Comments on Colorado's GEMM Phase 2 Facility Draft Plans

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The American Council for an Energy Efficient Economy (ACEEE) appreciates the opportunity to submit public comments to the Colorado Department of Public Health and Environment (CDPHE) on the Colorado Greenhouse Gas Emissions and Energy Management for Manufacturing (GEMM) Phase 2 facility draft plans. Our comments consist of (1) general comments on GEMM requirements and cross-cutting elements across the facility plans; and (2) specific comments on individual facility plans.

General Comments

We have the following general feedback and questions:

- **Consistency Across Draft Facility Plans**

  - **Details in general**: Some facility plans lack details on the specific applications and/or processes within their facility that could be decarbonized and/or the measures they investigated. It would be helpful to have additional information on the technologies being considered so that the public may evaluate the validity of the claims made, and better understand the comparison between reduction options and why certain proposed measures are viable and the best option(s) for a particular facility.

  - **Carbon price**:
    - **Estimate Validation**. While the agency has made a robust attempt at providing a standard social cost of carbon for compliance purposes. It is still up to the company to make those estimations, so detailed review should be done to validate numbers in the draft facility plans. For example, what happens if a FEED study raises the cost of carbon for compliance?
    - Additionally, the GEMM Guidance provides $2,500 per metric ton of methane (CH_4) and $33,000 per metric ton of nitrogen dioxide (N_2O) but we did not see these values being used in many of the plans.
    - **Benchmarking**. GEMM participants report a wide variety of carbon costs ($/tCO2e avoided). While plants present different reduction opportunities, we recommend that participants benchmark themselves against known projects in their planning. Publicly available data from California programs show that industrial facilities can achieve significant results at values lower than Regulation 27's $89/tCO2e, even with higher costs typically associated with California:
      - CA Food Production Investment Program (FPIP) - $40.9 / tCO2e avoided

  - CA Industrial Decarbonization and Improvement of Grid Operations (INDIGO) - $10.9/tCO2e avoided

  Moreover, awardees in the Colorado Clean Air Program are achieving reductions at approximately $127 / tCO2e avoided.

- **BACT details**: while a couple of companies provided information on control technologies, it would be helpful to learn more about other facilities' current control technologies. Is there a clearinghouse for the best available control technologies (BACTs) that are considered standard in Colorado? How do BACTs play a role in GEMM compliance?
- **Other metrics/considerations:** Is there a way for plans to consider other metrics such as social cost of co-pollutants, total system benefits, Environmental Product Declarations (EPDs), incentives for meeting other targets on a longer time scale? Is there an incentive for meeting long-term reduction goals beyond 2030 (given annual compliance periods post-2030)? E.g., a $400/MT CO2e measure that would bring a facility closer to 50% reduction by 2040 instead (for Suncor -- this is a theoretical scenario)?

- **Disproportionately impacted and residential communities (DICs):** We recommend consistent requirements for community impacts in Facility plans. The explanation of local impacts varies greatly between the submitted GEMM plans. Additional considerations may include risks, mitigation, co-benefits of measures, and any other community engagement plans that incorporate education/awareness of industrial activities or workforce development for facility employees. The requirements should require companies to describe the impacted communities, the impacts of the proposed plan measures on the local community and the extent of that impact, the plan and intent of the company to reduce any expected negative impacts of their plan. Additional questions include: (1) how were the requirements for "1-mile from a DIC" and "15 miles from a residential community" established? (2) Can the 1-mile radius be increased to cover additional vulnerable DICs that may have pipelines traversing their area (e.g., for the CCS proposed projects transporting carbon to the Northeastern part of Colorado), especially since DICs may have fewer resources to address and mitigate issues compared to residential communities.

- **Other programs and funding for compliance**: Although the Colorado Energy Office and several federal Department of Energy resources are named in the plan guidance document, only one company mentioned leveraging CITCO to help with compliance. We understand that JBS and YUMA ethanol have received funding from the Climate Action Plan. We strongly encourage each facility to explore these options, which could also include utility programs and other financial models like Commercial Property Assessed Clean Energy (C-PACE). If an AQCC "case manager" exists for each facility, we strongly recommend that a list of other resources be provided, to help with that facility's decarbonization plans. Additionally, are there requirements to disclose other funding sources already obtained for the proposed plan projects and how they will help with compliance, e.g., awarded CAP or federal grants.

- **Industrial facilities competitiveness within the Colorado economy**: At least two of the companies submitting facility plans mentioned the risks of carbon leakage due to GEMM compliance. While these claims need to be investigated, we would like to suggest further exploration of non-GEMM facilities and their emissions impact within the state. One idea is to do so on a sliding scale, perhaps as an amount of carbon equivalent per square footage or per product. Colorado should seek to support industrial companies for the health of the state economy and work with facilities to identify

ways to decarbonize while maintaining production to meet market demand and not lose out on maintaining industrial activity within the state.

We also provide the following informational resources to contextualize our comments and provide provide additional background during draft plan reviews:

- **Efficiency**
  - Thermal redesign, rightsizing topic brief
- **Industrial electrification**
  - Industrial heat pumps landing page
  - Industrial heat pumps 2022 report on savings potential
  - IHP Alliance Procurement Toolkit
  - Step by step guide to IHP procurement https://industrialheatpumpalliance.org/how-to-get-an-industrial-heat-pump-for-your-facility-a-resource-guide/
  - Co-benefits of IHPs topic brief
  - Map of small industrial boilers in non-attainment zones
  - Map of installed electric technologies
- **Industrial impacts on communities**
  - ACEEE summer study paper Title (Use "Title" style here)
- **Biogas as renewable energy** IEA-Bioenergy_Task-37_Biogas-Systems-in-Industry_022025.pdf
  - This applies to sites with anaerobic digesters that give off methane as part of their emissions as an alternative to flaring while reducing natural gas consumption.
- **Steps to ensure that flares are operating at high efficiencies:**
  - Flaring allows more methane into the atmosphere than we thought | University of Michigan News

Specific Facility Plan Comments

We offer the following specific comments on individual draft facility plans for further consideration:

American Gypsum – Eagle Plant

We appreciate the details on calculations in this facility plan's appendices. This facility plan states there are no cost-effective commercially available options with which to comply by 2030, thereby concluding that compliance would require changing their production lines and expressing concerns about carbon leakage. We have the following questions about the measures American Gypsum investigated:

- Could they provide more details on waste heat recovery via heat exchangers?
- Did they explore solar thermal measures given their need for process heat in the plant?
- Would they be interested in the Industrial Decarb Fund for compliance? If so, we strongly encourage that they be part of the process in providing feedback on establishing that fund.

It is interesting that other electrification options were not included, so it would be useful to know if American Gypsum already has electric equipment. If not, some options could include industrial drying ovens or other products such as Nyle's kilns, which includes material drying under their complete kiln system. Some informational resources on solar thermal measures that have been implemented in commercial, industrial and manufacturing set-ups include the following:

- Indianapolis airport case study
- California Dairies, Inc. case study

- Colgate-Palmolive case study
- Boortmalt malting plant case study
- Birra Peroni brewery case study

Cargill – Fort Morgan Plant

Cargill is clearly committed to their sustainability goals. Their plan is one of the few that includes detailed appendices and mentions the social costs of methane and nitrogen dioxide. It is encouraging that Cargill mentions the energy office's tax credit as a resource. Cargill is a partner in the Department of Energy (DOE) Better Plants program as well as a member of the Renewable Thermal Collaborative (RTC). We strongly encourage the facility to continue to explore opportunities offered through those resources, including the IHP Alliance which offers training and buyer-supplier connect sessions on industrial heat pump (IHP) technology. We have the following questions about the Cargill plan.

- Has Cargill considered recovering waste heat from wastewater or any heat pump opportunities?
- Is there a way to store natural gas and biogas (maybe underground) or convert to biomethane for easier storage and handling instead of flaring? What BACT is on the flare?
- What BACTs are on the boilers and other equipment?
- How did Cargill settle on a 30-year lifespan for a boiler in their calculations?
    - Their oldest boiler is 35 years old, but based on their plan they will be replacing even their 14-year-old boiler?
- For next steps, are there options to electrify the dryers (currently using natural gas)?

We'd like to share these following resources for greater context, in addition to those offered within our general comments.

- Electric Power Research Institute (EPRI) Report: Opportunities for Demonstrating Industrial Heat Pumps in the United States: Prototype Examples in the Food and Beverage Sectors
- Other types of heat pump technology include Nyle products like their dehydrator Home - Nyle Dehydrators or complete kiln system Nyle Dry Kilns | Lumber Drying | Heat Treating | Brewer, Maine

Golden Aluminum – Fort Lupton Mill

We appreciate this company's efforts in providing more details on their community impacts, especially using tools to learn more about the disproportionately impacted area. We have the following questions about the Golden Aluminum plan:

- Can they provide additional details about the technology being deployed, including more details on the low nitrogen oxide (NOx) burner?
- Are there waste heat recovery opportunities at Fort Lupton Mill?
- Are there details on how criteria air pollutant reductions were calculated that can help quantify the improvement in public health following emission reductions?
- We are aware of a federal grant that is helping with this project; how will that grant help with GEMM compliance by 2030?

Natural Soda

The electrification options were laid out in a straightforward way, and the detailed comparison and calculations for each option were easy to follow. It is unfortunate that all measures were estimated to be too expensive to implement. We have the following clarifying questions on the Natural Soda draft plan:

- What method was used by Burns McDonnell to settle on 55% displacement for the HTHP system e.g., optimization analysis, others?
  - Can Natural Soda share the numbers for 100% (which would likely need some kind of storage option), 50%, and 25%, like the electrode and electric boiler options.
  - Did Natural Soda consider other heat pump manufacturer options to quote the heat pump system?

We recommend that Natural Soda explore the DOE Better Plants program, given the company's strong commitment to energy, emissions, water, and waste reduction. Other useful resources include:

- IHP Alliance website and resources
- IHP Alliance procurement toolkit
- IHP Alliance step-by-step resource guide
- Lawrence Berkeley National Laboratory (LBNL) Electrification report
- Energy Innovation Decarbonizing Low Temperature Industrial Heat report
- International Energy Agency's (IEA) High Temperature Heat Pump Annex
- RTC's Playbook for Decarbonizing Process Heat in the Food & Beverage Sector

Sterling Ethanol

We appreciate the details provided about the manufacturing process at Sterling Ethanol. We have the following questions about the Sterling Ethanol draft plan:

- Are the control technologies mentioned in the plan considered the best available options?
- What is the timeline for the permitting process and how will the company ensure compliance by 2030 if there are any delays?
- Do the pipelines run under disproportionately impacted and/or residential communities? What are the protections for community members? Will these pipelines extend beyond the 1 mile distance?
- Are the wells near disproportionately impacted and/or residential communities? What are the protections for community members?
- Are there plans to capture co-pollutants as well?
- Is there a possibility for the well to store more CO_2 beyond 2030?

Sterling Ethanol's boiler is only 20 years old so it is understandable why electrification was not explored as a measure. For future projects that may be closer to the boiler's end of life, Sterling Ethanol could consider an industrial heat pump. Some additional resources for consideration include:

- ACEEE 2022 report - Industrial Heat Pumps: Electrifying Industry's Process Heat Supply, includes analysis of ethylene debutanizers, ethylene process water strip reboilers, and ethanol fuel (ethyl alcohol, dry mill).

- Skyven Arcturus project at an ethanol plant in Medina NY
- Aemetis project in California
- ACEEE blog post on small industrial boilers in non-attainment zones
- ACEEE topic brief on boiler replacements in net-zero scenarios

Suncor

We greatly appreciate this company's focus on efficiency measures, as we believe this is the first step in reaching decarbonization and sustainability goals. We'd also like to suggest the following additional efficiency measure: Three (3) of Suncor's active boilers are at least 50 years old, according to the Colorado Department of Labor's boiler database. Older boilers tend to be inefficient and more polluting than newer models. We highly recommend electrification options be explored to help with reductions at the plant. See some resources below. It is also interesting that Suncor is the only plan that mentions the state-managed fund for compliance. Getting Suncor's feedback on the fund would be useful since they may likely be the only facility using the Industrial Decarb Fund.

We have the following questions about the Suncor plan:

- Measure 18 was chosen for greater reduction potential, but there is little to no information on measure 8.
- Additional information on measure 10 would also be useful, given that its co-pollutant reduction potential is greater and cost is lower compared to measure 18.

We recommend the following resources to explore other decarbonization opportunities for refinery operations like Suncor:

- Report on the technical capabilities of IHPs (including refineries)

Yuma Ethanol

We appreciate the details provided about the manufacturing process at Yuma Ethanol. Given the similarities between this plan and that of Sterling Ethanol, we have largely the same questions and resources about this plan:

- Are the control technologies mentioned considered the best available?
- What is the timeline for the permitting process and how will the company ensure compliance by 2030 if there are any delays?
- Do the pipelines run under disproportionately impacted and/or residential communities? What are the protections for community members? Will these pipelines extend beyond the 1 mile distance?
- Are the wells near disproportionately impacted and/or residential communities? What are the protections for community members?
- Are there plans to capture co-pollutants as well?
- Is there a possibility for the well to store more CO_2 beyond 2030?
- How will the CAP grant help with compliance?

Yuma Ethanol's boiler is less than 20 years old so it is understandable why electrification was not explored as a measure. For future projects that may involve boilers closer to end of life, Yuma Ethanol could consider an industrial heat pump. Here are some additional resources:

- ACEEE 2022 report - Industrial Heat Pumps: Electrifying Industry's Process Heat Supply, includes analysis of ethylene debutanizers, ethylene process water strip reboilers, and ethanol fuel (ethyl alcohol, dry mill).
- Skyven Arcturus project at an ethanol plant in Medina NY
- Aemetis project in California

JBS – Greeley Facility

The details provided in this plan's appendices are very helpful. We have the following questions about the JBS plan:

- Can JBS provide clarification on why they chose a 15.5% reduction instead of 12.5% and the additionality that represents.
- If JBS plans to repurpose the captured methane, what is stopping them from doing so earlier than 2030, especially since the current project is well below the social cost of carbon? If it is due to cost, is there a way to incentivize early compliance?
- What BACTs will be used to reduce the increase in co-pollutant release? What BACTs will be applied to address the emissions from the propane used for the flare?
- Since methane (CH_4) is a more potent greenhouse gas than carbon dioxide (CO_2), JBS plans to address methane first. For further reductions, it would be helpful to know what kinds of boilers are on site and how many/which boilers can use biogas for fuel. Based on the boiler database, they have a boiler from 1959, indicating a prime opportunity for electrification, either through a 1:1 swap for an electric version, or a heat pump.

We share the following resources for further consideration:

- Some industrial facilities have started using anaerobic digestors as a source for a combined heat and power system. This option could reuse the methane from lagoons while providing onsite electricity, and perhaps this is part of the second phase of using the methane instead of flaring.
- EPRI Report: Opportunities for Demonstrating Industrial Heat Pumps in the United States: Prototype Examples in the Food and Beverage Sectors
- Some Nyle products that could be relevant for electrification: Home - Nyle Dehydrators, Nyle Dry Kilns | Lumber Drying | Heat Treating | Brewer, Maine
- Skyven Arcturus steam solutions – steam generating heat pump
- AtmosZero steam generating heat pump
- Other electrification options as available through the IHP Alliance procurement toolkit and the IHP Alliance step-by-step resource guide