fossil fuel appliances with heat pumps for space and water heating. American homes and businesses are also projected to nearly double solar PV capacity from 23GW in 2022 to about 45GW in 2030. Importantly, efficiency improvements from IRA outweigh the impacts of electrifying end-uses in buildings. Residential and commercial electricity demand in 2030 is projected to be 2%-3% lower than the No BIL/IRA scenario.

Equipment Replacement in Residential Buildings

Residential Space Heating



Residential Water Heating



■ Heat pumps
■ Electric heating other than heat pumps
■ Fossil fuels
■ Solar or heat pump water heater
■ Electric water heater

Equipment Replacement in Residential Buildings (Moderate Scenario). Data are based on projected residential equipment stock from the No BIL/IRA and Moderate scenarios. Values represent a comparison of the No BIL/IRA and Moderate scenarios by first calculating annual change in equipment stock for each equipment type, then subtracting the No BIL/IRA values from the Moderate scenario values. Heat pumps include air source heat pumps and ground source heat pumps. Fossil fuels include distillate fuel oil/kerosene boilers, distillate fuel oil/kerosene furnaces, natural gas boilers, natural gas furnaces, natural gas heat pumps, propane furnaces, wood stoves, natural gas water heaters, propane water heaters, distillate fuel oil and kerosene water heaters.

Energy-related emissions in the industrial and manufacturing sector decline 33%-42% below 2005 levels in 2030. The carbon sequestration credits in IRA make industrial CCS more attractive for sectors like ethanol, ammonia, and refining. In addition, IRA credits for hydrogen make the production of low-carbon hydrogen significantly more competitive with unabated fossil pathways. This analysis assumes that hydrogen demand will increase following the U.S. National Clean Hydrogen Strategy and Roadmap, using a range of assumptions about the carbon intensity of production. The increased hydrogen demand displaces natural gas demand in the industrial sector, and the hydrogen, when produced using onsite clean electricity, leads to significant emission reductions. In addition, IRA provisions that catalyze demand pull for low-carbon materials, including provisions for low carbon transportation materials and construction materials, expand the market for clean cement and steel.

These investments meet the challenge of ambitious climate targets

In 2021, the United States reaffirmed its commitment to leading a just transition to a clean energy economy and tackling the climate challenge by setting a series of ambitious targets:^{5,6}

1. Reducing greenhouse gas emissions 50-52% below 2005 levels in 2030
2. Reaching 100% carbon-free electricity by 2035
3. Achieving net-zero emissions by 2050
4. Delivering 40% of the benefits from federal climate and energy investments to disadvantaged communities.

Achieving these targets will require economy-wide actions funded by public and private investments. While there are many pathways to reach these targets, the key pillars of decarbonization are the same. The United States must decarbonize electricity, electrify energy services, increase energy efficiency, deploy enabling infrastructure, and accelerate innovation in clean energy and carbon reducing technologies across economic sectors, while ensuring benefits and costs of the transition are equitably distributed.

IRA and BIL meet this challenge. The results of this DOE analysis demonstrate that these policies make large strides toward climate targets while lowering energy bills and securing the American industrial base. They also underscore the importance of strategic and expansive implementation. All levels of government must work together and with the industry and public to build this future for the U.S. economy. Achieving these targets will ensure a cleaner and more secure energy system for all Americans.

¹ [The Inflation Reduction Act Drives Significant Emissions Reductions and Positions America to Reach Our Climate Goals. \(2022\). In DOE Fact Sheet \(DOE/OP-0018\). U.S. Department of Energy Office of Policy.](#)

² [DOE Fact Sheet: The Bipartisan Infrastructure Deal Will Deliver For American Workers, Families and Usher in the Clean Energy Future. \(2021\).](#)

³ [President Biden’s Investing in America Agenda is Boosting American Manufacturing and Clean Energy Deployment. \(2023, May 12\). U.S. Department of Energy Office of Policy.](#)

⁴ [Bistline, J., Blanford, G., Brown, M., Burtraw, D., Domeshek, M., Farbes, J., Fawcett, A., Hamilton, A., Jenkins, J., Jones, R., King, B., Kolus, H., Larsen, J., Levin, A., Mahajan, M., Marcy, C., Mayfield, E., McFarland, J., McJeon, H., . . . Zhao, A. \(2023\). Emissions and energy impacts of the Inflation Reduction Act. *Science*, 380\(6652\), 1324–1327.](#)

⁵ [FACT SHEET: President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-Paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies. \(2021, April 22\). White House Briefing Room.](#)

⁶ [Justice40 Initiative | Environmental Justice. The White House.](#)



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