Decarbonizing Minnesota's Natural Gas End Uses

Meeting 6

May 8th, 2020

Via Zoom

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Agenda

9:00	Welcome and Introductions
9:15	Updates and Announcements from Stakeholders
9:30	Process Check in, Content Review, Identify take-aways and questions
10:30	BREAK
10:45	Continued Discussion of Certainties and Uncertainties
11:15	Discussion of factors
11:55	Wrap Up and Next Steps
12:00	ADJOURN

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Updates and Announcements from Stakeholders

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Process Check in, Content Review, Identify take-aways and questions

Whole Group (15 min)

- Review what we've covered to date
- Any process questions?

Small Groups (20 min)

- What are everyone's take-aways at this point? (e.g., what have we learned collectively?)
- What are everyone's key remaining questions? (e.g., what do we still need to learn to make recommendations?)

Whole Group (25 min)

- Synthesize key take-aways and remaining questions from the small groups
- Begin identifying what we see as certainties and uncertainties for the future.

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Objectives

1. **Develop a set of shared guiding principles** for effectively assessing decarbonization options for natural gas end uses
2. **Build a shared understanding of the "current state"**
   a. Characteristics of the existing natural gas system (including its share of GHG emissions at a statewide level) and utility business models
   b. Emerging technology options
   c. Consumer and environmental considerations.
3. **Develop 2-4 natural gas end-use decarbonization scenarios** for the purpose of exploring how Minnesota should approach this challenge
4. **Identify research needs and form technical committees** to pursue research as warranted
5. **Develop recommendations** (via consensus to the extent possible) around what's needed to help Minnesota meet its aggressive decarbonization goals with respect to natural gas end uses.

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Decarbonizing NG End Uses in MN

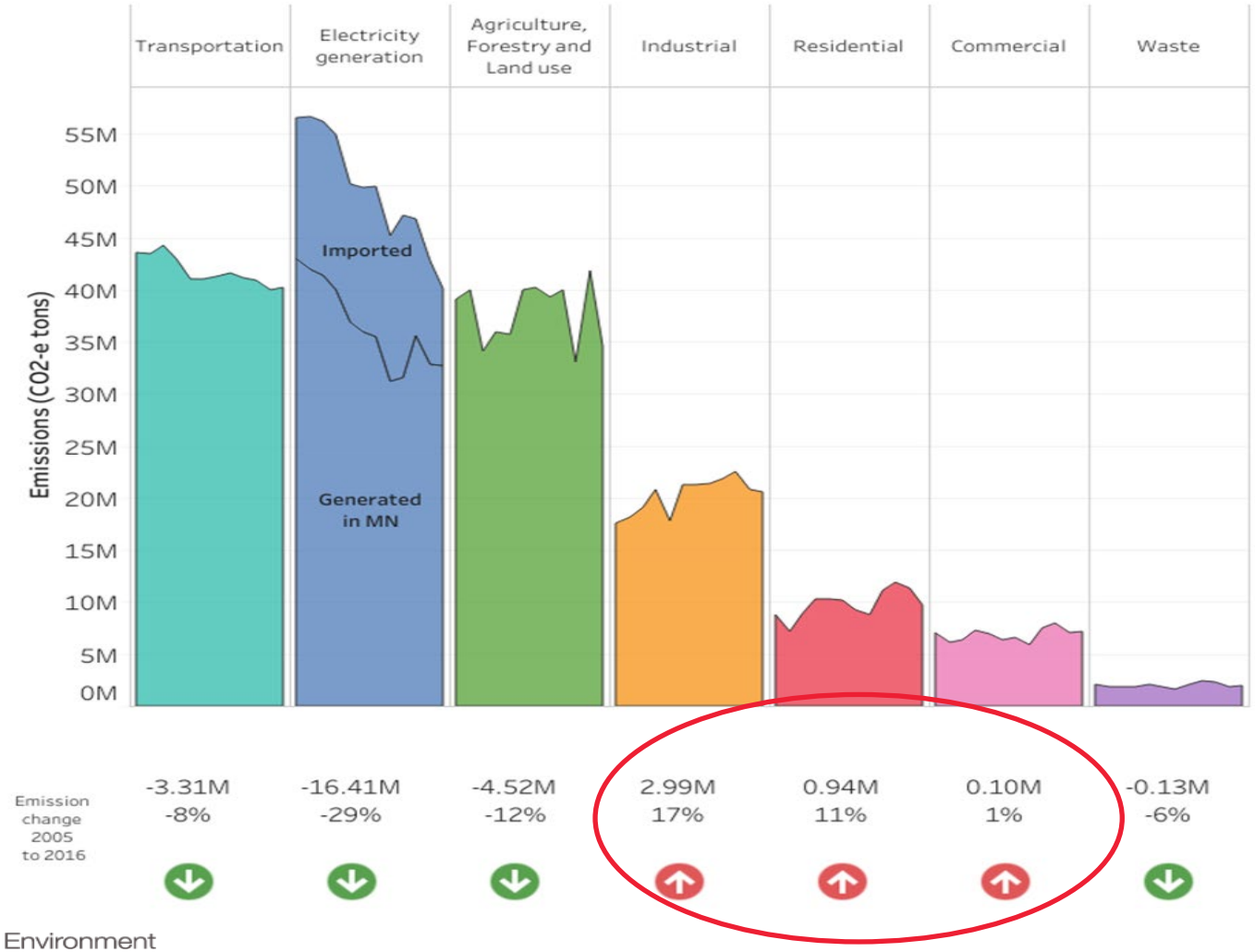
Participant Resources | Planning Team Resources

Decarbonizing NG -- Partici... | 1 hidden field | Filter | Grouped by 1 field | Sort | Color

	Name	Notes	Attachments	URL	Tags
CATEGORY: Meeting Materials (Count 8)					
1	Meeting 1: Kick-off	November 6, 2019: Includes an overview presentation from Audrey Partridge as well as a summary of the collective observations of the ...			
2	Meeting 2; Emissions	January 10, 2020: Drafted guiding principles for the process as well as presentations from Dr. Margaret Cherne-Hendrick and Adam Zoet ...			
3	Meeting 3: Modeling	February 14, 2020: Presentation on modeling from Dan Aas of E3.			
4	Meeting 4: Utility Perspectives	March 13, 2020: John Heer presented on an overview of the natural gas systems. Erica Larson of CenterPoint and Lauren Wilson of Xcel ...			
5	Meeting 5	April 10, 2020: Exploring technologies part 1 - presentations from Carl Nelson and Jon Blaufuss from Center for Energy and ...			
6	Meeting 6	May 8, 2020			
7	Meeting 7	June 12, 2020			
8	Meeting 9	July 10, 2020			
+					
CATEGORY: Knowledge Base (Count 6)					
9	California's Gas System in Transition	Report from GridWorks on transitioning California's gas system to meet state goals.		https://gridworks.org/wp-...	California
10	California's new long term gas planning docket	Link to docket related to long term gas planning - Rulemaking 20-01-007 and articles related to the announcement of the new docket.		http://docs.cpuc.ca.gov/Publish...	California
11	California's new long-term gas plan is a win	Blog by Michael Colvin from CA Environmental Defense Fund		https://www.edf.	California

5 records

Looking beyond electricity



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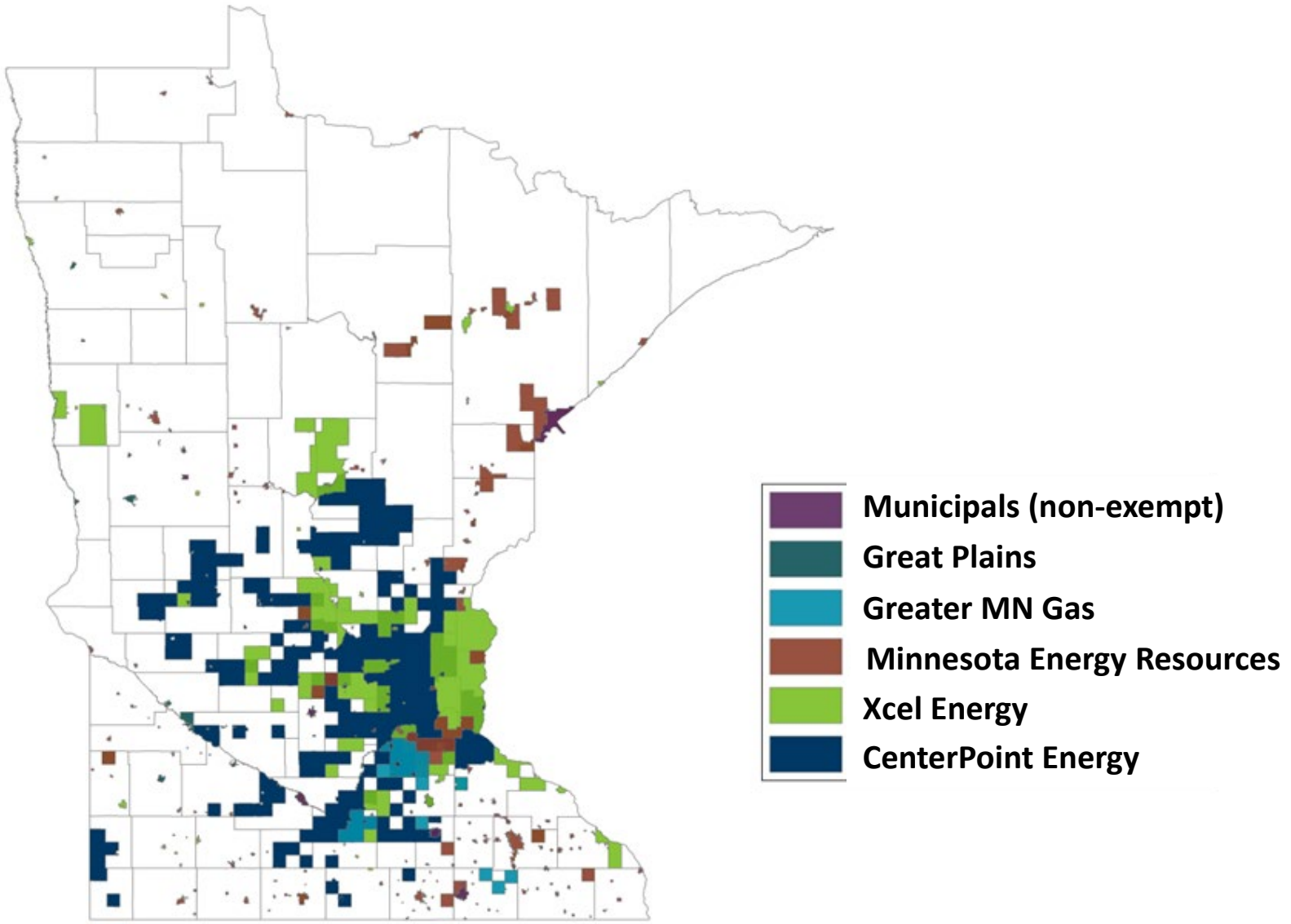
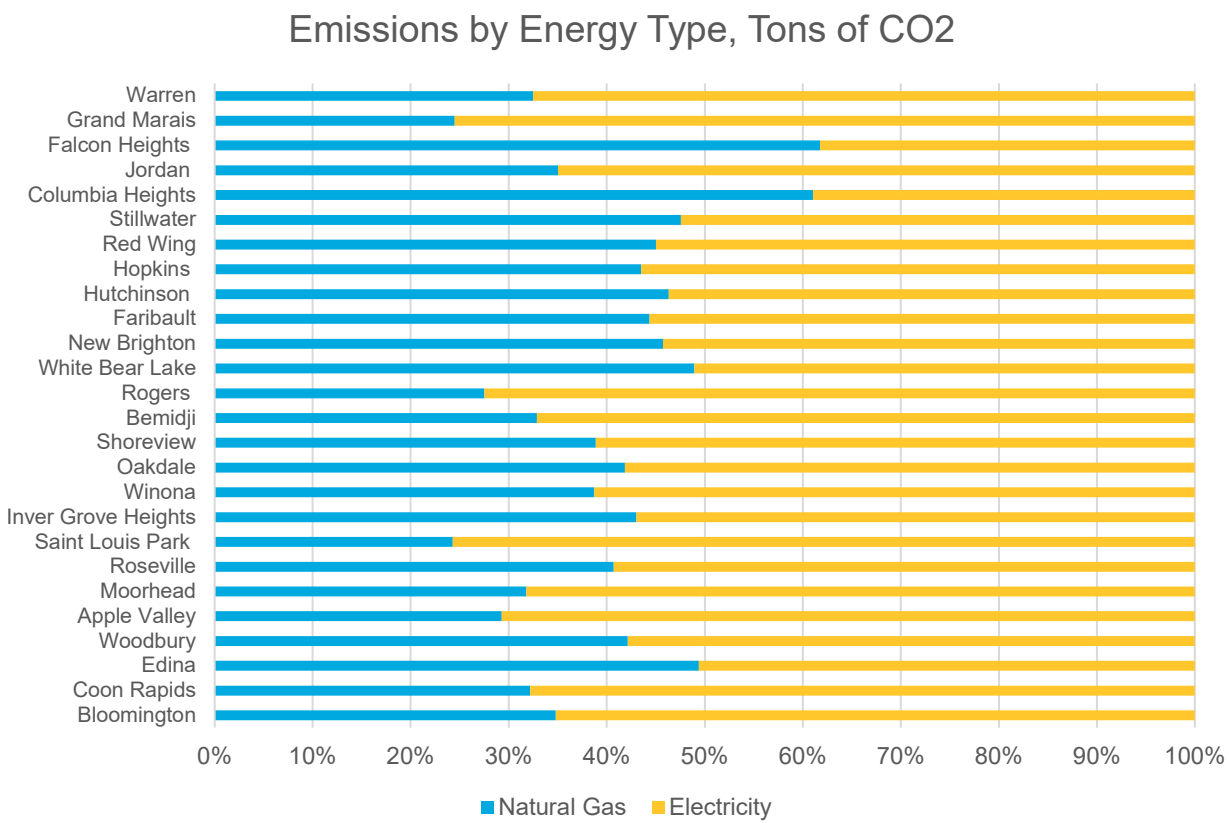
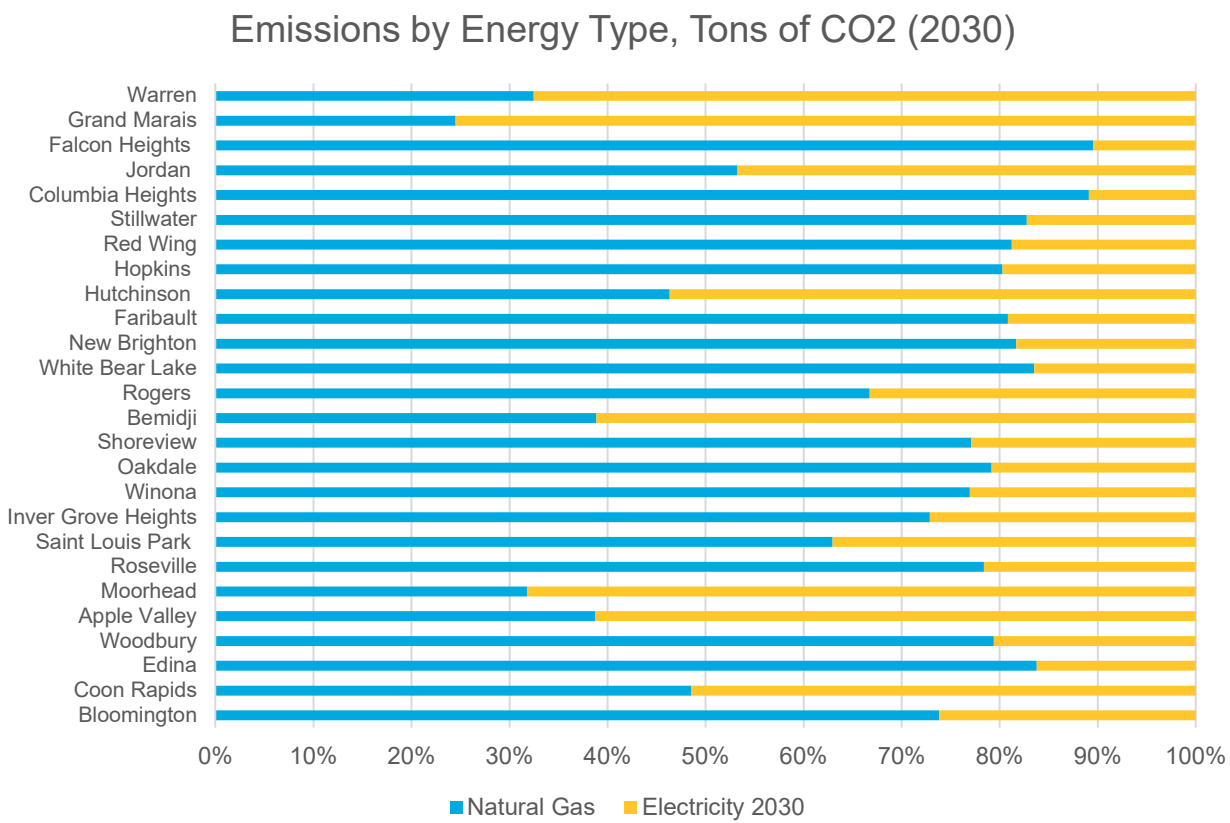
Source: https://www.pca.state.mn.us/air/state-and-regional-initiatives, Sept. 2019

Natural Gas Utility Service Territory Map

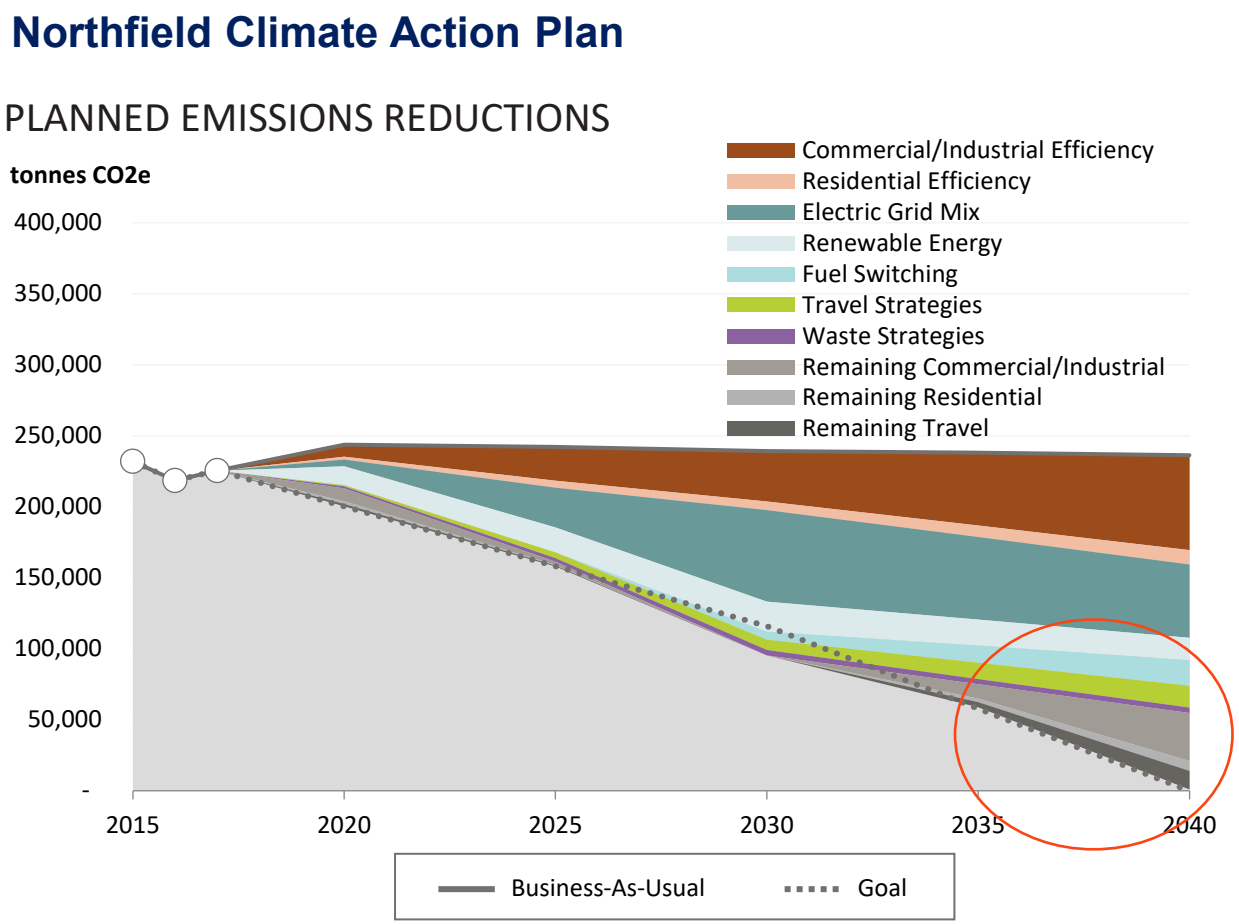


Community Emissions Profile



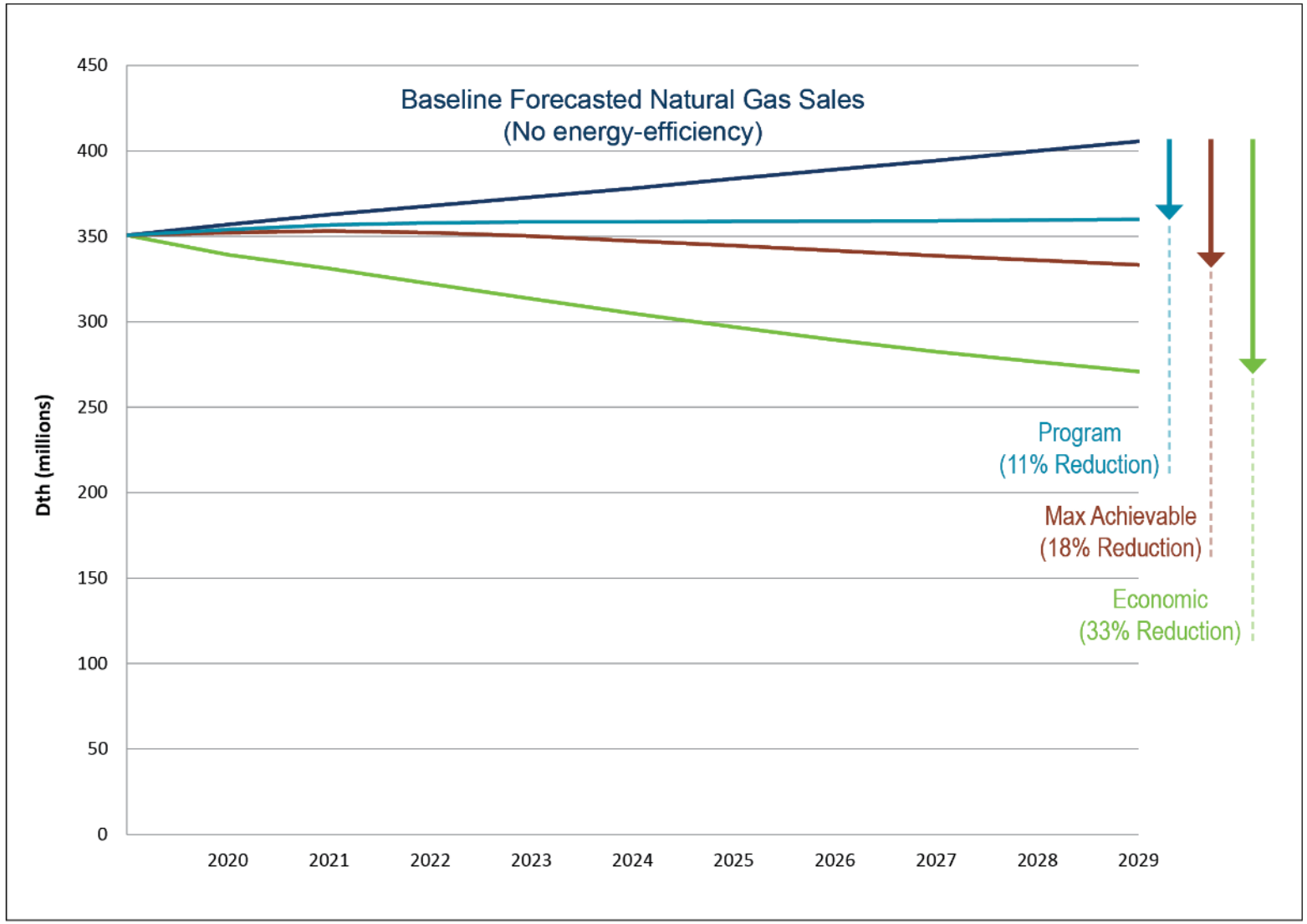


Advanced Thermal Strategies

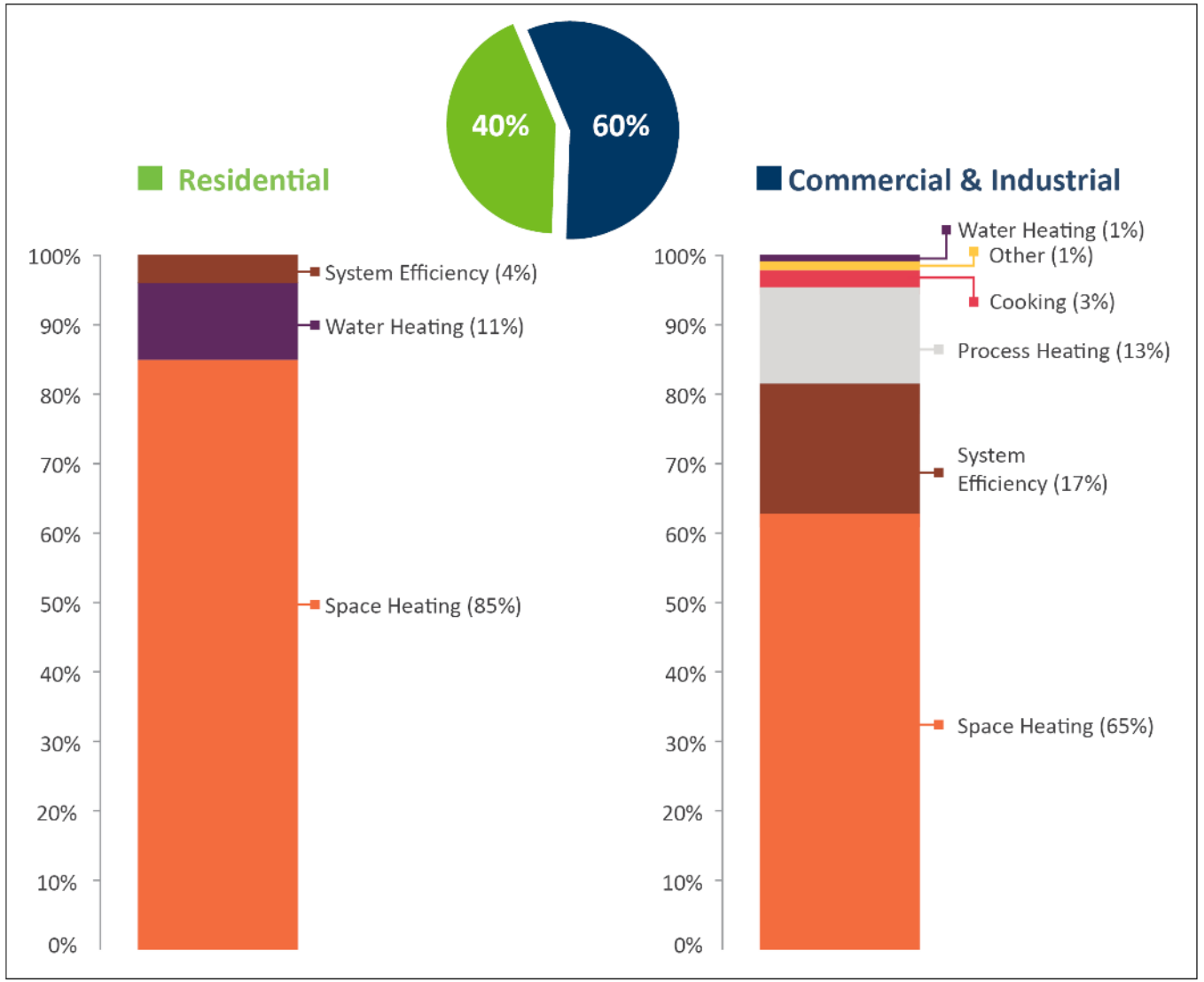


1. Fuel Switching
2. Combined Heat and Power
3. Ground/Air-source Heat Pumps
4. District Heating
5. Renewable Natural Gas
6. Carbon offsets
7. Emerging Technologies

Results – Gas Utilities

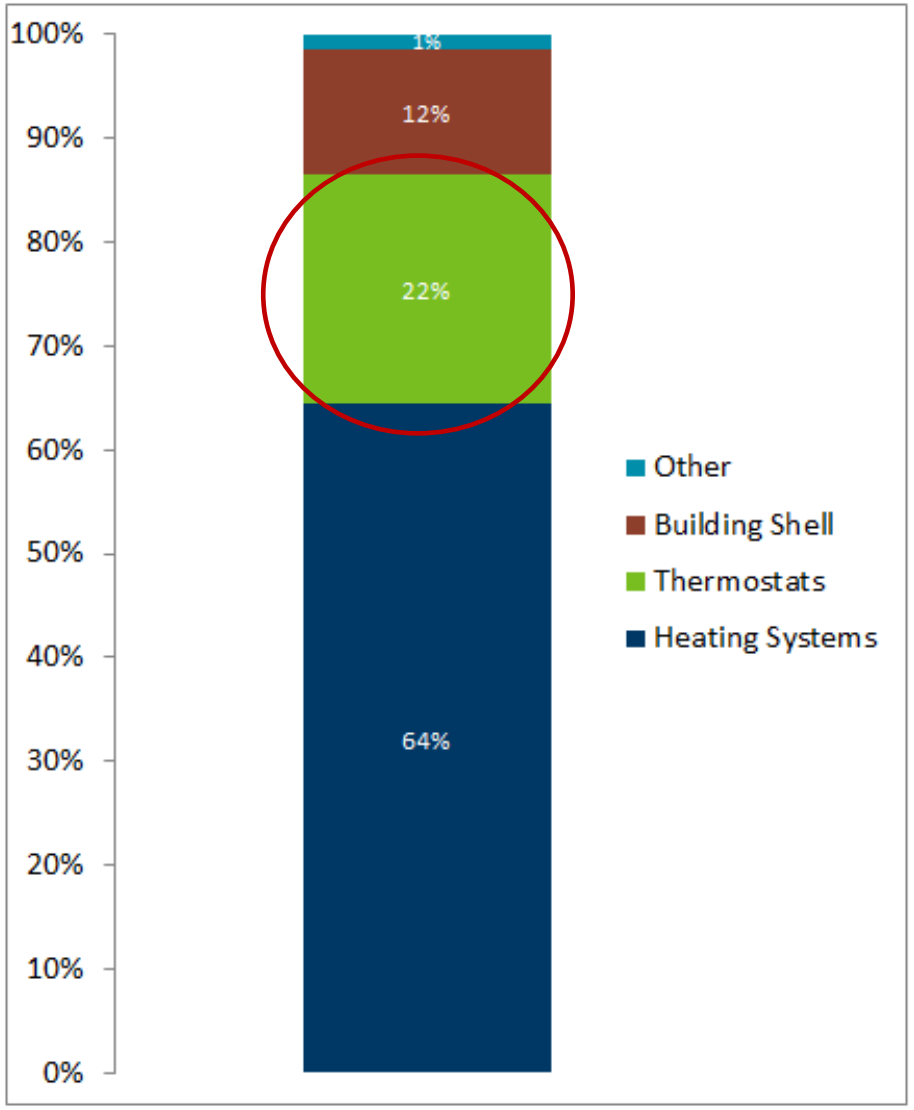


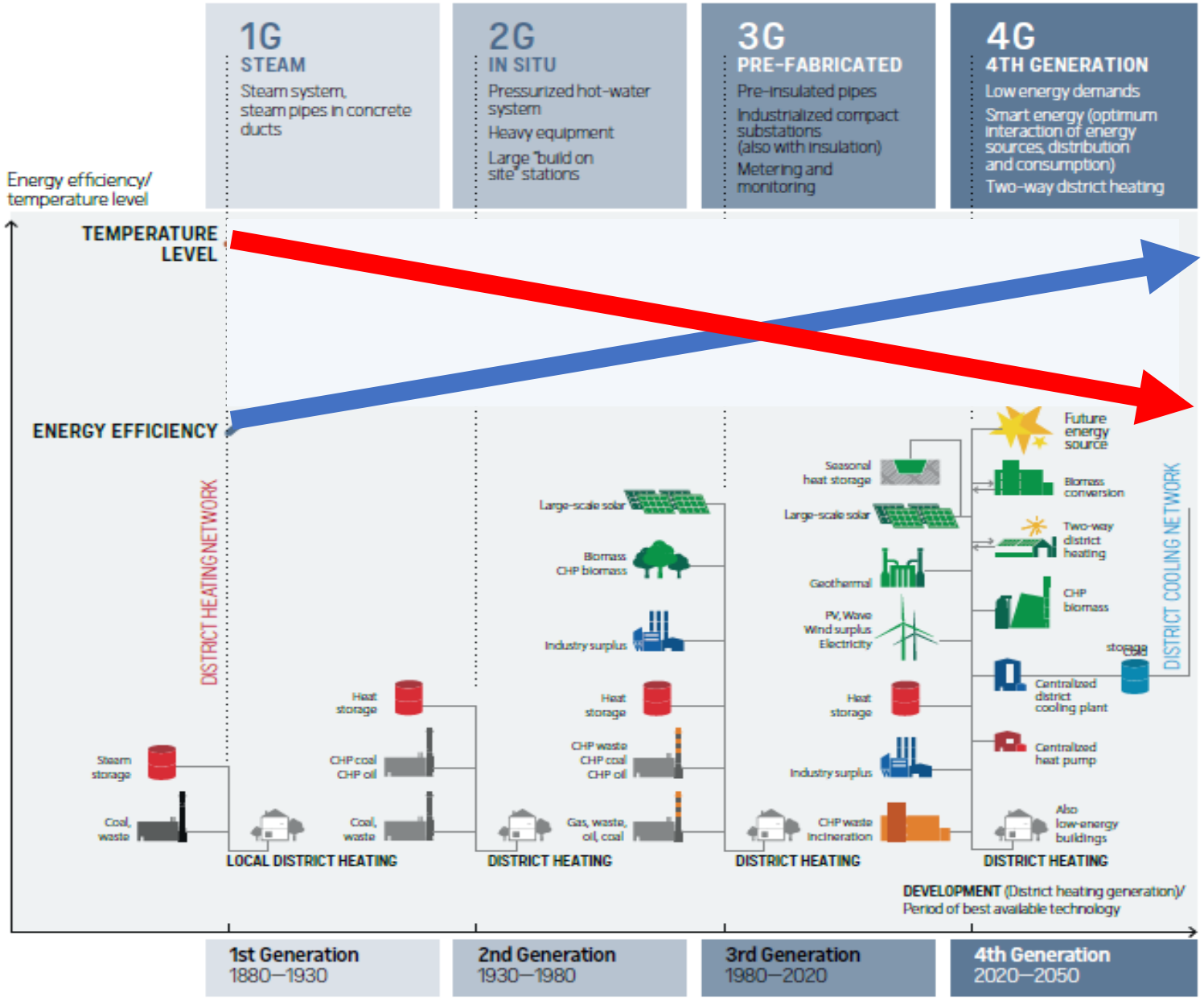
Sources of Natural Gas Potential



Smart Thermostats Grow in Importance

Measure categories within gas space heating end use



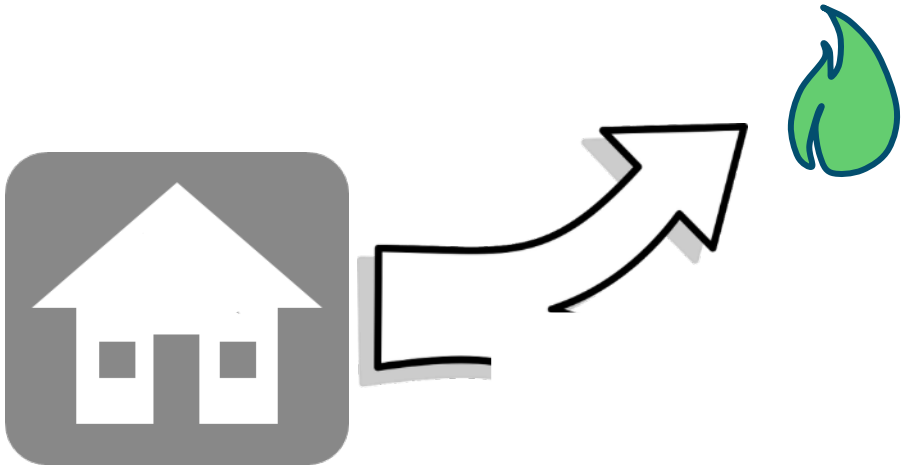


Source: Aalborg University and Danfoss District Energy, 2014

Integration & Renewables

Carbon/GHG Reduction

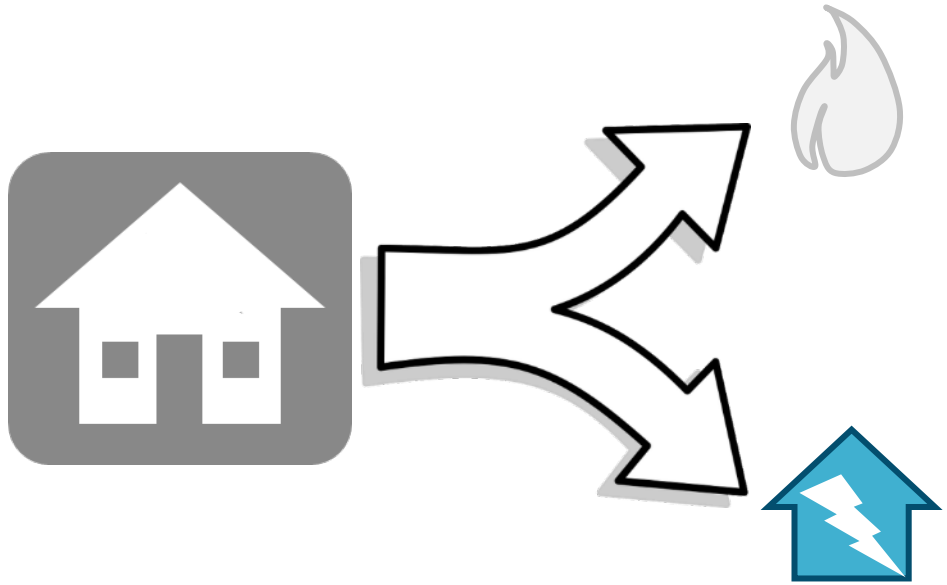
How will we heat our buildings?



Decarbonized gas
Renewable natural gas or hydrogen

+ Key Advantages: **repurposes existing infrastructure, minimal consumer disruption**, also reduces non-energy emissions
+ Key Drawbacks: **cost, not commercial**, can require extensive utility infrastructure and customer equipment retrofits

How will we heat our buildings?

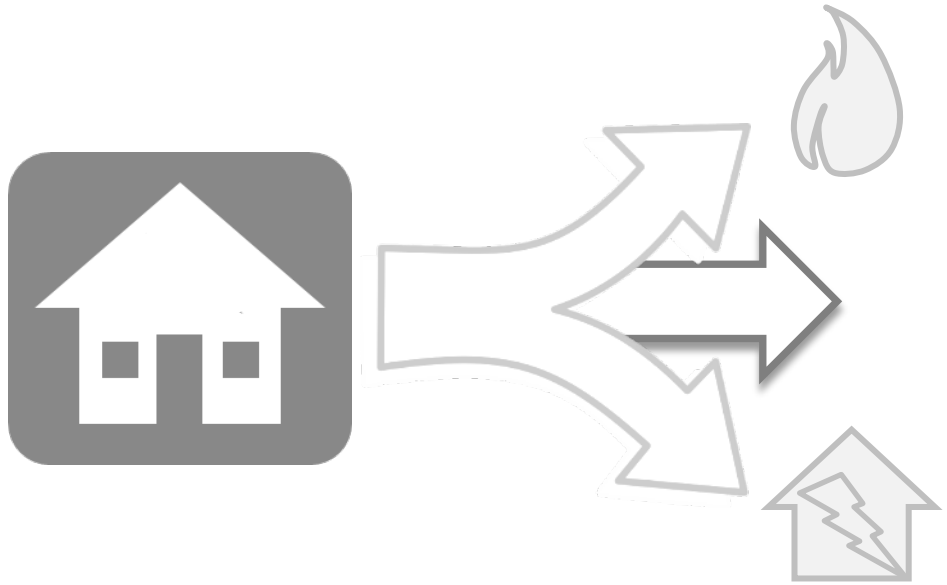


Decarbonized gas
Renewable natural gas or hydrogen

Electrification
Heat pumps, induction stoves

+ Key Advantages: **commercially available** products, **complementary to decarbonized electricity**, assists with climate adaptation
+ Key Drawbacks: requires building retrofits, **upfront consumer costs**, **electric peak load impacts**, potential for stranded assets and workforce transition challenges

How will we heat our buildings?



Decarbonized gas
Renewable natural gas or hydrogen

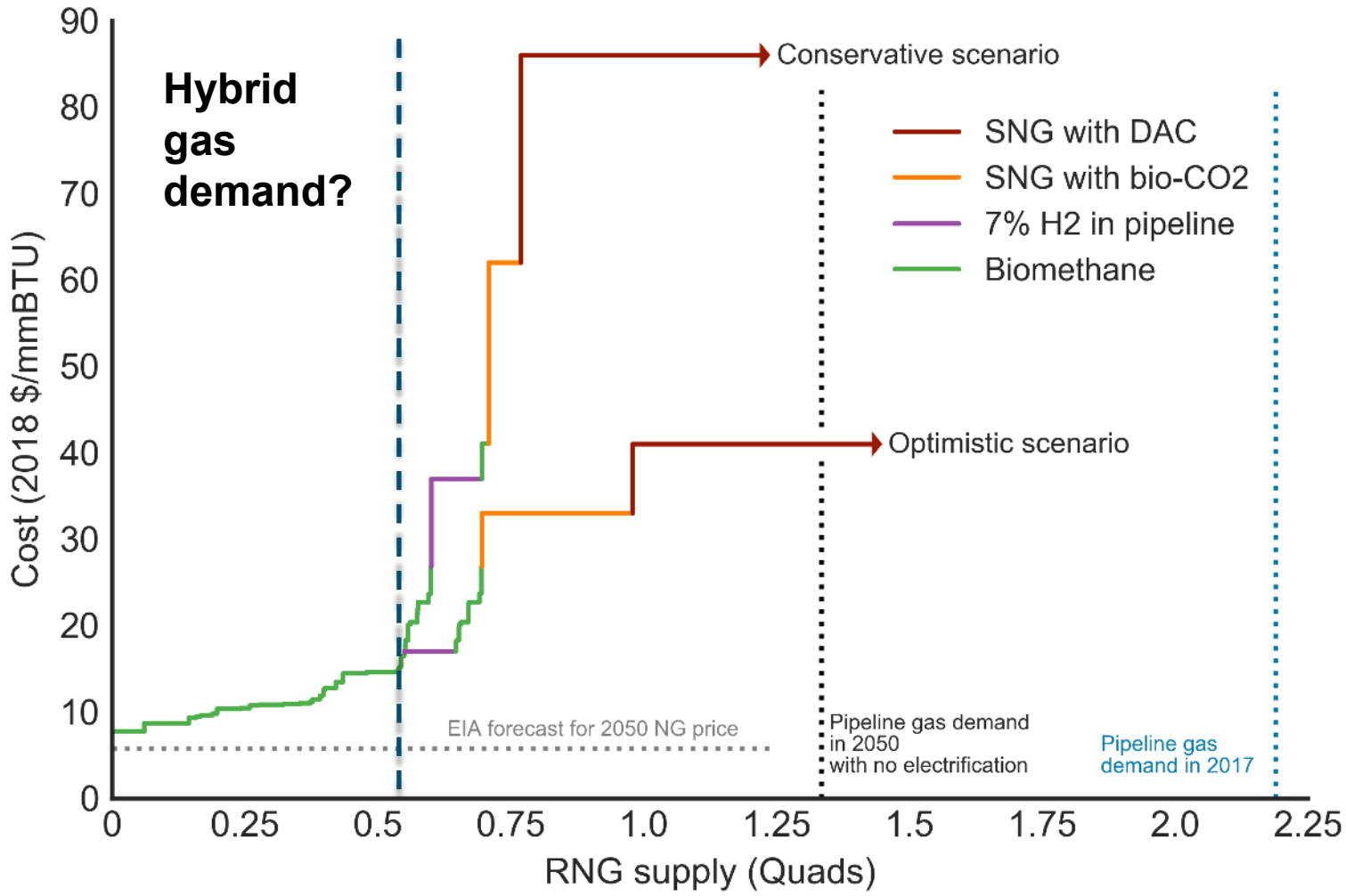
Hybrid
Heat pumps paired with gas

Electrification
Heat pumps, induction stoves

+ **Key Advantages**: reduces consumer disruption, **utilizes existing infrastructure**, reduces demand for more expensive varieties of decarbonized gas, **mitigates grid impacts**
+ **Key Drawbacks**: this approach is **not well studied** in the U.S., though it is **an emerging strategy in Europe**

E3 RNG Supply Curve: Hybrids

California Renewable Natural Gas (RNG) Supply Curve, 2050



Use of hybrids may allow for a larger percentage of gas throughput to be decarbonized

Lower throughput means that the more expensive forms of RNG could be avoided altogether

Conclusions for MN

Hypotheses on decarbonizing heat in MN:

- **Electrification will have a role:** electrification is a great strategy to efficiently deliver decarbonized energy for much of the year, but there are major challenges with peaks
- **Climate neutral fuels will have a role:** At a minimum, hydrogen and RNG will be important fuels to decarbonize hard to electrify sectors; they may also play an important role in buildings
- **There will be "no regrets" near-term actions:** They might include pilots focused on hybrid electrification, hydrogen, RNG, or deep energy efficiency retrofits
- **But there may be forks in the road**: Some strategies could lead to stranded assets or negative long-term equity impacts
- **A robust long-term planning framework is needed**: Key insights can be drawn from best available information today, but a long-term strategy must be able incorporate new information and learnings

Many questions remain, more work is needed

Research needs and gaps include:

- **Internally consistent and comprehensive cost data:** The all-in equipment cost of HVAC equipment and efficiency retrofits dominate the consumer economics of building electrification. There is not great comparative data available.
- **Long-run view on the impact of building decarb strategies on rates and bills:** Consumers will ultimately determine what building decarbonization strategies are adopted. Starting with the consumer perspective in mind clarifies what is possible.
- **Cost of conversion of portions or all gas systems to hydrogen:** 100% hydrogen gas blends appear to be far less costly from a commodity cost perspective than 100% RNG, but the difference in delivery costs is not well identified.
- **Business models for hybrid heat pumps**: Could a gas distribution utility function primarily as a peak capacity resource? And if so, how would they be compensated? Could hybrids be used to increase the flexibility of electric loads?

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- **Learned:**
  - EE landscape in MN
  - No one-size fits all solution – portfolio of approaches
    - Many possible decarb options, incl. ground source thermal.
    - Both RNG and electrification are expensive – cost is a challenge, so EE must be the first step to reduce the size of the challenge.
    - Need industrial sector solutions. Unique considerations for emissions reductions (e.g., large industry potentially moving elsewhere)
    - Need to assess potential comprehensively, including fuel switching and emerging tech
    - Utility or location-specific solutions – example of MERC with high industrial customer base (incl. exposure to competitive global markets) and broad, isolated territory.
    - Venn diagram – sweet spot between utilities, communities, other stakeholders. Opps for partnerships and unique solutions.
  - Matching end uses with fuels and tech, with attn. to cost effectiveness and decarb potential
  - Important to watch near-term tech development
- **Still need to learn:**
  - Consumer preferences and demand. Also what consumer education and engagement is needed? And what is our appetite for/comfort with new technologies? Could pilot this.
  - How will new tech perform in our climate?
  - Adapting building codes to MN
  - How we should think about infrastructure investment – expansion, contraction, replacement, etc., -- and what that looks like in different parts of the state and at what pace.
  - Carbon capture as a solution
- **Pandemic likely impacts:**
  - Construction curtailment and dispersal of living/less dense planning OR changes in living space design
  - Indoor air quality may come into sharper focus (e.g., gas vs electric stove tops)
  - Reinvestment and stimulus opportunities – jobs and infrastructure, incl. EE
  - What would stay-at-home in winter mean for NG?

Review Certainties and Uncertainties

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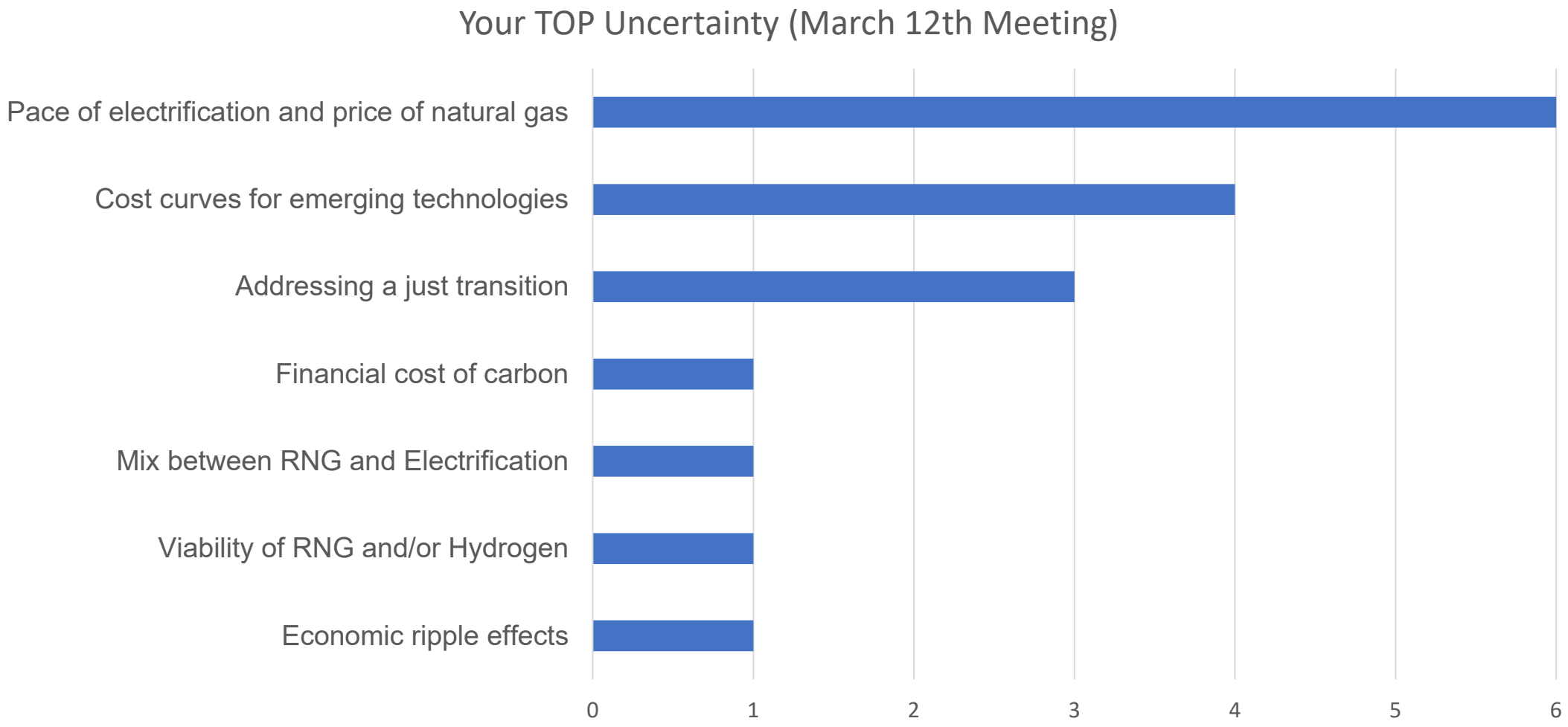
Uncertainties



TOP CERTAINTIES	TOP UNCERTAINTIES

• Decarbonization is important
• Pandemic Impacts
  • Residential sector end usage served by NG will be inelastic, reinforced by pandemic (focus here in near-term)
  • Commercial sector upheaval in near-term (e.g., no building convention centers, hotels, retail spaces)
  • Any solutions must consider pandemic impacts (e.g., reduce costs, create jobs, support recovery, public health impacts)
	• Price of natural gas (low vs high), driving comparative cost of alternatives (today $1.91/mmbtu). Connected to price of oil, since gas is byproduct of oil extraction.
	• Policy (favorable vs unfavorable)
	  • Carbon pricing – could change price of NG.
	  • Externality costs
	  • Does a green new deal recovery bill happen or not? Would create policy frameworks to support decarbonization. If not, path forward to decarb NG becomes more uncertain and difficult.
	  • Opps for new technology

DRAFT SCENARIOS

		Natural Gas Prices	
		Low	**High**
Policy Favorability to NG Decarb. Tech and Approaches	**Unfavorable**	A	B
	Favorable	C	D

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