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THE SECOND HALF OF THE DECISIVE DECADE

Potential U.S. Pathways on Climate, Jobs, and Health

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EXECUTIVE SUMMARY

Four years into the decisive decade on climate change, ambitious climate policy has put the United States within striking distance of its Nationally Determined Commitment (NDC) under the Paris Agreement. This policy pathway is spurring economic growth and protecting public health, driven largely by federal action.

The Inflation Reduction Act (IRA), Bipartisan Infrastructure Law (BIL), and CHIPS and Science Act (CHIPS), along with finalized rules from the U.S. Environmental Protection Agency (EPA), have significantly lowered America's greenhouse gas (GHG) emissions trajectory, more than doubling[i] the annual pace of emissions reductions this decade compared to the rate achieved in the 2010s.

Prior to these new laws and standards, the U.S. was on track to emit 4,880 million metric tons (MMT) of GHG in 2030, about 26 percent below 2005 levels. Under current policy, emissions are expected to drop to 4,140 MMT in 2030, 37 percent below 2005 levels and about halfway to the U.S. Nationally Determined Contribution (NDC) of 50-52 percent below 2005 levels by 2030.

The IRA, BIL, and CHIPS Act have already improved our economy, generating more than 334,000 jobs[ii] since August 2022 when the IRA passed Congress. These policies have also generated more than $500 billion in new private investment that leverages public funding by more than a factor of five[iii] over the past two years, representing more than half of total national private investment growth over that time – this means clean energy investments have been 64 percent higher than oil and gas investments. As a result, the U.S. is on track to cut the GHG intensity of its gross domestic product (GDP) 57 percent by 2030 compared to 2005 levels.

IRA provisions are giving Americans the choice to save money on their energy bills by switching from fossil fuels to clean energy.

- Federal electric vehicle tax credits have saved Americans $1 billion in upfront purchase costs[iv], and will provide $18,000-$24,000 in total consumer savings on fuel and maintenance per vehicle.
- Between August 2022-July 2023, utilities and power providers announced $270 billion in new utility-scale clean energy generation which will save customers $4.4 billion[v] on their energy bills.
- More than 3.4 million American families[vi] claimed $8.4 billion in residential clean energy and home energy efficiency credits against their 2023 federal income taxes, saving up to $3,100 per year, depending on the installed technology.

However, new or modified federal policy could end these benefits. In this research note, Energy Innovation[1] evaluates potential impacts on GHG emissions, the economy, and public health from two different future pathways in the U.S.

The Continued Climate Leadership scenario evaluates the effect on emissions, public health, and the economy[2] of achieving the 2030 U.S. NDC of 50-52 percent below 2005 emissions levels and net zero GHG emissions by 2050.

The Project 2025 scenario evaluates how the climate and energy provisions of that plan's energy and climate provisions would alter U.S. emissions, public health, and the economy.

Comparing the two scenarios reveals stark differences for America's economy and jobs, public health, consumer costs, and GHG emissions trajectories.

CLIMATE:

- The Continued Climate Leadership scenario reduces U.S. GHG emissions to 3,160 MMT in 2030 – 52 percent below 2005 levels – and net zero in 2050.
- The Project 2025 scenario increases emissions above the trajectory under current policies to 4,920 MMT in 2030 and 4,710 MMT in 2050.
    - The difference between these policy scenarios is more than 1,750 MMT, or 27 percentage points against our existing climate commitment, in 2030 and more than 4,700 MMT in 2050

JOBS:

- Continued Climate Leadership scenario adds 2.2 million jobs in 2030, and 2.1 million jobs in 2050. Of those, 1 million are additional direct jobs in both 2030 and 2050
- The Project 2025 scenario leads to 1.7 million lost jobs in 2030 and 260,000 lost jobs in 2050. The direct job losses are 750,000 in 2030 and 70,000 in 2050.
    - The difference between these policy scenarios is more than 3.9 million in 2030 and nearly 2.4 million in 2050.

HOUSEHOLD ENERGY COSTS:

- The Continued Climate Leadership scenario reduces household energy costs, saving $7.7 billion across all households in 2030 and $110 billion in 2050.
- The Project 2025 scenario increases electricity prices and reliance on petroleum for vehicles, costing an additional $32 billion across all households in 2030 and $24 billion in 2050.

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[1] Energy Innovation is a nonpartisan energy and climate policy think tank that produces independent analysis to inform policymakers of all political affiliations in the world's largest emitting regions. We do not endorse any political party or candidate, including those in the 2024 U.S. presidential election.

[2] All dollar amounts are in real 2023 dollars.

    - The difference between these policy scenarios is $40 billion in 2030 and $134 billion in 2050.

GDP:

- The Continued Climate Leadership scenario sees GDP growth of $450 billion per year by 2030 and $730 billion per year by 2050.
- The Project 2025 scenario decreases GDP $320 billion per year in 2030 and $150 billion per year in 2050
    - The difference between these policy scenarios is nearly $770 billion in 2030 and nearly $880 billion in 2050.

HEALTH:

- The Continued Climate Leadership scenario prevents 3,900 early deaths from air pollution by 2030 and 20,600 by 2050
- The Project 2025 scenario causes an additional 2,100 premature deaths by 2030 and 4,800 by 2050.
    - The difference between these policy scenarios is nearly 6,000 premature deaths in 2030 and nearly 25,400 in 2050.

Energy Innovation undertook this analysis to bring nonpartisan research to a rhetorical environment so all Americans - businesses, homeowners, and policymakers - can come to their own conclusions about the climate and energy futures on the table.

METHOD

This analysis uses the U.S. Energy Policy Simulator (EPS), developed by Energy Innovation, to evaluate the potential impacts of two future scenarios on U.S. emissions, the economy, and public health.

The EPS is a free and open-source climate and energy policy model available online at https://energypolicy.solutions. More information on the model, its structure, its peer reviewers, and how it is developed is available online[vii]. To accurately model all relevant provisions of Project 2025, this analysis uses a custom version of the EPS.[3]

For this analysis we constructed two policy scenarios and compared these to a Business-as-Usual (BAU) scenario, which reflects the latest trends on energy and technology cost and incorporates enacted federal policy and standards through August 2024.

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[3] The EPS is generally designed to model clean energy and climate policies rather than their reversal. For example, the publicly available simulator includes levers to achieve a certain percentage of the available mitigation potential for various industrial process emissions, but this lever is not designed to work with a negative setting. We therefore added in the ability to reverse several policies that are part of the BAU, including HFC abatement, agricultural incentives, state level vehicle standards, carbon capture and sequestration tax credits for industry, distributed solar tax credits, and the option to increase oil and gas production through expanded leasing.

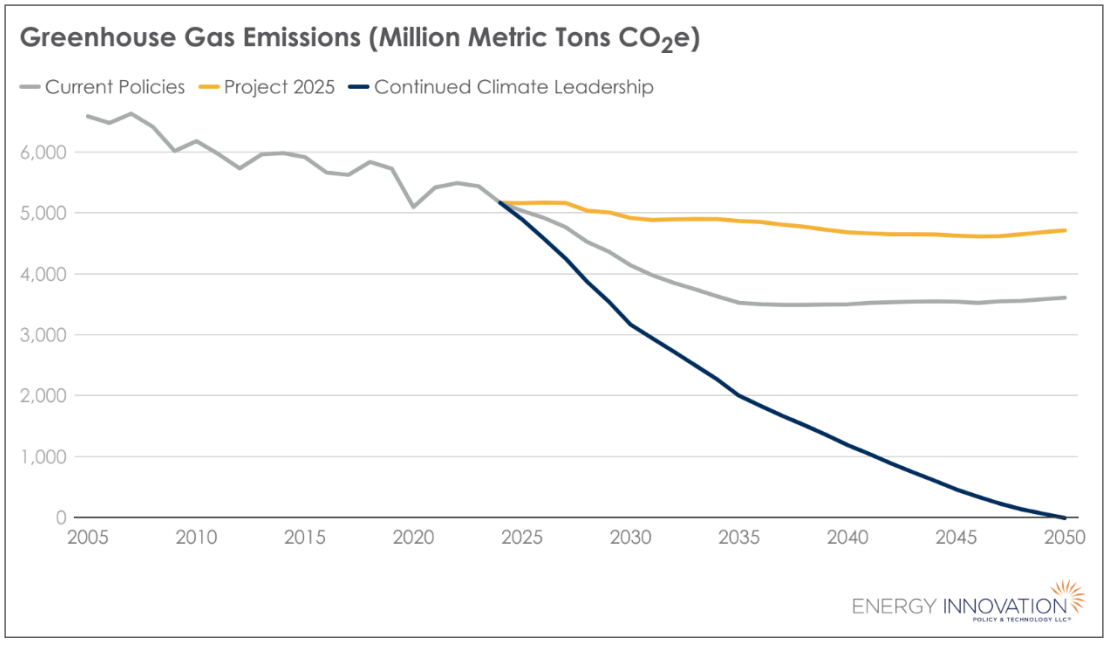
One scenario, "Continued Climate Leadership," maps policies that would achieve the U.S. NDC of 50-52 percent reduction in U.S. GHG emissions relative to 2005 by 2030 and net zero GHG emissions by 2050. More information on the Continued Climate Leadership scenario is provided in Appendix A.

The other scenario, "Project 2025," maps the climate and energy policies outlined in Project 2025 into the EPS. A description of the Project 2025 elements included in this scenario and how they were modeled is provided in Appendix B.

RESULTS

CLIMATE

Prior to passage of IRA, BIL, CHIPS and major EPA rules[4], the U.S. was on track to emit 4,880 MMT of GHGs in 2030, 26 percent below 2005 levels. Including progress on climate policy to date, the U.S. is now on track to emit 4,140 MMT in 2030, 37 percent below 2005 emissions. This progress more than doubles the historical rate of emissions and reductions and positions the U.S. to achieve its 2030 climate commitments.



Source: Energy Policy Simulator

[4] Includes EPA's oil and gas rules, emissions standards for light- and medium-duty vehicles, emissions standards for heavy-duty vehicles, and 111 rules for power plants.

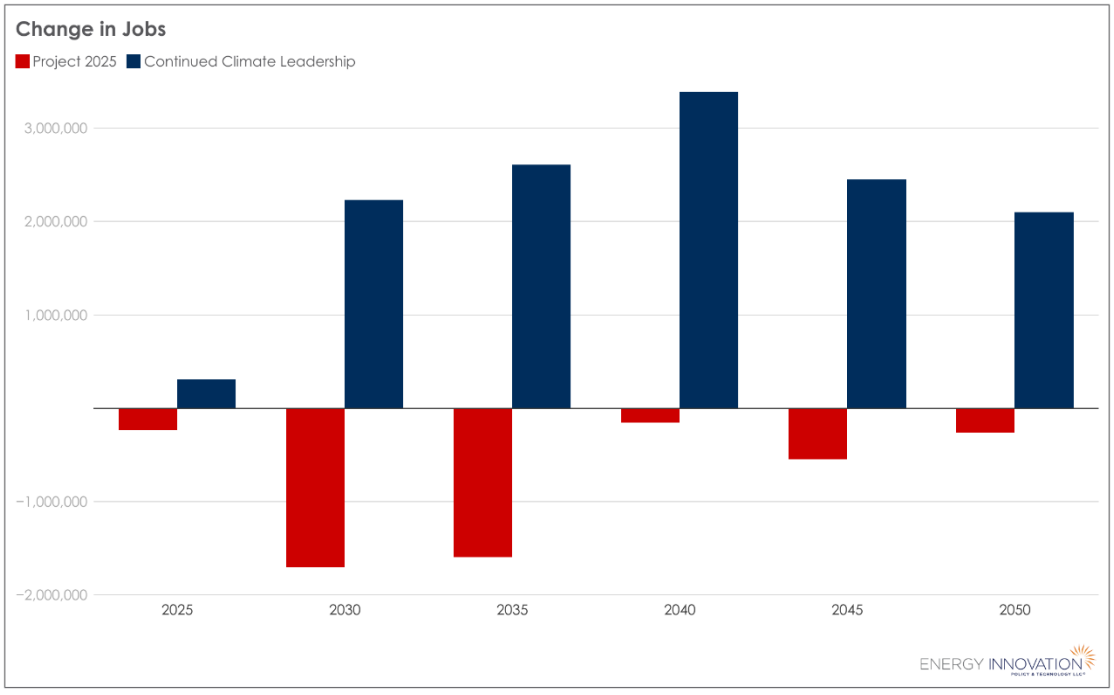
Under the Continued Climate Leadership scenario, U.S. emissions continue declining, dropping to 3,160 MMT (52 percent below 2005 levels) in 2030, and net zero in 2050, aligned with the existing U.S. commitments for 2030 and 2050.

Enacting the provisions outlined in Project 2025 would significantly increase emissions by 2030 and 2050, resulting in emissions of 4,920 MMT in 2030 and 4,710 MMT in 2050. This would more than roll back all the reductions achieved through the historic climate action achieved over the past few years and would put the U.S. 2030 and 2050 climate targets out of reach.

JOBS

Continued Climate Leadership would create thousands of new jobs by 2030 and into the future as additional clean energy is deployed, buildings are upgraded, and U.S. manufacturing is retooled. The Continued Climate Leadership scenario adds 2.2 million jobs in 2030, and 2.1 million jobs in 2050. Of those, 1 million are additional direct jobs in both 2030 and 2050.

The Project 2025 scenario reduces deployment of clean energy technologies and expansion of clean energy industries, significantly reducing job growth. Job gains occur in fossil fuel sectors, but they are more than offset by job losses elsewhere in the economy. The Project 2025 scenario leads to 1.7 million lost jobs in 2030 and 260,000 lost jobs in 2050, with direct job losses of 750,000 in 2030 and 70,000 in 2050.



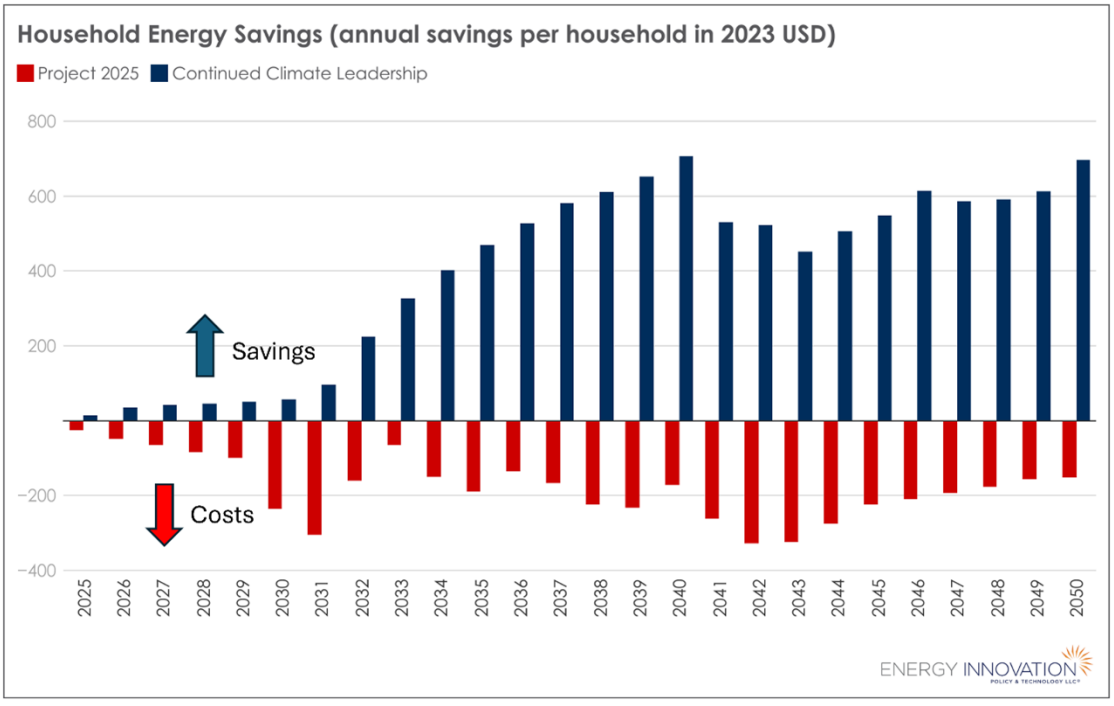
Source: Energy Policy Simulator

HOUSEHOLD ENERGY COSTS

Existing policies have helped cut projected future household energy costs[5] by expanding clean electricity production and shifting from petroleum to electricity for transportation fuels. Under the Continued Climate Leadership scenario, household energy costs drop even further, saving the average household $60 per year in 2030 and $700 in 2050 relative to BAU. Cumulatively, this saves $7.7 billion across all households in 2030 and $110 billion in 2050.Relative to 2021 expenditures, the scenario saves the average household $250 per year in 2030 and $430 per year in 2050.

By contrast, higher electricity prices and increased reliance on petroleum for vehicles would raise average household energy costs under the Project 2025 scenario, costing an additional $240 per year in 2030 and $150 in 2050 relative to the BAU. Cumulatively, this costs an additional $32 billion across all households in 2030 and $24 billion in 2050. Relative to 2021 expenditures, the scenario costs the average household an additional $40 per year in 2030 and $460 per year in 2050.

Contrasting these two pathways, this analysis finds a potential total change in average household energy costs of $290 in 2030 and $850 in 2050 from Project 2025's climate and energy policies to the Continued Climate Leadership scenario.



Source: Energy Policy Simulator

[5] Household energy costs include changes in spending on fuels in residential buildings and transportation costs.

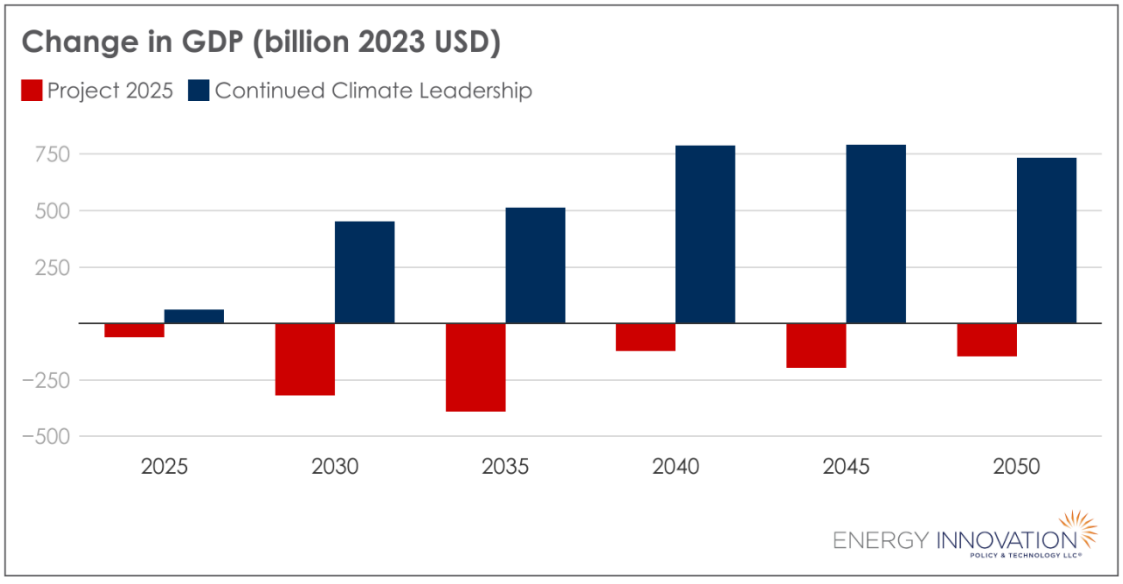
GDP

Provisions in existing laws – including IRA, BIL, and CHIPS – have created strong incentives to onshore clean energy industries, evidenced by hundreds of billions in investments announced since 2022 and increased economic activity.

Accelerated clean energy deployment has decoupled U.S. job and economic growth from GHG emissions. Under current policies[viii], the GHG emissions intensity of U.S. GDP falls to 140 grams of carbon dioxide equivalent (CO2e) per $1 in 2030, compared to 330 g CO2e per $1 in 2005 – a 57 percent drop from 2005 levels.

Under a Continued Climate Leadership scenario, GDP grows significantly as policies drive economic investment and clean energy deployment, further accelerating the decoupling of emissions from economic growth. The Continued Climate Leadership scenario sees GDP growth of $450 billion per year by 2030 and $730 billion per year by 2050.

Conversely, a Project 2025 scenario unwinds the laws that have encouraged onshoring of clean energy industries and significantly restricts the build-out of clean energy. As a result, the Project 2025 scenario decreases GDP $320 billion per year in 2030 and $150 billion per year in 2050.



Source: Energy Policy Simulator

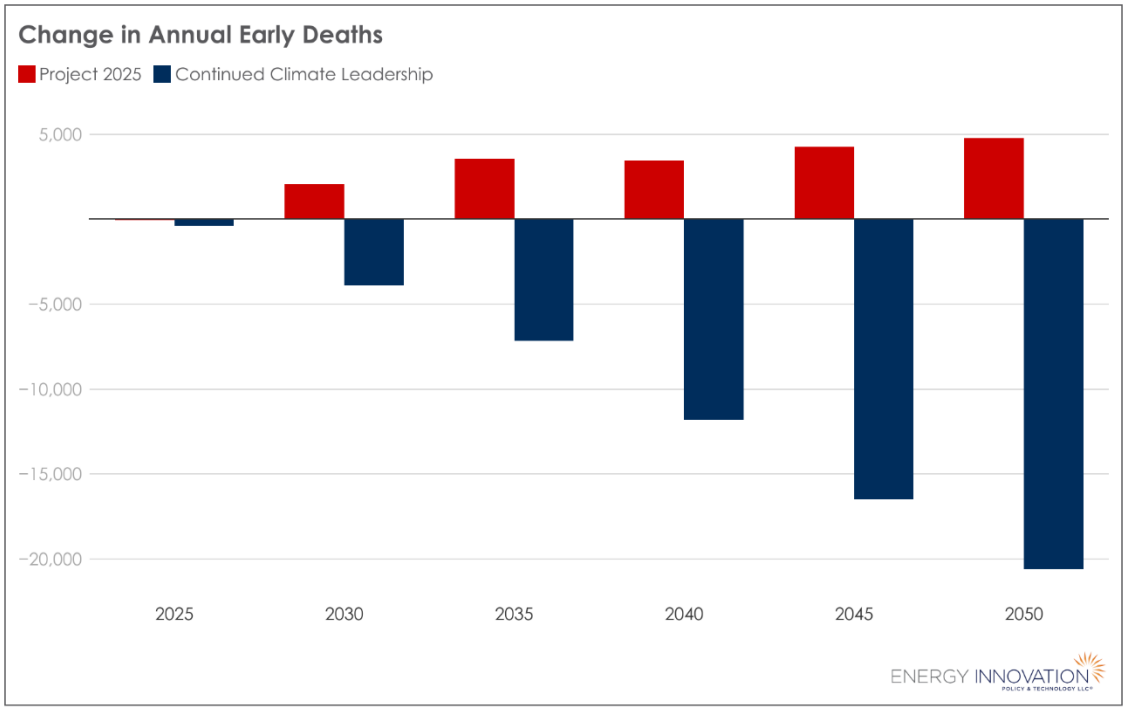
It is important to note that while the Project 2025 scenario modeled here only focuses on the climate and energy components, financial services company Moody's analyzed the full plan[ix] in June 2024 compared to a hypothetical second Biden administration term and found it would increase inflation and weaken economic growth by increasing costs for businesses and consumers, potentially threatening recession as soon as mid-2025 and increased unemployment by early 2026.

Contrasting these two pathways, this analysis finds a potential net change in GDP of $770 billion in 2030 and $880 billion in 2050.

HEALTH

Current climate policy has significantly improved public health by cleaning up the air we breathe and is likely to continue doing so by transitioning away from fossil fuels toward clean energy.

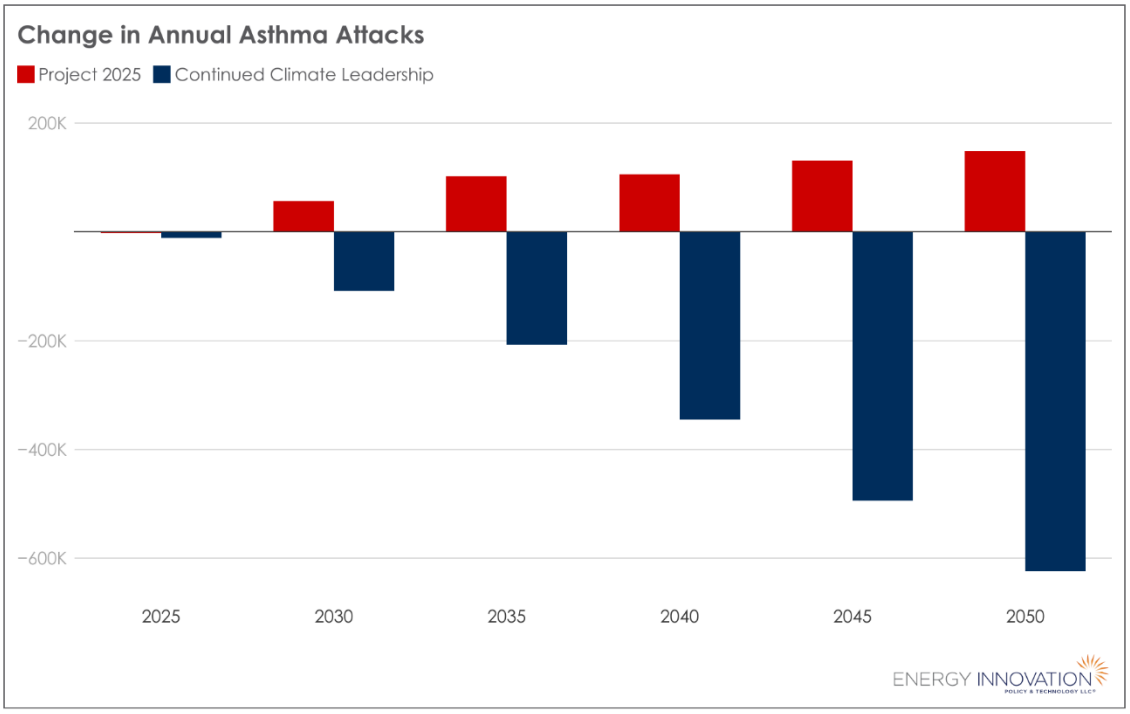
A Continued Climate Leadership scenario further increases these benefits, preventing 3,900 early deaths from pollution by 2030 and 20,600 by 2050; a reduction of 109,100 annual asthma attacks by 2030 and 623,600 by 2050; and 2,000 avoided hospitalizations by 2030 and 11,800 by 2050.



Source: Energy Policy Simulator

The cumulative value of lives saved from these public health improvements equals $44 billion in 2030 and $230 billion in 2050.

By contrast, Project 2025 increases fossil fuel combustion, causing great public health damage by increasing air pollution. This scenario causes an additional 2,100 premature deaths by 2030 and 4,800 by 2050; an increase of 56,800 annual asthma attacks by 2030 and 148,000 by 2050; and 1,090 additional hospitalizations 2,820 by 2050.



Source: Energy Policy Simulator

CONCLUSION

Recently adopted policies are delivering benefits for the U.S., its citizens, and its economy. However, continued progress on emissions is not guaranteed.

Future policy changes could build upon America's success to date, further cutting emissions, adding millions of jobs to the economy, and improving public health. Or they could undo this progress, jeopardizing U.S. climate targets, adding billions in energy costs to American households, costing the U.S. economy millions of jobs and billions in GDP, and increasing pollution-driven early deaths.

APPENDIX A: CONTINUED CLIMATE LEADERSHIP SCENARIO TO HIT UNITED STATES' NDC

Under the Paris Agreement, the U.S. has submitted a NDC to will reduce economy-wide GHGs by 50-52 percent in 2030 relative to 2005 and to reach net-zero emissions by 2050. The U.S. is currently on track[x] to reach 37 percent emissions reductions by 2030 relative to 2005. Closing the emissions gap to America's 2030 NDC requires additional federal policy, detailed in the Continued Climate Leadership scenario.

Energy Innovation, using widely understood federal policy designs, has constructed policy packages in each sector to reach the NDC. Collectively, these policies lead to 52 percent emissions reductions in 2030 and 70 percent in 2035, all relative to 2005, on the way to net zero emissions in 2050.

Industry	
Industrial electrification	A combination of incentives and standard-setting under existing authorities could move industrial process heating to zero-emissions, by making those systems cost-effective. Given the current economics of available technologies, new sales of low-temperature heating systems could achieve zero-emissions by 2030, and new sales of medium- to high-temperature systems could achieve zero-emissions by 2036.
Grey-to-green hydrogen	The IRA is accelerating the deployment of green hydrogen. With additional support for green hydrogen, it could fully replace grey hydrogen by 2030.
F-gas measures	The American Innovation and Manufacturing Act provides the EPA with authority to further strengthen the phase out of f-gases.
Methane capture and destruction	The EPA has existing authority to strengthen methane standards for natural gas and petroleum systems, as well as to incorporate standards for coal mines, water treatment and waste systems.
Industrial energy efficiency standards	The U.S. Department of Energy regularly updates energy efficiency standards for a wide range of appliances and systems and could update efficiency standards for industrial equipment as well.
Industrial carbon capture and sequestration	Robust incentives for CCS included in the IRA make it a cost-effective control technology for cement, refining, gas processing and petrochemicals.
Cement clinker substitution	Incentives or standards could increase clinker substitution in cement production.

N2O abatement in the chemicals industry	Nitrous oxide harms the climate, and control equipment is effective and low-cost. The White House recently announced that this kind of control equipment was being added to a major chemical production facility. Standards for nitrous oxide emissions from chemical factories would protect health.
Material efficiency	Support for innovation in design for material efficiency could support more efficient use of products like cement, iron and steel.
Electricity	
Clean energy standard	100 percent clean energy by 2035 could be achieved through state and national Clean Energy Standards, and/or a combination of policies, including expanded tax incentives, transmission policy, as well as updates to standards under existing regulatory authorities.
Demand response	The U.S. will have 200 gigawatts of cost-effective load flexibility potential by 2030, which could be unlocked by a range of policy signals and avoid roughly $15 billion in system costs.
Coal power standards	Unabated coal fired power generation is no longer cost competitive in the U.S. The IRA included a range of policies to help utilities save customers money by moving away from coal power generation and toward new clean energy and energy storage. The EPA uses existing authority to protect public health from the impacts of coal burning.
New gas power plant standards	By 2030, technological advances in energy storage and dispatchable clean energy will eliminate the need for new gas combined cycle plants. The EPA has existing authority to protect public health from the impacts of gas burning.
Offshore wind carveout	As the offshore wind industry expands, costs will continue to decline and allow for accelerated project development, especially with expanded state and Federal incentives.
Transportation	
Passenger car ZEV sales	Through a combination of state and federal fuel economy standards, vehicle incentives, and the rapidly decreasing price of electric vehicles, customers could choose 60 percent zero emission vehicles by 2030.
Freight ZEV sales	A combination of fuel economy standards, vehicle incentives, and the rapidly decreasing price of electric vehicles, make it possible for 62 percent of new sales of light-duty freight vehicles and 53 percent of heavy-duty freight vehicles to be zero emissions by 2030.
Fuel economy improvements for non-road vehicles	Non-road vehicles, like aircraft and ships, have significant potential for improved fuel economy. These improvements could be met with incentives or standards.

Sustainable aviation and shipping fuel	The Biden Administration set a target of 20 percent reduction in aviation emissions by 2030, achievable through an expansion of the IRA tax credit for Sustainable Aviation Fuel.
Freight logistics	The Biden Administration has an official national goal of a zero-emissions freight sector. Continued innovation in freight logistics will result in fewer freight truck miles traveled.
Transportation mode shifting	Increased investments in public transportation and alternative modes of transportation can result in fewer miles driven in vehicles.
Buildings	
Electric building equipment	Expanded incentives and improvements in appliance standards will make it possible for people to choose all-electric space and water heating equipment in 2030.
Building retrofitting	Expanded incentives for building retrofits will continue the trend of improving efficiency of existing buildings.
Building codes and appliance standards	Improvements in building codes and expanded incentives for building envelope materials will continue the trend toward more energy efficient new building construction.
Land Use	
Forest management	Increased investments in forest management can enhance carbon sequestration or prevent carbon losses from the forestry sector.
Afforestation and reforestation	Increased investments in afforestation and reforestation will increase the role of U.S. forests as a net carbon sink.
Wetland restoration	Increased investments in wetland habitat restoration and expansion will increase the role of U.S. wetlands as a net carbon sink.
Grassland restoration and avoided conversion	Increased investments in grassland restoration and avoided conversion will increase carbon stored in soils and increase the role of grasslands as a net carbon sink.
Livestock measures	Increased and more targeted funding towards methane management can meaningfully reduce the methane emissions from livestock.
Cropland measures	Expanding no-tillage practices and improved use of crop residues can reduce CO2, methane, and nitrous oxide emissions from cropland.
Other	
Enhanced rock weathering	Support for enhanced rock weathering such as new incentives and the U.S. Department of Agriculture's interim conservation practice standard can result in additional carbon sequestration.

Extend IRA tax credits	Tax credits included in the IRA make it cheaper and easier to adopt technologies that don't pollute our air or water.

APPENDIX B – PROJECT 2025 SCENARIO COMPONENTS AND METHODOLOGY

Section I. Project 2025 Scenario Components

Cross-Cutting	
Repeal IIJA and IRA	Project 2025 states that most provisions of the BIL and IRA should be repealed. The modeled scenario removes most BIL and IRA provisions from the BAU, including clean electricity tax credits, nuclear incentives, zero-emission vehicle tax credits, electric vehicle charging infrastructure incentives, Advanced Energy Manufacturing tax credits, hydrogen tax credits, tax credits for building equipment and efficiency upgrades, CCS tax credits, agricultural and forestry incentives, funding for renewable energy loans, U.S. Department of Agriculture assistance for rural electric cooperatives, the Advanced Industrial Facilities Deployment Program, and the Environmental Product Declaration Assistance program.
Department of Agriculture	
Reform agricultural subsidies	Project 2025 states that agricultural incentives should be reduced, and that agricultural programs should not consider climate change. As covered above, the modeled scenario therefore removes anticipated spending and emissions reductions on climate smart agricultural practices from the IRA.
Department of Energy	
Limit barriers to LNG expansion	Project 2025 recommends several measures aimed to increase LNG export capacity, including expanding the Natural Gas Act to expand required approvals beyond nations with free trade agreements, limiting permitting requirements and time needed for approvals, and maintaining the categorical exclusion from the National Environmental Policy Act. To represent the impact of these recommendations, we used a side case of the U.S. Energy Information Administration's Annual Energy Outlook on accelerated LNG buildout to add in natural gas production and price impacts.

Eliminate energy efficiency standards for appliances	Project 2025 states the next administration should work with Congress to modify or repeal the law mandating energy efficiency standards. The scope of the EPS does not allow us to easily quantify the impact of reversing all appliance standards, but we do reverse the recent water heater standards finalized by DOE in April 2024.
Eliminate carbon capture and sequestration programs	As covered above, we remove CCS tax credits from our BAU, including omitting the expected increases in CO2 capture.
Environmental Protection Agency	
Repeal the American Innovation and Manufacturing Act	The Project 2025 scenario removes the expected HFC emissions reductions and spending from the BAU.
Apply California's waiver to set its own vehicle standards to only criteria pollutants	Project 2025 states that California's Clean Air Act waiver to set its own vehicle pollutant standards should apply only to criteria pollutants, not GHGs. The modeled scenario therefore reverts GHG standards for California and all other states that have chosen to adopt them from the BAU starting in 2025, for both light- and heavy-duty vehicles.
Revise Clean Air Act 111 standards	Project 2025 states Section 111 standards should be revised, and that EPA cannot regulate GHGs.
Department of the Interior	
Expand oil and gas leasing	See Section II of Appendix B below.
Department of Transportation	
Revise vehicle GHG and fuel economy standards	Project 2025 states that GHG standards for vehicles should be revised and that fuel economy requirements should be returned to the minimum average fuel economy levels specified by Congress for model year 2020 vehicles, which achieve a fleet-

	wide average of 35 miles per gallon for passenger vehicles. It also recommends reconsidering the Cleaner Trucks Initiative. The modeled scenario therefore reverses EPA's recent multi-pollutant emissions standards and resets fuel economy requirements to 2020 levels for both light- and heavy-duty vehicles.
Department of the Treasury	
Revise the corporate income tax rate	Project 2025 includes a variety of recommendations for tax reforms that are generally outside the scope of the EPS. However, the EPS does use the corporate income tax rate when calculating financing of electricity generation capacity. For this component only, we use Project 2025's recommended 18 percent.

Section II. Methodology for Modeling Changes in Offshore and Onshore Fossil Fuel Production and Impacts

Offshore Leasing

Following the IRA's passage, the Bureau of Ocean Energy Management (BOEM) published the 2024–2029 National Outer Continental Shelf Oil and Gas Leasing Proposed Final Program.[xi] In accordance with the IRA, the proposal includes a total of three oil and gas lease auctions in the Gulf of Mexico over five years. This was the smallest offshore oil drilling plan in history and the fewest number of leases permitted under IRA to allow the U.S. Department of the Interior (DOI) to continue expanding its offshore wind program as intended through 2030.

This leasing program stands in contrast with the 2019–2024 National OCS Oil and Gas Leasing Draft Proposed Program proposed under the Trump administration as "a key aspect of the implementation of President Trump's America-First Offshore Energy Strategy".[xii] This Program proposed an expansion of leasing to the shores of all 22 U.S. states in the Alaska, Atlantic, Gulf, and Pacific regions (Hawaii excluded for lack of hydrocarbon resources), for a total of 47 oil and gas lease auctions over five years. Project 2025 calls for a reinstatement of this "America-First Offshore Energy Strategy," which would significantly expand fossil drilling and permitting offshore.[xiii]

Onshore Leasing

While the Biden administration initially paused leasing of federal land for oil and gas drilling, IRA effectively requires leasing auctions offering at least 2 million acres of land be held annually. In contrast, during the Trump administration's first three years, BLM offered an average of 8 million acres of federal land for leasing annually.

Modeling

We developed two scenarios to determine the incremental impact of expanded oil and gas drilling in line with the goals of Project 2025 against an IRA backdrop. Scenario 1 assumes a continuation of the least amount of additional federal oil and gas leasing allowed by IRA. Scenario 2 assumes a resumption of Trump-era leasing strategy.

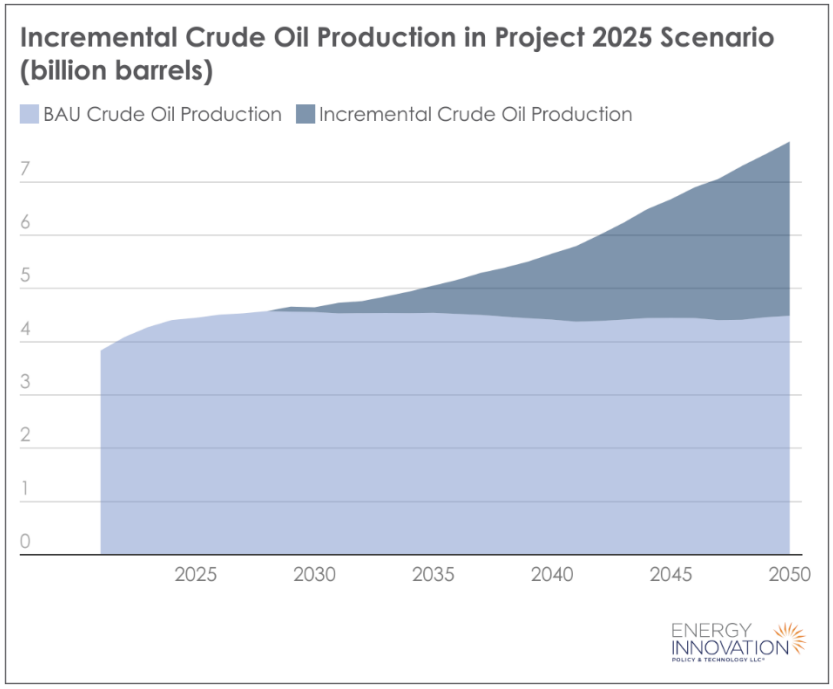
- **Scenario 1, Current-level Oil and Gas Development:** Assumes 2 million acres are offered at auction annually for onshore oil and gas development from 2023 through 2050. Assumes Biden's five-year offshore plan is implemented through 2029 and biannual, 60-million-acre auctions continue through 2050.
- **Scenario 2, Policy-driven Oil and Gas Development:** Assumes onshore leasing auctions return to Trump-era historical levels of 8 million acres per year. Assumes offshore leasing expands to levels proposed by Trump administration, with 47 sales every five years for a total of approximately 383 million acres offered per year.

Changes in Production and Related Emissions

To estimate total changes in oil and gas sector emissions, we fed the incremental difference in production between Scenario 1 and Scenario 2 into the U.S. EPS. The additional, incremental production in Scenario 2 is equivalent to a 73 percent increase in business-as-usual oil production and a 13 percent increase in business-as-usual gas production by 2050. For both oil and gas, over 98 percent of incremental production is expected to come from new offshore drilling. This equated to a cumulative increase of 880 Mt CO_2e through 2050.

Additionally, this incremental increase in production would result in reduced domestic oil and gas prices, altering technological choices made throughout the economy. We fed estimated price reductions into the U.S. EPS and found a cumulative increase of 1,480 Mt CO_2e through 2050 due to production changes.

Annual, economy-wide emissions changes due to oil and gas leasing are shown in Figure 2.



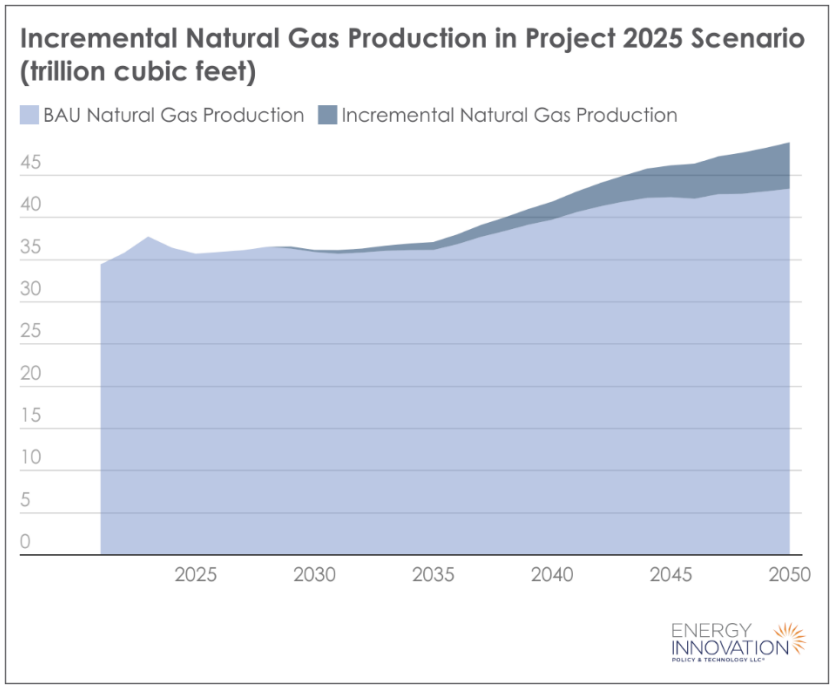
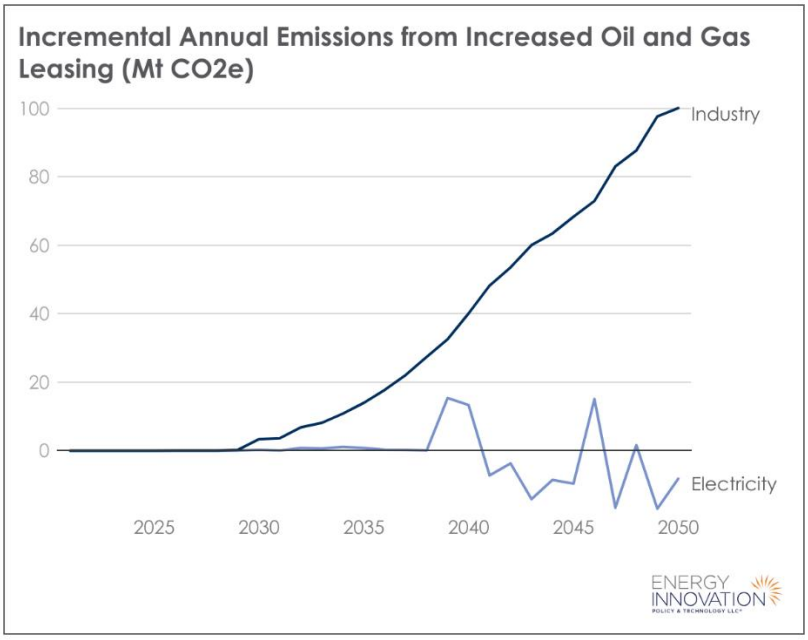


Figure 1: Incremental oil and gas production in the Trump-election scenario vs. EPS' BAU production



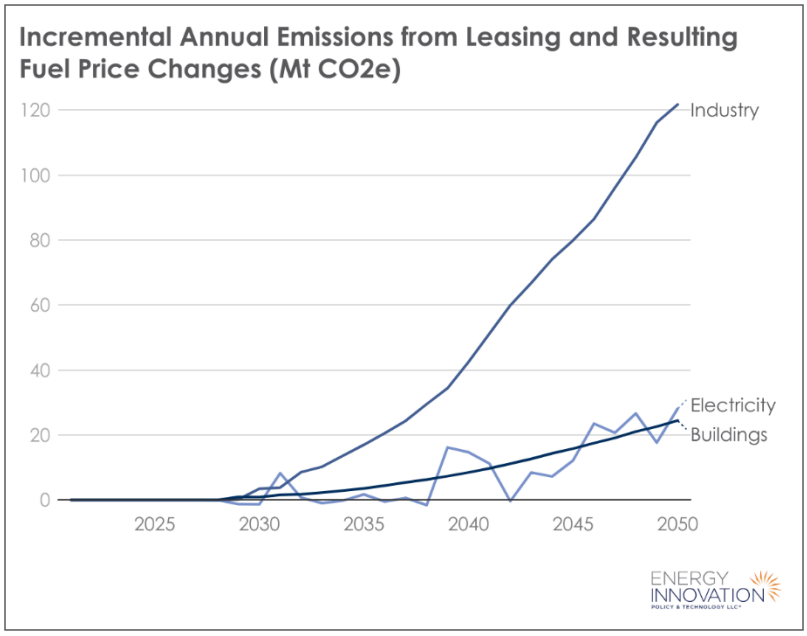


Figure 2: incremental annual greenhouse gas emissions by sector due to (left) increased oil and gas leasing without considering price impacts; and (right) increased oil and gas leasing and resulting fuel-price changes

Key Sources

- BOEM 5-year plans: 2017-2022[xiv], 2019-2024[xv], 2023-2028[xvi], 2024-2029[xvii]
- BLM oil and gas statistics[xviii]
- EIA AEO NEMS Methodology[xix]

Information on Inflation Reduction Act of 2022:

The IRA reinstated the following lease sales that were cancelled/expired:

- 257, 258, 259, 261

The law also tied offshore- and onshore-renewable leasing to oil-and-gas leasing

- Cannot issue a new offshore wind lease unless, in the prior year, BLM has held an offshore lease auction for oil and gas of at least 60 million acres that results in at least one lease
- To issue right-of-way grants for onshore wind and solar, BLM must offer onshore leases for oil and gas equal to 2 million acres or 50% of the acreage for which developers submit expressions of interest, whichever is less
    - Additionally, an oil-and-gas leasing auction must occur within the 120 days preceding a right-of-way grant

Background

Offshore oil and gas drilling on federal land

Under the Outer Continental Shelf Lands Act, BOEM must maintain a program mapping out oil and gas lease sales it is considering holding in the upcoming five years.[xx]

In 2018, the Trump DOI released its Draft Proposal on Outer Continental Shelf (OCS) Lease Sales for 2019–2024. The Program "would make more than 98 percent of the OCS available to consider for oil and gas leasing," with a total of 47 lease sales scheduled over five years — by far the most in history (Figure 3). The president also directed DOI to revise limits and regulations on oil and gas development.[xxi]

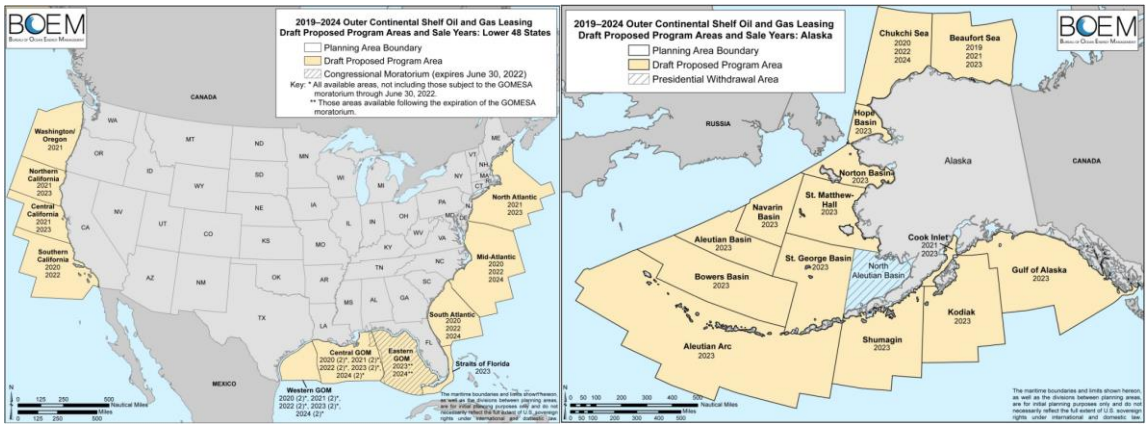


Figure 3: Areas subject to lease under Draft OCS Proposal 2019–2024

Upon taking office, President Biden paused new oil and gas leasing in line with attempts to limit climate and environmental impacts of oil drilling.[xxii] However, IRA

required that, in order to issue leases for offshore wind development, at least one oil and gas lease auction of at least 60 million acres must have been held in the previous year. As a result, the Biden Draft OCS Proposal for 2024–2029 includes three offshore oil and gas auctions, one every other year, exclusively in the Gulf of Mexico basin. This was the fewest permitted under IRA to continue leasing offshore wind sites and by far the fewest ever in a five-year BOEM plan; the average is 15 to 20 auctions.

In January of 2022 approximately 11 million acres of federal, offshore land was under active lease for oil and gas drilling.[xxiii] On average, between 2009 and 2020, approximately 2 million acres were leased per year of the average 93 million acres offered.[xxiv] This equates to approximately 2 percent of offered acreage leased in any year. See Figure 4 for annual acreage offered and leased.

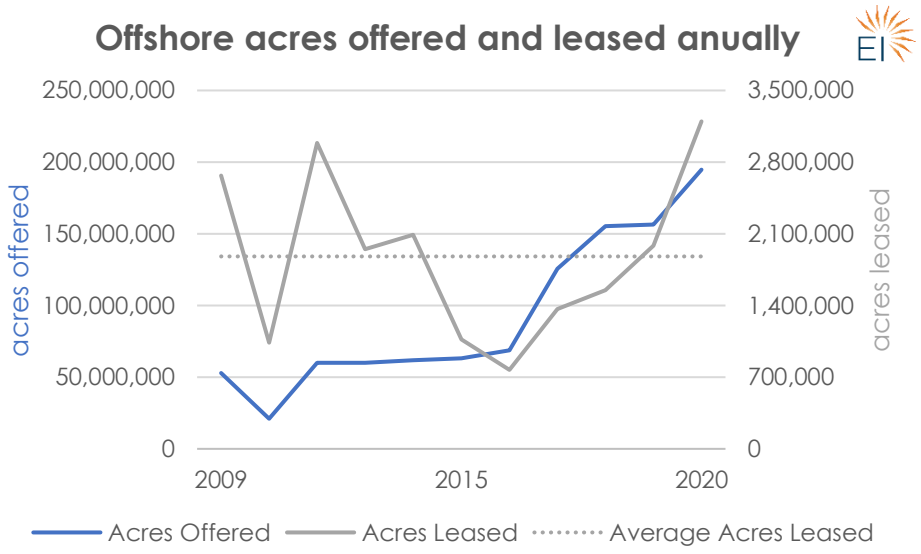


Figure 4

Onshore oil and gas drilling on federal land

As of the end of 2021, approximately 25 million acres of federal land were under lease for oil and gas development.[xxv] Between 2009 and 2021, 4.4 million acres were offered each year and approximately 1.1 million acres leased,[xxvi] averaging 32 percent of acres offered that were leased per year.[6] In the first half of 2022, the Biden administration has leased 71,000 acres of onshore federal land for oil and gas development.[xxvii]

[6] Average was 32 percent, weighted average was 25 percent

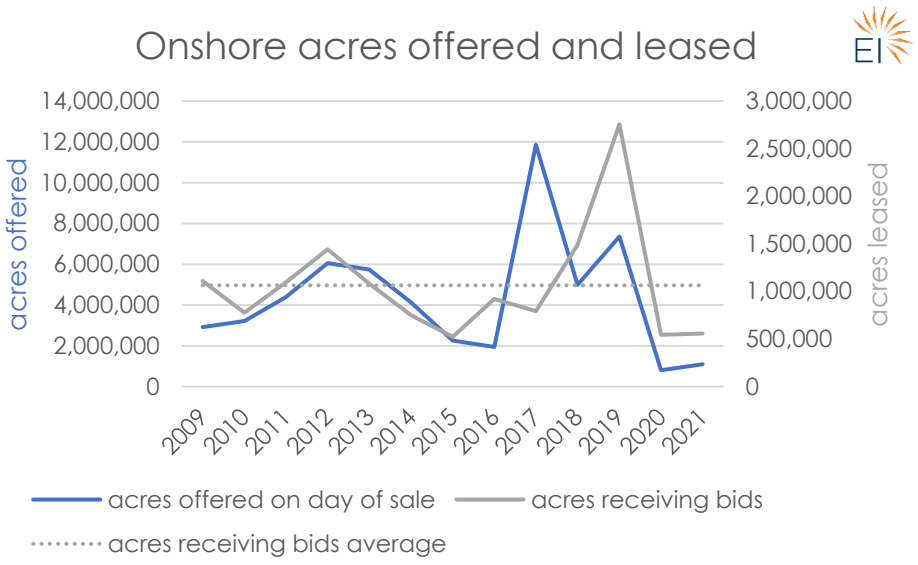


Figure 5

Methodology

To estimate the change in economy-wide GHG emissions from increased oil and gas leasing auctions, we estimated the incremental change in oil and gas production in a scenario incorporating revisions to oil and gas leasing in line with Project 2025 versus a scenario with continuation of current trends. We then fed these changes into the U.S. EPS to forecast the associated changes in emissions from extraction, processing, transmission, and distribution. These changes include incremental energy use alongside increased process emissions from the oil and gas sector.

Subsequently, we developed supply elasticities of price using EIA data to estimate changes in fuel prices that might result due to increased production. These elasticities translate changes in production into domestic demand impacts in the EPS.

This methodology in part follows that set out in Energy Innovation's 2022 modeling of the IRA.[xxviii]

Offshore production estimates under three scenarios

The two scenarios rely largely on data from various five-year Outer Continental Shelf Oil and Gas Leasing Programs.[xxix,xxx] We also used the following data and assumptions:

- Number of permits in 2023–2028 five-year plan (11 total, 10 for Gulf of Mexico Program Area 1 and one for Cook Inlet)
- Cancelled/expired permits from 2017-2022 five-year plan
- Planned lease auctions from 2019–2024 and 2024–2029 plans
- Production estimates by program area in 2023-2028 plan from Table 5-2
- Program area size in 2023-2028 plan from Table 5-3

- Average percentage of historically offered land compared to leased land (~2 percent; see Figure 4)
- Production depletion schedule estimated using data from EIA NEMS model[xxxi]
- Share of wells drilled on newly permitted offshore land from BOEM

Our methodology starts with the number of leases in each scenario. In **Scenario 1**, we assume lease auctions continue at the biannual rate set out in the 2024–2029 OCS Program Proposal, with offerings of 60 million acres put up every other year. In **Scenario 2**, we assume a return to the auction rate set out in the 2019–2024 OCS Program Proposal, with 47 auctions established every five years. We assume the acreage offered at each auction matches the historical average from 2009 to 2020: approximately 41 million acres per auction.[xxxii]

Then we convert these land offerings to estimated lease sales using the same historical source.[xxxiii] Notably, only approximately two percent of offshore land offered at auction is eventually leased. In contrast, at onshore auctions, approximately 30 percent of acreage offered is leased.

After determining the amount of land that is leased at auction, we produce drilling profiles per unit land area using BOEM data on the timeline of well completions for a given area of development. Typically, wells on leased land are drilled over a period of approximately 30 years, peaking after about 15 to 20 years. We take the average of the Low and High Production Scenarios from the BOEM data in Figure 6.

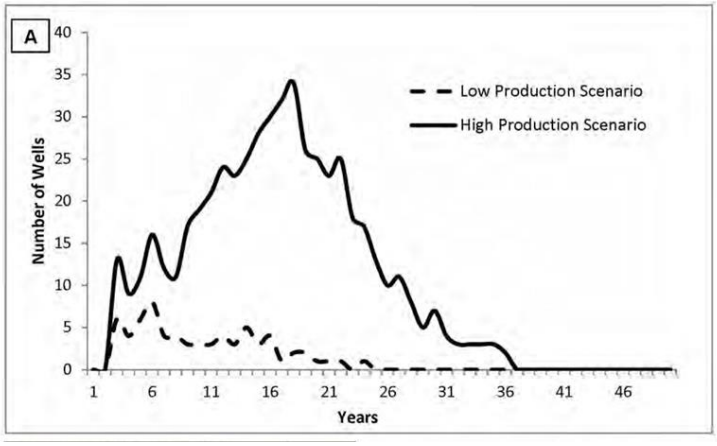


Figure 6: BOEM well-drilling profile for offshore leases

We then apply production depletion profiles to newly drilled wells that reflect the varying amount of product produced over the lifetime of the well. For example, around 50 percent of a well's total product is produced in its first year after drilling (Figure 7, *left*). Multiplying this depletion curve by the BOEM drilling profile results in an annual production profile shown on the *right* of Figure 7.

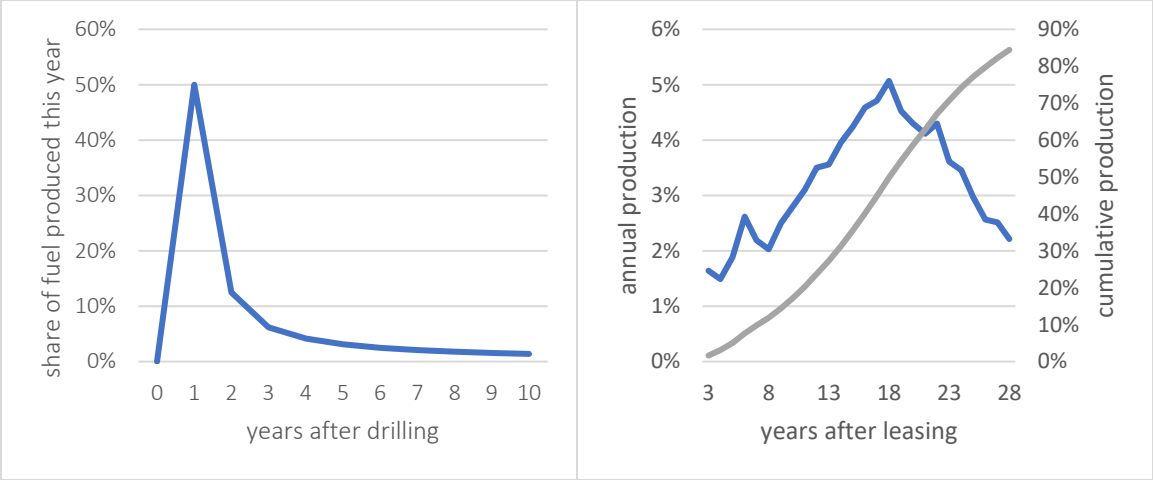


Figure 7: (left) offshore-well depletion curves; (right) resulting annual and cumulative production profiles

Data from Resources for the Future indicates 52 to 72 percent of emissions from increased production on public lands is offset by decreases in production elsewhere. 30 percent of this rebound effect is due to decreases in production on state and private land. As a result, we reduced our estimated production values by 19 percent (= 62% * 30%).[xxxiv]

We then calculated the change in domestic fuel prices resulting from the incremental increase in production. To do so, we developed price elasticities of supply using data from the U.S. EIA's Annual Energy Outlook 2023.[xxxv]

We input increased production values and estimated annual price changes into the U.S. EPS to simulate changes in production, processing, transmission, and distribution emissions as well as changes in consumption resulting from lower prices. The resulting changes in emissions reflect the total change in domestic emissions from increased oil and gas production and changes to consumption from the incremental production.
In summary, in Scenario 1, we assume 60-million-acre lease auctions are held biannually by BLM, resulting in approximately 1.2 million acres of leased land per sale according to the historical share of acres leased to offered. In Scenario 2, we assume that lease auctions return to Trump-proposed levels starting in 2026, resulting in an average of 47 leases every five years, or approximately 380 million acres offered each year.

Onshore production estimates under three scenarios

- Both scenarios use average oil and gas production per acre calculated from federal data on annual oil and gas production and total acres under lease.[xxxvi,xxxvii]
- Assume average percent of acres offered are leased (32 percent, see Figure 5)[7]

[7] Note that we used average, not weighted average percent of acres leased per year. Weighted average is 24%, non-weighted average is 32%

- Assume four-year-average delay from leasing to production

As shown in Figure 5, much smaller areas of federal land are offered in auctions for onshore oil and gas drilling than for offshore development. However, a larger share of offered land is eventually bid on at auction and leased.

Given a lack of data on drilling and production profiles for onshore leases, we assumed land goes into production at average production-to-area levels four years after the land is leased at auction. We sourced production data from DOI's Natural Resources Revenue Data[xxxviii] and Acreage in Effect from the Bureau of Land Management's Oil and Gas Statistics[xxxix] and calculated a production-to-area ratio as the quotient of annual production and the total acreage under lease from 2009 to 2021. We calculated ratios for each onshore gas and oil production.

IRA effectively requires leases be held offering at least 2 million acres of land annually, so in Scenario 1, we assume this rate of auctioning is held constant, resulting in approximately 490,000 annual acres leased each year. In Scenario 2, we assume auctions return to the average annual offerings at the historical level from 2017 to 2019, with 8 million acres offered and 1.7 million leased annually.

The same treatment of state- and private-land leakage is applied to onshore leasing as to offshore. The incremental oil and gas production is similarly fed into EPS to determine changes in production, processing, transmission, and distribution emissions as well as changes in consumption that result from lower prices.

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[i] https://energyinnovation.org/publication/u-s-energy-policy-simulator-version-4-0/
[ii] https://climatepower.us/research-polling/clean-energy-boom-report/
[iii]https://www.cleaninvestmentmonitor.org/reports/tallying-the-two-year-impact-of-the-inflation-reduction-act
iv https://home.treasury.gov/news/press-releases/jy2403
v https://cleanpower.org/investing-in-america/
vi https://www.irs.gov/statistics/soi-tax-stats-clean-energy-tax-credit-statistics
vii https://energyinnovation.org/2023/02/03/how-the-energy-policy-simulators-work-and-are-developed/
[viii] https://energyinnovation.org/publication/u-s-energy-policy-simulator-version-4-0/
ix https://www.economy.com/getfile?q=EA99E998-560D-4A12-85DE-3727A7EBE9A8&app=download
x https://energyinnovation.org/publication/u-s-energy-policy-simulator-version-4-0/
[xi]https://www.boem.gov/sites/default/files/documents/oil-gas-energy/leasing/2024-2029_NationalOCSProgram_PFP_Sept_2023_Compliant.pdf
[xii]https://www.boem.gov/sites/default/files/oil-and-gas-energy-program/Leasing/Five-Year-Program/2019-2024/DPP/NP-Draft-Proposed-Program-2019-2024.pdf
[xiii] https://static.project2025.org/2025_MandateForLeadership_FULL.pdf
[xiv]https://www.boem.gov/sites/default/files/oil-and-gas-energy-program/Leasing/Five-Year-Program/2017-2022/2017-2022-OCS-Oil-and-Gas-Leasing-PFP.pdf
[xv]https://www.boem.gov/sites/default/files/oil-and-gas-energy-program/Leasing/Five-Year-Program/2019-2024/DPP/NP-Draft-Proposed-Program-2019-2024.pdf
[xvi]https://www.boem.gov/sites/default/files/documents/oil-gas-energy/national-program/2023-2028_Proposed%20Program_July2022.pdf
[xvii]https://www.boem.gov/sites/default/files/documents/oil-gas-energy/leasing/2024-2029_NationalOCSProgram_PFP_Sept_2023_Compliant.pdf
[xviii]https://www.blm.gov/programs-energy-and-minerals-oil-and-gas-oil-and-gas-statistics
[xix] https://www.eia.gov/outlooks/aeo/nems/documentation/ogsm/pdf/m063(2020).pdf
[xx] https://eelp.law.harvard.edu/2018/08/offshore-oil-and-gas-drilling-leasing-program/

[xxi]https://www.federalregister.gov/documents/2017/05/03/2017-09087/implementing-an-america-first-offshore-energy-strategy

[xxii] https://www.federalregister.gov/documents/2021/02/01/2021-02177/tackling-the-climate-crisis-at-home-and-abroad

[xxiii] https://www.boem.gov/sites/default/files/documents//Lease%20stats%201-1-22.pdf

[xxiv] https://www.boem.gov/sites/default/files/documents/about-boem/SwilerComplete_24FEB2021.pdf

[xxv] https://www.blm.gov/programs-energy-and-minerals-oil-and-gas-oil-and-gas-statistics

[xxvi] Table 11 https://www.blm.gov/programs-energy-and-minerals-oil-and-gas-oil-and-gas-statistics

[xxvii] https://www.energynet.com/page/Government_Sales_Results

[xxviii] https://energyinnovation.org/wp-content/uploads/2022/08/Updated-Inflation-Reduction-Act-Modeling-Using-the-Energy-Policy-Simulator.pdf

[xxix]https://www.boem.gov/sites/default/files/documents/oil-gas-energy/leasing/2024-2029_NationalOCSProgram_PFP_Sept_2023_Compliant.pdf

[xxx] https://www.boem.gov/sites/default/files/oil-and-gas-energy-program/Leasing/Five-Year-Program/2019-2024/DPP/NP-Draft-Proposed-Program-2019-2024.pdf

[xxxi] https://www.eia.gov/outlooks/aeo/nems/documentation/ogsm/pdf/m063(2020).pdf

[xxxii] https://www.boem.gov/sites/default/files/documents/about-boem/SwilerComplete_24FEB2021.pdf

[xxxiii] https://www.boem.gov/sites/default/files/documents/about-boem/SwilerComplete_24FEB2021.pdf

[xxxiv] https://media.rff.org/documents/WP_20-16__Dec_2021.pdf

[xxxv] https://www.eia.gov/outlooks/aeo/

[xxxvi]https://revenuedata.doi.gov/downloads/production/

[xxxvii] https://www.blm.gov/programs-energy-and-minerals-oil-and-gas-oil-and-gas-statistics

[xxxviii] https://revenuedata.doi.gov/downloads/production/

[xxxix] https://www.blm.gov/programs-energy-and-minerals-oil-and-gas-oil-and-gas-statistics