



Cost of Carbon Abatement

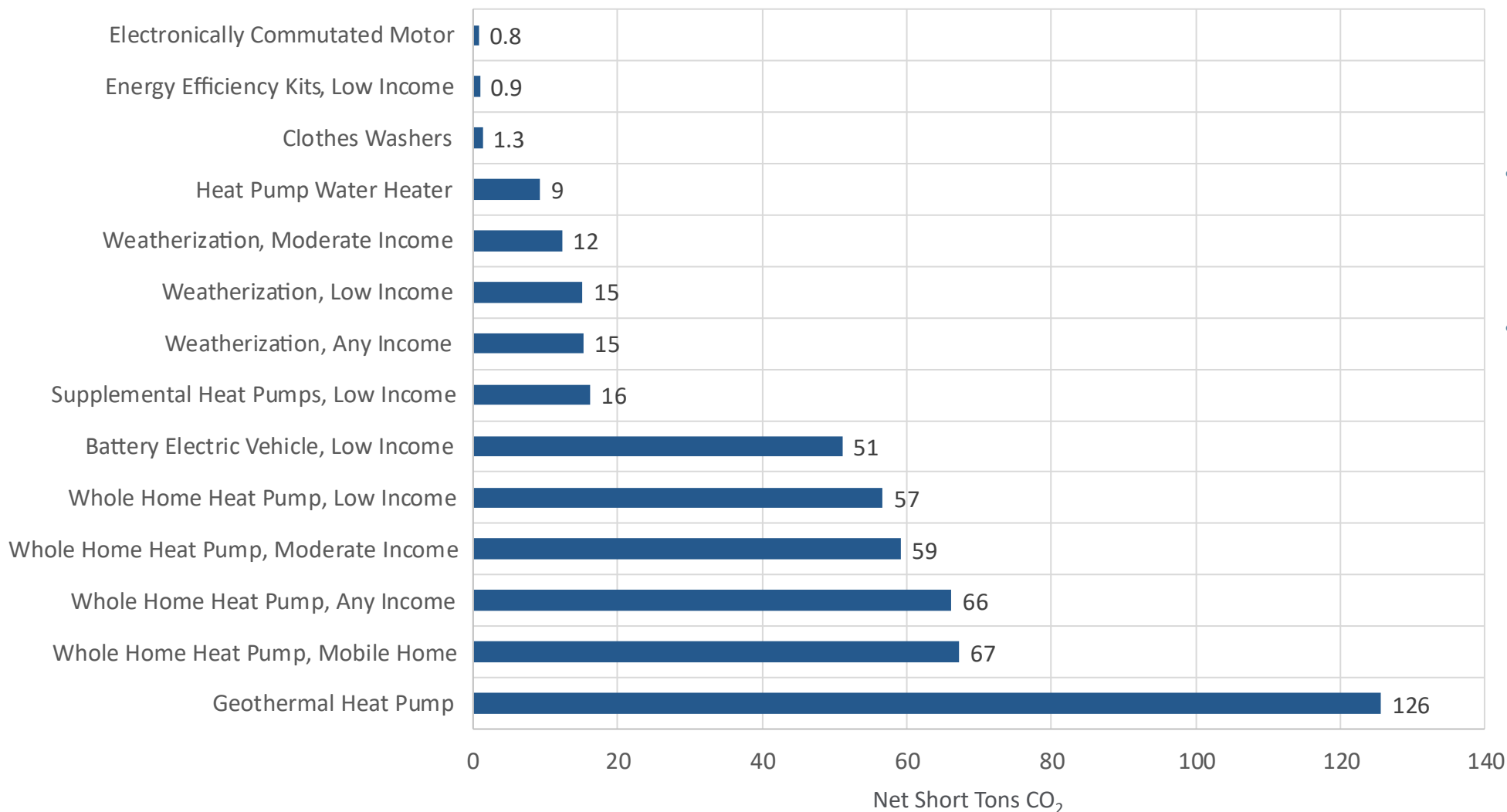
A preliminary evaluation of CO₂ savings and incentive costs across the Trust's FY 25 portfolio

Evaluating measures from a carbon abatement perspective

- CO₂ abatement and abatement cost are metrics -among others- to consider when prioritizing within a constrained budget.
- We used data from the Trust's project database from FY 25 to determine CO₂ savings, average incentive spend, and carbon abatement costs by measures.
- Maximum Achievable Cost-Effective (MACE) budgets submitted in TPVI are likely to exceed the 4% cap on the amount that the PUC is allowed to fund through "procurement" from the electric utilities in FY 27 and FY28. Depending on market uptake, budgets may be constrained.

Residential portfolio – carbon abatement per measure

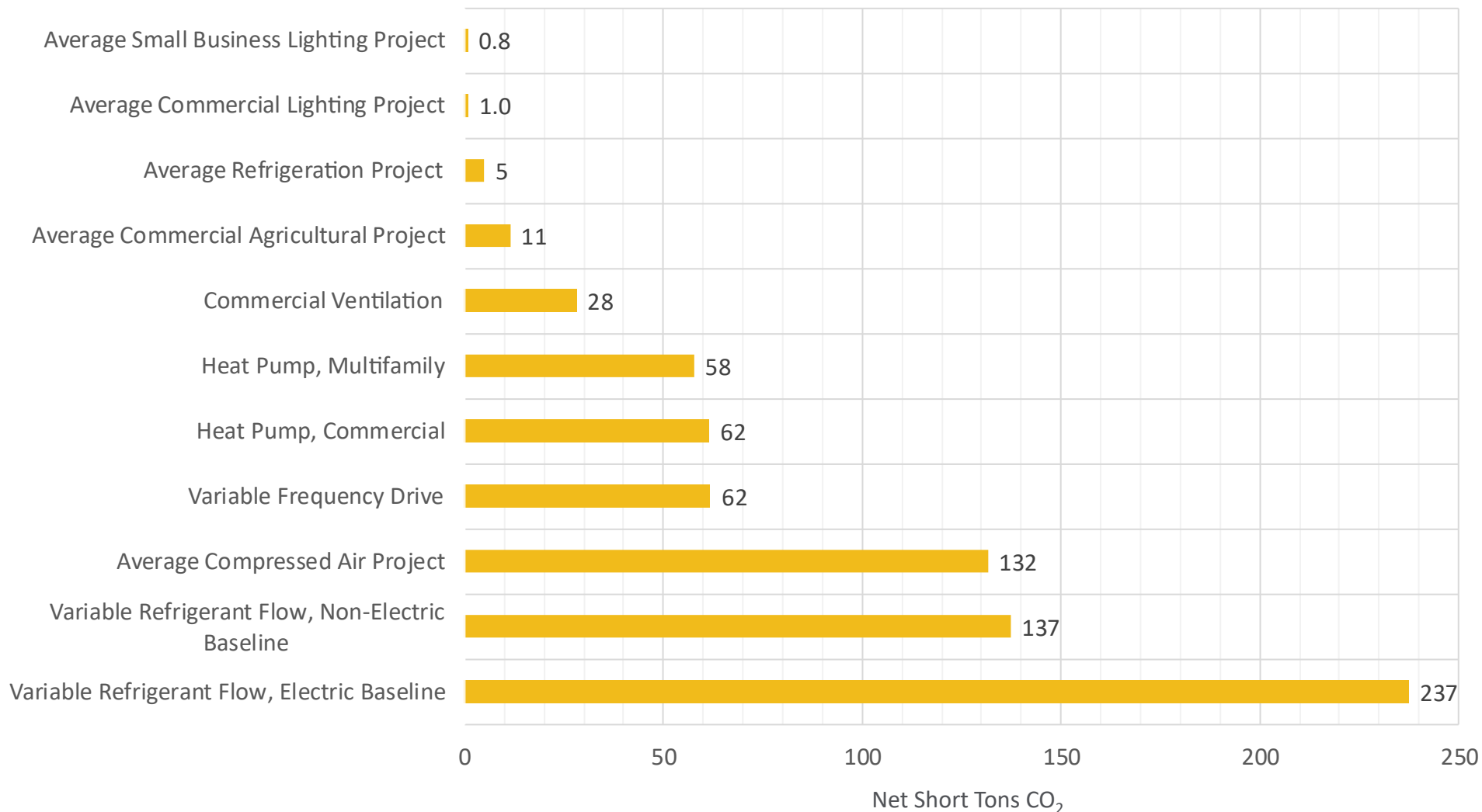
Net Short Tons of Lifetime CO₂ savings by Residential Measure



- Savings are dependent on baseline emissions.
- Heat pumps produce the most CO₂ savings.

C&I Prescriptive portfolio – carbon abatement per measure

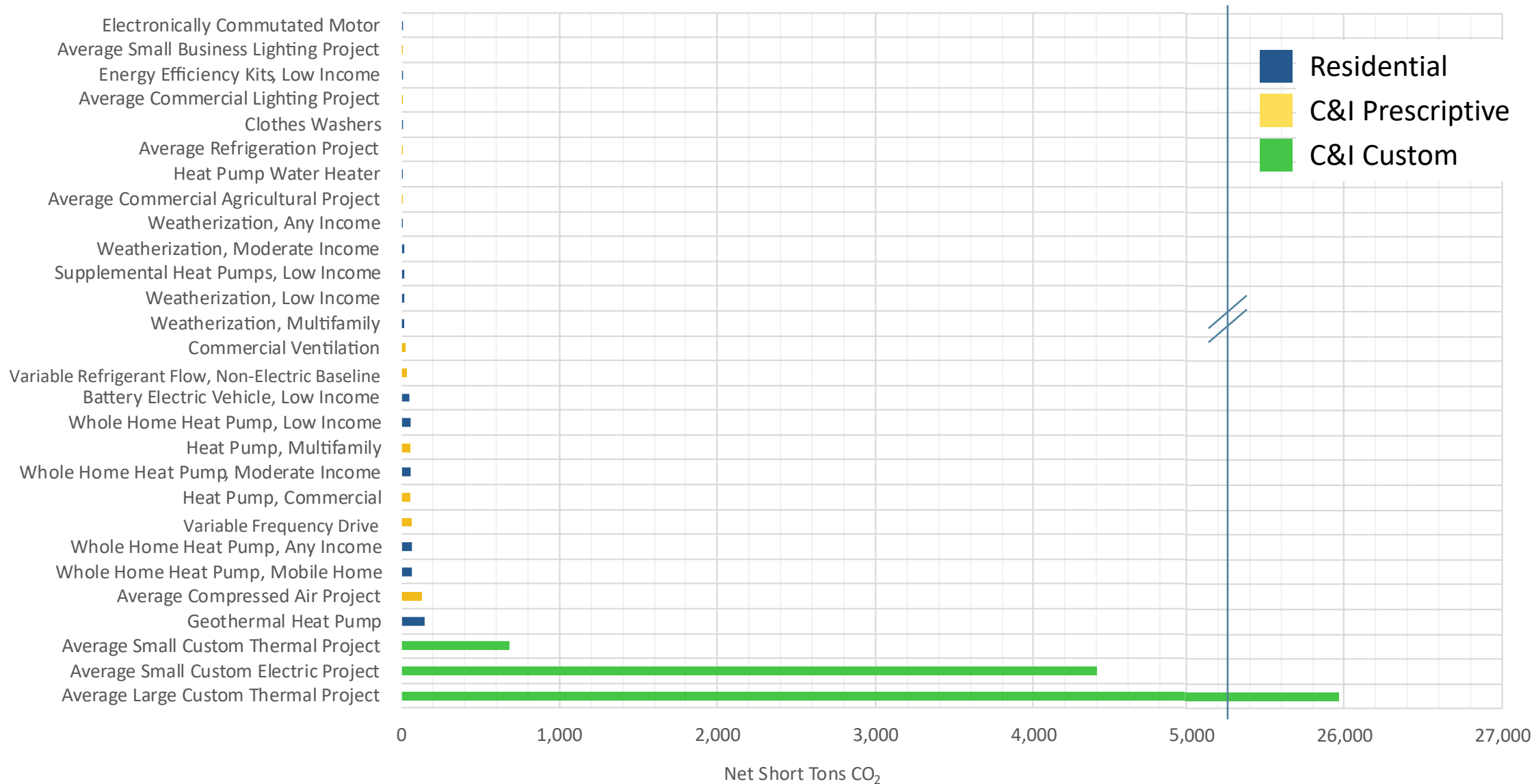
Net Short Tons of Lifetime CQ Savings by C&I Prescriptive Measure



- Compressed air projects produce the most CO₂ savings.
- Heat pumps in commercial and multifamily settings produce similar CO₂ savings as residential heat pumps.

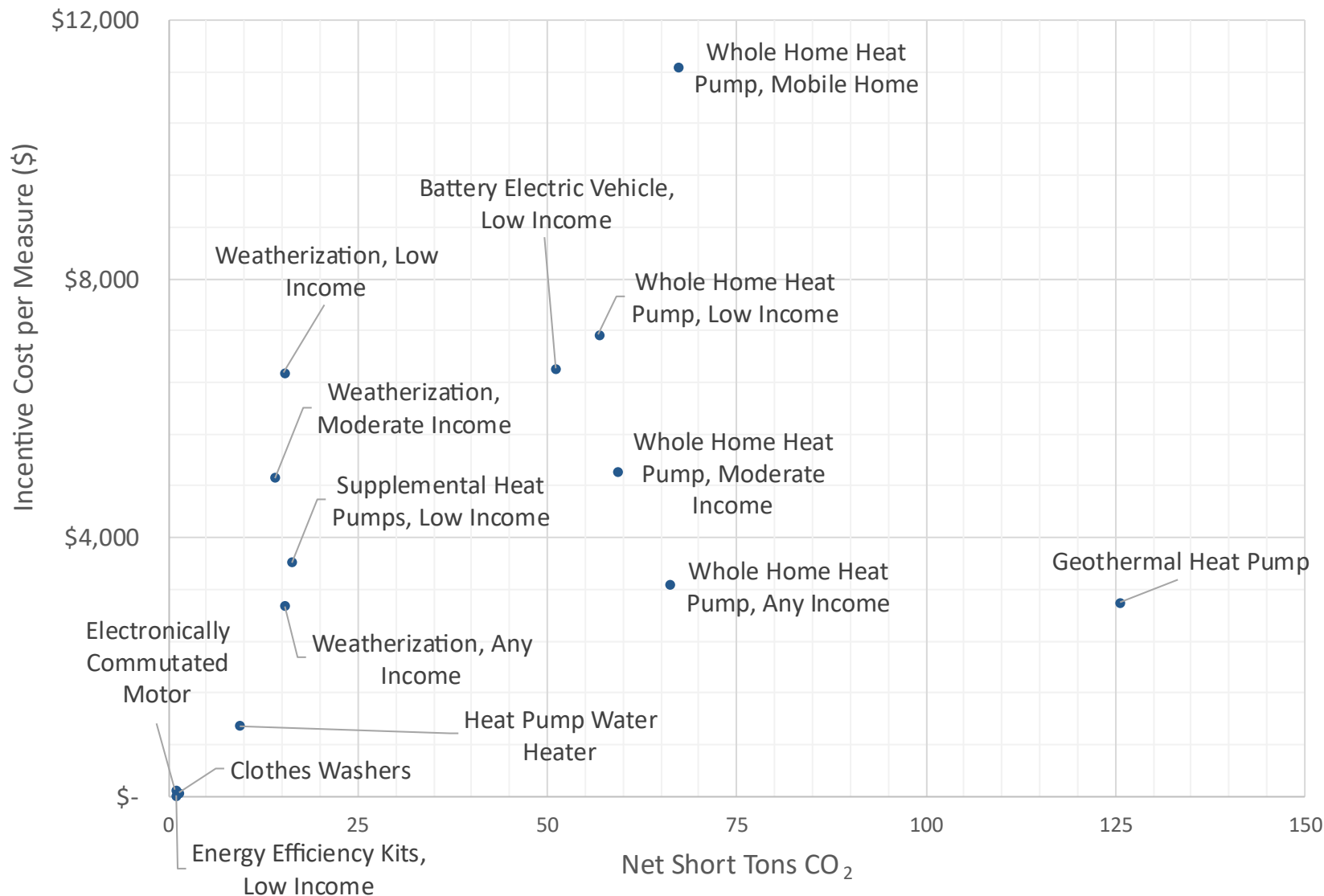
Overall portfolio – carbon abatement per measure

Net Short Tons of Lifetime CO₂ Savings by Measure



Residential portfolio – carbon abatement and incentive costs

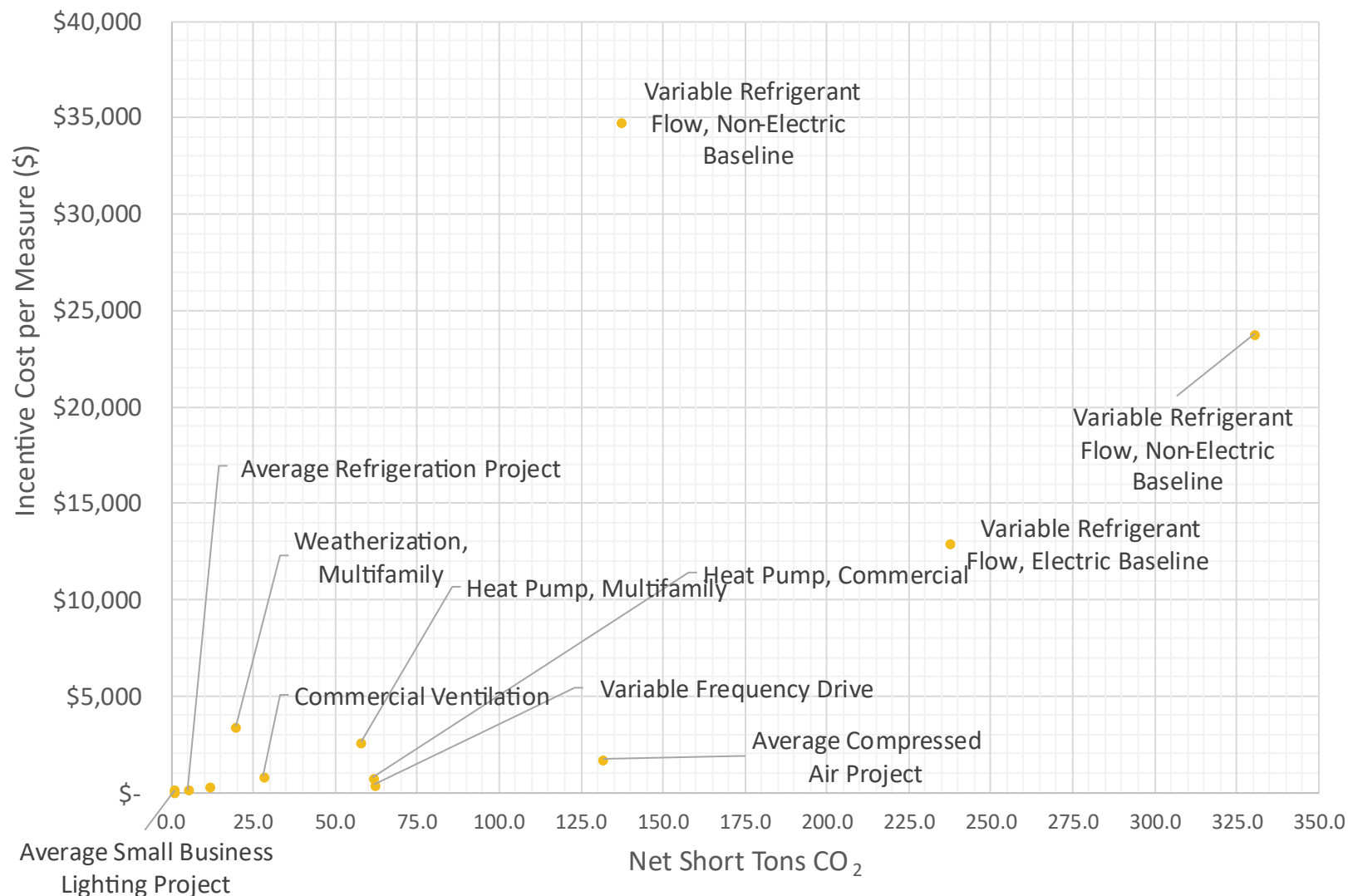
Net Short Tons of Lifetime CO₂ Savings and Incentive Costs- Residential Measures



- Projects with low incentive costs and high CO₂ savings (e.g. bottom right) maximize carbon abatement benefits/\$ of program investment
- Measures generally have a ~\$6,000 incentive cost for every ~50 net short tons of CO₂ savings

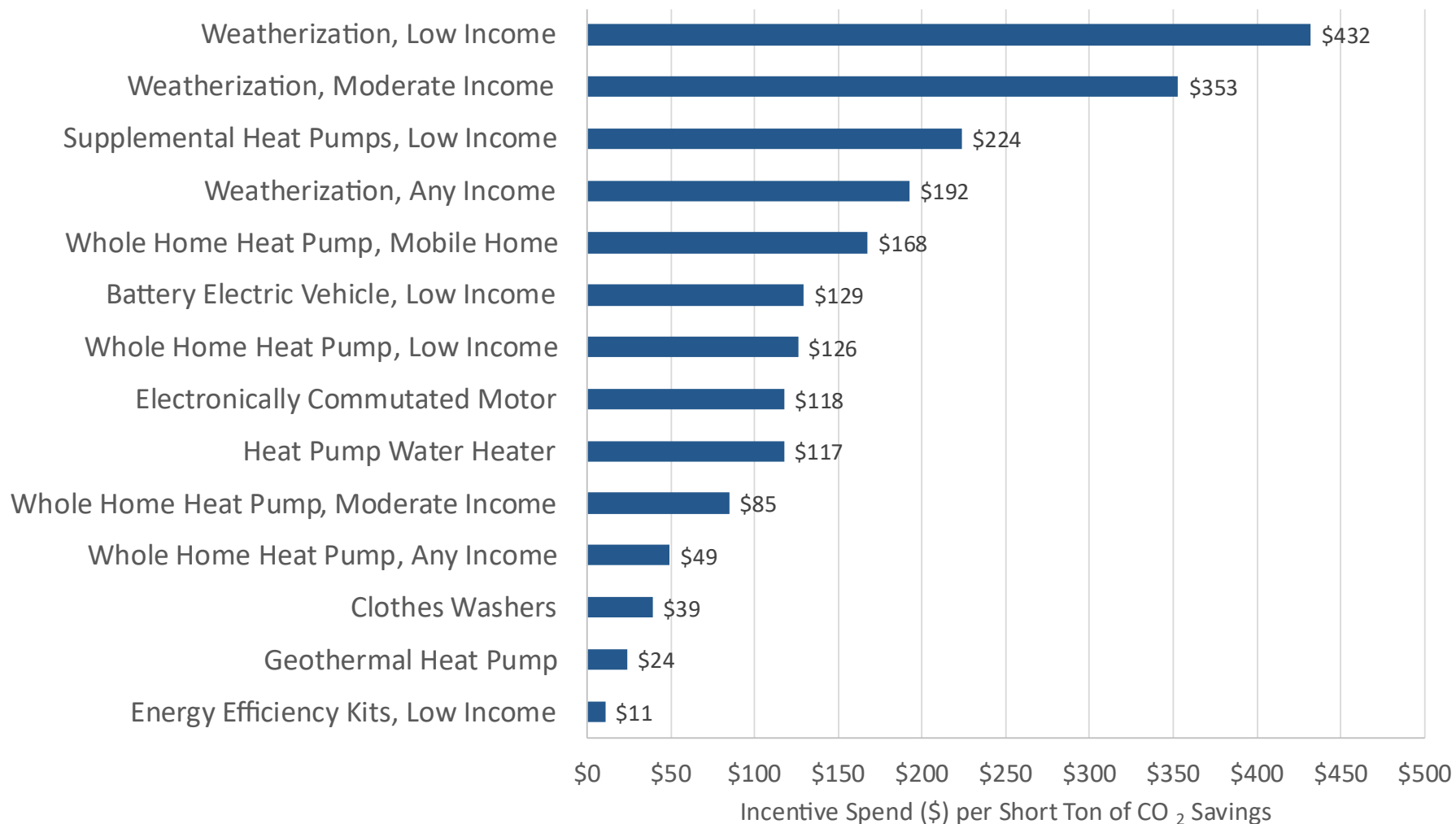
C&I Prescriptive portfolio – carbon abatement and incentive costs

Net Short Tons of Lifetime CO₂ Savings and Incentive Costs - C&I Prescriptive Measures



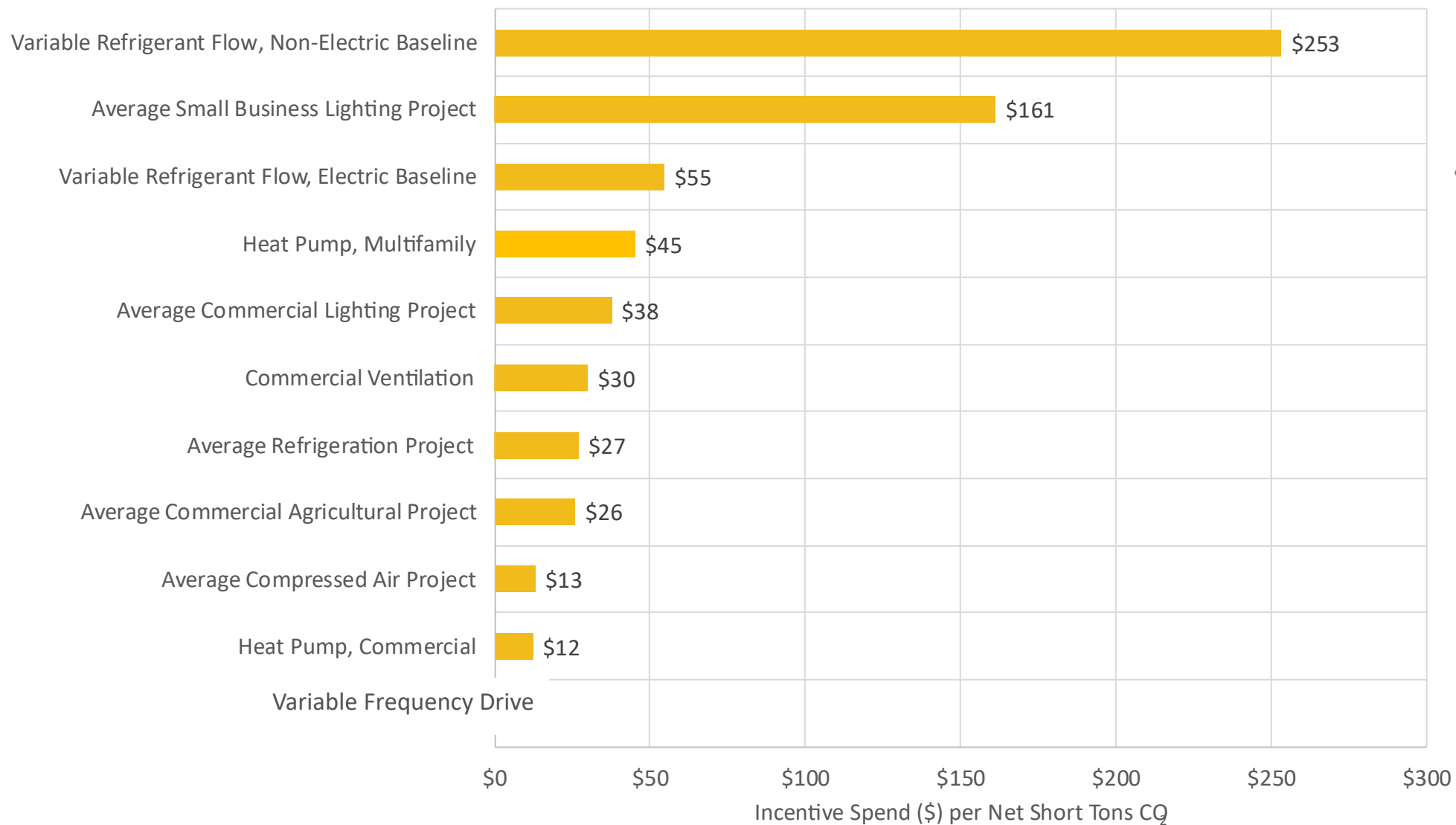
- Compressed air projects deliver significant CO₂ savings, at relatively low incentive costs.
- Commercial heat pumps deliver similar CO₂ savings, at a lower incentive cost, than residential heat pumps.

Residential portfolio - Carbon abatement cost (incentives)



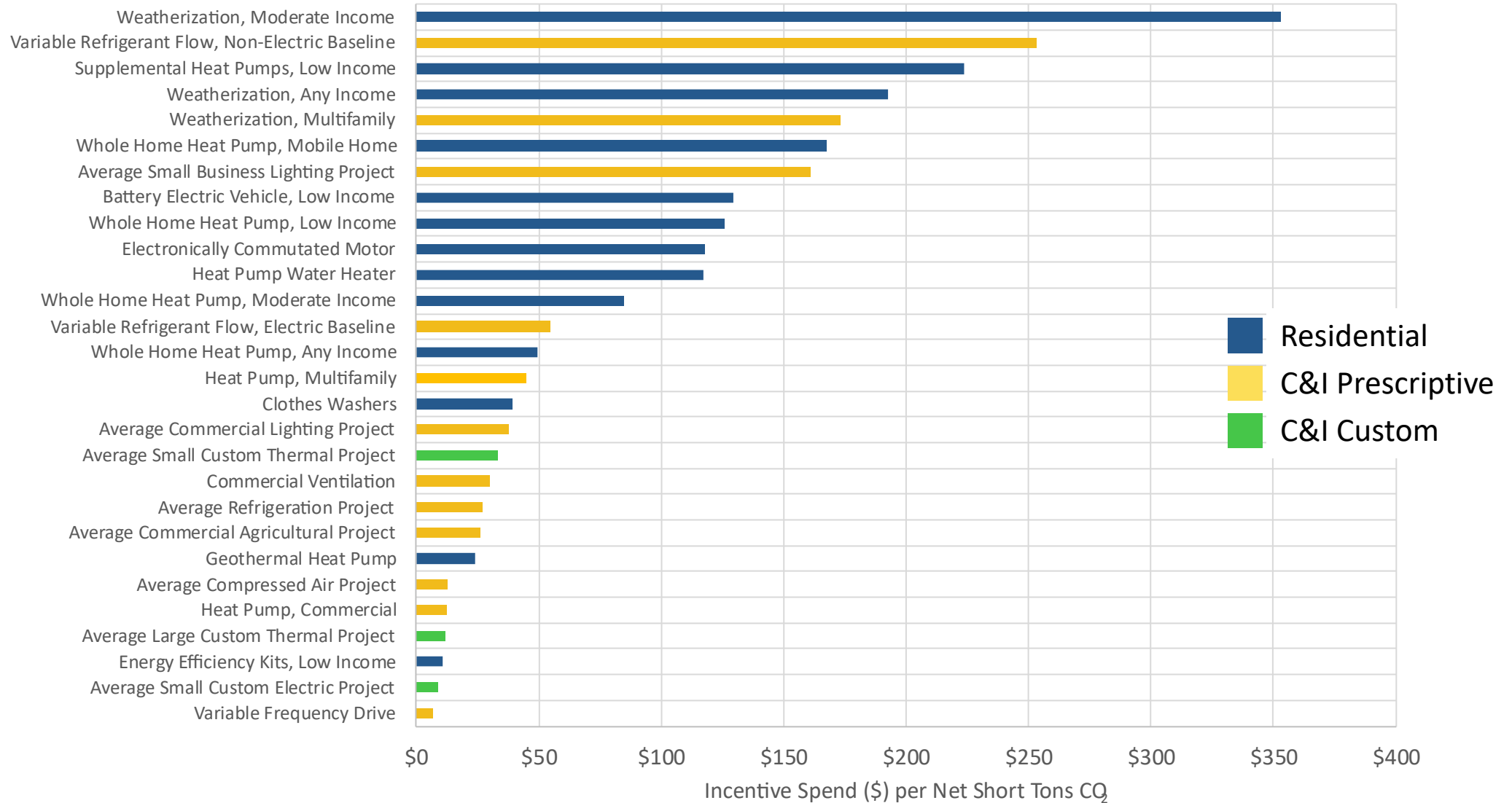
- Energy efficiency kits and clothes washers have low incentive costs that result in low carbon abatement costs.
- Weatherization and supplemental heat pumps have the highest incentive cost per ton of carbon abatement among Residential measures.

C&I Prescriptive portfolio – Carbon abatement cost (incentives)

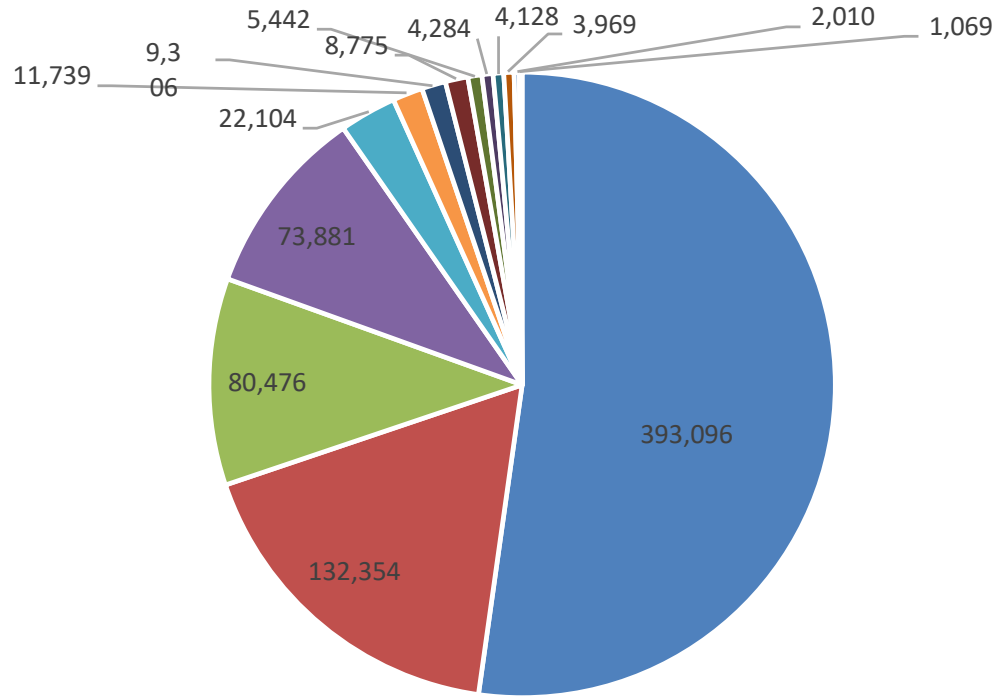


- Variable Frequency Drives have the lowest incentive costs per ton of carbon abatement across all measures evaluated.

Carbon abatement cost (incentives) across the Trust's portfolio



Heat pumps and heat pump water heaters produce the bulk of carbon abatement in Residential Programs



- Whole Home Heat Pump, Any Income
- Whole Home Heat Pump, Low Income
- Whole Home Heat Pump, Moderate Income
- Heat Pump Water Heater
- Weatherization, Any Income
- Electronically Commutated Motor
- Weatherization, Low Income
- Weatherization, Moderate Income
- Clothes Washers
- Battery Electric Vehicle, Low Income
- Supplemental Heat Pumps, Low Income
- Geothermal Heat Pump
- Whole Home Heat Pump, Mobile Home
- Energy Efficiency Kits, Low Income

Total Net Short Tons of CO₂ Savings by Residential Measure Incited in FY 25, To Date*

*effRT data was pulled on 6/17/2025

HP & HPWH produce the bulk of carbon abatement in Residential Programs

Measure	Estimated Total Lifetime CO ₂ Savings	Estimated Total Spend FYTD*	Measure Quantity, FYTD*	Net Short Tons of Lifetime CO ₂ Savings per Measure	Average Incentive (\$)
Whole Home Heat Pump, Any Income	393,096	\$ 19,446,340	5,956	66	\$3,265
Whole Home Heat Pump, Low Income	132,354	\$16,555,860	2,322	57	\$7,130
Whole Home Heat Pump, Moderate Income	80,476	\$ 6,836,368	1,364	59	\$5,012
Heat Pump Water Heater	73,881	\$ 8,972,437	8,209	9	\$1,093
Weatherization, Any Income	22,104	\$ 5,411,854	1,842	12	\$2,938
Electronically Commutated Motor	11,739	\$ 1,394,030	14,674	0.8	\$95
Weatherization, Low Income	9,306	\$ 3,386,514	517	18	\$2,667
Weatherization, Moderate Income	8,775	\$ 2,545,218	585	15	\$1,866
Clothes Washers	5,442	\$ 209,300	4,186	1.3	\$50
Battery Electric Vehicle, Low Income	4,284	\$ 554,988	84	51	\$6,607
Supplemental Heat Pumps, Low Income	4,128	\$ 934,218	258	16	\$3,621
Geothermal Heat Pump	3,969	\$ 81,000	27	147	\$3,000
Whole Home Heat Pump, Mobile Home	2,010	\$ 338,130	30	67	\$11,271
Energy Efficiency Kits, Low Income	1,069	\$ 11,880	1,188	0.9	\$10

*effRT data was pulled on 6/17/2025

Heat pumps & lighting produce significant carbon abatement in C&I Prescriptive Program

Measure	Estimated Total Lifetime CO ₂ Savings	Estimated Total Spend FY2025 To Date*	Measure Quantity, FY25 To Date*	Net Short Tons of Lifetime CO ₂ Savings per Measure	Average Incentive (\$)
Average Commercial Lighting Project	45,729	\$ 1,716,648	46,452	0.98	\$37
Heat Pump, Multifamily	42,736	\$ 1,925,685	740	58	\$2,602
Average Small Business Lighting Project	15,820	\$ 2,549,843	19,194	0.82	\$133
Heat Pump, Commercial**	12,996	\$ 158,250	211	62	\$750
Average Compressed Air Project	11,972	\$ 155,765	91	132	\$1,712
Average Commercial Agricultural Project	9,726	\$ 251,966	847	11	\$297
Weatherization, Multifamily**	1,374	\$ 238,221	70	20	\$3,403
Commercial Ventilation**	901	\$ 26,934	32	28	\$842
Variable Frequency Drives	681	\$ 4,400	11	62	\$400
Average Refrigeration Project	76	\$ 2,030	15	5	\$135

*effRT data was pulled on 6/17/2025

** FON incentives were excluded from CO₂ impact analysis, but are included in measure quantities here.

***This chart does not represent all measures in the C&I Prescriptive portfolio.

20 C&I Custom projects** will produce over 150,000 tons of carbon abatement

Measure	Estimated Total Lifetime CO ₂ Savings	Estimated Total Spend FY2025 To Date*	Measure Quantity, FY25 To Date*	Net Short Tons of Lifetime CO ₂ Savings per Measure	Average Incentive (\$)
Average Large Custom Thermal Project	103,873	\$ 1,197,868	4	25,968	\$299,467
Average Small Custom Electric Project	52,867	\$ 454,468	12	4,406	\$37,872
Average Small Custom Thermal Project	2,732	\$ 90,849	4	683	\$22,712

*effRT data was pulled on 6/17/2025

**This chart does not represent all measures in the C&I Custom portfolio, such as Lead By Example and ARPA funded projects.



Thank you! Questions?

Special Case: Pellet boilers

Average pellet boiler in FY 2025

Annual Gross kWh Savings	Annual Gross MMBtu Savings	Measure Life	Net Short Tons of Lifetime CO ₂ Savings
200 kWh	-6.59 MMBtu	25 Years	-57 Net Short Tons of CO ₂

- Due to the difficulty of monitoring for and enforcing use of waste wood, we assume wood pellets are not carbon neutral. Per EPA emissions inventory guidance, North American hardwood is estimated to emit 207 lb CO₂ per MMBtu of heat produced.¹
- Pellet boilers currently provide local economic development and energy independence benefits.
- 52 pellet boilers were rebated in FY 25 to date.

Special Case: Fossil & biomass distributed generation (DG) projects

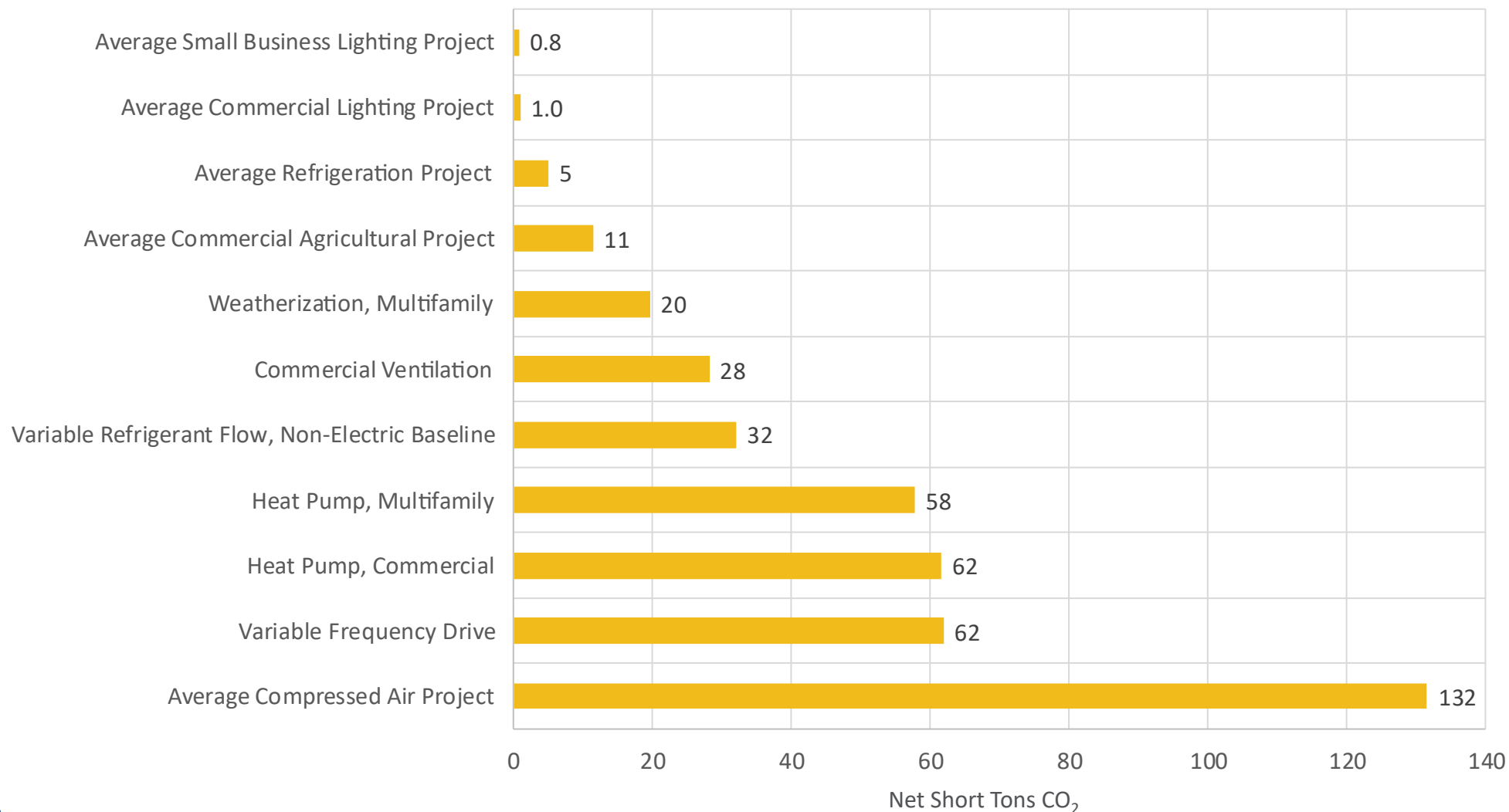
Example FY 2025 natural gas distributed generation project

Annual Gross kWh Savings	Annual Gross MMBtu Savings	Measure Life	Net Short Tons of Lifetime CO ₂ Savings
417,758	-3,623 MMBtu	20 Years	-793 Net Short Tons of CO ₂

- This FY 2025 project was a 75-kW natural gas CHP unit. DG projects are typically combined heat and power (CHP) projects using wood or natural gas.
- This FY 2025 project did not produce enough kWh savings to offset added emissions from new natural gas combustion, relative to the baseline of no CHP system.
- DG projects are rare in the C&I Custom Program. Two of five DG projects since FY2020 did produce CO₂ savings. Program staff will continue to monitor CO₂ of future projects and assess a larger sample size for potential changes to project requirements.
- A cleaner grid may make carbon neutrality for CHP projects increasingly challenging.

C&I Prescriptive portfolio – carbon abatement per measure

Net Short Tons of Lifetime CO₂ Savings by C&I Prescriptive Measure



- Compressed air projects produce the most CO₂ savings.
- Heat pumps in commercial and multifamily settings produce similar CO₂ savings as residential heat pumps.