Caiazza Comment Cost Methods Overview

Summary
This comment reviews information made available in May describing the cost methodologies. I have made the point in many of my comments that I believe the Integration Analysis documentation should describe all the control measures proposed, provide references for the assumptions used, supply the expected costs for those measures and list the expected emission reductions for the Reference Case, the Advisory Panel scenario and the three mitigation scenarios.

This documentation describes the calculation methodology but little else. I note that electrification of home heating is dependent upon building shell improvements. This recently provided documentation does not provide sufficient information to understand how typical homeowners will be affected by that control measure. Providing net system costs relative to the Reference Case is not sufficient because stakeholders don't know the total costs.

Background
Up until late May 2022 most of the values in the cost-benefit supporting documentation (Section 3.4 Benefits and Costs, Appendix G Integration Analysis Technical Supplement Section I) were only presented in bar charts. In other words, the values of the numbers are not included.

At a meeting in early May there was an opportunity for the public to ask questions about the New York State Energy Research & Development Authority (NYSERDA) work supporting the Draft Scoping Plan. I asked about the cost information and John Williams, Vice President, Policy and Regulatory Affairs, responded. He indicated that detailed information was available and suggested that I follow up for more information. I sent him an email asking for specific information. I explained that, for example, in Appendix G, Section I, Figure 48 lists the net present value of system expenditures in Reference Case and Scenarios 2-4. The only associated number given in the text is a mention that the Reference Case totals $2.7 trillion. I said that I believe that at a minimum the values of the cost categories listed on the right-hand side of the bar charts should be available in a table somewhere for each of the scenarios. I also said that detailed control measure costs should also be available so that the public can check the category costs and critique specifics.

On May 27 Mr. Williams responded.

> In response to your inquiry for additional cost information, we have added clarifying information to the existing Excel document, "Appendix G Annex 2: Key Drivers and Outputs," which can be found on the Climate Action Council Draft Scoping Plan website. At the end of the workbook, you will see a series of green tabs. The "Cost Methods Overview" tab describes how costs were calculated throughout the analysis. Accompanying tabs provide the data associated with the cost figures published in the Draft Scoping Plan.
>
> We hope this will help you and all stakeholders better understand how our cost analyses were performed. Please reach out if there are any questions.

My hats off to Mr. Williams for responding to my request. He was the only one in the Administration that has responded to any of my direct email comments.

While I really appreciate the response there still are problems. The first is that the information was provided so late that I was unable to find the time to develop detailed comments based on the material provided before the comment period ended. Secondly, only two things were provided: the numbers associated with the cost figures in Section 3.4 Benefits and Costs of Appendix G and a table summarizing the cost methods. I believe that it is problematic that a casual reader would have no idea that this new information has been included in an update because the appendices listing on the Climate Act Draft Scoping Plan page does not mention that an update is available. Furthermore tacking 15 tables at the end of an already huge spreadsheet does not foster easy use.
This comment is based on extracted information from the Spreadsheet: IA-Tech-Supplement-Annex-2-Key-Drivers-Outputs May 20, 2022 contained in the Table: Cost Methods Overview. The overview section of these comments lists the information provided with my italicized annotations.

Cost Methods Overview
The tab Cost Methods Overview had two tables. The upper table has three rows that described the net system costs, avoided GHG benefits, and health benefits.

Cost Category: Net System Costs
Description:
Net system cost for mitigation scenarios relative to Reference scenario
Methodology and Key Inputs
Calculated by summing all system costs (described in table below), including investment cost and fuel savings for each scenario relative to the Reference case.
Comment:
I have made the point in many of my comments that I believe the Integration Analysis documentation should describe all the control measures proposed, provide references for the assumptions used, supply the expected costs for those measures and list the expected emission reductions for the Reference Case, the Advisory Panel scenario and the three mitigation scenarios. Providing net system costs relative to the Reference Case is not sufficient because stakeholders don't know the total costs.

Cost Category: Avoided GHG Benefits
Description:
Includes avoided GHG benefits for each mitigation scenario relative to Reference scenario.
Methodology and Key Inputs
Calculated by multiplying the difference in GHG emissions of each greenhouse gas between each scenario relative to the Reference Case by $/ton provided in Annex 1, which uses the central estimate from NYSDEC's guidance: https://www.dec.ny.gov/regulations/56552.html). Benefits are displayed on an NPV basis over 2020-2050 period
Comment:

I attempted to reproduce these numbers and submitted a comment asking for clarification. This documentation does not help.

Cost Category: Health Benefits

Description:

Includes annual avoided health impacts attributed to a variety of factors including reduced combustion, air quality improvements.

Methodology and Key Inputs

See Appendix G health impacts documentation for more detail, and Annex 3 for more detailed outputs.

Comment:

No comment other than to note that this documentation is the most complete for any category.

The following information was provided in the second table in the Cost Methods Overview tab.

Cost Category: Electricity Incremental

Description:

Includes capital and operating costs for electricity generation, transmission, costs to upgrade existing distribution system, and in-state hydrogen production costs.

Methodology and Key Inputs

'Electric sector costs are calculated within E3's capacity expansion model, RESOLVE, which performs least-cost optimization to identify resource portfolios that meet New York State's policy goals while also maintaining reliability. Based on the resource portfolios developed in RESOLVE for each scenario, provided in Annex 2, system costs are calculated within the model using the levelized investment costs and fuel prices provided in the "Resource Costs - Mid" and "Mid Case Fuel Projections" tabs of Annex 1, as well as the ongoing costs of operating existing generation units, provided in the "Going Forward Fixed Costs" tab. Incremental distribution system costs are calculated using the DRV values provided on the "Distribution System Costs" tab of Annex 1, scaled to the increases in peak load by scenario. These costs are aggregated and levelized for the system, and calculated on an NPV basis over the 2020-2050 period. More detail on the electric sector modeling methodology can be found in Chapter 5 of Appendix G.

Where embedded system costs are estimated (Figures 45, 48, 50), AEO 2021 modeled prices for New York system in the Reference case (AEO includes NPCC for Upstate New York and for NYC+LI) are used to develop an estimate of current system expenditures (multiply AEO prices for generation, transmission, and distribution by load). This results in estimates of expenditures for generation, transmission, distribution in 2020. These are combined to create an estimate for total current system costs in 2020. We net out the generation and transmission costs captured by RESOLVE modeling in 2020 to ensure no double-counting of these costs, and hold the calculated embedded costs constant through 2050.

Comment:

The building investments documentation in the IA-Tech-Supplement-Annex-2-Key-Drivers-Outputs spreadsheet breaks out the annual sales, % of sales, and building stocks for the Reference Case and scenarios. Similar information for this cost category would be useful. It would also have been appropriate for E3 to have a workshop with presentations that explained what they are talking about here – it is rather dense.

Cost Category: Transportation Investment

Description:

Includes capital and operating expenses for light-duty vehicles, medium- and heavy-duty vehicles, and buses, in addition to charging infrastructure costs

Methodology and Key Inputs

Transportation sector investment includes capital cost and ongoing O&M cost (excluding cost for fuel and electricity, which are included in other cost categories). Capital costs are calculated by multiplying sales in each year in each scenario, available in Annex 2, by overnight capital costs, available in Annex 1. These overnight capital costs are then levelized according to sector-specific interest rates, provided in Annex 1. This category also includes cost for EV charging infrastructure, calculated on a per-vehicle basis and meant to represent cost for EV charging infrastructure levelized over each individual vehicle, with the per-unit cost for EV chargers included in Annex 1. Note capital cost for non-stock transportation end uses (such as rail, maritime, aviation) are generally excluded with exceptions noted below, and VMT reductions achieved in Scenarios 1-3 are assumed to occur at no incremental cost. Note Scenario 4 does include incremental costs associated with VMT reductions above Scenarios 2 and 3 (using data from DOE Moving Cooler report), in-state rail expansion (data from Environmental Impact Statement for Empire State Rail), and includes incremental cost for hydrogen and electric aviation (sourced from an EU funded report on hydrogen aviation: https://www.fch.europa.eu/publications/hydrogen-powered-aviation).

Where embedded system costs are estimated (Figure 45, 48, 50): to estimate ongoing payments for financed technologies, we take the modeled sales of devices in 2019, multiplied by $/device price in 2019, and back-cast by the financing lifetime of the technology (i.e., we are trying to capture ongoing payments for devices sold prior to the first modeled year but which are still within their financial lifetime). We combine the embedded system cost estimate with modeled estimate of investments in 2019 and 2020 to estimate the current expenditures in 2020. We recognize this is an approximation of ongoing financing payments for existing energy infrastructure.

Comment:

I have noted in other comments that it is not clear whether the costs of EV charging infrastructure were addressed. This documentation notes that it is included. I also questioned how the Integration Analysis handled EV charging on the street or in parking lots. Calculating costs per vehicle is an estimation expediency but it does not address

whether the infrastructure is available for all vehicles. Another question is whether the costs for electric service upgrades needed for chargers are included.

I submitted a comment relating to one aspect mentioned. Scenario 4 includes incremental costs associated with in-state rail expansion (data from Environmental Impact Statement for Empire State Rail). My comment showed that the incremental costs and benefits were inconsistent with the Environmental Impact Statement.

Cost Category: Building Investment

Description:

Includes capital and operating expenses for building equipment and appliances (e.g., space heaters, air conditioners, water heaters) and investments for building shell upgrades

Methodology and Key Inputs

Building sector investment includes capital cost and ongoing O&M cost (excluding cost for fuel and electricity, which are included in other cost categories). Capital costs are calculated by multiplying sales in each year in each scenario, available in Annex 2, by overnight capital costs, available in Annex 1. These overnight capital costs are then levelized according to sector-specific interest rates, provided in Annex 1

Where embedded system costs are estimated (Figure 45, 48, 50): to estimate ongoing payments for financed technologies, we take the modeled sales of devices in 2019, multiplied by $/device price in 2019, and back-cast by the financing lifetime of the technology. We combine the embedded system cost estimate with modeled estimate of investments in 2019 and 2020 to estimate the current expenditures in 2020. We recognize this is an approximation of ongoing financing payments for existing energy infrastructure.

Comment:

This description documents the calculation methods but does not describe the assumptions used. For example, building shell improvements are a necessary component of residential heating electrification. There is no documentation explaining what type of shell is proposed for different locations of the state.

Cost Category: Non-Energy

Description:

Includes mitigation costs for all non-energy categories, including agriculture, waste, and forestry.

Methodology and Key Inputs

Differences in annual non-energy emissions between mitigation scenario and the Reference scenario (found in Annex 2) are multiplied with annual $/tCO2e costs (found in Annex 1, tab "Non Energy Costs"). We calculate net investment for each Mitigation scenario relative to the Reference scenario, and costs are displayed on an NPV basis over 2020-2050 period. The non-energy emissions costs are calculated for waste,

agriculture, and forestry and land use categories separately. Agriculture and Waste costs are sourced from US data within EPA's 2019 report on Global Non-CO2 Greenhouse Gas Emission Projections & Mitigation report, while Forestry and Land Use mitigation costs are sourced from WRI's 2020 CarbonShot report. Mitigation costs on a $/tCO2e basis were applied to reductions/increased sequestration in each scenario (after adjusting for differences in GHG accounting between the EPA/WRI reports and the Climate Act accounting conventions).

Waste and agriculture costs for Scenarios 1-3 do not use the most expensive mitigation potential within the EPA report. Scenario 4 (Beyond 85% Reductions) includes incremental ambition in waste and agriculture beyond the other mitigation scenarios, so the incremental cost of agriculture and waste mitigation above the levels of Scenarios 1-3 are costed at a higher level in Scenario 4.

Comment:

This description documents the calculation methods but does not describe the assumptions used in sufficient detail to provide meaningful comments.

Cost Category: Renewable Gas

Description:

Includes fuel costs for renewable natural gas and imported green hydrogen consumed for final energy demand (excludes fuel used for electricity generation).

Methodology and Key Inputs

Final energy demand in MMBtu was multiplied by energy prices in $/MMBtu from internal E3 analysis of biofuels prices based on DOE Billion Ton Report, NYSERDA Potential of RNG report, and E3 analysis for hydrogen production costs. Note that renewable gas costs are meant to represent wholesale costs of gas, not retail rates for these fuels. See prices as published in Annex 1.

Note that the cost for hydrogen production and import into New York state is included 50% in the RESOLVE modeling and 50% in the demand-side modeling; see Annex 1 tab Hydrogen Costs for a breakdown of cost components of hydrogen we include.

Comment:

The references mentioned should be available for stakeholder review and comment.

Cost Category: Renewable Liquids

Description:

Includes fuel costs for renewable diesel and renewable jet kerosene consumed for final energy demand.

Methodology and Key Inputs

Final energy demand in MMBtu was multiplied by energy prices in $/MMBtu from internal E3 analysis of biofuels prices based on DOE Billion Ton Report. See prices for renewable fuels as published in Annex 1.

Comment:

The references mentioned should be available for stakeholder review and comment.

Cost Category: NETs

Description:

Includes costs for direct air capture of CO2 as a proxy for NETs.

Methodology and Key Inputs

For scenarios with NETs, we multiply annual tons mitigated by $/ton costs, with per-ton estimates for cost of electricity and natural gas with CCS for ultimate prices as documented in Annex 1. Capital and O&M costs for direct air capture system taken from Keith, et al. 2018, with electricity price of $0.10/kWh and natural gas prices from EIA AEO 2021.

Comment:

The reference to an electricity price of $0.10/kWh needs justification. That price seems awfully low and would lower mitigation costs significantly compared.

Cost Category: Other

Description:

Includes other direct costs including non-stock sector costs, oil & gas system costs, and HFC alternatives.

Methodology and Key Inputs

Non-stock sector costs (mostly industry EE but some EE for non-stock building EE) estimated using a $ per MMBtu saved value, oil & gas system costs are direct calculations of capital and operating costs for the oil & gas system in New York for each scenario from parallel Abt analysis, HFC alternatives are direct calculations of costs for new HFC replacements and refrigerant recovery for each scenario from parallel Guidehouse analysis.

These costs are calculated relative to a Reference scenario, so there are no HFC mitigation costs or non-stock cost for energy efficiency in the Reference case. Oil and gas system cost and HFC mitigation costs come form parallel analyses, non-stock cost for energy efficiency calculated by multiplying change in energy demand between Reference and mitigation scenarios by $/MMBTU cost for EE values for various sectors.

Where embedded system costs are estimated (Figures 45, 48, 50): for oil and gas system cost (the pipeline delivery system), we use EIA AEO data on sales, delivered cost, and wholesale cost of natural gas to estimate the cost of the natural gas delivery system, and treat that as embedded cost which is held constant throughout the model

period in real dollar terms across all scenarios. Estimate of embedded system costs = delivered natural gas revenues - wholesale natural gas revenues in New York state, with data from EIA: https://www.eia.gov/dnav/ng/ng_pri_sum_dcu_nus_m.htm

Comment:

The parallel analyses need to be provided to stakeholders.

Cost Category: Fossil Gas (known by everyone outside of the Climate Action Council as Natural Gas)

Description:

Includes fuel costs for fossil natural gas consumed for final energy demand (excludes fuel used for electricity generation).

Methodology and Key Inputs

Final energy demand in MMBtu was multiplied by energy prices in $/MMBtu for the Middle Atlantic census division from EIA AEO 2021. Annual demand for fossil gas (documented in Annex 2) multiplied by price for fossil gas (documented in Annex 1). Quantities of fuels are model outputs, with the model benchmarked to a variety of sources including the GHG Inventory and EIA State Energy Data System data for 2018. Note that fossil gas costs are meant to represent wholesale costs of gas, not retail rates for gas.

Comment:

The model benchmark results should be provided so that stakeholders can verify the assumptions used.

Cost Category: Fossil Liquids

Description:

Includes fuel costs for liquid petroleum products like gasoline, diesel, jet kerosene, LPG, and residual fuel oil consumed for final energy demand (excludes fuel used for electricity generation).

Methodology and Key Inputs

Final energy demand in MMBtu was multiplied by energy prices in $/MMBtu for the Middle Atlantic census division from EIA AEO 2021. Annual demand for fossil liquid fuels (documented in Annex 2) multiplied by price for fossil liquid fuels (documented in Annex 1). Quantities of fuels are model outputs, with the model benchmarked to a variety of sources including the GHG Inventory and EIA State Energy Data System data for 2018.

Comment:

The final scoping plan should use benchmarked data from 2019 and results from 2020 to confirm the methodologies are appropriate.

Cost Category: Other Fuel

Description:

Includes fuel costs for other fuels such as wood, coal, and petroleum coke consumed for final energy demand (excludes fuel used for electricity generation).

Methodology and Key Inputs

Final energy demand in MMBtu was multiplied by energy prices in $/MMBtu for the Middle Atlantic census division from EIA AEO 2021. Annual demand for other fuels (documented in Annex 2) multiplied by price for other fuels (documented in Annex 1). Quantities of fuels are model outputs, with the model benchmarked to a variety of sources including the GHG Inventory and EIA State Energy Data System data for 2018.

Comment:

The final scoping plan should use benchmarked data from 2019 and results from 2020 to confirm the methodologies are appropriate.

I prepared this comment because I wanted to make the point that the cost data are insufficient even though some additional information was provided in May. I have written extensively on implementation of the Climate Act because I believe the ambitions for a zero-emissions economy outstrip available renewable technology such that it will adversely affect reliability and affordability, risk safety, affect lifestyles, will have worse impacts on the environment than the purported effects of climate change in New York, and cannot measurably affect global warming when implemented. The opinions expressed in this document do not reflect the position of any of my previous employers or any other company I have been associated with, these comments are mine alone.

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