Roger Caiazza November 24, 2020 Comments on the Draft Guidance: Establishing a Value of Carbon, Guidelines for Use by State Agencies

Introduction

I am submitting these comments on the draft "Establishing a Value of Carbon, Guidelines for Use by State Agencies" document released on October 29, 2020 because the Climate Leadership and Community Protection Act (CLCPA) will affect the affordability and reliability of New York's energy. The draft does not appropriately address the CLCPA. The focus should be more on meeting the CLCPA targets and less on providing guidelines for state agencies. Because CLCPA has set targets, the guidance has to reflect that and the marginal abatement cost is the better approach choice.

I am a retired electric generation utility meteorologist with nearly 40-years of experience analyzing the effects of environmental regulations on electric and gas operations. The opinions expressed in these comments 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.

Background

According to the guidance document:

> This guidance establishes a value of carbon that can be used by State entities to aid decision-making and used as a tool for the State to demonstrate the global societal value of actions to reduce greenhouse gas emissions. The Department recommends that a value of carbon be used as part of a full and transparent assessment of environmental, economic, and social impacts, wherever appropriate. This guidance does not impose a compliance obligation or fee on any entity; the imposition of any such new compliance obligation or fee on any entity would require separate State action.

In section §75-0113, Value of Carbon the CLCPA states that the "social cost of carbon shall serve as a monetary estimate of the value of not emitting a ton of greenhouse gas emissions" and that "As determined by the department, the social cost of carbon may be based on marginal greenhouse gas abatement costs or on the global economic, environmental, and social impacts of emitting a marginal ton of greenhouse gas emissions into the atmosphere, utilizing a range of appropriate discount rates, including a rate of zero." The law states that DEC "shall consider prior or existing estimates of the social cost of carbon issued or adopted by the federal government, appropriate international bodies, or other appropriate and reputable scientific organizations."

The presentation for the September 17, 2020 Transportation Advisory Panel meeting includes a slide titled "Advisory panel objectives" that lists the following goals:

- Identify a range of emissions reductions, consistent with analysis, for the sector that contributes to achieving the statewide emission limits.
- Present a list of sector-based recommendations for emissions reducing policies, programs or actions, for consideration by the Climate Action Council for inclusion in the Scoping Plan.
- Evaluate the costs and benefits of recommended strategies, informed by the Value of Carbon established in accordance with Section 75-0113 of the CLCPA.

The last item in this list coupled with the enormity of developing an implementation plan to meet the ambitious targets of the CLCPA suggest that supporting the goals of the advisory panels should be the primary emphasis of this guidance.

Estimating the Value of Carbon – Two Approaches

New York State Energy Research and Development Authority (NYSERDA) and Resources for the Future prepared "Estimating the Value of Carbon: Two Approaches". It "reviews both the Social Cost of Carbon ($SC\text{-}CO_2$) approach and the Marginal Abatement Cost (MAC) approach to carbon valuation, with attention to specific considerations for the application of each approach to inform policy analysis and decision-making in NYS". In my original comments on last summer's workshop on a carbon price for New York I argued that the guidance documentation should also serve as a primer for the general public. I don't think that this document fulfills the need to explain the implications of the assumptions used on the values proposed for the general public.

Blastland et al. (2020) describe an approach for evidence communication that I believe would be an appropriate template for the public primer. Most importantly, the authors suggest that communications should offer "balance, not false balance". They explain that to fully inform people all the relevant information has to be presented. They describe this and offer a solution:

> Partial presentation of evidence crops up across scientific literature and in the public domain. Often, the argument made is that people can't take in lots of information at once. If you're presenting written information, you can make it easier for them. Here's a simple tip from research in medical communication: display the pros and cons in a table rather than stating them in the text. Imagine a table comparing proposed transmission-prevention policies that lays out the projected harms and benefits of each policy in terms of mortality, morbidity, economics, environment and mental health, breaking down subgroups and timescales. For your audiences, knowing what the key pros and cons are is crucial.

In this instance, a table of the differences in the $SC\text{-}CO_2$ damages values as a function of the different assumptions would be appropriate. As I show below, the assumptions make big differences.

New York Value of Carbon

The guidance document recommends a procedure for using a damages-based value of carbon along with a general review of the marginal abatement cost approach. According to the Executive Summary "The current guidance is focused on the damages-based value as a tool to aid state agencies as they begin to regularly consider greenhouse gas emissions and climate change in their decision-making. In some decision-making contexts, particularly those that have a history of valuing carbon, alternative approaches may be more appropriate."

These two approaches are discussed in detail in the guidance document and the Supporting Memo. The first approach is the damages approach exemplified by the Social Cost of Carbon ($SC\text{-}CO_2$) which is the present-day value of projected future net damages from emitting a ton of CO_2 today. The supporting memo gives an overview of the methodology and the specifics of the New York application. In brief the $SC\text{-}CO_2$ has been calculated using models that follow four steps. In all cases the projections are made out to 2300. Future emissions are predicted using factors such as economic growth, technology, and

population. Responses to climate change, such as temperature increase and sea level rise, are modeled. The economic impact on aspects of the economy, such as energy use, health, and agriculture, are projected from these climatic changes. Finally, the future damages are converted into their present-day value using discounting and add them up to determine total damages.

The second approach is "based on marginal GHG abatement costs". In this approach, the marginal cost measures the cost to reduce a ton of greenhouse gas and is used to develop a Marginal Abatement Cost Curve which is "a succinct and straightforward tool for presenting carbon emissions abatement options relative to a baseline (typically a business-as-usual pathway)". This curve "permits an easy to read visualization of various mitigation options or measures organized by a single, understandable metric: economic cost of emissions abatement". For each control option, a block with width equal to the amount of potential reductions and height equal to marginal cost of the option is prepared. In its recent review of the federal IWG social cost of carbon, the U.S. Government Accountability Office referred to the marginal abatement cost as a type of "target-consistent approach" to valuing emissions, which reflects the fact that this approach establishes a value that depends in part on the relevant emission reduction target.

DEC has chosen to apply the damages-based value of carbon approach to "provide accessible and practical assistance to State agencies and authorities where it is useful and appropriate". I believe that this focus is a mistake. The CLCPA's primary role for the value of carbon is not for the agencies and authorities targeted in the guidance. Instead the priority should be the value of carbon in the decision making by the Climate Action Council. The 22-member Council, supported by seven advisory panels and two working groups with over 120 people, is required to develop a "scoping plan outlining the recommendations for attaining the statewide greenhouse gas emissions limits" necessary to meet the law's schedule to meet its targets. Given that the CLCPA has specific reduction targets relative to a 1990 baseline, then the marginal abatement cost method should be the preferred approach in the guidance document.

In my comments on the July 24, 2020 Public Webinar on the Value of Carbon I suggested that the guidance should not only provide the information required by the CLCPA but should also include a primer for the public and policy makers who need to understand how the recommended metrics are used and the basis for the recommendations made. The Memo does provide an overview but it does not adequately describe all the issues related to valuing greenhouse gases with justification for the recommended resolution of those issues. The Climate Act is a transformational driver of change so the public needs to know the underlying rationale for valuing the reductions and thus the benefits. It is also important to justify deviations from the recommendations made by the U.S. Interagency Working Group (IWG). My comments below address this concern.

Emission Targets and the Value of Carbon

The guidance and supporting memo discuss the damages and marginal abatement cost but there are other metrics that describe 'equivalences' between climate-changing species used to determine contributions to climate impacts.

Mallapragada and Mignone (2020) describe two metrics: global warming potential (GWP) and global damage potential (GDP). They explain that:

> The GDP is expressed as "the ratio of the social cost of a given greenhouse gas (GHG) to the social cost of CO2 (SC-CO_2), where the social cost of a GHG measures the (discounted) cumulative economic damage of that GHG. The global warming potential (GWP) is expressed as the ratio of the absolute global warming potential (AGWP) of a given GHG to the AGWP of CO2, where the AGWP of a GHG measures the cumulative radiative forcing of that GHG. While the GDP and GWP both measure the climate impact of a given GHG relative to CO2—and while both are cumulative measures of impact—they estimate impact at different points along the causal chain.

GWP is used in the CLCPA and guidance document but it is only concerned with the physical differences of various gases on potential warming whereas the GDP considers both physical and economic differences.

There are two other metrics that should also be considered: global cost potential (GCP) and global temperature change potential (GTP). GCP is an end-point economic metric and defines price ratios between GHGs and CO2 that deliver the least-cost mitigation solutions to meet a specific climate target at a specific time (Balcombe et al, 2018). Similar to the GDP, this metric is typically an output from a climate-economic model that generates price ratios for different GHG mitigation options using an optimization model. It has not been used for carbon equivalency-related studies due to its complexity and dependence on system assumptions.

Compared to the GWP, the GTP goes one step further down the cause–effect chain and is defined as the change in global mean surface temperature at a chosen point in time in response to an emission pulse—relative to that of CO2. Whereas GWP is integrated in time, GTP is an end-point metric that is based on temperature change for a selected year. Similar to the GWP, the impact from CO2 is normally used as reference.

Tol et al., 2012 present a unifying framework that clarifies the relationships among four metrics establishing 'equivalences' among emissions of various species. Importantly, the framework distinguishes between cost benefits and cost effectiveness. The abstract states:

> We show that the global temperature change potential (GTP) is a special case of the global cost potential (GCP), assuming a (slight) fall in the global temperature after the target is reached. We show how the four metrics should be generalized if there are intertemporal spillovers in abatement costs, distinguishing between private (e.g., capital stock turnover) and public (e.g., induced technological change) spillovers. Both the GTP and GCP follow naturally from a cost-effectiveness framing of the climate change issue. We also argue that if (1) damages are zero below a threshold and (2) infinitely large above a threshold, then cost-effectiveness analysis and cost–benefit analysis lead to identical results. Therefore, the GCP is a special case of the GDP. The UN Framework Convention on Climate Change uses the GWP, a simplified cost–benefit concept. The UNFCCC is framed around the ultimate goal of stabilizing greenhouse gas concentrations. Once a stabilization target has been agreed under the convention, implementation is clearly a cost-effectiveness problem. It would therefore be more consistent to use the GCP or its simplification, the GTP.

This paper explains that once a cap is set, you should not use the social cost of carbon. The social cost of carbon is an efficiency concept. Establishing a price incentivizes society to develop the most efficient response to that price but does not guarantee specific emission levels. Once a specific target is

established in a cap that violates the efficiency principle inherent in the social cost of carbon. Instead a cap requires that emissions are valued to the shadow price of the cap.

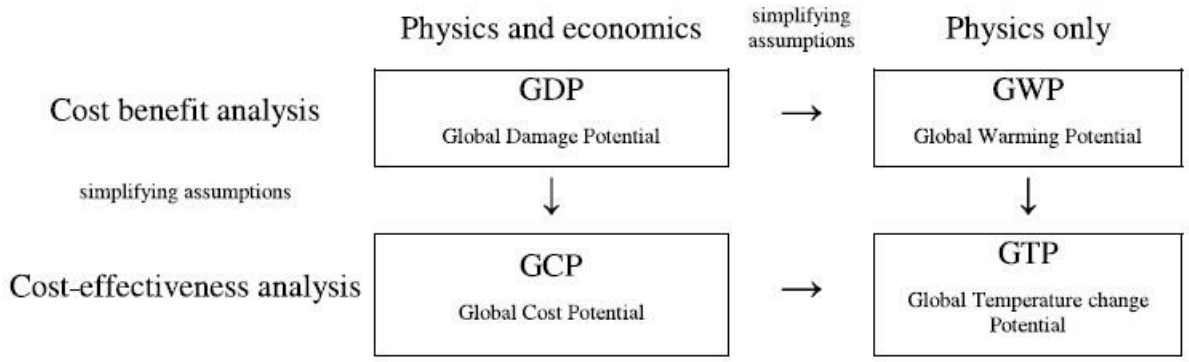


Figure 1: The relationships between the four main types of metrics to compare different components of climate-changing emissions. (Tol et al., 2012)

Social Cost of Carbon Dioxide

DEC's draft guidance recommends the use of the IWG damages-based value of carbon, also referred to as the social cost of carbon dioxide, methane, and nitrous oxide. The available materials includes an appendix with a table of different social cost values in 2020 dollars per metric ton of emissions (adjusted for inflation) based on different discount rates. The DEC "specifically recommends that State entities provide an assessment based on a range of discount rates from 1 to 3 percent to represent the range of potential impacts to society or alternatively, using only a central value that is estimated at the 2 or 2.5 percent discount rate". In the supporting Memo, NYSERDA suggests that DEC "treat the current IWG "central" SC-CO_2 estimate (at $53 per metric ton of CO2 in 2020) as a lower bound for damages, consider adopting a higher central SC-CO_2 value for use by NYS agencies, and develop guidance on when to use a range of SC-CO_2 values in analysis".

The CLCPA goals are emission reduction targets. Not only do the guidance document or supporting Memo fail to rationalize why a cost efficiency approach should be used going forward for the CLCPA but there isn't justification for the damages approach over the marginal abatement approach. The fact is that there is controversy over various aspects of the damages approach and the only indication of that is the discussion of discount rates in the supporting Memo. Equally important are the choice of time horizon and equilibrium climate sensitivity.

The guidance and supporting Memo discuss the discount rate and address some of the controversies associated with choosing a value. The guidance notes that "The federal IWG's central value applies a 3 percent discount rate that is consistent with the economics literature and in the federal government's Circular A-4 guidance for the consumption rate of interest", but then goes on to recommend either the 2% or 2.5% discount rate for use by NYS agencies. I believe that the justification for changing the central value recommended by the Integrated Working Group is inadequate.

The guidance document states that "The purpose of the discount rate when applied to actions by public entities should be, in part, to reflect public preferences as to costs as well as to public safety, welfare, and environmental protection." I think three things should be kept in mind when choosing the discount rate. The supporting Memo admits that "no consensus exists on what approach or rate to use for

discounting uncertain climate impacts over long time horizons". There is no question that the discount rate choice is primarily driven by value judgements. In addition, the guidance document notes that "Under the CLCPA (§75-0113(2)), New York State is required to consider global damages" and goes on to claim that "the global cost is the most appropriate value to use due to the global nature of climate change and the economy". New York State guidance should treat those things consistently.

My particular concern is that it appears that global interests are invoked where convenient and then ignored where inconvenient. The arguments supporting changing the central discount rate from 3% to something lower focus on the appropriate discount rate from the standpoint of developed countries. On one hand, the higher damages that justify the lower discount rates are primarily driven by the impacts to the world's poor who cannot develop resilient adaptation measures. On the other hand, the best way to mitigate those impacts is for the economies of the poor countries to develop the wealth needed for resiliency measures. It appears to me that in order for poor countries to develop their economies that they would want to value money spent today greater than saving it for later. One way to consider discounting is that it runs the compound rate of return exercise backwards, calculating how much would need to be invested at a reasonably expected interest rate today to result in the value of the averted future climate damage (Kreutzer, 2016). Setting a higher value of the cost of greenhouse gases today means that poor countries have less money to spend developing their economies to become more resilient in the long run. That ethical judgement choice argues for a higher discount rate than the values proposed in the guidance document because we know investments in the short-term will improve living standards today and resiliency to future damages due to extreme weather tomorrow.

I believe that a discussion of the time horizon should be included in the guidance document. The IWG social cost methodology projects future emissions using factors such as economic growth, technology, and population; responses to climate change, such as temperature increase and sea level rise; and the economic impact on aspects of the economy, such as energy use, health, and agriculture, due to the climate impacts. Ultimately, the social costs depend entirely on these projections. The supporting Memo selectively references only estimates that show large impacts and follows the lead of the IWG extending the time horizon out to 300 years which maximizes the cost impacts. However, it is wildly optimistic to assume that forecasts of technological change affecting economic growth, energy use, health, agriculture, and population can be estimated well enough to predict effects on the global economy that far into the future.

In testimony before the U.S. House of Representatives Subcommittee on Environment Committee on Oversight and Reform on September 24, 2020, Kevin D. Dayaratna estimated the effect of the time horizon. He used one of the primary integrated assessment models (DICE) used by the IWG to calculate SC-CO_2 to calculate the social costs out 150 years instead of the 300-year time horizon. Table 1 shows that in 2020 for a discount rate of 2.5%, the SC-CO_2 is reduced 22% using a 150-year time horizon and that the reduction increases for future estimates. Similarly, in 2020 for a discount rate of 3.0%, the SC-CO_2 is reduced 14% using a 150-year time horizon and that the reduction also increases for future estimates.

Table 1: Dayaratna Comparative Evaluation of the DICE Model for Different Time Horizons and Equilibrium Climate Sensitivities

DICE Model Average SC-CO_2 – Baseline, End Year 2300

Year	Discount Rate 2.5%	Discount Rate 3.0%	Discount Rate 5.0%	Discount Rate 7.0%
2020	$56.92	$37.79	$12.10	$5.87
2030	$66.53	$45.15	$15.33	$7.70
2040	$76.96	$53.26	$19.02	$9.85
2050	$87.70	$61.72	$23.06	$12.25

DICE Model Average SC-CO_2 - End Year 2150

Year	Discount Rate 2.5%	Discount Rate 3.0%	Discount Rate 5.0%	Discount Rate 7.0%
2020	$44.41	$32.38	$11.85	$5.85
2030	$50.82	$38.00	$14.92	$7.67
2040	$57.17	$43.79	$18.36	$9.79
2050	$62.81	$49.20	$22.00	$12.13

Differerence Baseline End Year 2300 to End Year 2150

Year	Discount Rate 2.5%	Discount Rate 3.0%	Discount Rate 5.0%	Discount Rate 7.0%
2020	-22%	-14%	-2%	0%
2030	-24%	-16%	-3%	0%
2040	-26%	-18%	-3%	-1%
2050	-28%	-20%	-5%	-1%

DICE Model Average SC-CO_2 – ECS Distribution Updated in Accordance with Lewis and Curry (2015), End Year 2300

Year	Discount Rate 2.5%	Discount Rate 3.0%	Discount Rate 5.0%	Discount Rate 7.0%
2020	$28.92	$19.66	$6.86	$3.57
2030	$33.95	$23.56	$8.67	$4.65
2040	$39.47	$27.88	$10.74	$5.91
2050	$45.34	$32.51	$13.03	$7.32

DICE Model Average SC-CO_2 – IWG ECS Distribution Relative to Lewis and Curry (2015) ECS Distribution, End Year 2300

Year	Discount Rate 2.5%	Discount Rate 3.0%	Discount Rate 5.0%	Discount Rate 7.0%
2020	-49%	-48%	-43%	-39%
2030	-49%	-48%	-43%	-40%
2040	-49%	-48%	-44%	-40%
2050	-48%	-47%	-43%	-40%

I believe that there is a serious problem with another aspect of the IWG SC-CO_2 that was over-looked by the Memo and guidance. Obviously, the effect of greenhouse gases on climate is a fundamental driver of the impacts. Equilibrium climate sensitivity (ECS) is the expected change in temperature when the atmospheric CO2 concentration doubles. The costs of this warming are dominated by the higher possible values of the ECS. The ultimate problem is that the IWG did not use the most recent values of the ECS for the value that the price of carbon initiative proposes to use. On July 23, 2015, Patrick Michaels presented relevant testimony to the House Committee on Natural Resources. Excerpts:

> *"In May 2013, the Interagency Working Group produced an updated SCC value by incorporating revisions to the underlying three Integrated Assessment Models (IAMs) used by the IWG in its initial 2010 SCC determination. But, at that time, the IWG did not update the equilibrium climate sensitivity (ECS) employed in the IAMs. This was not done, despite there having been, since January 1, 2011, at least 14 new studies and 20 experiments (involving more than 45 researchers) examining the ECS, each lowering the best estimate and tightening the error distribution about that estimate. Instead, the IWG wrote in its 2013 report: "It does not revisit other interagency modeling decisions (e.g., with regard to the discount rate, reference case socioeconomic and emission scenarios, or equilibrium climate sensitivity)."*
>
> *"Clearly, the IWG's assessment of the low end of the probability density function that best describes the current level of scientific understanding of the climate sensitivity is incorrect and indefensible. But even more influential in the SCC determination is the upper bound (i.e., 95th percentile) of the ECS probability distribution. Apart from not even being consistent with the AR4, now, more than five years hence, the scientific literature tells a completely different story. And this is very significant and important difference because the high end of the ECS distribution has a large impact on the SCC determination—a fact frequently commented on by the IWG2010."*

Dr. Judith Curry has prepared a table of different values of the ECS that illustrates the relative impacts of the indefensible cherry picking of a value that suited the agenda of the IWG rather than a more recent value.

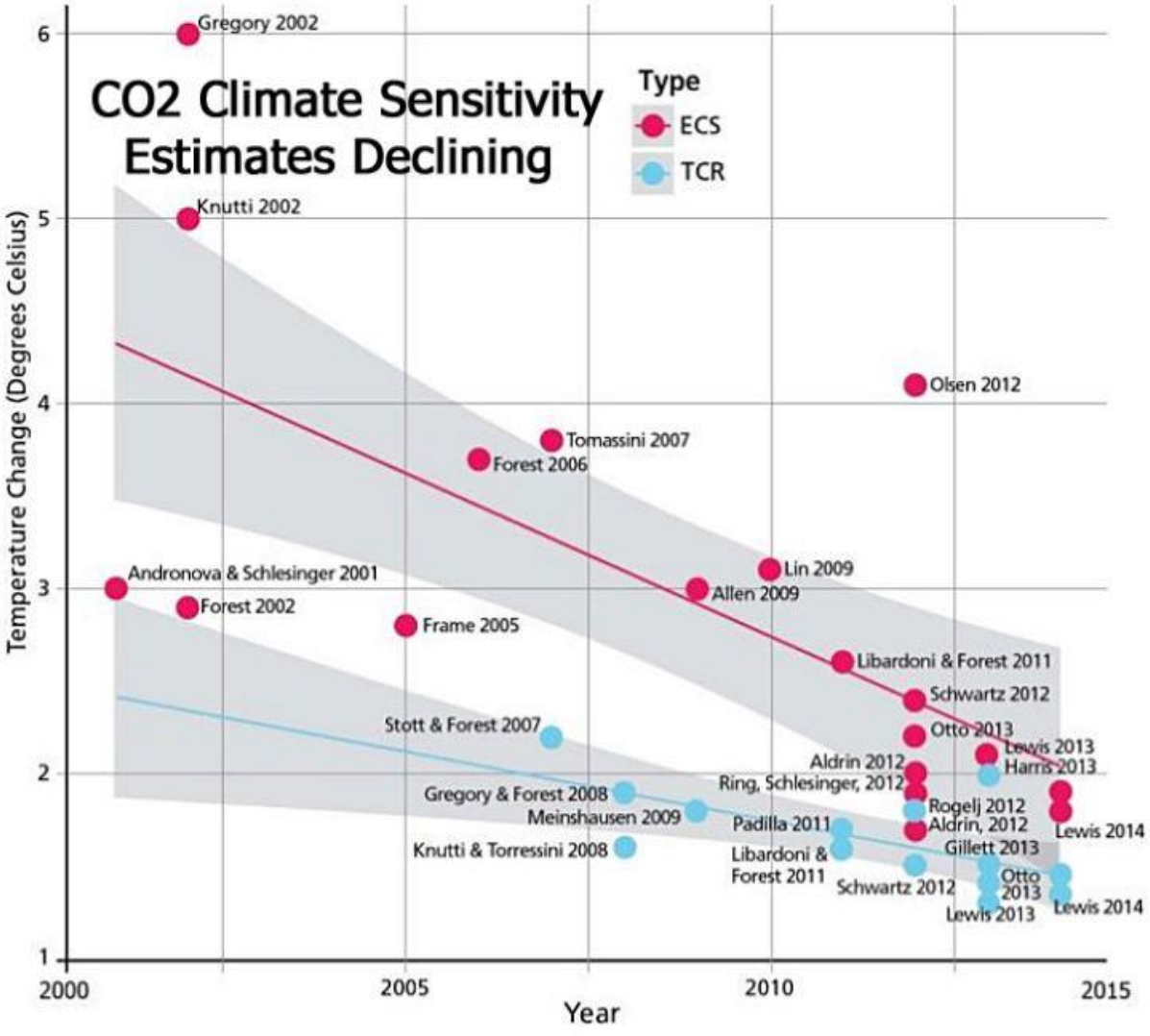
Table 2: Equilibrium Climate Sensitivities

	Median	5th pctile	95th pctile
US IWG	3.0	1.72	7.14
AR4	3.0	1.5	-
AR5	-	1.0	6.0
CMIP5	3.45	2.08	4.67
Lewis & Curry 14	1.64	1.05	4.05
Lewis (15)*	1.45	1.05	2.2

* Incorporates lower aerosol forcing of Stevens (2015)

Because the extreme values are a key driver of the ECS, the 95th percentile values are of most interest. Refer back to the Michaels testimony above to see that the IWG had lower values available to it for years but chose not to use them. There is another nuance to this table that is important to me personally as a meteorologist with over 40 years of experience with modeling and monitoring. The last two rows in this table are estimates based on monitoring and not modeling so, in my opinion, are more likely to be correct.

Finally, estimates of ECS have been declining for a long time, as shown in 2017 by Nicola Scafetta and colleagues. The following is their Figure 7: Compilation of published transient climate response (TCR) and equilibrium climate sensitivity (ECS) values to atmospheric CO2 doubling. Continued use of the ECS values used by the IWG is unsupportable.



In his testimony before the Environment Committee on Oversight and Reform on September 24, 2020, Dayaratna also estimated the effect of the ECS on the SC-CO2. Table 1 shows using the Lewis and Curry

2015 ECS values based on monitoring and not modeling that in 2020 for a discount rate of 2.5%, the SC-CO_2 is reduced 49% using a 300-year time horizon and that the reduction decreases for future estimates. Similarly, in 2020 for a discount rate of 3.0%, the SC-CO_2 is reduced 48% using a 300-year time horizon and that the reduction also decreases for future estimates.

Given that there are additional sources of uncertainty that reduce the social costs and that the choice of discount rate is a value judgement I recommend that the guidance document continue to use the 3.0% discount rate used by the IWG. There is insufficient justification in the Memo or guidance document to justify the change proposed.

There is another aspect of these additional sources of uncertainty. John Pezzey (2019) offered a relevant opinion that these social cost methodology issues and others he cites means that the values will always be disputed. He concludes:

> I suggest that any carbon prices used to inform climate policies, be they carbon prices used as policy instruments, or complementary, non-carbon-price policies, should instead be based on marginal abatement costs, found by modeling low-cost pathways to socially agreed, physical climate targets. A pathway approach to estimating carbon prices poses challenges to many economists, and is no panacea, but it avoids any illusion of optimality, and facilitates detailed analysis of sectoral policies.

Given these uncertainties and because the over-arching rationale for valuing the cost of greenhouse gases is to support the implementation of the CLCPA targets, the marginal abatement approach should be the preferred approach.

Social Cost of Methane and Nitrous Oxide

I support DEC's recommendation that "State entities use the updated estimates of the federal IWG social costs of carbon dioxide, methane, and nitrous oxide". The IWG "Addendum Valuing Methane and Nitrous Oxide Emission Changes in Regulatory Benefit-Cost Analysis" argues that using directly calculated societal cost values for methane and other non-CO2 greenhouse gases rather than global warming potential values (i.e. converting them to CO2 equivalents) is more appropriate and I agree.

However, there definitely is room for improvement. During the earlier iteration of the IWG work the US Environmental Protection Agency (EPA) realized that a social cost of gases other than CO2 were needed and found that there was a "paucity of peer-reviewed estimates of the social cost of non-CO2 gases in the literature". In response the EPA National Center for Environmental Economics developed estimates of the social cost of methane and nitrous oxide consistent with the methodology and modeling assumptions underlying the IWG social cost estimates. Their work was published in two papers: Marten, A.L., and S.C. Newbold (2012) and Marten, A.L., Kopits, E.A., Griffiths, C.W., Newbold, S.C., and A. Wolverton, (2015)

I suspect that I am not the only one suspicious when an agency prepares a study that forms the basis of the regulatory metric proposed by other agencies. I question the independence of the results in that approach. Ultimately, the work and findings of agency work go through political appointees before they

are released and there is no question that process motivates particular outcomes. In anticipation of such cynicism the Addendum states:

> "The methodology and estimates described in this addendum have undergone multiple stages of peer review and their use in regulatory analysis has been subject to public comment. With regard to peer review, the study by Marten et al. (2015) was subjected to a standard double-blind peer review process prior to journal publication. In addition, the application of these estimates to federal regulatory analysis was designated as Influential Scientific Information (ISI), and its external peer review was added to the EPA Peer Review Agenda for Fiscal Year 2015 in November 2014. The public was invited to provide comment on the peer review plan, though EPA did not receive any comments. The external peer reviewers agreed with EPA's interpretation of Marten et al.'s estimates; generally found the estimates to be consistent with the approach taken in the IWG SC-CO2 estimates; and concurred with the limitations of the GWP approach, finding directly modeled estimates to be more appropriate. All documents pertaining to the external peer review, including a white paper summarizing the methodology, the charge questions, and each reviewer's full response is available on the EPA Science Inventory website."

EPA addressed the deficiency identified by setting up a project, Valuing Non-CO2 GHG Emission Changes in Benefit-Cost Analysis to "improve upon the current treatment of non-CO2 GHG emission impacts in benefit-cost analysis". According to the peer review plan: a contractor picked three reviewers; the public, including scientific or professional societies was not asked to nominate peer reviewers; no public nominations were allowed through the Peer Review Agenda; the Agency did not provide significant and relevant public comments to the peer reviewers before they conducted their review; the review was not a public panel; and public comments were not allowed at the panel review. The fact that no comments were received from the public suggests that this was not well publicized. I also think that it is inappropriate that the papers are paywalled because the work was funded with public taxes. Because this work is the basis of the DEC recommendation public review copies should be made available.

EPA asked the three external reviewers recommended by a contractor to provide comments: Karen Fisher-Vanden, Professor of Environmental and Resource Economics, Director, Institute for Sustainable Agricultural, Food, and Environmental Science (SAFES), and Co-Director, Program on Coupled Human and Earth Systems (PCHES) at Penn State College of Agricultural Sciences; John Reilly, Senior Lecturer, Sloan School of Management and Co-Director, MIT Joint Program on the Science and Policy of Global Change at the Massachusetts Institute of Technology; and Steven Rose, Energy and Environmental Analysis Research Group, Electric Power Research Institute. All three are well-qualified to review the work but I have this nagging concern that the reviewers from academia would be reluctant to provide negative feedback lest it affect review of future funding.

The request for peer review focused on the mechanics of vetting the Addendum. The Science Inventory includes a peer review report that describes the process. EPA developed a white paper, Valuing Methane Emissions Changes in Regulatory Benefit-Cost Analysis, that described the problem, the two

different approaches for estimating societal valuation of impacts, the limitations of the global warming potential approach (GWP), and then developed its estimate of the direct estimation social costs. The reviewers were asked seven questions about the white paper and the primary Marten et al. (2015) reference. The report explains the metric and problems well and the comments from the experts indicate that there are significant issues that need to be resolved. The peer review report includes the responses from the three reviewers and concludes with a summary and response description:

> "EPA recently conducted a peer review of the application of the Marten et al. (2015) non-CO2 social cost estimates in regulatory impact analysis (RIA). Three reviewers considered seven charge questions that covered issues related to the EPA's interpretation of the estimates, the consistency of the estimates with the social cost of carbo estimates used in RIAs, EPA's characterization of the limits of the alternative GWP approach to approximate the social cost of non-CO2 GHGs, and the appropriateness of using the Marten et al. estimates in RIAs. The reviewers agreed with EPA's interpretation of Marten et al.'s estimates; generally found the estimates to be consistent with the social cost of carbon estimates; and concurred with the limitations of the global warming potential approach, finding directly modeled estimates to be more appropriate."

The problem that New York should address is that the values proposed were developed by one group, published in two papers, and peer-reviewed by three people. That may be inadequate for setting policy.

There is another issue associated with methane. Carbon dioxide is long-lived and accumulates over time because it stays in the atmosphere. Methane is a short-lived (10 to 12 years) pollutant that lasts in the atmosphere less because "methane undergoes hydroxyl oxidation and becomes carbon dioxide and water vapor. The resulting carbon dioxide is recycled and returned to the atmosphere, ending methane's warming". For the SC-$C0_2$ impacts are aggregated and discounted out to 2300 for the IWG assessment which is predicated on the long atmospheric lifetime of CO_2 (Archer et al., 2009). The IWG assumes a lifetime of 12 years so methane is not accumulating in the atmosphere.

Last summer the European Union (EU) proposed an initiative to reduce methane emissions. Myles Allen, a professor of Geosystem Science and head of the Climate Dynamics Group at Oxford Martin, University of Oxford submitted comments that offer a perspective on the issue of methane accounting that is relevant in this instance. Their work is based on the life-time difference between carbon dioxide and methane. Allen notes that the EU methane policy represents "an opportunity to clarify the definition of climate neutrality". Because methane is being destroyed relatively quickly as it's being added, its warming impact isn't determined by how much is being emitted but by how much more or less methane is being emitted over a period of time. Allen's primary concern was the effect of the global warming potential on agriculture. He argues that as long as the size of ruminant herds remain constant, they should not be targeted for reductions.

The CLCPA targets set a hard cap on methane emissions. Twelve years after the cap limit is reached the impact of methane on warming is done. It stands to reason that the economic impact on aspects of the

economy, such as energy use, health, and agriculture, projected from these climatic changes is also done. Therefore, the SC-CH_4 time horizon should be 2062, 12 years after the attainment deadline when methane emissions will be fixed in the state. It does not matter if there are emissions only that the emissions are fixed. The SC-CH_4 should be re-calculated to account for the New York social costs.

Presentation at Climate Action Council Meeting 5

There was a presentation by Maureen Leddy at the 24 November 2020 Climate Action Council Meeting that is worrisome because the approval deadline is only 23 working days after the public comment period ends and that period includes the Christmas holiday. The target timeline of milestones to meet the CLCPA deadline notes that the "Final released (CLCPA requirement) – January 1, 2021". However, §75-0113. Value of carbon (1) states "No later than one year after the effective date of this article, the department, in consultation with the New York state energy research and development authority, shall establish a social cost of carbon for use by state agencies, expressed in terms of dollars per ton of carbon dioxide equivalent". Governor Cuomo signed the CLCPA on July 18, 2019 so the effective date was in July. Given that the deadline has already passed it is imprudent to rush the review of these comments to meet an arbitrary deadline.

In my comments on the Value of Carbon webinar in July I said that I agree that guidance rather regulation makes more sense. However, I pointed out that the regulatory requirements mandate published responses to comments whereas I believe guidance documents don't have that mandate. Because I think this guidance should be comprehensive and inclusive, I suggested that even if it is not required that some sort of response to comments documentation be developed. Given the arbitrary review schedule my hope that DEC would address my comments seems unlikely.

Conclusion

My comments support the following conclusions:

- The focus of this guidance document is on use by State agencies but I believe that does not mean that the need for CLCPA implementation guidance should be overlooked. In order to justify the implementation costs of the CLCPA the damages approach of the social cost metrics may seem appropriate but because targets have been set the marginal abatement approach should be emphasized and used wherever possible in New York State going forward.
- DEC requested comment on whether the 2.0 or 2.5% discount rate for the SC-CO2 was more appropriate. I believe that neither is appropriate because the justification for changing the 3.0% discount rate central value recommended by the Integrated Working Group is inadequate.
- Documentation should be provided for the general public that describes the social costs approach. It should include a table showing the differences in estimates based on the assumptions used.

During the preparation of these comments I spent a lot of time reviewing the literature. It was disappointing that many of the sources I found were not included in the Memo or guidance documents. I recommend a second expert opinion. Either Richard Tol or Ross McKitrick could provide an alternate

perspective on the valuation of greenhouse gases that could prove valuable as the State tries to implement the CLCPA.

McKitrick (2016) evaluates carbon pricing policies in Canada and explains that "there may be many reasons to recommend carbon pricing as climate policy, but if it is implemented without diligently abiding by the principles that make it work, it will not work as planned, and the harm to the Canadian economy could well outweigh the benefits created by reducing our country's already negligible level of global CO2 emissions". Importantly he notes:

> However, a beneficial outcome is not guaranteed: certain rules must be observed in order for carbon pricing to have its intended effect of achieving the optimal balance between emission reduction and economic growth. First and foremost, carbon pricing only works in the absence of any other emission regulations. If pricing is layered on top of an emission-regulating regime already in place (such as emission caps or feed-in-tariff programs), it will not only fail to produce the desired effects in terms of emission rationing, it will have distortionary effects that cause disproportionate damage in the economy. Carbon taxes are meant to replace all other climate-related regulation, while the revenue from the taxes should not be funnelled into substitute goods, like renewable power (pricing lets the market decide which of those substitutes are worth funding) but returned directly to taxpayers.

New York State CLCPA implementation is trying to choose between many expensive policy options while at the same time attempting to understand which one (or what mix) will be the least expensive and have the fewest negative impacts on the existing system. If good picks are made then state ratepayers will spend the least amount of a lot of money, but if they are wrong, we will be left with lots of negative outcomes and even higher costs for a long time. Picking the correct value of carbon metric and values is critical to doing this right. A comprehensive response to comments justifying the choices made is an integral part of doing this right.

Roger Caiazza
Liverpool, NY 13090

References

Archer, D., M. Eby, V. Brovkin, A. Ridgwell, L. Cao, U. Mikolajewicz, and K. Tokos, 2009: Atmospheric lifetime of fossil fuel carbon dioxide. Annual Review of Earth and Planetary Sciences, 37, 117–134.

Balcombe, P., J.F. Speirs, N.P. Brandon, and A.D. Hawkes, 2018: Methane emissions: choosing the right climate metric and time horizon. Environ. Sci.: Processes Impacts, 20, 1323-1339, DOI: 10.1039/C8EM00414E.

Blastland, M., A.L.J. Freeman, S. van der Linden, T.M. Marteau and D. Spriegelhalter, 2020: Five rules for evidence communication. Nature **587**, 362-364, doi: https://doi.org/10.1038/d41586-020-03189-1

Kreutzer, D.W., 2016: "Discounting Climate Costs". Heritage Foundation *Issue Brief* No. 4575, , https://www.heritage.org/environment/report/discounting-climate-costs .

Mallapragada D. S. and B. K. Mignone, 2020: A theoretical basis for the equivalence between physical and economic climate metrics and implications for the choice of Global Warming Potential time horizon. Climatic Change, 158, 107–124, https://doi.org/10.1007/s10584-019-02486-7

Marten, A.L., and S.C. Newbold, 2012: Estimating the social cost of non-CO2 GHG emissions: methane and nitrous oxide Energy Policy 51: 957-972 (paywalled)

Marten, A.L., Kopits, E.A., Griffiths, C.W., Newbold, S.C., and A. Wolverton, 2015: Incremental CH4 and N2O Mitigation Benefits Consistent with the U.S. Government's SC-CO2 Estimates. Climate Policy. 15(2): 272-298 (Paywalled)

McKitrick, R., 2016: A practical guide to the economics of carbon pricing. University of Calgary School of Public Policy Research Papers, Vol. 9, Issue 28. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2844481

Pezzey J.C.V., 2019: Why the social cost of carbon will always be disputed. WIREs Climate Change. 10:e558. https://doi.org/10.1002/wcc.558

Scafetta, N., A. Mirandola, & A. Bianchini, 2017: Natural climate variability, part 2: Observations versus the modeled predictions. International Journal of Heat and Technology, 35(1), 518-526, http://www.iieta.org/sites/default/files/Journals/IJHT/35.Sp01_03.pdf

Tol, R.S.J., T.K. Berntsen, B.C. O'Neill, J.S. Fuglestvedt and K.P. Shine, 2012: A unifying framework for metrics for aggregating the climate effect of different emissions. Environ. Res. Lett. 7 044006, https://iopscience.iop.org/article/10.1088/1748-9326/7/4/044006