Carbon Fee & Rebate Policy for DC

ECONOMIC IMPACTS ANALYSIS WITH REMI PI+

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Who am I?

- Program Manager, Center for Climate Strategies (www.climatestrategies.us)
- Subnational/International Climate Policy Analyst ~10 years
  - USAID, NREL
  - State Climate Action Plans (KY, NY, PA, MD, MN)
- REMI Journeyman
  - Southern California (SCAG) Long-range Transportation Plan
  - Oregon and Washington Low-Carbon Fuel Standard
    - Detailed Supply Scenarios
  - PA Climate Action Plan 2015 Update – 12 policies, energy efficiency
  - Minnesota CSEO (climate action planning) – 20 policies, multiple sectors
  - DC Carbon Price!

Carbon Fee & Rebate: The Central Concept

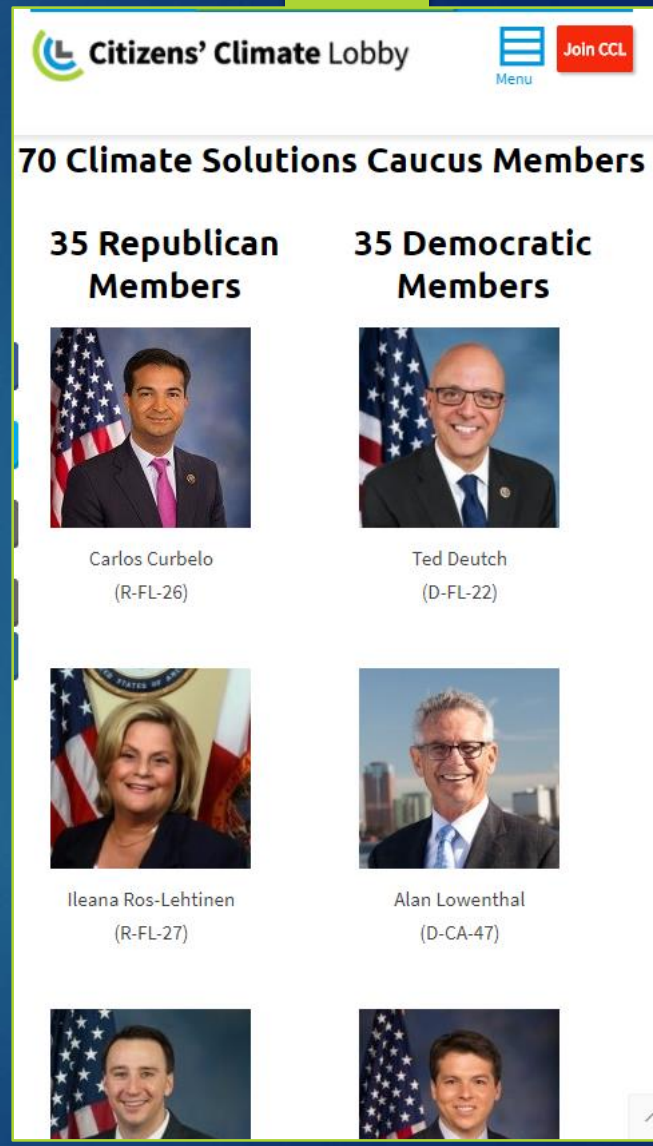
- Low, but steadily rising, price applied to carbon sources
  - Electricity, heating fuels, transportation fuels – charge set by emissions intensity, *not* per unit energy
  - Aggressive designs: $25+/ton fee level, rising $10+/ton every year
  - Milder designs: <$20/ton, rising 5% every year – nearly flat vs. inflation
- Price Signal – crucial to design!
  - Long-term policy – rising price announced over 10+ years
  - Homes and businesses: Opportunity to avoid – and Time to avoid – tax burden. ***3 year plan-ahead → ~30% larger response!***
- Return of Revenue to Economy
  - Never general revenue, or paying off a bond
  - $$, green investment, tax offsets – or a mix?
- No Cap, No Credits – Not a Cap & Trade

Carbon Fee & Rebate: Intended Market Shift

- Incentive to Power Suppliers (who pay the fee directly):
  - Lower tax burden on clean energy sources (less tax per MWh) – more price competitive
  - Low-emissions sources offer improved competitiveness, faster ROI
- Incentive to households and businesses (who see fee reflected in bills:
  - Switch to clean sources, adopt efficiency measures
- Potential for efficiency vs. distortion:
  - Administrative simplicity vs. more complex approaches (depending on revenue use, of course)
  - Redirection of revenue – driver of stimulus, investment, or tax reduction

Carbon Fee & Rebate: Perceived Political Advantage

- Market Friendliness & Absence of Mandate
  - Attractive to those who prize regulated-party flexibility
- Moderate/Bipartisan Appeal
  - Centrist groups, Reagan Republicans, etc. in vocal support
  - Bipartisan Groups (CCL, CLC, Bipartisan caucus) behind the concept
  - Conservatives seek alternative to regs (clean air, clean water)
- State-level interest
  - Canadian examples influential (BC, Alberta)
  - NE States: RGGI covers electricity only – no transportation or heating fuels



Results of Related Studies: The National Scenario

- Citizens Climate Lobby: 100% Cash Back!
  - $10/ton in 2016, $20 in 2017, $30 in 2018…. $200/ton in 2035
  - Family of 4: $290/month cash benefit in 2025, ~$400/month in 2035

- Border adjustment
- Emissions: 50%+ less
- Employment: 2.5M+
- GDP: $70-85B/year+

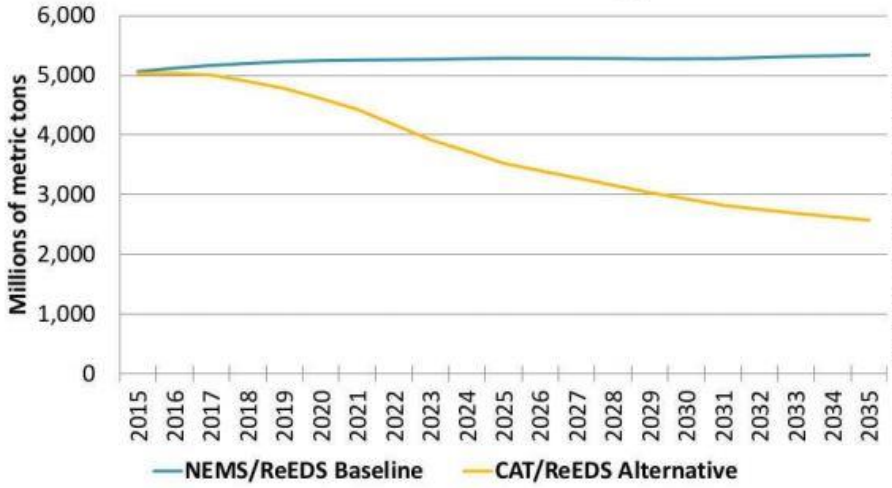


Figure 1: **U.S. CO2 emissions** under F&D (yellow) and without a carbon tax (blue). F&D reduces US emissions to 69% of 1990 levels by 2025, and to 50% by 2035.

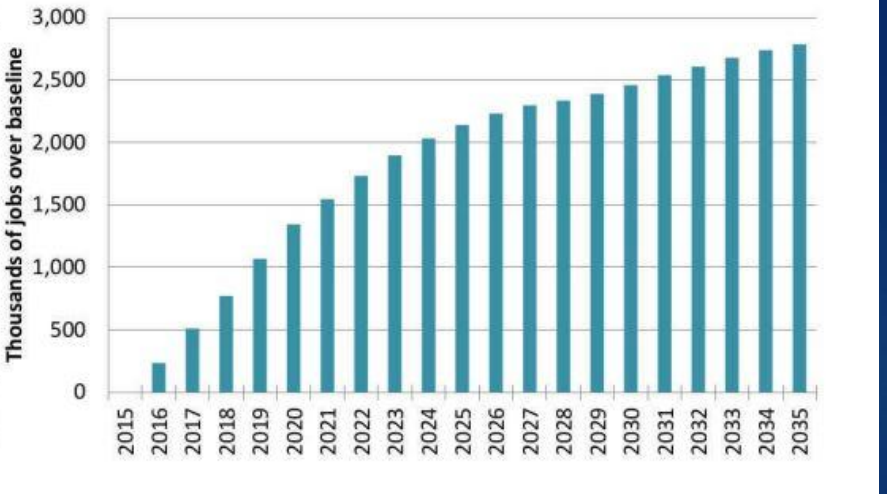


Figure 2: **Thousands of jobs created** by F&D relative to the case without a carbon tax. Over a million jobs created within 4 years, over 2 million within 9 years.

Enough Talk, Williamson – To the DC Study!

Studying a Fee/Rebate in DC

"Put A Price On It DC" – www.carbonpricedc.org

- Stakeholder coalition, 2 year campaign
  - Lead: Chesapeake Climate Action Network
- Unique policy design
  - Multiple uses of resulting funds – rebate to homes, investments, tax offsets to businesses
- Differences from CCL and other national studies – many!
  - Price levels, Border adjustment issues, Revenue uses
- Difference from other NE state-level analyses
  - No RGGI
  - No in-state power generation!

Elements of Scenario

- Fee: *$20/ton in 2019, increasing $10/ton each year*
  - 2027: $100/ton
  - 2032: $150/ton (the cap on the policy)
- Immediate payback of revenue:
  - 75% - 20% - 5%
- Commitment to progressive impact – lower-income households must be better off
  - Rebate weighted to low-income residents
  - 85% of funds allocated evenly; 15% used to enhance low-income rebate
  - Result: ~30% of population receives ~40% of the rebate funds

REMI as Policy Design Tool

- **It took a lot of runs to get to 75/20/5!**
- Multiple scenarios tested, iteration with decision-makers, through Spring & Summer 2017
- Multiple elements tested for relative impact
  - Rebate share: 70%, 75% or 80%? Or (like national study) 100%?
  - Tax offset to businesses: 0%, 5%, … or up to 30%?
  - Tax offset, or green investment? What balance?
  - Slow price increase (3%/year) or fast ($10/year)?
  - Cap: $100/ton or $150/ton? Or none?
- Goal: Balance policy-design goals – jobs production, emissions, business burden, progressive impact

What Gets Priced?

- Electricity Emissions
  - PJM mix
    - Context: DC RPS = 50% of electricity would be exempt from price by 2032
    - (Electricity getting cleaner already)
- Emissions from Gas & Other Heating Fuels
- Transportation: excise tax, parking meters, parking garages

- State-level border issues:
  - Avoiding leakage: gas/diesel taxed indirectly, not at pump
  - Inter-state & tourist travel: meter and garage fees
  - Offset to business costs – reduce, not just relocate, emissions

Modeling Specifics

INTO THE SPREADSHEETS WE GO!

Analytical Challenge #1: Modeling elasticity

- Workflow: CTAM and REMI
  - 2 Elasticity functions! Need to model response once, not twice!
- CTAM more detailed, more easily modified, on both elasticity and "stickiness"
  - Energy supply specificity
  - Stickiness
- Modeled *price response* (demand changes) in CTAM
- Modeled consequent *spending* and *revenue return* in REMI
- Using price variables in REMI: double-triggering elasticity functions

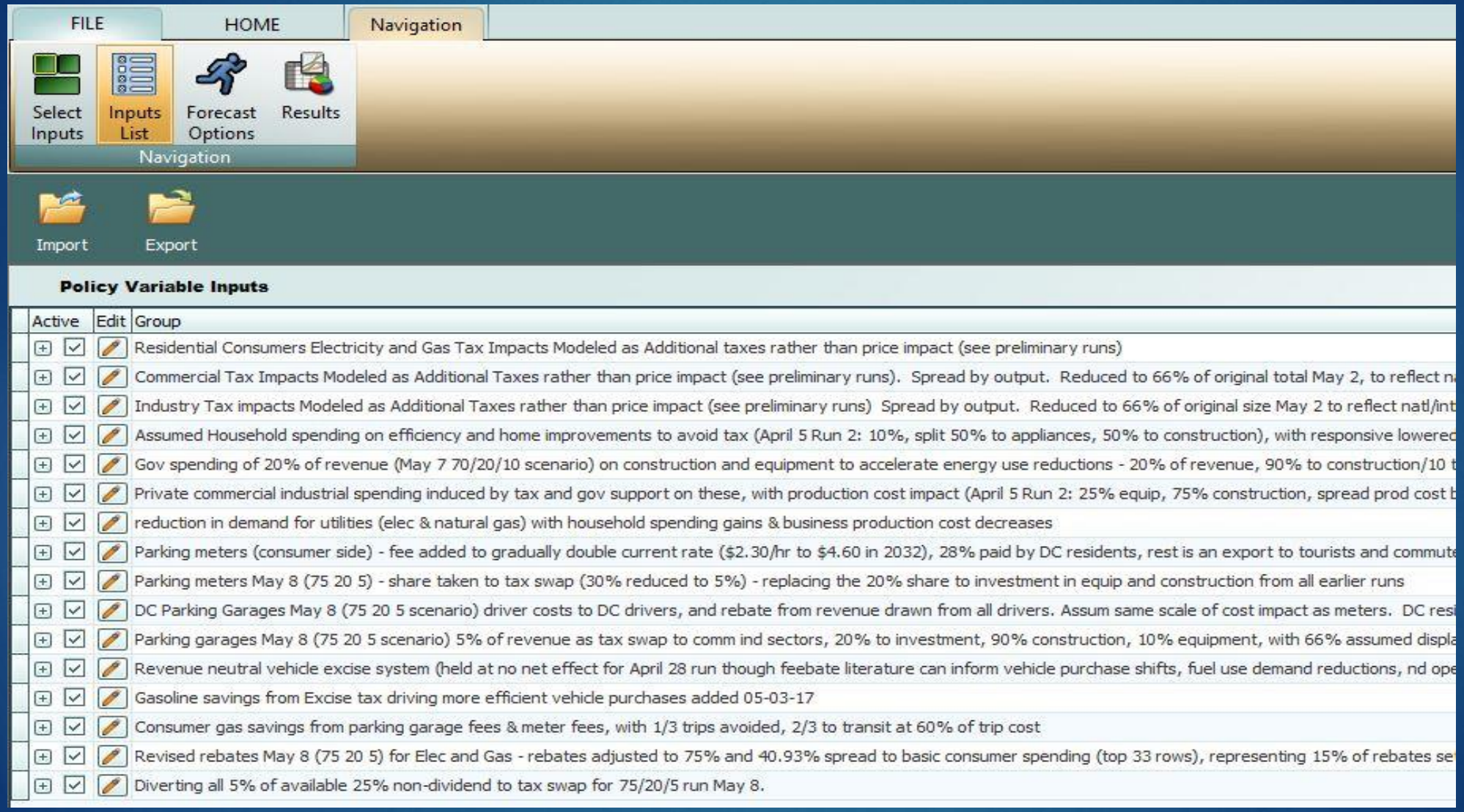
Analytical Challenge #2: Modeling a Price Signal

- Price response =/= *price signal* response
  - People, businesses will have some advance awareness – but not too much
- Planning ahead – how much?
  - Price on bill – or rebate check – as first awareness for many
  - Households =/= businesses, in terms of advance planning
- Other Assumptions: also moderate to conservative
  - Cost pass-through assumption: *100% of carbon price reaches end users*
  - Sources of private capital: mostly within DC (2/3 to 3/4)
  - Household and business investment capacity: low to moderate

Final Scenario: Direct Impacts

DC Carbon Fee-and-Rebate Initiative Summary of Projected Outcomes														
Scenario: $20 per ton fee, rising $10/year to $150 per ton in 2032. 75% of revenue to progressive rebate, 20% to investment, 5% to small business tax abatement														
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Fee rate (dollars per ton of greenhouse gas emissions)	$20	$30	$40	$50	$60	$70	$80	$90	$100	$110	$120	$130	$140	$150
Total revenue generated (millions, 2015$)	$140.9	$207.6	$275.6	$341.0	$404.5	$453.8	$503.8	$553.5	$605.7	$605.5	$609.6	$605.7	$601.7	$596.5
Total rebate to households (75% of all revenue, millions, 2015$)	$105.7	$155.7	$206.7	$255.8	$303.4	$340.4	$377.9	$415.1	$454.3	$454.1	$457.2	$454.3	$451.3	$447.4
Total green investment (20% of all revenue, millions, 2015$)	$28.2	$41.52	$55.1	$68.20	$80.9	$90.76	$100.8	$110.70	$121.1	$121.10	$121.9	$121.14	$120.3	$119.30
Total small business tax abatement (5% of all revenue, millions, 2015$)	$7.0	$10.4	$13.8	$17.1	$20.2	$22.7	$25.2	$27.7	$30.3	$30.3	$30.5	$30.3	$30.1	$29.8
DC general monthly rebate (family of four, 2015$)	$43	$63	$82	$101	$118	$131	$144	$157	$170	$169	$168	$166	$163	$160
Low-income monthly rebate (family of four, 2015$)	$74	$108	$142	$174	$204	$227	$249	$271	$294	$291	$290	$286	$282	$277
Emissions Reductions	1.1%	3.2%	5.2%	7.5%	9.7%	12.1%	15.8%	17.9%	18.8%	19.7%	20.5%	21.3%	22.1%	22.8%

Direct Impacts → REMI Inputs



Emissions Reductions

- Significant!
- DC on track to emit 7.5M – 8M tons per year (peak early 2020s)
  - DOEE Forecast
- Scenario: DC holds at 7.5M, starts to fall 0.2M per year
  - Final impact: below 6M tons in 2032
  - approx. *23% reduction* (Electricity & Gas)

REMI modeling rationale: Consumer Impacts

REMI Approach to Residential Impact:

- Lower demand for "utilities" (variable: *exogenous final demand*)
- Consumer saves money on utilities, which they can respend (variable: *consumption reallocation*)
- But the carbon price (larger than their demand-reduction savings by ~2.4x) lands on the consumer, passing through utility to DC Gov (variable: *Personal taxes*)

REMI modeling rationale: Commercial Impacts

REMI Approach to Business Impact:

- Lower demand for "utilities" (variable: exogenous final demand)
- Businesses save money on utilities (variable: production cost decreases, spread across sectors)
- But the carbon price lands on the consuming business, passing through utility to DC Gov (variable: production cost increases)
  - What about non-local ownership? National/multi-national businesses?
  - Assumption: only 2/3 of this cost absorbed within DC

REMI modeling rationale: Auto Excise Tax Change

Revenue-Neutral:

- Same total revenue collected from residents by government every year
- Change: higher excise for low-MPG cars, lower for high-MPG cars
  - How much? Based on Carbon Price!
- No expected change to # of cars purchased, just a shift in car types
- Only measurable $$ effect as REMI input: fuel savings.
  - Reduction in Consumer Spending on motor fuels/oils/lubricants sector
  - Offset with increase to Consumption Reallocation

Parking charges also modeled; now appear to be leaving policy design (small impact anyway)

Business Tax Abatement (5% of Revenue)

5% Share of total revenue spread across sectors generally as production-cost decrease

- Done with design specifics regarding this piece still undecided

Investment Fund (20% of Revenue)

20% share modeled as *exogenous demand increases* to:

- construction
- electrical equipment sectors

- Done without policy-design specifics in place; general assumption of a focus on big-ticket construction projects (construction, electrical equipment)
- Alternatives: Green Bank funding, transportation funding, matching funding to private investment – REMI approach would differ for each

The Rebate (75% of Revenue)

First Split:

- 85% of these funds spread equally to all households
- 15% set aside as additional rebates to households under 200% FPL
- Lowest-income ~30% of residents get ~41% of the money

Modeled:

- The 85% part – consumer spending increases to all sectors
- The 15% part – consumer spending increases to most but not all sectors (cut out foreign travel, investment services, etc.)

Making the model do it right:

- offsetting transfer payments vs consumption reallocation
- simple spending changes model misrepresented the income received

Final Scenario: Economic Impacts from REMI

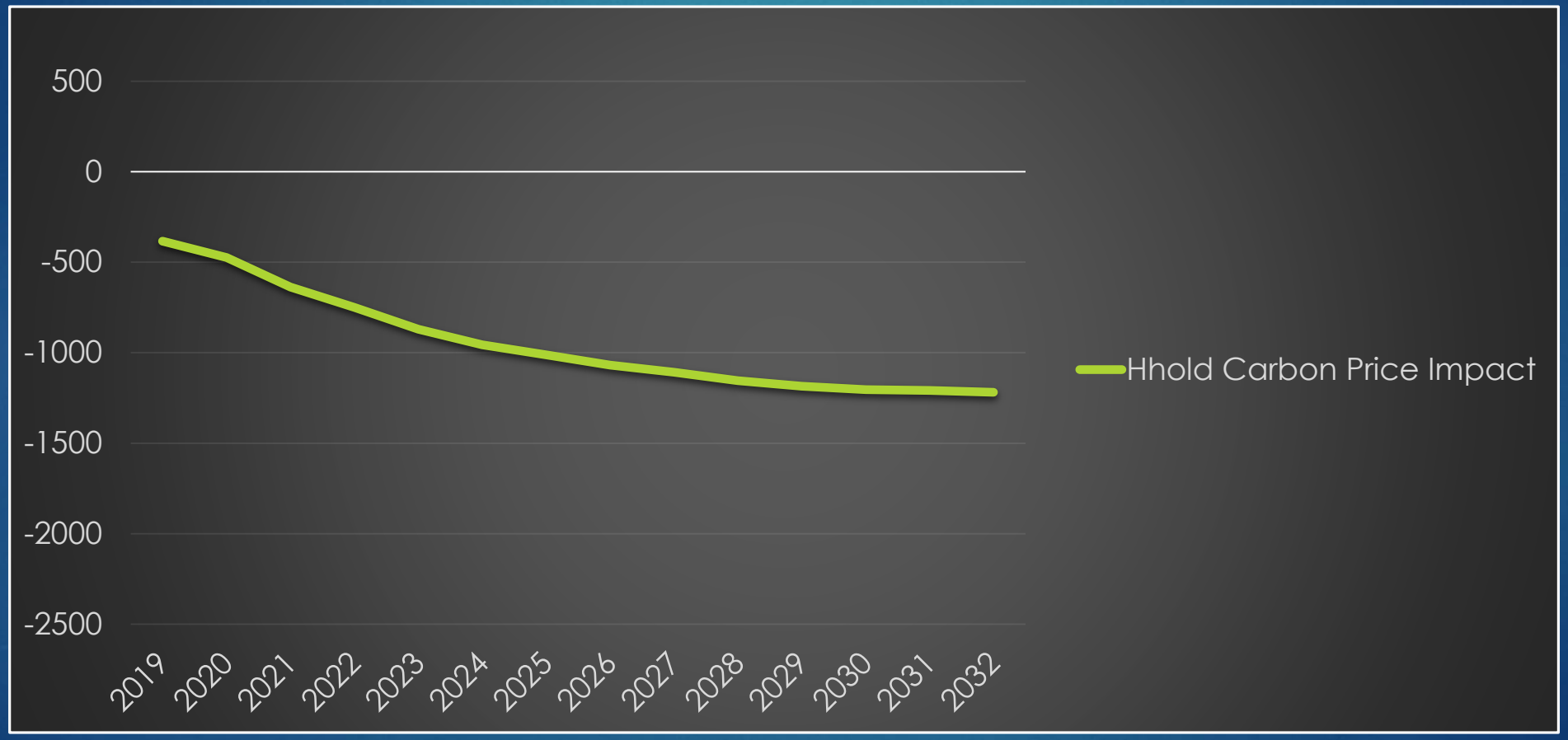
Jobs increase – net gain of 500+ new positions

- Top winners: construction, retail, nightlife, health care
- Sectors shedding jobs: utilities, consulting/legal/technical services

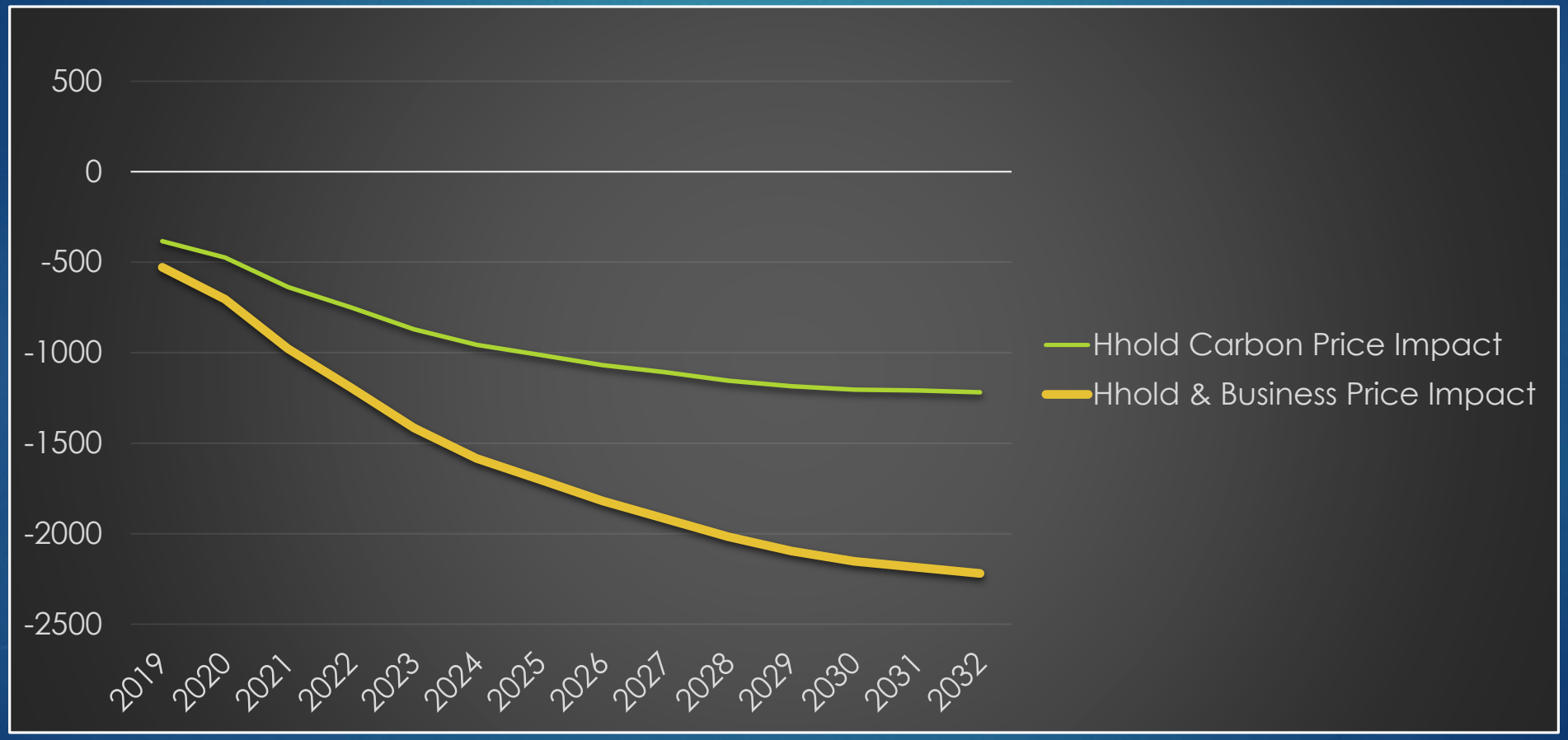
Net Neutral Overall Effect

- 500 more jobs: <0.06% of employment – a tiny change
- GDP, Incomes, Value Added, Output: <0.1% change

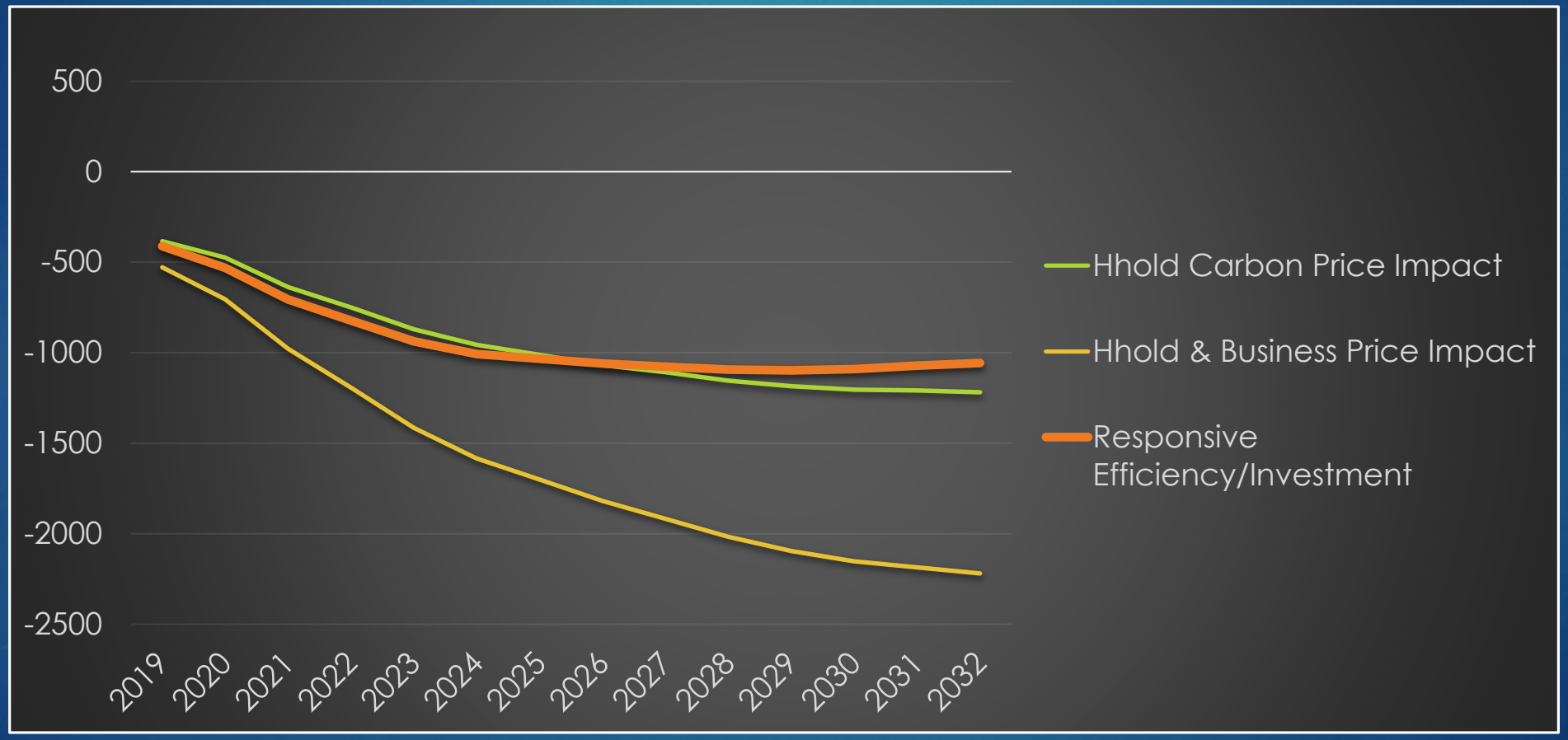
Understanding the Jobs Impact:
1. Isolating Carbon Price



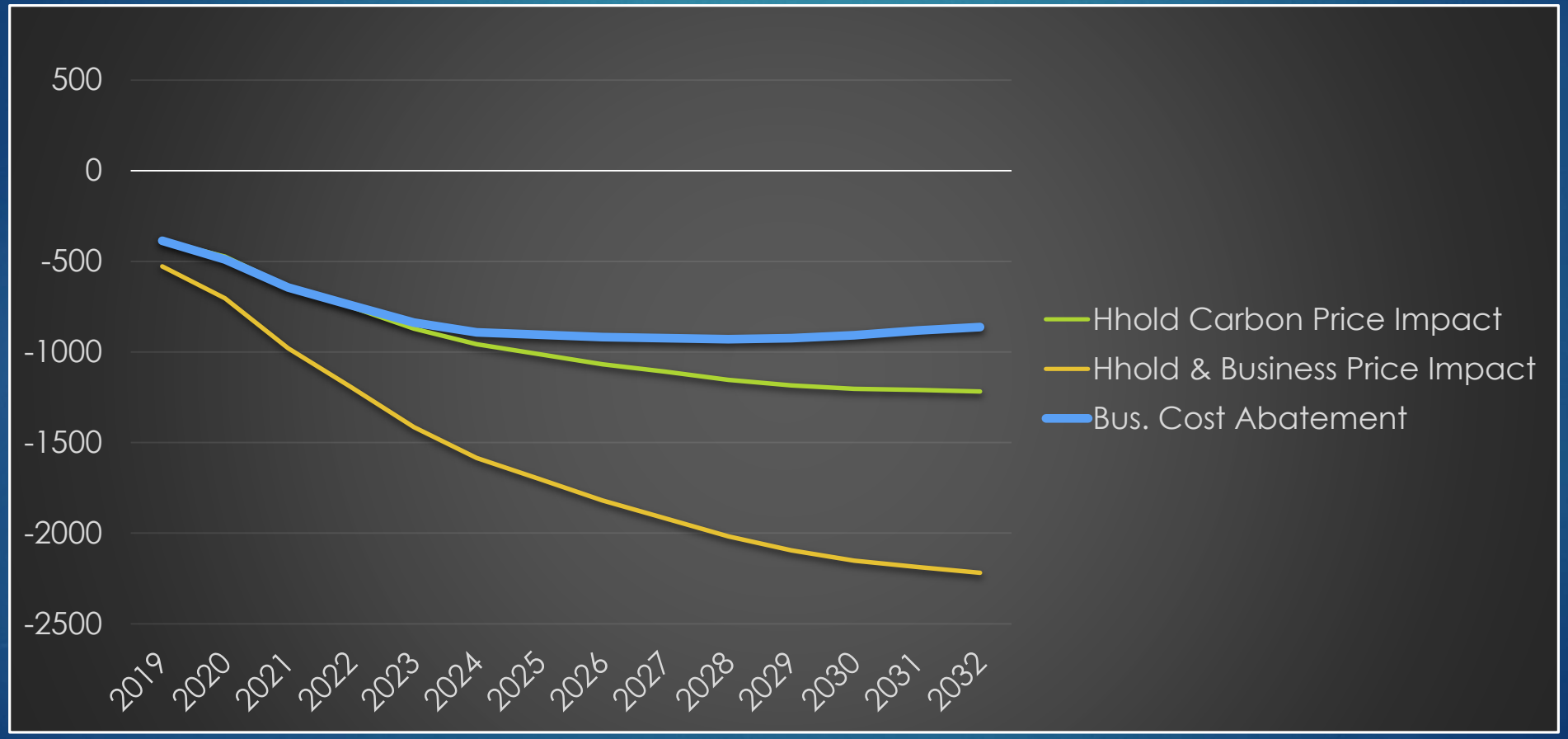
Understanding the Jobs Impact:
2. *Isolating Carbon Price*



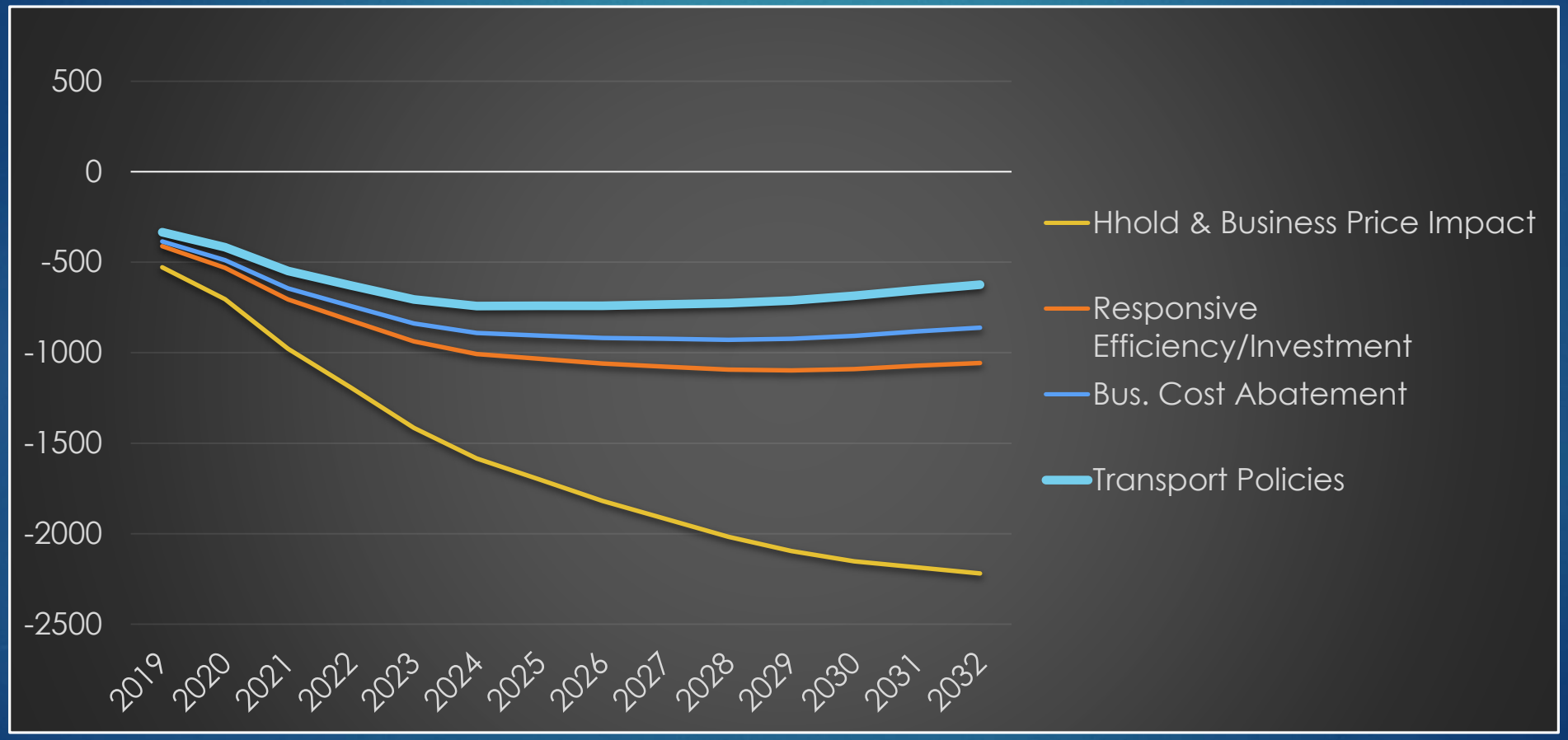
Understanding the Jobs Impact: *3. Families & Businesses Respond*



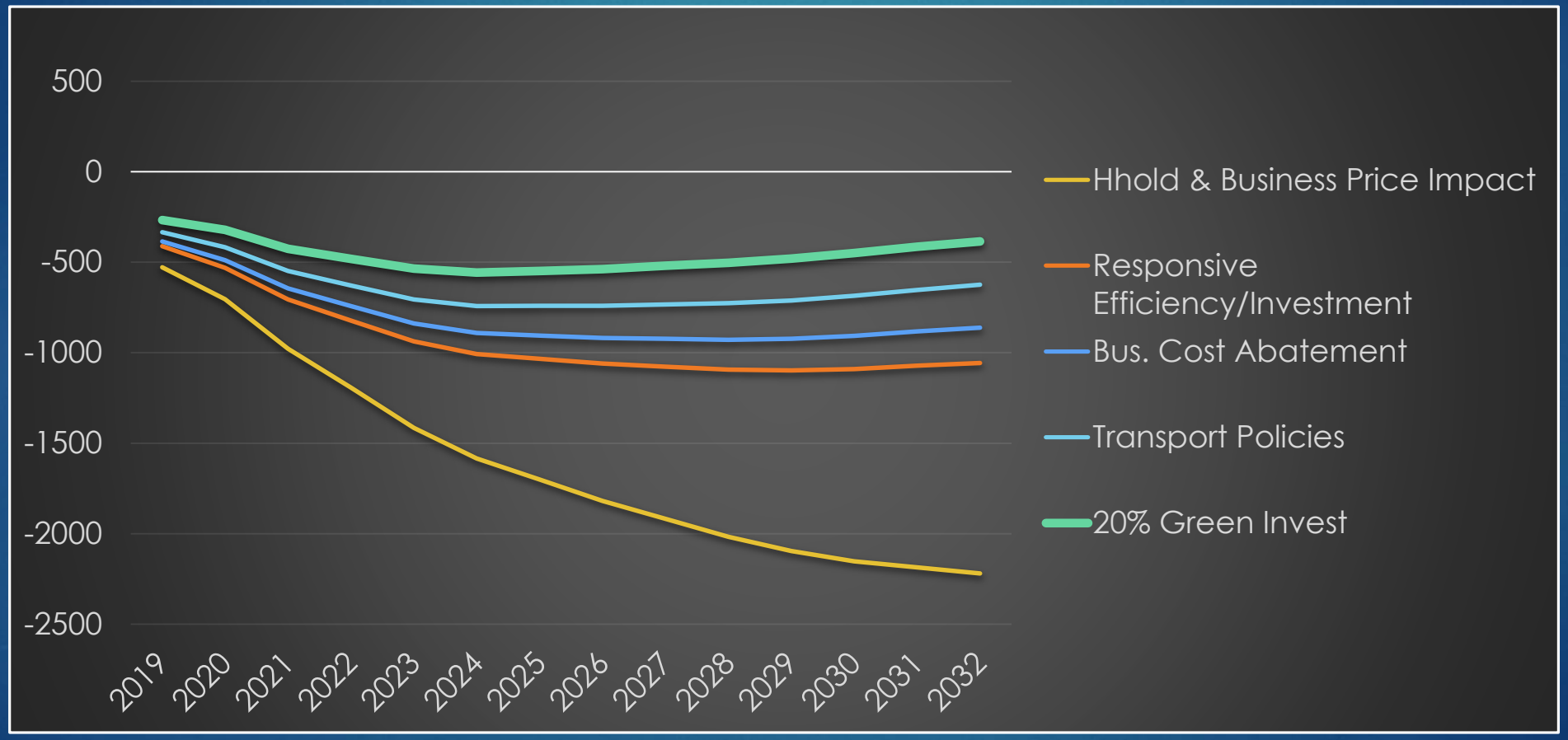
Understanding the Jobs Impact:
4. 5% to Lower Business Costs



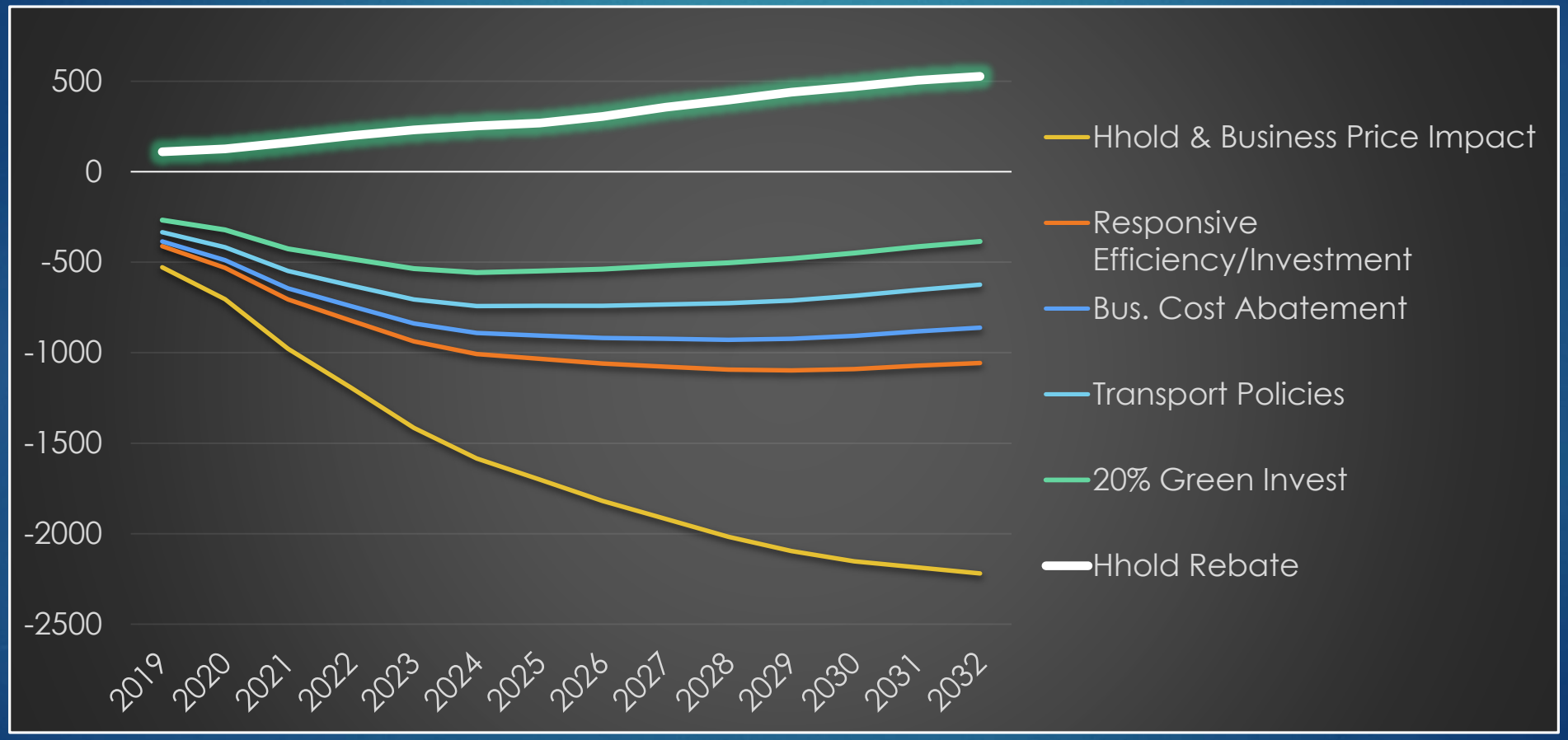
Understanding the Jobs Impact: *5. Adding Transport Component*



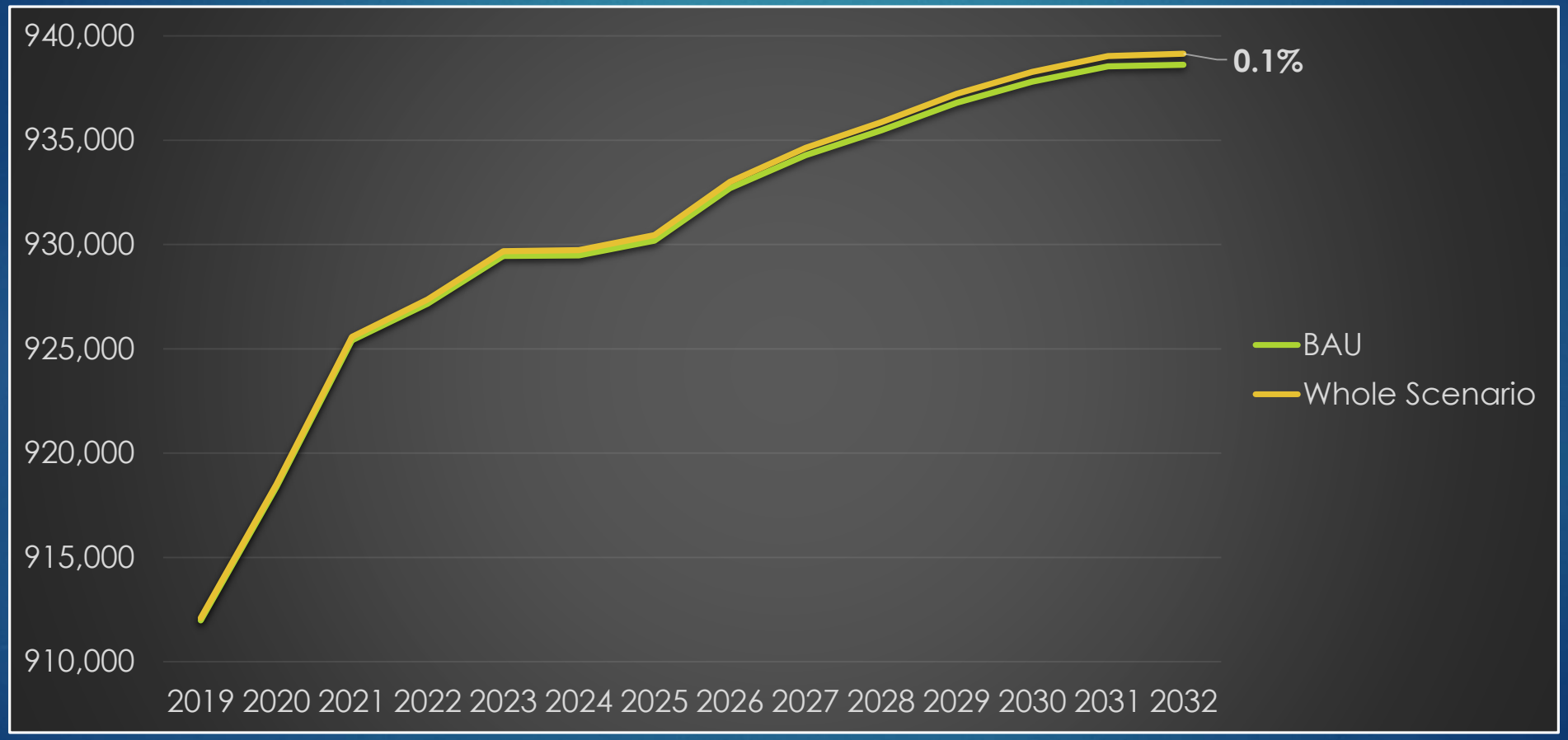
Understanding the Jobs Impact:
6. 20% as Green Investment



Understanding the Jobs Impact: *7. 75% Rebate to Residents*



Understanding the Jobs Impact: Comparing to Baseline



How do Different Sectors Fare? *Looking Beneath the Net Effect*

- Winners (8 key sectors):
  - Construction
  - Retail & Consumer-facing industries (Insider trading tip…)
- Losers (3 key sectors):
  - Utilities and Transportation Fuel Sales
  - Consultants, technical professional industries
- No Impact (55+ sectors):
  - Management, administration, education, tourism, service sectors, arts, finance, internet & cable…. All single-digit employment changes

Are these Projections Robust? *What if Assumptions Are Wrong?*

- Responsiveness to Carbon Price
  - How Elastic?
  - How Quick a Response?
- All costs indeed passed to consumers?
- How much external capital comes in to save the day?
- Pace of Investment? On time or lagged?
- Carbon intensity of energy supply! Future clean-energy advances change impact of carbon tax

Takeaways:

- Robust Dynamic: Balance of burdens with stimulus effects
- Most scenarios: <0.5% change to overall economy

Thank you very much!

QUESTIONS & COMMENTS (HAPPY TO DISCUSS):

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