BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF COLORADO

PROCEEDING NO. 20M-0218E

IN THE MATTER OF THE COMMISSION'S CONSIDERATION OF THE EXISTING RESOURCES OF TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC. PRIOR TO ITS INITIAL ELECTRIC RESOURCE PLAN APPLICATION PURSUANT TO 40-2-132, C.R.S.

INSTITUE FOR POLICY INTEGRITY REPORT,

EXHIBIT TO THE INITIAL COMMENTS OF NRDC, SIERRA CLUB, AND WCA

The Institute for Policy Integrity at New York University School of Law[1] submits this report on the presentation of the social cost of greenhouse gases in Tri-State Generation and Transmission Association's *Assessment of Existing Resources* in its 2020 Electric Resource Plan (revised August 2020), including the *Report on Benchmarking of Existing Resources* prepared by Black & Veatch and the *Demand Side Management and Energy Efficiency Potential Study* prepared by Mesa Point Energy & BrightLine Group.

Policy Integrity has a long history of testifying before the Colorado Public Utilities Commission on the social cost of greenhouse gases.[2] Policy Integrity is a non-partisan think tank dedicated to improving the quality of government decisionmaking through advocacy and scholarship in the fields of administrative law, economics, and public policy.

This report details:

- Why applying the social cost of greenhouse gases is important, and what the appropriate valuation should be;
- How Tri-State, Black & Veatch, and the *Demand Side Study* have underestimated the social cost of carbon;
- How both Tri-State and Black & Veatch have made incomplete presentations of the social cost of carbon that mislead or outright obscure the climate effects of Tri-State's existing resources; and
- Why Black & Veatch's choice of a discount rate of 2.21% for the benchmarking study necessitates use of a social cost of carbon based on a comparable discount rate.

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[1] No part of this report purports to present the views, if any, of New York University. Note that while Policy Integrity is based at New York University, our legal director, Jason Schwartz, lives and works in Denver, Colorado.

[2] See especially Policy Integrity's March 29, 2019 Comments (https://policyintegrity.org/documents/Electric_Rule_NOPR_Initial_Comments_on_SCC_2019.3.29.pdf), October 21, 2019 Comments (https://policyintegrity.org/documents/Colo_PUC_Additional_Revisions_on_SCC_Comments_2019.10.21-final.pdf), and April 2020 Comments (https://www.dora.state.co.us/pls/efi/EFI.Show_Filing?p_session_id=392943&p_fil=G_764542) and Reply Comments (https://www.dora.state.co.us/pls/efi/EFI.Show_Filing?p_session_id=392943&p_fil=G_765010).

The Requirement to Value the Social Cost of Carbon

In Colorado's Rules Regulating Electric Utilities, Rule 3605(a)(IV)(H) requires Tri-State's electric resource plan, including the assessment of existing resources, to show "the cost of the projected carbon dioxide emissions using the carbon cost calculated by the Commission based on the most recent assessment of the social cost of carbon developed by the federal government." Under Proceeding 19R-0096E, the Colorado Public Utilities Commission has not yet issued its own final table of calculations. But in SB 19-236, the Colorado legislature specified that utilities' electric resource plans must use a minimum value of $46 per short ton for year 2020 emissions, with the valuation increasing every year thereafter based on an "escalation rate," as established by the 2016 technical support document published by the federal Interagency Working Group on the Social Cost of Greenhouse Gases.[3]

As Policy Integrity has explained previously, the best available calculations for the social cost of greenhouse gases are simply the tables of annual values contained in the Interagency Working Group's 2016 technical support documents.[4] In Table A1 of the 2016 document on the social cost of carbon, the central value is calculated at a 3% discount rate and is given as $42 per metric ton in 2007$ for year 2020 emissions.[5] That is equivalent to about $46 per short ton in 2018$.[6] The central value increases to, for example, $60 per metric ton in 2007$ for year 2040 emissions, which is about $66 per short ton in 2018$.[7] This table of estimates is readily available online for use by Colorado utilities,[8] has been reviewed by the National Academies of Sciences among other prominent endorsers,[9] and its direct application to Colorado electric resource plans would be consistent with the statutory language from SB 19-236.[10]

In Proceeding 19R-0096E, the Commission has proposed instead starting with a value of $46 per short ton for year 2020 emissions, but then applying an "escalation rate" from the 2016 technical support documents.[11] There are two important decisions to make when applying such an approach as the Commission has proposed. First, the correct dollar-year for the base value must be specified. And second, escalation rates must be applied consistently with the 2016 technical support document.

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[3] C.R.S. 40-3.2-106(4).

[4] *See, e.g.*, Policy Integrity's Oct. 21, 2019 Comments & Apr. 23, 2020 Reply Comments, *supra* note 2.

[5] Interagency Working Group on the Social Cost of Greenhouse Gases (IWG), *Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis* at 25, App. A, Table A1 (2016), *available at* https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc_tsd_final_clean_8_26_16.pdf [hereinafter 2016 TSD].

[6] *See* Policy Integrity's Apr. 10, 2020 Comments, *supra* note 2, at 1-2 (explaining the calculation). $42/metric ton * 1 metric ton/2204.62 pounds = $0.019051/pound * 2000 pounds/short ton = $38.10/short ton. Alternatively, you can divide the social cost of carbon per metric ton by 1.10231 to convert to a per-short ton figure. To convert from 2007$ to 2018$, you can apply the U.S. Bureau of Labor Statistics CPI for all Urban Consumers, https://data.bls.gov/timeseries/CUUR0000SA0 (showing a ratio of 207.342 for 2007$, to 251.107 for 2018$). $38.1 * 251.107/207.342 = $46.14.

[7] *See* data and methodology *supra* notes 5-6.

[8] IWG, 2016 TSD, *supra* note 5, at 25, App. A, Table A1, *available at* https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc_tsd_final_clean_8_26_16.pdf.

[9] *See* Policy Integrity's Mar. 29, 2019 Comments, *supra* note 2, at 12-15 (explaining how the Interagency Working Group numbers have been reviewed by the National Academies, federal courts, the U.S. Government Accountability Office, and many economists, and how the numbers are being used by multiple other states).

[10] *See* Policy Integrity's Mar. 29, 2019 Comments and Oct. 21, 2019 Comments, *supra* note 2 (explaining how directly using the Interagency Working Group numbers would be consistent with SB 19-236).

[11] *See* Colo. PUC, Interim Decision Proposing Additional Rule Revisions on the Social Cost of Greenhouse Gases, Proceeding No. 19R-0096E.

On the first point, it is most rational to interpret the language from SB 19-236 as specifying the minimum social cost of carbon at $46 per short ton *in 2018$* for year 2020 emissions. The relevant language from SB 19-236 was first proposed on April 9, 2019, was signed into law on May 30, 2019, and also became effective May 30, 2019.[12] There is no reason to think that, when drafting the law in early 2019, the legislature was trying to guess what inflation rates would be in the future and so express their minimum value in terms of inflation rates that could not be known until nearly two years into the future. Indeed, we will not know the true value of 2020$ until around February 2021: calculations of inflation rates provided by the U.S. Bureau of Labor Statistics usually trail about two months behind, and the values for 2020$ cannot be calculated until the full year of data is compiled for year 2020.[13]

Furthermore, given that the legislature was so focused on using the federal Interagency Working Group's 2016 technical support document to set minimum values,[14] it makes sense to assume a dollar-year such that $46 per short ton will approximate the Interagency Working Group's central estimate for the social cost of carbon for year 2020 emissions. And as already detailed above, the Interagency Working Group's central estimate of $42 per metric ton in 2007$ for year 2020 emissions is equivalent to about $46 per short ton ($46.14, to be precise) in 2018$. While a true 2020$-equivalent value cannot yet be calculated, the Bureau of Labor Statistics has so far calculated inflation rates through June 2020.[15] If updated based on inflation rates for the first half of year 2020, the Interagency Working Group's central estimate would be $47.33 per short ton. Therefore, if Tri-State wishes to use "2020$" for other cost calculations, consistency would require also converting the base value of $46 per short ton for the social cost of carbon for year 2020 emissions from 2018$ into current dollars using rates for the first half of 2020, which would put the base value at $47.33.

On the second issue, the 2016 Technical Support Document does not specify a single "escalation rate" to apply to the central estimates. Instead, after calculating a specific social cost figure for each individual year, the Interagency Working Group calculated as *post hoc* summary statistics the average annual growth rates for various decades.[16] For example, over the years 2020-2030, the central estimate for the social cost of carbon tends to grow about 2.1% per year; by the 2030-2040 period, that changes to an average growth rate of about 1.9% per year.[17] Choosing instead a single "escalation rate" to apply over multiple decades could lead to significant departures from the actual year-by-year estimates reported by the Interagency Working Group. If either the Commission or Tri-State insists on not simply applying the Interagency Working Group's table of annual values, the specific growth rates for each individual decade should be applied, rather than a rate averaged across the entire timespan.

Finally, it is important to remember that SB 19-236 set only a floor for the consideration of the social cost of carbon, not a ceiling. The Commission has other, broader authorities to require a fuller consideration of climate externalities.[18] For example, nothing in SB 19-236 limits the Commission from

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[12] https://leg.colorado.gov/bills/sb19-236.

[13] *See* BLS, CPI for all Urban Consumers, https://data.bls.gov/timeseries/CUUR0000SA0 (providing, as of September 2020, monthly data through July 2020, and calculating annual averages only through 2019).

[14] *See* 40.3.2-106(6)(b) C.R.S. (referencing the 2016 technical update).

[15] *See* BLS, CPI for all Urban Consumers, https://data.bls.gov/timeseries/CUUR0000SA0 (providing, as of September 2020, a HALF1 value for 2020 of 257.557).

[16] *See* IWG, 2016 TSD, *supra* note 5, at 17; *see also* IWG, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis* 28 (2010), https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf [hereinafter 2010 TSD] (noting that the growth rate comes directly from the results of the models, "rather than assuming a constant annual growth rate as was done for the interim estimates").

[17] IWG, 2016 TSD, *supra* note 5, at 17, table 3.

[18] *See* Policy Integrity's March 2019 Comments, *supra* note 2, at 11-12 (interpreting §§ 40-2-123(1)(b), 40-3-101(2)).

requiring a utility to consider higher estimates of the social cost of carbon (for example, those calculated based on a different discount rate, such as a 2.5% discount rate rather than 3%), or from requiring a utility to consider the climate damages of upstream emissions associated with its operations.

The ultimate goal of applying the social cost of greenhouse gases is to allow the Commission first to compare the climate effects of various plans and proposals submitted by utilities against the costs and benefits of other alternatives, and then to transparently convey the costs and benefits of the Commission's final decisions to the public. In reviewing Tri-State's filings, the Commission should bear these goals in mind and should require Tri-State to apply the social cost of greenhouse gases in a way that enhances transparency around climate effects.

Both Tri-State and Black & Veatch Have Underestimated the Social Cost of Carbon

In their response to discovery request CC 1-3(c), Tri-State asserts that "Only the Benchmarking study includes the social cost of carbon. The projections in the Assessment of Existing Resources are the result of a study that did not include the social cost of carbon." This assertion is somewhat confusing, given that on pages 7-8 and 9-10 of Tri-State's *Assessment of Existing Resources* (and not in the sections on benchmarking), Tri-State includes a "social cost of carbon" column in its tables on Revenue Requirements for its coal-, oil-, and gas-fired facilities. On page 6 of the *Assessment*, Tri-State had explained that "Social Cost of Carbon is included in the revenue requirements tables for thermal resources as Tri-State is aware of the requirement to consider this value in its assessment of resources and resulting dispatches in relation to the ERP process. The Social Cost of Carbon is calculated as the resource carbon emission rate of each unit in tons per MWh times $46.00/ton social cost of carbon."

The values that Tri-State lists in those revenue requirements tables are the same as the year 2020 emission values listed as "cost adders" for each unit in the Excel Spreadsheet 20M-0218E_00000032, which was provided in response to discovery request CC 1-3. Those "cost adders" take each unit's short tons of carbon dioxide per megawatt-hour and multiply that by a value labeled as the "escalated" social cost of carbon. The "escalated" social cost of carbon starts with a base value of $46 per short ton for year 2020 emissions.[19] The dollar-years for that base value are not provided (despite a stray reference in the spreadsheet, in Sheet 1-cell A3, to "2007," which is the original dollar-year for the Interagency Working Group's estimates, and despite unlabeled and unused calculations in rows 39-40 that could be inflation-adjustments). By not specifying the dollar-year, the implication is that the value is listed in current dollars. So already, the base value seems to be underestimated in Tri-State's column of "escalated" values, because $46 per short ton would only be the minimum value if it is expressed in 2018$.

Tri-State then makes another methodological error in its column of "escalated" values, resulting in further underestimates. For emissions in years following 2020, Tri-State "escalates" the base value using the percentage increase from year to year that the social cost of carbon appears to grow in the Interagency Working Group's table. For example, because the Interagency Working Group listed $42 per metric ton in 2007$ as the value for both year 2020 and year 2021 emissions, Tri-State calculates the escalation rate for that first-year interval as 0%, and so keeps the social cost of carbon set at $46 per short ton for year 2021 emissions. Then, because the Interagency Working Group had calculated a $1 increase in year 2022, to $43 per metric ton, Tri-State applies a 2.38% escalation rate for year 2022

[19] In Response to CC 1-3 (July 30, 2020), Tri-State says "The document also specified a minimum cost of $46/short ton beginning in 2020. This was higher than the escalated value, so $46/ton was used for the starting year of 2021 and escalated from there." This statement is confusing. Taking the Interagency Working Group estimates and converting to short tons and 2018$ gives $46 per short ton; converting to 2020$ would give about $47, as shown above.

($1/$42 = 0.0238), to derive its value for year 2022 emissions of $47.09 per short ton ($46*1.0238=$47.09).

By approaching the social cost of carbon this way, Tri-State seems to misunderstand that the values from the Interagency Working Group's table were all rounded to the nearest dollar. This becomes apparent by looking at the underlying data runs, which report the 225 separate frequency distributions of the social cost of carbon estimates, with each distribution containing 10,000 estimates per model run, and with each of those individual estimates reported out to the sixth decimal place.[20] The Interagency Working Group did not estimate the social cost of carbon at precisely $42.00 per metric ton in 2007$ for both years 2020 and 2021, with no growth between the years; rather, two different estimates were both rounded to about $42. Indeed, the social cost of carbon should grow every year, "because future emissions are expected to produce larger incremental damages as physical and economic systems become more stressed in response to greater climatic change, and because GDP is growing over time and many damage categories are modeled as proportional to gross GDP."[21] Thus, in the Interagency Working Group's calculations, the growth rate in the social cost of carbon between years is never 0%.

Together with the unspecified dollar-years mistake, Tri-State's mistake in tabulating its "escalated" values led to additional underestimates of the social cost of carbon. Importantly, Black & Veatch then latched on to and compounded the two mistakes from Tri-State's methodology.

Specifically, in the *Report on Benchmarking of Existing Resources*, Black & Veatch picks both the wrong base value and the wrong escalation rate. For the base value, Black & Veatch used $46 per short ton for year 2021 emissions in 2020$,[22] rather than appropriately valuing the social cost of carbon at $46 per short ton for year 2020 emissions in 2018$.[23] (Though Black & Veatch's tables seem to suggest that the $46 base value is per MWh rather than per short ton, it is clear from its more detailed calculations of the social cost of carbon for each unit that it is first starting with a base value of $46 per short ton and then multiplying that by each unit's generation and emissions rates.[24]) To set year 2021 as the base value, Black & Veatch seems to be copying Tri-State's assumption that there is no escalation in the social cost of carbon from year 2020 to year 2021.[25] However, that assumption is wrong, for the reasons given above. Using the methodology that the Commission has proposed and applying the Interagency Working Group's summary statistic that the social cost of carbon grows about 2.1% per year in the 2020-2030 decade, the social cost of carbon for year 2021 emissions in 2020$ (at least through June-2020$), would be $48.17—not $46. Black & Veatch's base value is off by nearly 5%.

Next, Black & Veatch applies a constant growth rate of just 1.8% per year in the years after 2021, through year 2040. This growth rate seems to be based on the average of the year-to-year percentage differences that Tri-State calculated from the Interagency Working Group figures (from years 2020-

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[20] *See* IWG, Social Cost of Carbon Complete Data Runs (Aug. 26, 2016), https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc_2013_tsd_output_july_2015_revision.csv; *see also* IWG, How to Use the SC-CO_2 Data Run File (Aug. 26, 2016), https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc_complete_data_runs_readme.pdf.

[21] IWG, 2016 TSD, *supra* note 5, at 16.

[22] Despite repeatedly specifying that all costs are presented "in 2020 dollars," *e.g.*, Black & Veatch, *Report on Benchmarking of Existing Resources* 6 (as Appendix B to Tri-State's Electric Resource Plan, revised August 2020) [hereinafter *Benchmarking Report*], it is not clear what precisely Black & Veatch might mean. True 2020$ could not be calculated until after all data is in for year 2020. *See supra* note 13. Perhaps Black & Veatch mean current dollars as of inflation rates based on the first half of 2020.

[23] Black & Veatch, Benchmarking Report, *supra* note 22, at 15-16 (tables 4-5).

[24] *Id.*

[25] *Id.* at 10 ("Carbon costs were forecast similarly, based on the generation, the carbon emission rate of the resource and the first year Social Cost of Carbon (Social Cost of Carbon 2021) and an escalation rate based on the compound annual growth rate of the Social Cost of Carbon forecast provided by Tri-State.").

2040).[26] However, as explained above, Tri-State's calculations of the "escalation rate" all failed to appreciate that the underlying data was rounded. At several points, Tri-State calculated a 0% increase from year to year simply because two different estimates had both been rounded to the same number, even though the underlying data was still increasing every year. The Interagency Working Group already provided average estimates of growth per decade: 2.1% per year growth from 2020-2030, and 1.9% per year growth from 2030-2040. There is no way to average those actual growth rates and come up with a value of 1.8%. Consequently, Black & Veatch applied an underestimated growth rate every year.

Finally, in the *Demand Side Study*, Mesa Point Energy and BrightLine Group use Tri-State's "escalated" values of the social cost of carbon.[27] The *Demand Side Study*, therefore, has the same issues with underestimation as described above for Tri-State.

The following graph shows how both Tri-State and Black & Veatch underestimated the social cost of carbon. In the graph, the line labeled as Tri-State's calculations are the "escalated" values from Spreadsheet 20M-0218E_00000032. Again, though Tri-State did not specify a dollar-year, we assume (since they did not say otherwise) that they intended the values to represent current dollars. Note that these values calculated by Tri-State were also used by Mesa Point Energy and BrightLight Group in the *Demand Side Study*. The line labeled as "B&V" calculations shows the values that were backed out of the *Benchmarking Report*'s tables for existing resources: for example, Black & Veatch list the total social cost of carbon for Craig 1 as $53.5 million (2020$) for all that unit's year 2040 emissions, and with 715 GWh of generation and 2319 pounds per MWh in carbon dioxide emissions, that translates to a social cost of carbon of $64.53 per short ton for year 2040 emissions. That figure, $64.5 per short ton, is the same value that can be derived by starting with $46 per short ton in year 2021 and increasing by a constant 1.8% per year through year 2040—which was Black & Veatch's reported methodology. The values listed as "IWG Central" in the graph are the Interagency Working Group's central estimates, calculated at a 3% discount rate, converted from metric tons to short tons and adjusted to roughly current dollars based on the Bureau of Labor Statistics data through June 2020. (The values listed as "IWG 2.5%" are the similarly adjusted estimates from Interagency Working Group's calculations at a 2.5% discount rate, which are relevant for reasons explored below.) Finally, the values listed as "PUC Proposed Method" follow the methodology proposed so far by the Commission: namely, starting with a value of $46 per short ton in 2018$ for year 2020 emissions,[28] converting to roughly current dollars, and then escalating the rates at 2.1% per year through year 2029, then at 1.9% per year through year 2039, and finally at 1.6% per year from 2040 through 2050.[29] As the graph shows, the values used by Tri-State and Black & Veatch are anywhere from 3% to 8% underestimated in any given year, as compared to either the Interagency Working Group's central estimates or the values generated under the Commission's proposed methodology.

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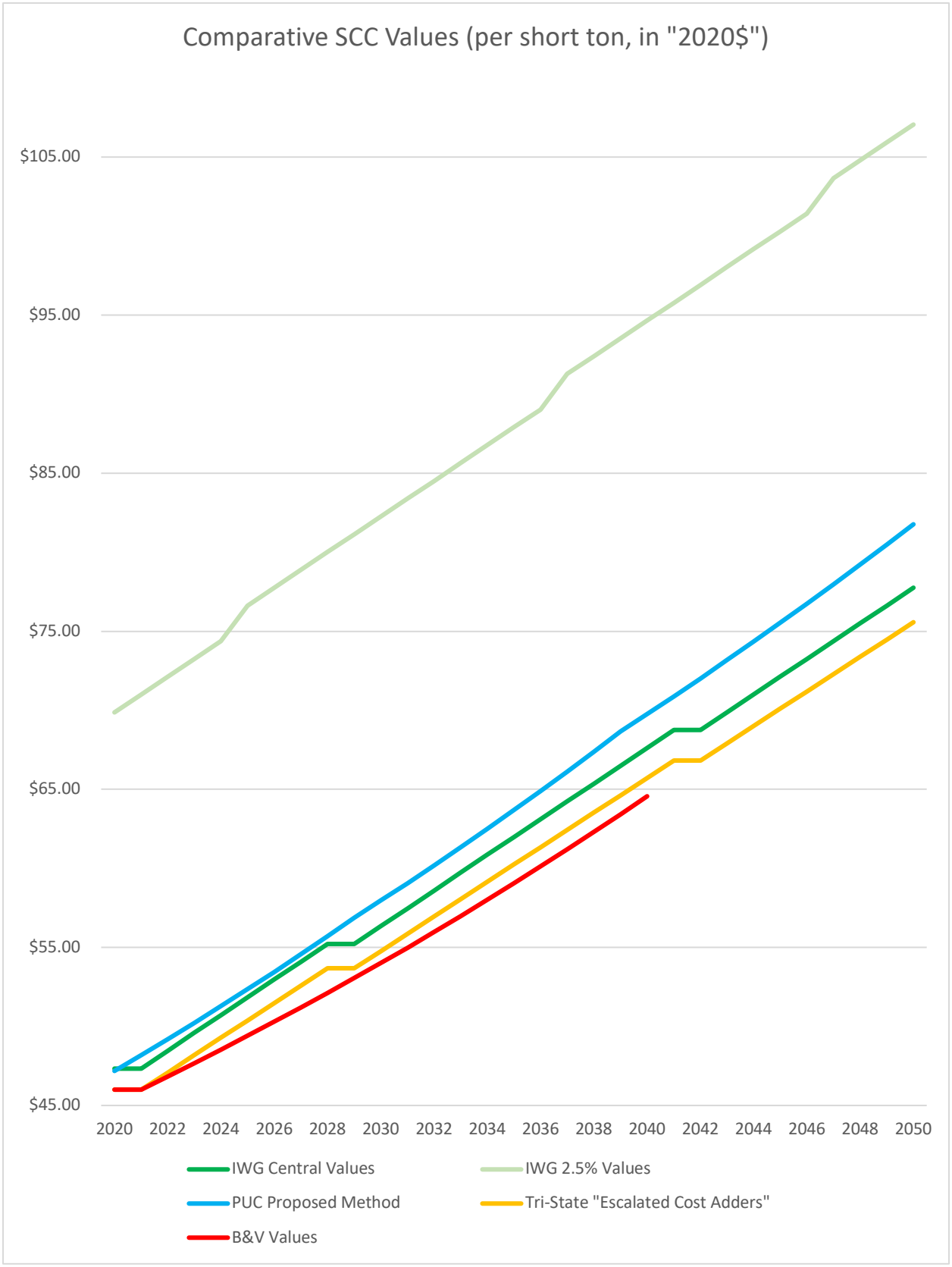
[26] *See* Response to CC 1-11 (July 30, 2020) (explaining that the escalation rate for benchmarking study is 1.8%); Response to CC 2-4 (August 17, 2020) ("The average of the escalations from 2021 to 2040 in the spreadsheet provided is 1.8%, which is why Black & Veatch used this value.").

[27] Mesa Point Energy & BrightLine Group, *Demand Side Management and Energy Efficiency Potential Study* at 14 (as Appendix C to Tri-State's Electric Resource Plan, revised August 2020) (explaining that the social cost of carbon, including the escalation rate, was "provided by Tri-State").

[28] Though the Commission proposed specifying 2020$, Policy Integrity's April 2020 Comments, *see supra* note 2, explained why doing so was inconsistent with the statute and with the best available economics, and why 2018$ instead was the appropriate metric.

[29] Note that the Interagency Working Group's 2016 technical update is unclear on which growth rate would apply to year 2030 emissions, as it lists an average growth rate of 2.1% for "2020-2030" and then an average rate of 1.9% for "2030-2040," with the year 2030 appearing in both ranges. This calculation conservatively starts applying the lower rate of 1.9% in the year 2030. Similarly, this calculation conservatively starts applying the lower rate of 1.6% in the year 2040.


Comparative SCC Values (per short ton, in "2020$")
$105.00
$95.00
$85.00
$75.00
$65.00
$55.00
$45.00
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
IWG Central Values
IWG 2.5% Values
PUC Proposed Method
Tri-State "Escalated Cost Adders"
B&V Values

Misleading and Incomplete Presentations of the Social Cost of Carbon

Besides underestimating the values for the social cost of carbon, both Tri-State and Black & Veatch also present the climate damages associated with existing resources in misleading and incomplete ways.

For example, Tri-State reports that the social cost of carbon is based on "$46/ton,"[30] yet never explains that this is the value per short ton in 2018$ only for year 2020 emissions, and that the value increases every year. Similarly, in the *Assessment's* revenue requirements tables for its existing resources, Tri-State only discloses a single social cost of carbon estimate in dollars per megawatt-hour for each resource.[31] Tri-State never makes clear that the values it lists are specific to year 2020 emissions alone. For example, even using the utility's own numbers (which are underestimated, as explained above), while Tri-State's estimate of the social cost of carbon for LRS 3 is $55.36/MWh in year 2020, by year 2040 Tri-State estimates the per-megawatt-hour climate damages for that unit at $79.09. Tri-State's presentation is misleading, as it implies that the social cost of carbon for each resource is fixed, when in fact it increases every year.

Additionally, Tri-State never discloses the various limitations of the social cost of carbon calculations. For example, Tri-State's calculations are all based on the emissions from combustion at various resources, and so exclude the climate damages from any upstream emissions associated with the operation of its various coal-, oil-, and gas-fired units. The upstream emissions could be significant, especially as compared with alternative electricity-generating resources, and the Commissions should require utilities, including Tri-State, to at least consider upstream emissions qualitatively, if not quantitatively. Tri-State should also disclose that the estimates of the social cost of carbon based on the Interagency Working Group's 2016 technical support document—while being the best currently available estimates—are still widely considered to be conservative estimates.[32] Tri-State should disclose that the social cost of carbon is a conservative estimate that currently does not capture many important categories of climate damages, such as wildfires.

The presentation of the social cost of carbon in the *Demand Side Study* are similarly misleading and incomplete, since they are based directly on Tri-State's estimates.

The presentation by Black & Veatch of the social cost of carbon in the *Benchmarking Report* is even more misleading. To begin, Black & Veatch also does not disclose the limitations of its estimates, such as that they omit any upstream emissions as well as many key climate damage categories, like wildfires. Black & Veatch also consider costs only through the year 2040,[33] even though it is standard to calculate the social cost of carbon through year 2050 emissions, and the Commission has proposed considering the social cost of carbon through at least year 2060 emissions.[34] Because the social cost of carbon continues to increase over time, cutting analysis off too soon can obscure a significant portion of future climate damages.

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[30] Tri-State, *Assessment of Existing Resources* at 6.

[31] *Id.* at 6-7. Note also that Tri-State has averaged the social cost of carbon values across the various units for Limon, Knutson, Pyramid, and Burlington, which obscures the slightly distinct carbon costs presented by individual units.

[32] *E.g.*, Richard Revesz et al., *Global Warming: Improve Economic Models of Climate Change*, 508 Nature 173 (making the case that the IWG estimates are almost certainly underestimates); *see also* Policy Integrity's March 2019 Comments, *supra* note 2, at 15 (explaining that future updates will almost certainly increase the valuation).

[33] *Benchmarking Report* at 1 ("for the years 2021-2040"); *id.* at 10-11; *id.* at 15-16 (showing NPV calculations, including social cost of carbon, only through year 2040).

[34] Commission, Interim Decision Proposing Additional Rule Revisions, *supra* note 11; *see also* IWG, 2016 TSD, *supra* note 5, at 25 (calculating the social cost of carbon through year 2050).

Black & Veatch go on to explain that because the "Social Cost of Carbon is a variable cost," it was not included in its calculations of levelized cost of capacity (LCOC), "which considers fixed costs only."[35] Consequently, because Black & Veatch only present the LCOC figures for Tri-State's existing gas- and oil-fired units and the benchmarked generic comparators (as opposed to for coal-fired units, for which the levelized cost of energy (LCOE) is shown),[36] Black & Veatch effectively take the social cost of carbon completely out of the equation for comparing Tri-State's existing gas- and oil-fired units against a benchmark. This incomplete presentation violates the goal of Rule 3605(a)(IV)(H), which was clearly intended to provide a complete view of the climate costs of both existing resources and alternative portfolios. Instead, Black & Veatch has implicitly and wrongly presented gas- and oil-fired units as if they had no climate costs.

Black & Veatch make a similar mistake in presenting a "Non-Colorado Benchmarking" supplemental analysis. Black & Veatch never explain the purpose of this "non-Colorado" presentation, except to say that in this supplemental analysis, "the Social Cost of Carbon was set to zero for both the Existing Resources and the Generic Resources."[37] The implication seems to be that if a source of carbon emissions is not physically located in Colorado, then perhaps the social cost of carbon is $0. This implication is false. Carbon dioxide is a global greenhouse gas that mixes throughout the planet's atmosphere and has the same effect on global climate change regardless of its point of origin. Whether a ton of carbon dioxide is emitted in Colorado or just over the state's border, the resulting climate damages to Colorado, to the United States, and to the world remain the same. And of course, if Colorado's electricity users are responsible for demanding the energy that produced a ton of carbon emissions, then Colorado is directly responsible for those emissions, regardless of where the energy resource is physically located. Colorado cannot isolate itself from the rest of the country when it comes to tackling the twin goals of mitigating climate change and developing a low-energy economy. As Colorado's legislature has expressed: "The creation of a low-cost, reliable, and clean electricity system is critical to achieving the level of greenhouse gas emissions necessary to avoid the worse impacts of climate change and advancing a robust and efficient *low-carbon economy for the state of Colorado and the Nation*"[38]—not just for Colorado alone. The "Non-Colorado Benchmarking" is misleading and unnecessary.

Inconsistent Application of the Discount Rate

In the *Benchmarking Report*, Black & Veatch explain that the net present value figures for both the LCOE and LCOC are presented from the perspective of the year 2020 and "using a discount rate equal to the debt interest rate."[39] In Tables 4 and 5, for both Craig Unit 1 and Generic Resource 1, the *Benchmarking Report* indicates that the debt interest rate—and so the real discount rate—is 2.21%.[40]

Policy Integrity takes no position in this report on what the appropriate overall discount rate is for Tri-State to use in assessing the net present value of the costs of various resource options. However, we emphasize that it is *inconsistent* to use social cost of carbon values that were calculated as central

[35] *Benchmarking Report* at 13 (as distinct from the levelized cost of energy, LCOE, which does include the social cost of carbon figures).

[36] *Id.* at 17 (table 6).

[37] *Id.* at 12; *see also id.* at ("LCOE results for the Basin Contracts show that each contract is less expensive than its Generic Composite if the Social Cost of Carbon is not applied.").

[38] § 40-2.125.5(1)(b) C.R.S. (emphasis added).

[39] *Benchmarking Report* at 11.

[40] *Id.* at 15-16.

estimates using a real 3% discount rate,[41] while simultaneously using a lower discount rate for all other cost considerations. In effect, the *Benchmarking Report* discounts future climate damages at a much higher rate than any other cost.

Discounting future climate damages at a higher rate than other costs violates best economic practices and ethnical norms about what we owe to future generations. If anything, future climate damages should be discounted at a lower rate than other, near-term costs, because there is a growing consensus in the economic literature that a declining discount rate framework would be most appropriate to assess the long-term policy implications of climate change, especially given the uncertainty about the discount rate itself over long periods of time.[42]

The Colorado legislature recognized the importance of taking a consistent approach to discount rates, and in particular of discounting the value of climate damages as calculated, for example, for year 2040 emissions back to net present value by using the same discount rate as was used to calculate the social cost of carbon itself.[43] The Interagency Working Group also stressed the importance of consistency in the application of discount rates.[44]

Because Black & Veatch has chosen to discount all near-term costs at a 2.21% rate, it would be inconsistent to rely on underlying social cost of carbon values that had been calculated at a higher discount rate of 3%. Instead, if the *Benchmarking Report* is to rely on a 2.21% discount rate overall, it would be more appropriate (though still quite conservative[45]) to at least use the social cost of carbon figures calculated at 2.5% discount rate. The Interagency Working Group provided the estimates calculated at a 2.5% discount rate precisely to reflect the possibility that interest rates could be highly uncertain over time, and so a declining discount rate framework might be more appropriate.[46] The graph above, on page 7 of this report, shows the estimates calculated at a 2.5% discount rate (converted to short tons and roughly current dollars) for comparison.

Sincerely,

Jason A. Schwartz, Legal Director
Institute for Policy Integrity
September 4, 2020

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[41] IWG, 2010 TSD, *supra* note 16, at 20 (discussing the calculation of a real consumption rate of interest of about 3%).

[42] *See* Policy Integrity March 2019 Comments, *supra* note 2, at 13.

[43] § 40-3.2-106(4) ("When calculating the cost of carbon dioxide emissions for any proceeding listed in subsection (1) of this section, the commission shall use the same discount rate as that used to develop the federal social cost of carbon dioxide, as set forth in the technical support document."). The social cost of carbon is calculated at a particular discount rate, to translate future climate damages over roughly three hundred years back to the value as of the year of emissions. For example, a social cost of carbon of $66 per short ton for year 2040 emissions (2018$) reflects the future stream of climate damages that a ton of carbon emitted in the year 2040 will cause for centuries, discounted back to year 2040 at a 3% discount rate. But if the policy assessment is being conducted in the year 2020, those damages still must be discounted future back to net present value as of the year 2020. The discount rate applied to bring the 2040 values back to net present value in year 2020 should be consistent with the discount rate used to calculate the social cost of carbon itself.

[44] IWG, 2016 TSD, *supra* note 5, at 17 ("damages from future emissions should be discounted at the same rate as that used to calculate the SC-CO2 estimates themselves to ensure internal consistency"); *see also* National Academies of Sciences, *Valuing Climate Damages: Updating Estimates of the Social Cost of Carbon Dioxide* 19, 182 (2017) (explaining the concern about inconsistent discount rates, and advising use of the social cost of carbon estimate "whose near-term discount rate most closely matches" the discount rate used for "other costs and benefits").

[45] Social cost of carbon values calculated using a 2.21% discount rate, or a declining discount rate framework, would be higher than the values calculated using a 2.5% discount rate.

[46] *See* IWG, 2010 TSD, *supra* note 16, at 23.