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In the Matter of a Commission Investigation into a Fuel Life-Cycle Analysis Framework for Utility Compliance with Minnesota's Carbon-Free Standard

Docket No. E-999/CI-24-352

INITIAL COMMENTS OF THE CLEAN ENERGY ORGANIZATIONS

June 5, 2025

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INTRODUCTION

Minnesota Center for Environmental Advocacy ("MCEA") and the Sierra Club (collectively, "Clean Energy Organizations" or "CEOs") appreciate the opportunity to submit these initial comments regarding the Commission's investigation into a fuel life-cycle analysis framework for utility compliance with the state's Carbon-Free Standard ("CFS") and the specific issues raised in the Commission's Notice of Comment Period for this docket.[1]

SUMMARY OF ARGUMENT

The CEOs' Initial Comment focuses on three key issues: (1) The legal reasons solid waste and/or biomass facilities cannot qualify as fully or partially carbon-free; (2) The policy reasons solid waste and/or biomass facilities should not qualify as fully or partially carbon-free; and (3) The methodology for calculating partial compliance for hydrogen co-firing and carbon capture and storage ("CCS").

1. Legal reasons solid waste and biomass do not qualify as carbon-free

In sections I-II, the CEOs discuss the legal reasons solid waste-burning and biomass-burning facilities cannot qualify as carbon-free.

The carbon-free definition. Biomass and solid waste cannot be considered carbon-free sources of generation under the plain language of the law. The CFS statute necessarily excludes such facilities from the definition of "carbon-free" because they do not generate electricity "without emitting carbon dioxide." The legislative history shows

[1] Minn. Pub. Utils. Comm'n, *In the Matter of a Commission Investigation into a Fuel Life-Cycle Analysis Framework for Utility Compliance with Minnesota's Carbon-Free Standard,* Notice of Comment Period, Docket No. E-999/CI-24-352 (Jan. 22, 2025).

that excluding these fuels from CFS compliance was fully intended by the legislature. Unlike under the Natural Gas Innovation Act, the CFS law does not establish a relative or comparative standard (one that considers emissions compared to another activity) or authorize the use of life-cycle analysis (Section I).

The partial compliance provision. Nor can facilities that burn biomass or solid waste be considered partially carbon-free under the statute, because they do not "utilize carbon-free technologies for electricity generation" (Section II). No life-cycle analysis of these fuels – which undeniably emit much higher levels of carbon dioxide (CO_2) per megawatt-hour (MWh) than gas plants or even coal plants – can render them either fully or partially carbon-free under the language of CFS statute.

2. Policy reasons solid waste and biomass should not qualify as carbon-free

In Sections III-VI, the CEOs discuss a variety of *policy* reasons Solid Waste and Biomass generating facilities should not be given carbon-free credit.

Creating a new incentive for waste burning. Even if the law allowed generation fueled by biomass or solid waste to be considered carbon-free based on a life-cycle analysis, the Commission should decline to exercise that authority as contrary to the public interest. Lack of carbon-free status will not drive existing power generators burning biomass and solid waste generators from the energy market, given the law's inherent flexibility and the option of those generators selling to regional markets. However, a grant of carbon-free status could drive the expansion of such generation, due to the new revenue derived from the ability to sell carbon-free credits. This would yield an inappropriate subsidy of

waste incineration by ratepayers, as well as cause increased power sector emissions, contrary to the CFS law's intent (Section III).

Administrative burden, unreliable results, and regulatory uncertainty. The sort of life-cycle analyses contemplated in the Notice of Comment Period would demand undue administrative effort, yield a highly speculative and fundamentally unreliable result, and create years of ongoing regulatory uncertainty (Section IV).

Determining the facility-specific impact of carbon-free status. The threshold step needed before conducting a life-cycle analysis would have to be determining whether granting carbon-free status would actually make any difference to emissions at all, compared to a counterfactual where that status is denied. This would require facility-specific and fuel-specific data, along with multi-layered assumptions related to the facility's future economic prospects, future climate and solid waste policy changes, and the rate of technological progress. If facilities continue operating as before, there would be no emissions change for the life-cycle analysis to estimate. Only if the financial benefit of being granted carbon-free status expanded or perpetuated generation based on biomass or solid waste would there be an emissions change to estimate (Section IV.A).

Highly speculative predictions and the need to verify and update. The kinds of assumptions and predictions necessary to compare facility emissions with counterfactual waste management emissions would be particularly speculative given how efforts needed to meet our climate and waste goals will necessarily transform existing waste management practices. (Section IV.B). And, since the Commission's decision to grant carbon-free status to waste-burning facilities would itself impact the counterfactual

scenario, the analysis would have to try to reflect that impact as well (Section IV.C). The Commission would also need to compare known and immediate emissions against uncertain emissions avoided over a period of years. Adjusting for the difference in timing and certainty would be extremely hard to do in a methodologically sound way, yet failure to adjust would inject a fundamental bias into the analysis. (Section III.D.) The critical assumptions on which a request for carbon-free status rests would need to be subject to some sort of verification, and given the number of predictions involved, any life-cycle analysis would have to be periodically updated, creating ongoing regulatory uncertainty. (Sections IV.E and F). And if the analysis is based on treating biogenic carbon emissions differently from fossil carbon, it would not only be administratively burdensome and highly speculative, but it would rely on the unfounded assumption that electric utilities will have the right to claim the benefit of carbon absorbed in the future by forests (Section IV.G).

Interfering with progress on climate, waste and air quality. Incentivizing more solid waste and biomass generation by classifying it as carbon-free would also undermine efforts to achieve the state's statutory climate and waste-management goals. Many lower-carbon alternatives exist to burning waste and biomass, but a Commission determination that burning these fuels counts as fully or partially carbon-free would inhibit the investments and programs needed to develop those alternatives (Section V). Incentivizing solid waste- and biomass-burning would also perpetuate or even increase emissions of health-harming air pollutants, especially in environmental justice areas (Section VI).

3. Calculating partial compliance for hydrogen co-firing and CCS

Finally, in Section VII, the CEOs discuss how partial credit should be determined for the two technologies that qualify for partial credit: hydrogen co-firing and CCS. In both cases, the Commission should consider significant changes in indirect emissions associated with the technologies in question, as well as changes in carbon emissions at the point of generation.

ARGUMENT

I. Life-cycle analysis cannot render the burning of solid waste or biomass "carbon-free" under the statutory definition

The Commission's Notice of Comment Period in this docket seeks comment on what action, if any, the Commission should take regarding "whether biomass, renewable natural gas, and solid waste should be eligible as fully or partially carbon-free generation resources based on a fuel life-cycle analysis."[2] The CEOs urge the Commission to find that these fuels are *not eligible,* as either fully or partially carbon-free resources, because generating technologies using these fuels emit CO_2. Indeed, plants burning biomass and solid waste emit even more CO_2 than coal plants per megawatt-hour (MWh) and far more than gas plants.[3] Thus, they cannot be considered "carbon-free" under the plain language of the statute, and the law does not allow the Commission to disregard the carbon emissions from these fuels on the basis of any sort of life-cycle analysis.

[2] While the comments below focus on biomass and solid waste facilities, we believe that many of the arguments would also apply to facilities that burn renewable natural gas (RNG). We may address this issue more deeply in response to comments regarding RNG by other parties.
[3] *See* Section V.A. below.

A. Carbon-free status under the CFS is not based on a comparative standard using life-cycle analysis, in contrast to innovation plans under the NGIA

The CFS statute defines "carbon-free" simply as "a technology that generates electricity without emitting carbon dioxide."[4] It is notable what this short definition does *not* say. It does not refer to net carbon emissions or net climate impact. It does not use the term carbon neutrality. It does not distinguish between technologies that burn waste and those that burn other feedstocks. It does not refer to avoided emissions or negative emissions. It does not refer to a life-cycle analysis.

The Commission has asked for comment on the issue of "calculating partial compliance by generators burning waste materials based on a fuel cumulative life-cycle basis considering greenhouse gas benefits *relative to alternative waste management methods*." We refer to this approach as a "comparative waste management analysis" and stress that the statutory definition of carbon-free does not allow such an analysis. It is not a relative or comparative definition. That is, whether or not a generating technology is carbon-free does not depend on how the technology's emissions compare to any other emitting technology, facility, or practice. For example, natural gas generation is treated the same as coal generation. Even if a gas plant can show it emits half as much CO_2 per MWh as a coal plant whose generation it is displacing, the gas plant's generation cannot be considered carbon-free. The gas plant still emits CO_2, and so all its generation falls outside the definition of carbon-free.

[4] Minn. Stat. § 216B.1691, subd. 1(b).

Similarly, even if a waste-burning generator can show it would emit fewer GHGs than if the same waste were landfilled, the waste-burning generator cannot be considered carbon-free. The waste-burning facility still emits CO_2, and so all its generation falls outside the definition of carbon-free, just like the gas plant's. The CFS law's strict and straightforward "without emitting carbon dioxide" standard cannot be rewritten into a far more lenient, complicated, and relative standard based on claims of emissions avoided elsewhere. This is true whether the generating facility claims to be avoiding emissions from more carbon-intensive generation or avoiding emissions from more carbon-intensive methods of waste disposal. Indeed, given that the CFS statute's goals (and the Commission's authority) do not encompass waste management, it would be even more inappropriate to replace the law's carbon-free definition with a comparative definition based on the relative emissions of alternative forms of waste management.

It is instructive to compare the CFS law with the Natural Gas Innovation Act ("NGIA"), which was enacted two years before the CFS law.[5] Unlike the CFS law, the NGIA explicitly establishes a comparative standard. It requires the Commission to find, before approving a utility's innovation plan, that the plan would have a "lower lifecycle greenhouse gas intensity" compared to "natural gas produced from conventional geologic sources."[6] It makes sense that the legislature would treat the gas sector differently than the electric sector, since the gas sector is just beginning to identify technologies that could help it decarbonize, and even incremental reductions may be

[5] Minn. Laws 2021, ch. 4, art. 8, §§ 20, 21, and 27.
[6] Minn. Stat. § 216B.2427, subd. 2(b)(5).

worth exploring through pilot projects. In addition, the life-cycle analysis mandated by the NGIA is only used to screen for innovative projects that appear sound enough to merit further study through a pilot project.

The electric sector, on the other hand, is already progressing toward deep decarbonization, and the goal of the CFS law is not to encourage technologies that deliver merely incremental carbon reductions. The CFS law is far more ambitious, requiring generating technologies that generate electricity without emitting any CO_2 at all. And the life-cycle analyses under consideration in this docket would not be used to merely identify projects worthy of further study through a pilot, but to actually determine a utility's ongoing compliance with an explicit statutory obligation – a goal which requires a higher standard of certainty.

The CFS law is also notably lacking in any language authorizing the Commission to conduct a life-cycle analysis, in striking contrast to the NGIA, which uses the term "lifecycle" twenty times throughout Minn. Stat. sections 216B.2427 and 216B.2428. As noted, the Commission can only approve a plan if its "lifecycle greenhouse gas intensity" is lower than that of natural gas.[7] The NGIA requires the Commission to issue "a general framework to compare the lifecycle greenhouse gas emissions intensities" of a list of technologies that could substitute for natural gas.[8] Utility plans must identify the "total lifecycle greenhouse gas emissions" that the plan would reduce or avoid, and explain the methodology used to calculate the "lifecycle greenhouse gas emissions reduced or

[7] Minn. Stat. § 216B.2427, subd. 2(b)(4).
[8] Minn. Stat. § 216B.2428, item (1).

avoided."[9] And utilities must annually report the "lifecycle greenhouse gas emissions reductions or avoidance achieved," while assessing each year the degree to which "the lifecycle greenhouse gas accounting methodology is consistent with current science."[10]

Clearly, the legislature knows how to establish a comparative standard and require use of a life-cycle-based analysis of GHGs, having recently done so under the NGIA. Yet, the legislature chose not to include such requirements in the language of the CFS law. And the legislature knows how to authorize the Commission to undertake the complex regulatory effort involved in assessing a comparative, life-cycle based standard, including by requiring it to establish a framework for such comparisons, yet it chose not to do so for the CFS law. It strains credulity to imagine – after the legislature so carefully and explicitly established comparative, life-cycle-based standards and requirements under the NGIA – that it intended the Commission to similarly apply a comparative, life-cycle-based standard under the CFS without once mentioning it in the statute itself, or discussing it in the over 20 hours of recorded legislative debate about the CFS. Indeed, the legislature not only failed to authorize the Commission to define "carbon-free" based on a comparative life-cycle analysis of emissions, it enacted a definition of "carbon-free" that leaves no statutory room for such an analysis.

While the carbon-free definition does not involve any comparison of a power plant's emissions with any other facility's or activity's emissions, there is one provision elsewhere in the CFS statute where the Commission is authorized to conduct a

[9] Minn. Stat. § 216B.2427, subd. 2(a), items (3) and (8).
[10] Minn. Stat. § 216B.2427, subd. 2(f), items (2) and (4).

comparative analysis. The law details when the Commission must modify or delay the CFS and other standards at Minn. Stat. § 216B.0691, subd. 2b (the so-called off-ramp provisions). Among the factors the Commission must consider when a utility seeks to delay or modify a standard obligation is the "additional electric load from beneficial electrification and the greenhouse gas emissions savings associated with those loads *as compared to* serving the load with nonelectric energy sources."[11] The law goes on to define beneficial electrification as "the substitution of electricity for a fossil fuel," under certain specified conditions.

The beneficial electrification provision is the only part of the CFS law that authorizes the Commission to consider how the GHG changes in the electric sector might affect GHG emissions in other sectors and to weigh those relative changes. Under this provision, for example, the Commission might allow a utility extra time to comply with its carbon-free obligation if it could demonstrate that delaying the emissions reduction in the electric sector would achieve even greater emission reductions in the transportation sector (by enabling more electric vehicles) or in the buildings sector (by enabling more heat pumps). Notably absent from the CFS law is a similar provision authorizing the Commission to consider how reducing GHG emissions in the electric sector might affect GHG emissions in the waste-management sector, or authorizing the Commission, in the words of the Notice of Comment Period, to consider "greenhouse gas benefits [of burning waste] relative to alternative waste management methods."

[11] Minn. Stat. § 216B.1691, subd. 2b(a)10 (emphasis added).

B. Legislators intended that generation from solid waste and biomass plants was not carbon-free under the law

Solid waste and biomass plants were both discussed during the passage of the CFS law, and the legislative history shows that the exclusion of such plants from the definition of carbon-free was intentional.[12] Witnesses at the House Climate and Energy Finance and Policy Committee hearing argued that the law as written would lead to less solid waste incineration and more landfilling, which would increase landfill methane emissions.[13] One witness suggested the law should be "revised to prevent public utility policy from interfering with solid waste management policy."[14] However, the bill's chief House author, Majority Leader Jamie Long, was not persuaded. He rejected as "factually inaccurate" the witnesses' argument that the bill would necessarily increase landfilling. He noted that both landfilling and incineration were at the bottom of Minnesota's waste management hierarchy, and that more favored methods like recycling, composting and waste diversion were cleaner alternatives to more methane-producing landfilling.[15] Thus, the bill was not amended in response to the witnesses' concerns.

Notably, at no time during this discussion of the witnesses' complaint that the bill discouraged incineration in favor of landfilling was there any suggestion that this concern could be resolved by finding solid waste incinerators to be carbon-free, or

[12] The wording of the "carbon-free" definition necessarily excludes the electricity generated by plants burning solid waste, biomass, and other carbon-emitting fuels. The Commission therefore does not need to consult the law's extensive legislative history on this point, and yet doing so confirms that excluding solid waste and biomass was intentional.
[13] Comments by Jeff Lundy, Hennepin Co. Commissioner, and Chris McConn, Minnesota Resource Recovery Association, House Climate and Energy Finance and Policy Committee, Jan. 18, 2023, at minutes 1:08:15 - 1:10:26 and 1:12:45 – 1:15:01, *available at* https://www.house.mn.gov/hjvid/93/896125.
[14] *Id.*, comments by Chris McConn, at 1:13:05.
[15] *Id.*, comments by Rep. Jamie Long, at 1:46:55 – 1:47:16.

partially so, using life-cycle analysis. If there was any legislative intention or expectation that solid waste incineration could be treated as carbon-free on any grounds, this would surely have been when it was mentioned. However, neither the pro-incineration witnesses nor the legislators themselves suggested the possibility that solid waste incinerators could be deemed fully or partially carbon-free under the language of the CFS law. It was therefore surprising when pro-incineration parties in the CFS docket argued for the first time that the law does indeed allow the Commission to find solid waste incineration to be carbon-free based on avoided landfill emissions.

In addition, Representative Marion O'Neill opposed the bill during the House floor debate, echoing the concern that the CFS law would suppress solid waste incineration and increase landfill GHG emissions. Once again, this concern did not lead to an amendment of the bill or prevent it from progressing toward enactment. Representative O'Neill even claimed that the CFS bill would cause all the solid waste-burning plants in Minnesota to close, noting that "if they burn, they're emitting carbon, so, and they produce energy, so they're underneath this mandate."[16] The CEOs disagree that the CFS is likely to have such impact on existing solid waste-incinerators. However, this is further evidence that legislators clearly understood that solid waste-fueled generation would not count as carbon-free generation under the CFS.

The legislative history similarly shows that generation fueled by waste biomass was not intended or expected to count toward compliance with the CFS, even when an

[16]Comments by Rep. Marion O'Neill, House Floor Session, Jan. 26, 2023, at minutes 5:49:40 – 5:53:40, *available at* https://www.house.mn.gov/hjvid/93/896169.

alternative method of disposing of the waste biomass would also emit CO_2. On the Senate floor, Senator Robert Farnsworth from Hibbing described how a Hibbing municipal generator burns wood chips from a pallet factory, and if not burned, those wood chips "would just be put in a field, and they would be left to rot. And as the foresters that I met with yesterday explained, that would emit CO_2."[17] However, Senator Farnsworth knew the bill as written meant the Hibbing plant would not be considered carbon-free, so he supported an amendment to let municipalities opt out of the CFS. When that amendment failed, he voted against the bill. Neither he nor any legislator suggested that the Commission could in the future deem the Hibbing plant fully or partially carbon-free using a life-cycle analysis that granted it credit for avoiding the emissions caused by leaving the wood chips in a field to rot.

In short, the legislative history shows that legislators intended and understood that under the CFS law, generation fueled by solid waste and waste biomass could not count toward CFS compliance. They heard the objections that other methods of managing the same waste would also have GHG emissions, but those objections did not lead them to amend the law or decline to pass it. And there was never any suggestion that the law allowed these carbon-emitting generators to be deemed carbon-free based on a life-cycle analysis that would let generators claim credit for avoiding GHG emissions elsewhere.

[17]Comments by Sen. Robert Farnsworth, Senate Floor Session, Part 2, Feb. 02, 2023, at minutes 1:02:28 – 1:03:11, *available at* https://mnsenate.granicus.com/player/clip/10105?view_id=1&redirect=true&h=d4d3df43d64903eb6913c3f78d9e5ea3.

C. The CFS does not treat biogenic CO_2 any differently than fossil CO_2

The Commission asks what action, if any, the Commission should take regarding "[d]efinitions of the sources of and requirements for a fuel to qualify as sustainable and waste biomass."[18] The Commission should not take *any* action to define sustainable and waste biomass because those terms are irrelevant under the CFS law. Generation based on biomass is not carbon-free under the law, regardless of whether it is sustainable biomass or waste biomass. It is treated like any other form of carbon-emitting generation.

The statutory carbon-free definition – "technology that generates electricity without emitting carbon dioxide" -- does not distinguish between CO_2 from biogenic sources and CO_2 from fossil sources. It would therefore be an error of law for the Commission to distinguish between biogenic and fossil CO_2 emissions. The only issue is whether the generating technology emits CO_2 or not.

The dictionary defines "emit" as "to throw or give off or out; to send out."[19] Minnesota Statutes § 116.06, which governs air pollution, defines "emission" as "a release or discharge into the outdoor atmosphere of any air contaminant or combination thereof."[20] The statutory definition of carbon-free is not cyclical when it comes to CO_2. It focuses solely on CO_2 discharged by a generating technology. It does not ask or authorize the Commission to consider when that CO_2 was first absorbed from the atmosphere, how long it had been sequestered in the fuel, or how long before forest growth might reabsorb

[18] Notice of Comment Period, p. 1.
[19] Merriam-Webster Dictionary, online, *available at:* https://www.merriam-webster.com/dictionary/emit.
[20] Minn. Stat. § 116.06, subd. 9.

the same amount of carbon. CO_2 being absorbed is the opposite of CO_2 being emitted, and the law defines carbon-free solely in terms of whether it is emitted.

The legislative history shows that lawmakers knew and intended that generation from waste biomass would be excluded from the definition of carbon-free, as discussed above. There is nothing in the legislative history to suggest lawmakers intended generation from *any* kind of biomass – waste or otherwise -- to be considered carbon-free.

In sum, generation fueled by burning biomass or solid waste cannot be considered "carbon-free" under the CFS law. Carbon-free is not defined in relative or comparative terms, so there is no need for a life-cycle analysis nor any statutory authority to conduct one. The legislative history shows that solid waste and biomass were intentionally excluded from carbon-free status, and the law treats biogenic carbon no differently than fossil carbon.

II. The partial compliance provision only applies to facilities that partially utilize technologies that "generate electricity without emitting carbon dioxide," not to solid waste and biomass facilities

The Commission also cannot use life-cycle analysis to calculate *partial* compliance by generators burning solid waste or biomass because the partial compliance provision simply does not apply to these types of generators. The partial compliance provision requires the Commission to "allow for partial compliance with subdivision 2g from: (i) electricity generated from facilities that utilize carbon-free technologies for electricity generation, but only for the percentage that is carbon-free."[21] The use of the term "carbon-

[21] Minn. Stat. § 216B.1691, subd. 2d(b)(2)(i).

free" in this sentence relates back to the definition of that term at subdivision 1(b) of the statute. Thus, the partial compliance provision can only apply to facilities that utilize "a technology that generates electricity without emitting carbon dioxide."

Of course, if a generating facility used a carbon-free technology for all of its generation, then its output would be entirely carbon-free, not just partially. The partial compliance provision would then have no meaning, yet under Minn. Stat. § 645.16, every state law "shall be construed, if possible, to give effect to all its provisions." The use of the term "partial compliance" then, and the phrase "but only for the percentage that is carbon-free," indicate that the Commission should only apply this provision to facilities that *partially* utilize a technology that generates electricity without emitting CO_2 so that a percentage of its output, but not all, can reasonably be deemed carbon-free.

Section 645.16 also states that "[t]he object of all interpretation and construction of laws is to ascertain and effectuate the intention of the legislature." The Commission can ascertain the intention of the legislature by the necessity for the law, the object to be obtained, and the contemporaneous legislative history, among other things.[22] Fortunately, the legislative history clarifies that the partial compliance provision was specifically intended to apply to facilities that co-fire with green hydrogen or partially employ CCS. The chief House author, Majority Leader Jamie Long, amended his original bill to include the partial compliance provision, and described that provision by stating, "we for example have a provision in here … that allows for partial credit, so that for

[22] Minn. Stat. § 645.16.

example if you were having green hydrogen at a particular facility that you were burning, under the old bill you would have had to have 100% replacement for that. Under the new bill you can credit the carbon-free power, which is incentivizing carbon-free electricity."[23]

Similarly, the chief Senate author, Senator Nick Frentz, discussed the importance of the partial compliance provision with respect to CCS. In a Senate committee hearing, he stated, "carbon capture is addressed significantly in the bill, especially in the partial credit. And I agree with you 100% that we're trying to reduce carbon going into the air. That's what we're doing here because global warming is a threat to our planet. And I'm glad to be an author of a bill in which carbon capture is counted, to the extent it captures the carbon, toward the 100% goal. . . . If we say our goal is to reduce carbon and there are technologies that exist now and that maybe we're going to invent and improve on in the future, we better be asking ourselves, if we're not interested in those, why is it we say that reduction in carbon is our focus?"[24]

Co-firing with green hydrogen and CCS are two emerging technologies that can reduce carbon emissions by some percentage when partially employed at a power plant, and these were the only two specific technologies the bill authors discussed with regard to the partial compliance provision. If these technologies are someday successfully applied to all of a facility's generation, they could indeed "generate electricity without

[23] Comments by chief House author Rep. Jamie Long, House Climate and Energy Finance and Policy Committee, Jan. 18, 2023, at minutes 1:43:51 – 1:44:15, *available at* https://www.house.mn.gov/hjvid/93/896125.

[24] Comments by chief Senate author Sen. Nick Frentz, Senate Energy, Utilities, Environment and Climate Committee, Jan. 25, 2023, at minutes 3:26:47 - 3:27:35, *available at* https://mnsenate.granicus.com/player/clip/9925?view_id=5&redirect=true&h=adda2f7454d75a9cc88a29e0cc91d836.

emitting carbon dioxide," moving the power grid closer to the goal of carbon-free electricity. However, these technologies are expected to be only partially employed at power plants for the next several years. Legislators intended this partial compliance provision to incentivize these emerging, potentially carbon-free technologies in the meantime. A plant co-firing green hydrogen can reasonably be viewed as a technological hybrid, combining technology fueled by natural gas (not carbon-free) with technology fueled by green hydrogen (carbon-free). Similarly, a plant using partial carbon capture can be viewed as combining a share of generation that lacks capture (not carbon-free) with a share of generation that employs capture technology (carbon-free).

By contrast, this is not true of facilities that burn solid waste, biomass, or other fuels that emit CO_2. These facilities are not partially utilizing any technology that can be said to generate electricity without emitting CO_2 (unless they *also* co-fire green hydrogen or employ partial CCS). Facilities burning solid waste or biomass are not emerging technologies that could potentially lead to power plants that "generate electricity without emitting carbon dioxide." On the contrary, since they emit more CO_2 than fossil fuels per MWh, increasing their use would only increase power sector carbon emissions. It is clear then that the partial compliance provision simply does not apply to these facilities under the plain reading of the law. Moreover, there is nothing in the legislative history to suggest that the legislature intended the partial compliance provision—or any other provision of the CFS law—to incentivize the burning of biomass, solid waste, or other

carbon-emitting fuels. Indeed, the chief House author actually stressed the importance of moving *beyond* solid waste incineration.[25]

Thus, it would be a clear error of law to apply the partial compliance provision to facilities that burn solid waste or any form of biomass. Such an interpretation would violate the statutory language and legislative intent. The partial compliance provision is a narrow *exception* to the rule at the heart of the CFS— that only technologies that "generate electricity without emitting carbon dioxide" are considered carbon-free.

III. Existing solid waste and biomass facilities can continue to operate as usual without carbon-free status, but granting them carbon-free status would result in a subsidy for waste management services paid for by ratepayers and potentially increase power sector carbon emissions

As discussed above, using a life-cycle analysis to determine the carbon-free status of solid waste and biomass plants was not the intent of, and is not permitted by, the CFS law. However, the CEOs also recommend the Commission not utilize a life-cycle analysis because it is not in the public interest for reasons discussed in this section as well as Sections IV - VI. We begin by stressing that denying carbon-free status to solid waste and biomass facilities will not force those facilities to stop operating. However, granting carbon-free status to such facilities could cause an increase in generation from them by providing a new financial subsidy. Ratepayers would end up subsidizing waste management services, while emissions of CO_2 and health-harming air pollutants from the power sector would increase.

[25] Comments by Rep. Jamie Long, House Climate and Energy Finance and Policy Committee, Jan. 18, 2023, at 1:46:55 – 1:47:16, *available at* https://www.house.mn.gov/hjvid/93/896125.

A. Existing solid waste and biomass facilities do not need carbon-free status to continue operating under the CFS

There appears to be a belief among some stakeholders that the lack of carbon-free status under the CFS will block existing solid waste- or biomass-burning facilities from operating in the future. For example, a recent report commissioned by the Partnership on Waste and Energy states that the ability of the St. Paul District Energy facility and another biomass-burning generator "to continue supporting wood waste management largely depends on the legislative outcome of the Carbon-free Standard for electricity."[26] This assertion misunderstands the impact of the CFS on such generators.

According to the Department of Commerce, biomass and solid waste generating facilities currently represent only about 2 percent of Minnesota's electricity generation.[27] There is plenty of room under the CFS for this 2 percent of generation to continue, even if it is not granted carbon-free status, especially before 2040. Even after 2040, when utilities must finally meet the 100 percent carbon-free obligation, utilities will still be allowed to generate or procure some amount of carbon-emitting generation. This is because the required percentage of carbon-free energy utilities must generate or procure is pegged to 100 percent of *sales,* not 100 percent of total generation/procurement.[28] The amount a utility must generate/procure in total is always more than the amount it sells

[26] Cambium, *Expanding Capacity for Woody Biomass Processing in the Twin Cities Metro Area, Feb. 2025., p. 5, available at* https://recyclingandenergy.org/wp-content/uploads/2025/03/Expanding-Capacity-for-Woody-Biomass-Processing_Cambium-Final-Report.pdf.
[27] Minn. Dept. of Commerce, Energy Policy and Conservation Quadrennial Report (2024), p. 104, Figure 5-1. This figure shows that 2 percent of generation comes from biomass, which the CEOs understand to include municipal solid waste given its inclusion under the category of biomass at Minn. Stat. § 216B.1691, subd. 1(c)(5).
[28] Minn. Stat. § 216B.1691, subd. 2g.

to account for the energy lost when electricity is transmitted (line losses). The difference between a utility's sales and a utility's total generation / procurement is the "line losses differential."

If the Commission interprets the CFS as it has interpreted the Renewable Energy Standard (which is similarly pegged to retail sales and not total generation),[29] then the difference between a utility's generation/procurement and its sales can still be met with carbon-emitting generation. And the size of the line losses differential can be considerable. For example, Xcel has estimated its line losses to be nearly 10 percent of generation.[30] The line losses differential is therefore plenty large enough to allow the 2 percent of existing biomass and solid waste generation to continue to be generated and sold to Minnesota utilities, even after 2040.[31]

Moreover, if Minnesota utilities no longer wanted to buy or rely on the output of facilities fueled by solid waste or biomass, the electricity generated by those facilities could still sell their power to buyers other than Minnesota utilities. We have seen this already at the Hennepin Energy Recovery Center ("HERC"). When the 2023 CFS legislation made HERC no longer eligible for RECs, the facility did not close down, and

[29] The issue of whether the required amount of carbon-free generation applies only to the level of a utility's retail sales or to a higher level that would cover line losses as well has been raised in Phase III of the CFS docket. Minn. Dept. of Commerce, *In the Matter of an Investigation into Implementing Changes to the Renewable Energy Standard and the Newly Created Carbon-Free Standard under Minn. Stat. § 216B.1691,* Reply Comments, Docket No. E-999/CI-23-151, p. 11 (Mar. 19, 2025). However, even if the Commission were to read the law in a way that requires carbon-free generation sufficient to cover line losses as well as retail sales, generators of carbon-emitting power could still sell that power to MISO or other regional markets.

[30] Xcel response to CEOs' Information Request 55, *In the Matter of Xcel Energy's 2024-2040 Upper Midwest Integrated Resource Plan*, Docket No. E002/RP-24-67 (April 29, 2024).

[31] In addition, even if a Minnesota utility's other carbon-emitting generation exceeded its line losses after 2040, it could still buy power from biomass and solid waste generating facilities and compensate through the purchase of renewable energy credits ("RECs").

the solid waste it burns was not diverted to landfills. Rather, Hennepin County starting selling HERC's generation directly into the wholesale electricity market via a power marketing firm, instead of selling it to a Minnesota utility.[32] A similar result would be expected for existing solid waste and biomass generators if a utility no longer wanted them in their portfolio.

Thus, given the line losses differential and the existence of regional markets, the CFS would not squeeze generators burning solid waste or biomass out of the electricity market if they lack carbon-free status. To be clear, the CEOs believe Minnesota *should* be rapidly shifting away from these generating technologies for health, climate, and other reasons. However, that shift will be (and is being) driven by laws and policies other than the CFS, such as by state recycling goals and the state's overall GHG reduction targets.[33] The CFS law does not force the closure of these plants.

B. Granting carbon-free status to solid waste and biomass facilities would create an inappropriate new subsidy for these facilities, paid for by ratepayers

While denying carbon-free status will not close existing solid waste and biomass facilities, *granting* carbon-free status to generation from such facilities would create a new economic subsidy for these technologies, incentivizing their ongoing or expanded use. It would do so by allowing these facilities to generate carbon-free credits that they could then sell to Minnesota utilities along with their power.[34] This would create a new revenue

[32] Contract between Hennepin County and Alliance for Cooperative Energy Services Power Marketing LLC, Contract No. PR00006149, commencing July 1, 2024.
[33] *See* Section V.
[34] It is unclear whether carbon-free status will be reflected in standalone marketable credits or bundled into "Energy Attribute Certificates" ("EACs"), which is a term used by our state Department of Commerce and

stream for these waste facilities, potentially extending their lives or even prompting the construction of new or expanded facilities.

The potential for carbon-free status causing the expansion of biomass facilities is particularly plausible. Indeed, Minnesota Power has indicated in its latest IRP that it is exploring the possibility of a new biomass facility, and its exploration will be based in part on the outcome of this proceeding.[35] And as we discuss below, ill-conceived climate policy has led to an expansion of biomass burning in Europe with severe environmental impacts, including to forests in the U.S.

Moreover, providing this new economic support to waste-burning facilities would mean some of the costs of handling wastes fall on electricity ratepayers, because ratepayers would ultimately pay for the carbon-free credits bought and retired by Minnesota utilities. This outcome was certainly never intended by the legislature, nor is there any obvious reason why any waste management costs should be paid for through electric rates.

A good example of how some waste-management costs have in the past been covered by electricity ratepayers can be seen in the history of the St. Paul District Energy cogeneration facility. As the Commission knows from its recent docket approving the extension of Xcel Energy's Power Purchase Agreement with District Energy, the facility

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others in the CFS docket. EACs would apparently document all the market-relevant attributes of the energy, including its renewable status and carbon-free status, and EACs that document carbon-free status would surely have a higher market value than other EACs. But whether carbon-free status is reflected in stand-alone credits, in EACs, or in some other type of tradeable certificate, carbon-free status represents an additional revenue stream for those facilities that can claim it.

[35] Minnesota Power, 2025-2039 Integrated Resource Plan, *In the Matter of Minnesota Power's Application for Approval of its 2025-2039 Integrated Resource Plan*, Docket No. E-015/RP-25-127, p. 8 (Mar. 3, 2025).

disposes of trees infested with the Emerald Ash Borer. However, Xcel has been subsidizing the facility's tree disposal service by paying above-market rates for District Energy's electrical output.[36]

The legislature has since 2021 sought to reduce this subsidy, statutorily requiring District Energy to obtain other funding that would enable the facility to continue to provide tree disposal services beyond the period of its agreement with Xcel.[37] In its order, the Commission noted that one way the facility can obtain other funding is through charging tipping fees on those delivering wood waste to the facility.[38] The MPCA has reportedly begun hosting stakeholder meetings discussing tipping fees, with the aim to make District Energy "economically sustainable."[39] The Commission has ordered a report from Xcel discussing what portion of future tipping fees can be returned to Xcel and refunded to Xcel's ratepayers.[40]

Thus, both the legislature and the Commission have taken steps toward reducing the power sector's subsidy of waste-management services. However, if the Commission were to grant carbon-free status to waste-burning facilities, it would be moving in the opposite direction, creating a new subsidy of waste-management services that would ultimately be paid for by Minnesota ratepayers.

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[36] Minn. Dept. of Commerce, *In the Matter of Xcel Energy's Petition for approval of a Power Purchase Agreement between Northern States power and St. Paul Cogeneration, LLC,* Comments , Docket No. E-002/M-21-590, p. 11 (Sep. 7, 2021).
[37] Minn. Stat. § 216B.2424, subd. 5c(d).
[38] Minn. Pub. Utils. Comm'n, *In the Matter of Xcel Energy's Petition for approval of a Power Purchase Agreement between Northern States power and St. Paul Cogeneration, LLC,* Order Approving Electrification Proposal and Extension of Power Purchase Agreement, Docket No. E-002/M-21-590, p. 4 (Nov. 4, 2024).
[39] *Id.*
[40] *Id.*

C. Incentivizing the use of generators that burn solid waste or waste biomass by deeming them carbon-free will increase power-sector emissions counter to the goal of the CFS, and will prioritize cutting waste-management emissions over cutting power-sector emissions

If waste-burning facilities are incentivized by receiving carbon-free status, and this leads to more such generation, carbon emissions from the power sector will increase. This is because solid waste and waste biomass facilities both emit far more CO_2 per MWh than gas or even coal plants.[41] There is no reason to believe the legislature intended to incentivize additional waste-burning. On the contrary, the CFS law actually eliminated a pre-existing incentive to burn solid waste at the HERC facility by excluding it from the definition of eligible energy technology, meaning its generation would no longer qualify under Minnesota's Renewable Energy Standard.[42] And, of course, interpreting the law in a way that encourages more waste burning undermines the CFS law's primary goal of reducing carbon emissions from the power sector.

The Commission should not interpret the CFS in a way that increases power sector emissions, even if it could arguably reduce or avoid emissions from the waste sector. The Commission's responsibility under the CFS primarily relates to reducing carbon emissions from the power sector. The local benefits subdivision specifies certain related issues the Commission should also consider, like maximizing labor benefits, air quality benefits, and affordability, and it encourages the location of carbon-free resources in communities where fossil fuel plants are retiring.[43] Conspicuously absent from the CFS

[41] *See* Section V.A.
[42] Minn. Stat. § 216B.1691, subd. 1a.
[43] Minn. Stat. § 216B.1691, subd. 2b(a).

law is any provision requiring or encouraging the Commission to consider the impact of the CFS on waste-management facilities or waste-management practices.

When implementing the CFS, the Commission should prioritize reducing carbon emissions from the power sector over seeking any potential reductions in waste-management emissions. Waste management-related emissions are governed by other state and federal laws,[44] and the Commission should not take on responsibility for them. This is especially true given that the lack of carbon-free status would not prevent existing facilities from operating, but a grant of carbon-free status would create a new subsidy of waste-burning paid for by ratepayers that could increase waste-burning and power sector emissions.

IV. Conducting a life-cycle analysis of facilities that burn solid waste or biomass would create new administrative burdens, cause regulatory uncertainty, and only produce speculative results

In addition to the reasons stated above, the Commission should further decline to utilize a life-cycle analysis because it would involve resource-intensive and contentious proceedings, thereby adding a significant administrative burden to determining CFS compliance. These proceedings would require the Commission to determine the actual impact of a grant of carbon-free status on emissions, to evaluate a series of predictions and judgments about the best model and the most appropriate inputs and assumptions

[44] For example, methane emissions from landfills are regulated under the Clean Air Act, sections 111(b) and 111(d) (https://www.epa.gov/stationary-sources-air-pollution/municipal-solid-waste-landfills-new-source-performance-standards#rule-summary); and air toxics from landfills are regulated under the Clean Air Act, section 112 (https://www.epa.gov/stationary-sources-air-pollution/municipal-solid-waste-landfills-national-emission-standards). Landfills are also regulated at the state level under Minn. R. 7011.3505 and the state incorporates the federal standards by reference under Minn. R. 7011.3505-3530.

to use in a life-cycle analysis, and to resolve debates among parties on these questions. Many of these questions will involve matters outside the Commission's regular expertise—for example, choosing the most accurate "counterfactual" scenario to use in the model regarding what would happen to municipal waste or wood waste if carbon-free status is not granted, and what the emissions of an alternate pathway would be. In addition, any life-cycle analysis would need frequent updating to reflect changing economics, technology, and policies, causing ongoing regulatory uncertainty since the percentage of a facility's output considered carbon-free could dramatically change or entirely disappear with changing conditions. The Commission should decline to go down a path that takes it so deeply and unnecessarily into this realm of speculation and uncertainty. Below, the CEOs discuss just some of the difficult steps such life-cycle analyses would require and that make their use impracticable and contrary to the public interest.

A. The actual waste-management impact of granting carbon-free status to a particular facility would need to be determined prior to estimating the emissions impact of granting carbon-free status

The threshold step prior to any life-cycle analysis considering the "greenhouse gas benefits relative to alternative waste management methods"[45] would have to be determining whether granting carbon-free status under the CFS would actually matter in the choice of waste management method. The proposed rationale for granting carbon-free status to waste-burning facilities has been that without it, the waste would be

[45] Notice of Comment Period, p. 2.

managed in another way, such as landfilling, which has higher GHG emissions than the waste-burning facility. The grant of carbon-free status would be based on giving the facility credit for the emissions avoided elsewhere due to the use of this waste-burning facility. But if the grant of carbon-free status would not in fact change how the waste is handled, there would be no avoided emissions elsewhere. There would therefore be nothing for the life-cycle analysis to estimate, and no basis for granting the facility carbon-free status.

The issue before the Commission would not be whether the waste in question could be burned and used to generate electricity. As discussed above, a lack of carbon-free status would not by itself prevent any utility or any party from burning waste to generate electricity. The issue before the Commission would be whether or not to grant the facility carbon-free status under the CFS. Any lifecycle analysis would therefore need to focus on the emissions impact of that decision, comparing the carbon emissions if the requested carbon-free status is granted to emissions under a counterfactual scenario where carbon-free status is not granted. It could well be that the waste in question would be burned under either scenario, in which case emissions are not reduced by the facility—they simply stay the same, and there is no waste management-related emissions change to give credit for.[46]

[46] There would, however, be an emissions change from the power sector perspective, since to the extent waste-burning facilities are relied on to meet the CFS, utilities will be investing less in wind, solar, batteries, and other technologies that have zero carbon emissions.

Importantly, no generic assumptions built into any life-cycle analysis model could substitute for this facility-specific threshold determination. The Commission would need to determine a particular facility's ongoing economic and political viability both with and without a grant of carbon-free status. This determination would require looking at predicted operating costs; predicted energy prices in the market; the waste stream in question; potential alternative revenue streams for the facility (like tipping fees); the potential range of alternatives for managing the waste; and the impact of current and future solid waste, air quality, and climate policies on both the waste-burning facility and the counterfactual scenarios.

If the waste in question would still be burned regardless of carbon-free status under the CFS, then there would be no "greenhouse gas benefit relative to alternative waste management methods," no reason for a life-cycle analysis, and no justification for granting the facility carbon-free status despite its carbon emissions. Currently, a substantial quantity of solid waste and waste wood is already burned for generation. For example, the Minnesota Pollution Control Agency ("MPCA") reports that about a million tons of Minnesota's municipal solid waste was incinerated in 2023.[47] The American Forest and Paper Association reported that in 2020 about 64 percent of member facility energy needs were met by biomass manufacturing residuals.[48] About a quarter million tons of

[47] Minnesota Pollution Control Agency, "2023 SCORE Report, Overview," online data available here: https://data.pca.state.mn.us/views/SCOREreport2023/Overview?%3Aembed=y&%3AisGuestRedirectFromVizportal=y.

[48] American Forest & Paper Association, "AF&PA Sustainability Goals: Achievements Summary, 2020, available here: https://www.afandpa.org/sites/default/files/2022-02/BPBP2020SustainabilityGoalsAchievementsSumary-2-2-22.pdf.

woody biomass from the Twin Cities area is burned at St. Paul's District Energy cogeneration facility.[49] The current incentives driving this waste-burning generation have nothing to do with the CFS law, and this generation does not need to be granted carbon-free status under the CFS to continue.

Only if more waste would be burned as a result of carbon-free status being granted would the emissions benefits of that grant relative to alternative waste management methods have to be estimated. As discussed, a grant of carbon-free status would allow generators burning solid-waste and biomass to sell carbon-free credits, providing a new stream of revenue not currently available. The economic impact of this new financial support for waste-burning would be hard to predict, even after a robust market for carbon-free credits develops. The value of such credits will depend on many factors, including other state or federal climate policies and the overall pace and cost of decarbonization technologies. Predicting this subsidy's economic impact would nonetheless be a necessary threshold step prior to any life-cycle analysis of the emissions impact of granting carbon-free status to waste-management facilities.

In short, before trying to estimate the emissions impact of a decision to grant carbon-free status to a waste-burning facility, the Commission would need to determine the actual waste management impact of such a decision. This determination would

[49] Cambium, *Expanding Capacity for Woody Biomass Processing in the Twin Cities Metro Area,* Feb. 2025., p. 13-14, *available at* https://recyclingandenergy.org/wp-content/uploads/2025/03/Expanding-Capacity-for-Woody-Biomass-Processing_Cambium-Final-Report.pdf.

require facility-specific data rather than generic assumptions about waste-management technologies.

B. Addressing the climate crisis and meeting solid waste goals will require transforming current waste management methods, making life-cycle assumptions related to waste management particularly speculative

Whether or not a waste-burning facility would have lower GHG emissions than a counterfactual scenario of alternative waste management methods depends on what alternative waste management methods are available for that waste stream in that location. This involves questions of economics (what alternatives are viable), technology (what alternatives are available), and policy (what alternatives are prioritized by state policy) that, even in ordinary times, would be very hard to predict. These, however, are no ordinary times. The drive to decarbonize is already transforming how we generate electricity; it will need to transform how we manage waste as well. This makes the assumptions that would be used in any life-cycle analysis of counterfactual waste management methods particularly speculative.

The global climate crisis is accelerating, with 2024 being the first full calendar year to exceed the 1.5° C global warming limit that the world agreed to pursue under the Paris Agreement.[50] This acceleration demonstrates the need for far more aggressive action to reduce GHGs across all economic sectors. As climate policies at the federal level have

[50] Kirsty McCabe, "World Exceeds 1.5° Threshold for Entire Year for the First Time," MetMatters, Royal Meteorological Society (Jan. 10, 2025), *available at:* https://www.rmets.org/metmatters/world-exceeds-15degc-threshold-entire-year-first-time#:~:text=2024%20was%20the%20hottest%20year,this%20such%20a%20big%20deal%3F.

been largely reversed under the new administration, the focus has turned to states to advance climate policy.

Achieving Minnesota's statutory goal of cutting its GHGs in half by 2030, and especially its goal of reaching net-zero by 2050,[51] will require changing our waste management methods, including eliminating or drastically reducing GHG emissions from landfilling, open-burning of wood waste, and other climate-harming waste management methods. Any life-cycle analysis of alternative waste management methods based on *current* alternatives would be inherently and severely biased. To avoid this bias, the analysis would have to estimate how the transformation of waste-management practices will unfold over time under the state's broader push to reach net zero, as well as under its ongoing efforts to meet solid waste goals. This would be extremely difficult for the Commission to do with any reasonable level of reliability.

C. The Commission's decision to grant carbon-free status to waste-burning facilities would itself impact alternative waste management practices, and the life-cycle analysis would have to estimate that impact

A Commission decision to grant a waste-burning facility carbon-free status would also undermine efforts currently underway to transform waste management practices (discussed more in Section V). Any life-cycle analysis would need to estimate how a grant of carbon-free status, and the financial incentive that comes with it, might impact alternative waste-management policies, practices, investments, technologies, and emissions. For example, if carbon-free status is granted to a solid waste burning facility,

[51] Minn. Stat. 216H.02, subd. 1.

would it reduce a county's incentive to invest in programs to expand recycling or composting rates or to improve methane recovery at its landfills? If carbon-free status is granted to generation fueled by waste woody biomass, would it reduce a county's incentive to invest in emerging technologies, like biochar or wood vaults, that could dispose of wood waste with far lower carbon emissions than combustion? Would it reduce the incentive to ban open-burning of wood waste or to develop new markets to utilize wood waste in new products? To what extent would grants of carbon-free status entrench waste-burning generation in ways that undermine innovation or new regulation?

Any life-cycle analysis would need to try to answer questions such as these. Of course, doing so would add another layer of difficulty and uncertainty to the assessment. However, failure to estimate how the Commission's decision could alter future waste-management practices and emissions would result in an inherently flawed assessment that ignores an important aspect of the situation.

D. Finding a valid way to compare known and immediate emissions against uncertain emissions avoided over a period of years would be extremely difficult

A life-cycle analysis for a waste-burning facility would also require comparing a relatively known quantity of emissions against a far more speculative one. The relatively known quantity would be the CO_2 emissions from the waste-burning facility, which would occur immediately upon combustion. The far more speculative quantity would be the emissions presumed to be avoided over a period of years by burning the waste rather than managing it using other means.

Many of the alternatives to burning waste would emit GHGs on a more delayed timeline. For example, if logging residues were left to decay in the forest, they would release their carbon over a period of many years.[52] If solid waste was landfilled, methane emissions from the landfill could occur over a period of decades.[53] When it comes to mitigating the effects of the climate crisis, time is of the essence. Emitting a certain amount of CO_2 today cannot be said to be harmless just because an equivalent amount of GHGs will be avoided years in the future. On the contrary, it is better to delay emissions than to front-load them, given the existence of tipping points in the climate system that once reached will further accelerate global warming.

Moreover, the emissions predicted to be avoided in the future will always be far more speculative than those emitted from the generating facility. Whether those emissions would be truly avoided – that is, whether they would actually have taken place but for the grant of carbon-free status -- would depend on the waste's alternative fate. That alternative fate would depend on waste management alternatives available now and in the future, on changing laws and policies, on varying and unpredictable consumer demand, and on the resources and technologies related to landfills, composting, recycling, and waste reduction, among other things. Predicting all of these developments becomes far harder as the climate crisis advances and Minnesota looks for new ways to reduce emissions in response.

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[52] Mary S. Booth, "Not carbon neutral: Assessing the net emissions impact of residues burned for bioenergy," *Environmental Research Letters* (Feb. 21, 2018), *available at:* https://iopscience.iop.org/article/10.1088/1748-9326/aaac88.
[53] Initial comments by MPCA, p. 4 (June 28, 2024).

Future emissions presumed to be avoided based on these layered speculations certainly could not be given the same weight as the immediate emissions we know will occur from waste-burning generators. Some sort of adjustment would need to be made to reflect the delayed and speculative nature of the avoided emissions. However any such adjustment would itself be highly subjective, adding yet another layer of uncertainty to the analysis. The need for such an adjustment is another reason the Commission should decline to utilize the life-cycle analysis approach to determining carbon-free status.

E. The assumptions on which a request for carbon-free status would be based would need to be subject to some verification mechanism

The life-cycle analysis of generation fueled by burning waste would require inputting the type and source of the waste used by the facility. However, there would need to be some mechanism to verify these inputs. This would be particularly important for facilities that burn waste biomass from various sources that change over time. The variability in the feedstock could alter the rate of carbon emissions per unit of energy as well as the rate of health-harming emissions affecting the local community.

Moreover, there would need to be some mechanism for ensuring that woody biomass claimed to be from waste wood was in fact waste and not made from trees harvested for the purpose of generating electricity. The inability to distinguish between waste biomass and harvested biomass has been a serious problem elsewhere. For example, the Drax power plant in the U.K. was converted from coal to wood, and it is now largely supplied from pellet mills located in the U.S. and Canada. While Drax claims it is only burning waste wood, recent reporting revealed extensive photographic evidence

of whole trees in North Carolina and Virginia entering the pellet mills that serve Drax, and of forests in British Columbia "shorn clean of their spruce, birch, and pine trees" by a Drax subsidiary logging to fuel the plant.[54] Media investigations, including one by the *New York Times*, have similarly found evidence that European companies claiming to sell logging residuals were in fact harvesting ancient trees clear cut from protected forests to grind into wood pellets.[55]

Of course, the Commission is not set up to verify information like the source of a waste feedstock and whether it is truly waste or was logged exclusively to be used for generating electricity. Unlike the MPCA or the IRS, it does not have inspectors or auditors that can verify the source and nature of the feedstock, nor is this the type of technical oversight the Department of Commerce provides. The difficulty the Commission would have in verifying the information supporting a carbon-free status request regarding a facility burning solid waste or biomass is yet another reason the Commission should decline to consider carbon-free status requests from such facilities.

F. Every few years the Commission would have to update any life-cycle analysis on which carbon-free status is based, causing ongoing regulatory uncertainty

A life-cycle assessment comparing emissions of a waste-burning facility to a counterfactual scenario of alternative waste management methods involves predicting

[54] Sarah Miller, "The Millions of Tons of Carbon Emissions That Don't Officially Exist: How a Blind Spot in the Kyoto Protocol Helped Create the Biomass Industry," *New Yorker,* Dec. 8, 2021, *available at:* https://www.newyorker.com/news/annals-of-a-warming-planet/the-millions-of-tons-of-carbon-emissions-that-dont-officially-exist.
[55] Sarah Hurtes and Weiyi Cai, "Europe is Sacrificing Its Ancient Forests for Energy," *New York Times* (Sep. 7, 2022), available at https://www.nytimes.com/interactive/2022/09/07/world/europe/eu-logging-wood-pellets.html.

multiple moving targets. Many of those predictions will necessarily prove inaccurate. In a few years, the waste stream could have changed, containing a greater or lesser amount of organics or plastics as a result of recycling, compost, and diversion policies, changes in packaging, or changes in consumer practices. New technologies may have emerged affecting alternative waste management practices, like technologies reducing landfill methane or converting wood waste to biochar, or these technologies may simply have gotten cheaper. Practices currently allowed, like the open burning of waste wood, could be banned. These changes could quickly render the original life-cycle analysis obsolete. As a result, the analysis would need to be updated every few years, duplicating the administrative effort of the original analysis.

Assuming that society progresses toward reducing the climate impact of all forms of waste management – which it must to achieve our statutory climate and solid waste goals – the counterfactual scenario's emissions will have gone down, meaning the CO_2 emissions of the waste-burning facility will have gone up by comparison and the share of its generation that could be considered carbon-free would be reduced. Updating the analysis to reflect this change could alter the economics of the facility by reducing its ability to generate and sell carbon-free credits, and possibly even cause its closure. Even the prospect of such a change in carbon-free status would disrupt county waste management planning, since programs and facilities to replace waste-burning take years of effort to fund and establish. On the other hand, failure to update the analysis on a regular basis would risk incentivizing waste-burning generation with high carbon

emissions even when the original justification for treating them as carbon-free status has disappeared.

In sum, carbon-free status based on the relative emissions of alternative waste management practices estimated during a time of policy, technology and economic change means that status would be necessarily temporary. The need to keep the status relatively current introduces ongoing regulatory uncertainty for utilities, the waste-burning facilities, and waste management planners. By contrast, deciding now that the law does not allow carbon-free status to be granted to carbon-emitting waste-burning facilities will provide greater certainty and encourage waste-management practices and CFS compliance plans that are based on more solid ground.

G. Life-cycle analyses that ignore or discount biogenic carbon emissions would be burdensome and speculative, and would require assumptions about who will be allowed to claim credit for future forest regrowth

The Commission's Notice of Comment Period asks for comment regarding "requirements for a fuel to qualify as sustainable and waste biomass," and regarding the recommendations of the Partnership on Waste and Energy from the CFS docket. These items suggest that the Commission is considering whether to conduct life-cycle analyses on grounds other than a comparative waste-management analysis. Considering whether the fuel is "sustainable" suggests that carbon emissions from woody biomass facilities could be disregarded based on their biogenic nature and whether the forests from which the woody biomass came are, by some criteria, sustainable. We refer to this type of analysis—which does not compare waste management methods but which focuses on the biogenic nature of the feedstock—as a "carbon neutrality" analysis. As we explained in

Section I, this type of analysis would also violate the language and intent of the law, and as we explain in Section V, woody biomass is by no means carbon-neutral on a climate-relevant timescale. Here we explain why, even if the law allowed such analyses, the Commission should decline to conduct them on public interest grounds.

Life-cycle analysis using a carbon-neutrality approach would, like those using a comparative waste-management approach, be administratively burdensome and depend on highly speculative assumptions. The Commission would also need to estimate the extent to which a grant of carbon-free status and the financial revenue from being able to sell carbon-free credits could increase biomass burning and associated carbon emissions.

Such an analysis would also take the Commission into the realm of predicting future forest carbon absorption rates. And it would have to factor in the possibility that in the future, the forests in question will convert from carbon sinks to carbon sources as climate change causes more severe droughts, insect infestations and fires. Research shows that on a global level the carbon sink that has long been provided by the world's forests fell dramatically in 2023, absorbing almost no CO_2 on a net basis.[56]

The analysis would also need to predict whether emerging policy-driven technologies might actually sequester the carbon in the wood in question rather than releasing it through burning, and whether the grant of carbon-free status inhibits the

[56] Piyu Ke, *et al.*, "Low latency carbon budget analysis reveals a large decline of the land carbon sink in 2023," *National Science Review,* Oct. 22, 2024, *available at* https://academic.oup.com/nsr/article/11/12/nwae367/7831648; *see also* World Energy Data, "Trees and land absorbed almost no CO_2 last year. Is nature's carbon sink failing?" Oct. 19, 2024, *available at* https://www.worldenergydata.org/trees-and-land-absorbed-almost-no-co%e2%82%82-last-year-is-natures-carbon-sink-failing/.

development of such alternatives. And the analysis would have to somehow balance today's emissions against tomorrow's predicted reabsorption, which would at best take place over many decades, and include a cut-off deadline after which reabsorption is too late to count.

Finally, such an analysis would be based on the unfounded assumption that today's electric utilities get to claim offsetting credit for the growth of tomorrow's forests. In fact, we have no idea who will be allowed to take credit for that growth. It is a politically fraught question that will have to be resolved someday by the legislature, or perhaps by federal law or even international treaty.

The Commission should decline to consider any life-cycle analyses that would consider a fuel's "sustainability" or give credit for future carbon absorption due to the highly speculative nature of any such analyses along with the inappropriateness of assuming today's electric utilities should get credit for the carbon absorbed by tomorrow's forests.

For the reasons listed in items A through G above, it would not be in the public interest to deem solid waste- or biomass-burning facilities fully or partially carbon-free based on a life-cycle analysis. This is the case whether that analysis is based on comparing their emissions to those of waste management alternatives or on treating biogenic carbon differently than fossil carbon.

V. Granting carbon-free status to solid waste- or biomass-burning facilities undermines efforts to achieve state climate and waste-management goals

A. Incentivizing more burning of solid waste and biomass undermines efforts to achieve Minnesota's climate goals

Generating electricity by burning either biomass or solid waste means emitting far more CO_2 per unit of electricity than burning gas or even coal. Natural gas plants emit about 1,000 lbs CO_2e/MWh, and coal plants emit about 2,000 lbs CO_2e/MWh. However, an analysis of 21 biomass-burning facilities in California found that on average they emitted 3,928 lbs CO_2e/MWh, or roughly twice the rate of coal plants and four times the rate of gas plants.[57] Even the most efficient of the studied plants emitted 2,498 lbs CO_2e/MWh, while the least efficient emitted 11,564 lbs CO_2e/MWh, a rate nearly six times higher than coal plants and nearly twelve times higher than gas plants.

Solid waste plants also emit far more CO_2/MWh than gas or coal plants. A recent study of the nation's municipal solid waste incinerators found that they emitted CO_2 at a rate 1.7 times the rate of coal plants.[58] In addition, much of the CO_2 emitted from solid waste-burning plants derives not from biomass in the waste stream but from plastics and synthetics, which contain carbon derived from fossil fuels. Indeed, the EPA reports that more than half of the CO_2 emitted by solid waste incineration in 2021 is attributable to

[57] Center for Biological Diversity, "Biomass Energy is Polluting: A False Climate Solution that Worsens the Climate Crisis," (June 2020 update), *available at*: https://www.biologicaldiversity.org/programs/climate_law_institute/pdfs/Biomass-Energy-Is-Polluting-2.pdf.
[58] Neil Tangri, "Waste incinerators undermine clean energy goals," *PLOS Climate* 2(6) (2023), *available at* https://journals.plos.org/climate/article?id=10.1371/journal.pclm.0000100.

plastics.[59] If landfilled, those plastics would not contribute significantly to methane emissions because plastics do not biodegrade in measurable quantities under anaerobic conditions.[60] However, when burned those plastics release their carbon immediately.

In order for Minnesota to meet its statutory goals to cut GHG emissions in half by 2030 and reach net zero by 2050,[61] *all* GHG-emitting activities will have to be scrutinized for ways to reduce emissions. This includes both waste burning and waste landfilling. Thus, the emissions from waste-burning must be reduced to meet our climate goals.

However, if waste-burning facilities are subsidized through the sale of carbon-free credits, it could lengthen the lives of existing facilities or lead to new or expanded facilities. A grant of carbon-free status to waste-burning facilities would thus help entrench or even expand waste-burning generation. And by wrongly suggesting that burning waste poses no harm to the climate, a grant of carbon-free status to waste-burning could reduce the societal and regulatory pressure to invest in waste management practices that truly pose no harm, or much less harm, to the climate.

With regard to biomass, considerable research has been done comparing the climate impact of burning wood for electricity versus burning fossil fuels. One major study of Massachusetts forests found that it would take 45-75 years of forest re-growth to make burning trees for electricity no worse for the climate than a coal plant, and it

[59] U.S. Environmental Protection Agency, "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022," p. 7-3, *available at*: https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2022.
[60] U.S. Environmental Protection Agency, "Landfill Carbon Storage in EPA's Waste Reduction Model," web page, *available at:* https://www.epa.gov/sites/default/files/2016-03/documents/landfill-carbon-storage-in-warm10-28-10.pdf.
[61] Minn. Stat. § 216H.02, subd. 1.

would take 90 years of forest re-growth to make the same facility no worse for the climate than a natural gas plant (and both of these figures require the assumption that the forest re-growth is ultimately credited to the waste-burning facility).[62] Another analysis found that even when making assumptions that favor biomass, burning wood for electricity rather than coal would still *worsen* global warming "over the critical period through 2100."[63] A third analysis found that "replacing fossil fuels with wood will likely result in 2-3x more carbon in the atmosphere in 2050 per gigajoule of final energy."[64]

And even if the woody biomass being burned can be reliably identified as waste wood, that does not mean burning it is harmless. As we discuss below, there are other ways to manage waste wood that could prevent or delay the emission of the carbon it contains.

B. Incentivizing more burning of solid waste and biomass undermines efforts to achieve Minnesota's waste management goals

Changes in waste management methods will be driven in the years ahead both by ambitious climate goals and ambitious waste management goals. Indeed, the management of solid waste is already being driven in lower-carbon directions by waste-management policies, which include efforts to move away from burning waste altogether.

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[62] Thomas Walker, et al., "Carbon Accounting for Woody Biomass from Massachusetts (USA) Managed Forests: A Framework for Determining the Temporal Impacts of Wood Biomass Energy on Atmospheric Greenhouse Gas Levels," *Journal of Sustainable Forestry,* 32:1-2, 130, at 150 (Table 7) (2013), *available at* https://www.tandfonline.com/doi/abs/10.1080/10549811.2011.652019.

[63] John D. Sterman, et al., "Does replacing coal with wood lower CO_2 emissions?" *Environ. Res. Lett.* 13 (2018) 015007, at 8, *available at* https://iopscience.iop.org/article/10.1088/1748-9326/aaa512/pdf.

[64] Timothy D. Searchinger, et al., "Europe's Renewable Energy Directive Poised to Harm Global Forests," *Nature Communications,* 9, 3741, at 2 (2018), *available at:* https://www.nature.com/articles/s41467-018-06175-4.

The state is seeking to reduce both landfilling and incineration and to move toward the statutorily preferred methods of waste reduction and reuse, waste recycling, and composting.[65] For example, state law establishes the goal that metro counties will recycle or compost 75 percent of total solid waste by the end of 2030, and non-metro counties will recycle or compost 35 percent of total solid waste by that date.[66] On October 29, 2024, Hennepin County's Board of Commissioners formally adopted its most recent solid waste plan, the foundation of which is a "Zero Waste Plan" developed "to meet the county's goal of diverting 90% or more of waste from landfills or incinerators," and giving highest priority to actions that accelerate the closure and repurposing of the HERC.[67]

The state has a long way to go to meet its waste-management goals. It will need significantly more successful programs related to recycling, composting, and waste diversion to achieve them. It will also need to better regulate and manage its landfills, such as by employing daily cover and other methods that can reduce the creation of methane and improving methane collection.[68] It will likely require new laws, new investments, and technological innovation to achieve these goals.

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[65] Minn. Stat. § 115A.02(b).
[66] Minn. Stat. § 115A.551, subd. 2a.
[67] Hennepin County 2024-2029 Solid Waste Management Plan, p. 4, and Hennepin County Zero Waste Plan, *both available at* https://www.hennepin.us/en/your-government/projects-initiatives/solid-waste-planning.
[68] Ebun Ayandele, et al., "Top Strategies to Cut Dangerous Methane Emissions from Landfills," RMI website (Sep. 7, 2022), *available at* https://rmi.org/top-strategies-to-cut-dangerous-methane-emissions-from-landfills/.

However, granting carbon-free status to waste-burning facilities would interfere with efforts to transform solid waste management practices by incentivizing and subsidizing ongoing and expanded waste-burning. It would also create the false impression that burning waste does not harm the climate when in fact it does. Burning waste is only arguably less harmful for the climate when compared to worse options that are currently allowed but which cannot be continued if we are to achieve our climate and waste management goals.

As with solid waste, there are emerging options for managing waste wood that release fewer GHGs than burning it in biomass plants. For example, Minneapolis is investing in a process to convert wood from diseased or damaged trees into "biochar," a charcoal-like substance that when added to soils both enriches the soil and sequesters carbon.[69] Waste wood can also be buried in special enclosures known as "wood vaults" designed to semi-permanently sequester the carbon.[70] Composting waste woody biomass can sequester carbon in soils.[71]

Granting waste-burning facilities carbon-free status under the CFS would undermine all of these waste management policies and programs by incentivizing waste-burning and wrongly suggesting it does not harm the climate. This would stand in

[69] Susan Du, "Minneapolis is on the leading edge of biochar, a carbon sequestering material full of promise and still under research," *Star Tribune* (July 14, 2024), *available at:* https://www.startribune.com/minneapolis-is-on-the-leading-edge-of-biochar-a-carbon-sequestering-material-full-of-promise-and-still-under-research/600380658.
[70] Ning Zeng and Henry Hausman, "Wood Vault: remove atmospheric CO2 with trees, store wood for carbon sequestration for now and as biomass, bioenergy and carbon reserve for the future," *Carbon Balance and Management,* 17(1) (2022), *available at:* https://repository.library.noaa.gov/view/noaa/58644.
[71] Martha Walden, "Composting Mill Waste Wins Blue Ribbon for the Climate," *Northcoast Environmental Center* (Dec. 7, 2020), *available at*: https://www.yournec.org/composting-mill-waste-wins-blue-ribbon-for-the-climate/.

contrast to the legislative history of the CFS, which shows support for moving away from waste-incineration (including removing HERC from the eligible energy definition) and promoting recycling, composting and waste diversion.[72] The risk of interfering with progress in waste management, along with the risk of interfering with progress in reaching our climate goals, are yet additional reasons why granting carbon-free status to solid waste and biomass facilities is not in the public interest.

VI. Granting carbon-free status to waste-burning facilities would perpetuate or increase harm to human health, especially in environmental justice areas

The Commission is required to "take all reasonable actions within the Commission's statutory authority to ensure this section [216B.1691] is implemented in a manner that maximizes net benefits to all Minnesota citizens."[73] One of the benefits the Commission must try to maximize is "ensuring that statewide air emissions are reduced, particularly in environmental justice areas."[74] Interpreting the CFS law in a way that would increase the incentive to burn solid waste and biomass fails to ensure statewide air emissions are reduced. On the contrary, it perpetuates those emissions and could increase them. Both solid waste plants and biomass plants emit pollutants with potentially severe health impacts, and those impacts have fallen disproportionately on environmental justice communities.

For example, HERC, the most well-studied of the state's solid waste incinerators, has historically been Hennepin County's largest emitter of nitrogen oxides, and its second

[72] Comments by Rep. Jamie Long, House Climate and Energy Finance and Policy Committee, Jan. 18, 2023, at 1:46:55 – 1:47:16, *available at* https://www.house.mn.gov/hjvid/93/896125.
[73] Minn. Stat. § 216B.1691, subd. 9(a).
[74] Minn. Stat. § 216B.1691, subd. 9(a)(5).

largest emitter of sulfur dioxide and particulate matter ($PM_{2.5}$)[75] -- pollutants known to contribute to cardiovascular and respiratory disease and premature death. HERC has been estimated to contribute to 1 to 2.2 premature deaths and $11-24 million in health impacts annually.[76] HERC also emits dioxins, which are carcinogenic, and HERC is the county's third largest emitter of lead, which can cause developmental problems in children, among other harms.[77] These emissions add to the already high pollution-related health damages experienced in the environmental justice community where HERC is located. [78] Solid waste incinerators in general are major emitters of all these pollutants, as well as other highly toxic air pollutants of growing concern.[79]

Biomass-burning plants also emit dangerous air pollutants and can have an even greater impact on human health than coal plants. A 2022 analysis modeled the health impacts of the Hibbard biomass plant in Duluth, and it indicated that Hibbard likely contributed to 6.4 premature deaths and $70 million in total health impacts in the year 2021 alone.[80] These estimated health impacts are comparable to the Boswell coal plant's

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[75] PSE Healthy Energy, "Hennepin Energy Recovery Center: Fact Sheet" (Nov. 2022), *available at:* https://www.sierraclub.org/sites/default/files/2023-08/PSE%20HERC%20Fact%20Sheet.pdf.
[76] *Id.*
[77] *Id.*
[78] An analysis by the state Department of Health and the MPCA has found that "the highest estimate rates of air pollution-related death and disease are found in neighborhoods with the largest percentage of Black, Indigenous and People of Color (BIPOC), low-income and uninsured residents, and people who live with a disability." MDH and MPCA, "Life and Breath: Twin Cities Metro Area," (Sep. 2023), *available at* https://data.web.health.state.mn.us/web/mndata/life_and_breath.
[79] Neil Tangri, "Waste incinerators undermine clean energy goals," *PLOS Climate* 2(6) (2023), *available at* https://journals.plos.org/climate/article?id=10.1371/journal.pclm.0000100; Cui Li, et al., "Identification of emerging organic pollutants from solid waste incinerations by FT-ICR-MS and GC/Q-TOF-MS and their potential toxicities," *J. Haz. Mat. Vol. 48, 128220* (2022), *available at* https://www.sciencedirect.com/science/article/abs/pii/S0304389422000085.
[80] PSE Healthy Energy, "Incorporating Health and Equity Metrics into the Minnesota Power 2021 Integrated Resource Plan," (April 2022) p. 28, *available at:* https://fresh-energy.org/

estimated health impacts, even though Boswell generates more than 200 times more electricity.[81] This could be because biomass facilities nationwide have been subject to relatively lax environmental regulation and therefore are allowed to use less effective pollution controls. A 2014 analysis of 88 air permits for biomass power plants showed they were allowed to emit far higher levels of certain health-harming pollutants per MWh than coal plants, including nitrogen oxides, volatile organic compounds, particulate matter, and carbon monoxide.[82]

Moreover, these health harms are currently falling disproportionately upon environmental justice communities. Minnesota has seven operating municipal solid waste-burning facilities, six of which are located in or near an environmental justice community.[83] And the analysis of Hibbard mentioned above found that its large health impacts fall disproportionately on Native people. The explicit mandate to the Commission to interpret the CFS statute in a way that maximizes the reduction in air pollution emissions, especially in environmental justice areas, further counsels against granting solid waste and biomass facilities carbon-free status, whether through a life-cycle analysis or otherwise.

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publication/incorporating-health-and-equity-metrics-into-the-minnesota-power-2021-integrated-resource-plan.

[81] *Id.*, p. 17, 19.

[82] Mary S. Booth, *Trees, Trash, and Toxics: How Biomass Energy Has Become the New Coal,* Partnership for Policy Integrity (April 2, 2014), at 5, 18, *available at* https://www.pfpi.net/wp-content/uploads/2014/04/PFPI-Biomass-is-the-New-Coal-April-2-2014.pdf.

[83] Tishman Environment and Design Center, *The Cost of Burning Trash: Human and Ecological Impacts of Incineration in Minnesota* (2020), *available at* https://static1.squarespace.com/static/5d14dab43967cc000179f3d2/t/5fc653c09ee0f32b872bd1c4/1606833089063/Minnesota.pdf.

As explained in Sections III through VI, even if the law allowed solid waste and biomass facilities to be granted carbon-free status, such grants would not be in the public interest for several reasons. They would inappropriately subsidize waste management services through electric rates, and give undue priority to reducing waste sector GHGs over the CFS's goal of reducing electric sector emissions. Any life-cycle analyses conducted to support such grants would require burdensome administrative proceedings, cause ongoing regulatory uncertainty, and produce only highly speculative results. And such grants would undermine ongoing and future efforts to achieve climate goals, waste-management goals, and air quality goals.

VII. The percentage of generation considered carbon-free from facilities using hydrogen co-firing or CCS should reflect the overall percentage reduction in CO_2 emissions per MWh

Next, the Commission's Notice of Comment Period asks for comment regarding how to calculate partial compliance for fossil fuel generation with hydrogen co-firing and for fossil fuel generation with CCS. The CEOs agree that the partial compliance provision should be read to include these two technologies because facilities employing them can be said to partially "utilize carbon-free technologies for electricity generation"[84] as required by the provision. In addition, both technologies were mentioned by the CFS bill's authors as technologies to which the provision is intended to apply. [85]

[84] Minn. Stat. § 216B.1691, subd. 2d(b)(2)(i).
[85] *See* Section II.

A. Assessing the overall reduction in carbon emissions associated with hydrogen co-firing or CCS requires considering changes in both direct and indirect emissions

The caveat that the Commission may grant such facilities carbon-free compliance credit "only for the percentage that is carbon-free" requires the Commission to calculate what percentage of the facility's generation may reasonably attributed to "a technology that generates electricity without emitting carbon dioxide," as carbon-free is defined by the law. The most reasonable way to make that calculation is to determine the percentage by which overall CO_2 emissions are reduced by these technologies compared to the same plants without these technologies. This requires looking at both the reduction in CO_2 emissions at the power plant ("direct emissions") and the associated increases in CO_2 emissions occurring upstream and downstream of the power plant ("indirect emissions"), at least where those indirect emission increases are significant and reasonably attributable to the use of the CCS or hydrogen co-firing. Including indirect emissions changes as well as direct ones will prevent an overestimation the percentage of a facility's generation that can legitimately be considered carbon-free.

The legislative history also indicates the intent that the Commission should consider upstream and downstream carbon emissions associated with these technologies. In the House committee hearing, the chief House author of the CFS bill twice referred to compliance based on the use of *green* hydrogen at a gas plant.[86] "Green hydrogen" is the commonly-used term for hydrogen that is produced through electrolysis using carbon-

[86] *See* comments by chief author and House Majority Leader Jamie Long (discussing green hydrogen), Climate and Energy Finance and Policy Committee, Jan. 18, 2023, at minutes 1:22:51 – 1:22:59 and at 1:43:51 – 1:44:15, *available at* https://www.house.mn.gov/hjvid/93/896125.

free energy. The only way to differentiate green hydrogen from hydrogen produced in other, far more carbon-intensive ways is by looking upstream at the emissions associated with the production of the hydrogen. In addition, during the House floor debate, an amendment was introduced to make promotion of CCS a state policy. The chief House author objected that "the amendment does not distinguish between carbon that is permanently sequestered and carbon that is used for enhanced oil recovery, which would actually increase carbon emissions,"[87] and the amendment failed. Given the bill author's recognition that CCS could actually increase carbon emissions when EOR is used, it follows that the author did not intend the Commission to ignore downstream emissions.

We note that considering the significant indirect emissions associated with hydrogen and CCS does not require anything like the speculative assumptions and administrative burden associated with conducting a life-cycle analysis of biomass- or solid waste-burning using either a comparative waste-management analysis or a carbon neutrality analysis. It does not require making long-term assumptions about the impact of carbon-free status on the facility, climate policies, alternative waste management practices and technologies, or forest growth rates. It simply requires isolating and estimating the significant indirect CO_2 emissions reasonably attributable to these carbon-reducing technologies. These estimates would surely have to be done anyway, as part of obtaining the investment and subsidies that utilizing the technologies would require.

[87] Comments by Majority Leader Jamie Long, House Floor Session, Jan. 26, 2023, at minutes 2:40:29 -2:40:39, *available at*: https://www.house.mn.gov/hjvid/93/896169.

B. Partial compliance credit for hydrogen co-firing

Focusing on the actual overall emission reductions obtained from co-firing with hydrogen, including indirect emission changes, is important because some forms of hydrogen production would yield CO_2 emissions per MWh that are much higher than continuing to burn natural gas alone.

1. Carbon reduction at the point of generation

Hydrogen has a lower energy density than natural gas. As a result, the percentage by volume of hydrogen co-fired at a natural gas plant yields a considerably lower percentage reduction in CO_2 emissions, especially at the lower co-firing levels. For example, according to the EPA, a natural gas plant cofiring with 30 percent hydrogen by volume will reduce that plant's CO_2 emissions by only 12 percent.[88] Such a plant should be granted partial compliance credit only for the percentage reduction in CO_2/MWh at the plant since only that percentage can be deemed carbon-free, and that figure should be further adjusted if there are significant indirect CO_2 emissions related to the upstream hydrogen production.

2. Carbon emissions upstream of the point of generation

Co-firing with hydrogen at a natural gas plant could greatly increase overall CO_2 emissions, depending on how the hydrogen is made. Fortunately, the Commission will likely be able to rely on the federally-required determination of the carbon emissions

[88] U.S. Environmental Protection Agency, *New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units, etc.*, Proposed Rule, 88 Fed. Reg. 33240, 33308 (May 23, 2023). EPA also specifies that natural gas plants cofiring with 10% hydrogen would cut CO_2 by only 3%, and cofiring with 75% hydrogen would cut CO_2 by 49%.

associated with hydrogen production, rather than needing to require and assess a new calculation of indirect emissions.

Carbon emissions from hydrogen production vary greatly. If hydrogen is derived from the steam reformation of natural gas, co-firing with it would result in somewhat higher overall CO_2 emissions than just burning that natural gas directly in the power plant.[89] If the hydrogen is made through electrolysis, it could either be carbon-free or it could have emissions so high its use would greatly increase overall carbon emissions, depending on how the electricity used to power the electrolysis was generated.[90]

However, rather than making its own estimate of the carbon emissions associated with producing the hydrogen, the Commission can rely on the federally-required estimate of the very same thing. The amount of the 45V tax credit available to the hydrogen producer under the Inflation Reduction Act depends directly on the level of carbon emissions associated with its production. The highest section 45V tax credit for hydrogen production is reserved for processes with CO_2 emissions between zero and 0.45 kg CO_2/kg H2.[91] (By way of comparison, this hydrogen would be at least twenty times less carbon-intensive than hydrogen produced today using SMR, which produces an average of about 10 kg CO_2/kg H2.[92]) To obtain the highest 45V credit, the hydrogen producer would have to demonstrate to the IRS that the hydrogen was produced in a

[89] *Id.*, at 33307.
[90] *Id*.
[91] U.S. Department of Treasury, IRS, *Section 45V Credit for Production of Clean Hydrogen, etc.,* Notice of Proposed Rulemaking, 88 Fed. Reg. 89220, 89221 (Dec. 26, 2023).
[92] Wilson Ricks *et al.*, "Minimizing Emissions from Grid-Based Hydrogen Production in the United States," *Env. Res. Lett.* 18 014025 (2023), *available at*: https://iopscience.iop.org/article/10.1088/1748-9326/acacb5.

way that was carbon free, or virtually so, documenting its electricity purchases through Energy Attribute Certificates ("EACs").[93]

If the 45V tax credit survives Congressional efforts to repeal it and continues to be available under the rules recently adopted by the IRS, documentation that the hydrogen came from a production facility receiving the highest available credit under Section 45V would represent a reasonable presumption that there are no upstream carbon emissions associated with the hydrogen production, or at least none significant enough to warrant the Commission's consideration. If the tax credit does not survive, the Commission is unlikely to face any hydrogen co-firing facilities given the high cost of unsubsidized hydrogen production.

3. Calculating the partial compliance credit

In sum, to calculate the percentage of partial compliance credit granted to a natural gas plant co-firing with hydrogen, the Commission should estimate the direct and indirect emissions of the plant per MWh with hydrogen co-firing and compare it to what its CO_2/MWh would be if the plant burned natural gas only. If the hydrogen came from a facility receiving the highest tax credit under section 45V, the Commission can reasonably presume the carbon emissions associated with hydrogen production are effectively zero. The percentage reduction in CO_2/MWh resulting from the hydrogen co-firing would be the percentage that can reasonably be deemed carbon-free and thus the percentage of generation that should be granted partial compliance credit.

[93] U.S. Department of Treasury, IRS, *Credit for Production of Clean Hydrogen and Energy Credit,* Final regulations, 90 Fed. Reg. 2224, 2250 (Jan. 10, 2025).

C. Partial compliance credit for CCS

When deciding what share of the output of a plant with CCS the Commission will consider carbon-free, it should similarly focus on the actual overall emissions reduction obtained from employing CCS technology, considering the changes in both direct emissions and indirect ones. Failing to factor in the significant indirect emission increases associated with CCS would result in overestimating the overall reduction in CO_2 emissions, and thus overestimate the percentage of generation that can reasonably be considered carbon-free.

1. Carbon reduction at the point of generation

Calculating the direct emissions reduction at a plant with CCS should be done on a CO_2/MWh basis, as the Notice of Comment Period specifies, to reflect the large parasitic steam and power load of the carbon capture technology. According to a 2023 Department of Energy analysis, adding 90-95% post-combustion capture to an existing coal plant can reduce net plant efficiency by 24-25%.[94] If the plant seeks to generate the same amount of electricity as before it adds capture, and powers the capture technology on-site by burning additional coal, it will produce even more CO_2 than before. If 90% of that additional CO_2 is also subject to capture, the EPA estimates CO_2 emissions at such a coal

[94] National Energy Technology Laboratory, *Eliminating the Derate of Carbon Capture Retrofits – Revision 2,* Department of Energy (Mar. 31, 2023), at 6, *available at* https://www.osti.gov/servlets/purl/1968037/.

plant will therefore result in a somewhat lower (87.1%) emission reduction on a per MWh-net basis.[95]

2. Carbon Emissions upstream of the point of generation

However, the CO_2 emissions associated with powering the CCS process might not be captured or even be produced at the same facility. They may occur at a separate plant or multiple plants, like with the proposed Project Tundra, which would capture CO_2 from the Milton R. Young coal plant. This project would consume the energy equivalent of up to 27% of the output of the coal plant to meet the steam and electrical needs of the CCS process.[96] At one point it was indicated that the power for the CCS process could come from a purpose-built gas power plant and boiler, but later the Revised Draft Environmental Assessment said the project would purchase the electricity needed to power the CCS process from "the Minnkota electricity system (*i.e.*, grid) that includes multiple generation sources."[97]

These indirect upstream emissions will be substantial and should be reflected in the calculation of what share of the output of a plant with CCS can be considered carbon-free. There is no reason to ignore the carbon emissions associated with powering the CCS

[95] U.S. Environmental Protection Agency, *New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units, etc.*, Proposed Rule, 88 Fed. Reg. 33240, 33338 (May 23, 2023).
[96] Comments on the Revised Draft Environmental Assessment for Project Tundra on Behalf of Sierra Club, CURE, and Dakota Resource Council (May 13, 2024), at 6.
[97] U.S. Department of Energy, Revised Draft Environmental Assessment for North Dakota, CarbonSAFE: Project Tundra, DOE/EA-2197D (April 13, 2024), Appendix K, at K-28, *available at:* https://www.energy.gov/nepa/articles/doeea-2197-revised-draft-environmental-assessment-april-2024.

process just because they may come from a plant other than the one to which the CCS is being added.

3. Carbon emissions downstream of the point of generation

The calculation should also reflect downstream CO_2 emissions related to CCS, which can also be substantial. Downstream emissions associated with energy used to support the compression of the CO_2 (if not done at the power plant) and its transmission, injection, and storage should be considered, along with estimated rates of CO_2 leakage during transmission and injection. For CO_2 injected into geologic sequestration sites, the Commission should adjust the CO_2/MWh calculation to reflect any estimated leakage during the foreseeable future. This estimated leakage should be based on the most recent and most site-specific data available to the Commission at the time.

Moreover, the Commission should determine that use of captured CO_2 for Enhanced Oil Recovery ("EOR") disqualifies a facility from receiving *any* partial credit. EOR is a process in which captured CO_2 is injected into oil fields to facilitate more oil extraction from the ground. The risk of CO_2 leakage from EOR is obviously higher than the leakage expected from CO_2 injected into geological sites chosen precisely for their ability to sequester CO_2. CO_2 leakage from EOR is a particular risk if the oil wells are not properly plugged and abandoned. The EPA reports that there are already around 3 million abandoned oil wells in the U.S., of which over half are unplugged, and these unplugged wells are actively emitting both methane and CO_2.[98] Moreover, using CO_2 to

[98] U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022*, at p. 3-117, *available at* https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2022.

extract additional oil will inevitably result in new carbon emissions when that extra oil, which would otherwise stay underground, is burned. Indeed, the CO_2 emissions attributable to the extra oil flushed from the ground may even exceed the amount of CO_2 captured and then injected to obtain it.[99] The Commission should therefore find that electricity generation that captures CO_2 and then uses that CO_2 for oil production is not "carbon free" and is thus not eligible for partial credit, given the leakage risk and the fact that the process necessarily creates additional CO_2 emissions through the extracted oil.

As noted, the CFS bill's chief House author objected on the House floor to a proposed amendment to make promoting CCS the policy of the state, on the grounds that it failed to distinguish between permanently sequestered carbon and carbon used "used for enhanced oil recovery, which would actually increase carbon emissions." Making capture projects where the CO_2 would be used for EOR ineligible for partial carbon-free status would prevent this increase in emissions, consistent with legislative intent.

4. Calculating the partial compliance credit

In sum, once the Commission has determined a CO_2/MWh value for a plant using CCS considering direct, upstream, and downstream emissions, it should give partial compliance credit to that plant commensurate with the percent reduction in CO_2 emissions per MWh attributable to the CCS project. For example, if the full analysis,

[99] Each ton of CO_2 injected into an oil field can yield 2-3 barrels of oil. [U.S. NETL web page, *Commercial Carbon Dioxide Uses: Carbon Dioxide Enhanced Oil Recovery:* https://www.netl.doe.gov/research/coal/energy-systems/gasification/gasifipedia/eor] Each barrel of oil emits 0.43 metric tons of CO_2. [U.S. EPA web page, *Greenhouse Gases Equivalencies Calculator – Calculations and References:* https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator-calculations-and-references] Each ton of CO_2 used for enhanced oil recovery, therefore, can produce oil with emissions from 0.86 and 1.29 metric tons CO_2.

including upstream and downstream emissions, shows that a plant achieving 90% capture at the stack actually achieves a reduction in CO_2/MWh-net of 75% compared to the plant's emission rate without CCS, the Commission should treat 75% of the plant's generation as carbon-free, and give compliance credit accordingly.

CONCLUSION

For the reasons set forth above, the CEOs respectfully request that the Commission find as follows:

1. Electricity generation fueled by burning solid waste, biomass, or other fuels that emit CO_2 when burned are not eligible for treatment as carbon-free under the CFS as a matter of law because they do not generate electricity "without emitting carbon dioxide," as required under the definition of carbon-free at Minn. Stat. § 216B.1691, subd. 1(b).

2. The partial compliance provision at Minn. Stat. § 216B.1691, subd. 2d(b)(2)(i) applies to facilities that partially employ a technology that, if fully employed at the facility, could potentially generate electricity without emitting CO_2, such as facilities using hydrogen co-firing or CCS. The provision does not apply to facilities that burn solid waste, biomass, or other fuels that emit CO_2 unless they also partially employ a technology described in the previous sentence, and then only the percentage of generation attributable to that technology would be considered carbon-free.

3. [ALTERNATIVE TO FINDINGS 1 AND 2] The Commission declines to consider requests to grant full or partial carbon-free status to electricity generation fueled by solid waste, biomass, or other fuels that emit CO_2 when burned, finding that such grants would be contrary to the public interest. Granting such requests based on life-cycle analysis would be contrary to the public interest because:

   (A) granting such requests would increase power sector CO_2 emissions by incentivizing more burning of solid waste and biomass, which runs counter to the goals of the CFS law and legislative intent;

   (B) such analyses would be administratively burdensome, demand a high degree of speculation regarding multiple factors, and yield unreliable results;

(C) the need to update the analyses as circumstances change would create ongoing regulatory uncertainty disruptive to energy planning and waste-management planning;

(D) granting carbon-free status to such facilities could undermine efforts to reach state climate and waste-management goals; and

(E) granting carbon-free status to such facilities could undermine efforts to reduce health-harming air pollutants, particularly in environmental justice areas, contrary to the goal of Minn. Stat. § 216B.1691, subd. 9.

4. When determining what percentage of generation from a facility employing hydrogen co-firing or CCS should be considered carbon-free under section 216B.1691, subd. 2d(b)(2)(i), the Commission will base it on the total percentage reduction in overall CO_2 emissions per MWh of generation resulting from use of the technology. Overall CO_2 emissions will reflect reductions in the CO_2 emissions at the point of generation ("direct emissions") as well as any significant CO_2 emissions increases reasonably attributable to the hydrogen co-firing or CCS technologies that occur upstream or downstream of the point of generation ("indirect emissions"). The total percentage reduction in overall CO_2/MWh is the total percentage of the facility's generation that will be considered carbon free.

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/s/ Barbara Freese

Barbara Freese
Staff Attorney
Minnesota Center for Environmental Advocacy
1919 University Ave W, Suite 515
St. Paul, MN, 55104
bfreese@mncenter.org
Attorney for Clean Energy Organizations