Kellogg Insight
Professor David Besanko
October 7, 2022

Northwestern
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The Insightful Leader Live:

What Your Need to Know About the New Climate Bill

The topic of today's talk is a piece of legislation known as the Inflation Reduction Act

Poll: The Inflation Reduction Act …

1. Is a health care bill … and a tax reform bill … and a climate policy bill … and a deficit reduction bill
2. Will have a negligible effect on inflation
3. Will have a very small effect on global greenhouse emissions and temperature rise
4. Is a "big f …ng deal": excellent public policy that does more good than harm
5. Requires permitting reform to be optimally effective

Outline of the talk

- Inflation Reduction Act of 2022 (IRA): a high-level overview
- Will the IRA make a difference?
  - To the budget deficit?
  - To inflation?
  - To global temperature rise?
- Why the climate provisions of the IRA are a "big f …ng deal" (BFD)
  - Important innovative policy provisions
  - Incentives and opportunities for U.S. to build a robust climate economy
  - Social benefits exceed social costs … by a lot
- A key next step
- Q&A

Inflation Reduction Act

- Overview
- Will it make a difference?
- Why the climate provisions of the IRA are a BFD
- A key next step
- Q&A

One slide overview of the history of the Inflation Reduction Act

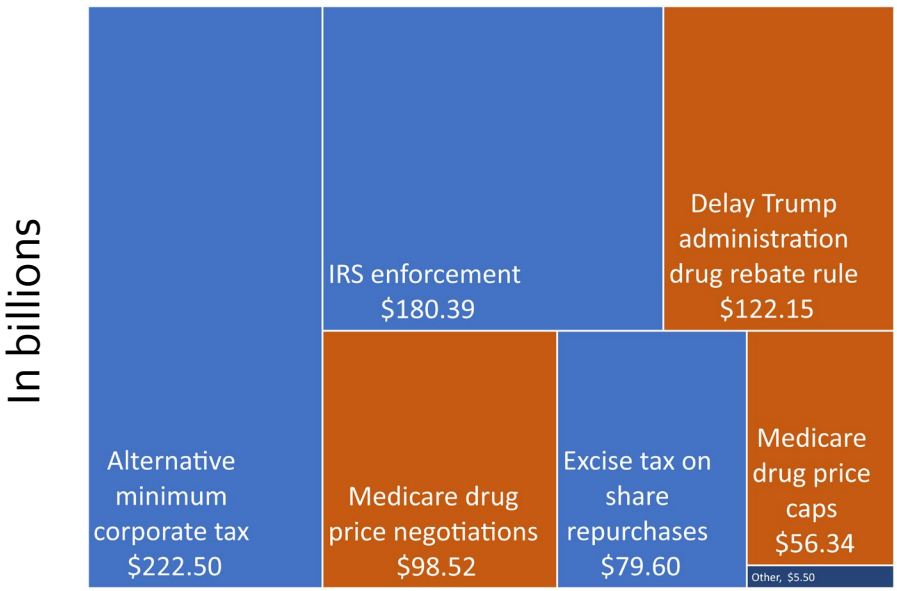
Spring 2020	Candidate Joe Biden proposes Build Back Better Plan: plan for public investment in social and physical infrastructure, social safety net, environmental protection rivaling New Deal and Great Society in scope
April-May 2021	Biden administration introduces American Jobs Plan (AJP) and American Families Plan (AFP)
Summer 2021	• Physical infrastructure provisions of AJP spun off and eventually becomes the Infrastructure Investment and Jobs Act ($>1 trillion in spending over five years), passed and signed into law in November 2021 • Build Back Better Act introduced as a budget reconciliation package to fulfill remaining aspects of AJP and AFP, with an initial scope of $3.5 trillion in additional (gross) spending over 10-years
Fall 2021	• Following negotiations to win support of Senators Manchin (D-WV) and Sinema (D-AZ) in the Senate and a group of moderate Democrats in the House, scope was reduced to a $2.2 trillion package. • Passed House by a vote of 220-213 in mid-November 2021
December 2021	Senator Manchin pulls support for the bill
January-July 2022	Behind-the-scenes, Sen. Manchin and Senate Majority leader Chuck Schumer negotiate provisions of the Inflation Reduction Act
July 2022	• Passes Senate by 51-50 margin with Vice President Kamala Harris breaking the tie • Passes House by 220-207 margin • Signed into law by President Biden on August 16, 2022

IRA: Overview

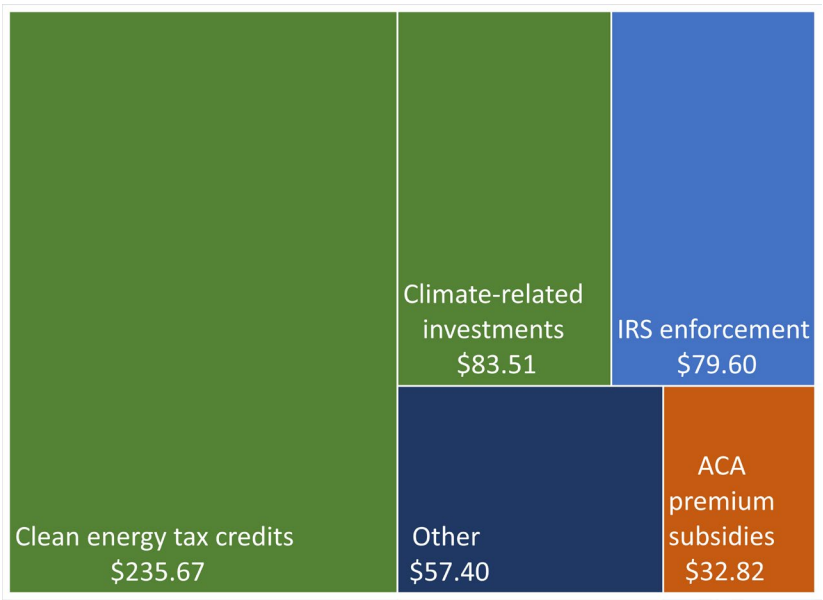
- Health care
- Taxation
- Climate provisions

Inflation Reduction Act: Biggest drivers of budgetary impacts from CBO analysis

Increased revenue or decreased spending: $765 billion, 2022-2031



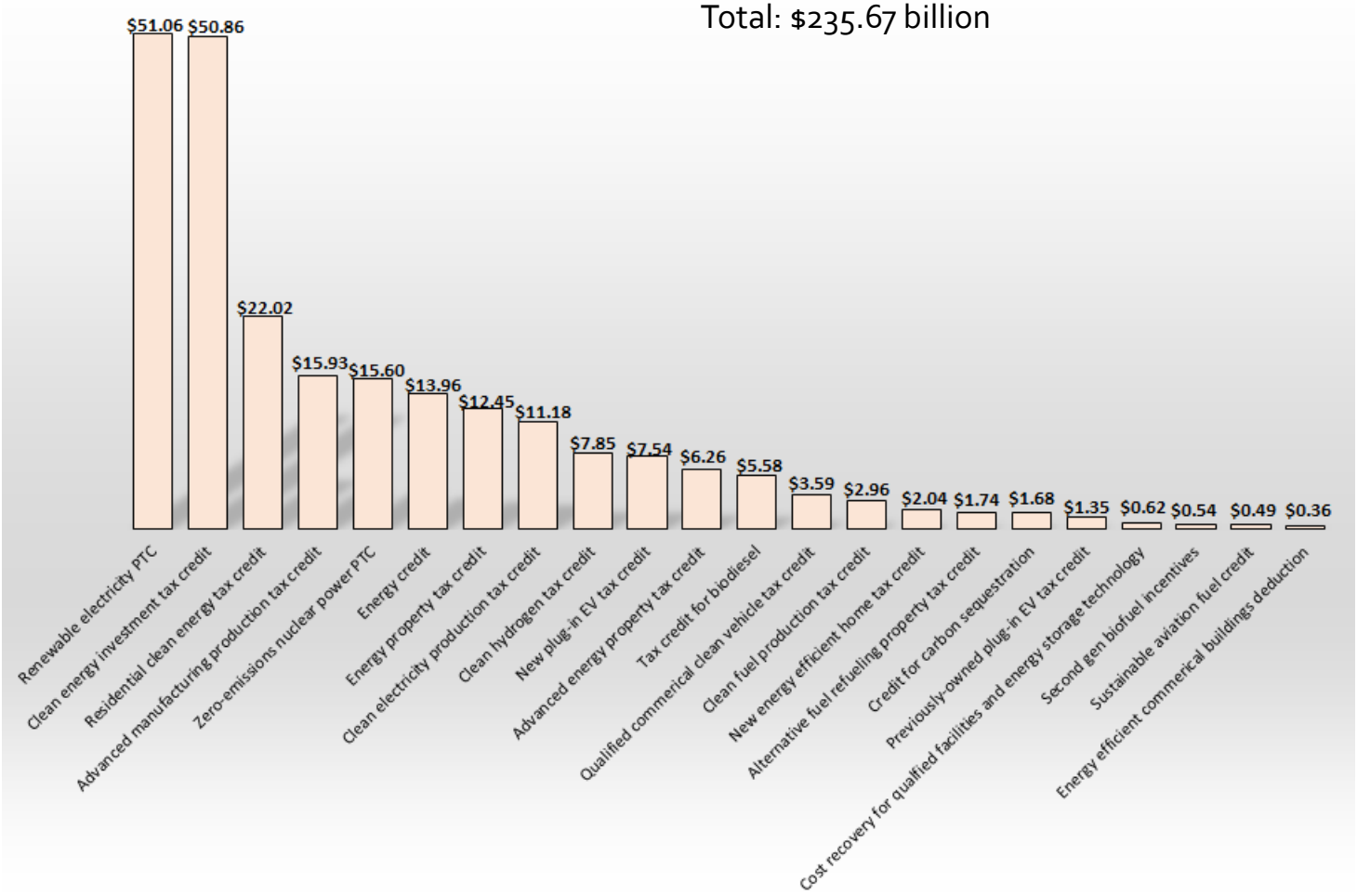
Decreased revenue or increased spending: $489 billion, 2022-2031



Sources: Congressional Budget Office, "Estimated Budgetary Effects of H.R. 5376, the Inflation Reduction Act of 2022, " https://www.cbo.gov/system/files/2022-09/PL117-169_9-7-22.pdf (accessed October 3, 2022) and Popovich, Nadja and Brad Plumer, "How the New Climate Bill Would Reduce Emissions," *New York Times* (August 12, 2022), https://www.nytimes.com/interactive/2022/08/02/climate/manchin-deal-emissions-cuts.html (accessed October 4, 2022).

Clean energy tax credits in the Inflation Reduction Act

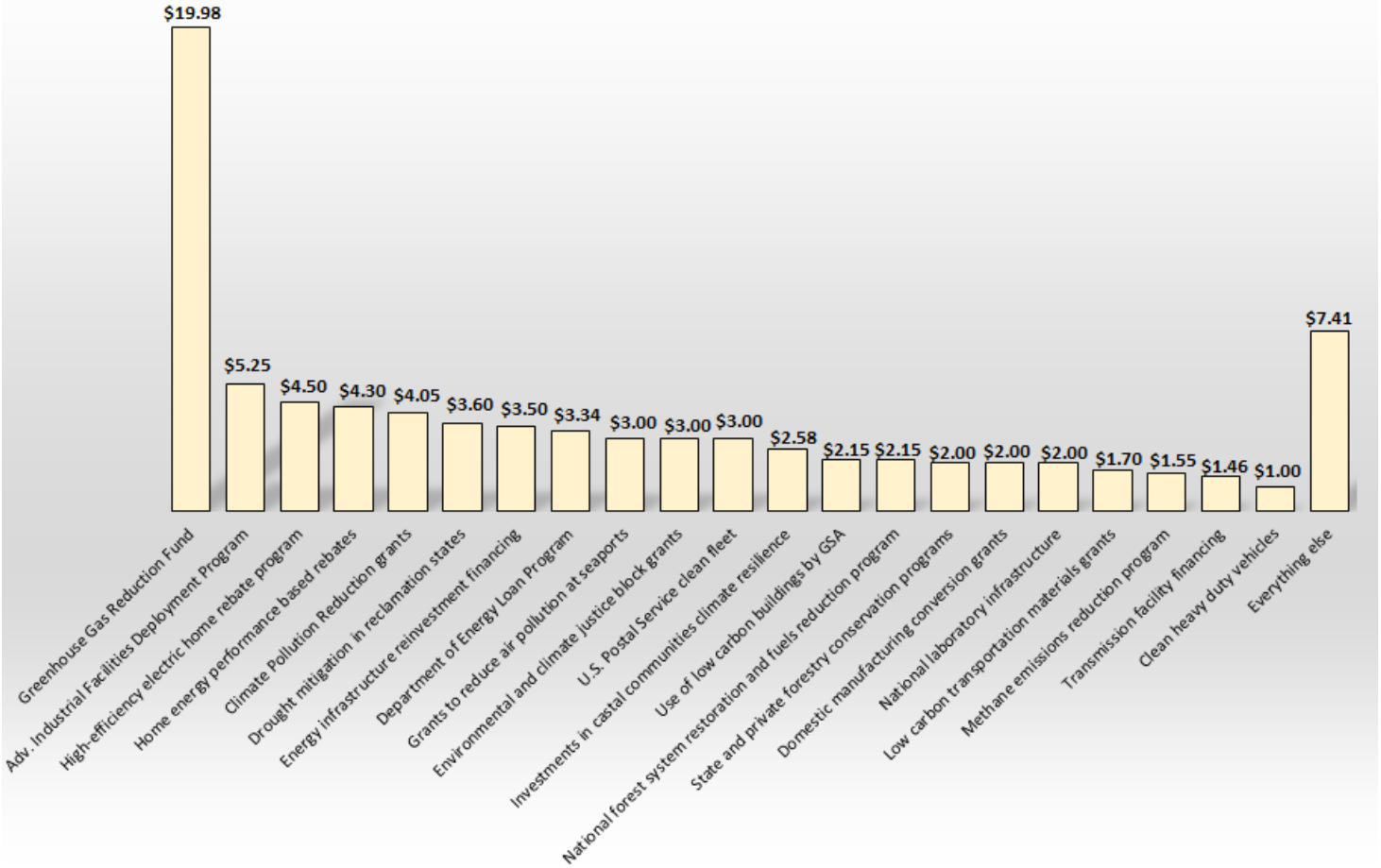
Additional spending, 2022-2031 (in billions)
Total: $235.67 billion



Source: Congressional Budget Office, "Estimated Budgetary Effects of H.R. 5376, the Inflation Reduction Act of 2022, " https://www.cbo.gov/system/files/2022-09/PL117-169_9-7-22.pdf (accessed October 3, 2022)

Clean energy investments in the Inflation Reduction Act

Additional spending, 2022-2031 (in billions)
Total: $83.51 billion



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Inflation Reduction Act

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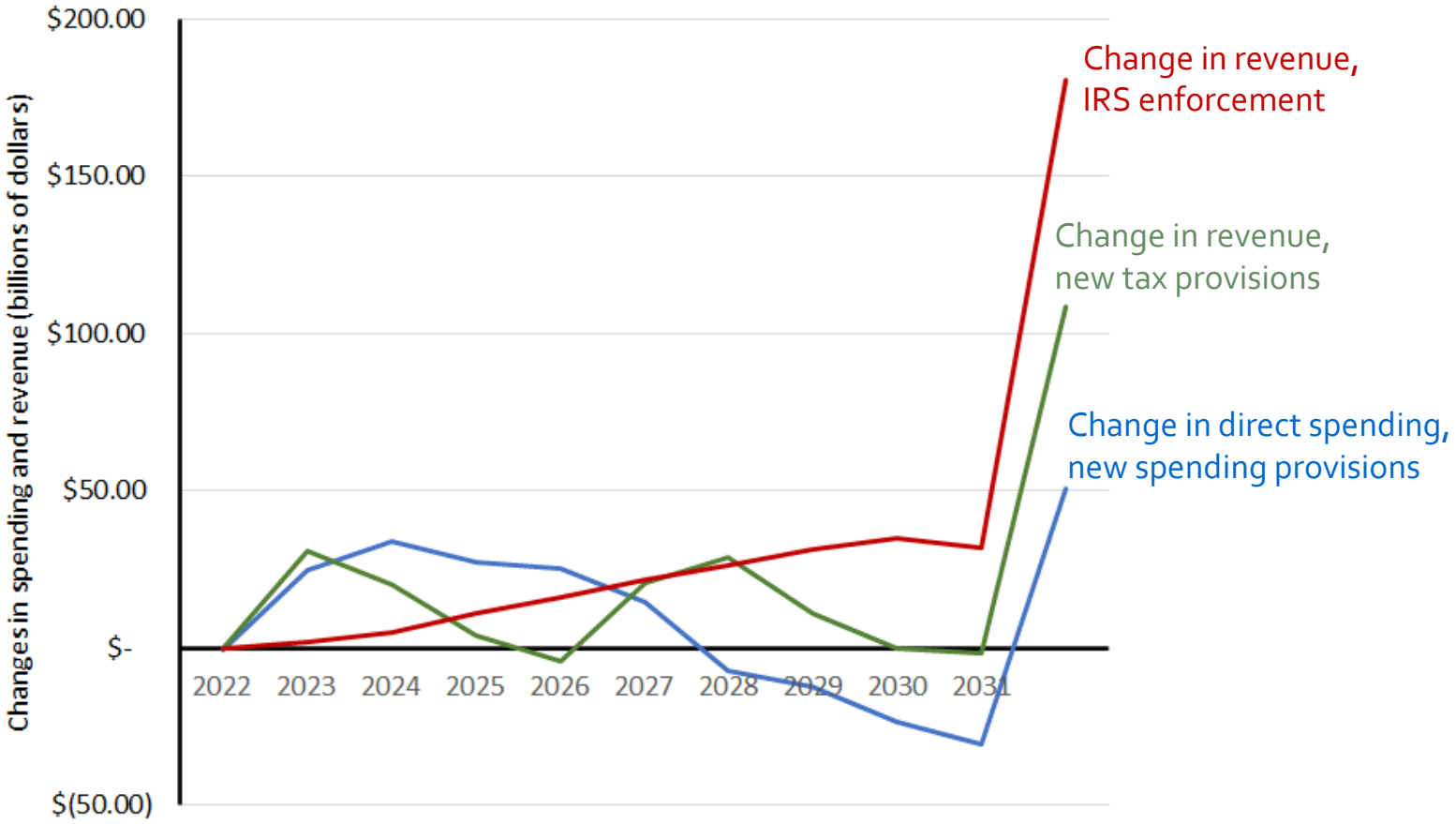
Inflation Reduction Act: CBO estimates of budgetary implications—year-by-year budgetary implications



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Inflation Reduction Act: CBO estimates of budgetary implications—10-year budgetary implications

Item	Change, 2022-2031 (billions)
(1) Change in direct spending, new spending provisions	$50.58
(2) Change in revenue, new tax provisions	$108.66
(3) Change in revenue, IRS enforcement	$180.39
Change in budget deficit: (1) – (2) – (3)	($238.49)

Source: Congressional Budget Office, "Estimated Budgetary Effects of H.R. 5376, the Inflation Reduction Act of 2022, " https://www.cbo.gov/system/files/2022-09/PL117-169_9-7-22.pdf (accessed October 3, 2022)

Inflation Reduction Act: CBO estimates of budgetary implications—10-year budgetary implications in context

U.S. federal government projected outlays and revenues (baseline) and changes due to IRA, 2022-2031

	in billions											Total
	Actual, 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2022–2031
Outlays, baseline	$ 6,822.4	$ 5,871.8	$ 5,873.6	$ 5,979.8	$ 6,299.8	$ 6,643.5	$ 6,957.8	$ 7,440.7	$ 7,584.8	$ 8,073.6	$ 8,469.2	$ 76,017.0
Change in direct spending from IRA		$ (0.62)	$ 24.79	$ 33.80	$ 27.11	$ 24.98	$ 14.74	$ (7.47)	$ (12.52)	$ (23.51)	$ (30.72)	$ 50.58
Percentage change		*-0.01%*	*0.42%*	*0.57%*	*0.43%*	*0.38%*	*0.21%*	*-0.10%*	*-0.17%*	*-0.29%*	*-0.36%*	*0.07%*
Revenues, baseline	$ 4,047.1	$ 4,836.0	$ 4,889.6	$ 4,923.9	$ 4,981.5	$ 5,279.7	$ 5,548.4	$ 5,715.6	$ 5,934.0	$ 6,161.3	$ 6,401.8	$ 58,719.1
Change in revenues from IRA, tax provisions		$ -	$ 30.6	$ 20.0	$ 3.8	$ (4.3)	$ 20.6	$ 28.7	$ 10.8	$ (0.2)	$ (1.5)	$ 108.7
Change in revenue from IRA, IRS enforcement		$ -	$ 2.0	$ 5.1	$ 11.1	$ 16.1	$ 21.7	$ 26.3	$ 31.2	$ 34.9	$ 31.9	$ 180.4
Change in revenue from IRA, total		$ -	$ 32.6	$ 25.1	$ 15.0	$ 11.9	$ 42.3	$ 55.0	$ 42.0	$ 34.7	$ 30.4	$ 289.1
Percentage change		*0.00%*	*0.67%*	*0.51%*	*0.30%*	*0.22%*	*0.76%*	*0.96%*	*0.71%*	*0.56%*	*0.48%*	*0.49%*
Deficit, baseline	$ 2,775.3	$ 1,035.8	$ 984.0	$ 1,055.9	$ 1,318.3	$ 1,363.8	$ 1,409.4	$ 1,725.1	$ 1,650.8	$ 1,912.2	$ 2,067.4	$ 17,297.9
Change in deficit from IRA		$ (0.62)	$ (7.82)	$ 8.66	$ 12.16	$ 13.11	$ (27.60)	$ (62.48)	$ (54.54)	$ (58.21)	$ (61.15)	$ (238.49)
Percentage change		*-0.06%*	*-0.79%*	*0.82%*	*0.92%*	*0.96%*	*-1.96%*	*-3.62%*	*-3.30%*	*-3.04%*	*-2.96%*	*-1.38%*

Sources: Congressional Budget Office, "Estimated Budgetary Effects of H.R. 5376, the Inflation Reduction Act of 2022, " https://www.cbo.gov/system/files/2022-09/PL117-169_9-7-22.pdf (accessed October 3, 2022) and Congressional Budget Office, "The Budget and Economic Outlook: 2022 to 2032," May 2022, https://www.cbo.gov/publication/57950 (accessed October 4, 2022).

Inflation Reduction Act: macroeconomic impact according to the Penn-Wharton Budget Model

- Effect on inflation:

> "The Act would have no meaningful effect on inflation in the near term but would reduce inflation by around 0.1 percentage points by the middle of the first decade. These point estimates, however, are not statistically different from zero, indicating a low level of confidence that the legislation would have any measurable impact on inflation."

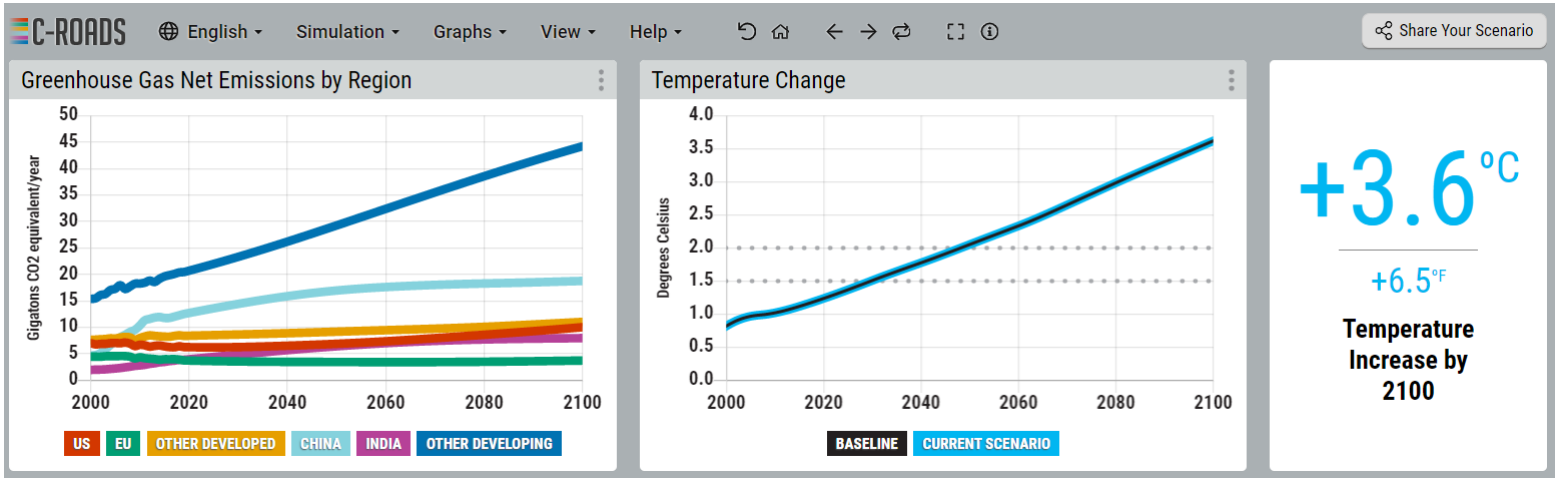
- Effect on real GDP:

> "Relative to current law, the Act would slightly reduce GDP in the first decade while slightly increasing GDP by 2050. These estimates include the impact of debt reduction, carbon reduction, and tax incentives on investments and working hours."

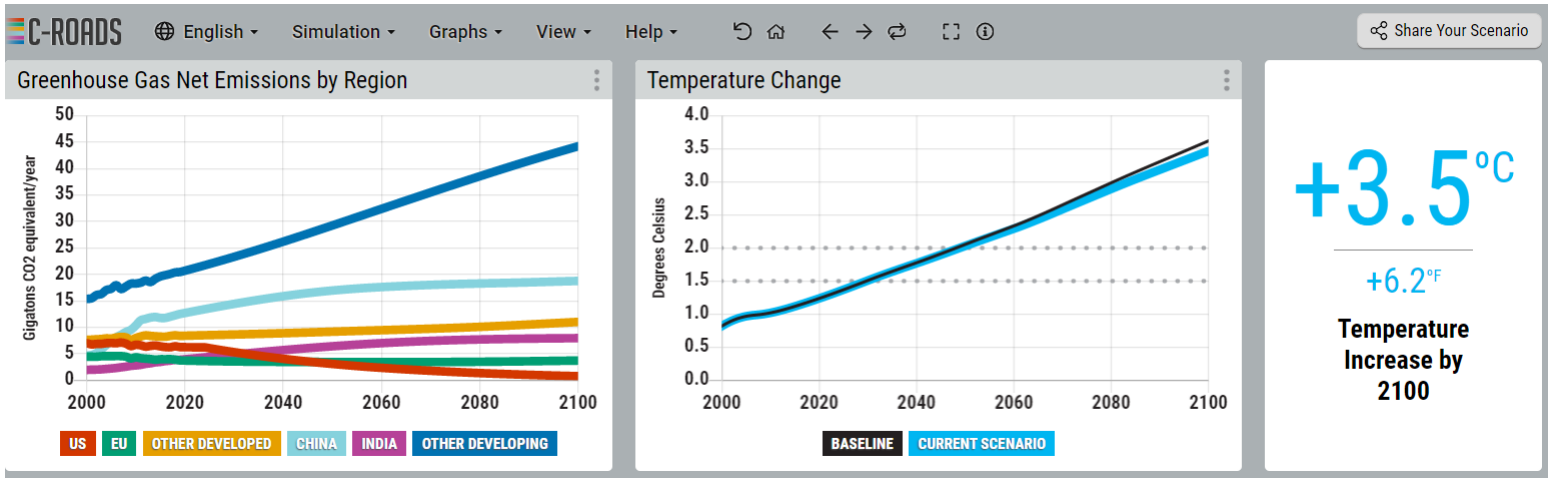
Source: Penn Wharton Budget Model, "Senate-passed Inflation Reduction Act: Estimates of Budgetary and Macroeconomic Effects," https://budgetmodel.wharton.upenn.edu/issues/2022/8/12/senate-passed-inflation-reduction-act (accessed October 4, 2022)

How much difference will the Inflation Reduction Act make for reducing global warming?

- Climate Interactive baseline scenario consistent with projections in the Intergovernmental Panel on Climate Change(IPCC) 5th Assessment "business as usual" emissions scenario



- Assumes 2.5% decrease in annual emissions in U.S. due to IRA
- Roughly consistent with Princeton University REPEAT model forecast



Source: Climate Interactive, "The C-ROADS Climate Change Policy Simulator," https://www.climateinteractive.org/c-roads/ (accessed October 6, 2022)

Inflation Reduction Act

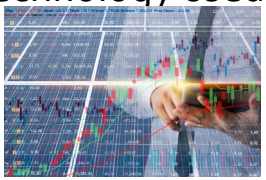
- Overview
- Will it make a difference?
- Why the climate provisions of the IRA are a BFD
- A key next step
- Q&A

Why the climate provisions of the Inflation Reduction Act are a BFD: Three reasons

1. Important innovative policy provisions
2. Incentives and opportunities for U.S. to build a robust climate economy
3. The social benefits exceed social costs … by a lot

Example #1: Technology-neutral clean energy tax credits—production tax credit

- IRA extends traditional ("Section 45") PTC for renewable electricity facilities (e.g., wind or solar plants) that begin before end of 2024:
  - PTC provides a credit against a firm's corporate income tax based on amount of electricity produced in the qualifying facility
- For new plants begun in 2025 or afterwards, IRA creates new technology-neutral production tax credit:
  - Power plants would qualify for production tax credit irrespective of technology used, provided that GHG emissions ≤ 0

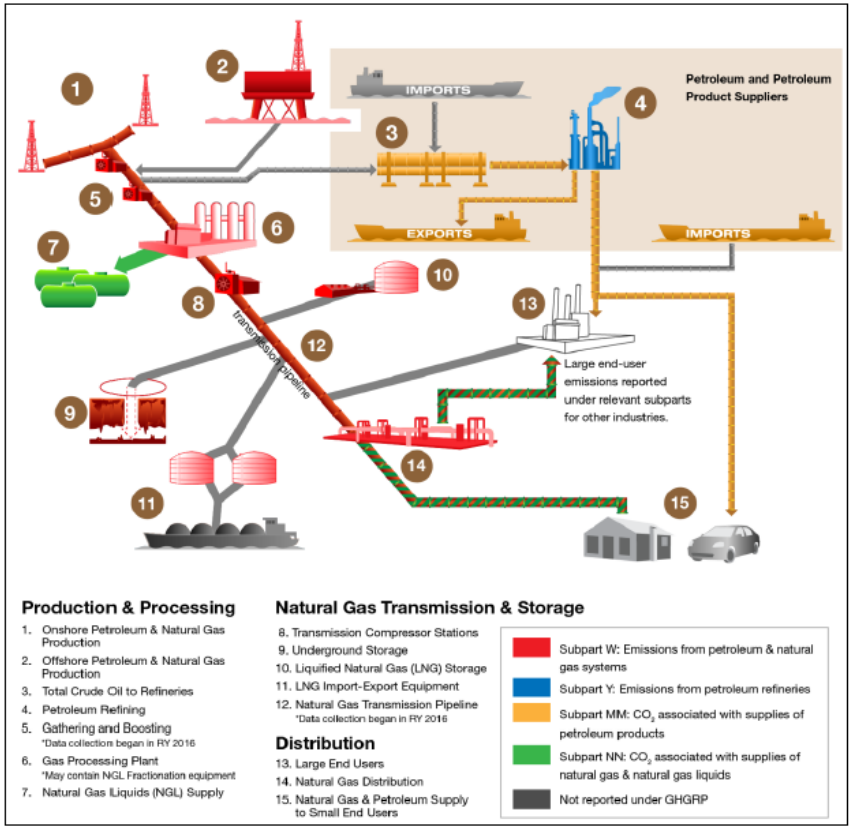


- Important for two reasons:
  - Effectively extends PTC to, among other things, electricity storage facilities
  - Emissions-based subsidies have incentives that replicate those of a carbon tax:
    - Carbon tax: You pay if you have positive carbon emissions
    - Emissions-based subsidies: You pay (by foregoing the subsidy) if you have positive carbon emissions
    - Creates incentives for fossil-based electricity producers to find ways to eliminate emissions, such as retrofitting natural gas plants with carbon removal technologies

Example #2: Methane emissions fee

- Begins at $900 per metric ton of methane (CH_4) in 2024, increases to $1,200 per ton CH_4 in 2025, and $1,00 per ton CH_4 thereafter

- This is a big deal!
  - First time the U.S. has imposed a fee on emissions of a greenhouse gas (GHG)
  - One ton of CH_4 has 25× the global warming potential (GWP) of one ton of CO_2
  - The level of the fee is very sensible:
    - $900 per metric ton of CH_4 is equivalent to $36 per ton CO_2
    - $1,200/ton CH_4 = $48 per ton CO_2e
    - $1,500/ton CH_4 = $60 per ton CO_2e
    - Consistent with lower bound estimates of the social cost of carbon



- Facilities in red (with two exceptions) are subject to the charge
- Almost 2,200 facilities accounting for about 78 million metric tons of CO_2e in 2019 are subject to the fee

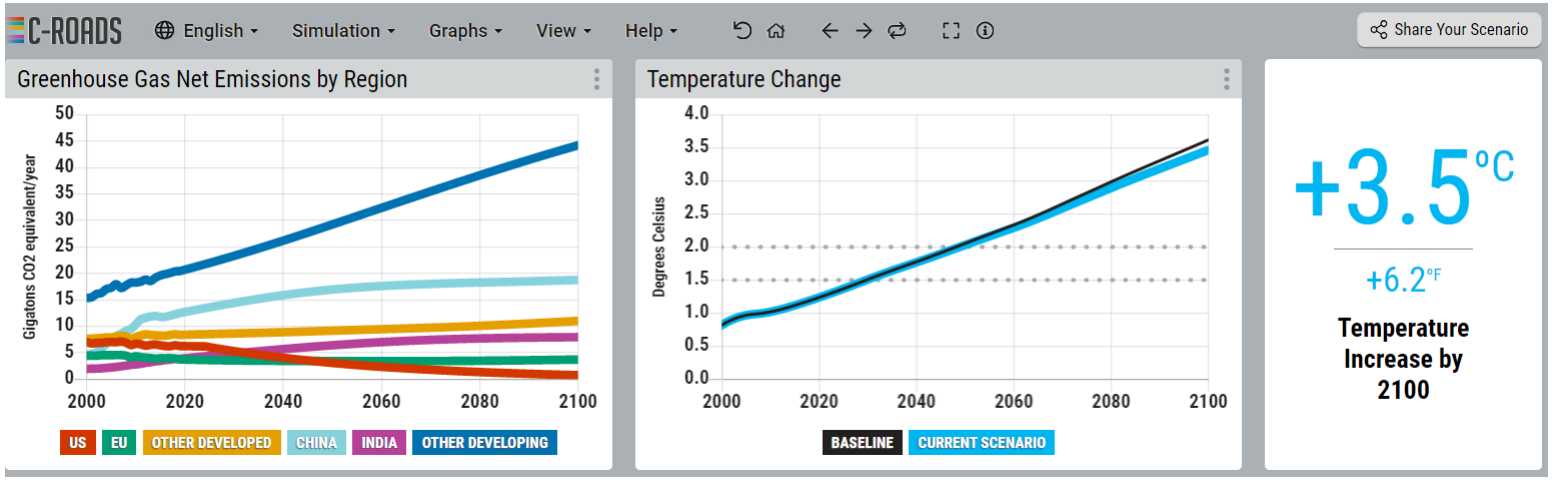
Source: Ramseur Jonathan, "Inflation Reduction Act Methane Emissions Charge: In Brief," Congressional Research Service, report R47206 (August 29, 2022), https://crsreports.congress.gov/product/pdf/R/R47206#:~:text=The%20charge%20starts%20at%20%24900,or%20tax%20on%20GHG%20emissions. (accessed October 6, 202

Example #3: Greenhouse Gas Reduction Fund

- First federal-level green financing model, akin to a national version of state-level or local-level green banks (such as the Connecticut Green Bank or the Montgomery County Green Bank)
- Provides $27 billion of competitive grants to state, local and tribal governments and non-profit institutions in three tranches:
  - $12 billion in competitive grants for investments in and financial support for qualified projects that reduce emissions or promote renewable energy
  - $8 billion in funding specifically directed toward low-income and disadvantaged communities to support zero-emissions projects
  - $7 billion in funding specifically directed toward low-income and disadvantaged communities to support renewable energy projects
- Recipients are non-profit organizations that provide capital for green projects:
  - Also can be used by state and local governments to set up their own green banks
- This is a big deal:
  - Not only provides capital for projects that are socially valuable but which could not, on their own, attract sufficient private capital to be viable …
  - But also they can work synergistically with tax credit provisions of IRA (more below)

Why having a robust climate economy in the U.S. is important

- Allows U.S. better control over its own fate in global energy markets, e.g., more buffered from oil price shocks
- Increases U.S. credibility in climate diplomacy
- Gives the U.S. the ability to affect emissions reductions outside the U.S. through technology transfer



The clean energy tax credits are open ended

- My analysis of CBO scoring of IRA suggests that additional "spending through the tax code" of tax credits will be $236 billion over 10 years
- But the amount could be higher than this since there is no "budget limit" on the tax credits—they are open ended
- If renewable electricity investment and production is higher than CBO forecasts, the spending could be higher than this
- Credit Suisse analysis from August suggests that total tax credits earned could be twice the CBO estimate … suggesting tax credit incentives may be more powerful than is currently assumed*

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SCIENCE

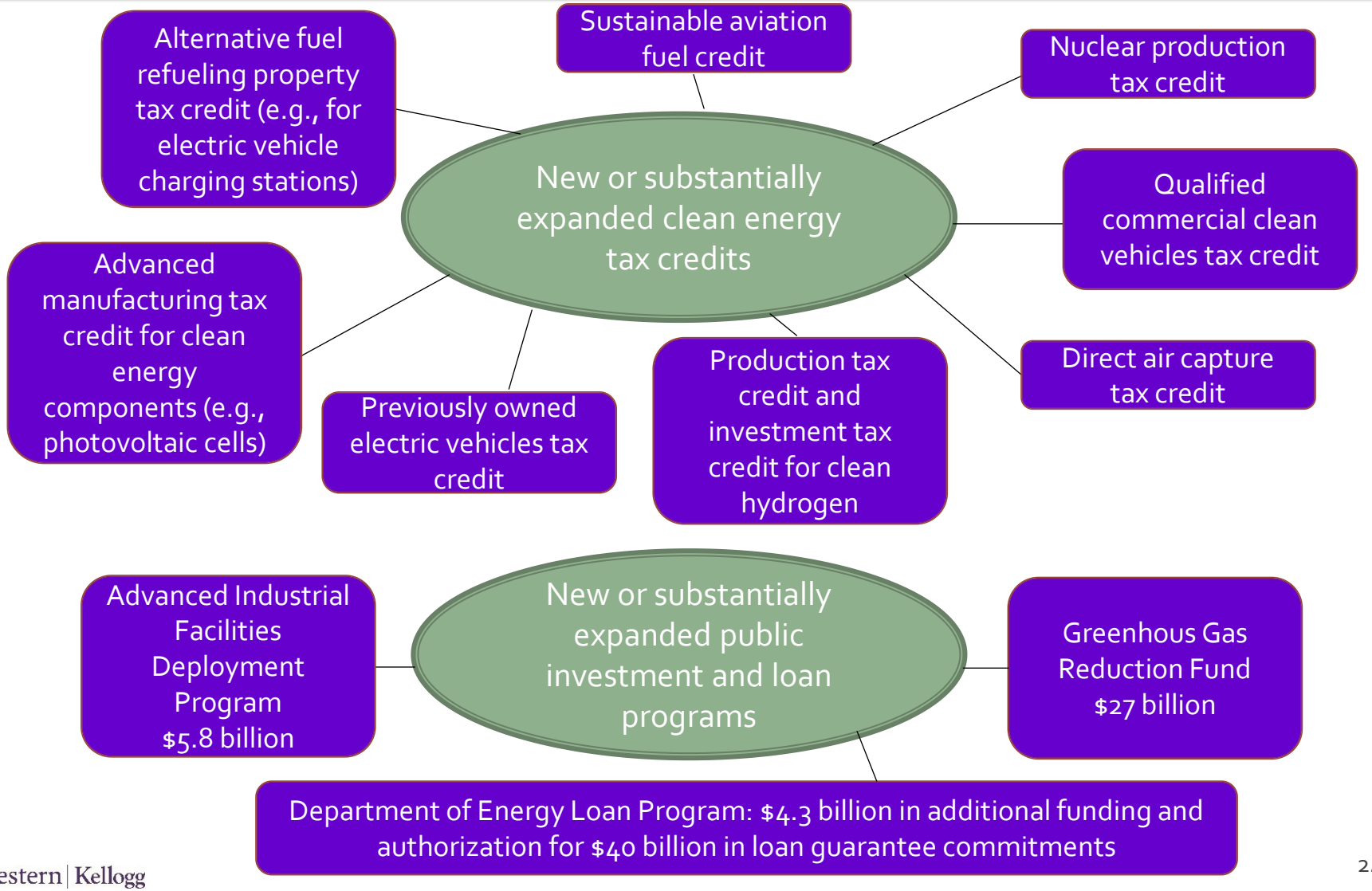
The Climate Economy Is About to Explode

A new report suggests that the Inflation Reduction Act could be even bigger than Congress thinks.

By Robinson Meyer

*Source: Meyer, Robinson, "The Climate Economy is About to Explode," *The Atlantic* (October 6, 2022) , https://www.theatlantic.com/science/archive/2022/10/inflation-reduction-act-climate-economy/671659/ (accessed October 6, 2022)

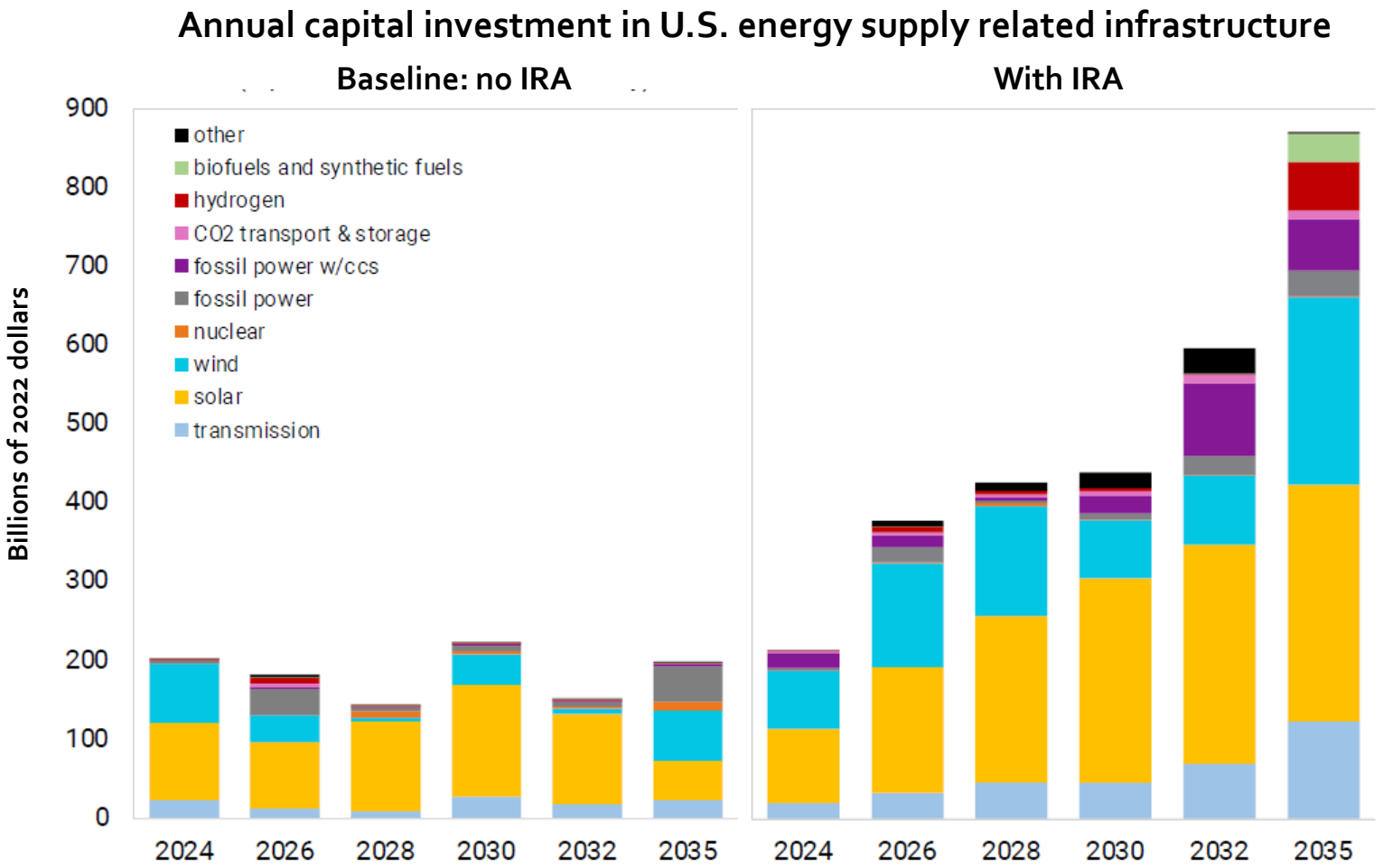
New tax credits and new sources of clean energy funding



IRA contains novel domestic sourcing provisions: Example—plug-in electric vehicle (EV) tax credit

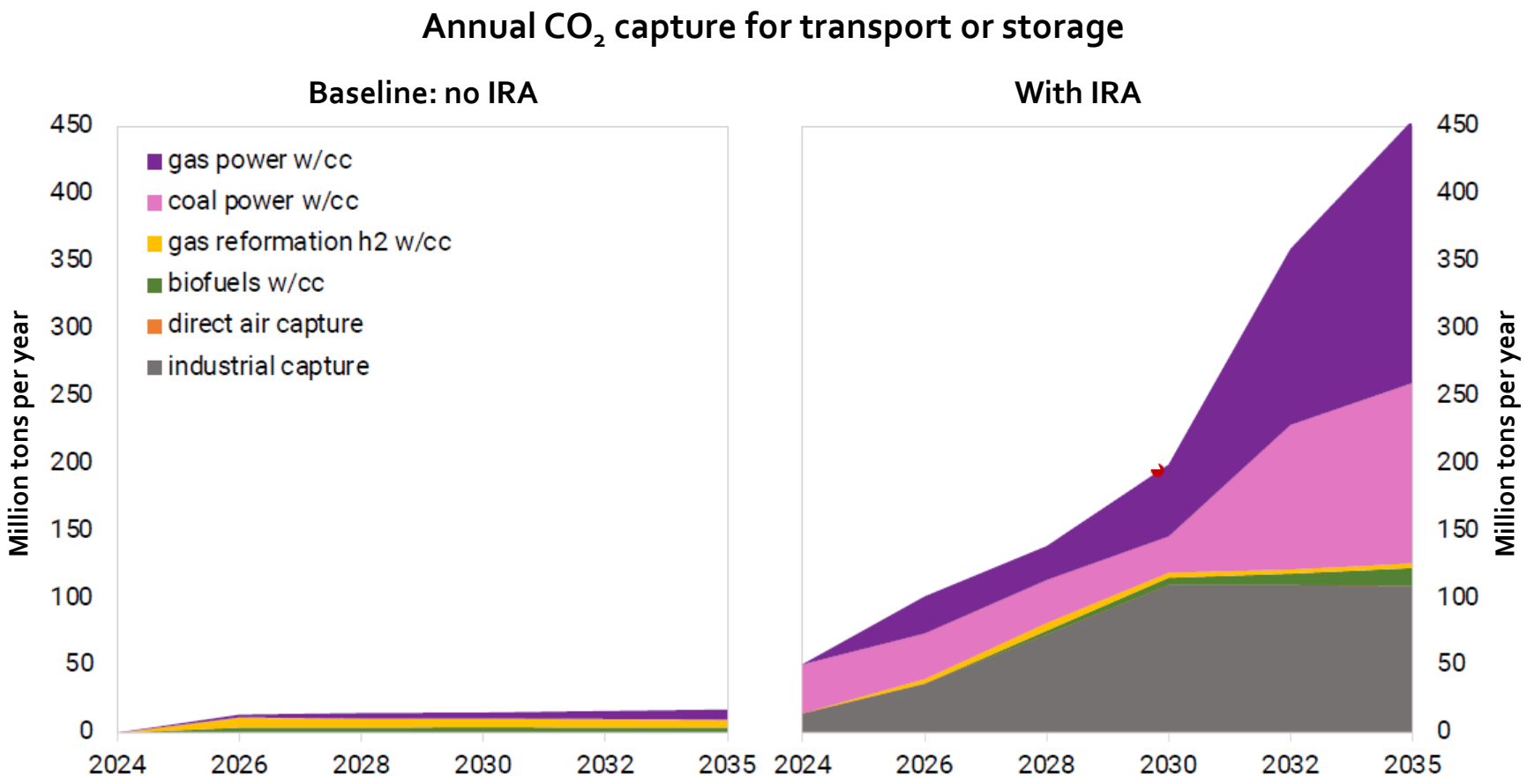
- IRA extends the plug-in EV tax credit for new EVs, worth up to $7,500 for income-qualifying individuals
- To qualify for the credit final assembly of vehicle must take place in North America
- To qualify for $3,750 of the credit, a certain % of battery components must be manufactured and assembled in the U.S. (from 50% in 2023 to 100% by 2029)
- To qualify for $3,750 of the credit, a certain % of minerals used in batteries must be processed in free-trade agreement country or recycled in North America (from 40% in 2023 to 80% by 2027)
  - No minerals can be obtained from Russia, China, North Korea, and several other "entities of foreign concern"
- U.S. has had a long tradition for domestic content regulations for federal government procurement and for federal transportation and water funding grants to states, but it is novel to promote domestic sourcing via tax credits

Princeton University Zero Lab REPEAT Model: Forecast impact of IRA on private investment in energy supply infrastructure



Source: Jenkins, J.D., Mayfield, E.N., Farbes, J., Jones, R., Patankar, N., Xu, Q., Schivley, G., "Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act of 2022 ," REPEAT Project, Princeton, NJ, August 2022, https://repeatproject.org/docs/REPEAT_IRA_Prelminary_Report_2022-09-21.pdf (accessed October 4, 2022)

Princeton University Zero Lab REPEAT Model: Forecast impact of IRA on use of carbon capture



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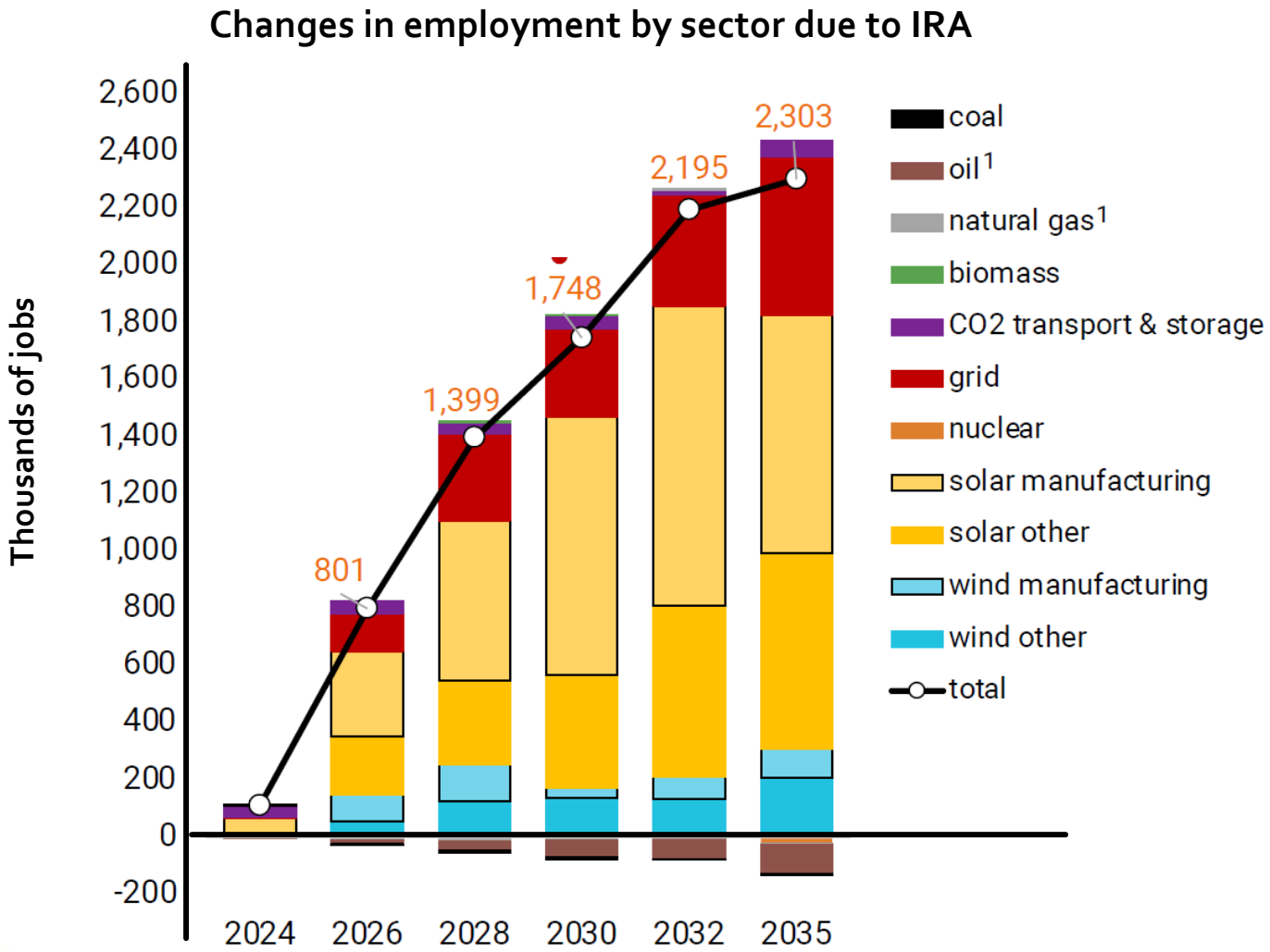
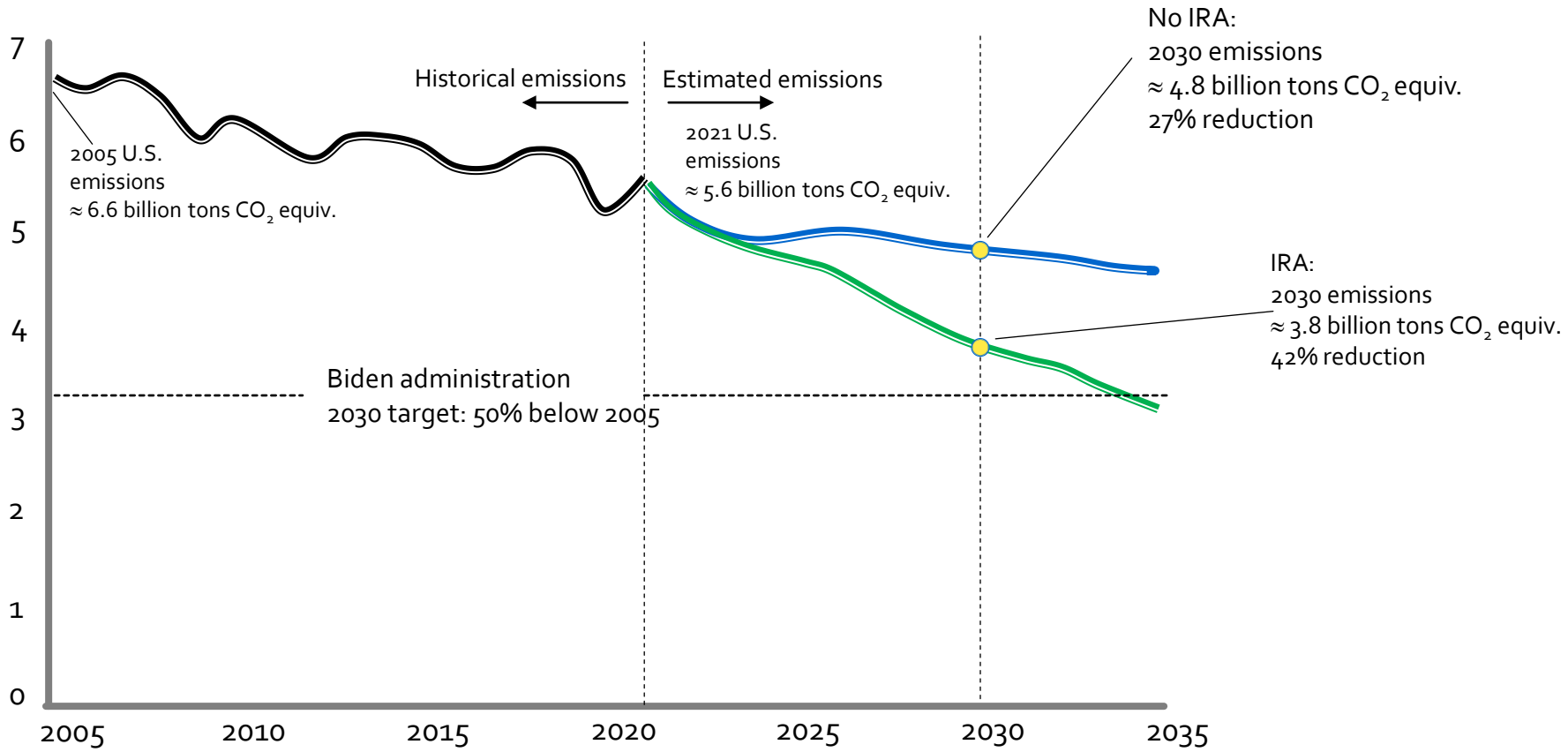
Princeton University Zero Lab REPEAT Model: Forecast impact of IRA on employment



Inflation Reduction Act: Impact on carbon emissions



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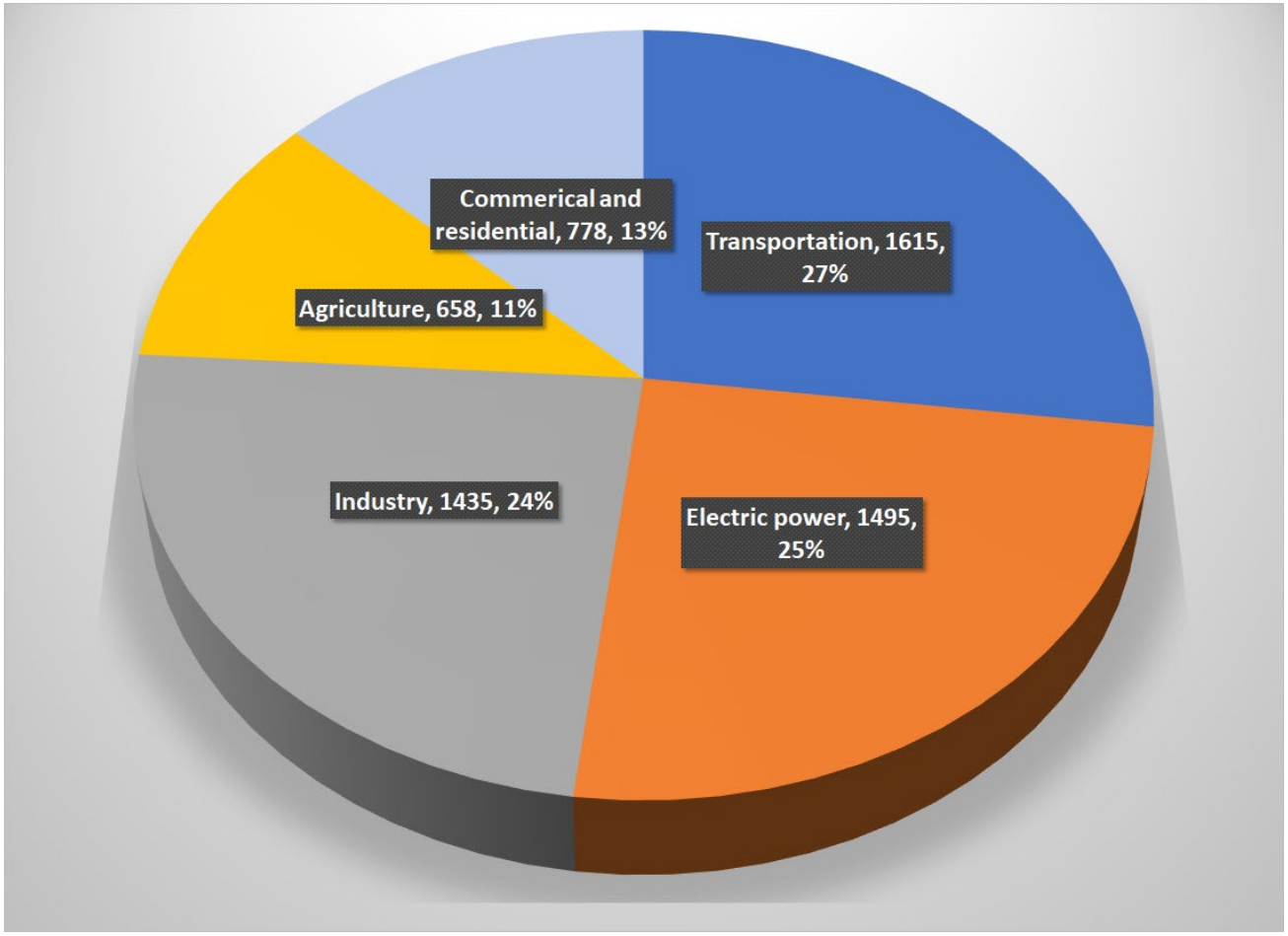
Sources of U.S. greenhouse gas emissions

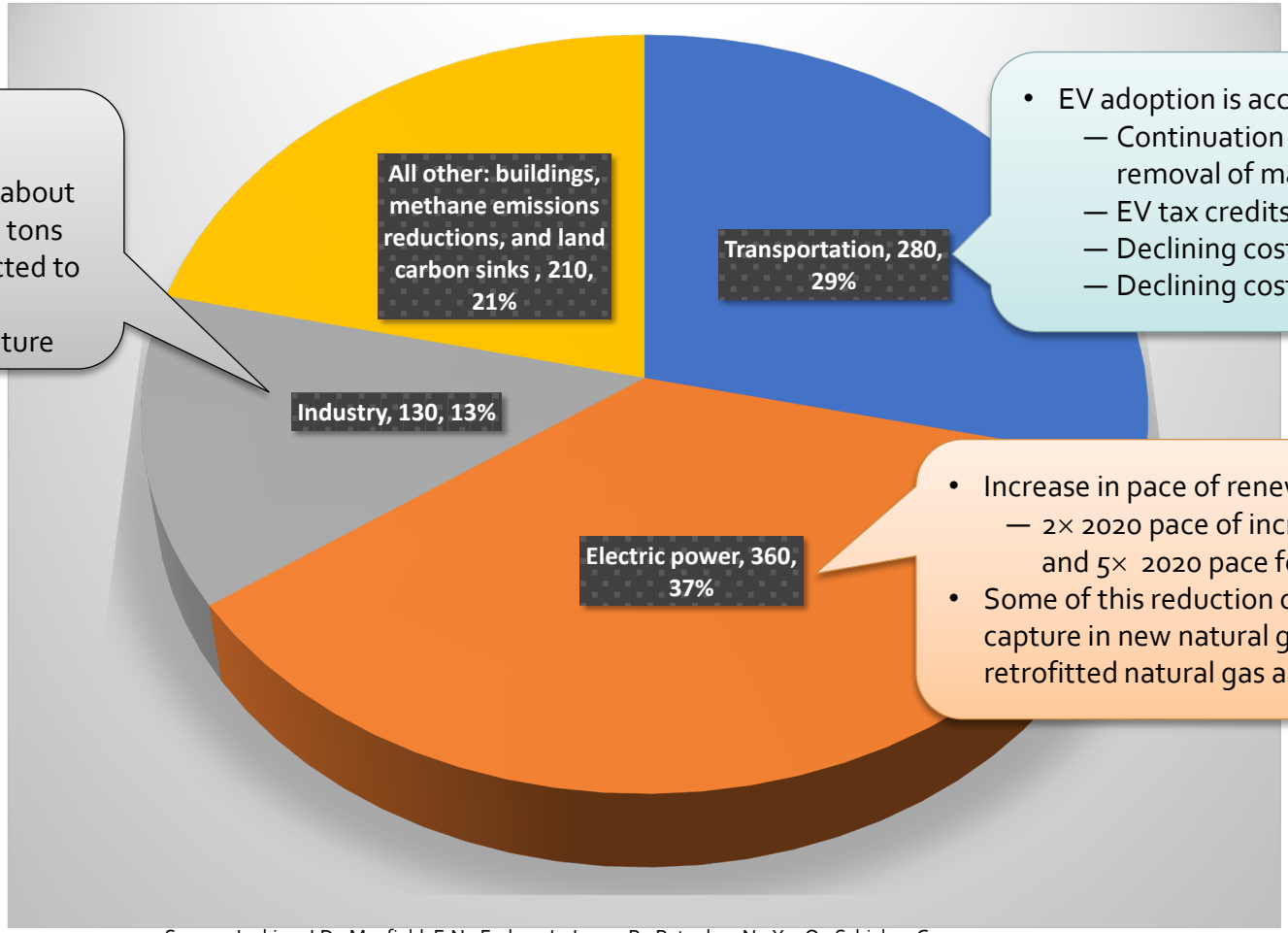
U.S. greenhouse gas emissions, 2020 (million metric tons CO_2-equivalent)



U.S. Environmental Protection Agency, "Sources of Greenhouse Gas Emissions," https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions (accessed October 5, 2022)

Main drivers of emissions reductions under the Inflation Reduction Act

Emissions reductions, 2022-2030 by source (million metric tons CO_2-equivalent)



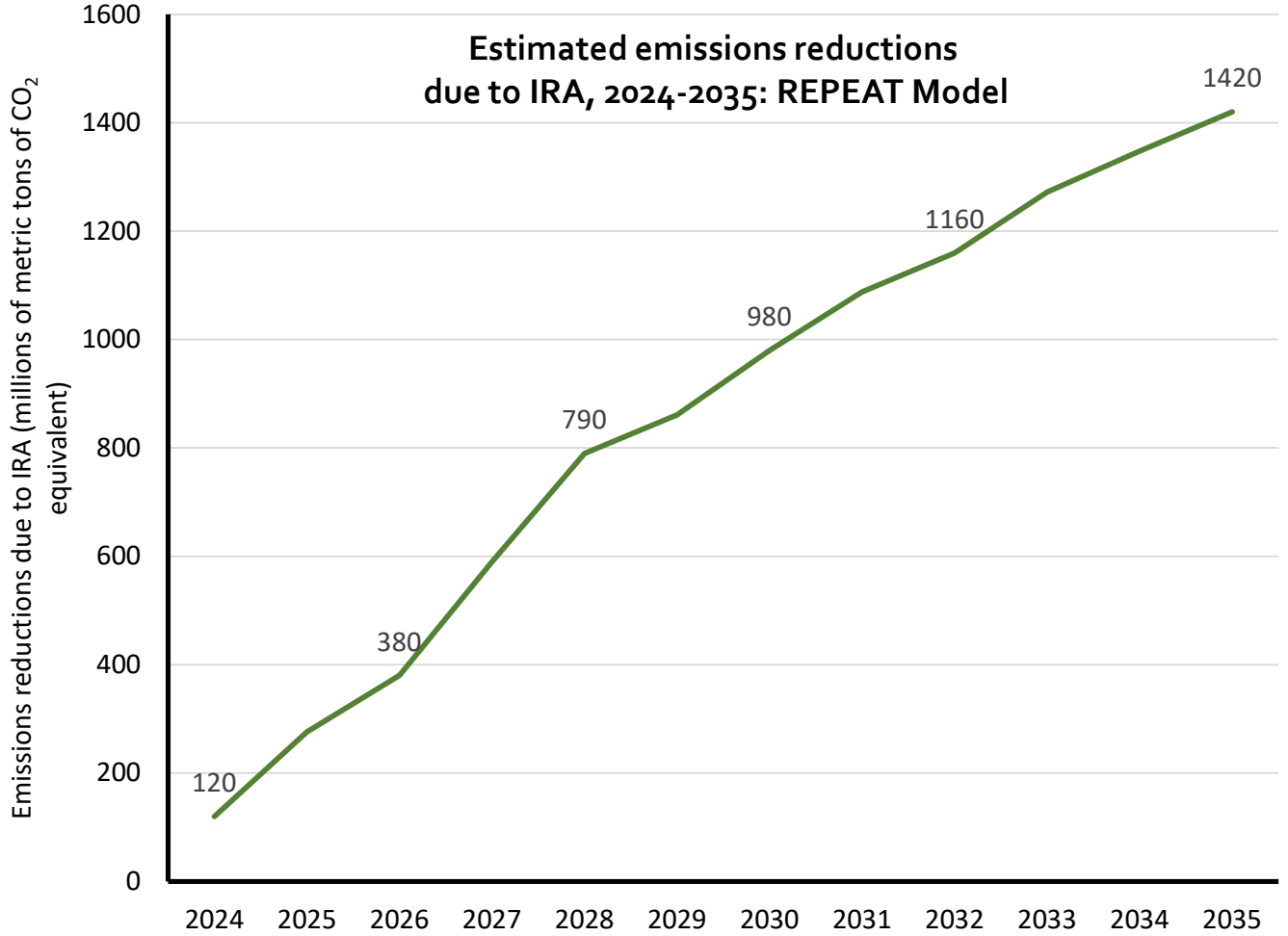
Significant amount of reduction (about 100 million tons CO_2) expected to come from carbon capture

- EV adoption is accelerated due to
  - — Continuation of new EV tax credits, plus removal of manufacturer caps
  - — EV tax credits for used vehicles
  - — Declining costs of batteries and fuel cells
  - — Declining costs of charging stations

- Increase in pace of renewable capacity additions
  - — 2× 2020 pace of increase for wind in 2025-26 and 5× 2020 pace for solar in 2025-26
- Some of this reduction comes from carbon capture in new natural gas-fired plants and retrofitted natural gas and coal plants

Source: Jenkins, J.D., Mayfield, E.N., Farbes, J., Jones, R., Patankar, N., Xu, Q., Schivley, G., "Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act of 2022 ," REPEAT Project, Princeton, NJ, August 2022, https://repeatproject.org/docs/REPEAT_IRA_Prelminary_Report_2022-09-21.pdf (accessed October 4, 2022)

CO_2 emissions reductions due to IRA



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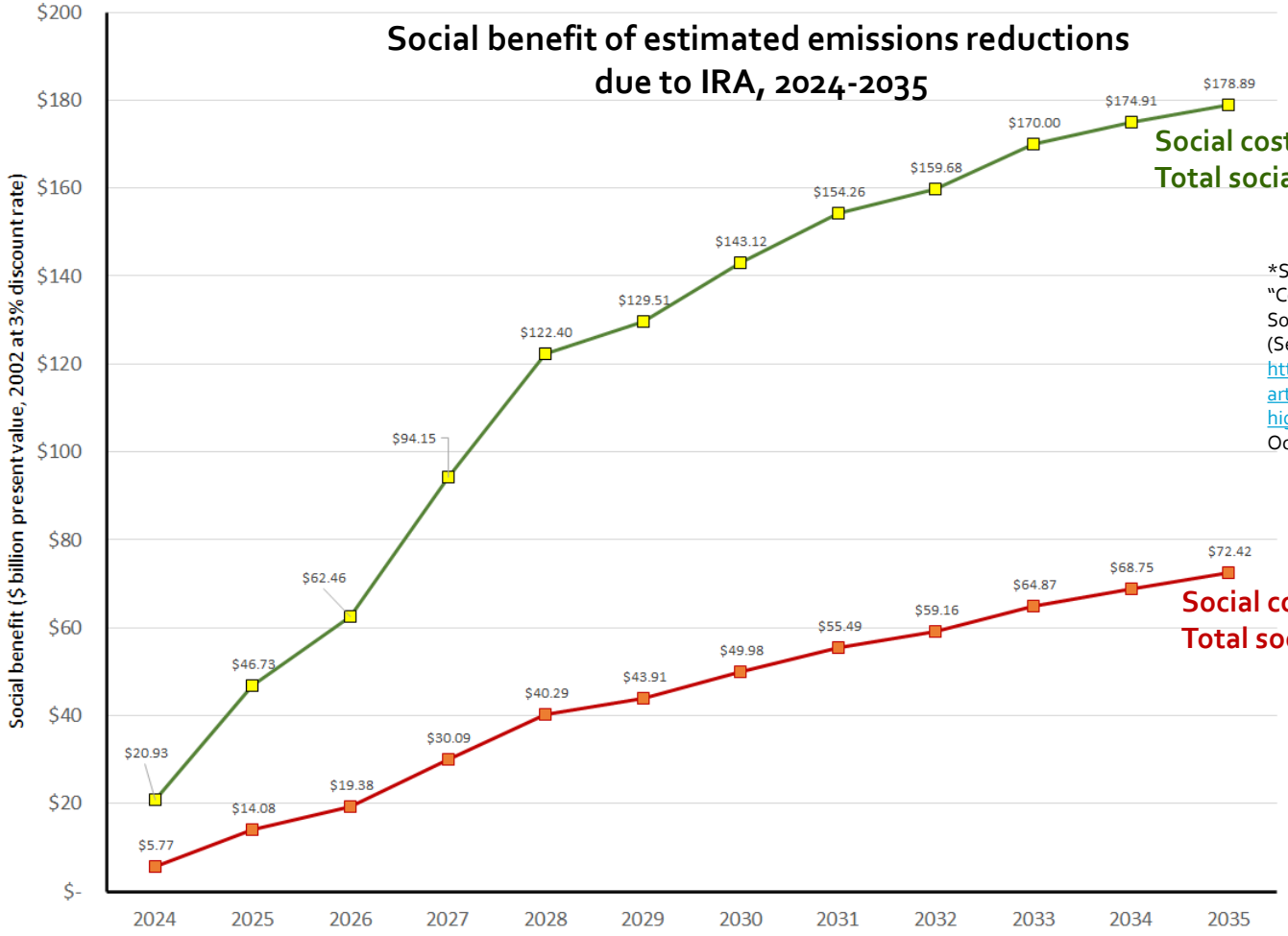
Social benefit of CO_2 emissions reductions due to IRA



Social cost of carbon: \$185/ton CO_2e*
Total social benefit: \$1,457 billion

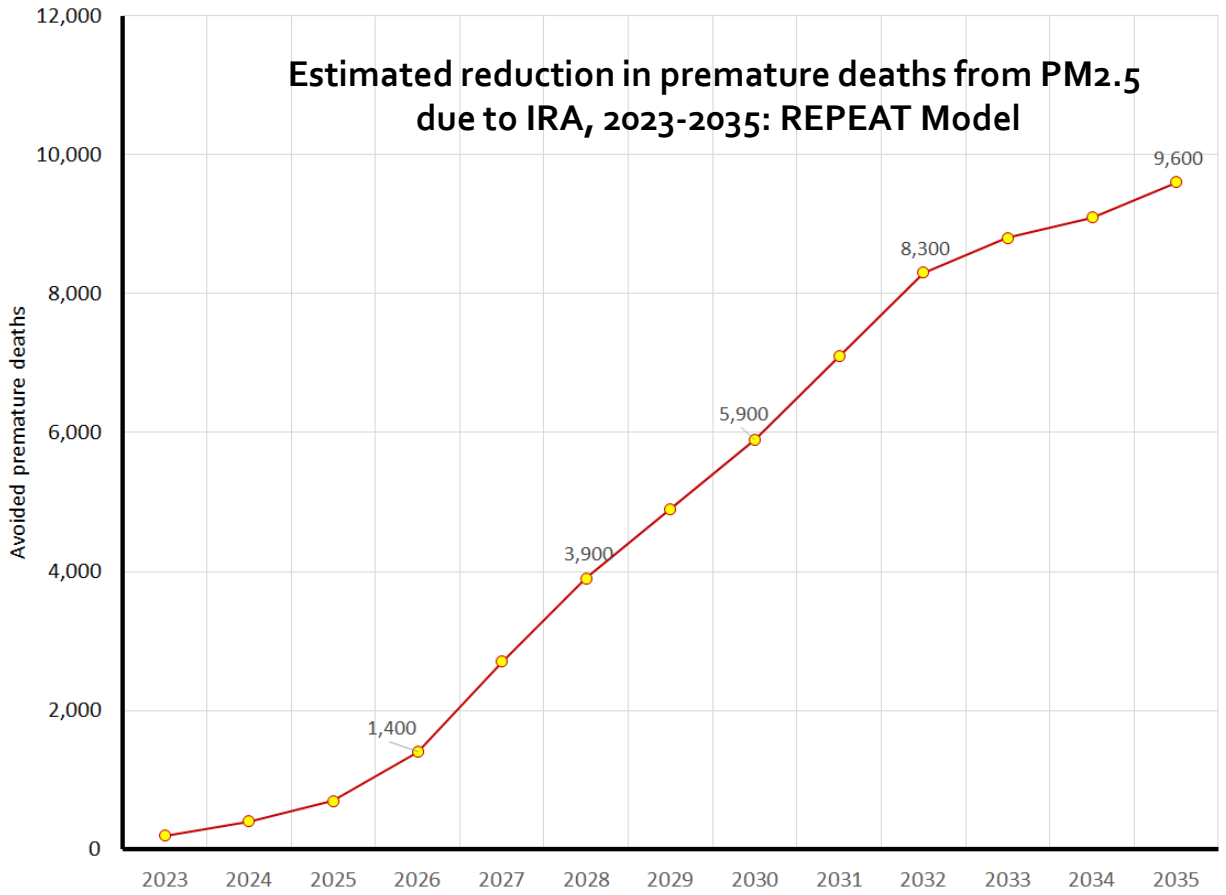
*See: Resources for the Future, "Comprehensive Evidence Implies a Higher Social Cost of CO_2" (September 1, 2022), https://www.rff.org/publications/journal-articles/comprehensive-evidence-implies-a-higher-social-cost-of-co2/ (accessed October 4, 2022)

Social cost of carbon: \$51/ton CO_2e
Total social benefit: \$524 billion

Source: My calculations based on Jenkins, J.D., Mayfield, E.N., Farbes, J., Jones, R., Patankar, N., Xu, Q., Schivley, G., "Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act of 2022 ," REPEAT Project, Princeton, NJ, August 2022, https://repeatproject.org/docs/REPEAT_IRA_Prelminary_Report_2022-09-21.pdf (accessed October 4, 2022)

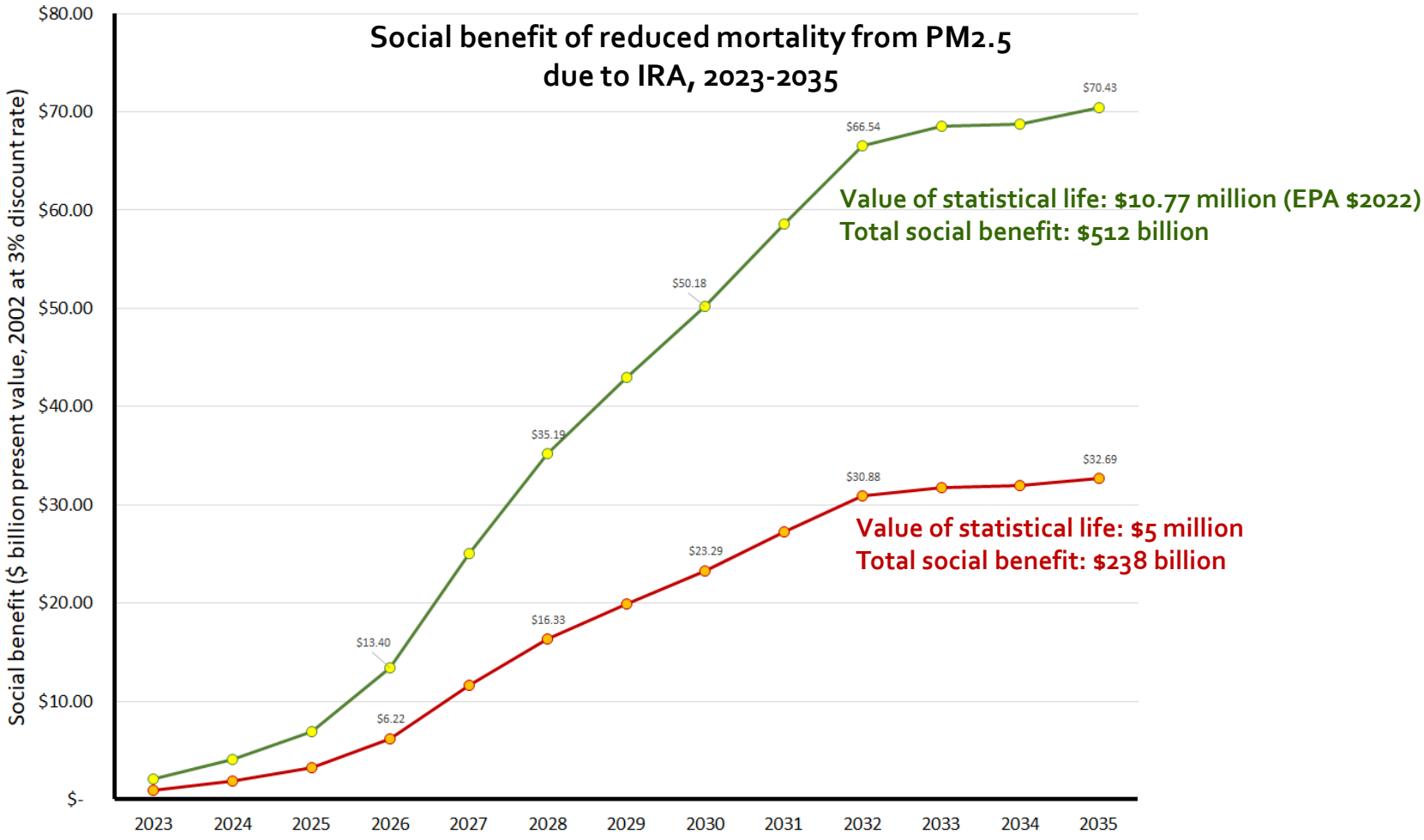
Premature deaths avoided due to reduced fine particulate matter (PM 2.5) resulting from Inflation Reduction Act

- IRA reduces emissions of PM2.5, primarily through:
  - Shift from coal-based electricity production to renewable-based electricity production
  - Reduced usage of gasoline due to shift from internal combustion engine vehicles to electric vehicles
- PM2.5 is a deadly pollutant, so reducing it reduces the risk of premature death



Source: Jenkins, J.D., Mayfield, E.N., Farbes, J., Jones, R., Patankar, N., Xu, Q., Schivley, G., "Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act of 2022 ," REPEAT Project, Princeton, NJ, August 2022, https://repeatproject.org/docs/REPEAT_IRA_Prelminary_Report_2022-09-21.pdf (accessed October 4, 2022)

Social benefit of avoided premature deaths from PM2.5 due to IRA



Source: My calculations based on Jenkins, J.D., Mayfield, E.N., Farbes, J., Jones, R., Patankar, N., Xu, Q., Schivley, G., "Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act of 2022 ," REPEAT Project, Princeton, NJ, August 2022, https://repeatproject.org/docs/REPEAT_IRA_Prelminary_Report_2022-09-21.pdf (accessed October 4, 2022)

Summing up: net social benefits of climate provisions of IRA, 2032-2035 (at 3% discount rate)

Social benefits from reduced carbon emissions	≈ $500 billion to $1,500 billion
Social benefits from reduced mortality from PM2.5	≈ $240 billion to $500 billion
Other benefits or costs	• Increase in consumer welfare due to lower prices (electricity, EVs) • Increase in business profitability of "winners" (e.g., firms in clean energy sectors) less decrease in business profitability of "losers" (e.g., firms in fossil-based sectors) • Other benefits to U.S. from expansion of clean energy economy (e.g., reduced exposure to shocks in global oil markets) • Other public health benefits of reduced air pollution (e.g., reduced incidence of asthma)
Social cost: federal government outlays	≈ $275 billion (present value, 2022-2031 at 3%)
Net	≈$465 billion - $1,725 billion (at least)*

Inflation Reduction Act

- Overview
- Will it make a difference?
- Why the climate provisions of the IRA are a BFD
- A key next step
- Q&A

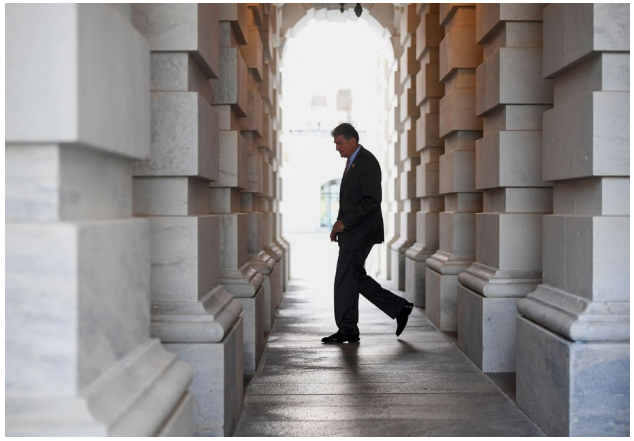
We need long-distance high-voltage transmissions line

- The IRA does not change two fundamental aspects of renewable-based electricity generation:
  - Intermittency
  - Geography of wind and sunshine resources versus geography of demand
- More high-voltage power lines needed to deal with both problems
- Princeton University Zero Lab* estimates that:
  - 80% of potential emissions reductions due to IRA will not be realized if growth in transmission line capacity remains at current rate of about 1% per year
  - 25% will not be realized if transmission line capacity increases at 1.5% annually
  - Need growth in transmission line capacity of 2.3% to realize estimated reductions shown earlier in this presentation
- Key public policy challenge:
  - Unlike interstate natural gas and oil pipelines which are regulated by the federal government (through Federal Energy Regulatory Commission or FERC), long-distance transmission lines are regulated by individual states

*Source: Jenkins, J.D., Farbes, J., Jones, R., Patankar, N., Schivley, G., "Electricity Transmission is Key to Unlock the Full Potential of the Inflation Reduction Act," REPEAT Project, Princeton, NJ, September 2022, https://repeatproject.org/docs/REPEAT_IRA_Transmission_2022-09-22.pdf (accessed October 6, 2022)

Manchin “permitting bill”

- Expedites Mountain Valley pipeline through West Virginia
- Places two-year limit on time to conduct environmental impact assessments for oil and gas pipelines and other infrastructure projects under the National Environmental Policy Act
- Places limits on time for court challenges under NEPA
- Extends some federal government authority over high-voltage, long-distance power lines by allowing the President to designate up to 25 high-priority energy infrastructure projects that would receive priority federal review
- Though imperfect, it does more good than harm (I believe), but for the moment it is now dead



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Northwestern
Kellogg

Thank You!