Economic Implications of the Climate Provisions of the Inflation Reduction Act

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Introduction

Motivation

The Inflation Reduction Act is the largest US Federal commitment to climate change to date.

Early models yielded different estimates of:

- emissions impacts
- fiscal costs
- impact on new investments

Key questions and approach

Key questions:

1. What are the implications of IRA for energy markets?

2. What are the macroeconomic implications of the climate provisions of IRA?

3. How does IRA's subsidies approach compare to a carbon tax?

Approach:

- Implications for energy markets using US-REGEN model

- Macro impact via analytical model and FRB/US

IRA subsidizes clean energy investment

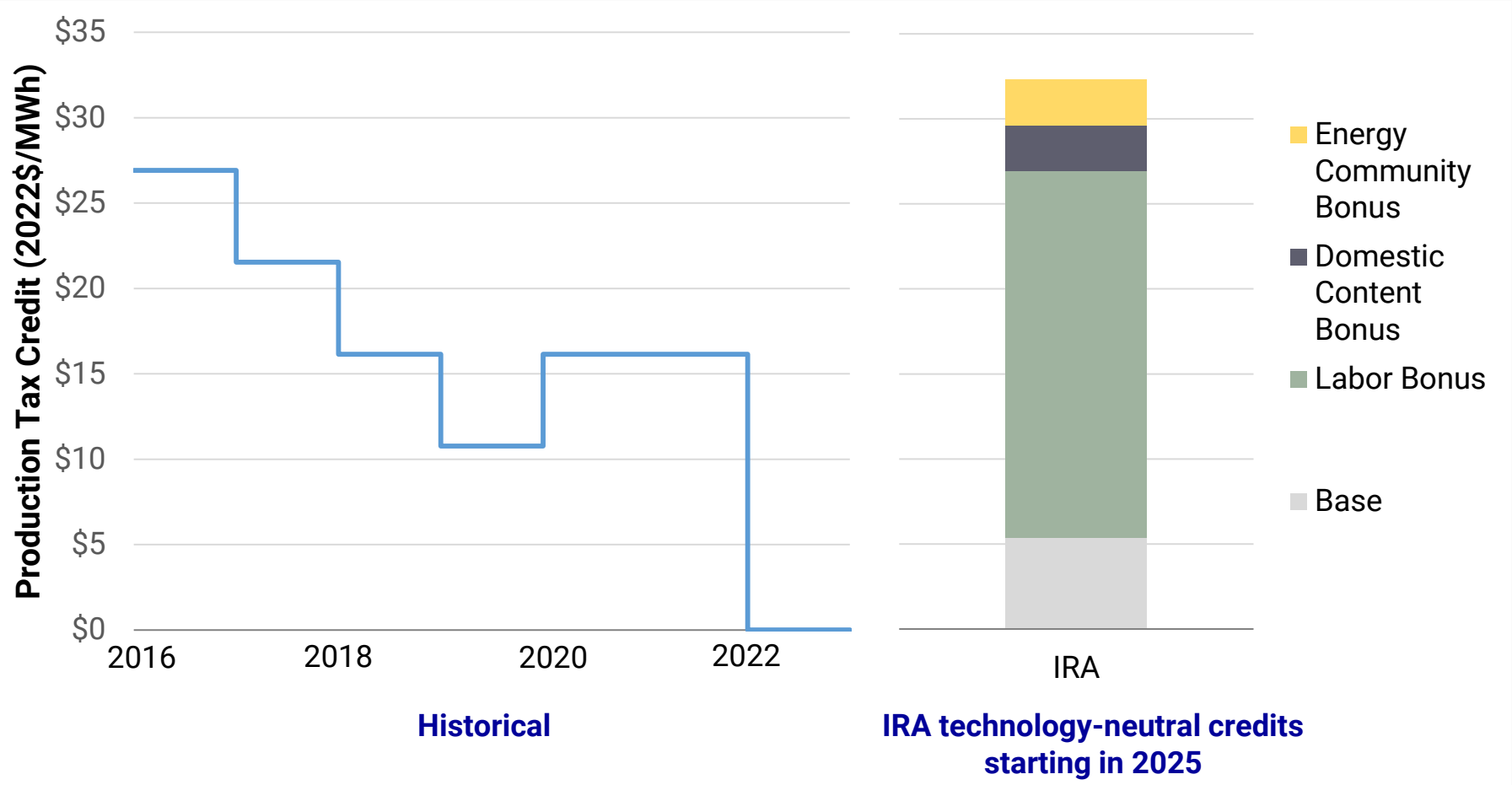
Major categories:

- Clean electric power generation:
  - Investment tax credit (ITC) and production tax credit (PTC)
  - Uncapped, expiring only after emissions targets are reached
  - Bonuses for meeting labor and domestic sourcing req.
- Electric vehicles and residential appliances:
  - $7500 EV tax credit subject to sourcing/income req.
- Carbon capture and clean fuels:
  - Larger financial incentives allowing for fossil fuel CCS (45Q)
  - Tax credit for clean hydrogen (45V)

Joint Committee on Taxation and Congressional Budget Office scored climate provisions at $392 bn over 10 years

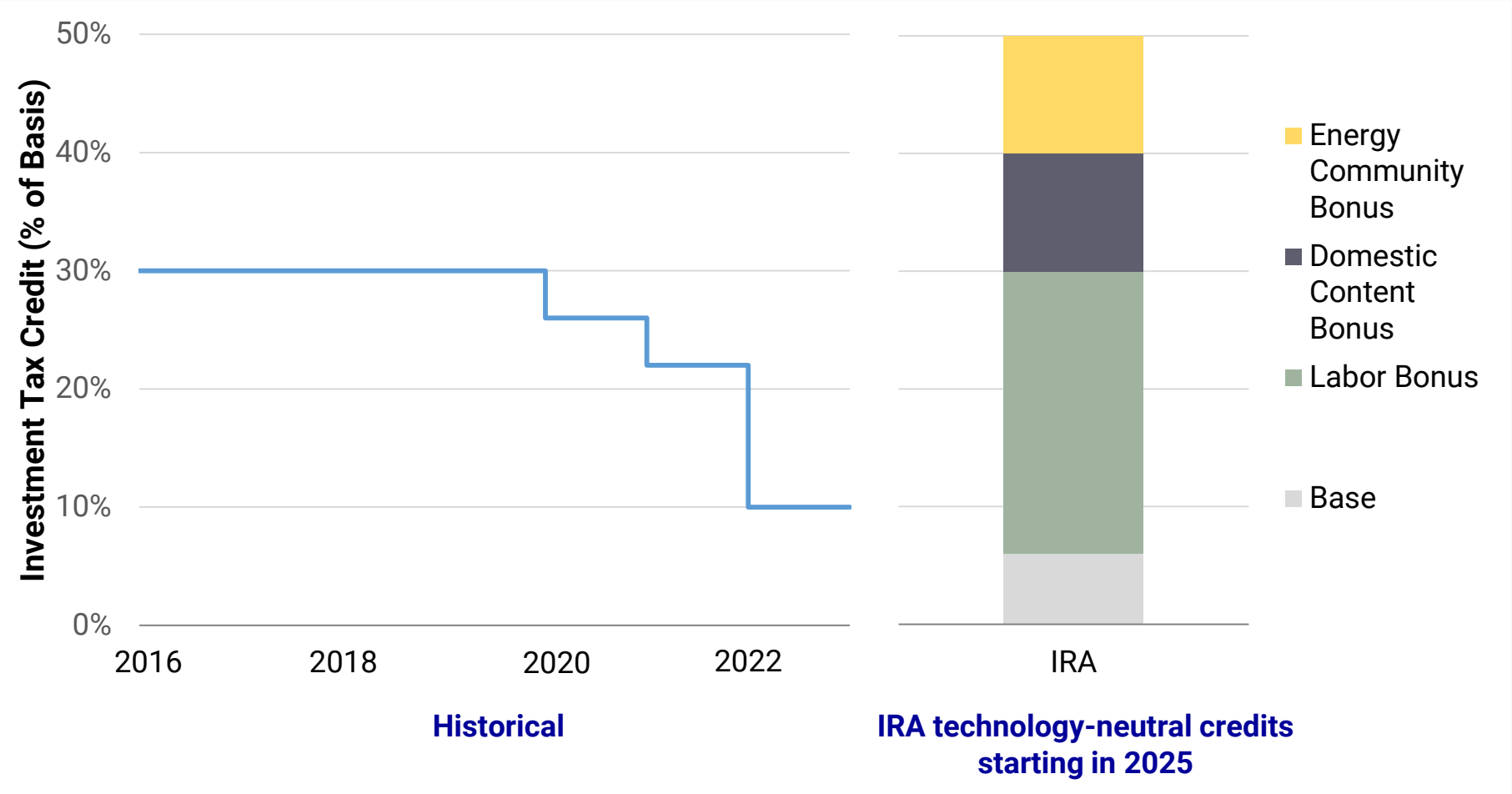
IRA tax credits relative to previous credits

Production tax credit



IRA tax credits relative to previous credits

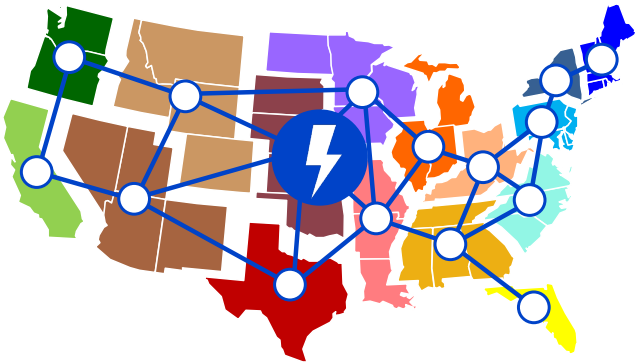
Investment tax credit



Micro Impacts

Overview of US-REGEN

Electric Generation



Detailed representation of:

- Energy and capacity requirements
- Renewable integration, transmission, storage
- State-level policies and constraints

Integrated

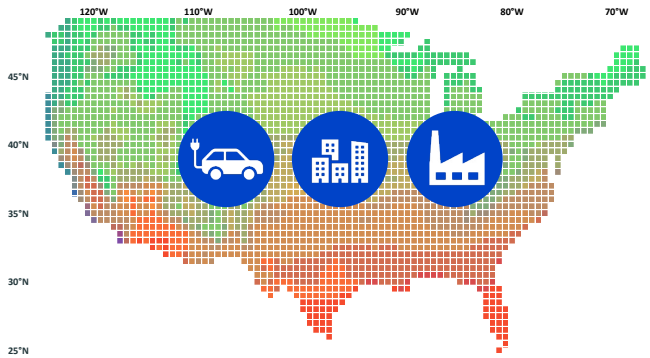
Hourly Load, Renewables, and Prices

Modeling Approach:

Intertemporal cost minimizing for electricity sector

Individual utility-maximization (logit models) for end-use energy

Energy Use



Detailed representation of:

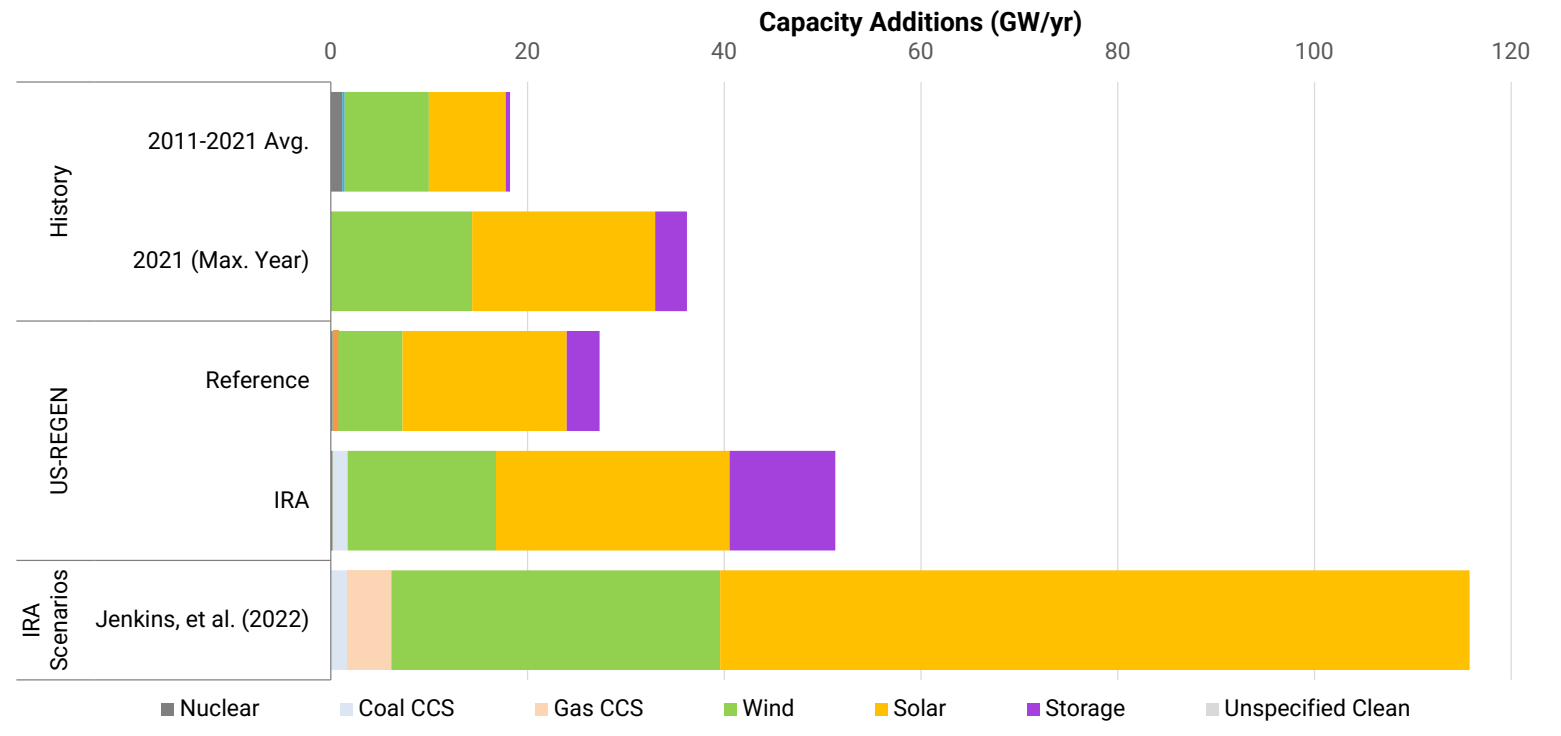
- Customer differences across end-use sectors
- End-use technology trade-offs (logit models)
- Electrification and efficiency opportunities

Documentation, articles, and reports available at https://esca.epri.com

Science IRA multi-model comparison available at: https://www.science.org/stoken/author-tokens/ST-1277/full

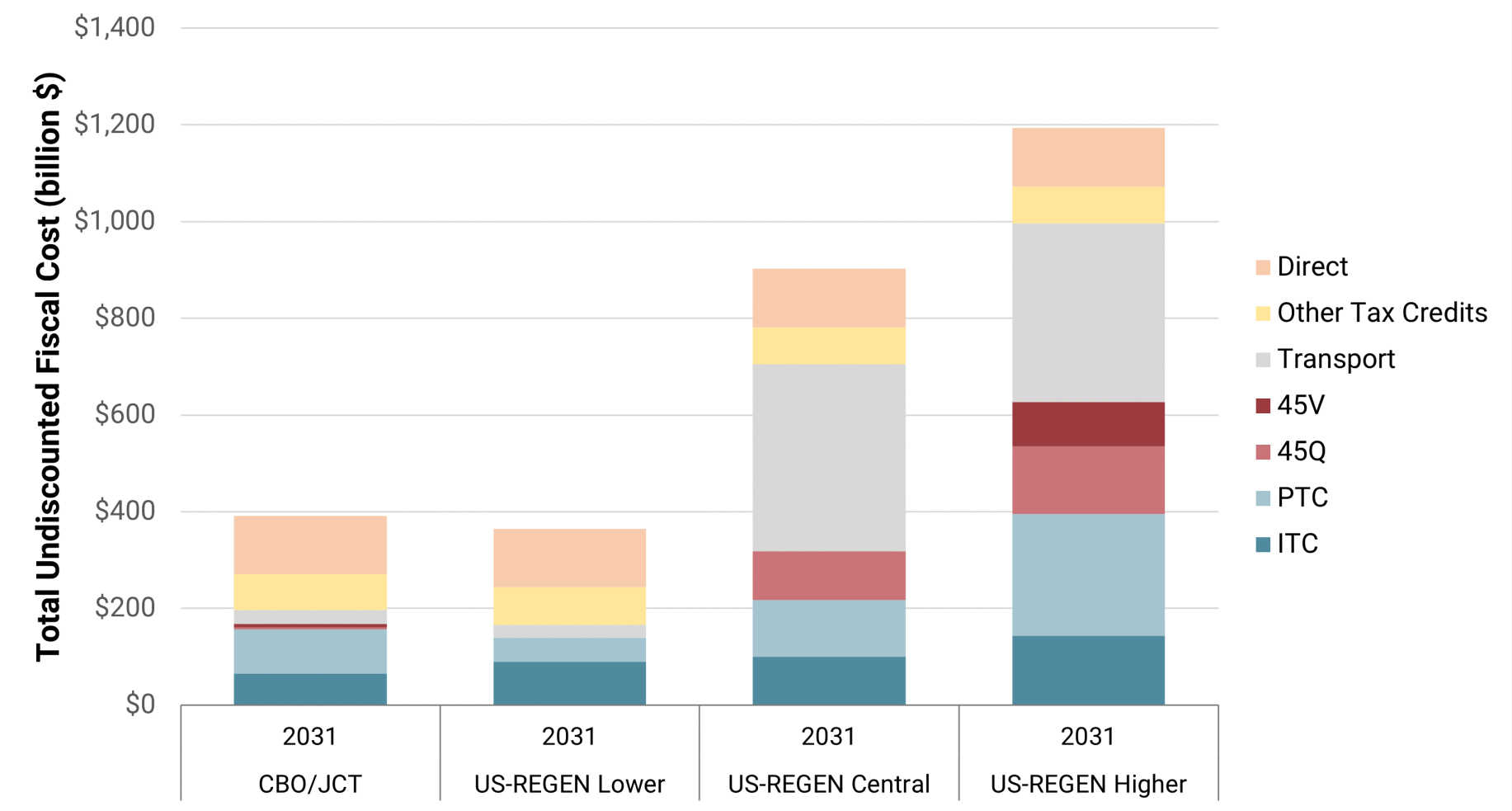
Increase in clean electricity investment due to IRA

- US-REGEN projects 50% increase in clean electricity investment relative to 2021
- US-REGEN central projection is moderate relative to some other modeling

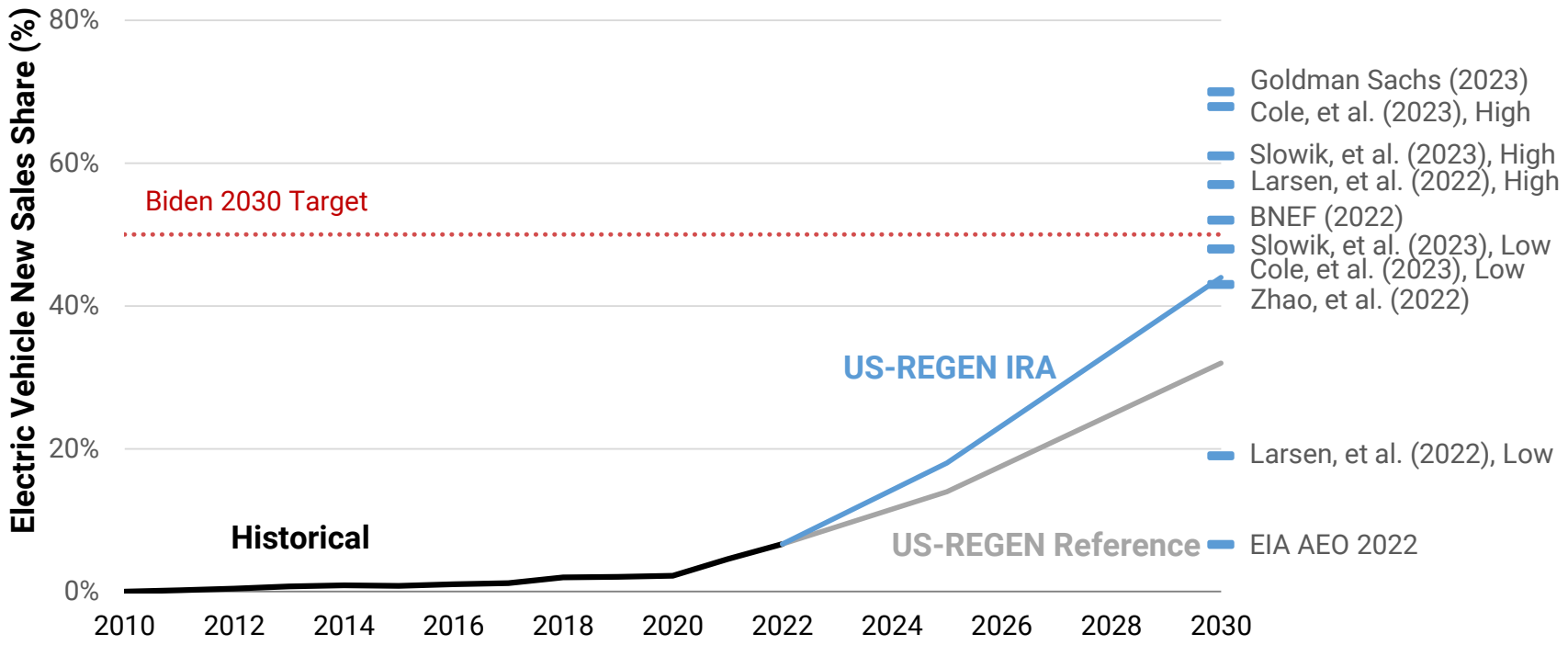


Projections of range of fiscal costs

Comparison of REGEN and JCT/CBO score

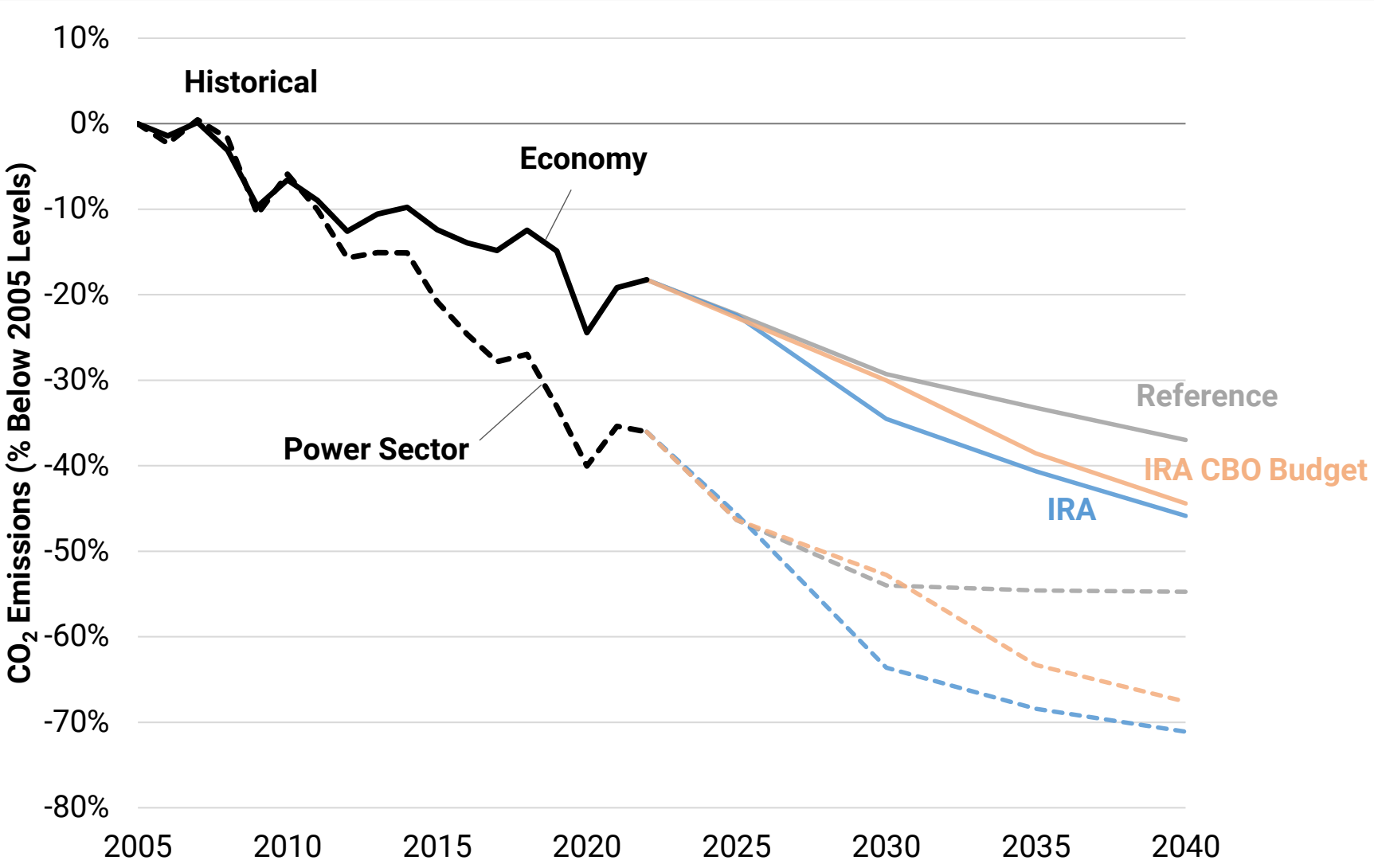


EIA estimates of EV sales lower than other models

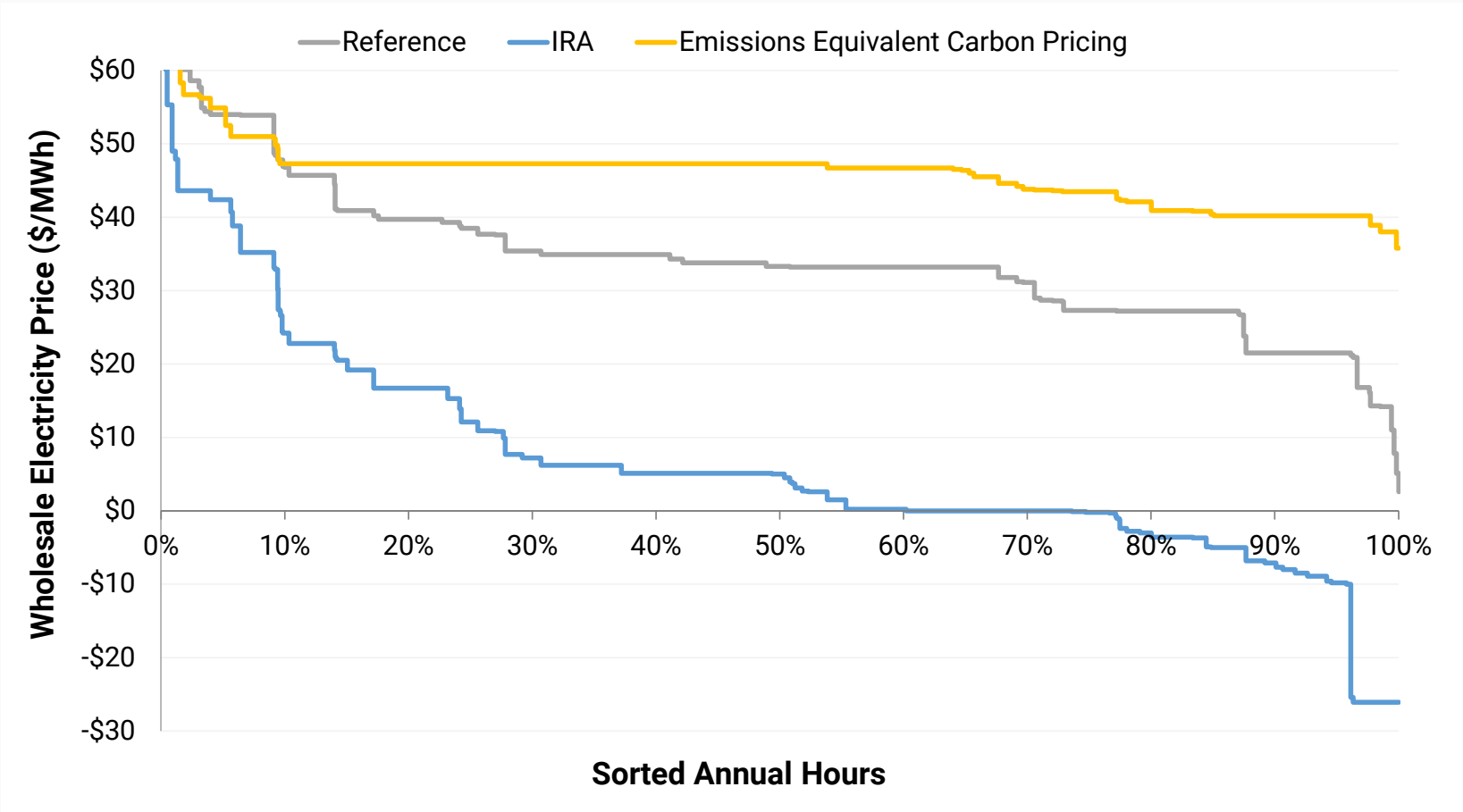


IRA lowers carbon emissions by 7 pp in central case

Emissions relative to 2005 levels

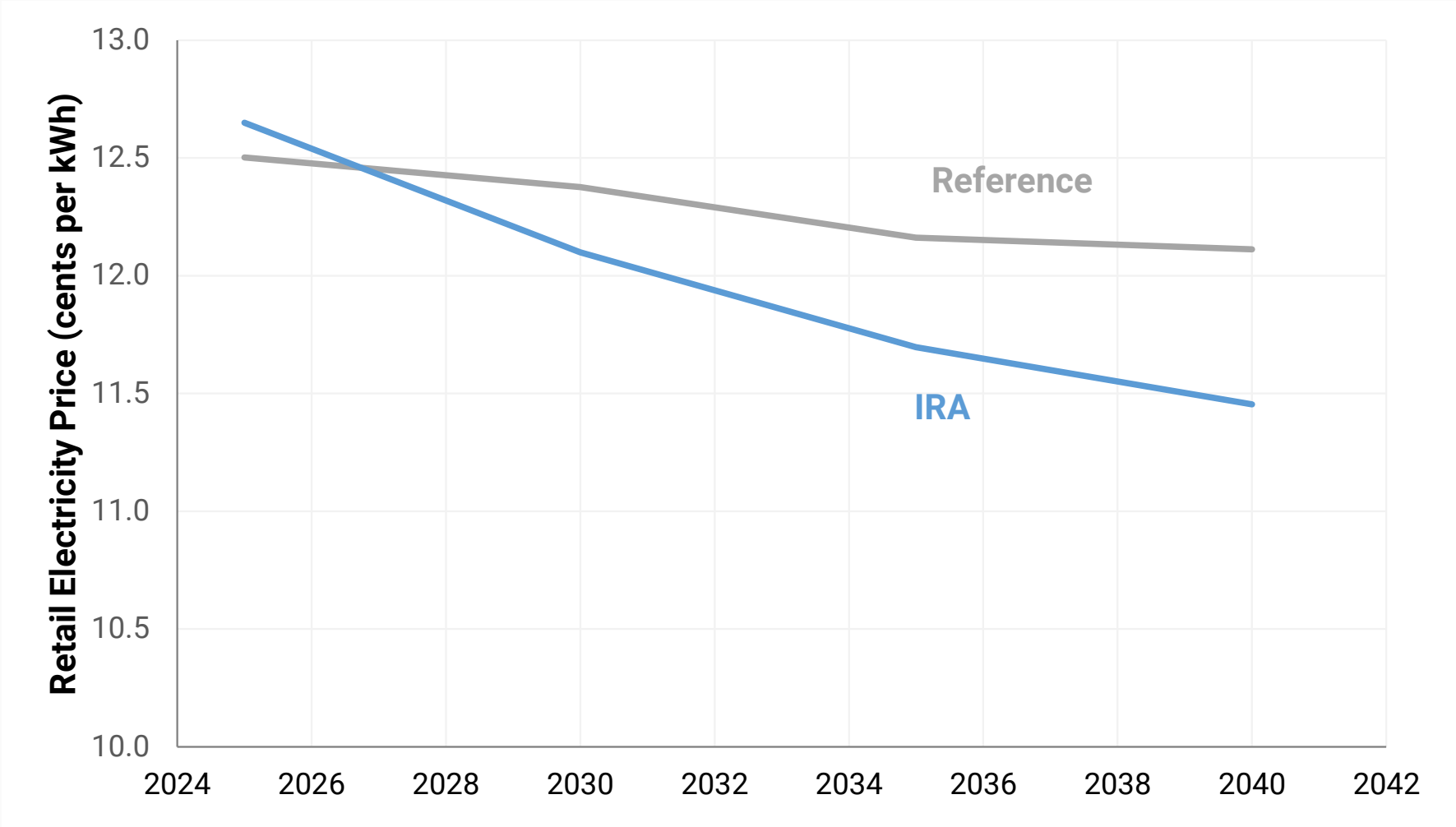


IRA raises possibility of negative electricity prices



- Projections for Southwest Power Pool in 2050
- Wholesale price could be zero or negative for almost 50% of hours

IRA decreases retail electricity prices



Macro Impacts

Climate provisions expand potential in the long run...

Steady state effects:

- Decrease in electricity prices raises production
- Increase in output, wages, consumption, and labor productivity
- Long-run *crowding in* of capital and increases in employment

. . . but raise demand in the short-run

Transition path:

- Energy investment increases immediately, while output is fixed
- Consumption falls and real interest rates rise
- Crowding out extends to fossil fuel and non-energy capital

Bottlenecks:

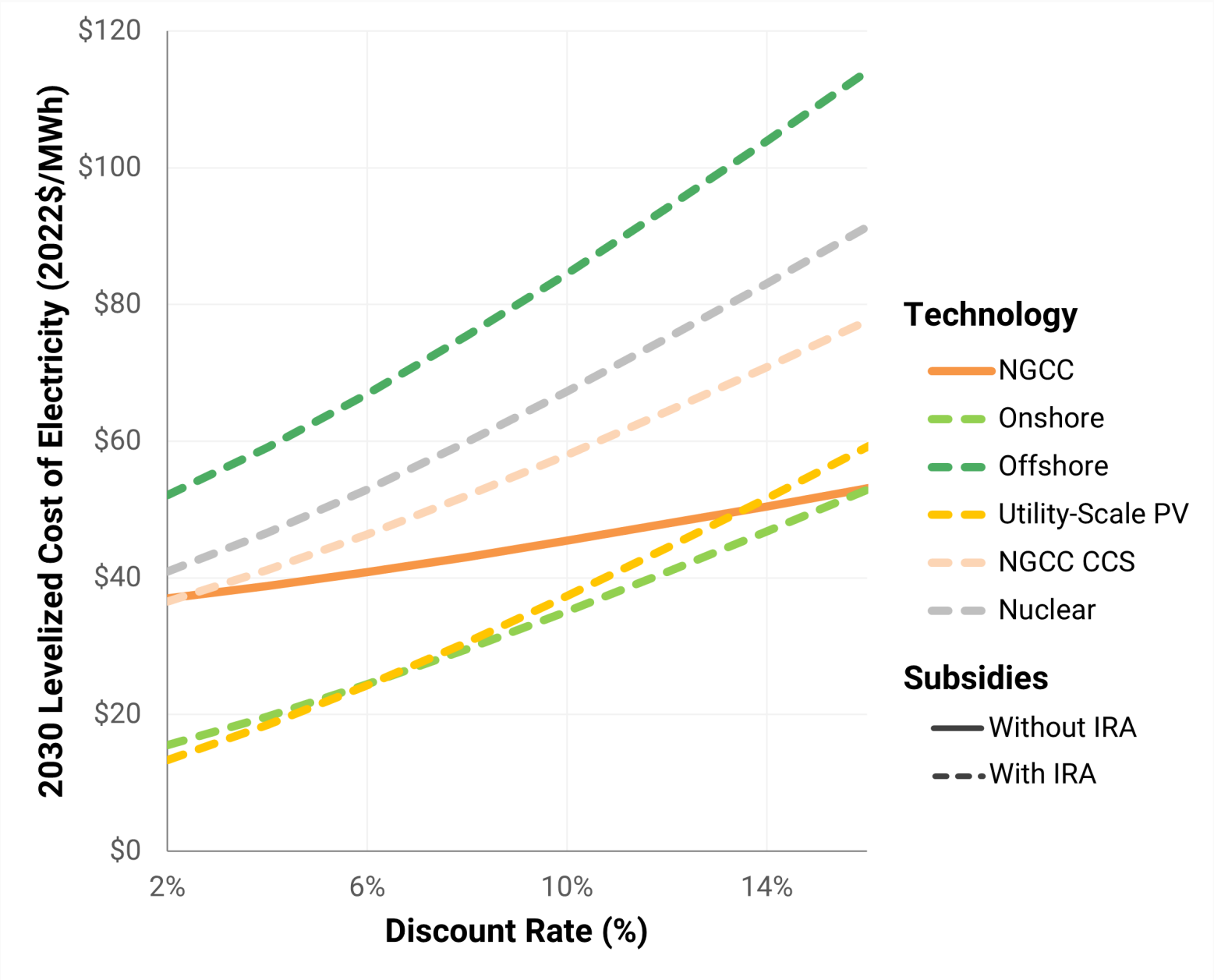
- Bottlenecks constrain initial investment, slow transition
- Bottlenecks may raise fiscal cost under ITC
  - PTC proportional to *real* investment but ITC proportional to *nominal* investment
- Increases in price of capital but lower path for real interest rate

Transition impacts are likely modest

	Nominal, 2018-2022 averages		REGEN IRA impact, 10-year avg
	$ billions	% of GDP	$ bn (2022)
Electric power structures	79	0.4	21
Electrical transmission and distribution	52	0.2	7

- Substantial structures investment but modest in aggregate
- FRB/US finds demand effects result in very small increases in output, employment, core inflation initially
  - Headline inflation falls due to lower retail electricity prices
- Important limitations to FRB/US modeling:
  - Lack of detailed electricity or energy market in FRB/US
  - Not modeling effects of IIJA and CHIPs Act

Higher interest rates negatively impact clean energy generation



Policy Considerations

Carbon tax delivers lower abatement costs

Metric (units)	2021	IRA Scenario 2030	IRA Scenario 2035	Carbon Tax 2030	Carbon Tax 2035	Difference (p.p.) 2030	Difference (p.p.) 2035
Generation Share (%)							
Coal	22%	11%	8%	7%	4%	-4%	-5%
Coal CCS	0%	3%	3%	0%	0%	-3%	-3%
Gas	39%	20%	18%	35%	34%	15%	17%
Gas CCS	0%	0%	0%	0%	0%	0%	0%
Other	2%	9%	11%	7%	8%	-2%	-3%
Nuclear	19%	17%	14%	17%	16%	0%	2%
Hydro	6%	6%	6%	6%	6%	0%	0%
Wind and Solar	13%	33%	41%	28%	32%	-6%	-9%
CO_2 (% Drop from 2005)	35%	64%	68%	64%	68%	0%	0%
Generation Price ($/MWh)	$64	$56	$52	$65	$62	16%	20%
Abatement Cost ($/t-$CO_2$)	N/A	$45-61	$45-61	$10	$10	-85%	-82%

- Only modeling the power sector
- Carbon tax leads to more gas generation, less coal and renewables

IRA highly cost-effective relative to estimates of the social cost of carbon

- Again, only modeling the power sector
- Compare IRA to alternative, not to Almighty

Conclusion

Key takeaways

1. What are the implications of IRA for energy markets?
   - 50% increase in renewable power generation with $900 bn in fiscal expenditures over 10 years
   - Possibility of very low or negative wholesale electricity prices; retail rate impacts are more limited

2. What are the macroeconomic implications of the climate provisions of IRA?
   - Long-run supply side benefits from lower electricity prices
   - Higher interest rates and upstream costs could negatively impact clean energy investment

3. What are the merits of IRA's subsidy approach relative to a carbon tax?
   - Optimal policy favors carbon tax over subsidy approach
   - IRA subsidies highly cost-effective relative to SCC

Several follow-on questions

1. What are the distributional implications of IRA?
    - By income
    - By geography
    - By demographic characteristics
2. What are the best complementary policies to drive additional emission reductions?
    - Fiscal impacts likely a key consideration in 2025 (end of TCJA (2017) tax cuts, growing concerns about deficit)
    - Coordination with other large emitters also a key consideration