Duluth Energy Plan Commission Recommendation

January 23, 2025

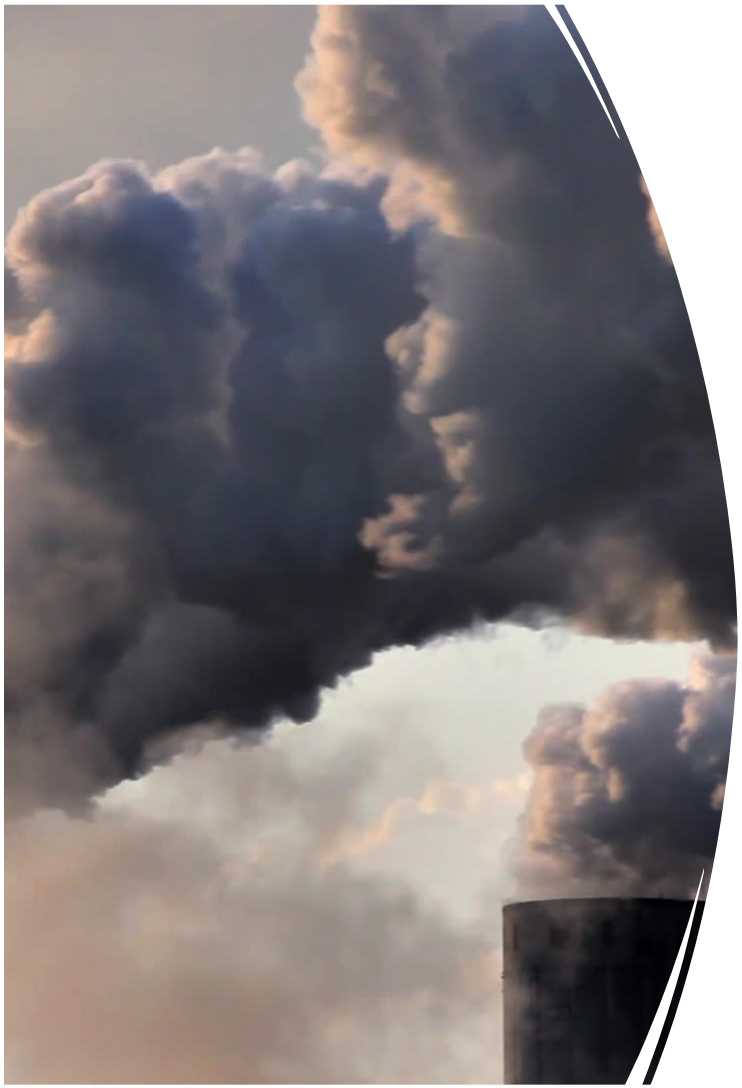
"The purpose of the commission is to advise the administration and city council on ways to achieve the goal of reducing the city's greenhouse gas emissions by 80 percent by 2050"

From Duluth City Ordinance Chapter 2 Article XXV

1. The Goal: Greenhouse Gas (GHG) Reduction

- Duluth
- 80% by 2050 from 2008 levels (EPC's charge by City Council on 3-13-2019)
- 100% by 2050 (Mayor Larson statement 2022)

- State of Minnesota
  - 50% by 2030 from 2005 levels
  - 100% by 2050 from 2005 levels
  - 100% carbon free electricity by 2040, 55% from renewable sources
- Reference: MN Action Framework 2022



2. The Cause: Burning of Fossil Fuels

Fossil fuels

- The burning of coal, oil, and natural gas for electricity and heat is the largest source of greenhouse gas emissions. Fossil fuels account for over 75% of global greenhouse gas emissions.

Reference: US Environmental Protection Agency (EPA)

- Greenhouse gases trap the sun's heat in the Earth's atmosphere, causing climate change.

Reference: United Nation Climate Action

2. The Cause: Greenhouse Gas (GHG) Emissions per Fuel

Pounds of CO_2 emitted per million British thermal units (Btu) of energy for various fuels:

- Coal (anthracite) 228.6
- Coal (bituminous) 205.7
- Coal (lignite) 215.4
- Coal (subbituminous) 214.3
- Diesel fuel and heating oil 161.3
- Gasoline (without ethanol) 157.2
- Propane 139.0
- Natural gas (aka methane gas) 117.0

- Reference: American Geosciences Institute

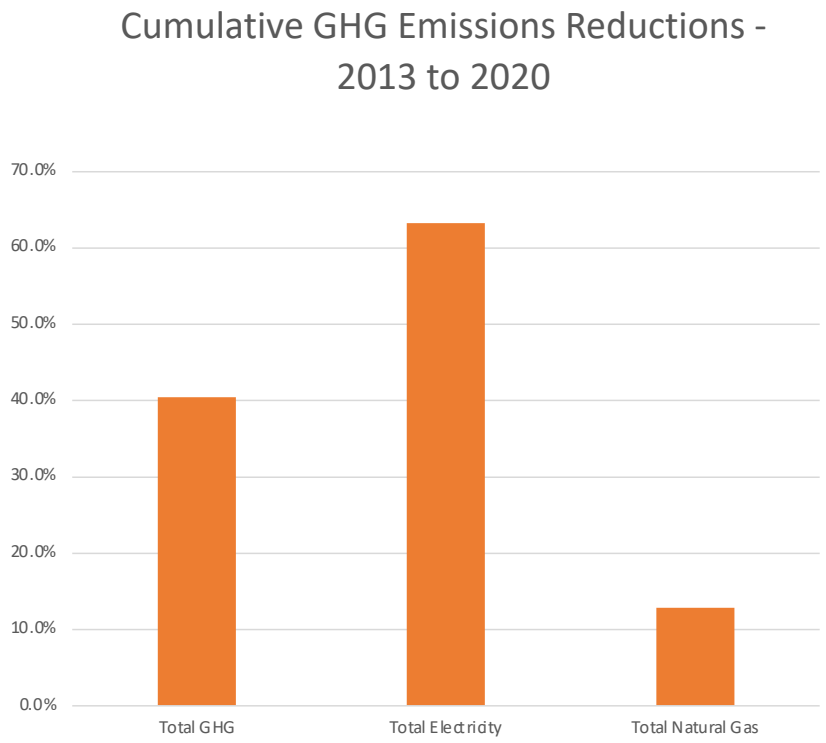
3. The Trends: City Owned Facilities and Vehicles

- 2008 – 39,006 metric tons CO2e
- 2023 – 14,301 metric tons CO2e
- 63% reduction

3. The Trends: Duluth Community GHG Reductions - 2013 to 2020

- Total community GHG: 40% reduction (from 1,444,482 to 680,780 tons CO2e)
- Total electricity GHG: 63% reduction (from 724,677 to 266,341 tons CO2e)
- Total natural gas GHG: 13% reduction (from 401,037 to 349,668 tons CO2e)

Reference: Regional Indicators Initiative Minnesota



3. The Trends: Duluth Community GHG 2013 to 2020

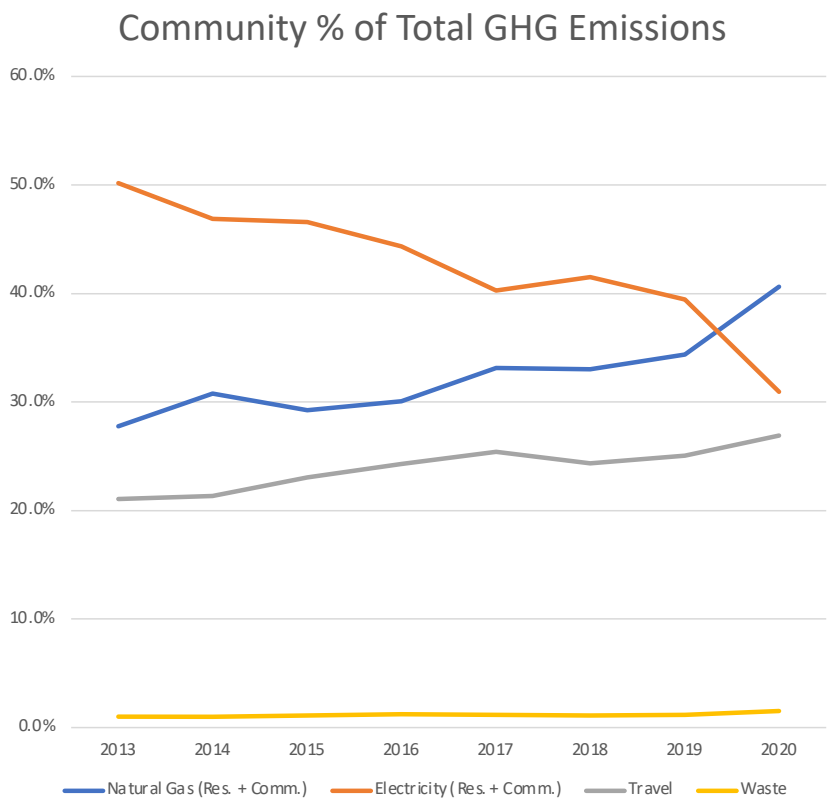
- Percent of Duluth's GHG from electricity

Decreased from 50.2% in 2013 to 30.9% in 2020

- Percent of Duluth's GHG from natural gas

Increased from 27.8% in 2013 to 40.6% in 2020

Reference: Regional Indicators Initiative Minnesota



4. The Problem:

Thermal energy is being primarily provided by the burning of fossil fuels.

- While the GHG from electricity usage has decreased significantly, this is not true for natural gas.
- Electricity - Minnesota Power, has reduced its GHG by switching to renewable energy systems, currently 50% of its energy is from renewables.
- Electricity – There have been many improvements in major electrical equipment over the past 20-30 years.
- Electricity - Minnesota law requires Minnesota electric utilities to be 100% carbon free by 2040.
- Natural gas – There is a limit to GHG reductions because the energy source is fossil fuel.

5. The solution:

Zero GHG Thermal Energy

- Demand Side
- Supply Side
- Hybrid of Demand and Supply Side – Thermal Energy Network

5. The Solutions: Demand Side Actions

- Demand side – reducing the energy needed to operate a building (ECO – Energy Conservation and Optimization programs)

  1. Improve building envelopes
  2. Use passive solar design principles
  3. Use more energy efficient equipment

- Demand side measures can potentially reduce energy needs by up to 38%
- This is a very important aspect for Comfort System mission and activities

5. The Solutions: Supply Side Actions

- Supply side – change to clean energy sources

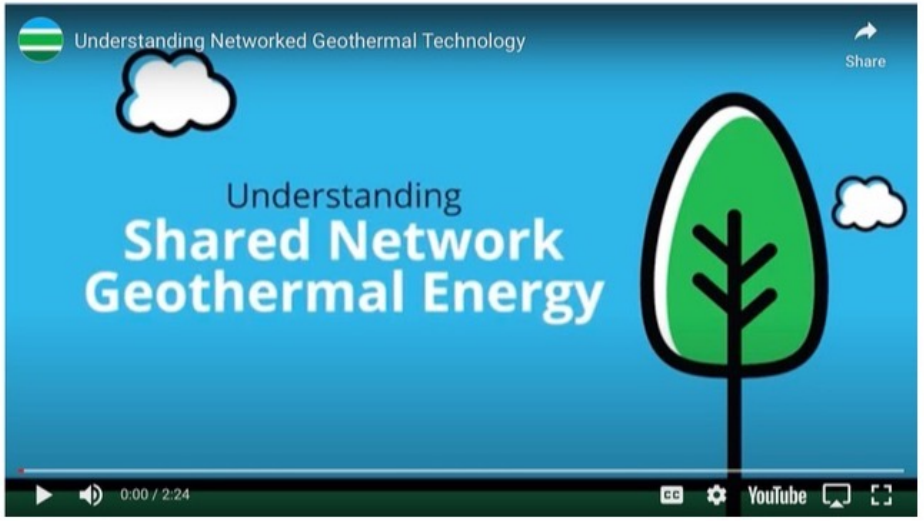
    1. Passive solar design
    2. Electrification from clean electricity
    3. Heat pumps – air and ground source
    4. Geothermal energy
    5. Thermal energy networks

5. The Solution: UMD's Bagley Outdoor Classroom

5. The Solutions: Thermal energy networks

- Thermal energy network can be thought of as many ground source heat pumps connected together
- Provide both heating and cooling
- Provide consistent heating when outside temperatures are very low
- Provide up to six units of thermal energy for every one unit of input energy (COP)
- They are expandable and can be connected to other thermal networks
- Are a local and resilient energy source

Quick Intro to Thermal Energy Networks



6. The EPC Recommendation

We need to act now to start transitioning Comfort Systems to a more sustainable model for their own longevity and the benefit of their customers. The Energy Plan Commission recommends that the Duluth City Council and the Duluth Administration:

1. Create a position or task force focused on developing a plan for Duluth Comfort Systems to meet the City's goal of zero greenhouse gas (GHG) emissions by 2050.
2. Provide secure funding to support energy transition planning for Comfort Systems.

6. Recommendation: Background

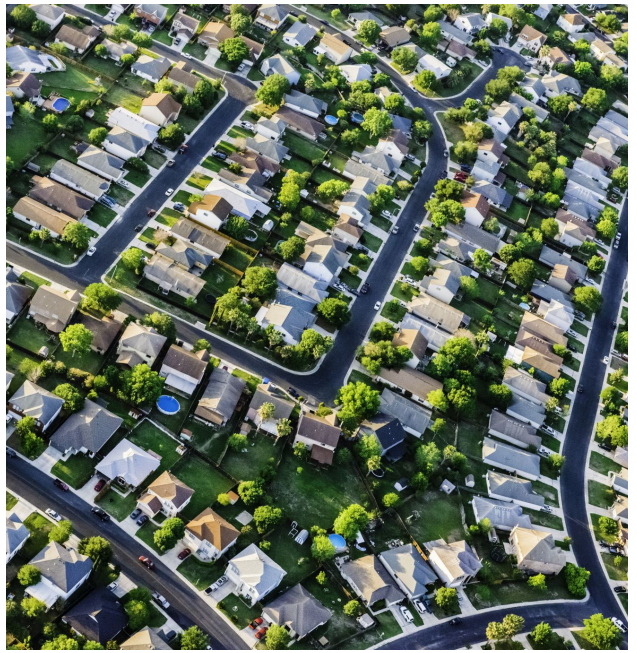
- 1. The City of Duluth has a stated goal of reducing GHG emissions 50% by 2030 and reaching carbon neutrality by 2050.
- 2. GHG emissions from methane gas consumption within the City of Duluth has been reduced by 12.8% (2013 to 2020). This compares to GHG emissions from electricity consumption within the City of Duluth which has been reduced by 63.2% over the same time frame. (Source - Regional Indicators Initiative)
- 3. Community wide GHG emissions from methane gas as a percent of the total community emissions has increased from 27.7% in 2013 to 41.6% in 2020. In contrast, community wide GHG emissions from electricity as a percentage of the total emissions have decreased from 50.1% in 2013 to 30.9% in 2020. (Source - Regional Indicators Initiative)
- 4. These emissions can be reduced significantly by energy conservation measures.
- 5. The remaining thermal energy can be totally produced by clean energy sources that are currently available and beneficial to both the utility and its customers.
- 6. With city-wide updates to utility infrastructure come additional opportunities for resiliency planning such as burying electricity lines to reduce potential power outages.
- 7. As customers of Comfort Systems convert to electric alternatives for their thermal energy needs, the cost of natural gas will rise for those left on the system. Since electrification often requires substantial upfront costs, this increase in cost will be borne by customers who are least able to afford these increases.
- 8. Planning for the decarbonization of Comfort Systems should include a study of their current operations, a revision of their business model and a transition to clean energy sources which will include replacement of existing natural gas equipment.
- 9. This transition may also include changes in City policy. This could include, for example, a policy of working with developers and builders of new or substantially renovated buildings to encourage electrification.
- 10. A number of Cities around the country have established similar long-term funding for their sustainability needs through taxes, mill rate increases, etc.

6. Recommendation: Background

6. With city-wide updates to utility infrastructure come additional opportunities for resiliency planning such as burying electricity lines to reduce potential power outages.
7. As customers of Comfort Systems convert to electric alternatives for their thermal energy needs, the cost of natural gas will rise for those left on the system. Since electrification often requires substantial upfront costs, this increase in cost will be borne by customers who are least able to afford these increases.
8. Planning for the decarbonization of Comfort Systems should include a study of their current operations, a revision of their business model and a transition to clean energy sources which will include replacement of existing natural gas equipment.
9. This transition may also include changes in City policy. This could include, for example, a policy of working with developers and builders of new or substantially renovated buildings to encourage electrification.
10. A number of Cities around the country have established similar long-term funding for their sustainability needs through taxes, mill rate increases, etc.

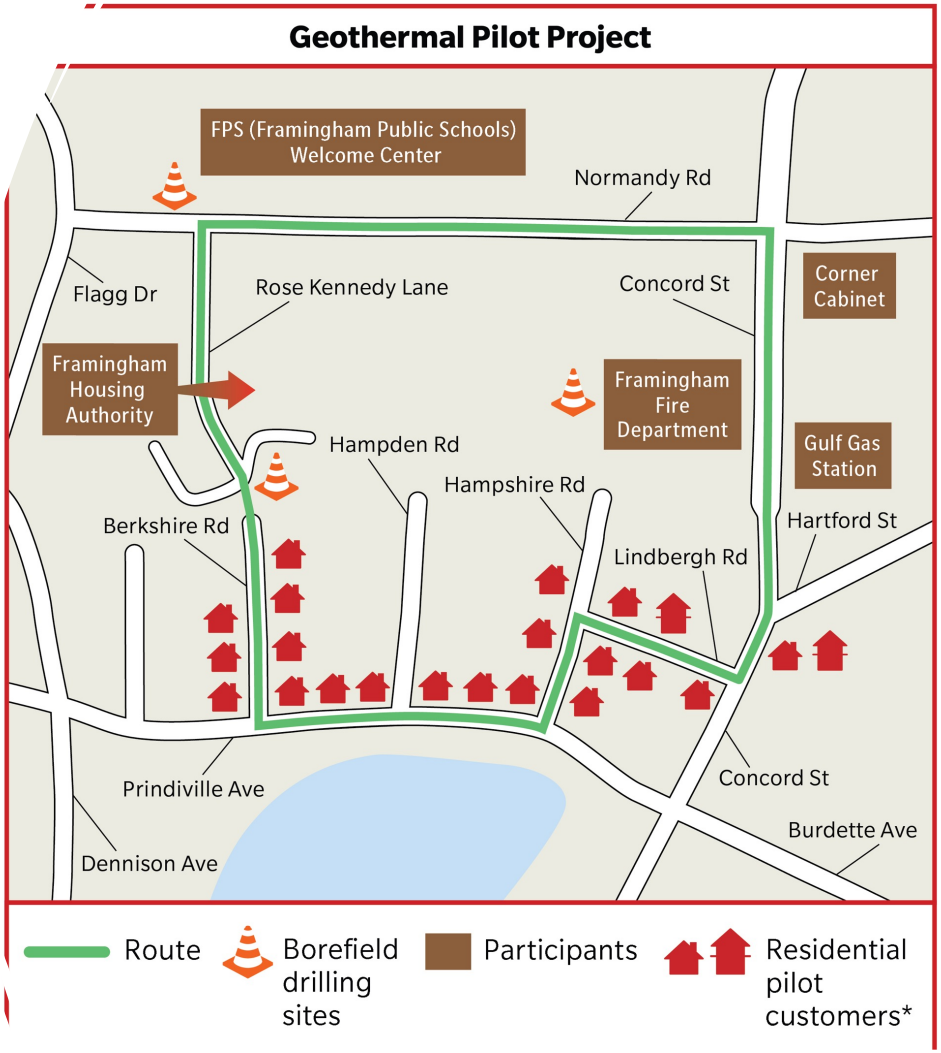
7. Examples: How other communities have funded sustainability goals

- Ann Arbor, MI - 20-year mill levy passed – provides $6.8 million per year – 18 person staff
- Denver, CO – 0.25% sales and use tax - raises $40 million annually for sustainability efforts
- Athens, OH - $0.002/kWh charged on electric bills
- Boulder, CO – Climate tax of about $50 per year per residential customer (higher amounts for commercial and industrial) - raises $6.5 million for climate efforts
- Orange County, NC – property tax increase of $0.0025 per $100



7. Examples: Technologies

- HEET & Eversource Energy: Thermal Energy Network Pilot in Framingham, MA
- Vermont Gas Systems
- MN Natural Gas and Innovation Act (NGIA) - CentrePoint Energy and XCEL Energy PUC filings

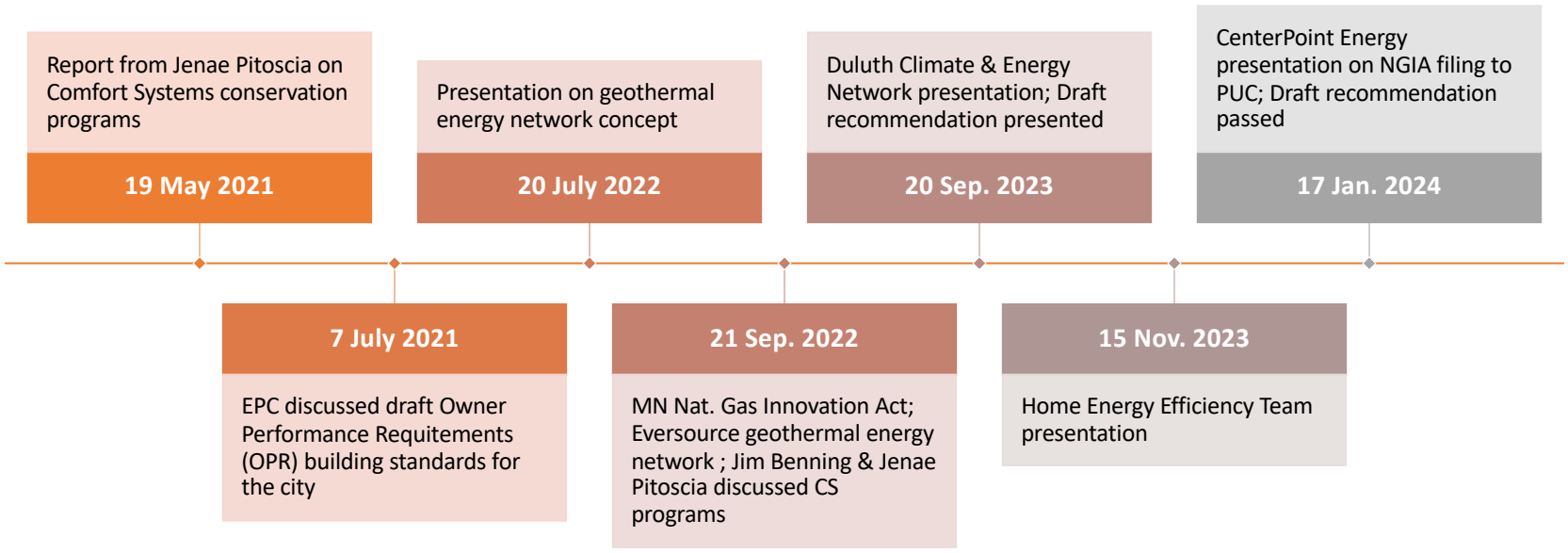


7. Examples: Geo-Thermal Energy Networks in Minnesota

- Rochester City Hall
- Woodbury Central Park
- Metro Transit's North Loop Garage
- Carleton College
- The Heights Redevelopment Project – East Saint Paul
- Winona Public Schools

Questions, Comments

EPC Meetings related to Comfort Systems



Eversource – Framingham Mass. Geothermal Pilot Project

- https://www.youtube.com/watch?v=Hu3I0LfgMiM&t=1s

Link to Regional Indicators Initiative

- https://www.regionalindicatorsmn.com

EPC Presentation to the Duluth City Council – January 23, 2025

Thank you

President Tomanek and councilors, I'd like to **thank you** first for this opportunity for the Duluth Energy Plan Commission (the EPC) to speak to you tonight about the recommendation that we made to the City last year.

EPC History

My name is Gary Olson, and I am the chair the EPC. Our commission was formed in 2019 by City Ordinance and was chartered to have seven members. Some of our commissioners are here tonight (**introduce commissioners**), and they are able to answer questions about this recommendation as well as I am.

Grateful for City Staff

We are also very grateful for the many **city staff** that has worked with us over these five plus years. We are especially grateful for the knowledge, advice, and leadership of our City's Sustainability Officer, **Mindy Granley**, who by the way, was one of the original commissioners on the EPC.

I have a short presentation about the recommendation, the reasons for the recommendation and the solutions that we are urging the City to pursue. (Start PP)

Slide 1 The EPC Purpose

The City's **charge given to the EPC** was to "advise the administration and city council on ways to achieve the goal of reducing the city's greenhouse gas emissions by 80% by 2050".

Slide 2 The Goal

In addition to this original **goal**, Mayor Emily Larson, in 2022, updated that to a 100% reduction. And the State of Minnesota has, in recent legislation, established the goal of 100% reduction of GHGs statewide by the year 2050.

Slide 3 The Cause

Just to remind us, the **major causes** of GHG emissions is the burning of fossil fuels including coal, oil and natural gas (or methane). This burning produces 75% of the GHG emissions in the world. Greenhouse gases trap the sun's heat causing climate change.

Slide 4 The Cause

I wanted to include this slide, and this photo of the Duluth Energy Plant, to point out that changing from burning coal to burning natural gas or methane, which this plant has done, is a significant improvement in reducing GHGs. However, we are still using the burning of natural gas throughout our community for the majority of our thermal energy needs, and this will still produce significant GHGs.

Slide 5 The Trends

So, let's turn to where we are now and how things are **trending**. For the **corporate city**, we have made significant progress on our goal: being at 63% GHG reduction in 2023 from a 2008 baseline. And this we should be grateful for. The problem is that our improvements have flattened out recently and we still have the remaining 37% to eliminate.

Slide 6 **The Trends**

Now let's look at the Duluth **community as a whole** and its GHG emissions. In 2010 the State of Minnesota started the Regional Indicators Initiative. It was established to give Minnesota cities more detailed information on their energy, water, travel and waste usage community wide. The EPC has looked at this data for Duluth and have noted the following trends. From the period between 2013 and 2020, we have achieved a 40% reduction of GHGs community wide. There has been a 63% reduction from the electricity sector but only a 13% reduction in the natural gas sector.

Slide 7 **The Trends**

This graph really reveals the **issue of most concern** to our meeting the City's GHG reduction goal. This graph shows the percent of the community's GHG emissions from the four main sectors. The orange line is the electricity sector, the blue line is the natural gas sector, the gray line is the transportation sector, and the yellow line at the bottom is the waste sector. As you can see, the orange line, the electrical sector, has gone from about 50% GHGs community wide in 2013 to about 31% in 2020. The blue line, the natural gas sector, has gone from about 28% GHGs community wide in 2013 to almost 41% in 2020. This is the trend that we are most concerned about.

Slide 8 **The Problem**

This brings us to the **problem** which is that we are getting most of our thermal energy needs met from the burning of fossil fuels. For the electricity sector there is more clarity on how to decarbonize the production of energy. So, the question is how we can meet our thermal needs of heating and cooling our buildings without the burning of fossil fuels.

Slide 9 **The Solution**

The **solution** to this problem is to find ways to get our thermal energy needs met while not producing GHGs. Traditionally there are two ways of solving this problem. Reduce the **demand** for energy needed for buildings or changing the **supply** of energy to buildings to cleaner energy sources. Our Commission has seen a third solution, thermal energy networks, which I would say is a combination of both demand and supply solutions.

Slide 10 **The Solution**

On the **demand side**, Energy Conservation and Optimization programs (or ECO – the new name for the old CIP programs) provide ways of reducing the energy needs of buildings. These include improving building envelopes, using passive solar design principles, and installing more efficient equipment. Making these improvements can save up to 38% of the energy needs of an existing building. And this is a very important aspect of what Comfort Systems is doing and needs to continue to do, and on a more robust level.

Slide 11 **The Solution**

On the **supply side** there are potentially carbon free energy sources that can provide the thermal energies that we need for heating and cooling. These include passive and active solar design, electrification of heating and cooling systems, the use of air and ground source heat pumps, geothermal energy and thermal energy networks.

Slide 12 **The Solution**

Here is one local example, the Bagley Outdoor Classroom at UMD, that incorporates many of the elements of **demand and supply side** solutions.

Slide 13 **The Solution**

I want to emphasize the attributes of these **thermal energy networks**. They can be thought of as many ground source heat pumps connected together, they can provide both heating and cooling, they can provide efficient and consistent heating when temperatures are very low, and they are a local and a resilient energy source. **Amazingly** they can provide up to six units of thermal energy for each one unit of input energy. This means that we can tap into the significant local energy resource that is right below our feet. Finally, these networks can be added to and connected to other thermal energy networks creating district sized systems.

Slide 14 **The Video**

And since a picture is worth a thousand words, I have a short video on geothermal energy networks.

Link to short video of a thermal energy network. (2:24)

Slide 15 **The Recommendation**

Which brings us to the **EPC recommendation**.

We need to act now to start transitioning Comfort Systems to a more sustainable model for their own longevity and the benefit of their customers.

The Energy Plan Commission recommends that the Duluth City Council and the Duluth Administration:

1. Create a position or task force focused on developing a plan for Duluth Comfort Systems to meet the City's goal of zero greenhouse gas (GHG) emissions by 2050.
2. Provide secure funding to support energy transition planning for Comfort Systems.

Slide 16 **The Recommendation**

This is the **background information** we included with this recommendation. The first five points I have already covered.

Slide 17 **The Recommendation**

I wanted to mention the **last five points** of this background information.

- City-wide updates to utility infrastructure can provide additional opportunities for resiliency planning.
- As customers of Comfort Systems convert to electric alternatives for their thermal energy needs, the cost of natural gas will rise for those left on the system. This increase in cost will be borne by customers who are least able to afford these increases.
- Planning for the decarbonization of Comfort Systems should include a study of their current operations, a revision of their business model and a transition to clean energy sources.
- This transition may also include changes in City policy. This could include, for example, a policy of working with developers and builders to encourage electrification.
- A number of Cities around the country have established long-term funding for their sustainability needs through taxes, mill rate increases, etc.

Slide 18 **Examples**

Here is a few **examples** of how other communities have **funded** their sustainability goals.

Slide 19 **Examples**

Here are three important **examples** of how **other utilities** have started working on these goals of decarbonization. One is the geothermal pilot project in Framingham MA completed by Eversource Energy with advice and help from HEET. Another is how Vermont Gas Systems, a natural gas utility, has established its decarbonization programs. And another is the filings by CentrePoint Energy and XCEL Energy to the PUC under the MN Natural Gas Innovation Act.

Slide. 20 **Examples**

Finally, here are **examples of geo-thermal energy network projects in Minnesota.** The photo is our thermal energy network in downtown Duluth. This energy network is a fossil fuel-based network. The other, and probably the largest thermal energy network in Duluth, is the heating and cooling system at UMD.

Slide 21 **The Q & A**

The last thing that I would like to say is in a broader context. As we think about energy resources, we need to keep in mind that the two largest energy sources that America (and the world) have is the energy from the sun and the energy stored in the earth. We have just recently developed technologies to utilize both of these energy sources. With the advent of photovoltaics and wind turbines we have very cost-effective ways to harness the sun's energy. And with the advent of heat pump technology, we will soon have a cost-effective way of harnessing the earth's energy. These "local" clean energy sources are the energies that we need to pursue.

Thank you for this opportunity. I would like to **give you time** to ask us questions or to discuss this recommendation.

Other issues and points

- Stranded assets – issue of building infrastructure needing to be retired before the end of its useful life
- Net present value (NPV) of a project
- Inflation Reduction Act – and how it can help us
- $30,000,000 budgeted for purchasing natural gas in Comfort Systems budget
- Comfort Systems – 28,000 gas customers out of 31,000 customers
- Duluth Energy Plant – district energy – is a thermal energy network but not using clean energy source (GHG emissions free)
- WLSSD – West Superior Street project to provide design documents for a thermal energy network using WLSSD as an energy source to provide the thermal energy needs of West Superior Street during its redevelopment
- HEET – Eversource Thermal Energy Project – Framingham MA – funded by US Dept of Energy Grant - $7.8 million
- Volts Podcast with David Roberts – January 1, 2025 – Framingham MA Project
- XCEL and CentrePoint Energy – NGIA filings
- Duluth Climate and Energy Network
- International Energy Agency (IEA) report "World Energy Investment" stated that clean energy sources set a record high of $2 trillion out of $3 trillion total global energy investments
- Obama quote of 2015 – "We are the first generation to feel the impact of climate change and the last generation that can do something about it"
- Ann Arbor MI – Sustainable Energy Utility established in 2024 – "will be an opt-in, supplemental, community-owned energy utility that provides 100% renewable energy from local solar and battery storage systems installed at participating homes and businesses in the city."
- City Councilor on the EPC
- Renewable natural gas has limited potential to meet the nation's energy needs: 4% to 7% due to dependence on waste and feedstock availability

Questions from City Councilors about EPC Recommendation 1

Wendy Durwachter – Do you have a ballpark off what other city's have paid to convert?

Terese Tomanek – Can you tell me the goals that were set out for Comfort Systems? Does that include just City buildings or does that include residences? Do you have an estimate how much it would cost per household and if there would be any grants that would help the households absorb that cost?

Roz Randorf – One of your recommendations was for either a task force or a position. How do you see Mindy Granley's position fitting into this? Isn't that her charge? (Follow-up to Mindy's comments) A position or a task force is all fine but what you really need is $55 million dollars because it looks like you have plans in place. (Mindy's comments focused mainly on capturing waste heat, not a thermal energy network capturing the ambient heat from the ground to make heat pump technology a thermal source)

Arik Forsman – (To Mindy) About smaller projects that we could start with. She discussed down scaling the Lincoln Park project to less buildings or to send heat to Lot D or part to downtown could shave $20 million off that cost. She does not have any residential neighborhood numbers. We are all waiting see how the Framingham project goes. We don't need to be the early, early adopters. We can watch to see what others are doing.

Wendy Durwachter – In your report you mentioned a possible task force. I know we have many impassioned environmentalists in town, many with science in their backgrounds. Do you think we could create a task force – example – group called vibrant streets that have worked on bikeways and walkways to improve our town – do you think that this could move forward with a volunteer task force? Follow-up – Do any of you know of any way of converting a position at Comfort Systems to this topic or have you explored this?

Janet Kennedy – My question is around infrastructure and if there was the ability to get it into thermal. Thinking about the City Department and your rule, Ms. Granley, and the public works – is there more of a collaboration that could happen with your rule and City Public Works? (Mindy mentioned Jim Benning, Director of Public Works, being supported of these grants and that grants don't provide city staff positions but there may be some help that could come from the DOE energy futures grant monies.) What about the project with WLSSD and partnerships. Won't there be a need for partnerships be important? (Mindy – Partnerships are important, but WLSSD is not an energy provider.) I would be more open to hear about a task force, but what I would need is to hear about the skills that you would have on that task force to maybe bring in some of that funding, somebody with grant experience, lobbying experience. Since we can't hire more folks for Mindy's department, we could have a task force with volunteers that would have those skills.

Terese Tomanek – I have a question about the cost savings if Downtown businesses convert to this or theoretically all our households convert to this and if all those cost savings could be channeled into the cost of construction? To clarify, what would be the cost savings in what we pay for natural gas if that is not being paid since we would have another source of energy? What those cost savings might be?

Mike Mayou – As we are talking about natural gas, if we did nothing with natural gas, could we hit our GHG reduction goal by 2050? We have to make strides since we are at 2025, and we are looking at 25 more years before we are facing that deadline. So, the conversation that you want to set up essentially is that we need to start now to make progress towards this goal. Is that correct? A follow-up to the City Administration, has the City thought about if the City could add added capacity at Comfort Systems or part of the Sustainability Office that could work on these issues of reaching these climate goals? We have had discussions about this at the Public Utilities Commission and the budget is pretty restrictive according to code limited to natural gas and making sure that is funded. So, there are limitations with the utilities budget in particular for a position to help reduce the amount of natural gas that's used. In the framework of Mindy's office, has that conversation started or happened yet?

Wendy Durwachter – I am wondering if there could be a brief task force to consult with these other communities that have done this, and you have said all of these have different budgets for this. But possibly through consultation with conversations with communities listed and do a data gathering of what they've saved and what their expenses are, it seems it would make the argument really convincing to administration and to the skeptics?