Congressional Research Service
Informing the legislative debate since 1914

U.S. Greenhouse Gas Emissions Trends and Projections from the Inflation Reduction Act

January 12, 2023

Congressional Research Service
https://crsreports.congress.gov
R47385

CRS REPORT
Prepared for Members and
Committees of Congress

Congressional Research Service
Informing the legislative debate since 1914

SUMMARY

R47385

January 12, 2023

Jonathan L. Ramseur
Specialist in Environmental Policy

U.S. Greenhouse Gas Emissions Trends and Projections from the Inflation Reduction Act

Pursuant to international climate change treaty obligations, the United States submitted a nonbinding pledge in 2021 to reduce its greenhouse gas (GHG) emissions by 50%-52% below 2005 levels by 2030. The 117th Congress enacted several laws that, in part, support this GHG emissions reduction target: the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58) and a budget reconciliation measure commonly referred to as the Inflation Reduction Act of 2022 (IRA; P.L. 117-169). IRA, in particular, represents a milestone in U.S. federal climate policy. Each of the eight IRA titles contains some number of provisions that directly or indirectly address U.S. GHG emissions.

Members of Congress may consider IRA and IIJA and the GHG emissions goals within a wider context, including recent GHG emissions trends and the role of existing federal and state climate policies. In addition, Congress may consider whether the new laws are sufficient to meet U.S. emissions reduction commitments and how the recently enacted provisions may interact with any proposed laws or regulations. Some Members have voiced opposition to IRA provisions, which may affect the oversight of its implementation in the 118th Congress.

U.S. GHG emissions reached their highest level in 2007 and have generally decreased since that time. The 2020 annual emission levels were approximately 21% below levels in 2005—the year the United States uses as a benchmark for its international GHG pledges. The decrease in emissions between 2019 and 2020 was largely due to the impacts of the Coronavirus Disease 2019 (COVID-19) pandemic on travel and economic activity. Based on carbon dioxide (CO_2) emissions data, total U.S. GHG emissions likely increased between 2020 and 2021.

Federal climate change policies have evolved and currently include a range of activities implemented under various legal authorities. Federal rulemakings that address GHG emissions have generated considerable interest, controversy, and court challenges. In some cases, the rulemakings are still under development and have not been implemented.

Several recent analyses use computer simulation models to prepare estimates of U.S. GHG emissions through 2030. These models compare baseline scenarios with emission scenarios that include the effects of legislation enacted in the 117th Congress, particularly IRA. The models indicate that under baseline conditions (i.e., without IRA), U.S. GHG emissions would decrease by 24% to 35% by 2030 compared with 2005 levels. The models estimate that with the addition of IRA, U.S. GHG emissions would decrease by 30% to 43% by 2030 compared with 2005 levels. The range of estimates is due to a number of uncertain factors, such as future oil and natural gas prices, the rate of increase in electricity transmission, and implementation of IRA provisions, among others.

None of the modeled scenarios indicates that the United States would meet its 2030 GHG emissions target. Some of the non-modeled provisions may promote the development of technologies that could result in emissions reductions over a longer time horizon. In addition, the estimates indicate that most of IRA's projected emissions reductions come from the electric power sector in the 2030 time frame, and other provisions—particularly those affecting emissions in the transportation sector—are expected to result in emissions reductions after 2030.

If Members want to spur U.S. GHG emissions reduction beyond the projections from the models, a range of policy options remain available. Policymakers could increase IRA's funding amounts or tax incentives. Alternatively, policymakers could employ different approaches in subsequent legislation. Options include market-based approaches, such as carbon pricing mechanisms or regulatory standards for particular facilities or sectors. To some degree, such efforts are underway at the state level. In addition, a range of developing federal regulatory actions would likely play a role in the level of U.S. emissions over time. The authors of the modeling studies point out that the IRA climate provisions would decrease costs associated with other existing or future requirements or policy activity from the federal government or state and local governments. If these additional policies were implemented, some argue, they may help achieve the 2030 target.

Contents

Figures

Contacts

Introduction

Millions of discrete sources throughout the United States produce greenhouse gas (GHG) emissions.[1] These sources include motor vehicles, electric power plants, industrial facilities, commercial buildings, households, and agricultural activities. Human-related GHG emissions have increased since the beginning of the industrial era, increasing atmospheric concentrations of GHGs.[2]

A wide array of actions that seek to reduce GHG emissions are underway or being developed by international and subnational entities (e.g., U.S. state actions or regional partnerships), as well as by the U.S. federal government. Federal climate change policies have evolved and currently include a range of activities implemented under various legal authorities, such as the Clean Air Act.

The 117th Congress considered and ultimately enacted two laws that include a number of provisions that could have direct or indirect effects on U.S. GHG emission levels.

- On November 15, 2021, President Biden signed the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58). IIJA is a broad infrastructure law that addressees multiple economic sectors that produce GHG emissions, including transportation and energy, among others.
- On August 16, 2022, President Biden signed a budget reconciliation measure commonly referred to as the Inflation Reduction Act of 2022 (IRA; P.L. 117-169). Each of the eight IRA titles contains some number of provisions that directly or indirectly address issues related to climate change, including reduction of U.S. GHG emissions.

Several organizations, including the Department of Energy, have used models to assess the effects these acts may have on U.S. GHG emission levels over the next decade.[3] This report examines these assessments and considers their results in a wider context. For example, how do the projected emissions reductions compare with historical emissions levels and recent trends? How

[1] The primary greenhouse gases (GHGs) emitted by human activities—and estimated by the U.S. Environmental Protection Agency (EPA) in its annual inventories—include carbon dioxide (CO_2), methane, nitrous oxide, sulfur hexafluoride, chlorofluorocarbons, hydrofluorocarbons, and perfluorocarbons. Other GHGs include water vapor, carbonaceous and sulfuric aerosols, hydrochlorofluorocarbons, and elevated tropospheric ozone pollution generated by emissions of nitrogen oxides and volatile organic compounds, such as solvents.

[2] For example, atmospheric concentrations of CO_2 have increased by over 45% compared with preindustrial levels (i.e., 1850-1990). See Intergovernmental Panel on Climate Change (IPCC), *AR6 Climate Change 2021: The Physical Science Basis*, August 9, 2021, p. SPM-5, at https://www.ipcc.ch/report/ar6/wg1/.

[3] The modeling groups include the following: Rhodium Group, A Turning Point for US Climate Progress: Assessing the Climate and Clean Energy Provisions in the Inflation Reduction Act, August 12, 2022, at https://rhg.com/research/climate-clean-energy-inflation-reduction-act/ (hereinafter Rhodium Group, A Turning Point for US Climate Progress); Princeton University Rapid Energy Policy Evaluation and Analysis Toolkit (REPEAT), *Electricity Transmission is Key to Unlock the Full Potential of the Inflation Reduction Act*, September 2022, at https://repeatproject.org/docs/REPEAT_IRA_Transmission_2022-09-22.pdf (hereinafter Princeton REPEAT, *Electricity Transmission*); Princeton University REPEAT, *Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act of 2022*, August 2022, at https://repeatproject.org/docs/REPEAT_IRA_Prelminary_Report_2022-09-21.pdf (hereinafter Princeton REPEAT, *Preliminary Report*); Energy Innovation, *Modeling the Inflation Reduction Act Using the Energy Policy Simulator*, August 23, 2022, at https://energyinnovation.org/publication/modeling-the-inflation-reduction-act-using-the-energy-policy-simulator/ (hereinafter Energy Innovation, *Modeling the Inflation Reduction Act*); and Department of Energy, "The Inflation Reduction Act Drives Significant Emissions Reductions and Positions America to Reach Our Climate Goals," August 2022, at https://www.energy.gov/sites/default/files/2022-08/8.18%20InflationReductionAct_Factsheet_Final.pdf.

do the projected reductions compare with hypothetical scenarios without the recent enactments of IIJA and IRA (i.e., baseline scenarios)? How do the projected reductions compare with U.S. emission reduction goals for 2030?

A discussion of these issues provides further context for the potential role that these acts may play in U.S. climate policy going forward. Policymakers may consider whether the existing policies are sufficient to meet specific objectives. Another consideration for Members is how these recently enacted policies may interact with any subsequent laws or regulations.

This report

- discusses historical U.S. GHG emissions and trends;
- highlights federal and state climate change policies, particularly those addressing GHG emission levels, but does not provide a comprehensive summary of all policies related to climate change;
- briefly discusses the history of federal climate change legislation and summarizes two enacted measures in the 117th Congress, IIJA and IRA;
- discusses U.S. goals to reduce GHG emissions by 2030 and beyond;
- discusses recent estimates of U.S. GHG emissions for 2030, particularly regarding the potential emission effects from IRA; and
- provides considerations for policymakers in the context of the emissions projections.

Historical U.S. GHG Emissions and Recent Trends

The U.S. Environmental Protection Agency (EPA) prepares an annual inventory of U.S. GHG emissions. The inventory includes estimates of gross emissions, emission sinks, and net emissions.[4] The most recent inventory includes annual estimates from 1990 through 2020.[5] As illustrated in **Figure 1**, gross U.S. GHG emissions reached their highest level in 2007 and generally decreased since that time. The 2020 annual emission levels were approximately 20% below levels in 2005—the year the United States uses as a benchmark for its international GHG pledges.

Policymakers may view the 2020 emission levels and their relationship with U.S. goals with some caution. The 9% decrease in emissions between 2019 and 2020 was the largest annual decline in EPA's inventory history and, according to EPA, "largely due to the impacts of the coronavirus (COVID-19) pandemic on travel and economic activity."[6] Carbon dioxide (CO_2) emissions data from the energy sector for 2021 appear to indicate that total U.S. GHG emissions likely increased

[4] *Gross emissions* refer to total emissions from all sources, and it does not account for removals of CO_2 emissions from the atmosphere by *emission sinks*, such as forests, vegetation, and soils. U.S. sinks removed about 812 million metric tons (MMT) in 2020, about 14% of gross emissions. *Net emissions* include the sum of gross emissions estimates and removal estimates. The U.S. Nationally Determined Contribution (NDC) is measured in terms of net emissions. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks*, 2022, at https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2020 (hereinafter EPA GHG Inventory).

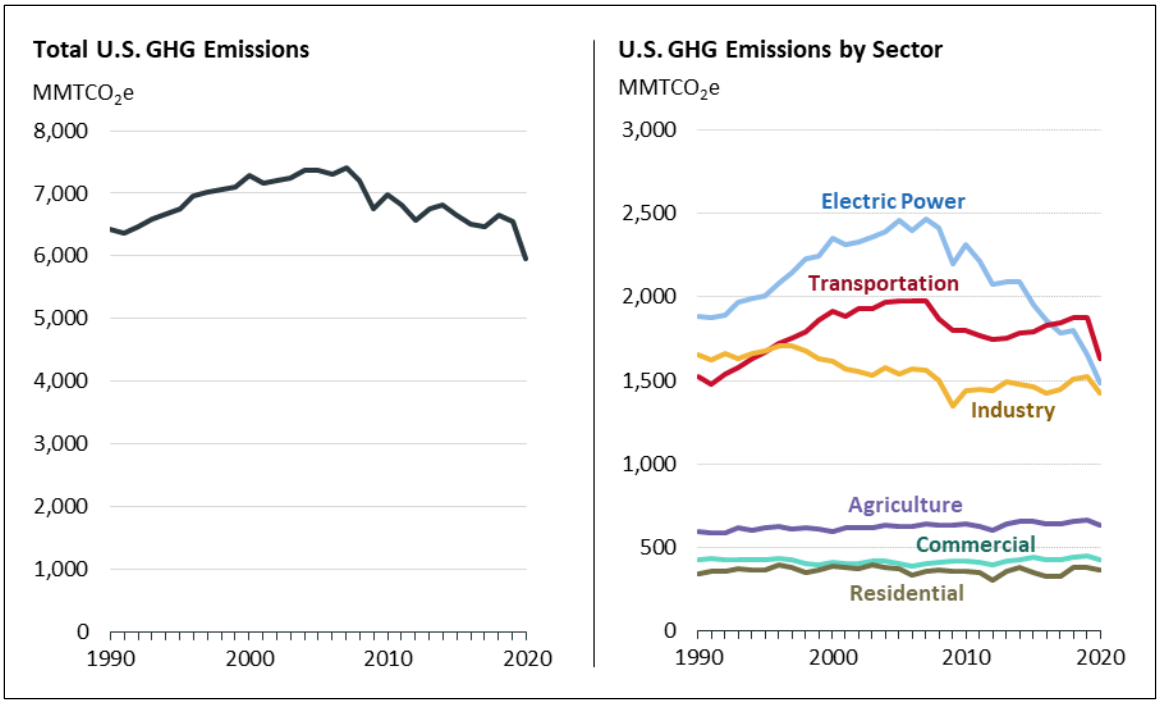
[5] GHG emissions data and trends can be presented in several ways, with each presentation telling a different story. The GHG emissions in EPA's GHG Inventory and in this report generally concern annual emission levels. Other GHG emission measures include cumulative GHG emissions, GHG emissions intensities (e.g., emissions per gross domestic product), and GHG emissions per capita.

[6] EPA GHG Inventory, p. ES-4.

between 2020 and 2021. The Energy Information Administration (EIA) provides energy-related CO_2 emissions on a more up-to-date schedule than EPA's inventory, which involves an interagency process as well as expert and public reviews before finalization.[7] EIA found that CO_2 emissions account for approximately 80% of total U.S. GHG emissions, and their fluctuations generally track with the annual percentage changes in total GHG emissions from EPA's inventories.[8] EIA data indicate that CO_2 emissions from the energy sector increased by 7% between 2020 and 2021.[9] Total GHG emissions are likely to follow a similar trend in 2021.

Figure 1 shows the GHG emissions contributions and trends by sector between 1990 and 2020. As the figure indicates, emissions in the electricity sector decreased by 40% between 2005 and 2020. As the side-by-side comparison illustrates, the decrease in total U.S. GHG emissions over the past 15 years is related to decreases in the electricity sector.

Figure 1. Total Gross U.S. GHG Emissions and Emissions by Sector: 1990-2020



Source: Prepared by the Congressional Research Service (CRS) using data from the U.S. Environmental Protection Agency (EPA), *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2020*, 2022, at https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks (EPA GHG Inventory).

Notes: $MMTCO_2e$ = million metric tons of carbon dioxide-equivalent emissions. $MMTCO_2e$ is used because greenhouse gases (GHGs) vary by global warming potential (GWP). GWP is an index that allows comparisons of the heat-trapping ability of different gases over a period of time. The scales of the y-axes in the above figures are different. The figure presents gross emissions (i.e., the total emissions from all sources), and it does not account for net removals of carbon dioxide (CO_2) emissions from the atmosphere by vegetation and other sinks. U.S.

[7] Although the EPA and Energy Information Administration (EIA) estimates are generally consistent, there are minor differences in how some emissions are reported.

[8] Based on a comparison of the annual rates of change between CO_2 emissions in the energy sector (EIA data) and total GHG emissions (EPA data).

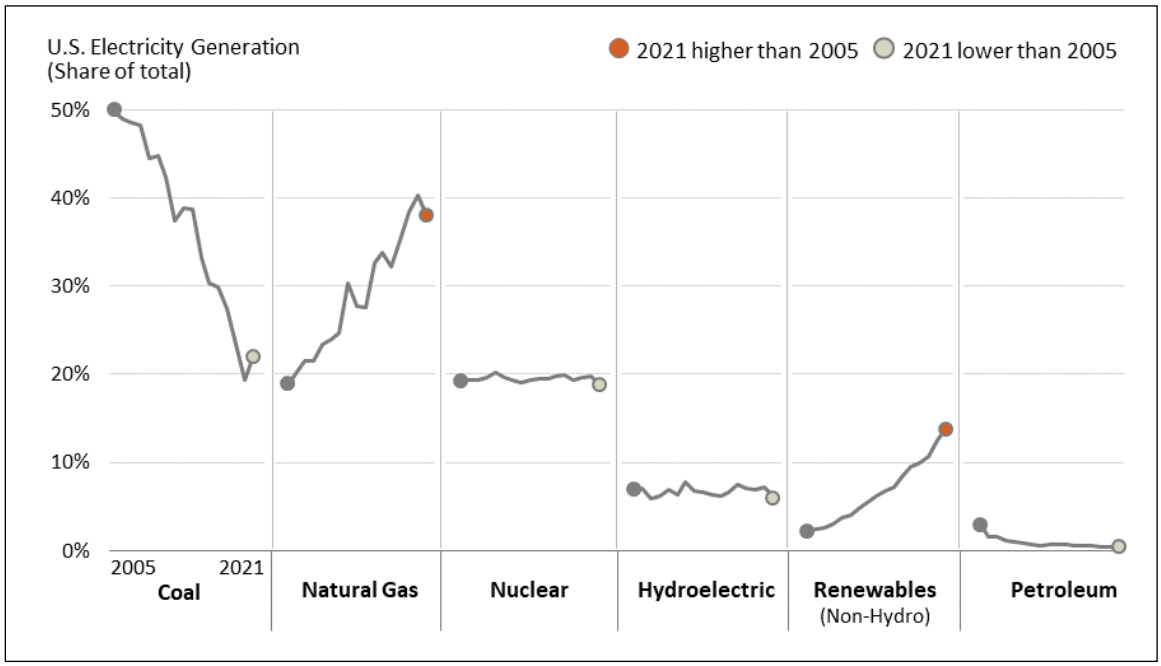
[9] Emission levels in 2021 were 3% below levels in 2019. See EIA, *Monthly Energy Review*, September 2022, at https://www.eia.gov/totalenergy/data/monthly/#environment.

GHG emissions can be categorized in a variety of ways. This figure uses the economic sectors from EPA's GHG Inventory.

Developments in the U.S. electricity generation portfolio played a key role in the emissions decrease in the electricity sector and total U.S. emission levels. Different fossil fuels, such as coal and natural gas, generate different amounts of GHGs per unit of generated electricity. For example, a typical natural-gas unit in the United States yields about 40% of the GHG emissions of a coal-fired unit per megawatt-hour of electricity.[10] Some sources of electricity generation, such as nuclear power, wind, and solar, emit no GHG emissions at the point of power generation. As illustrated in **Figure 2**, over the past decade, coal's contribution to electricity generation decreased, while natural gas and renewable generation both increased. Several factors likely played a role in this change, including technological advances, particularly hydraulic fracturing, as well as federal tax incentives for renewable energy and renewable portfolio standards in the states.[11]

Figure 2. Percentage of Total Electricity Generation by Energy Source

2005-2021



Source: Prepared by CRS using data from Energy Information Administration (EIA), "Electric Power Monthly," Table 1.1, at https://www.eia.gov/totalenergy/data/monthly/#environment.

Notes: Renewable sources include wind, utility scale solar, wood fuels, landfill gas, biogenic municipal solid waste, other biomass, and geothermal. Petroleum includes petroleum liquids and petroleum coke.

U.S. Climate Change Policies—In Brief

Historically, policymaking entities in the United States—Congress, federal agencies, state and local governments—have proposed, and in some cases established, a variety of climate change

[10] See EIA, "How Much Carbon Dioxide Is Produced per Kilowatthour When Generating Electricity with Fossil Fuels," at https://www.eia.gov/tools/faqs/faq.cfm?id=74&t=11.

[11] For more discussion, see CRS Report R45453, *U.S. Carbon Dioxide Emissions in the Electricity Sector: Factors, Trends, and Projections*, by Jonathan L. Ramseur.

policy approaches. In many cases, the policy approaches have generated considerable debate and opposition from policymakers and stakeholders.

The following sections highlight developments and activities at the federal, state, and local government levels. These policies have played varying roles in the recent trends in GHG emissions levels and they will continue to affect levels going forward.

Federal Policies[12]

A variety of federal policies have indirectly affected GHG emissions through the years. These have involved a range of activities implemented under various legal authorities. These activities have included regulatory standards, tax incentives, data gathering and reporting, and financial support for GHG mitigation technologies. Several of these regulatory programs continue today and have indirectly limited GHG emission increases from vehicles,[13] appliances and equipment, buildings,[14] and transportation fuels.[15]

A 2007 Supreme Court decision altered the federal environmental policy landscape. In *Massachusetts v. EPA*, the Court ruled that EPA has authority under the Clean Air Act to regulate GHG emissions from motor vehicles as air pollutants. This decision led to a shift in federal policies toward more direct regulation of GHG emissions. During the Obama Administration, EPA issued rules to limit GHGs from various sources, including electric power plants, vehicles, and oil and natural gas production facilities. These rulemakings, and related efforts that followed, have generated considerable interest, controversy, and court challenges.[16] In some cases, the rulemakings are still under development and have not been implemented. Other rules remain in place.[17]

Executive branch policies and actions addressing U.S. GHG emissions typically reflect the policy objectives of the incumbent Administration at the time. Recent EPA regulatory activities include, but are not limited to, the following:

[12] For more details regarding the history of federal climate change policies, see CRS Report R46947, *U.S. Climate Change Policy*, coordinated by Richard K. Lattanzio.

[13] For example, the Corporate Average Fuel Economy (CAFE) standards promulgated by the National Highway Traffic Safety Administration (NHTSA) set fuel economy targets, in miles per gallon, for newly manufactured passenger cars and light trucks sold in the United States. These standards have the co-benefit of reducing GHG emissions from these vehicles.

[14] For more information, see CRS Report R46719, *Green Building Overview and Issues*, by Corrie E. Clark.

[15] The Energy Policy Act of 2005 (P.L. 109-58), amended by the Energy Independence and Security Act of 2007 (EISA; P.L. 110-140), established the Renewable Fuel Standard (RFS). The RFS includes scheduled volume mandates that grow each year (starting with 9 billion gallons in 2008 and ascending to 36 billion gallons in 2022). EPA administers the RFS. For more information, see CRS Report R44045, *The Renewable Fuel Standard (RFS): Waiver Authority and Modification of Volumes*, by Kelsi Bracmort.

[16] A comprehensive discussion of the history and factors that have played a role in the development of these rules is beyond the scope of this report.

[17] For example, EPA's 2015 final rule establishing GHG emission standards for new fossil fuel-fired utility boilers and natural gas-fired stationary combustion turbines remains in place. The New Source Performance Standard for new and modified power plants relies in part on carbon capture and sequestration (CCS) technology to reduce emissions by about 20% compared with the emissions of what was considered (at the time of the rule) a state-of-the-art coal-fired plant without CCS. See EPA, "Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units," 80 *Federal Register* 64509, October 23, 2015.

- In January 2021, EPA promulgated GHG emission standards for aircraft engines equivalent to the standards adopted by the International Civil Aviation Organization (ICAO).[18]
- In November 2021, EPA issued a proposed rule that would reduce methane and other air pollution from new and existing sources in the oil and natural gas industry.[19] EPA issued a supplemental proposal in November 2022, which, according to EPA, would "strengthen and expand" the 2021 proposal.[20]
- In December 2021, EPA finalized GHG emissions standards for passenger cars and light trucks for Model Years (MY) 2023-MY2026.[21]
- In May 2022, EPA announced the initiation of a separate rulemaking to establish multi-pollutant emission standards from light-duty and medium-duty vehicles for MY2027 and later.[22]
- In September 2022, EPA solicited "pre-proposal" outreach with questions for stakeholders regarding its strategy to address CO_2 emissions from *existing* fossil-fuel-fired power plants.[23] (As mentioned above, EPA finalized regulations for *new* fossil-fuel-fired power plants in 2015.) This potential rulemaking would follow from the legal developments with the Obama Administration's 2015 Clean Power Plan (CPP) and the Trump Administration's 2019 Affordable Clean Energy (ACE) rule. Both the CPP and ACE rules were the subject of extensive litigation, and neither was implemented.[24]
- In December 2022, EPA finalized regulations to address nitrogen oxide (NO_x) emissions from heavy-duty vehicles in MY2027 and beyond. The proposed rule from March 2022 also included regulations addressing GHG emissions. EPA stated that the agency would address these emissions in a separate rulemaking.[25]

[18] EPA, "Control of Air Pollution From Airplanes and Airplane Engines: GHG Emission Standards and Test Procedures," 86 *Federal Register* 2136, January 11, 2021.

[19] EPA, "Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector," 86 *Federal Register* 63110, November 15, 2021.

[20] EPA, "Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review," 87 *Federal Register* 74702, December 6, 2022.

[21] EPA, "Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions Standards," 86 *Federal Register* 74434, December 30, 2021.

[22] For more information on this potential rulemaking, see EPA "Potential SBAR Panel: Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles," at https://www.epa.gov/reg-flex/potential-sbar-panel-multi-pollutant-emissions-standards-model-years-2027-and-later-light.

[23] See EPA, "Pre-Proposal Public Docket: Greenhouse Gas Regulations for Fossil Fuel-fired Power Plants," at https://www.epa.gov/stationary-sources-air-pollution/pre-proposal-public-docket-greenhouse-gas-regulations-fossil-fuel; and EPA, "Questions for Consideration," at https://downloads.regulations.gov/EPA-HQ-OAR-2022-0723-0002/content.pdf.

[24] For more background on these legal developments, see "West Virginia v. EPA: Greenhouse Gas Regulation and the Major Questions Doctrine" in CRS Report R47276, *Supreme Court Term October 2021: A Review of Selected Major Rulings*, coordinated by Valerie C. Brannon.

[25] The final rule (signed December 20, 2022) is available at https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-and-related-materials-control-air-pollution. EPA, "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards," 87 *Federal Register* 17414, March 28, 2022. According to EPA, this regulation will be the first of three in a series of rulemakings that would set new standards for criteria pollutants, such as fine particulate matter and nitrogen dioxide, and GHG emissions for heavy-duty vehicles. For more information, see EPA, "Heavy-Duty 2027 and Beyond: Clean Trucks Proposed Rulemaking," March 2022, at https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1014874.pdf.

State and Local Policies

In the absence of comprehensive federal controls on GHG emissions, some state and local governments have taken a variety of actions—both legal mandates and voluntary efforts—for approximately 20 years. Selected examples of currently implemented policies include the following:

- California implements a GHG emissions cap-and-trade program that covers electric power, selected industries, and fossil fuel distributors.[26]
- Eleven U.S. states participate in the Regional Greenhouse Gas Initiative (RGGI),[27] a cap-and-trade program that covers CO_2 emissions from electric power.
- Thirty states, three U.S. territories, and the District of Columbia require a minimum amount of electricity generation by eligible sources such as renewables.[28]
- Seventeen states have adopted California's more stringent vehicle emissions standards,[29] and forty-five states and the District of Columbia provide incentives for electric vehicles, hybrids, or both.
- The California Air Resources Board adopted regulations in August 2022 to phase out the sale of conventional gas-powered vehicles by 2035.[30] New York, Washington, and Massachusetts have similar requirements in various stages of development.
- Governors from 23 states and Puerto Rico announced a commitment to reduce net GHG emissions from their states by at least 50%-52% below 2005 levels by 2030 and achieve net-zero GHG emissions no later than 2050.[31]

[26] For more information, see the California Air Resources Board website at https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program. Washington State established a comparable cap-and-trade program that is scheduled to start in 2023 (see State of Washington Department of Ecology, "Washington's cap-and-invest program," at https://ecology.wa.gov/Air-Climate/Climate-Commitment-Act/Cap-and-invest).

[27] The Regional Greenhouse Gas Initiative (RGGI) states are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Virginia, and Vermont. Through executive branch action, Pennsylvania is seeking to join RGGI. Some policymakers in Pennsylvania's legislative bodies have voiced strong opposition to joining RGGI and the governor's actions to join the program without enacting new legislation. In addition, the governor of Virginia has proposed removing his state from RGGI.

[28] Database of State Incentives for Renewables & Efficiency, "Renewable & Clean Energy Standards," at https://s3.amazonaws.com/ncsolarcen-prod/wp-content/uploads/2019/07/RPS-CES-June2019.pdf. See also CRS Report R45913, *Electricity Portfolio Standards: Background, Design Elements, and Policy Considerations*, by Ashley J. Lawson.

[29] California Air Resources Board, "Low Emissions Vehicle Program," at https://ww2.arb.ca.gov/our-work/programs/low-emission-vehicle-program; and California Air Resources Board, "States that have Adopted California's Vehicle Standards under Section 177 of the Federal Clean Air Act," at https://ww2.arb.ca.gov/sites/default/files/2022-05/%C2%A7177_states_05132022_NADA_sales_r2_ac.pdf.

[30] The regulations were sent to the state's Office of Administrative Law, which will make a determination by November 22, 2022 (see California Air Resources Board, "Advanced Clean Cars II," at https://ww2.arb.ca.gov/rulemaking/2022/advanced-clean-cars-ii).

[31] The degree to which state and local governments can achieve these targets without federal action is uncertain, as the legal authorities and jurisdictions over GHG emissions sources may be limited in some cases. U.S. Climate Alliance, "U.S. Climate Alliance Commits to Achieve Net-Zero Emissions No Later than 2050," press release, April 23, 2021, at https://www.usclimatealliance.org/publications/newtargets.

Climate Change Legislation

Legislative Approaches Prior to the 117th Congress

Members of Congress have historically expressed a range of perspectives regarding climate change issues. Members seeking to limit or remove GHG emissions from the atmosphere have considered a range of policy options, including

- carbon pricing frameworks (e.g., carbon taxes or cap-and-trade programs);[32]
- sectoral approaches, such as a clean energy standard;
- research funding or tax policies that support low-emission technologies;
- creation of publicly funded entities to facilitate private investment into domestic low-carbon, climate-resilient infrastructure (i.e., green banks);
- loan guarantees to support the development or deployment of low-emission technologies; and
- support for adaptation and international cooperation.

Other legislative approaches have sought to prohibit certain approaches. For example, a number of resolutions introduced in recent years have stated that multisector carbon pricing approaches are not in the economic interests of the United States.[33] In addition, some Members have introduced bills that would limit the authority to regulate GHG emissions under the Clean Air Act.

Votes on comprehensive climate change policy have been relatively rare in either chamber of Congress.[34] Prior to the 117th Congress, examples of enacted legislation involving climate change issues included tax incentives to promote renewable energy sources and carbon capture and sequestration efforts.[35] The 116th Congress enacted the American Innovation and Manufacturing (AIM) Act of 2020, which established a 15-year timeline to reduce domestic hydrofluorocarbons (HFCs), a potent class of GHGs used in air conditioning and refrigeration equipment.[36] The AIM Act phasedown schedule aligns with international commitments to phase down HFCs under the

[32] For more information, see CRS Report R45472, *Market-Based Greenhouse Gas Emission Reduction Legislation: 108th Through 117th Congresses*, by Jonathan L. Ramseur.

[33] For example, between the 112th Congress and going through the 115th Congress, Members introduced resolutions in both the House and Senate expressing the view that a carbon tax is not in the economic interests of the United States. In 2016 and 2018, the House passed resolutions "expressing the sense of Congress that a carbon tax would be detrimental to the United States economy" (H.Con.Res. 89 and H.Con.Res. 119, respectively). In the 117th Congress, during debate on S.Con.Res. 5, the Senate voted (50-50, not agreed to) on S.Amdt. 887, which would have established "a deficit-neutral reserve fund relating to prohibiting a Federal carbon tax."

[34] One example is H.R. 2454, the American Clean Energy and Security Act of 2009 ("Waxman-Markey"), in the 111th Congress, which would have established an economy-wide cap-and-trade system to reduce GHG emissions. The House passed H.R. 2454 in 2009. Companion legislation in the Senate, S. 1733, was reported from the Committee on Environment and Public Works; the bill was not brought up for consideration on the Senate floor.

[35] For more information on the energy tax incentives available before the 117th Congress, see CRS Report R46865, *Energy Tax Provisions: Overview and Budgetary Cost*, by Molly F. Sherlock.

[36] The AIM Act was included in the Consolidated Appropriations Act, 2021 (P.L. 116-260, Division S, §103). The act directed EPA to implement the requirements through regulations.

Kigali Amendment to the Montreal Protocol. The Senate advised and consented to the ratification of the Kigali Amendment on September 21, 2022.[37]

Climate Change Legislation in the 117th Congress

During the 117th Congress, both President Biden and majority leadership in the House and the Senate called for comprehensive approaches to address climate change. The following sections focus on two enacted legislative measures in the 117th Congress: IIJA and the budget reconciliation measure commonly referred to as the Inflation Reduction Act or IRA. These acts include provisions that are likely to have direct or indirect effects on GHG emission levels, particularly the provisions in IRA. In addition, both of these acts include provisions that address other aspects of climate change policy, such as adaptation efforts. These acts and their potential effects on GHG emissions are discussed below.

Beyond IIJA and IRA, some Members of the 117th Congress have introduced other proposals that address climate change in some capacity. These proposals were referred to more than 35 committees,[38] and some proposals were enacted. For example, P.L. 117-167 (often referred to as the "CHIPS and Science Act"), enacted August 9, 2022, contains some provisions related to climate change, including authorizations for appropriations for research on carbon removal and alternative fuels, among other purposes.

Infrastructure Investment and Jobs Act

On November 15, 2021, President Biden signed the IIJA (P.L. 117-58). IIJA is a broad infrastructure law that addresses a range of sectors, including transportation and energy, among others. IIJA provisions include climate mitigation policies and programs in surface transportation with increased funding for public transportation and intercity passenger rail.[39] IIJA provisions involve a number of energy issues that may have an effect on GHG emissions, including the following:

- energy efficiency and renewable energy;
- electric grid reliability, resilience, and cybersecurity;
- carbon capture, utilization, and storage;
- hydrogen research and development;
- nuclear energy;
- battery manufacturing, recycling, and critical minerals; and
- fossil energy programs.[40]

[37] U.S. Congress, Senate, *Amendment to Montreal Protocol ("Kigali Amendment")*, Senate Consideration of Treaty Document 117-1, 117th Cong., 1st sess., November 2021. The vote was 69-27, with 4 not voting.

[38] For more details, see CRS Report R46947, *U.S. Climate Change Policy*, coordinated by Richard K. Lattanzio; and CRS Report R45472, *Market-Based Greenhouse Gas Emission Reduction Legislation: 108th Through 117th Congresses*, by Jonathan L. Ramseur.

[39] For more details, see CRS In Focus IF11921, *Surface Transportation and Climate Change: Provisions in the Infrastructure Investment and Jobs Act (P.L. 117-58)*, by William J. Mallett.

[40] For more details on the energy provisions, see CRS Report R47034, *Energy and Minerals Provisions in the Infrastructure Investment and Jobs Act (P.L. 117-58)*, coordinated by Brent D. Yacobucci.

A number of studies have estimated the impact of IIJA on GHG emissions. For example, a 2022 study from Princeton University estimated that U.S. emissions would decrease to 26% below 2005 levels without IIJA and 27% below 2005 levels with IIJA.[41] This analysis did not include potential effects (e.g., changes in passenger and freight miles traveled) from IIJA funding for transportation, rail, and public transit. However, a 2021 analysis from the Georgetown Climate Center concluded that the emission effects from the IIJA transportation provisions are uncertain and could result in an increase or decrease in emissions. This analysis concluded emission effects would depend on implementation and funding decisions made by state, federal, and local governments.[42]

Inflation Reduction Act

On August 16, 2022, President Biden signed H.R. 5376 (P.L. 117-169), the IRA. The eight titles in IRA address a range of issues, including climate change matters, among other policy objectives. Each of the titles contain some number of provisions that directly or indirectly address issues related to climate change, including reduction of U.S. GHG emissions or promotion of adaptation and resilience to climate change impacts.[43] Many of these provisions involve funding for new or existing programs, including provisions that

- modify, extend, or provide new tax credits for electricity from "clean" and renewable resources, alternative fuels, energy efficiency, manufacturing, and clean vehicles;[44]
- impose a charge on methane emissions from specific oil and gas facilities;[45]
- provide funding for carbon removal activities;
- provide funding for energy efficiency projects;
- provide funding for low-emission fuels and technologies;
- provide funding for energy rebates and efficiency, electricity transmission, industrial and energy infrastructure, and advanced vehicle manufacturing;
- provide funding for offshore wind energy development and increase royalty rates for federal land and offshore oil and gas leases;
- provide funding to support zero-emission technologies in low-income areas;
- provide funding for use of low-carbon construction materials in transportation projects;
- provide funding to for low-carbon building materials and low- or no-emission energy projects; and
- provide funding for a tribal electrification program.

[41] Princeton REPEAT, *Preliminary Report*.

[42] Georgetown Climate Center, "Issue Brief: Estimating the Greenhouse Gas Impact of Federal Infrastructure Investments in the IIJA," December 2021, at https://www.georgetownclimate.org/articles/federal-infrastructure-investment-analysis.html.

[43] For more details on the climate change-related provisions of the budget reconciliation measure commonly referred to as the Inflation Reduction Act of 2022 (IRA), see CRS Report R47262, *Inflation Reduction Act of 2022 (IRA): Provisions Related to Climate Change*, coordinated by Jane A. Leggett and Jonathan L. Ramseur.

[44] For more information on these tax provisions, see CRS Report R47202, *Tax Provisions in the Inflation Reduction Act of 2022 (H.R. 5376)*, coordinated by Molly F. Sherlock.

[45] The methane charge is the first federal price (i.e., carbon price) on GHG emissions.

U.S. GHG Emission Reduction Goals

The United Nations Framework Convention on Climate Change (UNFCCC) is the principal international treaty to acknowledge and address human-driven climate change. The United States ratified the treaty in 1992.[46] Pursuant to the 2015 Paris Agreement (PA), the second major subsidiary agreement under the UNFCCC,[47] countries must submit GHG emission reduction pledges referred to as a Nationally Determined Contribution (NDC). Targets and actions pledged in NDCs are nonbinding. Participating countries must update their NDCs every five years. U.S. NDCs include the following:

- **2015 NDC:** reduce net GHG emissions[48] by 26%-28% below 2005 levels by 2025; and
- **2021 NDC:** reduce net GHG emissions by 50%-52% below 2005 levels by 2030.

According to the Biden Administration, the 2021 NDC "exceeds a straight-line path to achieve net-zero emissions, economy-wide, by no later than 2050."[49]

Figure 3 illustrates actual U.S. GHG emissions (including an estimate for 2021) and the reduction targets for 2025 and 2030 and Biden's goal to achieve net-zero emissions in 2050. As the figure indicates, 2020 emissions were 21% below 2005 levels. Estimated emissions in 2021 were 16% below 2005 levels.

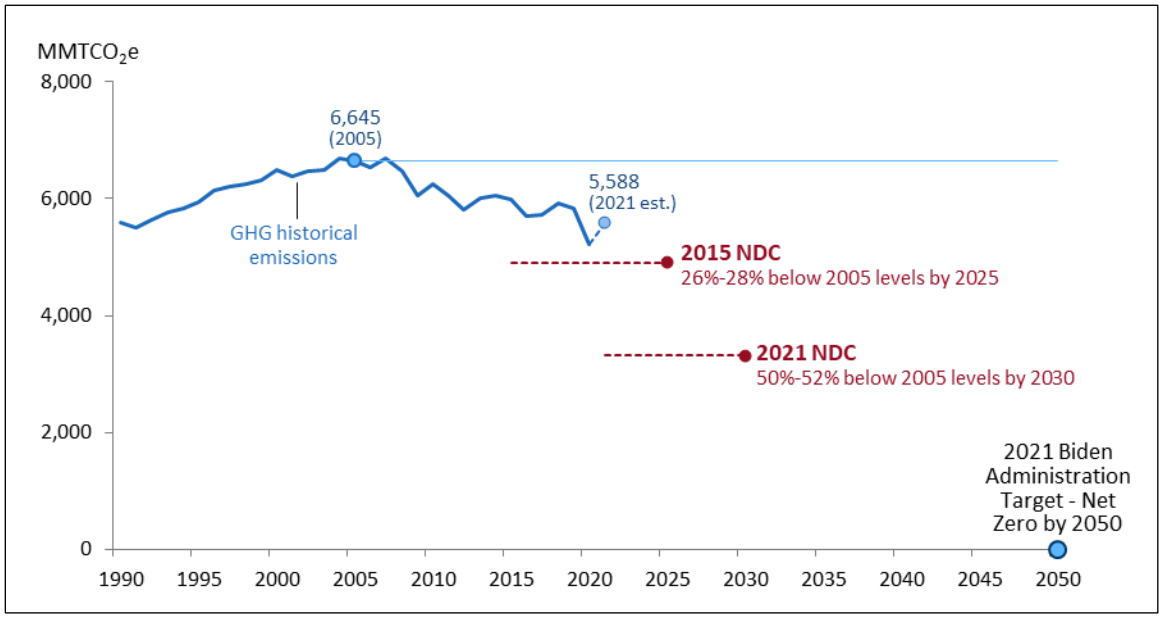
[46] U.S. Treaty Number 102-38.

[47] See CRS In Focus IF11746, *United States Rejoins the Paris Agreement on Climate Change: Options for Congress*, by Jane A. Leggett.

[48] *Net emissions* includes the sum of gross emissions estimates and removal estimates (see footnote 4).

[49] The White House, "The United States of America Nationally Determined Contribution Reducing Greenhouse Gases in the United States: A 2030 Emissions Target," April 22, 2021, at https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/United%20States%20of%20America%20First/United%20States%20NDC%20April%2021%202021%20Final.pdf.

Figure 3. Historical U.S. GHG Net Emissions Compared with U.S. Emissions Targets



Source: Prepared by CRS; actual U.S. GHG emissions from EPA GHG Inventory.

Notes: NDC = Nationally Determined Contribution pursuant to the United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement. $MMTCO_2e$ = million metric tons of CO_2 equivalent. This measure is used because GHGs vary by global warming potential (GWP). GWP is an index that allows comparisons of the heat-trapping ability of different gases over a period of time. The GHG emissions in the figure are *net* GHG emissions. Net GHG emissions account for removals of CO_2 emissions from the atmosphere by emission sinks, such as forests, vegetation, and soils. The U.S. NDC is measured in terms of net emissions.

CRS calculated the 2021 U.S. GHG emission estimate based on CO_2 data from EIA. EIA provides energy-related CO_2 emissions on a more up-to-date schedule than EPA's inventory, which includes GHGs from all sources. The CO_2 emissions in EIA's reports account for approximately 80% of total U.S. GHG emissions, and their fluctuations generally track with the annual percentage changes in total GHG emissions from EPA's inventories. EIA data indicate that CO_2 emissions from the energy sector increased by 7% between 2020 and 2021. CRS applied this percentage increase to total net GHG emissions in 2020, resulting in an estimate of 5,588 $MMTCO_2e$ in 2021 (see EIA, *Monthly Energy Review*, September 2022, at https://www.eia.gov/totalenergy/data/monthly/#environment).

U.S. GHG Emission Estimates in 2030

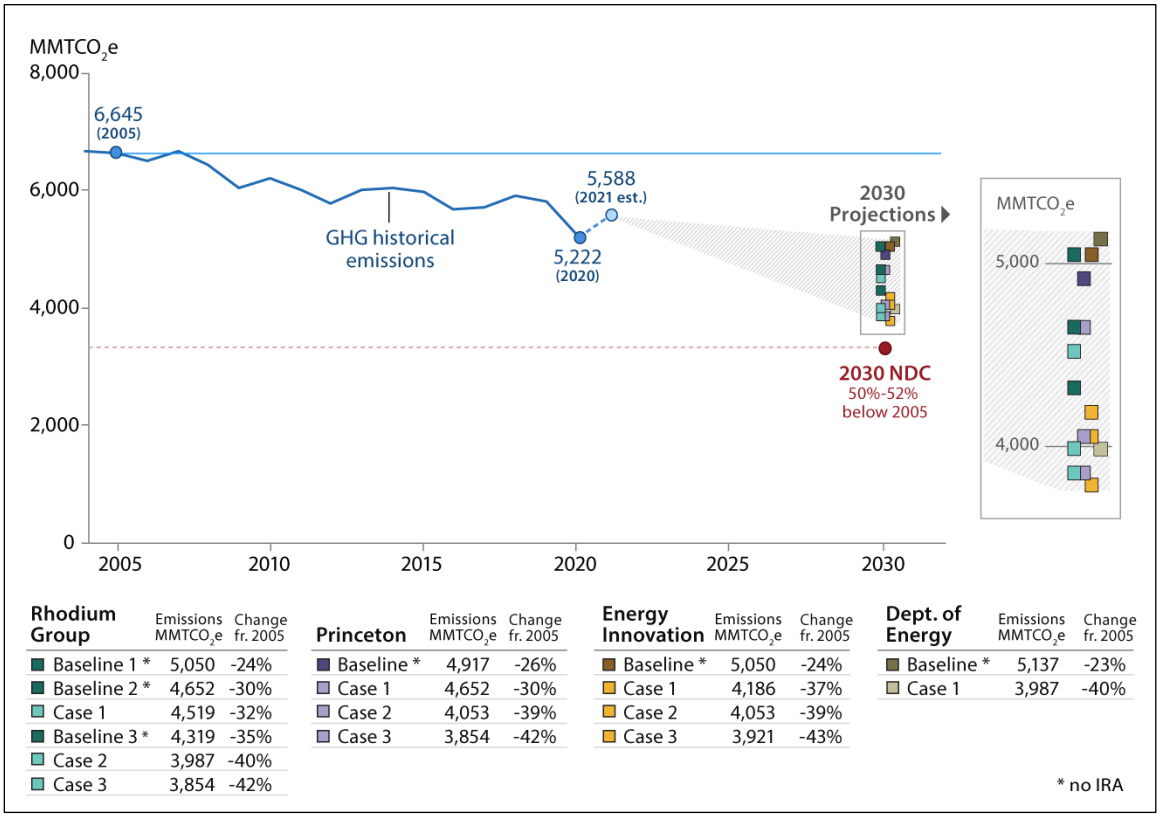
Several recent analyses from groups in the private sector, academia, and the federal government used computer simulation models to prepare estimates of U.S. net GHG emissions through 2030.[50] These models compare baseline scenarios (without IRA) with emission scenarios that include IRA. Based on the results from these models, IRA's climate change provisions are likely to result in net GHG emissions reductions as compared to emissions scenarios without IRA. Each of the analyses included multiple IRA scenarios to account for uncertain factors, such as future oil

[50] Rhodium Group, *A Turning Point for US Climate Progress: Assessing the Climate and Clean Energy Provisions in the Inflation Reduction Act*, August 12, 2022, at https://rhg.com/research/climate-clean-energy-inflation-reduction-act/ (hereinafter Rhodium Group, *A Turning Point for US Climate Progress*); Princeton REPEAT, *Electricity Transmission*; Energy Innovation, *Modeling the Inflation Reduction Act Using the Energy Policy Simulator*, August 23, 2022, at https://energyinnovation.org/publication/modeling-the-inflation-reduction-act-using-the-energy-policy-simulator/ (hereinafter Energy Innovation, *Modeling the Inflation Reduction Act*); and Department of Energy, "The Inflation Reduction Act Drives Significant Emissions Reductions and Positions America to Reach Our Climate Goals," August 2022, at https://www.energy.gov/sites/default/files/2022-08/8.18%20InflationReductionAct_Factsheet_Final.pdf.

and natural gas prices, the rate of increase in electricity transmission, and implementation of IRA provisions, among others.

Figure 4 illustrates the results of these analyses and indicates that under baseline conditions (without IRA), U.S. net GHG emissions would decrease by 23% to 35% by 2030 compared with 2005 levels. The models estimated that with the addition of IRA, U.S. net GHG emissions would decrease by 30% to 43% by 2030 compared with 2005 levels.

Figure 4. Net U.S. GHG Emissions, Selected Emission Estimates, and U.S. NDC



Rhodium Group	Emissions MMTCO2e	Change fr. 2005
Baseline 1 *	5,050	-24%
Baseline 2 *	4,652	-30%
Case 1	4,519	-32%
Baseline 3 *	4,319	-35%
Case 2	3,987	-40%
Case 3	3,854	-42%

Princeton	Emissions MMTCO2e	Change fr. 2005
Baseline *	4,917	-26%
Case 1	4,652	-30%
Case 2	4,053	-39%
Case 3	3,854	-42%

Energy Innovation	Emissions MMTCO2e	Change fr. 2005
Baseline *	5,050	-24%
Case 1	4,186	-37%
Case 2	4,053	-39%
Case 3	3,921	-43%

Dept. of Energy	Emissions MMTCO2e	Change fr. 2005
Baseline *	5,137	-23%
Case 1	3,987	-40%

* no IRA

Source: Prepared by CRS; actual U.S. GHG emissions from EPA GHG Inventory; Rhodium Group emission estimates from Rhodium Group, *A Turning Point for US Climate Progress: Assessing the Climate and Clean Energy Provisions in the Inflation Reduction Act*, August 12, 2022, at https://rhg.com/research/climate-clean-energy-inflation-reduction-act/ (hereinafter Rhodium Group, *A Turning Point for US Climate Progress*); and Princeton estimates from Princeton University REPEAT, *Electricity Transmission is Key to Unlock the Full Potential of the Inflation Reduction Act*, September 2022, at https://repeatproject.org/docs/REPEAT_IRA_Transmission_2022-09-22.pdf; Energy Innovation estimates from Energy Innovation, *Modeling the Inflation Reduction Act Using the Energy Policy Simulator*, August 23, 2022, at https://energyinnovation.org/publication/modeling-the-inflation-reduction-act-using-the-energy-policy-simulator/; and Department of Energy estimates from Department of Energy, "The Inflation Reduction Act Drives Significant Emissions Reductions and Positions America to Reach Our Climate Goals," August 2022, https://www.energy.gov/sites/default/files/2022-08/8.18%20InflationReductionAct_Factsheet_Final.pdf.

Notes: NDC = Nationally Determined Contribution pursuant to the UNFCCC Paris Agreement. $MMTCO_2e$ = million metric tons of CO_2 equivalent. This measure is used because GHGs vary by global warming potential (GWP). GWP is an index that allows comparisons of the heat-trapping ability of different gases over a period of time. The GHG emissions in the figure are *net* GHG emissions. Net GHG emissions account for removals of CO_2 emissions from the atmosphere by emission sinks, such as forests, vegetation, and soils. The U.S. NDC is measured in terms of net emissions.

The 2021 U.S. GHG emission estimate is calculated by CRS based on CO_2 data from EIA. EIA provides energy-related CO_2 emissions on a more up-to-date schedule than EPA's inventory, which includes GHGs from all sources. The CO_2 emissions in EIA's reports account for approximately 80% of total U.S. GHG emissions, and their fluctuations generally track with the annual percentage changes in total GHG emissions from EPA's inventories. EIA data indicate that CO_2 emissions from the energy sector increased by 7% between 2020 and 2021. CRS applied this percentage increase to total net GHG emissions in 2020, resulting in an estimate of 5,588 $MMTCO_2e$ in 2021 (see EIA, *Monthly Energy Review*, September 2022, at https://www.eia.gov/totalenergy/data/monthly/#environment).

The modeling results all find that most of IRA's projected emissions reductions come from the electric power sector in the 2030 time frame. As an illustrative example, **Figure 5** displays the results from one of the studies,[51] depicting the GHG emissions reductions estimated by sector: electric power, industry, transportation, and carbon removal. Compared with a baseline scenario (without IRA), electric power sector emissions decrease by 51%. In contrast, transportation sector emissions are projected to remain roughly level (decrease by 1%).[52] As discussed below, many of the IRA provisions may take longer than 2030 to have full effect, such as tax incentives for electric or zero-emission vehicles that would penetrate vehicle markets slowly and would have more influence on GHG emissions after 2030. Therefore, these estimates do not represent a full accounting of potential effects of the law.

Figure 5. Estimated GHG Emissions Reductions by Sector in 2030

Based on Rhodium Group Modeling

Source: Prepared by CRS; emissions estimates from Rhodium Group, *A Turning Point for US Climate Progress*.

Notes: $MMTCO_2e$ = million metric tons of CO_2 equivalent. This measure is used because GHGs vary by global warming potential (GWP). GWP is an index that allows comparisons of the heat-trapping ability of different gases over a period of time. Carbon removal includes "forest and soil practices, direct air capture and other actions."

[51] **Figure 5** depicts the results from the Rhodium Group's "central case," which is identified as "Case 2" in **Figure 4**.

[52] The Energy Innovation model produced comparable results for the electric power and transportation sectors (Figure 2 in Energy Innovation estimates from Energy Innovation, *Modeling the Inflation Reduction Act*). The Princeton model produced larger reductions in the transportation sector compared with the other models (Princeton REPEAT, *Electricity Transmission*, p. 9).

Considerations for the 118th Congress

The GHG emissions modeling results presented in this report may be instructive for policymakers as they consider climate change policies in the 118th Congress. As **Figure 4** illustrates, none of the modeled scenarios indicate that the United States would meet its GHG emissions target for 2030: 50%-52% below 2005 levels. The range of estimates for emissions levels in 2030 indicate the amount of uncertainty in the modeling results.

In addition to the 2030 GHG emissions estimates, some of the models provide additional analysis, examining the role of particular factors in the estimates. One of the factors generating the uncertainty and the range of estimated emissions reductions in 2030 is the rate in which electricity transmission is expected to expand over the next decade. The Princeton model examined the specific role of this factor by isolating this variable in its modeling scenarios.[53] The Princeton model found that the annual rate of transmission expansion is likely to play a pivotal role in the degree to which IRA provisions reduce U.S. GHG emissions. Historically, electricity transmission has expanded by about 1% per year. One model indicates that less than 20% of the potential emission reduction from IRA would be realized if transmission expansion remains at this pace. To achieve the full potential of IRA's emissions reductions, the same model indicates that transmission would need to expand by 2.3% per year.[54] The 117th Congress enacted legislation aimed at accelerating transmission development (e.g., IIJA) and considered a range of issues, such as permit reform, that could increase expansion.[55] The IRA modeling results and the role of transmission expansion may provide further context for the consideration of these issues in the 118th Congress.

In addition, authors of some of the models note that, in some cases, IRA provisions could not be included in their emissions analyses. The treatment of these and other provisions vary by simulation model.[56] Some of the provisions not modeled include those that promote the development of technologies that could result in emissions reductions over a longer time horizon (i.e., beyond 2030), but the estimated effects of these provisions is uncertain.

Some of the models examine the effects of IRA provisions beyond the 2030 time horizon. These models indicate that the emission effects of the IRA climate provisions are expected to produce results on different time horizons. In some cases, the results indicate greater emission reductions are achieved after 2030, for example:

- The transportation-related provisions are likely to take longer to yield GHG emissions reductions than the provisions affecting the electric power sector due to the duration of vehicle stock turnover cycles.[57] For instance, the Princeton

[53] The other modeling groups did not specifically analyze the role of transmission. For example, the Energy Innovation model assumed, among other things, that "necessary transmission will be built, interconnection delays are addressed" (Energy Innovation, *Modeling the Inflation Reduction Act).*

[54] Princeton REPEAT, *Electricity Transmission*.

[55] For further information, see CRS In Focus IF12253, *Introduction to Electricity Transmission*, by Ashley J. Lawson.

[56] For example, the Princeton study states that such provisions include the tax incentives for hydrogen production and support advanced energy and manufacturing activities. See, for example, Princeton REPEAT, *Preliminary Report*, pp. 16-18; the Energy Innovation study states, "some provisions or funding mechanisms were excluded from the modeling due to difficulty translating certain spending categories or incentives into emissions reductions. These programs could likely yield small additional GHG reductions beyond what we have modeled."

[57] See, for example, David R. Keith et al., "Vehicle Fleet Turnover and the Future of Fuel Economy," *Environmental Research Letters*, 2019. This study found that "it takes 19.6 years for the new technology to account for 90% of the on-road fleet."

study indicates that the emissions reductions in 2035 in the transportation sector are almost double the reductions in 2030.[58] In addition, the Energy Innovation study states that transportation emissions reductions in 2035 or 2040 will be "significantly greater than in 2030 given the stock turnover dynamic."[59]

- Carbon capture and storage activity is estimated by some of models to increase substantially after 2030. For example, the Rhodium Group study estimated that installed carbon capture would more than double between 2030 and 2035.[60] The Princeton study indicated similar results.[61]

If Members want to incentivize U.S. GHG emissions reduction beyond the projections from the models discussed in this report, a range of policy options remain available. IRA contains a number of climate-related provisions across multiple economic sectors. The general approach of IRA's climate provisions is to promote GHG reduction through tax incentives and direct funding. Policymakers could increase the funding amounts or tax incentives in these provisions. Alternatively, policymakers could employ different approaches in subsequent legislation. Options include market-based approaches, such as carbon pricing mechanisms (e.g., fee on emissions or a cap-and-trade program) or regulatory standards for particular facilities or sectors.[62] As discussed above, to some degree, such efforts are underway at the state level. The authors of the studies discussed in this report point out that the IRA climate provisions may support the development of additional requirements from the federal government or state and local governments by reducing the costs of lower-carbon energy sources and technologies. If these additional policies are implemented, some argue, they may help achieve the 2030 target.[63]

In addition, a range of regulatory actions from the Biden Administration (discussed above) may contribute to further emissions reductions over the next decade and beyond. The role of these regulations is uncertain, as their implementation is likely to face opposition from policymakers and stakeholders.

Author Information

Jonathan L. Ramseur
Specialist in Environmental Policy

[58] Princeton REPEAT, *Electricity Transmission*, p. 5. In addition, the Energy Innovation study states "transportation emissions reductions in 2035 or 2040 will be significantly greater than in 2030 given the stock turnover dynamic." Energy Innovation, *Modeling the Inflation Reduction Act*.

[59] Energy Innovation, *Modeling the Inflation Reduction Act*.

[60] Rhodium Group, *A Turning Point for US Climate Progress*, p. 6. For further information on carbon capture and sequestration, see CRS Report R44902, *Carbon Capture and Sequestration (CCS) in the United States*, by Angela C. Jones and Ashley J. Lawson.

[61] Princeton REPEAT, *Preliminary Report*, figure on p. 13.

[62] For more discussion of general approaches to GHG emissions mitigation, see CRS In Focus IF11791, *Mitigating Greenhouse Gas Emissions: Selected Policy Options*, by Jonathan L. Ramseur et al.

[63] See, for example, Rhodium Group, *A Turning Point for US Climate Progress*.

Acknowledgments

Amber Wilhelm, CRS Visual Information Specialist, helped create many of the figures in this report.

The brief discussion of the history of U.S. climate change policies in this report is based on a more comprehensive discussion from CRS Report R46947, *U.S. Climate Change Policy*, coordinated by Richard K. Lattanzio.

Disclaimer