Decarbonizing Minnesota's Natural Gas End Uses Stakeholder Process

Clean Energy Partnership Board Meeting

February 9, 2021

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AGENDA

- About the Stakeholder Process
- Why the Process was Convened
- What We've Done So Far
- Where We Are
- Where We're Going
- Questions/Discussion

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About the Stakeholder Process

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About the stakeholder process

- Explore pathways and develop recommendations around decarbonizing natural gas end-uses in Minnesota.
- Take a portfolio approach
- Use scenario planning
- Drive toward consensus

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About the stakeholder process

- Convened by GPI and CEE
- Planning Team includes:
  - Luke Hollenkamp, City of Minneapolis
  - Nick Mark, CenterPoint Energy
  - Nick Martin and Sydnie Lieb Ph.D., Xcel Energy
  - Margaret Cherne-Hendrick Ph.D., Fresh Energy
  - Trevor Drake, Great Plains Institute
  - Audrey Partridge, CEE
- Stakeholders include a broad range of entities and perspectives.
- Learn more at: https://e21initiative.org/natural-gas/

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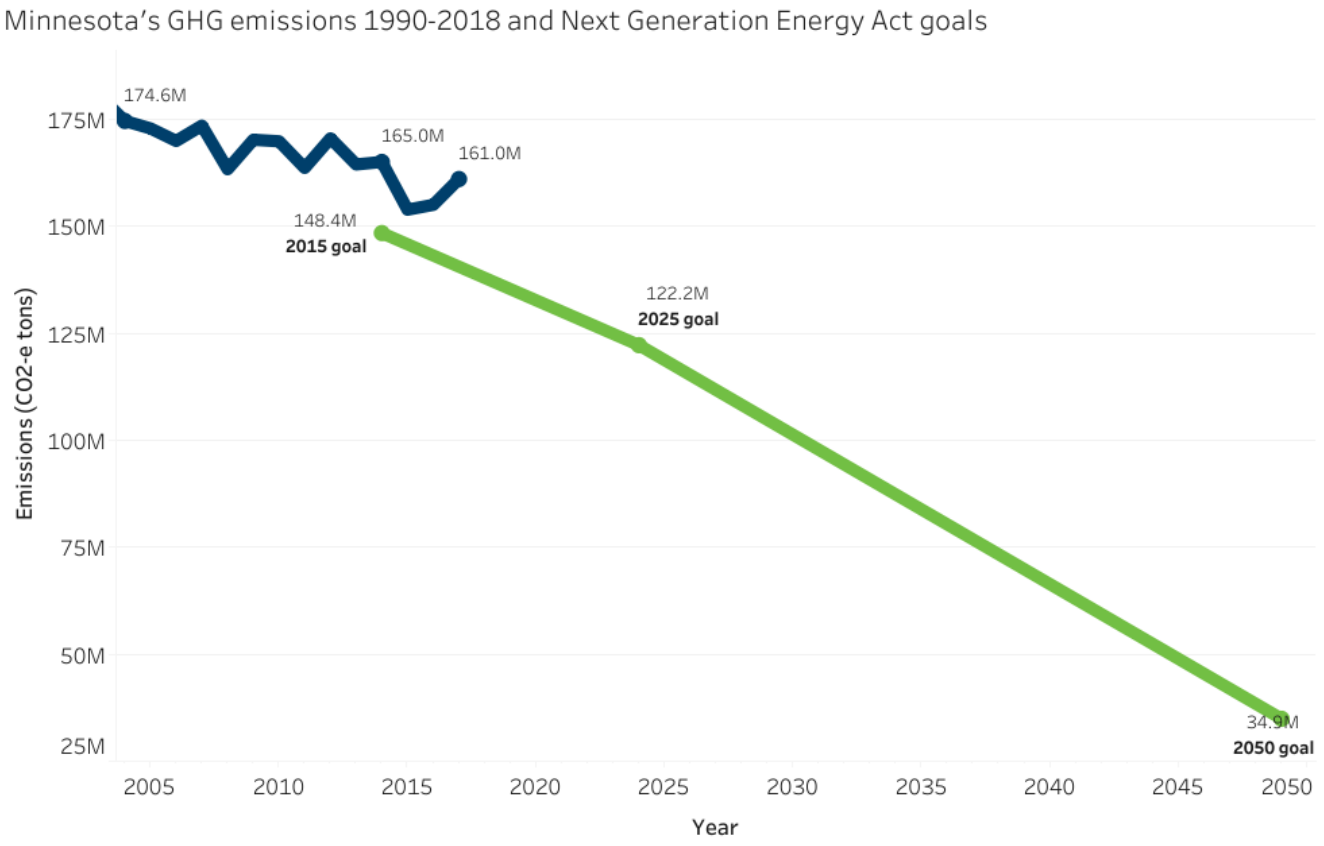
Why the process was convened?

Minnesota emissions goals

Greenhouse gas emissions data

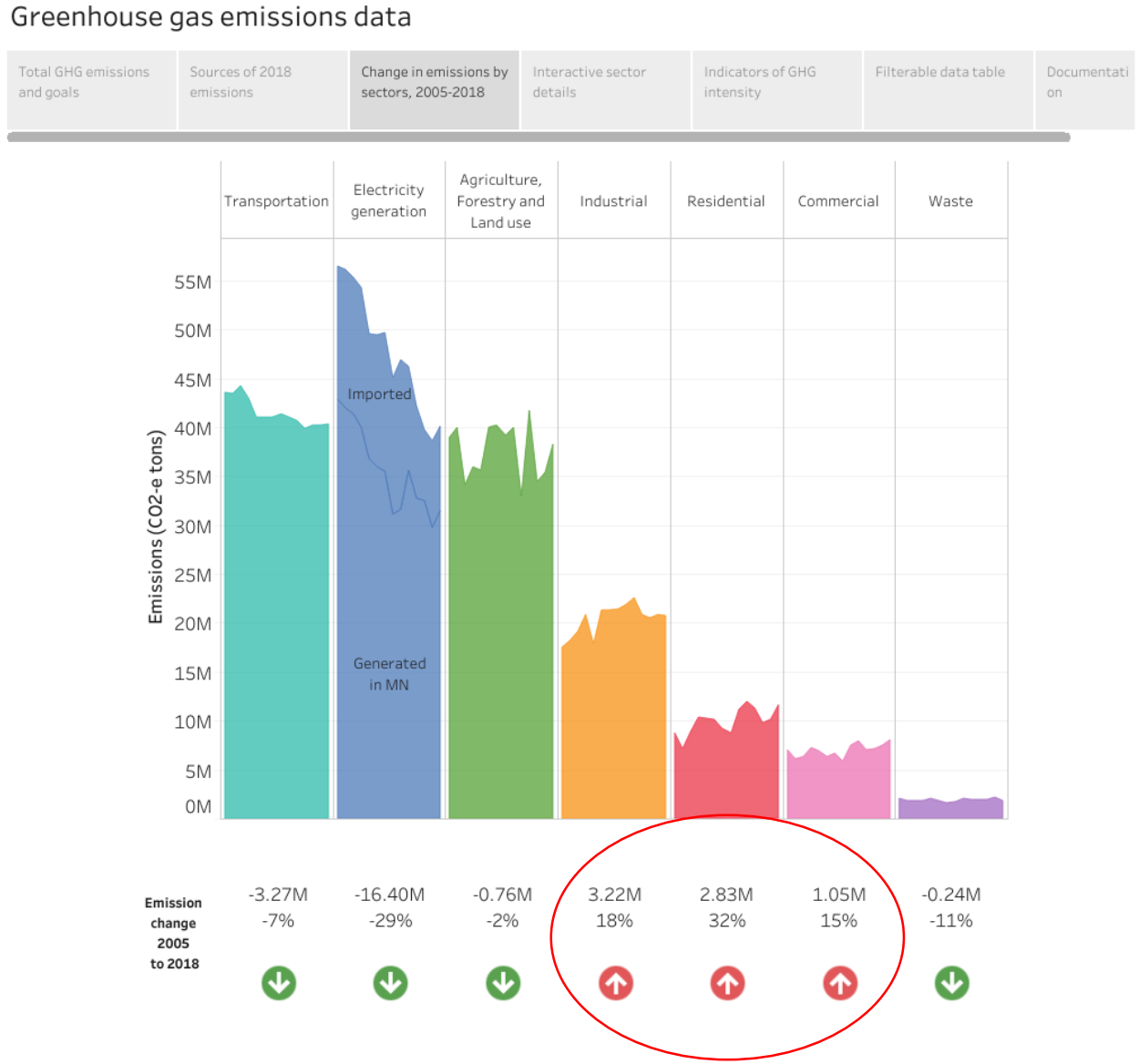
Total GHG emissions and goals	Sources of 2018 emissions	Change in emissions by sectors, 2005-2018	Interactive sector details	Indicators of GHG intensity	Filterable data table	Documentation



Minnesota is behind in meeting our milestone greenhouse gas reduction goals.

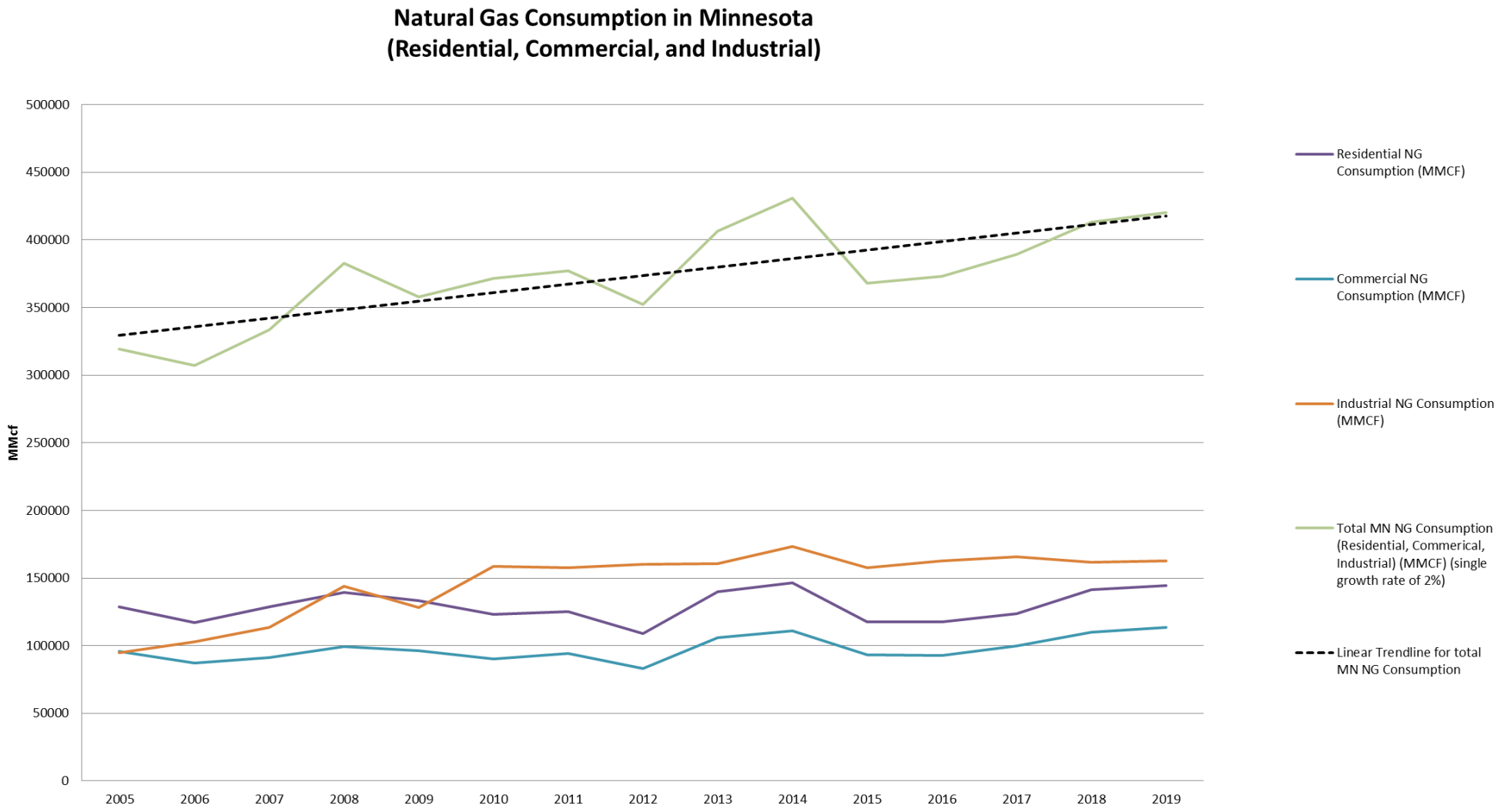
Source: https://www.pca.state.mn.us/air/state-and-regional-initiatives

MN emissions trends by sector



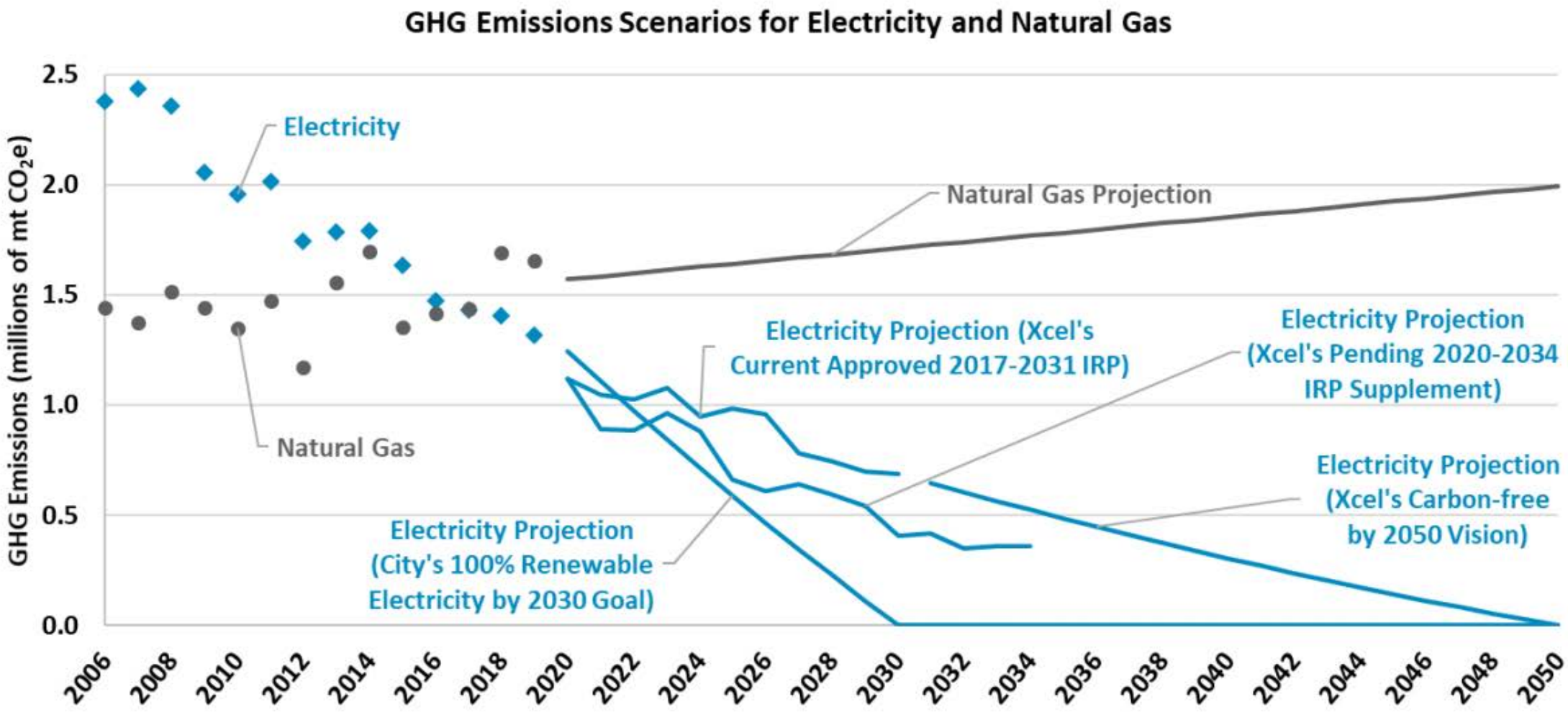
Source: https://www.pca.state.mn.us/air/greenhouse-gas-emissions-data

MN trends in natural gas consumption



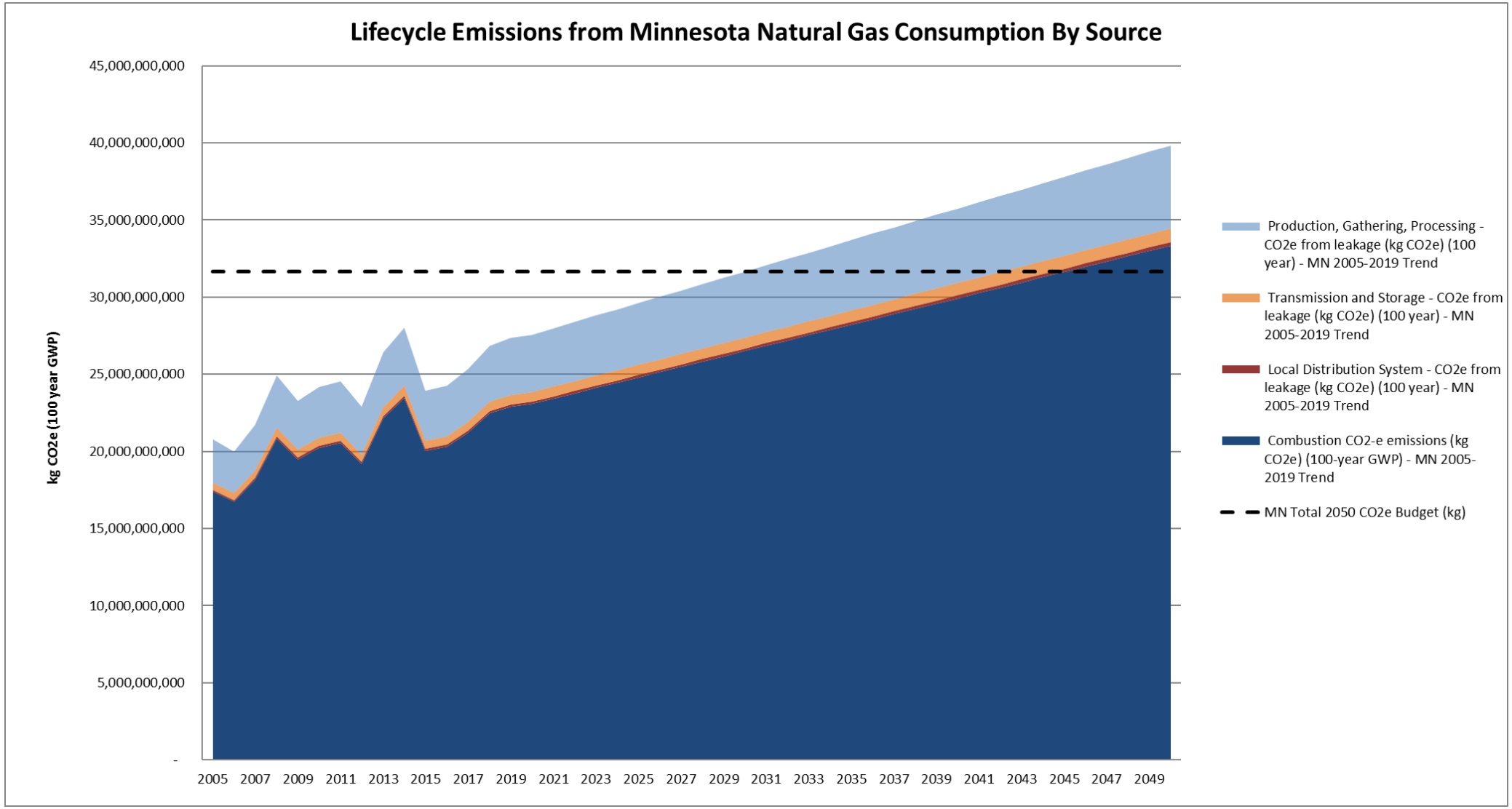
Source: U.S. Energy Information Administration

Mpls trends in natural gas consumption/emissions



Source: Clean Energy Partnership - 2019 Annual Report and Q3 2020 Board presentation

MN emissions from natural gas



Reducing emissions from natural gas will be challenging, with wide-ranging implications.

What we've done so far.

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Guiding Principles

Affordability

- Keep space heating and water heating affordable for all Minnesota residents, particularly in under-resourced communities that experience the highest energy burden (share of household income spent on all types of energy costs).
- Keep space heating, water heating, and process loads affordable for Minnesota businesses.

Equity

- Ensure that the decarbonization of natural gas end uses is done in a way that reduces current inequities and does not create new inequities, in terms of costs and benefits.
- Ensure that the benefits of the transition – in terms of emissions benefits, economic benefits, public health benefits, and energy affordability benefits – are experienced among Minnesotans, especially workers, under-resourced communities, and communities in Greater Minnesota.
- Ensure that all Minnesotans have the ability to adopt technologies and fuels that decarbonize natural gas end uses affordably and effectively.

Guiding Principles

Environment

- Work toward practical, scalable, timely solutions to achieve reductions in GHG emissions and other pollutants.
- Maintain urgency, in line with Minnesota's established GHG reduction goals as well as leading climate science from the United Nations Intergovernmental Panel on Climate Change.

Economy

- Ensure that decarbonization of natural gas end uses in Minnesota supports economic development and innovation throughout the state.
- Manage disruption and create opportunities with regard to businesses, workforce, communities, and infrastructure.

System Considerations

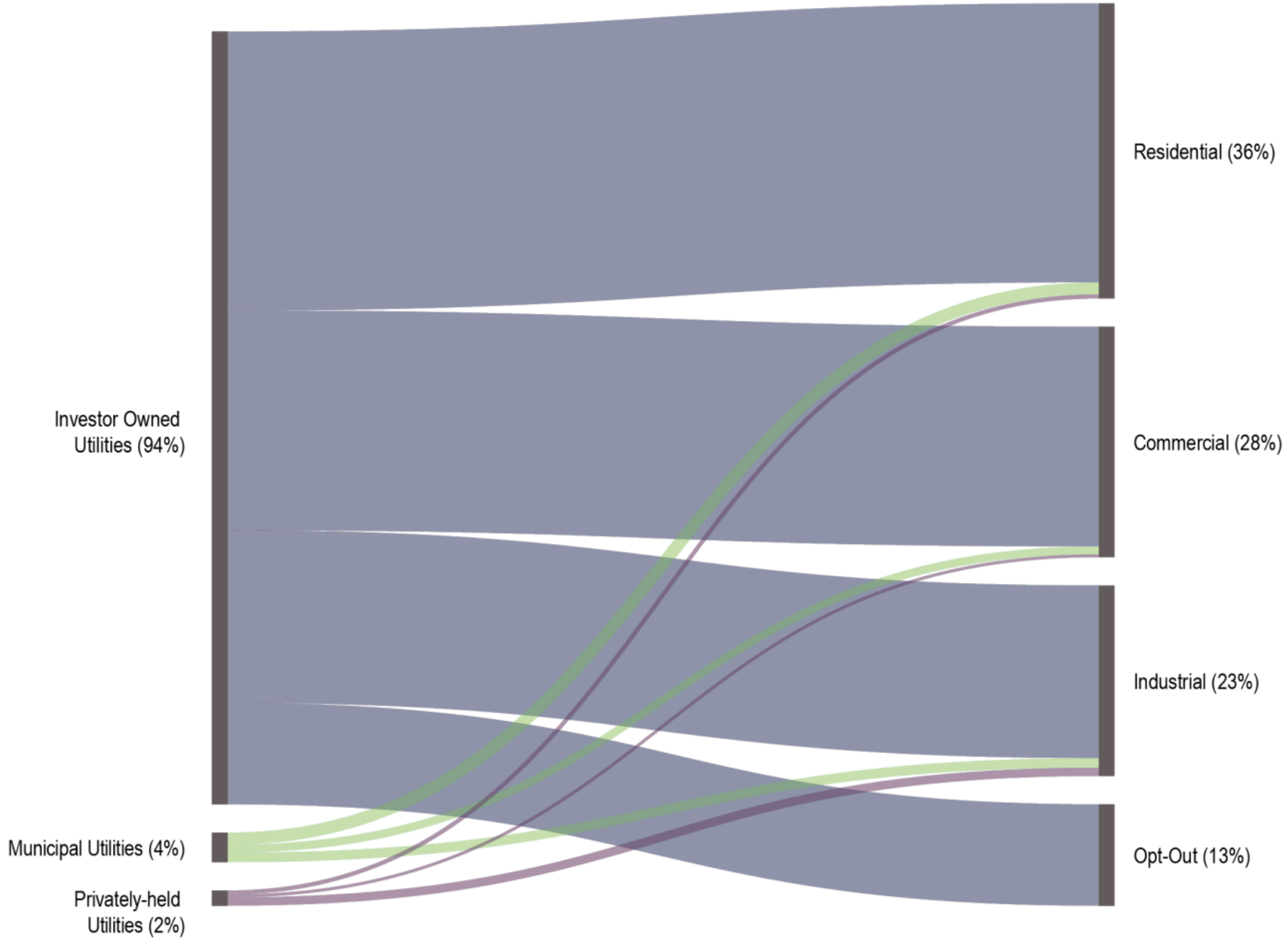
- Tailor metrics of success to be specific to Minnesota's current and future climate, economy, energy system, and other unique characteristics.
- Consider system impacts and unintended consequences for both gas and electric to ensure a cost-effective transition to utilize current assets strategically and avoid unnecessary expense.
- Develop a portfolio of solutions that improves upon the current situation (with attention to these principles) and is capable of meeting Minnesota's diverse end use needs.
- Consider the different conditions and priorities of local communities in developing solutions.

Natural Gas Emissions and Attributes

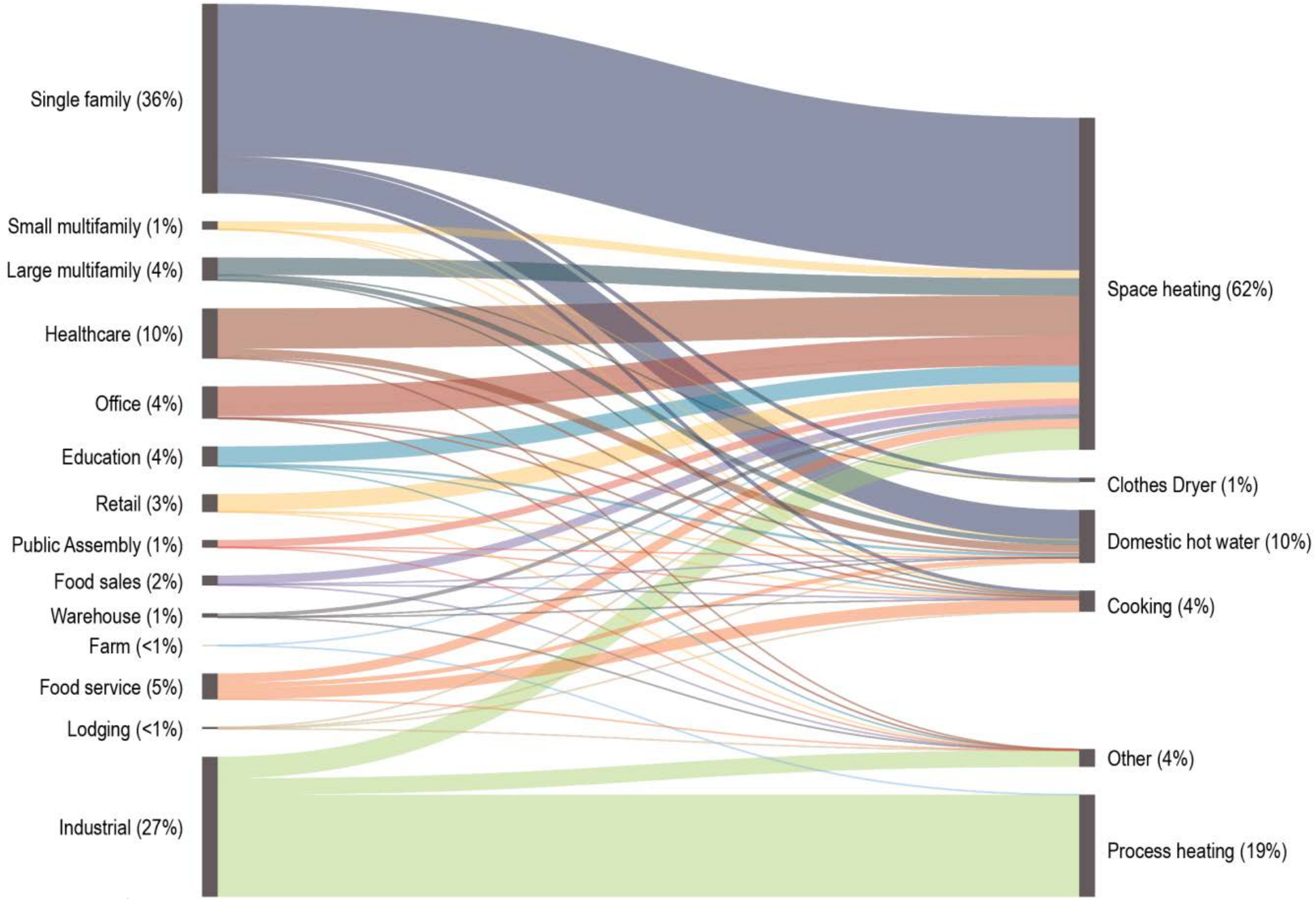
Natural gas is a fossil fuel that creates 2 types of greenhouse gas (GHG) emissions, plus pollutants.

Combustion emissions (Carbon dioxide, CO2)	Leakage emissions (Methane, CH4)	Criteria pollutants that affect air quality, carbon monoxide (CO)

Natural gas is currently plentiful, relatively inexpensive, and capable of meeting Minnesota heating loads.



Source: Minnesota Department of Commerce



Source: Minnesota Department of Commerce

Potential decarbonization solutions

- **Deep dive into technologies and fuels**
  - Energy Efficiency
  - Geothermal District Energy Systems
  - Electrification
  - Renewable Natural Gas
  - Hydrogen

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Other Considerations

- Workforce
  - Challenges and opportunities
  - Current and future
- Equity
  - Challenges and opportunities
  - Current and future

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Where we are now.

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This study investigates opportunities for 100% gas end-use decarbonization through 3 scenarios

Technology focus

High Electrification

- **Almost all buildings switch to ASHPs and GSHPs. Heating is supplied by electricity throughout the entire year. Some features:**
  - All-electric for new construction
  - High efficiency through building retrofits
  - Industrial electrification where technically viable

High Electrification with Gas Back Up

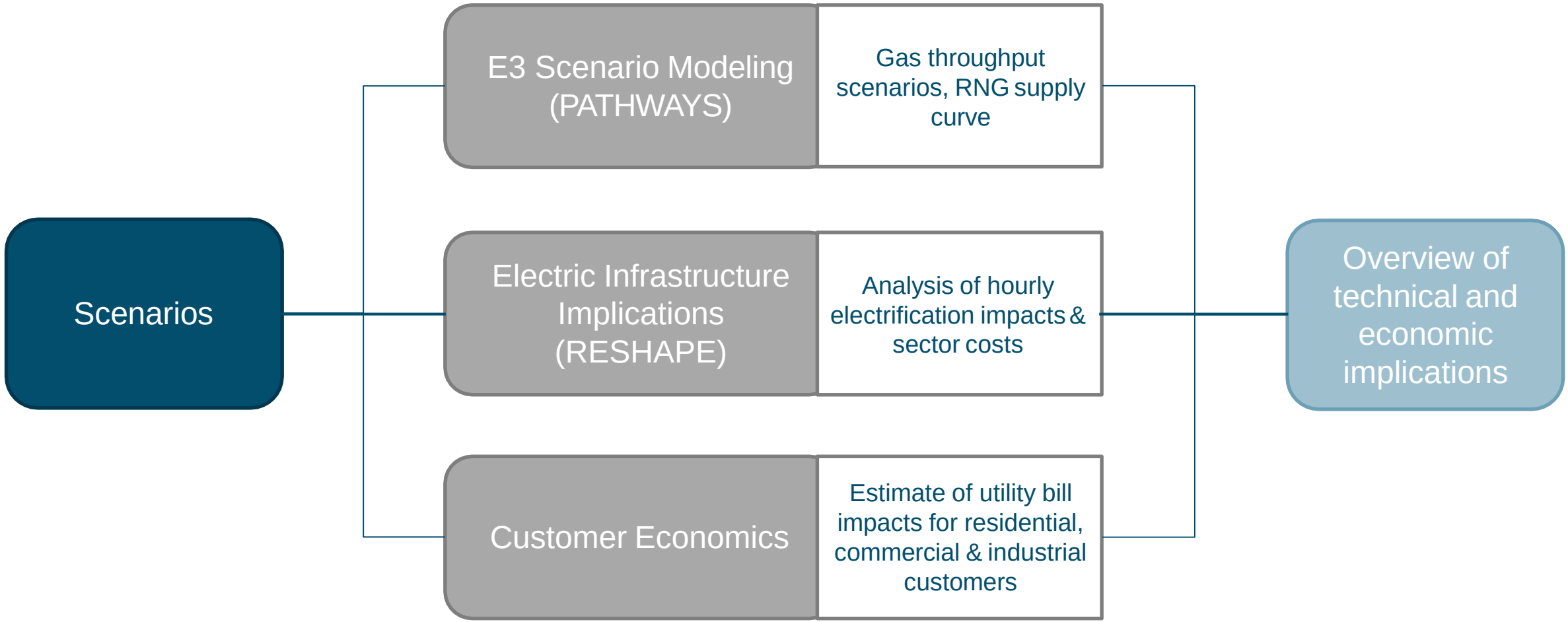
- **Buildings keep their gas connection and are supplied with a heat pump combined with gas furnace that serves as back up in the coldest hours of the year. Some features:**
  - All-electric for new construction
  - High efficiency through building retrofits
  - Industrial electrification where technically viable

High Decarbonized Gas

with dedicated hydrogen in industrial sector

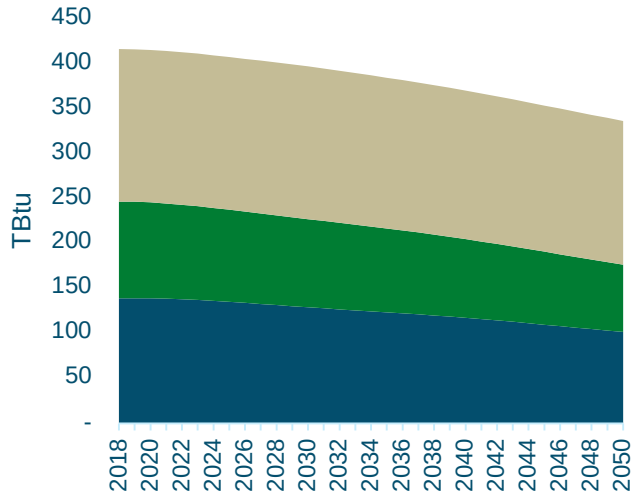
- **Buildings keep their gas connection while natural gas is gradually replaced by RNG. The industrial sector switches to hydrogen. Some features:**
  - RNG supplied by biomethane and synthetic natural gas
  - High efficiency through building retrofits
  - Dedicated hydrogen in Industry, 7% hydrogen blend in other sectors

Modeling approach: 3 steps to analyze the impacts of gas end-use decarbonization scenarios

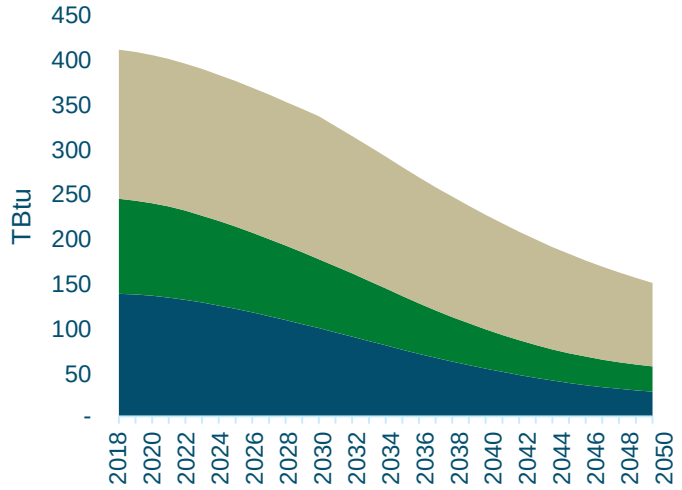


The decarbonization scenarios show a varying decline in gas consumption

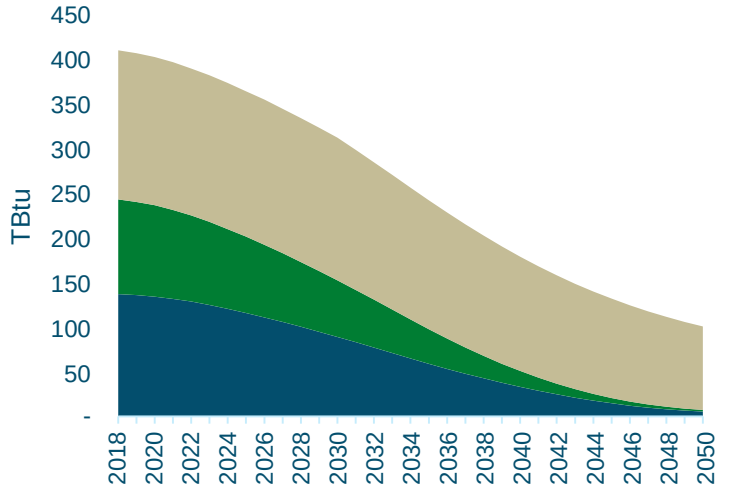
High Decarbonized Gas



Electrification with Gas Back Up



High Electrification



Residential | Commercial | Industrial

- **Overall gas sales declines slightly**
- **Sales decline mostly as a result of energy efficiency (and moderate switch to HPs)**

- **Gas sales in buildings declines steeply**
- **Reliance on gas in coldest hours (24% of residential heating load)**

- **Gas sales in buildings sector almost eliminated towards 2050**
- **Gas sales dominated by industrial sector in 2050**

Sources & assumptions: full list of scenario parameters is included in the Appendix.

Electricity consumption increases in Electrification scenarios

High Decarbonized Gas

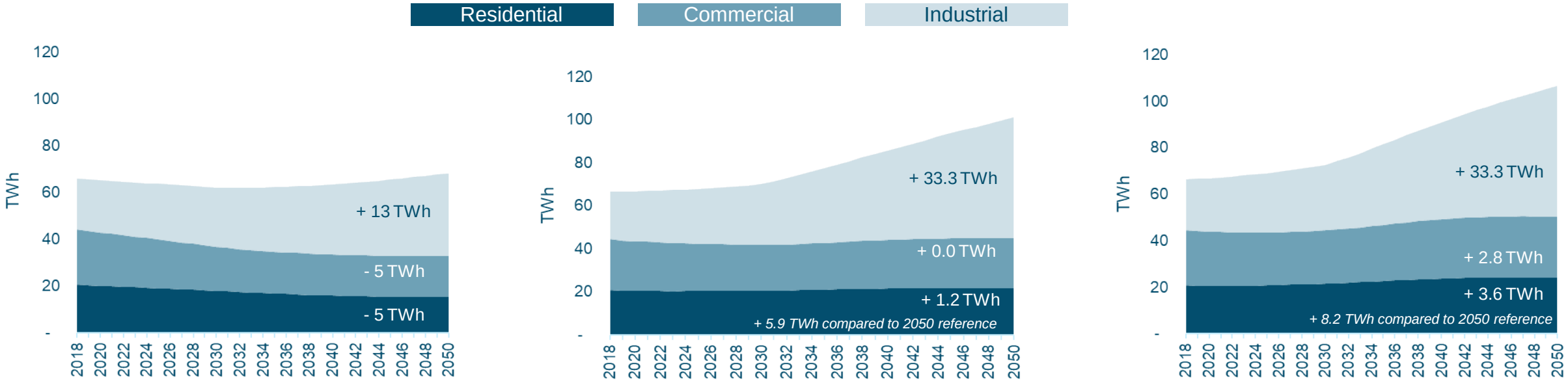
- **Electricity load increases by around 4%**
- **Limited growth in industrial sector as a result of electrification in sectors with low temperature heat**

Electrification with Gas Back Up

- **Electricity load grows by 52%**
- **Most of load growth corresponds to significant industrial electrification**
- **Load in buildings increases only slightly as a result of efficiency**

High Electrification

- **Electricity load grows by 59%**
- **Most of load growth corresponds to significant industrial electrification**
- **Load in buildings increases only slightly as a result of efficiency**



Sources & assumptions: electricity consumption is largely influenced by energy efficiency measures in the reference scenario. Increases electricity sales in High Electrification and Electrification with Gas Back Up scenario are the result of fuel switching. Average COPs per measure are included in the Appendix.

High-Level Takeaways for all Three Scenarios

- Decarbonization of Minnesota's natural gas end-uses by 2050 is possible.
- Efficiency will be an important tool (in terms of costs and feasibility).
- Energy costs will increase (compared to today).
- Will require significant policy and financing.
- Continued technological improvements will help.

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Where we're going.

Next Steps – Develop Recommendations

- **Break into subgroups (December 2020)**
  - Utility and regulatory
  - Workforce
  - Residents and small businesses
  - Large commercial and industrial
  - Equity considered throughout
- **Bring in outside experts and information as needed**
- **Subgroups report back to larger group and agree upon recommendations (January-March 2021)**
- **Final Report (April 2021)**

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From there, we'll work to move the recommendations forward.

Thank you!

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