In the Matter of Establishing an Updated 2023 and 2024 Estimate of the Costs of Future Carbon Dioxide Regulation on Electricity Generation Under Minn. Stat. § 216H.06

Docket No. E999/DI-22-236
Docket No. E999/CI-07-1199

CLEAN ENERGY ORGANIZATIONS' INITIAL COMMENTS
On Behalf Of

Fresh Energy
Minnesota Center for Environmental Advocacy
Sierra Club
Union of Concerned Scientists

July 13, 2023

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INTRODUCTION

These initial comments are offered by Fresh Energy, Minnesota Center for Environmental Advocacy, Sierra Club, and the Union of Concerned Scientists ("Clean Energy Organizations," or "CEOs"). They are in response to the Commission's March 29, 2023, Second Notice of Extended and Supplemental Comment Period seeking comments on updating the Commission's future cost of carbon regulation estimates and comments on how to apply those values, particularly given recent and imminent carbon regulatory changes.[1]

The two provisions the Commission mentions – Minnesota's landmark new Carbon-Free Standard ("CFS") and the EPA's recently-proposed limits on power plant carbon dioxide (CO_2) emissions -- both reflect the heightened urgency and ambition around decarbonization that has emerged since the Commission last updated future carbon regulatory costs in 2020.[2] This heightened urgency is also reflected in the new state law requiring the Commission to employ the EPA's CO_2 externality costs, which are several times higher than the Commission's own previous estimate of CO2 externalities.[3]

The requirement to use the EPA's externality costs makes it particularly important that the Commission reconsider its practice of letting utilities completely replace carbon

[1] Minn. Pub. Utils. Comm'n, *In the Matter of Establishing an Updated 2023 and 2024 Estimate of the Costs of Future Carbon Dioxide Regulation on Electricity Generation under Minn. Stat. § 216H.06,* Second Notice of Extended and Supplemental Comment Period, Docket Nos. E999/CI-07-1199; E999/DI-22-236 (Mar. 29, 2023).
[2] Minn. Pub. Utils. Comm'n, *In the Matter of Establishing an Updated 2020 Estimate of the Costs of Future Carbon Dioxide Regulation on Electricity Generation under Minn. Stat. § 216H.06*, Order Establishing 2020 and 2021 Estimate of Future Carbon Dioxide Regulation Costs, Docket No. E-999/DI-19-406 (Sep. 30, 2020) [hereinafter "2020 Regulatory Costs Order"].
[3] Laws of Minnesota 2023, chapter 7, section 18 (amending Minn. Stat. § 216B.2422, subd. 3).

externality costs with lower carbon regulatory costs, as we explain in Part I of these comments. We go on to discuss why the Commission need not attempt to estimate the costs of compliance with the CFS or the proposed EPA rule (Part II); why the Commission should adopt a $0-75/ton regulatory cost starting in 2028 as its estimate of the costs of future regulations requiring carbon reductions *beyond* the requirements of the CFS or EPA rule (Part III); and why the Commission should articulate requirements around the modeling of carbon externality and regulatory costs to provide results that are more transparent, realistic, and useful to the Commission and the public (Part IV).

ANALYSIS

I. The non-internalized portion of the statutorily-mandated carbon externality costs must be retained in utility modeling

The Commission asks in its March notice how it should implement the newly enacted requirement to apply the federal Social Cost of Greenhouse Gases. We discuss here in Part I why this new requirement means the Commission can no longer allow utility modeling to completely replace a carbon externality value with a smaller regulatory value, as it currently allows (indeed, instructs) utilities to do in scenarios with both externality and regulatory costs. A simple change – instructing utilities to retain the non-internalized portion of the externality costs (i.e., the externality cost minus the regulatory cost) in their modeling -- would reconcile the Commission's approach with the requirements of the new law and with basic economic principles.

A. State law now mandates that the Commission give far greater weight to climate impacts than it has in the past

Since the 1990s, the Commission has made its own estimate of the range of future costs to the environment ("externality costs") associated with a ton of CO_2, and utilities have been required under Minn. Stat. § 216B.2422, subd. 3 to use this estimated range when evaluating resource options in regulatory proceedings. The Commission's first estimated range of externality costs for CO_2, made in 1997, was only $0.30 - $3.10/ton.[4] In 2018, the Commission increased this range of values considerably, to $9.05 - $42.46/ton (for 2020).[5] Both the 1997 estimates and the 2018 estimates followed lengthy evidentiary proceedings that required the Commission to reach beyond its traditional areas of expertise to predict how the global climate crisis would unfold over many decades.

In 2023, the legislature revised § 216B.2422, subd. 3, relieving the Commission of the responsibility and the authority to make its own estimate of the future climate damages from CO_2.[6] The Commission is now required to provisionally adopt and apply the draft Social Cost of Greenhouse Gases estimates published by the EPA[7] (which for consistency we will refer to as EPA's externality costs). The EPA's externality cost estimate for a ton of CO_2 ranges from $120 - $340/metric ton (for 2020). This range of

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[4] Minn. Pub. Utils. Comm'n, *In the Matter of the Quantification of Environmental Costs Pursuant to Laws of Minnesota 1993, Chapter 356, Section 3,* Order Establishing Environmental Cost Values, Docket No. E-999/CI-93-583, (Jan. 3, 1997).

[5] Minn. Pub. Utils. Comm'n, *In the Matter of Further Investigation into Environmental and Socioeconomic Costs Under Minnesota Statutes Section 216B.2422. Subdivision 3,* Order Updating Environmental Cost Values, Docket No. E-999/CI-14-643 (Jan. 3, 2018) [hereinafter "2018 Externalities Update"].

[6] Laws of Minnesota 2023, chapter 7, section 18.

[7] U.S. Environmental Protection Agency, *Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances,* External Review Draft, Docket No. EPA-HQ-OAR-2021-0317 (Sep. 2022), available at https://www.epa.gov/system/files/documents/2022-11/epa_scghg_report_draft_0.pdf [hereinafter "EPA Social Cost of GHGs 2022"]

costs -- several times higher than the Commission's 2018 estimate of CO_2 externality costs -- is a more up-to-date, authoritative, and accurate reflection of the dangers of the climate crisis.

By mandating the use of the EPA's externality costs for greenhouse gases – which include not just CO_2 but also methane and nitrous oxide -- the legislature is requiring that climate impacts be weighed far more heavily when the Commission evaluates resource options and when it considers any requested delays in the implementation schedule of the new CFS (so-called "off-ramp" requests).[8] The law also mandates that the Commission adopt the EPA's final GHG externality cost values when available, and that it adopt the externality cost estimates by the federal Interagency Working Group (or IWG, of which EPA is a member), but only if the EPA's values are exceeded by the Interagency Working Group's values.[9]

B. Entirely replacing the statutorily-mandated externality costs with much lower regulatory costs would violate the amended Minn. Stat. § 216B.2422, subd. 3(b) and run counter to basic economic principles

Currently, the Commission allows utilities to assume in their modeling that once a carbon regulatory cost is projected to be in place (estimated to be in 2025), they need no longer include any carbon externality cost.[10] The Commission first allowed this sort of complete replacement of the externality cost with the regulatory cost in 2007, at which

[8] Laws of Minnesota 2023, chapter 7, sections 6 and 18.
[9] Laws of Minnesota 2023, chapter 7, section 18.
[10] 2020 Regulatory Costs Order, *supra* note 2.

time it made sense.[11] In 2007 the projected range of regulatory costs ($4 - $30/ton), was far higher than the projected range of externality costs (still only $0.30 - $3.10/ton, plus inflation). By building those future regulatory costs into their modeling, utilities were therefore more than fully internalizing the then-current estimate of externality costs. That is, the externality costs would now be reflected in the cost of the energy (even if the emissions continued), meaning they would no longer be "externalities." Utility and Commission resource choices would therefore more likely align with the socially optimal outcome under basic economic principles.

However, the Commission continued allowing the replacement of the externality costs with regulatory costs even after the situation was reversed, and externality costs became much higher than projected regulatory costs. This reversal happened in 2018 when the Commission both increased the externality costs (to $10.07 - $46.96/ton in 2025[12]) and decreased the projected regulatory costs (to $5 - $25/ton in 2025[13]). After that, the projected regulatory costs were roughly half as high as the Commission's range of estimated externality costs, meaning they could only "internalize" roughly half the externalities.

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[11] Minn. Pub. Utils. Comm'n, *In the Matter of Establishing an Estimate of the Costs of Future Carbon Dioxide Regulation on Electricity Generation under Minnesota Statutes § 216H.06,* Order Establishing Estimate of Future Carbon Dioxide Regulation Costs, Docket No. E-999/CI-07-1199, at 4 (Dec. 21, 2007).
[12] 2018 Externalities Update, *supra* note 5.
[13] Minn. Pub. Utils. Comm'n, *In the Matter of Establishing an Updated 2016 Estimate of the Costs of Future Carbon Dioxide Regulation on Electricity Generation Under Minn. Stat. § 216H.06,* Order Establishing 2018 and 2019 Estimate of Future Carbon Dioxide Regulation Costs, Docket No. E-999/DI-17-53, at 10 (June 11, 2018)[hereinafter "2018 Regulatory Costs Order"].

Continuing to nonetheless allow these regulatory costs to completely replace the externalities has therefore had the effect of seriously obscuring future climate damages. In recent years this approach has quietly injected into the modeling the assumption that climate costs and concerns will suddenly drop by nearly half in 2025, rather than continuing to intensify as the science indicates. Using the mid-ranges of both sets of values by way of example, utility models have been assuming in their all-important reference case analysis[14] that $28.52 in environmental externalities caused by a single ton of CO_2 is internalized (or somehow just vanishes despite emissions continuing) once the utility pays a $15.00 regulatory cost. This approach was already unsupportable before the law was revised, and it is far more unsupportable now.

Section 216B.2422, subd. 3(b) now specifies that the Commission use the EPA draft social cost values "including the time horizon, global estimates of damages, and the full range of discount rates from 2.5 to 1.5 percent, with two percent as the central estimate."[15] This makes the mid-range carbon externality estimate $210/metric ton in 2025.[16] If the Commission continues to allow complete replacement in utilities' reference case, it would thus be allowing utilities to imagine that payment of a mere $15 regulatory cost would be sufficient to fully internalize $210 in climate damages.[17]

[14] In two of the five scenarios currently required, there are no regulatory costs at all and thus the externality costs survive beyond 2025. However, it is the reference case that is invariably the focus of the utility's IRP and the one that is most thoroughly compared to other potential resource pathways.
[15] Laws of Minnesota 2023, chapter 7, section 18.
[16] The EPA's estimated cost under the 2.0% discount rate is $190/ton for 2020, rising at a rate that would put it at $210/ton by 2025. EPA Social Cost of GHGs 2022, *supra* note 7, Table ES-1, p. 3.
[17] These numbers are illustrative but not directly comparable since Minnesota values are in short tons while the federal values are in the slightly larger metric tons. However, adjusting for these inconsistencies would not alter our fundamental arguments.

There is a far more reasonable and workable alternative that CEOs urge the Commission to adopt instead: to recognize that a $15 regulatory cost only internalizes $15 worth of the externality. The balance of the externality cost ($210 - $15, or $195 in our example) would thus remain an externality, and this major cost would continue to be recognized as such in the utilities' modeling.

1. Complete replacement of the new externality values would violate section 216B.2422, subd. 3

The legislature has with unprecedented specificity instructed the Commission to use much higher CO_2 externality values than it has used in the past, including the "full range" of discount rates and subsequent values from the federal IWG if higher.[18] Having limited the Commission's authority by carefully setting forth the CO_2 externality values it must now rely on, it is inconceivable that the legislature would intend the Commission to then ignore these values starting in a year of the Commission's choosing, replacing them with much lower regulatory cost values also of the Commission's choosing. And the statute provides no authority for the Commission to undertake such a replacement. The unauthorized replacement of the statutorily-mandated values would therefore violate the plain language of section 216B.2422, subd. 3, rendering its 2023 amendment almost entirely meaningless.

[18] Laws of Minnesota 2023, chapter 7, section 18.

2. Retaining the non-internalized portion of the externality cost would restore consistency with fundamental economic principles, would yield more realistic modeling results, and is easily implemented

When projected carbon regulatory costs first fell below estimated externality costs in 2018, the Commission acknowledged that the challenge of reconciling the two types of costs was placed in "sharper relief."[19] Nonetheless the Commission chose to "avoid combining" the costs because it would pose "conceptual challenges," and "might be difficult for utilities to implement via their computer models."[20] However, these concerns are misplaced.

a. Basic economic principles require retaining the balance of the externalities

We attach to these comments a statement to the Commission by Dr. Stephen Polasky, a Regents Professor and the Fesler-Lampert Professor of Ecological/Environmental Economics at the University of Minnesota.[21] As his statement shows, Dr. Polasky is eminently qualified to address the conceptual aspects of this issue. Among other things, he has: focused on environmental externalities, environmental regulation, and climate change in his research and publications; served as Senior Staff Economist for environment and resources for the President's Council of Economic Advisers (1998-1999); served on the Science Advisory Board for the EPA; coauthored the textbook *Economics and the Environment;* been author on over 250 peer-reviewed journal articles; and presented expert testimony to the Commission regarding externality values.

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[19] 2018 Regulatory Costs Order, *supra* note 13, at 10.
[20] *Id.*
[21] Statement of Dr. Stephen Polasky to the Minnesota Public Utilities Commission, July 13, 2023, attached.

Dr. Polasky explains why the replacement of an externality value with a smaller projected regulatory cost is "inconsistent with fundamental economic principles." He states that "[a] regulatory cost that is only a portion of the external cost can only partially internalize the externality cost." Noting the Commission's current estimated regulatory costs of $5-25 per short ton compared to the EPA's social cost of CO_2 of $190/metric ton, Dr. Polasky states that "[s]uch a low projected regulatory cost falls far short of internalizing the full externality cost of carbon emissions. The balance of the externality cost would remain an externality." Dr. Polasky urges the Commission to discontinue its current approach of allowing the lower regulatory value to replace the externality cost.

In short, there are no conceptual challenges created by continuing to recognize the non-internalized portion of the externality cost, as the Commission expressed concern about in its 2018 order. Rather, it is assuming that a small regulatory cost can fully internalize a large externality cost that poses conceptual challenges by violating fundamental economic principles.

b. The different way regulatory and externality costs are modeled strongly supports retaining the balance of the externalities

In their January report, which predates the statutory requirement to use EPA's externality values, the Minnesota Pollution Control Agency and the Department of Commerce ("the Agencies") "acknowledge the general economic principle that in order to reach the socially optimal outcome, the full magnitude of the externality should be internalized by the utility in the decision-making process."[22] Nonetheless, the Agencies went on to support retaining the practice of completely replacing a larger externality value with a smaller regulatory value on the grounds that the two values are treated differently by the utilities' models, applied at different stages and with different impacts. CEOs agree that the regulatory and externality values are treated differently by the models, but this is no reason to completely eliminate the externality values once regulatory costs kick in. On the contrary, it is a reason to retain the balance of the externality value.

EnCompass is the capacity expansion model now used by many Minnesota utilities, including all three of the state's investor-owned utilities and its largest cooperative, so we focus our comments on this model. CEOs have ourselves acquired substantial experience using EnCompass as intervenors in IRP proceedings, both in analyzing utility modeling and in retaining a consultant to conduct our own EnCompass modeling.

EnCompass allows costs to be added to a scenario at two different stages -- either as a "dispatch adder" or in a post-processing step as an "add-on cost." In their recent IRPs, Minnesota Power, and Otter Tail Power have put the projected regulatory costs in as a dispatch adder, as have CEOs in our EnCompass modeling.[23] (Xcel took a hybrid

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[22] Minn. Dept. of Commerce and Minn. Pollution Control Agency, *In the Matter of Establishing an Updated 2023 and 2024 Estimate of the Costs of Future Carbon Dioxide Regulation on Electricity Generation under Minn. Stat. § 216H.06,* Docket Nos. E999/CI-07-1199 and E999/DI-22-236, at 6 (Jan. 5. 2023).

[23] Minnesota Power, *In the Matter of Minnesota Power's Application for Approval of its 2021-2035 Integrated Resource Plan*, 2021 Integrated Resource Plan, Docket No. E015/RP-21-33 (Feb. 1, 2021); Otter Tail Power, *In the Matter of Otter Tail Power Company's 2022-2036 Integrated Resource Plan*, Application for Supplemental

approach, including the regulatory costs as a dispatch adder during resource selection but not when modeling the sensitivities, which we discuss more in Part IV.)[24] This means that, like the price of fuel and other projected internal operating costs, the regulatory costs influence resource selection and how often a resource is dispatched into the market. The regulatory costs suppress the dispatch of carbon-emitting resources, sometimes significantly. This dispatch suppression is a realistic projection of how regulatory costs would affect unit operations if the regulatory costs actually come into effect on the scale and schedule predicted. If the regulatory costs are overestimated, they will lead to a underestimation of the likely dispatch of carbon-emitting units and of their emissions and associated externalities. The reverse is true if regulatory costs are underestimated.

By contrast, the externality costs – which by definition are not paid by the utility – are modeled by Xcel, Minnesota Power, and CEOs as a post-processing add-on cost, calculated after EnCompass has determined the scenario's resource mix and dispatch rates.[25] Externality costs added at this stage do not affect resource choice or dispatch rates, and therefore do not suppress projected emissions. This is a realistic projection of energy

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Resource Plan Approval 2023-2037, Docket No. E017/RP-21-339 (Mar. 31, 2023); Clean Energy Organizations, *In the Matter of* the *2020-2034 Upper Midwest Integrated Resource Plan of Northern States Power Company d/b/a Xcel Energy,* Initial Comments, Docket No. E002/RP-19-368 (Feb. 11, 2021); Clean Energy Organizations, *In the Matter of Minnesota Power's Application for Approval of its 2021-2035 Integrated Resource Plan,* Initial Comments, Docket No. E015/RP-21-33 (Apr. 28, 2022).

[24] Xcel Energy, *In the Matter of the 2020-2034 Upper Midwest Integrated Resource Plan of Northern States Power Company d/b/a Xcel Energy,* Reply Comments, Docket No. E002/RP-19-368 (June 25, 2021).

[25] Otter Tail Power, on the other hand, has put externality values in as a dispatch adder in its IRP, meaning the externalities would affect resource choice, suppressing dispatch and emissions. This is not appropriate since externalities are not paid by the utility and would not actually impact dispatch and emissions; including externalities at this stage leads to an underestimate of likely emissions. Otter Tail Power Co. Response to CEO IR 064, *In the Matter of Otter Tail Power Company's 2022-2036 Resource Plan,* Docket No. E017/RP-21-339 (May 15, 2023).

market dynamics, where generating resources are dispatched based on internal variable costs, not reflecting the costs their dispatch imposes on the environment and society.

The costs of any modeled scenario should be presented in a way that clearly differentiates between the costs the utility is expected to incur and charge its ratepayers (the Present Value Revenue Requirement, or "PVRR") and the externality costs imposed on society as a whole. However, as we discuss more in Part IV, the presentation of these costs varies among utilities, and CEOs request that the Commission instruct utilities in future filings to clearly differentiate expected internal costs from estimated externalities.

Because the model treats (and should treat) regulatory and externality costs differently, keeping the balance of the externalities in place will yield results different from the Commission's two current scenarios that consider externalities imposing low and high externality costs without any regulatory costs (Scenarios A and B in the Commission's 2020 order).[26] Applying a regulatory cost as a dispatch adder will increase a scenario's PVRR while suppressing its dispatch and emissions. The commensurate reduction in the externality cost per ton, applied as a post-processing add-on, will reduce the total externalities (as will the dispatch suppression).

The result – higher internal costs but relatively lower externalities – is precisely what would be expected and intended by environmental regulations. Modeling both a regulatory cost and the balance of the externality tells the Commission and the public how much of a scenario's costs would be borne by ratepayers and how much would be

[26] 2020 Regulatory Costs Order, *supra* note 2, at 9.

borne by society as a whole if these regulatory costs were implemented. This information would not be available under the existing Scenarios A and B because they include no regulatory costs at all.

c. Retaining the balance of the externalities is easily implemented

CEOs recommended approach would be easy to implement. Utilities already model externality costs in all five of the Commission's scenarios. In three of those scenarios, including the reference scenario, they then reduce those externality costs to zero when regulatory costs appear, currently assumed to be in 2025. Under our recommended approach, they would in that year simply reduce that externality cost/ton by the size of the regulatory cost/ton, leaving the balance of the externality in place.

For example, using the mid-range externality costs estimated by the EPA for 2025 and the mid-range regulatory cost projections last adopted by the Commission (and ignoring for now the difference between the state's use of short tons and the EPA's use of metric tons): utilities would assume a $210 externality cost for every ton of CO2 emitted until 2025.[27] In that year they would add a $15/ton regulatory cost and reduce the externality cost to $195/ton ($210 minus $15) instead of to zero.

CEOs' proposed approach of retaining the balance of the externalities is therefore a simple way to comply with the statute's requirement to apply the full federal externality values, and it also respects the basic economic principle that a small regulatory cost can only internalize a commensurate share of externalities.

[27] The EPA's estimated cost under the 2.0% discount rate is $190/ton for 2020, rising at a rate that would put it at $210/ton by 2025. EPA Social Cost of GHGs 2022, *supra* note 7, Table ES-1, p. 3.

II. The Commission need not try to estimate the compliance costs of the carbon-free standard or the proposed EPA rule in this docket

The Commission has requested comment on how the likely range of CO_2 regulatory costs should incorporate the new CFS and the regulatory costs resulting from the EPA's proposed new rule under section 111(b) and (d) of the Clean Air Act. For reasons described in this Part, we explain why the Commission should not and need not try to estimate in this proceeding the costs of complying with the CFS and the EPA rule.

When the law requiring the Commission to estimate future carbon regulatory costs was passed in 2007, it was widely assumed that Minnesota utilities would soon be subject to a cap-and-trade law that would require utilities to pay a per-ton allowance price for the right to emit each ton of CO_2. The Commission had already acknowledged the need to consider these future carbon regulatory costs in resource planning, and forecasting such costs had become a matter of considerable debate in resource dockets.[28] Estimating what the regulatory cost would likely be under a cap-and-trade system involved assessing publicly available information about legislative proposals, existing regional carbon markets, and a growing literature predicting future cap-and-trade costs.

If a cap-and-trade system (or a carbon tax) had been enacted it would have imposed *uniform costs* per ton of emissions on all Minnesota utilities and all carbon-

[28] *See e.g.* Minn. Pub. Utils. Comm'n., *In the Matter of Northern States Power Company d/b/a Xcel Energy's Application for Approval of its 2005-2019 Resource Plan,* Order Approving Resource Plan as Modified, Finding Compliance with Renewable Energy Objectives Statute, and Setting Filing Requirements, Docket No. E-002/RP-04-1752 (July 28, 2006) (requiring Xcel to consider carbon regulatory risk in future resource filings); Office of Administrative Hearings, *In the Matter of the Application of Otter Tail Power Company and Others for Certification of Transmission Facilities in Western Minnesota,* Findings of Fact, Conclusions of Law, and Recommendation, MPUC Docket No. ET-9/CN-05-619 (Aug. 15, 2007) (considering competing carbon regulatory forecasts).

emitting generating units. For this reason, it made sense for the Commission to estimate these future costs once in a single docket (periodically updated), and to have those estimates apply to all utilities, rather than for the Commission to estimate such costs anew in every resource proceeding before them.

A. The Commission cannot reasonably estimate in this docket the cost of compliance with the CFS or the EPA rule because those compliance costs will vary by utility and unit

The carbon regulatory costs faced by Minnesota utilities under the CFS and the proposed EPA rule are far from uniform, in contrast to what was expected when section 216H.06 was enacted. The cost of compliance with the CFS will vary by utility, depending on each utility's resource mix, its current carbon emissions, and its access to carbon-free power sources, among other things. It will also depend on Commission orders regarding how the CFS should be implemented, which have yet to be issued.[29]

The cost of compliance with the proposed EPA rule will also vary by utility and by unit.[30] For example, coal plant operators have four compliance paths they may choose between: (1) installing 90% carbon capture and storage (CCS) by 2030; (2) installing 40% gas co-firing by 2030 and retiring by 2040; (3) cutting their capacity factors to 20% by 2030 and retiring by 2035; or (4) retiring by 2032. New and existing large gas plants may choose between installing 90% CCS by 2035 or co-firing with 30% low-carbon hydrogen by 2032 and 96% hydrogen by 2038. Which approach a utility chooses for its particular units will

[29] The Commission is required to "issue necessary orders detailing the criteria and standards" to measure a utility's efforts to meet the CFS and determine whether the utility is achieving it. Laws of Minnesota 2023, chapter 7, section 7 (amending Minn. Stat. § 216B.1691, subd. 2d).
[30] 88 Fed. Reg. 33240 (May 23, 2023).

depend on a long list of factors including the unit's age, efficiency, operating and maintenance costs; other potential environmental compliance costs; its access to carbon sequestration sites, natural gas pipelines, and hydrogen sources; and the cost of replacing any retired units with cleaner alternatives.

This lack of a uniform regulatory cost makes it impossible or at least impracticable for the Commission to estimate in this proceeding the costs of compliance with either the CFS or the proposed EPA rule. Even attempting to do so would require unit-specific information not currently in the Commission's possession.

And rather than promoting administrative efficiency, even if the Commission could estimate each utility's costs of compliance with these laws, it would be a waste of resources. As we discuss next, utilities will need to identify their own utility-specific and unit-specific compliance costs under the CFS and EPA rule in their future resource plans. An average estimate of compliance costs with these two laws by the Commission would be of little if any use in these plans.

Instead of trying to estimate the costs of compliance with the CFS and proposed EPA rule, the Commission should comply with the requirement of section 216H.06 by adopting an estimate of the potential costs of *additional* carbon regulations that can be expected as the climate crisis intensifies, as we discuss in Part III.

B. The Commission should clarify in this docket that utilities must demonstrate compliance with the Carbon-Free Standard and the EPA rule in their resource plans

Most of the compliance deadlines in the new CFS and the new EPA rules are several years in the future, but meeting those deadlines in an optimal way requires long-term advance planning and implementation, starting now. Many compliance options can take several years to implement, especially if they require new transmission lines, involve major new technologies with which utilities are unfamiliar, or demand the widespread deployment of distributed technologies.

The new state law already requires utilities to report to the Commission their plans, activities, and progress in meeting the CFS and the enhanced RES in their IRPs.[31] And the Commission cannot approve an IRP unless it is consistent with the public interest and complies with the renewable energy preference and other longstanding state standards.[32] So IRPs must show compliance with the CFS and the Commission cannot approve a plan that would violate the CFS.

Once the EPA rule is finalized – currently scheduled for April, 2024[33] -- utility resource plans will need to show how they will comply with those requirements too. As for any utility plans filed before the rule is finalized, they should show how the utility would comply with the rule if adopted as proposed. This would be consistent with the forward-looking goal of section 216H.06: namely, to ensure that the costs of future carbon regulations are recognized in utility resource proceedings. It would surely be imprudent for a utility to make long term plans that would violate the proposed EPA rule, and inconsistent with the public interest for the Commission to approve any such plan.

[31] Laws of Minnesota 2023, chapter 7, section 11 (amending Minn. Stat. § 216B.1691, subd. 3).
[32] Minn. Stat. § 216B.2422, subds. 2 and 4.
[33] This is the scheduled date of finalization of the proposed rule in the federal Unified Agenda published by the U.S. Office of Information and Regulatory Affairs. *See* https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202304&RIN=2060-AV09.

The Commission should therefore instruct utilities in their next IRPs to show how they plan to comply with both the CFS and the EPA rule. These plans must also include the utility's estimated costs of achieving compliance, without which the Commission and the public cannot know how the utility's plan compares to alternative compliance approaches. This is especially true for expenditures related to new or refurbished nonrenewable energy facilities, which must be shown to overcome the state's renewable energy preference.[34] CEOs expect that full consideration of all costs and risks will show that it will generally be in the public interest to comply with the CFS and EPA rule by replacing the carbon-emitting resources with carbon-free renewable energy technologies, demand response, energy efficiency and storage rather than by retrofitting existing thermal plants.

III. The Commission should estimate the range of costs associated with additional future carbon regulations aimed at ongoing carbon emissions, adopting a $0-$75/ton estimate beginning in 2028

A. Utilities face the risk of additional future carbon regulations as long as they continue to emit CO2 in a warming world

Utilities cannot prudently assume that as long as they meet the requirements of the CFS or the proposed EPA rule they will face no additional restrictions on their remaining carbon emissions. Neither law will necessarily cut emissions as fast or as fully as needed to meet global climate goals.

Under the Paris Agreement and the Glasgow Pact, the US and the other nations of the world agreed to hold global warming to "well below 2° C" above preindustrial levels

[34] Minn. Stat. § 216B.2422, subd. 4.

and to pursue efforts to limit warming to 1.5º C.[35] To align the nation with the reductions needed to stay within the 1.5º limit, the Biden administration submitted the nation's Nationally Determined Contribution under the Paris Agreement, pledging to cut US greenhouse gases by 50-52% by 2030 (below 2005 levels).[36] The administration also set the goal of achieving net zero US emissions economy-wide by 2050[37] and the goal of creating a carbon-free US electric grid by 2035.[38] It described this 2035 goal for the US power sector as "a crucial foundation for net-zero emissions no later than 2050."[39] A series of modeling studies considering how the US can meet its decarbonization targets all similarly stress the need to have the power sector decarbonize at a particularly aggressive pace.[40] And a 2022 federal study conducted by the National Renewable

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[35] Parties to the U.N Framework Convention on Climate Change, *Paris Agreement,* Article 2 (Dec. 12, 2015), available at https://unfccc.int/files/essential_background/convention/application/pdf/english_paris agreement.pdf; *Glasgow Climate Pact,* Advance Version, para. 20 (Mar. 8, 2022), available at https://unfccc.int/sites/default/files/resource/cma2021_10_add1_adv.pdf.

[36] "The United States Nationally Determined Contribution: Reducing Greenhouse Gases in the United States: A 2030 Emissions Target," submitted to NDC registry April 22, 2021. https://unfccc.int/sites/default/files/NDC/2022-06/United%20States%20NDC%20April%2021%2020 21%20Final.pdf [hereinafter, "US NDC"].

[37] Exec. Order 14,008, Tackling the Climate Crisis at Home and Abroad, 86 Fed. Reg. 7619, 7622 (Feb. 1, 2021).

[38] The White House, *Fact Sheet: President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-Paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies* (Apr. 22, 2021), https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadershipon-clean-energy-technologies.

[39] U.S. State Department and Executive Office of the President, *The Long-Term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050*, at 5 (Nov. 2021) available at https://www.whitehouse.gov/wp-content/uploads/2021/10/US-Long-Term-Strategy.pdf.

[40] *See e.g.* Nathan Hultman, et al., *Charting an Ambitious U.S. NDC of 51% Reductions by 2030*, Univ. Md. Center for Global Sustainability (Mar. 2021), *available at* https://cgs.umd.edu/research-impact/publications/working-paper-charting-ambitious-us-ndc-51-reductions-2030; Robbie Orvis, *A 1.5 Celsius Pathway to Climate Leadership for the United States*, Energy Innovation (Feb. 2021), *available at* https://energyinnovation.org/wp-content/uploads/2021/02/A-1.5-C-Pathway-to-Climate-Leadership-for-The-United-States.pdf; *Accelerating Decarbonization of the U.S. Energy System*, National Academies of Sciences, Engineering, and Medicine, The National Academies Press (2021), *available at*

Energy Laboratory found multiple ways to achieve a 100% clean electricity system in the US by 2035 while producing significant benefits exceeding the costs.[41]

Neither the EPA's proposed rule nor the CFS would achieve a fully decarbonized power grid by 2035. The EPA's proposed rule does not cover most gas plants, and it allows ongoing emissions from coal plants into the 2030s and beyond, depending on the compliance path chosen. The state's CFS is more encompassing than the proposed EPA rule, but still would not decarbonize the power sector as fast and fully as needed. The law allows the use of Renewable Energy Credits (RECs) for compliance, and depending on how the Commission implements the law in future orders,[42] this could allow significant ongoing carbon emissions. And the CFS does not require 100% carbon-free power until 2040, and this percentage applies to retail sales rather than to total generation or purchases.

Moreover, the world is not currently on track to meet the internationally-agreed climate protection goals. [43] This means we will be required to make even steeper emission

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https://nap.nationalacademies.org/catalog/25932/accelerating-decarbonization-of-the-us-energy-system; Ben Haley et al., *Annual Decarbonization Perspective: Carbon-Neutral Pathways for the United States* 2022, Evolved Energy Research (2022), *available at https://www.evolved.energy/post/adp2022#:~:text This%20report%20inaugurates%20a%20series,energy%20and%20climate%20change%20mitigation.*; Union of Concerned Scientists, *A Transformative Climate Action Framework: Putting People at the Center of Our Nation's Clean Energy Transition* (2021), *available at* https://www.ucsusa.org/resources/clean-energy-transformation.

[41]Denholm, Paul, Patrick Brown, and Wesley Cole, et al., *Examining Supply-Side Options to Achieve 100% Clean Electricity by 2035,* National Renewable Energy Laboratory (2022), available at https://www.nrel.gov/analysis/100-percent-clean-electricity-by-2035-study.html. Notably, this report precedes the enactment of the Infrastructure Investment and Jobs Act and the Inflation Reduction Act, which will reduce the costs of achieving 100% clean electricity by 2035.

[42] Laws of Minnesota 2023, chapter 7, Section 7.

[43]According to the most recent assessment by the Intergovernmental Panel on Climate Change (IPCC), there remains a "substantial 'emissions gap'" between the emissions track the world is on (based on nation's climate pledges as of October 2021) and the emissions mitigation pathways needed to limit

cuts or deploy even more negative emissions technologies in the years ahead to have a chance of staying below 1.5ºC or even below 2º C. Ongoing carbon emissions will cause substantial and increasing damage,[44] as the legislature has formally recognized by requiring the use of EPA's externality values. The frequency of weather and climate disasters in the US causing over a billion dollars in damage is now several times higher than in earlier decades, even after adjusting for inflation.[45] It is imprudent to assume that society will continue to bear these enormous costs indefinitely as the planet continues to heat up. It is likely that the climate disasters that lie ahead -- an accelerating drumbeat of record-breaking wildfire seasons, droughts, heatwaves, storms and floods – will stoke growing public alarm. This alarm could well translate into additional carbon restrictions beyond the CFS or the EPA's proposed rule.

In short, as long as utilities continue to emit CO2, thereby contributing to the deepening climate crisis, they face the risk of additional future carbon regulation. In compliance with the mandate of section 216H.06, the Commission should attempt to estimate that ongoing regulatory risk so it is not ignored in resource planning.

We do not know what form future carbon restrictions could take. They might appear as a new federal clean energy standard or a more aggressive state CFS. They could

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warming to 1.5º C with no or limited overshoot or to limit warming to 2º C. IPCC, *Summary for Policymakers, Climate Change 2021: Synthesis Report of the IPCC Sixth Assessment Report,* paras. A.4, A.4.3 (Mar. 2023), available at https://www.ipcc.ch/report/ar6/syr/; Max Bearak and Nadja Popovich, "The World is Falling Short of its Climate Goals. Four Big Emitters Show Why," *New York Times* (Nov. 8, 2022), available at https://www.nytimes.com/interactive/2022/11/08/climate/cop27-emissions-country-compare.html

[44] *Climate change widespread, rapid, and intensifying*, IPCC press release (Aug. 9, 2021) available at https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr/.

[45] National Centers for Environmental Information, *Billion-Dollar Weather and Climate Disasters,* National Oceanic and Atmospheric Administration, website (accessed June 25, 2023), available at https://www.ncei.noaa.gov/access/billions/.

appear as stricter power plant emission limits. Or they could appear as a price on carbon emissions through a cap-and-trade law or a carbon tax. CEOs propose that given the uncertainties, the most reasonable way to recognize the residual regulatory risk is to estimate a cost/ton as a proxy for that risk. Of course, this cost would only attach to the remaining carbon emissions, which will be shrinking as utilities comply with the CFS and the EPA rule.

B. An estimated range of $0 – 75/ton costs beginning in 2028 would reasonably reflect the residual regulatory risk

Multiple studies over the years have estimated what sort of carbon cost would be required for the world to cut GHGs in line with limiting warming to the levels agreed to in international climate negotiations. A 2021 analysis by Wood Mackenzie found that it would take carbon prices of $160/metric ton by 2030 to cut GHGs in line with the world limiting warming to 1.5° C.[46] Another analysis, by the International Energy Agency, estimated that to achieve net zero energy-related CO2 emissions globally by 2050 required CO2 prices in advanced economies of $130/metric ton in 2030, rising to $205/metric ton in 2040.[47] A third study, by the High-Level Commission on Carbon Prices in a report sponsored by the World Bank, found in 2017 that staying well below

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[46] Wood Mackenzie, *Significant Increase in Carbon Pricing is Key in 1.5-degree World*, (Mar. 4, 2021), available at https://www.woodmac.com/press-releases/significant-increase-in-carbon-pricing-is-key-in-1.5-degree-world/#:~:.text=Wood%20Mackenzie%20Asia%20Pacific%20Head,at%20the%20end%20of%202020.%E2%80%9D [hereinafter "Wood Mackenzie 2021"].

[47] *World Energy Model Documentation,* International Energy Agency, at 17 (Oct. 2021), available at https://iea.blob.core.windows.net/assets/932ea201-0972-4231-8d81-356300e9fc43/WEM_Documentation_WEO2021.pdf [hereinafter "IEA 2021"].

2.0° C (the less ambitious Paris Agreement goal) would require carbon prices of at least $50-100/metric ton by 2030, if complemented by other well-designed policies.[48]

Most recently, a 2022 research paper by the International Monetary Fund (IMF) assessed the impact of a carbon floor price of $75/metric ton by 2030 for high-income nations, finding it would be sufficient to reduce emissions in line with keeping warming below 2.0° C.[49] Indeed, the authors wrote that such a price floor "is the only feasible option out of all those we considered in the paper to prevent the planet from heating to dangerously high temperatures."[50]

The IMF's estimate of carbon costs of $75/ton by 2030 would be a reasonable proxy for the upper cost of future carbon regulations. The proposed EPA rule applies to what might be considered the low-hanging fruit when it comes to decarbonizing the power sector: the largest coal and gas plants. Further abating power sector emissions – such as by eliminating the last ten percent of emissions from a coal plant employing 90% carbon capture, or eliminating emissions from the less frequently run intermediate and peaker plants – can be expected to cost more on a cost/ton basis. It may be on the conservative side for an upper edge of the cost range given that it aims to limit warming to below

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[48] High-Level Commission on Carbon Prices, *Report of the High-Level Commission on Carbon Prices*, The World Bank, (2017), at 3, 50, available at https://www.carbonpricingleadership.org/report-of-the-highlevel-commission-on-carbon-prices. The High-Level Commission also found that carbon costs of $40-80/ton were needed by 2020.

[49] Jean Chateau, Florence Jaumotte and Gregor Schwerhoff, *Economic and Environmental Benefits from International Cooperation on Climate Policies,* International Monetary Fund Departmental Paper (March 17 2022), available at https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2022/03/16/Economic-and-Environmental-Benefits-from-International-Cooperation-on-Climate-Policies-511562.

[50] Jean Chateau, Florence Jaumotte and Gregor Schwerhoff, *Why Countries Must Cooperate on Carbon Prices,* IMFBlog (May 19, 2022), available at https://blogs.imf.org/2022/05/19/why-countries-must-cooperate-on-carbon-prices-2/.[hereinafter "IMF 2022"].

2.0° C rather than to the far safer 1.5° C goal, which studies by the International Energy Agency and Wood Mackenzie found would require carbon costs of $130 to $160/metric ton by 2030 to achieve.[51] Moreover, according to the IMF, $75/ton should be a price *floor*, and the IMF stresses that many countries might have to set higher prices to achieve their NDCs.[52] However, a $75/ton cost estimate would at least stand as a recognition that ongoing carbon emissions from power plants can expect to come under increasing regulatory pressure as the planet heats up and as society seeks to achieve full decarbonization.

A low regulatory cost estimate of $0/ton would represent the possibility that no further carbon regulations will be put in place. It is possible, for example, that technological and price improvements from carbon-free energy sources could drive carbon emission reductions even faster than the CFS and EPA rule, making stricter carbon regulations unnecessary. Alternatively, the Commission could keep the $5/ton lower value currently in place, but this value is so low that it will rarely have a significant effect on the modeling. By adopting a lower value of $0/ton the Commission can eliminate one of the five modeling scenarios it currently requires, as we discuss in Part IV.

We stress that these cost values should not be seen as substitutes for the actual utility- and unit-specific costs of complying with the CFS and the EPA rule, which each utility should set out in its IRP and other resource filings. Those compliance costs should be included in each IRP with as much specificity as possible. This proposed $0-75 cost

[51] IEA 2021, *supra* note 47; Wood Mackenzie 2021, *supra* note 46.
[52] IMF 2022, *supra* note 50.

range would represent the potential cost of future laws which we can expect to restrict the residual carbon emissions associated with generating electricity as the climate crisis advances.

We propose that these regulatory costs should be presumed to come into effect in 2028. Carbon regulatory efforts in the immediate future will necessarily focus on implementing the CFS and EPA rule. However, in the next few years we will have a much better idea of whether we are on track to meet our pledge under the Paris Agreement to cut our GHG emissions 50-52% by 2030. If we are far off track, or if the science indicates even deeper cuts are needed to address the crisis, tighter regulations on power sector emissions could reasonably be expected to come into effect by 2028.

IV. The Commission can eliminate one of its five scenarios and should instruct utilities to model regulatory and externality costs in a realistic and transparent way

The Commission has asked for comment on whether to use the same five scenarios combining regulatory and environmental cost values established in its 2020 Regulatory Costs Order. These five scenarios, which we label Scenarios A through E consistent with that order, require modeling using the following mix of costs:

A. Low externality costs/No regulatory costs
B. High externality costs/No regulatory costs
C. Low externality costs/Low regulatory costs
D. High externality costs/High regulatory costs
E. A reference case employing Middle or High externality costs/Middle or High regulatory costs

Scenarios C, D, and E all assume regulatory costs ranging from $5 - $25 begin in 2025. The 2020 Regulatory Costs Order states that regulatory costs should replace externality costs in 2025 in Scenarios C and D; the order does not state that regulatory costs should replace externality costs in the reference case,[53] though it has been interpreted that way by utilities.[54]

CEOs support keeping four of these scenarios, though all scenarios should retain the balance of the statutorily-required externalities, as we discuss in Part I. Scenario C, assuming the low end of the range of regulatory costs ($5/ton), can be discontinued if the Commission adopts the $0-$75/ton cost range CEOs propose. The current low-end cost of $5/ton is so low that it has little if any impact on modeling. It might as well be zero, in which case Scenario C would not differ from Scenario A.

However, we urge the Commission to instruct utilities to model regulatory and externality costs in a way that more realistically reflects market dynamics and that clearly provides critical information about a resource scenario's costs and whether they fall on ratepayers or the environment.

Minnesota law has long required the Commission to pay special attention to environmental externalities and future climate regulatory costs, and the 2023 amendments to the externalities law raise this requirement to a whole new level. Yet despite state law's particular focus on these two cost categories, both the externality and regulatory costs have tended to get lost in utility IRPs, buried and undifferentiated among other costs. IRPs often fail to provide answers to basic questions about the costs. For example, what exactly are the externality and carbon regulatory costs for the utility's

[53] 2020 Regulatory Costs Order, *supra* note 2, at 8, 9.
[54] *See e.g.,* the IRPs cited *supra,* notes 23 and 24.

preferred plan and the alternatives to which it is compared? How much could externalities and regulatory costs be reduced by pursuing a lower-carbon scenario? And how much could a utility reduce externalities and with what cost or savings for ratepayers? Given Minnesota law's explicit emphasis on these particular cost categories and the growing urgency around climate change, IRPs should enable the Commission and the public to clearly answer these questions.

One source of the confusion relates to the inconsistent way utilities handle regulatory and externality costs in their modeling and in how they report costs in their IRPs. As we discuss in Part I(B)(2), most utilities and the CEOs appropriately model externality costs in EnCompass as post-processing add-ons, meaning that unlike projected regulatory costs they do not influence how the model dispatches units or selects resources. However, Otter Tail Power lumps externality costs in with regulatory costs and models them *both* as dispatch adders in their "Externalities Included" runs, even though externality costs in reality would have no effect on dispatch.[55]

There is also variability in how utilities report these categories of costs to the Commission. Xcel in its last IRP correctly modeled future regulatory costs as a dispatch adder in the resource selection phase. Then it fixed those plans and ran them through various sensitivities. For these sensitivities, Xcel did not include the regulatory costs as a dispatch adder, and it reported the regulatory costs in the total PVSC ("Present Value

[55] Otter Tail Power Co. Response to CEO IR 064, *In the Matter of Otter Tail Power Company's 2022-2036 Resource Plan,* Docket No. E017/RP-21-339 (May 15, 2023).

Social Cost") rather than in the PVRR.[56] Otter Tail Power's IRP, by contrast, refers to both its regulatory costs and its externality costs as part of its net PVRR for its "Externalities Included" runs, even though externalities by definition would never be part of a revenue requirement.[57] Minnesota Power, meanwhile, presented its scenario costs in the form of a "Net Present Value," or NPV, combining internal costs and externalities.[58]

Clarity about what costs a utility faces and what costs are being imposed on the environment and society as a whole really matters. Without a clear delineation of these two cost categories, the Commission cannot determine what would be an appropriate trade-off between them, if and when there is a trade-off. The Commission might well conclude that utilities' internal costs should go up $X in order to reduce externality costs by $Y. To assess that trade-off, the Commission and the public need to know the line between internal costs and externalities. Obscuring that line prevents the kind of full and transparent understanding needed to judge what resource mix best serves ratepayers and the public interest.

It is even more important to clearly delineate externality costs now that much higher carbon externalities are required by statute, especially when considering how quickly to retire coal units, which cause enormous climate damage each year they

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[56] Xcel Energy, *In the Matter of the 2020-2034 Upper Midwest Integrated Resource Plan of Northern States Power Company d/b/a Xcel Energy,* Supplement, 2020-2034 Upper Midwest Integrated Resource Plan, Docket No. E002/RP-19-368, at 31 (June 30, 2020).

[57]Otter Tail Power, *In the Matter of Otter Tail Power Company's 2022-2036 Integrated Resource Plan*, Application for Supplemental Resource Plan Approval 2023-2037, Docket No. E017/RP-21-339, Appendix I (Mar. 31, 2023).

[58] Minnesota Power, *In the Matter of Minnesota Power's Application for Approval of its 2021-2035 Integrated Resource Plan*, 2021 Integrated Resource Plan, Docket No. E015/RP-21-33, at 51, 57 (Feb. 1, 2021).

continue to operate. For example, assume a coal unit would under a certain resource scenario emit 3 million metric tons of CO_2 in 2030, its last year before retirement. The climate damage just from the unit's 2030 CO_2 emissions would range from $420 million to $1.14 billion, with a central estimate of $690 million.[59] An alternative resource scenario that could replace that coal unit with carbon-free alternatives one year sooner would thus prevent from hundreds of millions of dollars to over a billion dollars in climate damage. This is clearly something the Commission and public should consider when alternative scenarios are being weighed.

To more realistically reflect market dynamics and to provide the transparency necessary to allow the Commission and the public to weigh the externalities and regulatory costs of various scenarios, the Commission should instruct utilities to:

- Model future regulatory costs as dispatch adders under EnCompass because regulatory costs would actually affect dispatch (or use a comparable method under other models);
- Model externality values as post-processing add-ons under EnCompass because externality costs would not actually affect dispatch (or use a comparable method under other models);
- Identify the future regulatory costs of each scenario as part of its PVRR, because regulatory costs would be internal costs for which the utility would seek rate recovery;
- Identify the externality costs of each scenario, and present these costs separately from the PVRR. Since the discount rates for the GHG externality cost ranges are already built into the EPA's externality estimates and specified by the amended law,[60] the externality costs should not be subject to any additional discounting except for during the period prior to the year the emissions occur. This calculation should be consistent with how the social costs were discounted to their emissions year.

[59] Damage figures are based on the EPA's estimate that a ton of CO_2 emitted in 2030 would cause $140 in social costs at a 2.5% discount rate, $230 at a 2.0% discount rate, and $380 at a 1.5% discount rate.

[60] Laws of Minnesota 2023, chapter 7, section 18.

These instructions will allow the Commission to give due consideration to both externalities and regulatory costs, as state law intends. They will also better reveal the relationship between the two categories of costs and how they shift under different resource scenarios.

CONCLUSION

The Commission must instruct utilities to retain the balance of the carbon externality costs after regulatory costs are assumed to apply. Allowing the complete replacement of externality costs with smaller regulatory costs would violate the newly-enacted requirement to consider the full range of EPA's draft GHG externalities, as well as violate fundamental economic principles. Retaining the balance of the externalities is easily modeled.

The Commission need not try to estimate the costs of complying with the CFS or the proposed EPA rule in this proceeding, because they are utility- and unit-specific costs not amenable to Commission estimation. However, the Commission should adopt under section 216H.06 a cost estimate representing the residual regulatory risk that attaches to carbon emissions not prevented by the CFS or EPA rule, and $0-$75/ton beginning in 2028 would be a reasonable proxy for that risk. The Commission should also establish criteria to ensure the model scenarios it requires yield more transparent and realistic treatment of both regulatory and externality costs.

We summarize below our answers to the Commission's specific questions, referencing our related discussion of these issues:

Issue: What values should the Commission establish as the likely range of costs of future carbon dioxide (CO_2) regulation on electricity generation?

The Commission should establish an upper carbon regulatory cost of $75/ton and a lower carbon regulatory cost of $0/ton. This range of costs would appropriately recognize the remaining regulatory risk faced by power plants, in addition to the CFS and proposed EPA rule, given the potential for stricter carbon limits as the climate crisis deepens. (Part III(B)).

1. Should the Commission adopt the Agencies' recommendations from its January 5, 2023, Report? If not, how should the Agencies' recommendations be modified? The Agencies recommend the Commission:

> **a. raise the upper bound of the existing range of likely costs of CO_2 regulation to $30 per ton of CO2 emitted;**
>
> No, the upper bound of the cost range should be $75/ton. (Part III(B)).
>
> **b. keep the lower bound at $5 per ton of CO2 emitted;**
>
> CEOs recommend a lower bound of the cost range of $0/ton. (Part III(B)).
>
> **c. set an annual escalation factor for the regulatory cost of carbon at 4%;**
>
> CEOs support this recommendation.
>
> **d. keep 2025 as the threshold planning year for which these values should begin to be applied; and**
>
> The Commission should set 2028 as the threshold planning year for which these values should begin to be applied. (Part III(B)).
>
> **e. continue to direct utilities to use the same scenarios of combining regulatory and environmental cost values as established in the September 2020 order.**
>
> The Commission can eliminate one of the five scenarios, and should require retaining the balance of the externality costs after regulatory costs are applied. (Parts I and IV). It should also specify how the regulatory and externality costs should be modeled and reported. (Part IV).

2. How do capacity expansion models, such as EnCompass, treat CO2 regulatory costs differently than environmental externalities in resource planning and resource acquisition proceedings?

Capacity expansion models like EnCompass can and should treat projected CO_2 regulatory costs as dispatch adders, the way they treat other projected operating costs. By contrast, externality costs should be modelled as a post-processing add-on. (Part I(B)(2)). The Commission should specify how these costs should be reported to ensure transparency around these cost categories, which state law particularly directs the Commission's attention to. (Part IV).

3. Are there other issues or concerns related to this matter?

CEOs have presented our primary concerns in these comments.

4. How should the Commission's likely range of regulatory costs incorporate the requirements of Minnesota Session Laws 2023, chapter 7, section 10, which requires the Minnesota utilities to generate or produce 100 percent carbon-free electricity by 2040 (the Carbon-Free Standard)?

The Commission should clarify that each utility must demonstrate in its IRPs how it plans to comply with the Carbon-Free Standard, rather than the Commission attempting in this docket to estimate each utility's cost of compliance. (Part II).

5. How should the Commission implement Minnesota Session Laws 2023, chapter 7, section 18, which requires the Commission to adopt estimates released by the federal Interagency Working Group on the Social Cost of Greenhouse Gases or its successors, and requires that the resource planning and acquisition proceedings incorporate these estimates?

This provision requires the Commission to give far more weight to carbon externalities when assessing resource options or considering CFS off-ramp requests. Its enactment makes it even more important to retain the balance of the externality costs in scenarios that apply regulatory costs. (Part I).

6. How should the Commission incorporate potential regulatory costs resulting from the U.S. Environmental Protection Agency's CO2 regulation under the section 111(b) and (d) rules?

As with the Carbon-Free Standard, the Commission should require each utility to demonstrate in its IRPs how it plans to comply with the EPA rule. The Commission need not try to estimate the unit-specific compliance costs for these rules. (Part II.B).

Dated: July 13, 2023

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STATEMENT OF DR. STEPHEN POLASKY

July 13, 2023

To the Minnesota Public Utilities Commission

In the Matter of Establishing an Updated 2023 and 2024 Estimate of the Costs of Future Carbon Dioxide Regulation on Electricity Generation under Minn. Stat. § 216H.06

Docket No. E999/CI-07-1199; E999/DI-22-236.

I understand that the Minnesota Public Utilities Commission is currently updating its estimate of future carbon regulatory costs related to energy generation. I have been asked to submit a statement addressing the Commission's current practice of authorizing utilities in their resource planning to replace the use of an externality value with a smaller projected regulatory cost. This replacement is inconsistent with fundamental economic principles. Policy should attempt to internalize external costs. A regulatory cost that is only a portion of the external cost can only partially internalize the externality cost and is not good public policy. I urge the Commission to discontinue this approach.

I am a Regents Professor and the Fesler-Lampert Professor of Ecological/Environmental Economics at the University of Minnesota. My research and publications focus on issues at the intersection of ecology and economics, including environmental externalities, environmental regulation, and climate change. I served as Senior Staff Economist for environment and resources for the President's Council of Economic Advisers from 1998-1999. I served on the Science Advisory Boards for US EPA and NOAA. I am a fellow of the Association of Environmental and Resource Economists, the American Academy of Arts and Sciences, and the American Association for the Advancement of Science. I was elected into the National Academy of Sciences in 2010. I am coauthor of the textbook *Economics and the Environment* (2017), and an author on over 250 peer-reviewed journal articles. In 2015 I submitted expert testimony to this Commission in the proceeding in which it established its current externality values.[1] My testimony addressed the issue of internalizing externalities and the federal Social Cost of Carbon values and the methodology by which they were estimated.

The fundamental economic principle in addressing pollution that imposes costs on others is to internalize the external costs from pollution so that the firm causing the pollution faces the full cost of their actions. The goal of environmental regulation is to internalize external pollution damages to the firm so it has the correct incentive to reduce harm from pollution. If a firm pays a fee equal to the marginal external damage, it will have the

[1] *In the Matter of the Further Investigation into Environmental and Socioeconomic Costs Under Minnesota Statutes Section 216B.2422, Subdivision 3,* Docket No. E-999/CI-14-643.

correct incentive. For carbon, the social cost of carbon is an estimate of the marginal external damage so that it is, at least in principle, the correct fee to charge.

Firms may have some cost associated with environmental regulation, such as having to buy permits under a cap-and-trade system. IF (and it is a really big if) the number of permits is set at the efficient level of pollution so that the marginal costs of reducing pollution equal the external costs, then the marginal cost paid by firms will be equal to the marginal damage and the cost faced by the firm and the social cost of carbon would be the same. In reality, if the cap is quite lax (such as under the Regional Greenhouse Gas Initiative or other existing permit markets) then the cost paid by firms for a unit of emissions will be low relative to the damages caused by the unit of pollution and society will not have succeeded in fully internalizing the externality.

I understand that Minnesota has recently enacted a law requiring the Commission to use as its externality values the Environmental Protection Agency's draft Social Cost of Greenhouse Gas Estimates, with the two percent discount rate as the central estimate. The central estimate for carbon dioxide (CO_2) for 2020 is $190/metric ton.[2] Meanwhile, the PUC's projected range of regulatory costs for carbon emissions is far lower, currently at $5 to $25 per short ton effective in 2025. Such a low projected regulatory cost falls far short of internalizing the full externality cost of carbon emission. The balance of the externality cost would remain an externality. The full cost of the externality, more accurately represented by the Social Cost of Carbon, should therefore continue to be recognized in resource planning.

[2] Environmental Protection Agency, *Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances,* Sept. 2022, External Review Draft.