Michigan Council on Climate Solutions: Energy Intensive Industries Workgroup Recommendations

October 2021

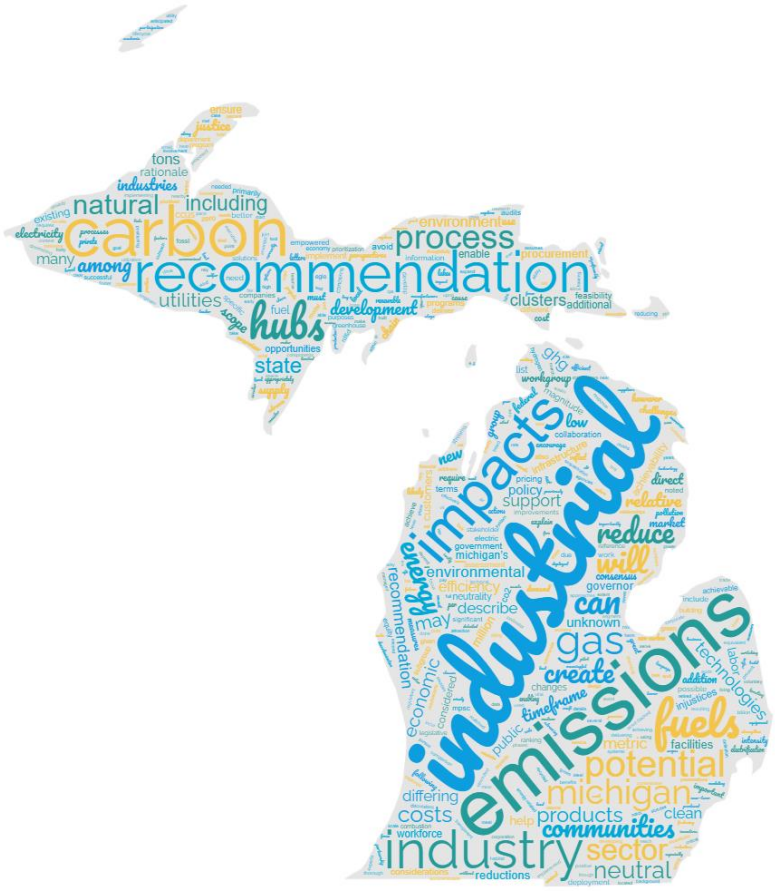

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Table of Contents

Background

As of 2018, Michigan's industrial sector accounted for 11.7 percent of the state's total energy-related direct carbon dioxide emissions, excluding emissions from electricity produced to serve industry.[1] Those emissions are primarily due to on-site natural gas combustion. Given that industry accounts for roughly a third of electricity sales in Michigan, emissions from electric power production for industry would add another 10.5 percent, totaling to around 22.2 percent of statewide energy-related emissions coming from industry.[2]

In terms of metric tons of greenhouse gas (GHG) emissions per year, The Energy Intensive Industries workgroup scope can be broken down as follows:

- **Scope 1 Emissions (on-site):** 17 million metric tons CO_2 equivalent greenhouse gas emissions per year.[3] Of this, 9 million metric tons are from the combustion of fossil fuels (e.g., natural gas burned on site to fuel industrial processes), and 8 million metric tons are from process emissions (e.g., emissions released during the chemical processing of steel and cement)
- **Scope 2 Emissions (off-site electricity production):** Estimated 17.3 million metric tons CO_2 emissions per year.[4]
- **Scope 3 Emissions (supply chain):** Unknown

Process-wise, the workgroup met 10 times for approximately 2 hours per meeting, between April 26 – September 27, 2021. Members of the public were able to join the workgroup during an open sign-up period between January and March 2021. The process followed three phases:

1. the group heard presentations from external experts to build a shared understanding of challenges and possible solutions to reducing emissions from industry;
2. the group held facilitated discussions to begin exploring potential recommendations that could work for Michigan's unique context;
3. the group worked to review and refine a list of recommendations based on the previous presentations and discussions.

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[1] U.S. Energy Information Administration, State Energy-Related Carbon Dioxide Emissions by Sector, (2018), accessed October 11 2021. https://www.eia.gov/environment/emissions/state/excel/table4.xlsx

[2] U.S. Energy Information Administration, Retail Sales of Electricity by End-Use Sector, (2018), accessed October 11 2021. https://www.eia.gov/beta/states/states/mi/data/dashboard/consumption

[3] Data from the U.S. Environmental Protection Agency 2019 Greenhouse Gas Reporting Program, accessed September 2020. https://www.epa.gov/ghgreporting

This number includes 98 Michigan industrial facilities and excludes 137 facilities that fall under the categories of Energy Utilities, Petroleum, Natural Gas, Waste/Landfills.

[4] This number was found by applying industry's 29.4% of retail electricity sales referenced in footnote 2 to the states 58.9 million metric tons of CO_2 emissions from the electricity sector referenced in footnote 1.

Throughout the process, the workgroup co-chairs solicited feedback from participants and sought to incorporate it into the discussions and resulting recommendations.

In acknowledging the overlap between workgroups, the stakeholders have requested that the Council balance these recommendations with those from other workgroups, including how they will impact industry and specifically energy costs.

Summarized Recommendations

Below, we have summarized the list of recommendations. The full recommendations, including additional details and a rationale for each, follow this list. The recommendations are listed in order of the anticipated impact on GHG emissions.

Five Prioritized Recommendations:

1. The Governor should direct the Michigan Public Service Commission (MPSC) to initiate a stakeholder process to explore how Michigan's electric and natural gas utilities can deliver carbon neutral fuels to Michigan's industrial sector by 2050.
2. The State of Michigan and the Michigan Economic Development Corporation (MEDC) should support the building and attraction of industrial hubs and clusters, with emphasis on carbon capture, utilization, and sequestration (CCUS).
3. The Governor should direct the Michigan Department of Environment, Great Lakes, and Energy (EGLE) and the MPSC to convene a stakeholder workgroup to recommend programs and partnerships to advance energy efficiency and process improvements to enable achieving carbon neutrality by 2050 in the industrial sector.
4. The Governor should direct EGLE to form a workgroup to craft, assess, model the potential impacts of, and implement a policy for public procurement of low carbon products, which would create a market demand for low carbon products and support industry to pursue technology innovation that can reduce emissions.
5. The Governor should support a federal carbon pricing market.

Additional Recommendations for Consideration:

6. While many suppliers cannot share their supply chain information to customers due to trade secrets, the state should support voluntary measures among manufacturers to decarbonize their supply chain through programs.
7. The state should strengthen its relationships with federal agencies to position itself as a leader in the RD&D space.
8. The state should address non-carbon GHG emissions from industry, including gases such as sulfur hexafluoride (SF6).

Detailed Recommendations

Below, we have described the five prioritized recommendations in more detail, including a rationale for each, an assessment of various impacts, and considerations for achievability and feasibility. The recommendations are listed in order of the anticipated impact on GHG emissions. Sub-items under the recommendations are lettered or numbered for reference purposes only; the letters or numbers do not reflect a ranking or prioritization unless otherwise noted.

I. Deliver Carbon Neutral Fuels to Industry by 2050

1) Overview of recommendation.

Rationale: Michigan's industrial sector is primarily fueled by natural gas, which is currently economical relative to other energy sources. Achieving Michigan's climate goals will require innovative solutions that can supply industry with carbon neutral energy sources as cheaply as possible. Many of these solutions will need to be developed through collaboration between Michigan's natural gas and electric utilities and industry.

Recommendation: The Governor should direct the Michigan Public Service Commission (MPSC) to initiate a stakeholder process to explore how Michigan's electric and natural gas utilities can deliver carbon neutral fuels to Michigan's industrial sector by 2050.

The proceeding should include the following components:

A. An assessment of how natural gas is currently used in the industrial sector, which fuels may best enable those end uses to achieve carbon neutrality as cost effectively as possible, and what policy and infrastructure changes are needed to facilitate the development and deployment of those fuels. These fuels should include, but should not be limited to, electrification, renewable natural gas, and hydrogen. In addition, geothermal and district heating systems, combined heat and power, and industrial clusters and hubs (see more on these below) may help with enabling the cost-effective delivery of these fuels.

B. Identification and implementation of pilot projects and legislative and regulatory policy changes that can help to advance carbon neutral fuels for the industrial sector.

2) In what timeframe is this recommendation achievable?

Both components of this stakeholder engagement process should be completed before 2025. However, the actions resulting from this process may take longer to implement, though they have great promise to reduce GHG emissions from the industrial sector in Michigan.

3) **What is the relative magnitude of this recommendation, in terms of GHG emissions reductions?**

Up to 9 million metric tons of CO_2 equivalent by 2050, primarily scope 1 fossil fuel combustion

4) **Describe the potential impacts of this recommendation on environmental justice.**

As noted under recommendation #3, industrial infrastructure has previously been the cause for environmental injustices in many communities. To avoid any future injustices, the siting of industrial infrastructure, including for the delivery of low/no emissions fuels, must be done thoughtfully, with thorough and meaningful involvement from communities at an early stage.

In addition, building out the energy system to deliver carbon neutral fuels to industry may cause rate impacts on other customer classes. The MPSC should carefully evaluate infrastructure decisions to avoid creating an undue rate burden on vulnerable customers.

5) **Describe the potential impacts of this recommendation on labor.**

Providing industry with carbon neutral fuels and technologies will likely create both challenges and opportunities for Michigan's workforce. The specific impacts will depend on which fuels and technologies are deployed to serve industrial energy needs. For example, significant industrial electrification may create new workforce opportunities for workers in the electric sector, but may reduce opportunities for workers in the gas sector. These impacts should be considered as part of the process outlined above. To the extent there will be new workforce opportunities, the state should work to facilitate fair and equitable access to those opportunities.

6) **Describe the potential impacts of this recommendation on the environment.**

The goal of this process is to significantly reduce greenhouse gas emissions from industry through fuel switching. However, all fuels and technologies may have environmental impacts. Significant electrification may require greater land use for renewable energy such as wind and solar. If sited appropriately and with community input, renewables can be sited to minimize environmental impacts and maximize co-benefits, such as pollinator friendly habitat planted under solar panels. Significant development of carbon neutral gaseous fuels may also have environmental impacts. Producing green hydrogen for industry would likely have many of the same environmental impacts as electrification, given that wind and solar will be needed to power electrolyzers. Renewable natural gas would have reduced lifecycle GHG emissions, but would still emit some air pollution at the point of combustion.

7) **Describe the potential impacts of this recommendation on economic development.**

The actions resulting from this process will likely create several economic development opportunities. Regardless of the fuels or technologies being deployed, delivering carbon neutral fuels and technologies to the industrial sector will require significant investment in research, development, and deployment, including building out new infrastructure.

8) **What are the relative costs of this recommendation? Unknown, or different timeframe – explain why:**

The stakeholder engagement process outlined above would be very inexpensive in comparison to magnitude of investment that will be needed to significantly reduce emissions from the industrial sector. A year-long stakeholder engagement process could cost around $300,000 to $500,000, though the costs may vary depending on the process design and extent of modeling required.

Delivering carbon neutral fuels and technologies to industry will be expensive, and the costs will depend on a number of factors, including the mix of fuels and technologies deployed, policy favorability for those fuels and technologies, and the relative cost of conventional natural gas. Recent modeling conducted in Minnesota found that, by 2050, delivering carbon neutral fuels to industry would incur an incremental $3.5 billion to $11 billion annually (in nominal dollars)[5].

9) **Who is empowered to implement this recommendation?**

- State government – Executive
- Private sector
- Other: This requires participation, collaboration, and implementation by both state government and industry.

10) **Is there consensus among the subgroup for this recommendation, or are there differing perspectives? If differing perspectives, what are they?**

There was consensus amongst the group for this recommendation

11) **What are the most important considerations for achievability and feasibility of this recommendation?**

NOTE: Letters and numbers in the list below are for reference purposes only; they do not reflect a ranking or prioritization.

A. In conducting this assessment, the following should be considered:

   i. Carbon neutral fuels should be matched to specific industrial assets and processes, rather than to customers or industry segment. For example, a certain customer or industry may have some assets and processes that can be electrified, and others that may be better suited to carbon neutral gaseous fuels.

[5] Great Plains Institute and Center for Energy and Environment with modeling by E3, *Decarbonizing Minnesota's Natural Gas End Uses Stakeholder Report*, (July 2021), Figure 24: "Incremental resource costs for industry across the three scenarios in 2050". https://e21initiative.org/wp-content/uploads/2021/07/Decarbonizing-NG-End-Uses-Stakeholder-Process-Summary.pdf

ii. In considering renewable natural gas for industry, the assessment should account for how much renewable natural gas can feasibly be produced, especially given potential competition from the transportation sector.

iii. Green and blue hydrogen should be considered both as a fuel blended into the natural gas system and as a direct fuel (which would require new infrastructure).

iv. Many net-zero fuels will require new infrastructure to be built. The associated costs and benefits should be considered, including impacts on energy rates for industrial customers and all customers, as well as potential equity impacts.

B. Concerning pilot projects and legislative and regulatory policy changes, the workgroup suggests that Michigan Department of Environment, Great Lakes, and Energy (EGLE) and the MPSC look initially at the following opportunities:

i. A renewable portfolio standard (RPS) for natural gas utilities, which would require or incentivize an increasing supply of renewable natural gas or hydrogen.

ii. Address the inability of utilities to receive credit for fuel switching under the Energy Waste Reduction (EWR) program.

iii. Encourage electric and natural gas utilities to support the development clean industrial clusters and hubs.

iv. Encourage electric utilities to develop rate designs that reduce the costs of newly electrified loads.

v. Encourage electric and natural gas utilities to develop programs that can assist industries with updating equipment to accommodate net zero GHG emissions technologies and approaches.

vi. Encourage electric and natural gas utilities to expand access to voluntary green pricing programs for industrial customers.

vii. Identify what electric and natural gas infrastructure needs to be built to scale up net zero GHG emissions energy supply for industry.

viii. Ensure that economic signals are set to appropriately drive behavior for demand response, including lifting the restriction on full-service customers participating directly in MISO demand response programs (individually or via aggregators).

ix. Consider implementing an asset-backed supply program, which would create a structure that allows Michigan industrial manufacturing

companies to enter into supply contracts for Michigan based electricity supply.6

x. Explore how industrial energy use, aggregated by NAICS code, could be reported on a statewide level to better understand the landscape of industrial GHG emissions, without infringing on confidential business information (CBI) and privacy concerns and ensuring the information is appropriately managed.

II. Support the Development of Clean Industrial Hubs and CCUS

1) Overview of recommendation.

Rationale: Clean industrial hubs and clusters, including those enabling carbon capture, utilization and sequestration (CCUS), can help Michigan's industrial sector to achieve greenhouse gas emissions reductions as cost effectively as possible through shared infrastructure, the efficient co-location of industrial facilities, and the efficient use of materials and energy streams. Importantly, industrial hubs have previously been the cause for environmental injustices in many communities. To avoid any future injustices, the siting of industrial hubs must be done thoughtfully, with thorough and meaningful involvement from communities at an early stage. Wisely developing clean industrial hubs and clusters will require collaboration among industrial customers, communities, and utilities, and support from the State of Michigan.

Recommendation: The State of Michigan and the Michigan Economic Development Corporation (MEDC) should support the building and attraction of industrial hubs and clusters, with emphasis on CCUS.

2) In what timeframe is this recommendation achievable?

In order to enable commercial scale deployment of clean industrial hubs in the long-term, near-term actions must be taken. Question 11 lists a set of near-term actions for consideration.

[6] Michigan energy intensive industrial customers want access to renewable electricity supply. The Asset Backed Supply Program would create a structure which allows Michigan industrial manufacturing companies to enter into supply contracts for Michigan based electricity supply. The competitive development of new generation under this program will help ensure low-cost generation resources are added to Michigan without the cost risk of this new generation being placed on residential customers of the utility. Additionally, this program provides the opportunity for economic development and job creation from energy intensive industrial manufacturing providing a longer-term option for them to control their energy cost.

3) **What is the relative magnitude of this recommendation, in terms of GHG emissions reductions?**

Up to 8 million metric tons of CO_2 equivalent by 2050, primarily scope 1 process emissions (carbon captured, utilized, sequestered)

Clusters and hubs also enable recommendation #1.

4) **Describe the potential impacts of this recommendation on environmental justice.**

As noted above, industrial hubs have previously been the cause for environmental injustices in many communities. Without close attention to environmental justice and equity, industrial hubs may be implemented in ways that exacerbate existing injustices or create new ones.

To avoid any future injustices, the siting of industrial hubs must be done thoughtfully, with thorough and meaningful involvement from communities at an early stage. Wisely developing clean industrial hubs and clusters will require collaboration among industrial customers, communities, and utilities, and support from the State of Michigan. To appropriately address equity and environmental justice concerns, the state should assess and better define how industry can work with affected communities. There should be a way to measure effective and successful engagement.[7]

5) **Describe the potential impacts of this recommendation on labor.**

Industrial hubs may create new workforce opportunities, as the development of hubs may lead to infrastructure development. The development of hubs may also create challenges if industrial facilities are being relocated to other places within Michigan. In this case, hubs may create local workforce challenges.

6) **Describe the potential impacts of this recommendation on the environment.**

The intention behind fostering industrial hubs is to reduce emissions among Michigan's industrial sector, make industrial processes more efficient, and allow sharing of industrial waste streams for beneficial use, all of which can reduce environmental impacts. However, the clustering of industries in a specific location could also have adverse environmental impacts if not well planned and managed.

7) **Describe the potential impacts of this recommendation on economic development.**

Industrial hubs and clusters provide a significant economic development opportunity, as they may require new infrastructure to be built. In addition, hubs have the promise of making Michigan's industries more cost-competitive in a decarbonized economy, positioning them to last and maintain economic benefits for the state.

[7] The Federal Energy Regulatory Commission (FERC) has a scoping process that includes review of socioeconomic impacts as well as environmental impacts, which might inform this recommendation: https://www.ferc.gov/resources/processes/flow/process-eis-text

8) **What are the relative costs of this recommendation? Unknown, or different timeframe – explain why:**

The costs of policy changes to support the development of industrial hubs may be minimal, however the actual implementation of hubs may be costly, with those costs dependent on many factors.

9) **Who is empowered to implement this recommendation?**

- Local government
- State government – Executive
- State government – Legislative
- Federal government – Executive
- Federal government – Legislative
- Private sector

As noted below, fostering hubs will require collaboration among all of the actors listed above.

10) **Is there consensus among the subgroup for this recommendation, or are there differing perspectives? If differing perspectives, what are they?**

There was broad support among the group for this recommendation, however there were also concerns expressed how equity and environmental justice would be addressed in practice. Stakeholders noted that there isn't an existing successful model for how industry and communities can collaborate.

11) **What are the most important considerations for achievability and feasibility of this recommendation?**

The following measures should be considered:

NOTE: Letters in the list below are for reference purposes only; they do not reflect a ranking or prioritization.

A. Provide incentives for co-locating industrial facilities that can share infrastructure, energy, or materials streams to achieve significant greenhouse gas emissions reductions.

B. Foster collaboration among industrial companies to develop carbon capture, utilization, and sequestration (CCUS).

C. Update the contiguous industrial site definition to better allow energy-intensive industries access to renewable generation and more efficient cogeneration that could utilize low/zero carbon fuels.

D. Foster collaboration and engagement between industry and local communities to ensure that hubs and clusters are sited appropriately and do not incur harm upon

nearby communities. Moreover, ensure that existing industrial hubs and clusters are not incurring harm upon nearby communities.

E. To appropriately address equity and environmental justice concerns, the state and industry should work with affected communities to minimize impacts. In addition, there should be a way to measure effective and successful engagement.[8]

III. Enable Carbon Neutrality by 2050 through Energy Efficiency and Process Improvements

1) Overview of recommendation.

Rationale: Energy efficiency is a vital tool that can help Michigan's industrial sector reduce greenhouse gas emissions while keeping energy costs reasonable. In addition, industrial customers may need to make process changes and technology upgrades to enable them to accommodate net zero GHG emissions fuels. Both energy efficiency and process improvements should be considered collectively and holistically to ensure that Michigan's industries can achieve carbon neutrality by 2050 as cost effectively as possible. Notably, Michigan has several existing programs and partnerships that assist industrial facilities in advancing energy efficiency.

Recommendation: The Governor should direct the Michigan Department of Environment, Great Lakes, and Energy and the Michigan Public Service Commission to convene a stakeholder workgroup to recommend programs and partnerships to advance energy efficiency and process improvements to enable achieving carbon neutrality by 2050 in the industrial sector.

2) In what timeframe is this recommendation achievable?

The State should start industrial energy audits, technical assistance, and financial assistance programs immediately, and implement the stakeholder process before 2023. This will ensure that industry puts itself on a path to achieve the high levels of efficiency and the process improvements that are needed to reach carbon neutrality by 2050.

[8] The Federal Energy Regulatory Commission (FERC) has a scoping process that includes review of socioeconomic impacts as well as environmental impacts, which might inform this recommendation: https://www.ferc.gov/resources/processes/flow/process-eis-text

3) **What is the relative magnitude of this recommendation, in terms of GHG emissions reductions?**

Up to 5 million metric tons of CO_2 by 2050, primarily scope 1 fossil fuel and scope 2 electricity – although, we assumed electricity carbon intensity is driven to zero by 2050 and there will be diminishing carbon returns of using less electricity (and more cost savings). When recommendation #1 is successful there will be diminishing returns on scope 1 and 2 efficiency. The calculation assumes 1% year-over-year reduction in greenhouse gas emission due to energy efficiency for the next 20 years, starting with 9 million[9] metric tons CO_2e from fossil fuels and 17.3[10] metric tons CO_2 from electricity. A forecasted model for the next 30 years is not available but could be developed as part of this recommendation.

4) **Describe the potential impacts of this recommendation on environmental justice.**

Energy efficiency and process improvements may be able to reduce local air pollution in communities located near industrial facilities – this should be considered when making such improvements.

5) **Describe the potential impacts of this recommendation on labor.**

Energy efficiency would create new workforce opportunities from the energy audits and implementation. The availability of trained assessors could be a problem, and intensive training and attraction of new labor could present challenges.

6) **Describe the potential impacts of this recommendation on the environment.**

Energy efficiency improvements have the ability to reduce emissions and avoid the need for additional energy system infrastructure that would have environmental impacts. In other words, it can make better use of the infrastructure we already have in place, reducing the need to cause additional impacts.

7) **Describe the potential impacts of this recommendation on economic development.**

Energy efficiency improvements can create multiple benefits including lower operating costs and boosting local economy activity.

8) **What are the relative costs of this recommendation? Unknown, or different timeframe – explain why:**

Unknown

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[9] Data from the U.S. Environmental Protection Agency 2019 Greenhouse Gas Reporting Program, accessed September 2020. https://www.epa.gov/ghgreporting

This number includes 98 Michigan industrial facilities and excludes 137 facilities that fall under the categories of Energy Utilities, Petroleum, Natural Gas, Waste/Landfills.

[10] This number was found by applying industry's 29.4% of retail electricity sales referenced in footnote 2 to the states 58.9 million metric tons of CO_2 emissions from the electricity sector referenced in footnote 1.

9) Who is empowered to implement this recommendation?

- State government
- Private sector
- Other: This requires participation, collaboration, and implementation by both state government, industry, utilities, and financial institutions.

10) Is there consensus among the subgroup for this recommendation, or are there differing perspectives? If differing perspectives, what are they?

There was consensus amongst the group for this recommendation.

11) What are the most important considerations for achievability and feasibility of this recommendation?

The following measures should be included:

NOTE: Letters in the list below are for reference purposes only; they do not reflect a ranking or prioritization.

A. Expand technical assistance to aid industry in implementing energy efficiency and other measures to reduce GHG emissions through, but limited to the Retired Engineer Technical Assistance Program and the Industrial Assessment Center at Michigan State University.

B. Ensure that industrial energy audits offered through state or utility programs are comprehensive, going beyond lighting and insulation efficiency, and focus on equipment and industrial process efficiency. In addition, audits should identify opportunities to deploy carbon neutral fuels and technologies (see more under recommendation #1).

C. Leverage existing partnerships or create new partnerships between academia, state and federal agencies, utilities, and companies to develop more advanced approaches to industrial energy efficiency and enabling carbon neutral fuels.

D. Ensure that there are robust financing options to help industrial customers pay for the costs of efficiency measures, especially for small to medium companies. These options may include tax policy changes, accelerated depreciation, grants, commercial property-assessed clean energy, and expansion of existing green financial assistance programs, such as the Michigan Saves program. Priority should be given to facilities in disadvantaged communities. Importantly, the funding mechanisms for these incentives should be designed to avoid creating competitive disadvantages between industrial customers or cross subsidization between customer classes.

E. Expand education and outreach on energy efficiency offerings for industrial customers, including small and medium businesses.

IV. Implement a Policy for Public Procurement of Low Carbon Products

1) **Overview of recommendation.**

   Rationale: Public and private procurement is a critical lever that the State of Michigan can use to create demand for low carbon and circular economy products. In many states, these policies are referred to as “buy clean.” Such a policy would encourage or require that any state government procurement meet established carbon intensity benchmarks for certain industrial products being purchased.

   Recommendation: The Governor should direct EGLE to form a workgroup to craft, assess, model the potential impacts of, and implement a policy for public procurement of low carbon products, which would create market demand for low carbon products and support industry to pursue technology innovation that can reduce emissions. The workgroup should include both state government and industry stakeholders and should recommend specific policy language and design.

2) **In what timeframe is this recommendation achievable?**

   The workgroup that is proposed by this recommendation could be tasked with assessing the timeframe for achievability. The workgroup itself could be convened before 2025, with the policy taking place shortly thereafter.

3) **What is the relative magnitude of this recommendation, in terms of GHG emissions reductions?**

   This recommendation would increase the pace of decarbonization for recommendations #1, #2, #3.

4) **Describe the potential impacts of this recommendation on environmental justice.**

   Lowering the emissions intensity of industrial products may help to alleviate air pollution in communities living near industrial facilities.

5) **Describe the potential impacts of this recommendation on labor.**

   A low carbon procurement policy could create additional workforce opportunities for companies that are able to manufacture low carbon products.

6) **Describe the potential impacts of this recommendation on the environment.**

   By reducing the lifecycle emissions intensity of industrial products, this recommendation can have positive impacts on the environment.

7) **Describe the potential impacts of this recommendation on economic development.**

   This recommendation will support the development of industries making low carbon products.

8) **What are the relative costs of this recommendation? Unknown, or different timeframe – explain why:**

Unknown – to be assessed by workgroup.

9) **Who is empowered to implement this recommendation?**

State government, in collaboration with industry

10) **Is there consensus among the subgroup for this recommendation, or are there differing perspectives? If differing perspectives, what are they?**

There was strong support for this recommendation among the group. However, there were several questions raised about the specific policy that would eventually be implemented. The group acknowledged that these details would need to be worked out by the task force that develops the policy.

11) **What are the most important considerations for achievability and feasibility of this recommendation?**

Importantly, the requirements within the policy must be set appropriately to drive innovation and must rely on transparent information and disclosure. As such, the workgroup should consider environmental product declarations (EPDs) along with a procurement policy so that there is clear and comparable data available regarding the cradle-to-grave emissions intensity of products. EPDs should take advantage of existing reporting mechanisms to allow streamlined and convenient reporting.

In addition, the state should work to create a more circular economy to support carbon reductions at all scopes. Manufacturers can reduce their direct emissions through the use of energy recovery from waste streams, and reduce their supply chain emissions by utilizing more recycled feedstocks, including feedstocks generated through advanced/chemical recycling.

Finally, the state should consider implementing outreach and education to highlight processes and products that can help to reduce GHG emissions.

V. Support a Federal Carbon Pricing Market

1) **Overview of recommendation.**

Rationale: A federal carbon pricing market would help to advance net zero GHG emissions technologies and approaches.

Recommendation: The Governor should support a federal carbon pricing market.

2) **In what timeframe is this recommendation achievable?**

Unknown – it depends on bipartisan collaboration at the federal level.

3) **What is the relative magnitude of this recommendation, in terms of GHG emissions reductions?**

   This recommendation would increase the pace of decarbonization for recommendations #1, #2, #3 and #4.

4) **Describe the potential impacts of this recommendation on environmental justice.**

   This would likely reduce pollution in communities where industrial facilities are located.

5) **Describe the potential impacts of this recommendation on labor.**

   This would likely create labor opportunities for industries that are positioned to reduce emissions but may create labor challenges for industries that are not.

6) **Describe the potential impacts of this recommendation on the environment.**

   This would have positive environmental impacts by reducing greenhouse gas emissions.

7) **Describe the potential impacts of this recommendation on economic development.**

   This would create significant economic development opportunities by enabling a market transformation.

8) **What are the relative costs of this recommendation? Unknown, or different timeframe – explain why:**

   This would require significant investment to reduce emissions.

9) **Who is empowered to implement this recommendation?**

   Federal government

10) **Is there consensus among the subgroup for this recommendation, or are there differing perspectives? If differing perspectives, what are they?**

    There was broad support for this occurring at the federal level.

11) **What are the most important considerations for achievability and feasibility of this recommendation?**

    There was significant discussion about whether this is feasible as it depends on bipartisan collaboration.

Additional Recommendations

VI. Supply Chain

Rationale: Decarbonizing supply chains will reduce scope 3 emissions.

Recommendation: While many suppliers cannot share their supply chain information to customers due to trade secrets, the state should support voluntary measures among manufacturers to decarbonize their supply chains through programs.

Examples include, but are not limited to:

- Supply chain audits
- Partnering with academia and national labs to conduct facility walkthroughs
- Working with suppliers that are signers to the UN Global Compact, ISO 50001 certified, or other formal programs or commitments.
- Amending the Clean Corporate Citizen and the Michigan Business Pollution Prevention Partnership statutes to support these recommendations.

VII. Research, Development, and Deployment (RD&D)

Recommendation: The state should strengthen its relationships with federal agencies to position itself as a leader in the RD&D space.

VIII. Address Non-Carbon GHG Emissions From Industry:

Recommendation: The state should address non-carbon GHG emissions from industry, including gases such as sulfur hexafluoride (SF6).