



PRINCETON UNIVERSITY

ZERO LAB

Zero-carbon Energy Systems Research and Optimization Laboratory

Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act of 2022

August 2022

The REPEAT Team

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Montara Mountain Energy: Emily Leslie, Andrew Pascale (renewable energy candidate project areas, transmission cost surface)

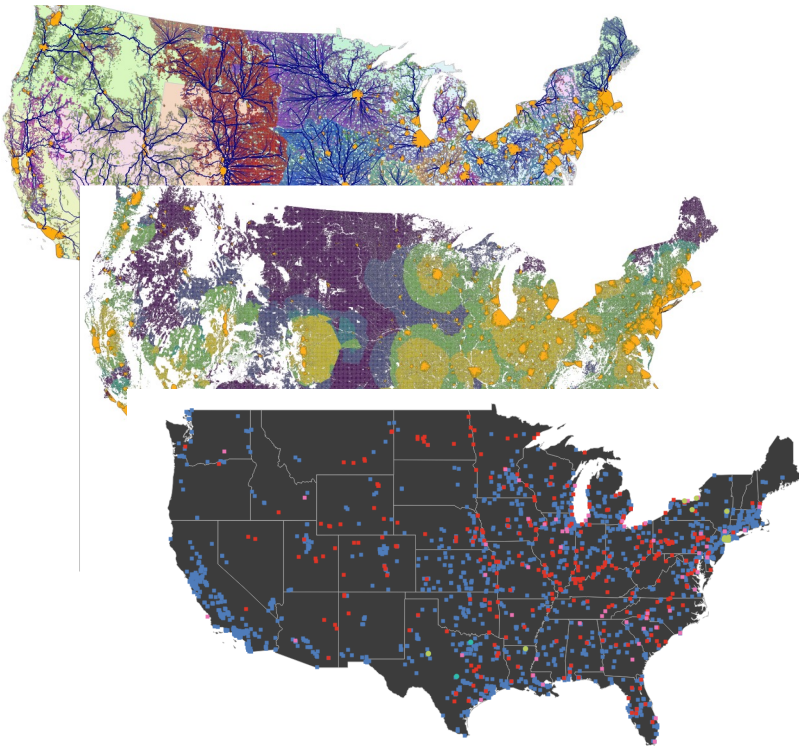
Website development by [Hyperobjekt](#).

Funded by a grant from the **Hewlett Foundation**

See our full reports, data, and analysis at repeatproject.org and link to section-by-section summary of each legislation (with notes on how we modeled each) at <http://bit.ly/REPEAT-Policies>

Analysis Framework

1. Geospatially-resolved inputs

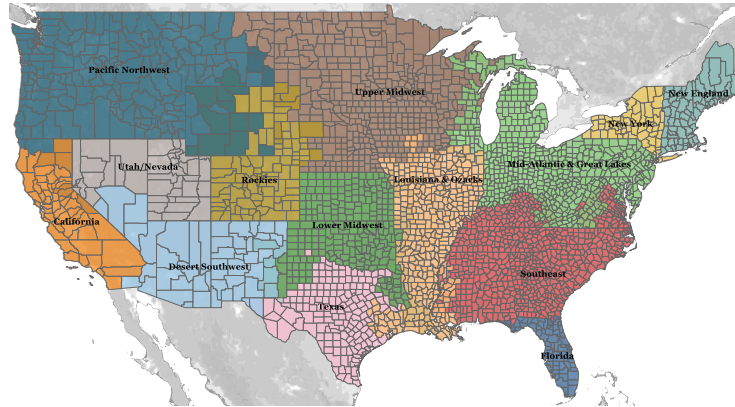


2. Macro-energy systems modeling

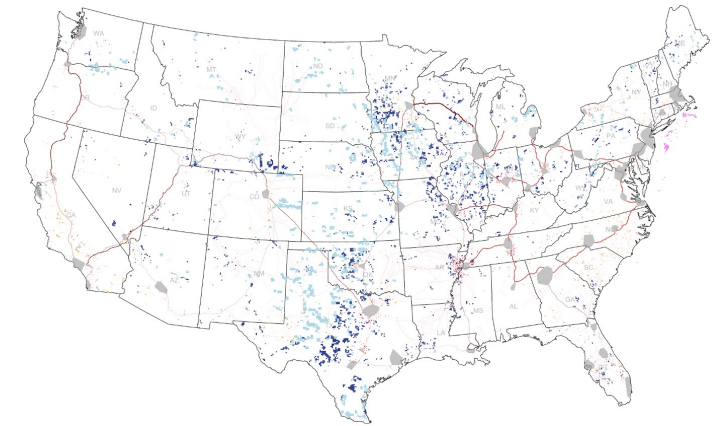


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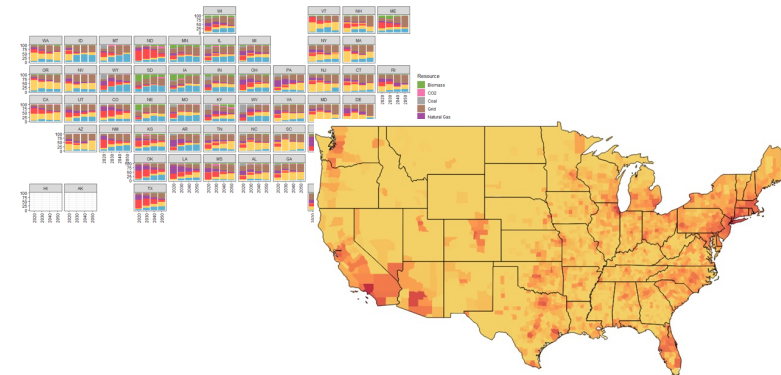
EnergyPATHWAYS
scenario tool
+
RIO
optimization tool



3. Geospatially-resolved downscaling & mapping

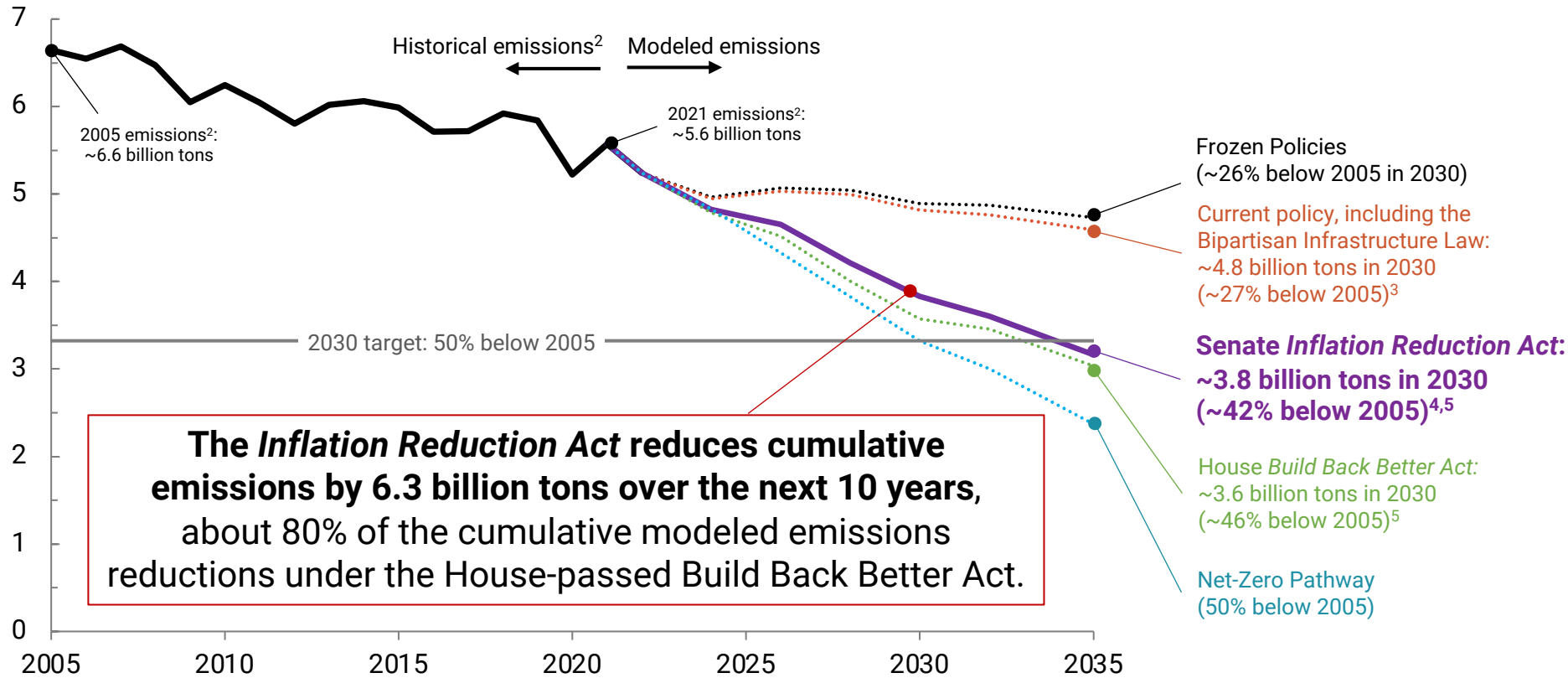


4. Impact modeling (employment & air pollution)



Historical and Modeled Net U.S. Greenhouse Gas Emissions (Including Land Carbon Sinks)

billion metric tons CO₂-equivalent (Gt CO₂-e)¹



The Inflation Reduction Act reduces cumulative emissions by 6.3 billion tons over the next 10 years, about 80% of the cumulative modeled emissions reductions under the House-passed Build Back Better Act.

The Senate *Inflation Reduction Act* would:

- **cut annual emissions in 2030 by an additional ~1 billion metric tons below current policy.**
- **get the U.S. to within ~0.5 billion tons of the 2030 climate target**

1 - CO₂-equivalent emissions calculations use IPCC AR4 100 year global warming potential as per [EPA Inventory of Greenhouse Gas Emissions and Sinks](#). All values should be regarded as approximate given uncertainty in future outcomes.

2 - Historical data from [US EPA Inventory](#) for 2005-2020; 2021 preliminary emissions estimate assumes total net emissions change in proportion to 6.7% year-on-year change in CO₂ emissions from energy and industrial processes estimated by [Global Carbon Monitor](#).

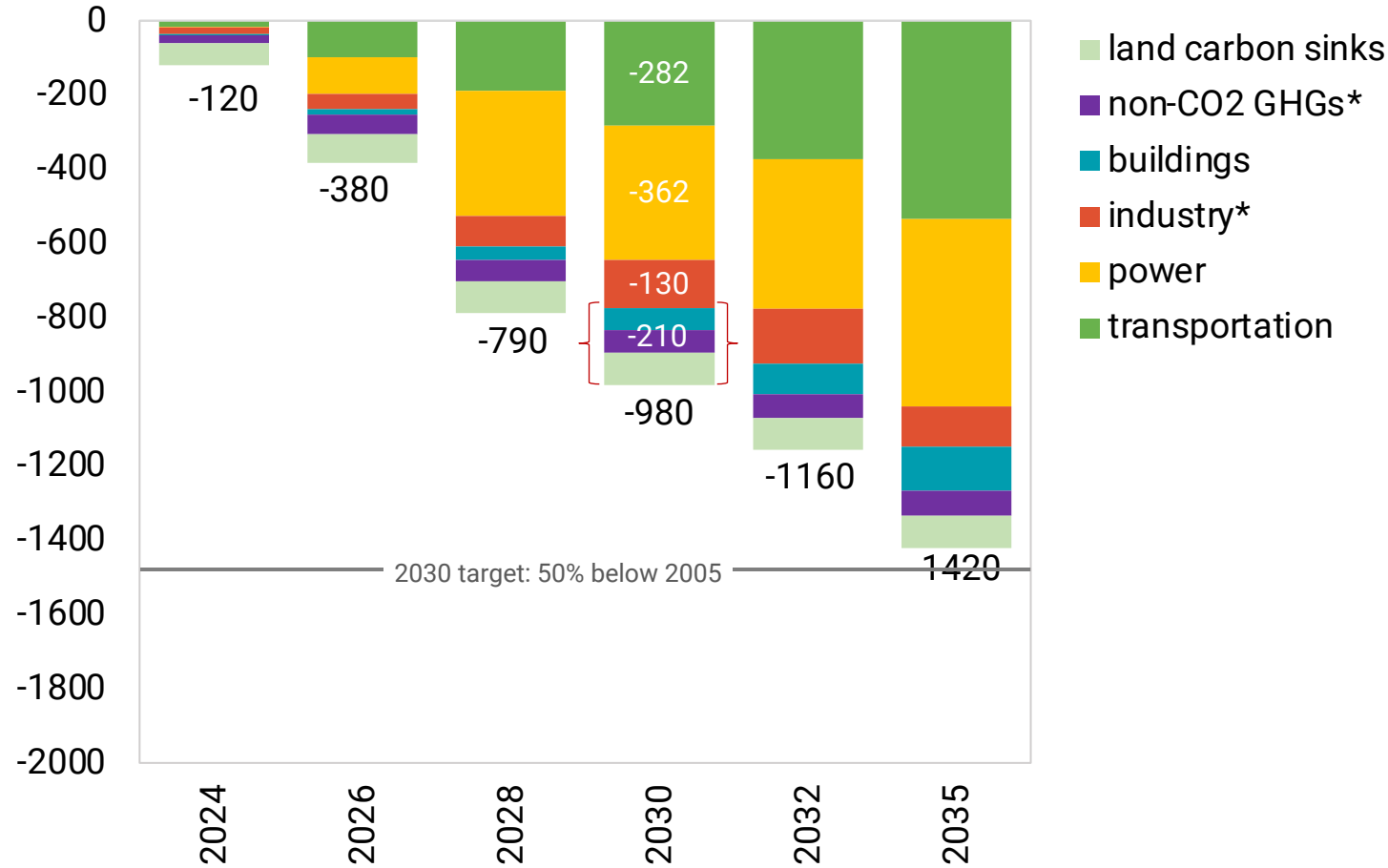
3 - Modeled emissions exclude any changes in passenger and freight miles traveled due to surface transportation, rail, and transit investments in IIJA. [According to the Georgetown Climate Center](#), emissions impact of these changes depend heavily on state implementation of funding from IIJA, which could result in anywhere from -14 Mt to +25 Mt change in CO₂ emissions from transportation in 2030.

4 - Results reflect preliminary modeling based on the [July 27, 2022 draft legislation](#).

5 - Results reflect average of estimated high and low oil & gas production scenarios, which span +/- 20 Mt CO₂-e in 2030 (see p. 14-15). Impact on land carbon sinks based on analysis by [Energy Innovation](#).

Annual Change in Net U.S. Greenhouse Gas Emissions Relative to Current Policy (including Bipartisan Infrastructure Law)

million metric tons CO₂-equivalent (Mt CO₂-e)¹



The *Inflation Reduction Act* cuts U.S. emissions primarily by **making clean energy cheap**.

The largest gains are made by **accelerating deployment of clean electricity and vehicles**, reducing 2030 emissions ~360 Mt and ~280 Mt respectively.

The Act also incentivizes installation of **efficiency upgrades and carbon capture in industrial sectors**, contributing ~130 Mt of reductions.

Rebates, tax credits and grants to spur **electrification and efficiency improvements in buildings; reductions in methane emissions in the oil and gas sector** spurred by the methane fee and grants; and funding to improve **conservation and carbon sequestration in forest and agricultural lands** also contribute important reductions (~210 Mt collectively).

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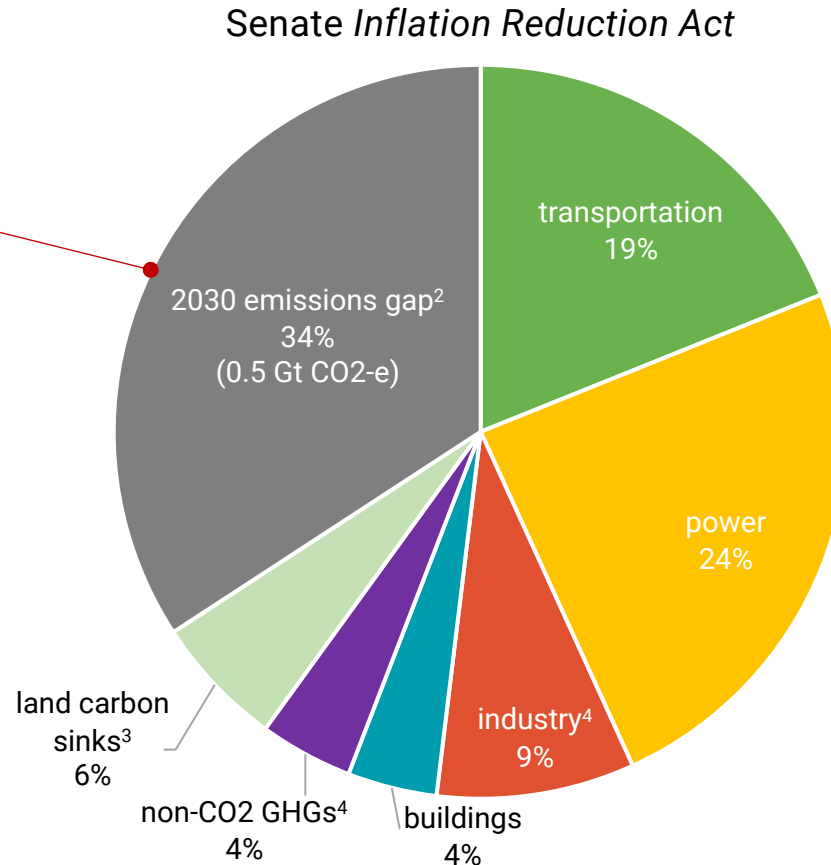
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Contributions to Additional Net U.S. Greenhouse Gas Emissions Reductions Below Current Policy Needed to Reach 2030 Climate Target
percentage of net emissions reductions relative to Current Policy (including the Bipartisan Infrastructure Law) to reach 50% below 2005 levels (-1.5 Gt CO₂e)¹

The *Inflation Reduction Act* closes about two-thirds of the remaining emissions gap between current policy and the nation's 2030 climate target (50% below 2005)



By driving down the cost of clean energy and other climate solutions, the Act also **makes it easier for states or cities or companies to increase their climate ambitions.**

It also **reinforces the economic benefits of any future federal regulations** enabling more ambitious future rules.

(These dynamic effects of the bill are not captured in this modeling.)

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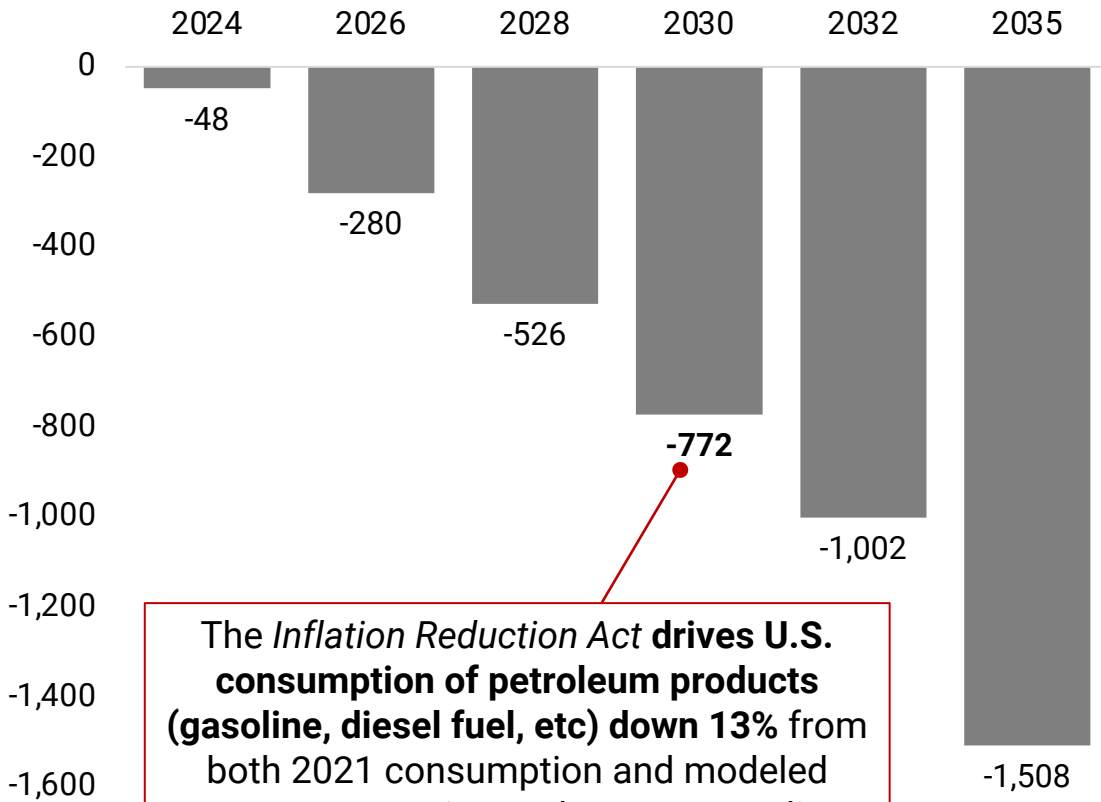
4 - Results reflect average of estimated high and low oil & gas production scenarios, which span +/- 20 Mt CO₂-e in 2030 (see p. 14-15).

Changes in annual U.S. petroleum product and natural gas consumption vs Current Policy (including Bipartisan Infrastructure Law)

Senate Inflation Reduction Act

Petroleum Products

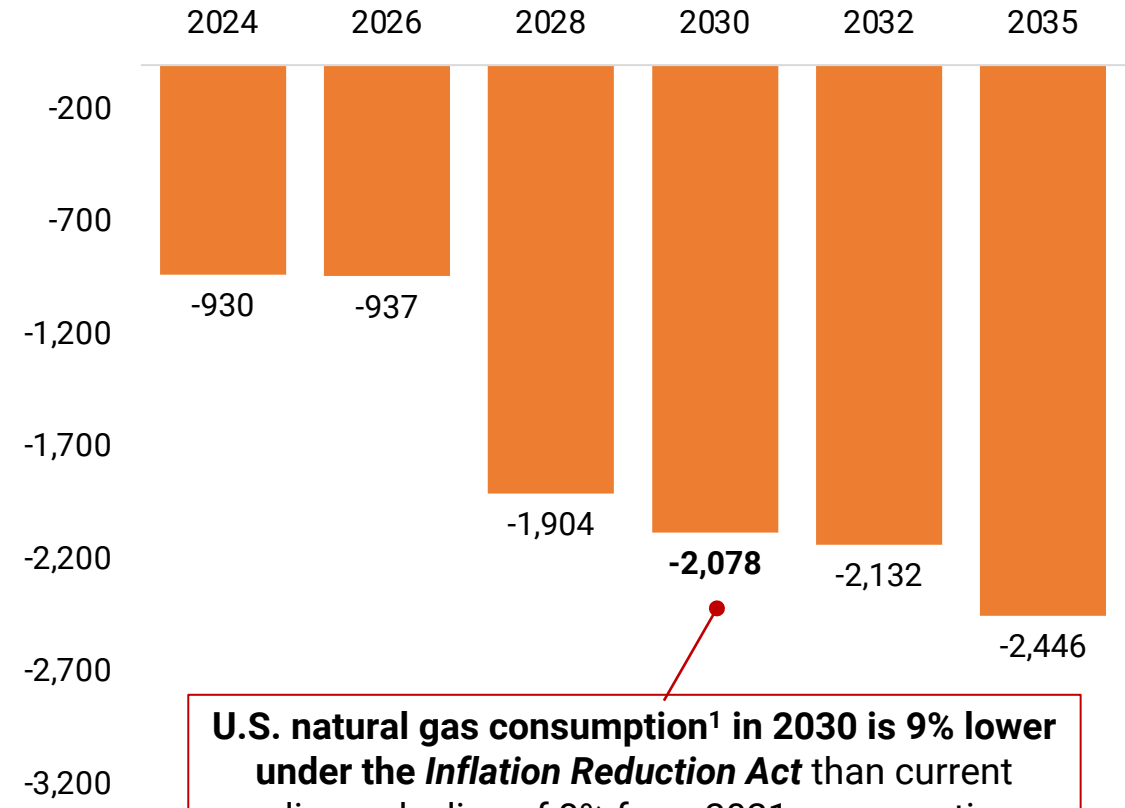
million barrels per year (mmbbl/y)



The *Inflation Reduction Act* drives U.S. consumption of petroleum products (gasoline, diesel fuel, etc) down 13% from both 2021 consumption and modeled 2030 consumption under Current Policy.

Natural Gas

billion cubic feet per year (bcf/y)



U.S. natural gas consumption¹ in 2030 is 9% lower under the *Inflation Reduction Act* than current policy, a decline of 8% from 2021 consumption.

Historical Annual Capacity Additions vs. Modeled Annual Average Capacity Additions

gigawatts/year

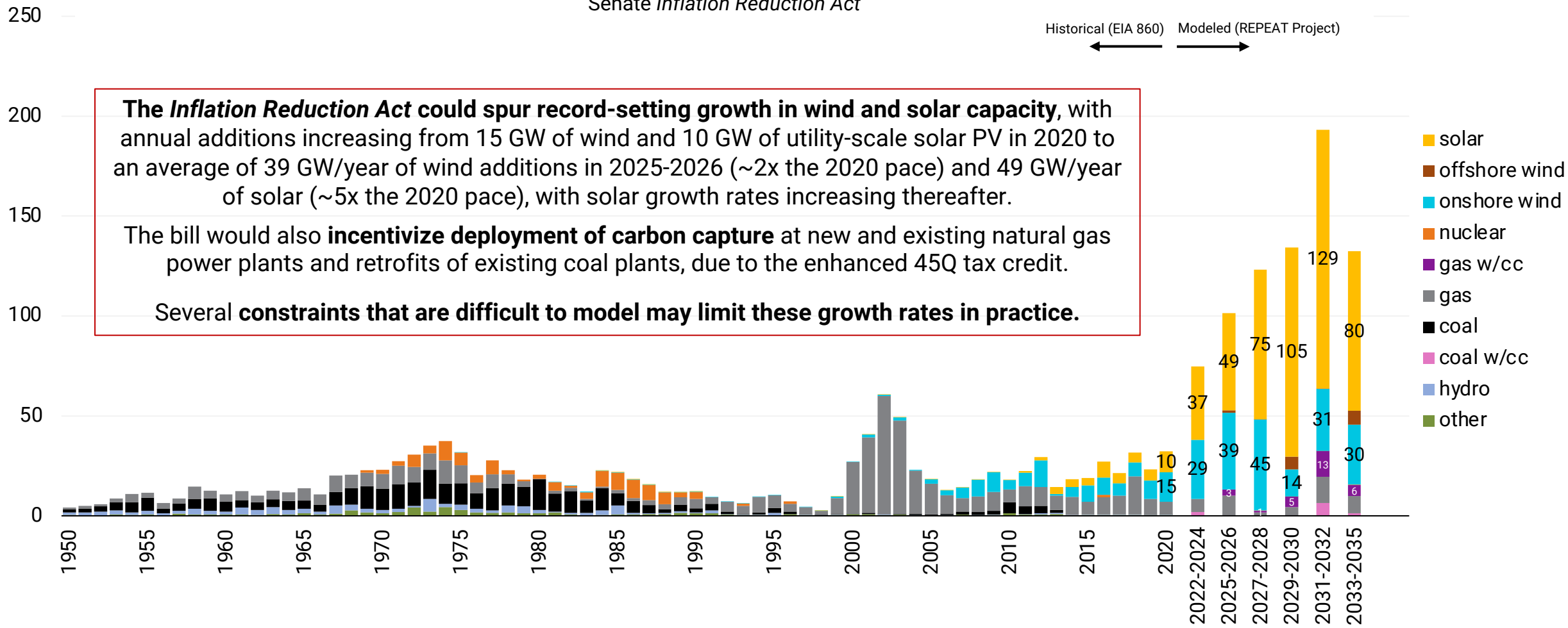
Senate Inflation Reduction Act

Historical (EIA 860) ← → Modeled (REPEAT Project)

The Inflation Reduction Act could spur record-setting growth in wind and solar capacity, with annual additions increasing from 15 GW of wind and 10 GW of utility-scale solar PV in 2020 to an average of 39 GW/year of wind additions in 2025-2026 (~2x the 2020 pace) and 49 GW/year of solar (~5x the 2020 pace), with solar growth rates increasing thereafter.

The bill would also **incentivize deployment of carbon capture** at new and existing natural gas power plants and retrofits of existing coal plants, due to the enhanced 45Q tax credit.

Several **constraints that are difficult to model may limit these growth rates in practice.**



Beyond the direct emissions reduction impacts of the policies modeled in this report, the *Inflation Reduction Act* contains important policy measures and programs that will build spur innovation and maturation of nascent advanced energy industries, build U.S. clean energy manufacturing and supply chains, improve public health and environmental justice, and drive investment and economic opportunities in communities across the United States.

- The Act builds on the demonstration and hubs funding in the Bipartisan Infrastructure Law by providing **early market deployment opportunities over the next decade that will drive innovation and maturation of important nascent clean technologies** that need to be ready for wide-scale deployment in the 2030s and 2040s, including clean hydrogen, carbon capture, zero-carbon liquid fuels, direct air capture, advanced nuclear and geothermal energy, and more.
- The Act contains **robust support for the development of American manufacturing of solar, wind, battery and electric vehicle components and assembly as well as critical minerals processing.** Those policies are important to expand supply chains and enable rapid scale-up of these technologies, and they will also **create hundreds of thousands of manufacturing jobs across the country**, giving countless communities a direct, tangible, near-term stake in the clean energy transition.
- A package of **environmental justice provisions** in the *Inflation Reduction Act* **provide at least \$60 billion to reduce harmful pollution in environmentally overburdened communities**, ensure more equitable access to renewable energy and energy efficiency and building electrification opportunities, and improve public health and climate resiliency.
- The *Inflation Reduction Act* provides grants, loans, and tax incentives that will drive **hundreds of billions of dollars in cumulative investment in American energy communities between now and 2030.**



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