Appendix A7 - Carbon Tax Modeling Results

Approach

The modeling assumed that a carbon tax would be applied to all generators coal, oil, and natural gas generating units located within Connecticut in the year 2025, under the Base Load Reference scenario described in Section 1.[1] The purpose was to determine both the resulting change in emissions and economic impact from various levels of carbon taxes. Table A7.1 shows the range of carbon taxes used in each scenario. The values range from $0.00 to the 2020 Social Cost of Carbon (SCC Price), and an additional carbon price taken from the 2018 Avoided Energy Supply Components in New England (AESC Price) study.[2, 3] The 'Carbon Price with RGGI' column uses a CO2 allowance price set by the RGGI as an adder to the tested Connecticut Carbon Tax price.

Table A7.1: Tested Carbon Taxes and Prices

Connecticut Carbon Tax (2019$/short ton)	Carbon Price with RGGI (2019$/short ton)
0.00	7.93 (RGGI Price)
5.32	13.25
10.63	18.56
21.26	29.19
31.89	39.82
42.53	50.45 (SCC Price)
92.07	100.00 (AESC Price)

Figure A7.1 below compares the carbon tax revenue and cost impacts for the various price points tested. The tax revenue refers only to the carbon tax. Tax revenue reported here does not include lost or increased tax revenue from other Connecticut taxes. The results indicate that a modest carbon tax of $6.03/short ton (nominal) would result in $23.30 million in tax revenue in the modeled year 2025, and $9.50 million in additional revenue from existing contracts, which, if all of the tax revenue were credited back to Connecticut ratepayers would more than offset the increase in wholesale energy prices associated with the tax. At the $6.03 price, CO_2 emissions would decline by 31 percent within Connecticut as in-state facilities run less frequently. Overall CO_2 emissions would remain relatively the same region-wide (decreasing by about 1 percent), though part of Connecticut's share would effectively be redistributed across the other states as shown by Figure A7.3. In-state emissions of other air pollutants would remain relatively the same (Figures A7.4 and A7.5).

Any higher carbon price would not result in a net neutral or positive price impact for Connecticut ratepayers because wholesale energy prices would increase beyond the value of the tax revenue and

[1] Generators less than 25 MW, or those that receive set-asides pursuant to 22a-17431(f)(4)(B) or 22a-174-31(f)(4)(F) were found to make negligible contributions to the results summarized in Figures A7.1 through A7.5.

[2] Synapse Energy Economics. Avoided Energy Supply Components in New England. 2018. https://www.synapse-energy.com/sites/default/files/AESC-2018-17-080.pdf

[3] Synapse Energy Economics. Avoided Energy Supply Components in New England. 2018. https://www.synapse-energy.com/sites/default/files/AESC-2018-17-080.pdf

revenue from existing contracts. Under the highest carbon tax of $104.54/short ton, wholesale energy prices increase by about $5.00/MWh.

Figure A7.1: Connecticut Revenue and Cost Impact Comparison

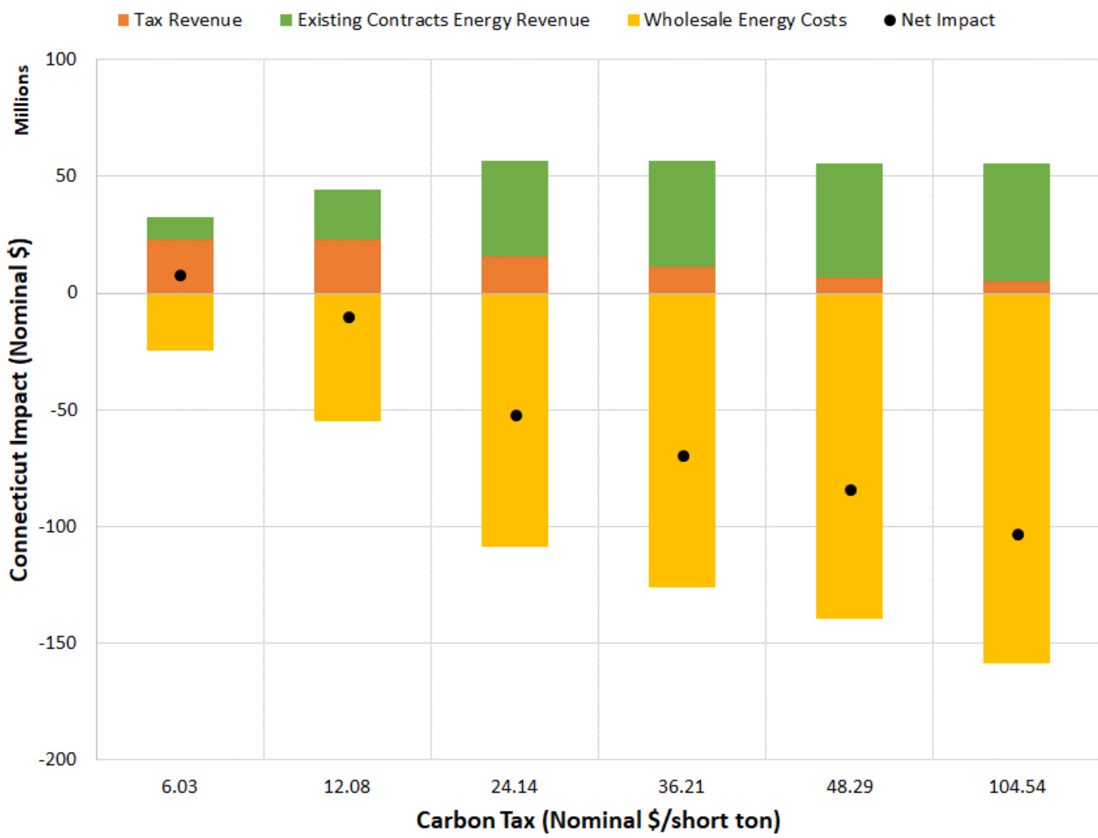
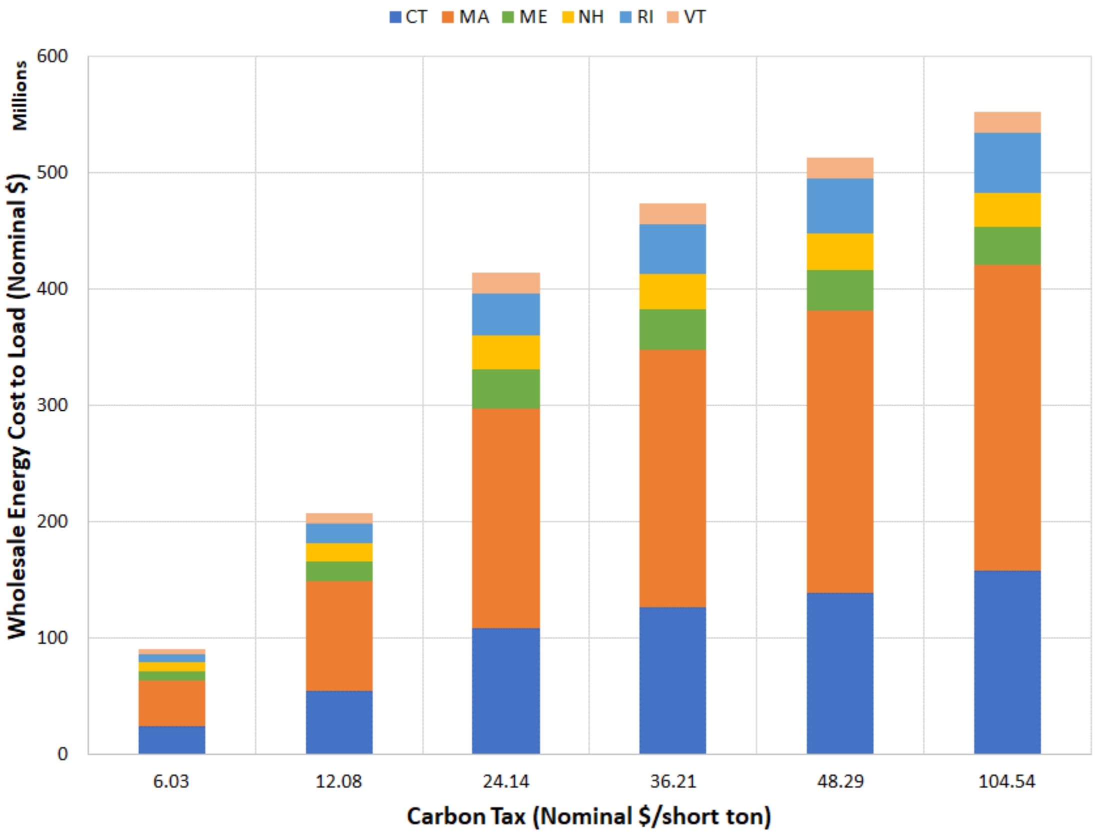


Figure A7.2 shows the wholesale market cost increases for each ISO-NE state (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont), as other states rely on Connecticut's efficient natural gas resources to provide fossil generation. Wholesale market impacts to ISO-NE at large were approximately $90.60 million for a $6.03/short ton tax and grew to $207.90 million for a $12.08/short ton tax. Connecticut incurs about one-quarter of the wholesale cost impacts, which is consistent with its load share in ISO-NE. Other states also have contracted energy that benefits from increased wholesale market energy prices and therefore the net impact to other states will be based on load that is not under contract. Other New England states' recent renewable and clean energy procurements have contract terms that run from the mid-2030s to after the 2040 end of the IRP period. Hedged load in each state would therefore benefit until the contracts expire, when future contract prices would be increased to account for the tax.

Figure A7.2: Wholesale Energy Cost Impact, ISO-NE States



Figures A7.3, A7.4, and A7.5 show the emissions impact of the carbon tax. Generation located in Connecticut displayed a high sensitivity to the carbon tax: in-state CO_2 emissions were cut by more than half under a $12.08/short ton carbon tax. System-wide emissions increased slightly because carbon tax increases caused less efficient generation to replace generation subject to the carbon tax.

Impacts to SO_2 emissions were minimal, as combined-cycle units that comprise most of redispatch have fairly strong environmental controls relative to unaffected units, such as municipal solid waste and wood waste. NOx emissions impacts were also minimal compared to CO_2 emissions impacts because natural gas combustion produced limited emissions relative to other unaffected fuel types. $PM_{2.5}$ emissions reductions for Connecticut roughly followed the CO_2 emissions trajectory.

Figure A7.3: CO2 Emissions Comparison, ISO-NE States

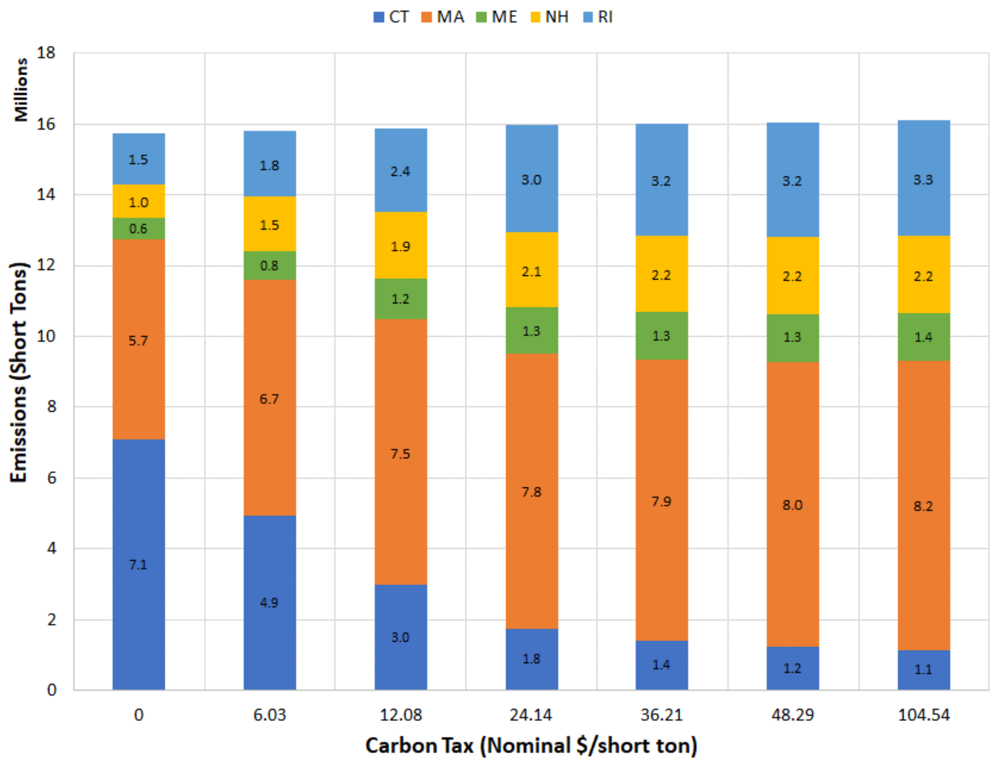


Figure A7.4: NO_x Emissions Comparison, ISO-NE States

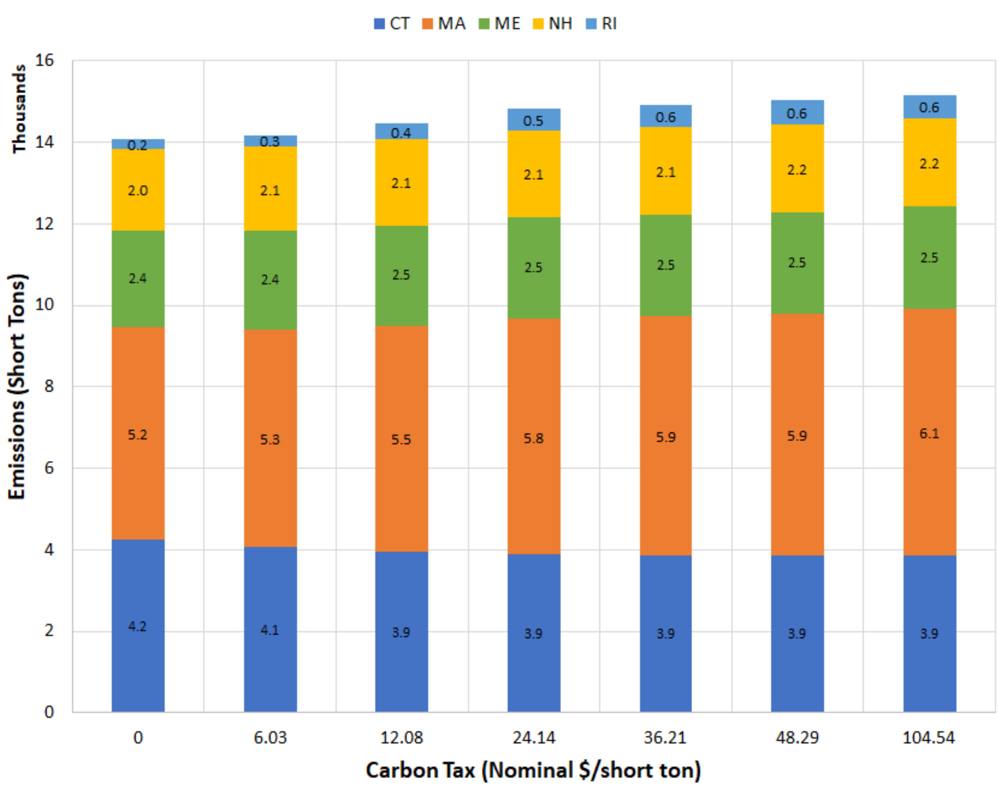


Figure A7.5: $PM_{2.5}$ Emissions Comparison, ISO-NE States