



BUREAU OF ENERGY AND
TECHNOLOGY POLICY

Slides for the morning and
afternoon sessions are in separate
decks. This is the **morning** deck.

December 8, 2022

Methane/Natural Gas Distribution Planning and Policies

Technical Session 7
CT 2022 Comprehensive Energy Strategy

Session is being
recorded



Logistics & Housekeeping

- This session is being recorded
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- Please turn off your audio and video except when speaking
- To enter the queue to provide verbal comment, use Zoom's *raise hand* feature (more details will be provided later)
- Use the chat function to ask questions about presentations or procedures.

Today's Agenda – Morning

Click on an agenda section heading to jump to the relevant slides

Welcome & Introduction

9:00-9:05 am

Public Comment

9:05-9:35 am

Topic Introduction

9:35-10:10 am

Reducing the Carbon Intensity of Gas - Approaches & Benefits

10:10-11:45 am

Q&A

11:45-12:00 pm

-----LUNCH-----

12:00-1:00 pm

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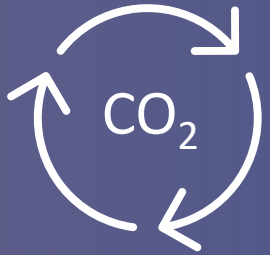


Today's Agenda – Afternoon

Slides for the afternoon session are in a separate deck

Challenges of Decarbonizing Gas & Existing Gas Infrastructure	1:00-2:05 pm
Q&A	2:05-2:20 pm
What Other States are Doing	2:20-3:55 pm
Q&A	3:55-4:10 pm
Public Comment	4:10-4:40 pm
Wrap Up	4:40-4:50 pm

UPCOMING TECHNICAL SESSION



Session 8: Market-Based Decarbonization Programs & Low-Carbon Incentives

Thursday, December 15, 2022, from 9 a.m. to 5 p.m. ET

We also intend to schedule general listening sessions for early next year



More information on the CES webpage:
<https://portal.ct.gov/DEEP/Energy/Comprehensive-Energy-Plan/Comprehensive-Energy-Strategy>

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Technical Session	Meeting Date(s)	Deadline for Written Comments
7	Dec. 8, 2022 9 a.m. - 5 p.m. ET (Today)	January 6, 2023, at 5:00 p.m. ET
8	Dec. 15, 2022 9 a.m. - 5 p.m. ET	TBD

Written Comment Opportunities

- After each technical session DEEP will be accepting written comments
- Email comments to DEEP.EnergyBureau@ct.gov or submit them via [Energy Filings](#)
- For additional submission instructions and specific questions for which DEEP is seeking responses, please watch for an upcoming notice
- All notices are posted on the CES web page: <https://portal.ct.gov/DEEP/Energy/Comprehensive-Energy-Plan/Comprehensive-Energy-Strategy>

WELCOME & INTRODUCTIONS

Thanks for joining our technical session today!

Comprehensive Energy Strategy Scope & Objectives

- **Scope:** electricity, thermal energy, and fuels for transportation
- **Objectives:**
 - Examine future energy needs in the state and identify opportunities to reduce costs, ensure reliable energy availability, and mitigate public health and environmental impacts of CT's energy use
 - Provide recommendations for legislative and administrative actions to aid in achievement of interrelated environmental, economic, security, and reliability goals

BETP Mission: to manage energy, telecommunication, and broadband policy issues and program deployment with the goal of establishing a clean, economical, equitable, resilient, and reliable energy future for all residents.

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DEEP's Approach to the 2022 CES

5 Key Lenses

- **Climate** – meeting greenhouse gas reduction obligations under Global Warming Solutions Act
- **Equity** – energy decisions that produce equitable outcomes
- **Affordability** – energy decisions that produce affordable outcomes
- **Economic development** – workforce development; economic competitiveness
- **Reliability & Resilience** – energy system improvements and load balancing

Key Strategies

- Build on and/or modify findings and recommendations of 2013 and 2018 CESs
- Consider emerging issues not addressed in a prior CES
- Rely on results from recent, major quantitative studies where appropriate rather than duplicate efforts

3 Key Factors

- The carbon intensity of the electric grid
- Need for emission-reduction solutions that facilitate climate change adaptation, resilience, and energy security
- Fuel price volatility

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Tentative CES Development Timeline

- **September 2022** – Technical Sessions 1-3
- **Nov. & Dec. 2022** – Technical Sessions 5-8
- **December 2022 – January 2023** – Drafting & Public Comment Periods for 3 White Papers
 - Building Thermal Decarbonization
 - Active Demand Response
 - Hydrogen
- **Q1 & Q2 of 2023** – CES Drafting, Public Comment Opportunities, & Listening Sessions

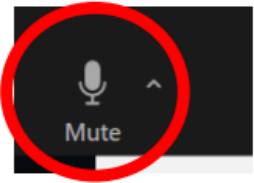
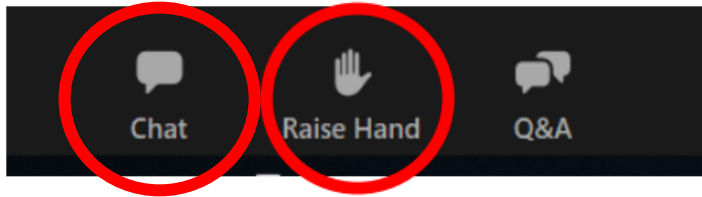
Technical Session Topics

1. Hard-to-Decarbonize End Uses
2. Heat Pump Market Barriers & Strategies
3. Building Thermal Decarbonization Support Strategies
4. Building Thermal Decarbonization – Economic Potential & Technology Targets [written comment opportunity only – no live technical session]
5. Electric Demand Response
6. Alternative Fuels
7. Natural Gas Planning & Policies
8. Carbon Pricing & Low-Carbon Incentives

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Questions and Comments



**Lower left
of the
screen**

At the conclusion of each panel DEEP will hold a brief question and answer period.

If you have a question for a presenter, please drop it into the chat to Jeff Howard. DEEP will pose as many questions as time allows to the speakers. Clarifying questions will be prioritized. Leading questions will not be accepted.

If you would like to make a comment during the public comment periods:

- Please use the “Raise Hand” feature if you would like to speak
- After any interested elected officials have provided their comments, you will be invited to provide your comment in the order the hands were raised
- Please unmute yourself, state your name and affiliation
- Given time limitations, please limit your comment to 2 minutes.
- After your comments, please remember to click the “Mute” button

General Public Comment

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Topic Introduction

Eric Annes – CT DEEP – Bureau of Energy & Technology Policy (BETP)

Julia Dumaine – CT Public Utilities Regulatory Authority (PURA)

Eric Annes – CT DEEP – Bureau of Energy & Technology Policy (BETP)

(speaker order may vary)

Click on an agenda section heading
to jump to the relevant slides

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CT DEEP - BETP

Natural Gas in the CES

2013

“The [recommended strategy] further seeks to align Connecticut’s energy future with the emerging opportunity provided by shale gas for a lower-cost, less-polluting, and domestically available (and thus more reliable) foundation for society’s energy needs.

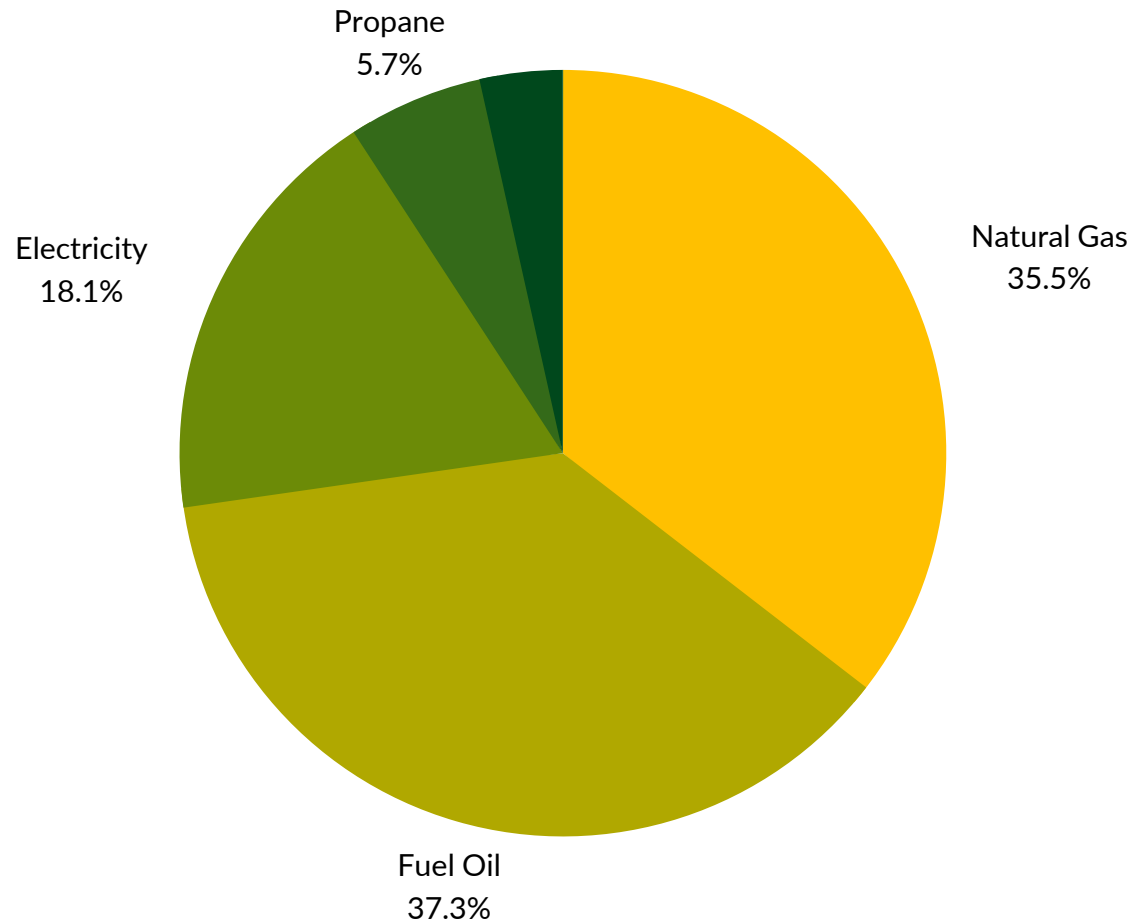
In identifying natural gas as a bridge to a truly sustainable energy future, it puts forward a seven-year game plan for expanding access to natural gas across Connecticut with a goal of providing nearly 300,000 Connecticut homes, businesses, and other facilities with an energy choice that includes natural gas.”

2018

“Expansion of Connecticut’s natural gas system for thermal use was a critical strategy of the 2013 CES that was designed to give customers greater choice in their energy options and to reduce emissions from oil combustion. However, given a narrowing in the differential prices between natural gas and fuel oil, the demand for gas has decreased significantly in the intervening years, especially in the residential sector. . .

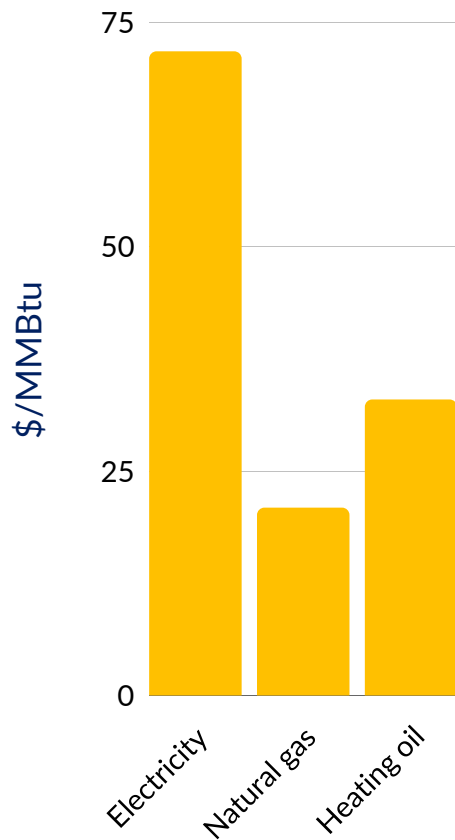
At this time, natural gas provides a cost-effective, relatively cleaner energy supply that Connecticut will need to continue to count on as we increase the capacity and reliability of renewable options.”

Natural Gas Usage in Home Heating



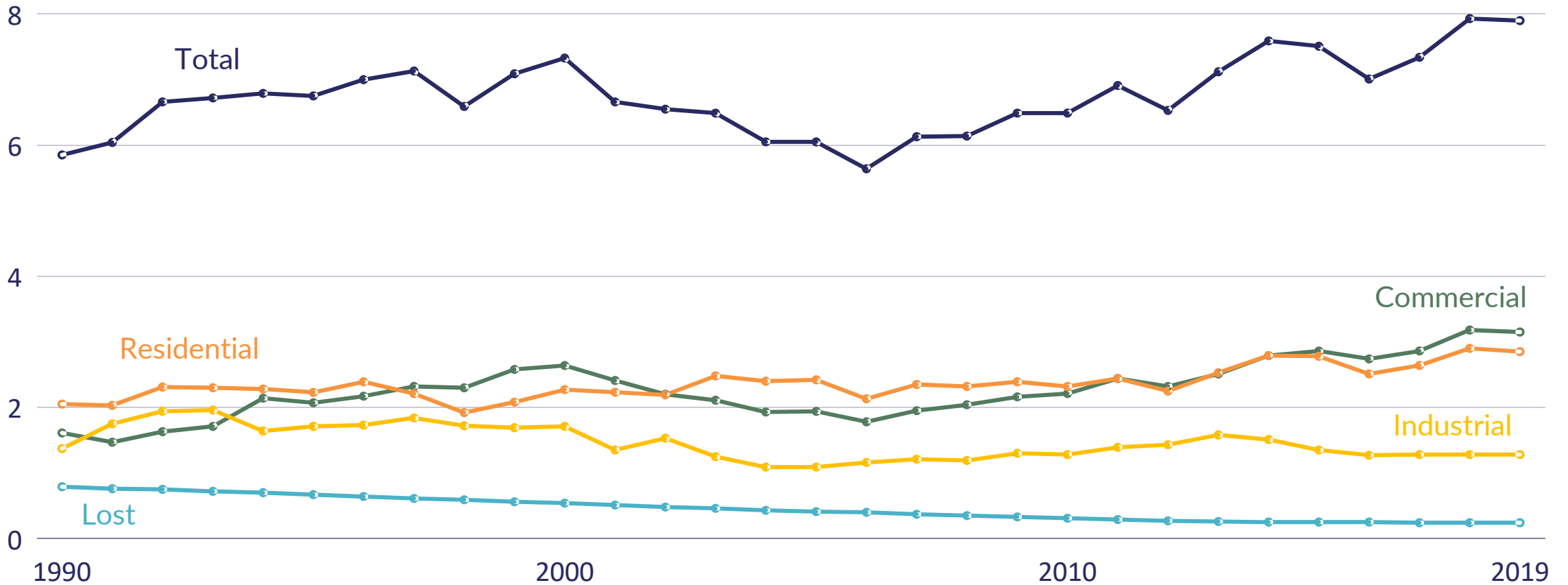
Energy Source	Proportion
Natural Gas	35.5%
Fuel Oil	37.3%
Electricity	18.1%
Propane	5.7%
Other/None	3.5%

Unit Cost of Heating with Different Fuels

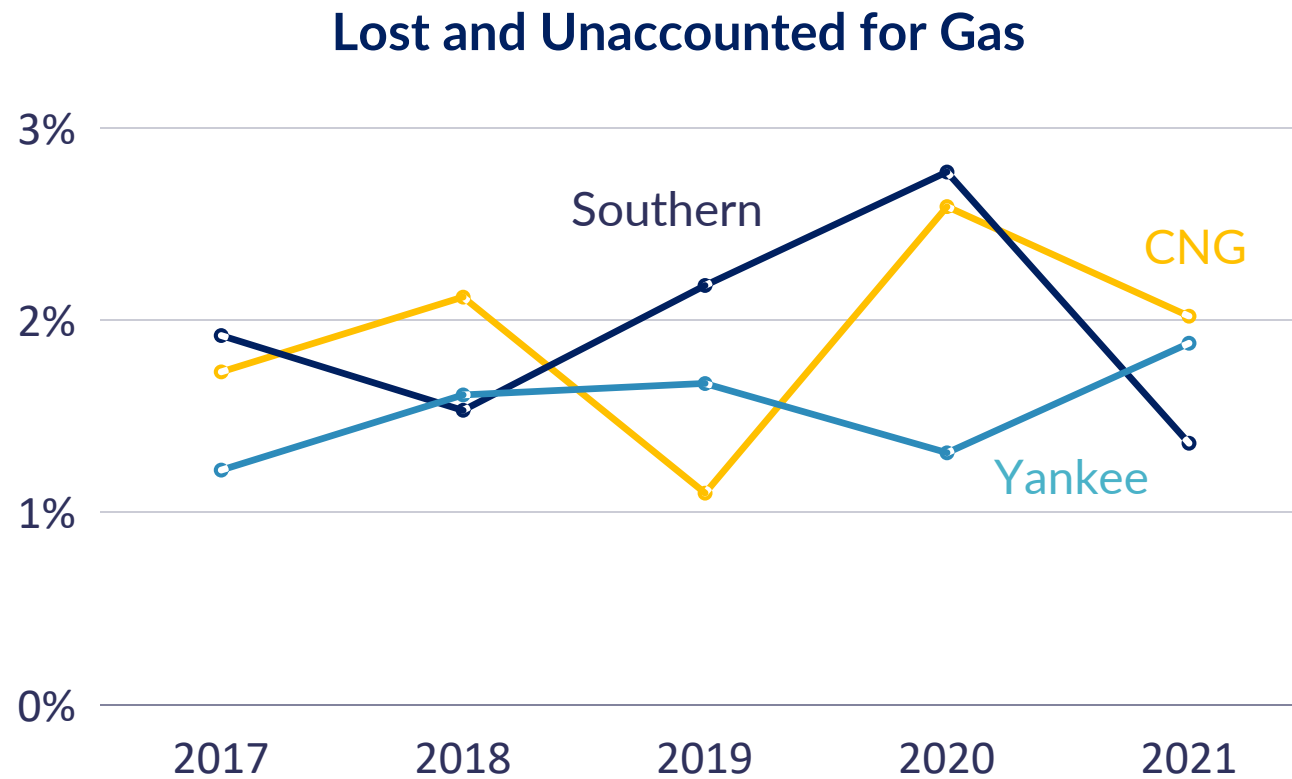


Fuel	Standardized cost (\$/MMBtu)	Original cost	Original Unit
Electricity (electric resistance)	71.795	0.2450	\$/kWh
Natural gas	20.906	2.1680	\$/ccf
Heating oil	32.974	4.5300	\$/gallon

Non-Electric Natural Gas Emissions



Distribution System Lost and Unaccounted for Gas



The LDCs have accelerated cast iron and bare steel system replacement programs

These accelerated replacement programs have brought the timeframe for replacement from approximately 60 to 80 years down to 20 years or less

Winding Down of Gas Expansion Plan

Docket No. 22-08-24 Final Decision

PURA undertook a review of the natural gas companies natural gas infrastructure system expansion plan to determine whether it continues to be consistent with the state's Comprehensive Energy Strategy and Title 16 of the Connecticut General Statute

The Authority determined that changed conditions and decisions made since the system expansion plan's inception warrant an "immediate winding down of the system expansion plan"

Natural Gas and the C&LM Plan

2022

DEEP directed Utilities to begin phasing out residential natural gas equipment incentives from the C&LM portfolio

Does not include C&I or non-equipment incentives like weatherization

2023

Phase-out will begin

DEEP has directed Utilities to transition Residential New Construction program to all-electric offering

Only customers with non-condensing systems will be eligible for highly efficient natural gas furnaces and boilers

2024

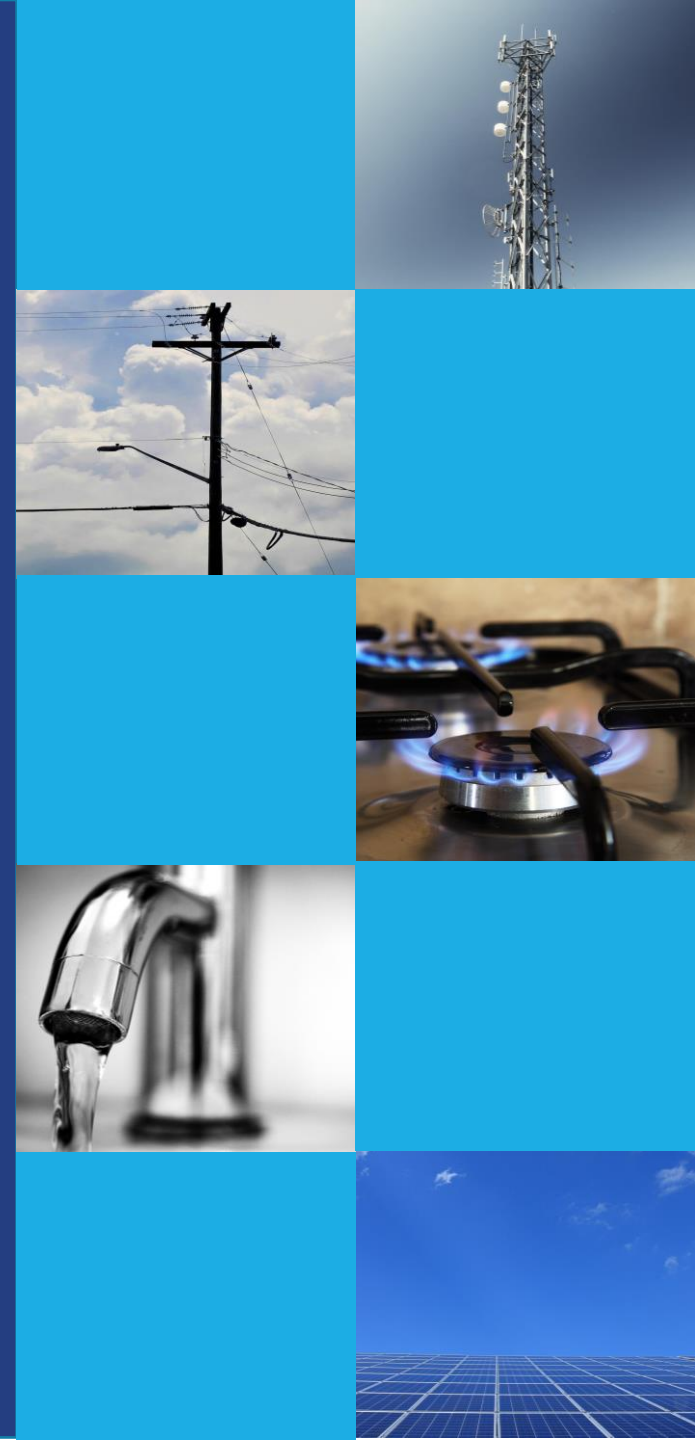
Phase out residential natural gas incentives by end of year

PURA

Natural Gas in Connecticut

Past, Present, & Future

2022 CES Technical Meeting #7
December 8, 2022



Key Definitions

Local Distribution Company (LDC):

- A natural gas distribution company
- Refers to Southern Connecticut Gas (SCG), Connecticut Natural Gas (CNG), and Yankee Gas (Eversource)

Gas Company:

- Per CGS § 16-1: anyone that owns, leases, maintains, operates, or controls in the public rights-of-way for the transmission and distribution of gas used for heat or power within this state, or manufacturers of gas to be so transmitted or distributed for such purpose.
- Does not include biomass gasification plants or a municipal gas utility

System Expansion Plan (SEP):

- Connecticut's previous natural gas expansion plan authorized by Public Act 13-298.

System Expansion Reconciliation (SER):

- The rate mechanism used by the LDCs to recover investments made in pursuit of the SEP

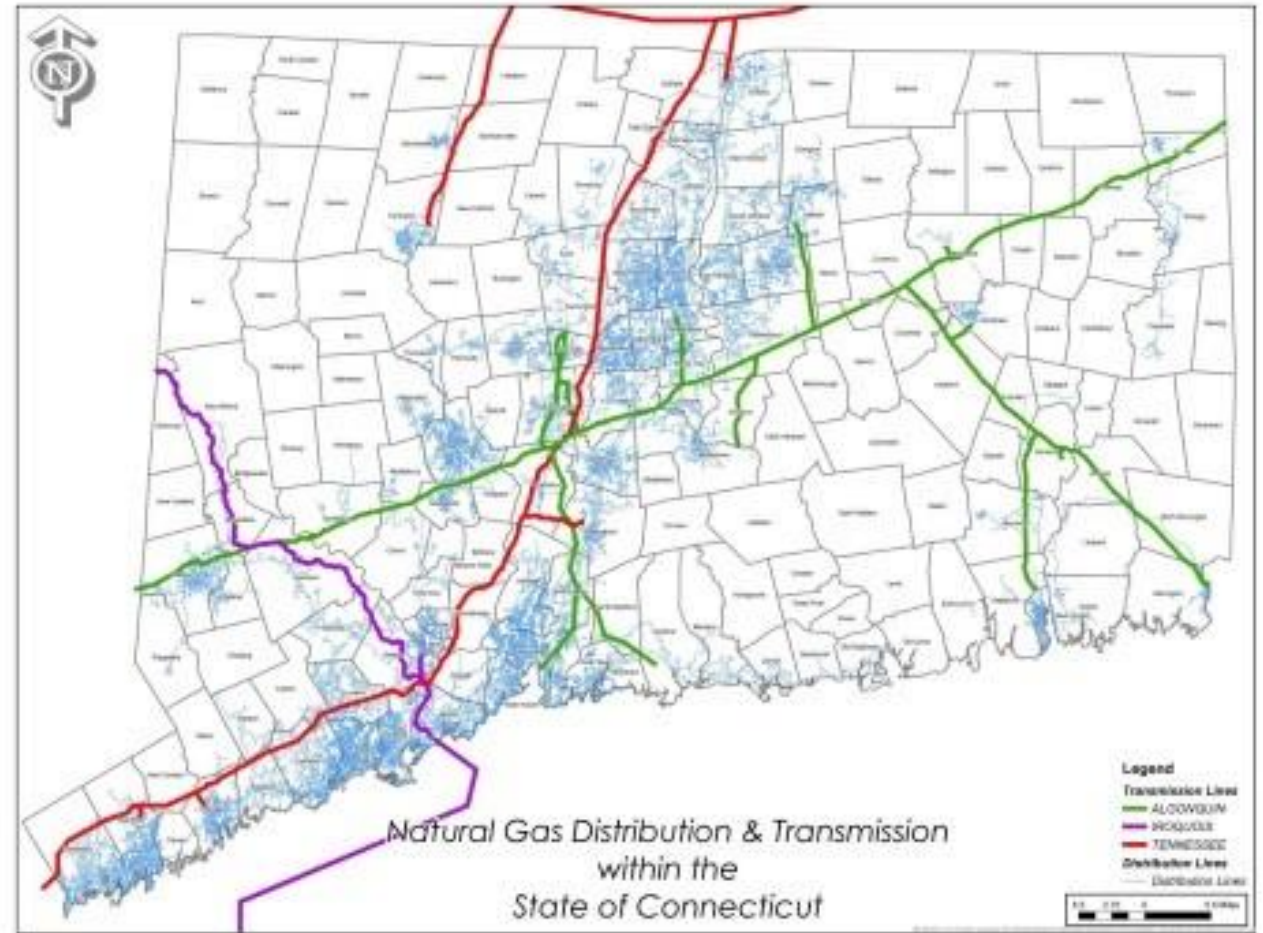
Purchased Gas Adjustment (PGA):

- Rate adjustment mechanism that permits LDCs to pass the cost of gas directly through to their customers in accordance with Con. Gen. Stat. Sec. 16-19b. The PGA is a direct pass-through cost; the LDCs do not earn a profit on the cost of gas.

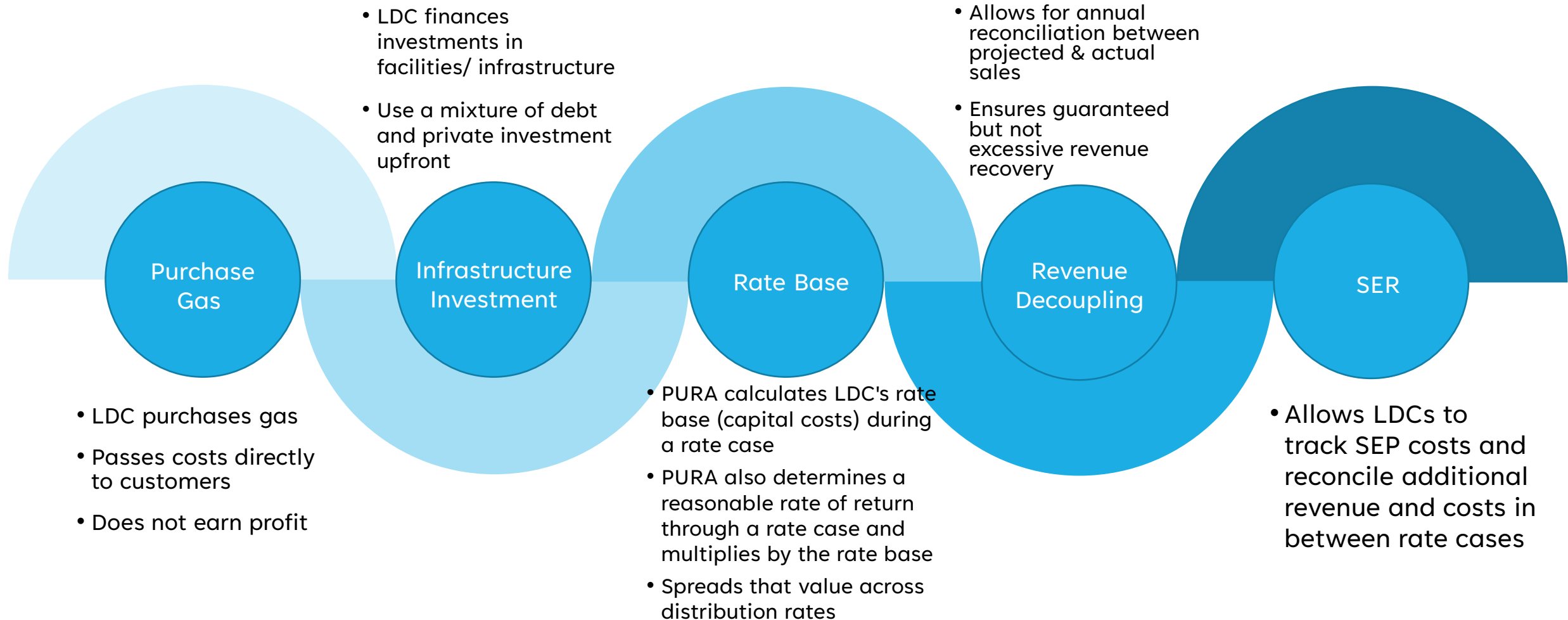


Overview of Natural Gas in Connecticut

- Three gas companies
- 600,000 customers
- 118 towns



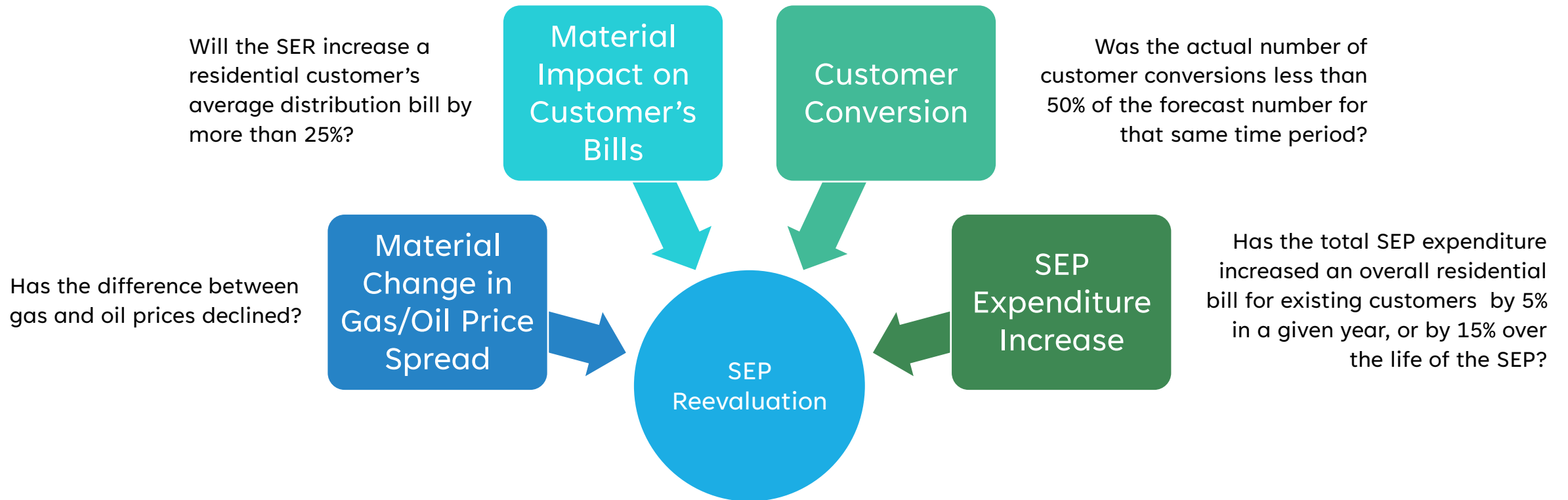
The LDC Business Model



The System Expansion Plan

Goal: Convert 280,000 customers to natural gas over ten years

Risk Containment Triggers



Dkt. No. 21-08-24

- **Purpose:** Investigate deceptive marketing techniques, and to evaluate whether the SEP was still consistent with DEEP's CES.
- **Decisions:**
 1. Yankee Gas was found to be in violation of CGS § 16-19(d)(f) and fined \$1.2m.
 2. Conditions have changed substantially enough to warrant an immediate wind-down of the SEP program.
- **Orders:**
 1. End the enrollment of new customers in SEP effective of the Decision date
 2. Directing 100% of NFM credit to offset rate base
 3. Cease all marketing efforts regarding the SEP



Future of Gas

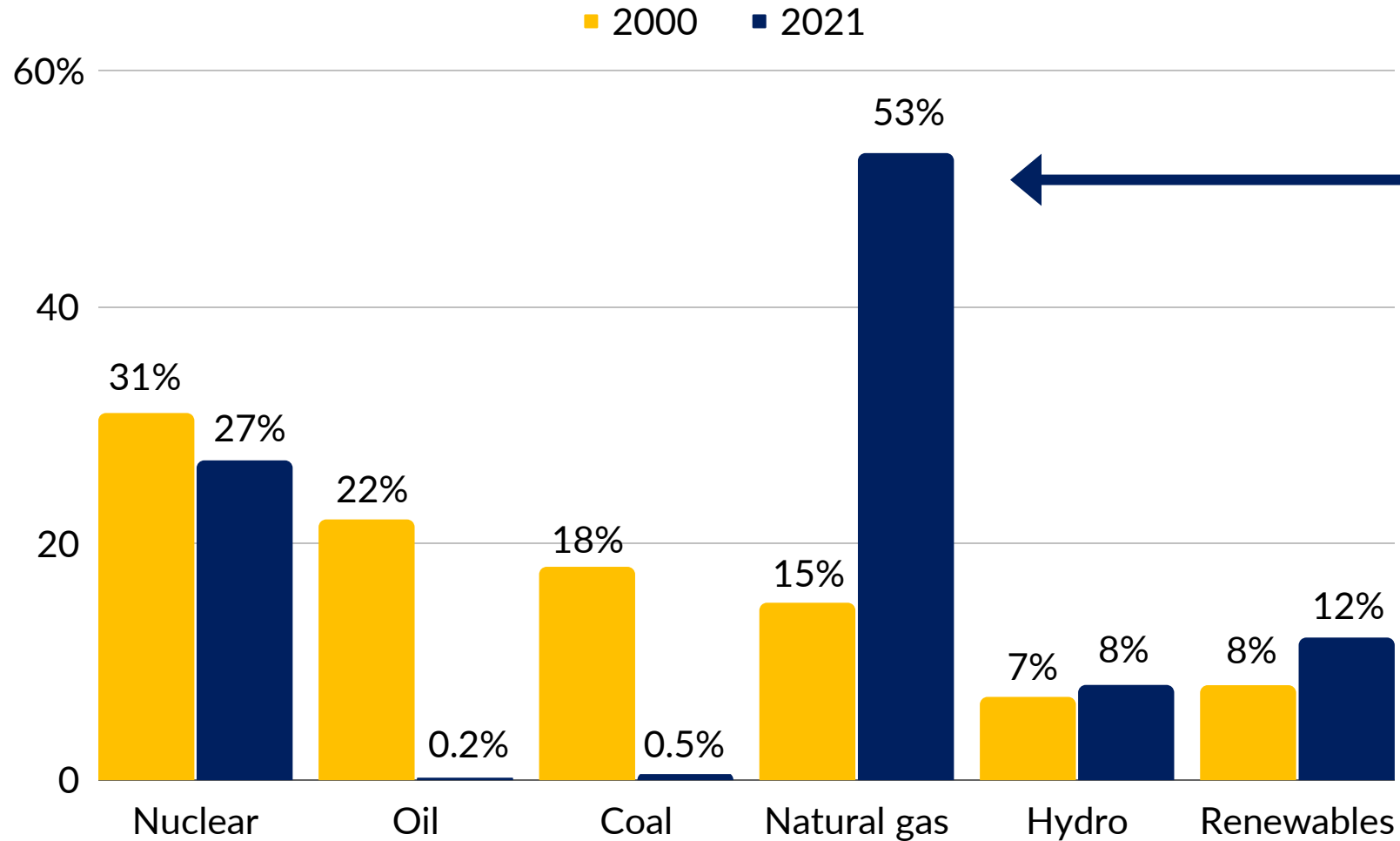
What's next?

- DEEP announced the 2022 CES Process in January 2022; PURA investigation into SEP was ongoing
- PURA will continue to participate in the CES proceeding as appropriate
- PURA will continue to hold annual SER review dockets



CT DEEP - BETP

Regional Reliance on Natural Gas

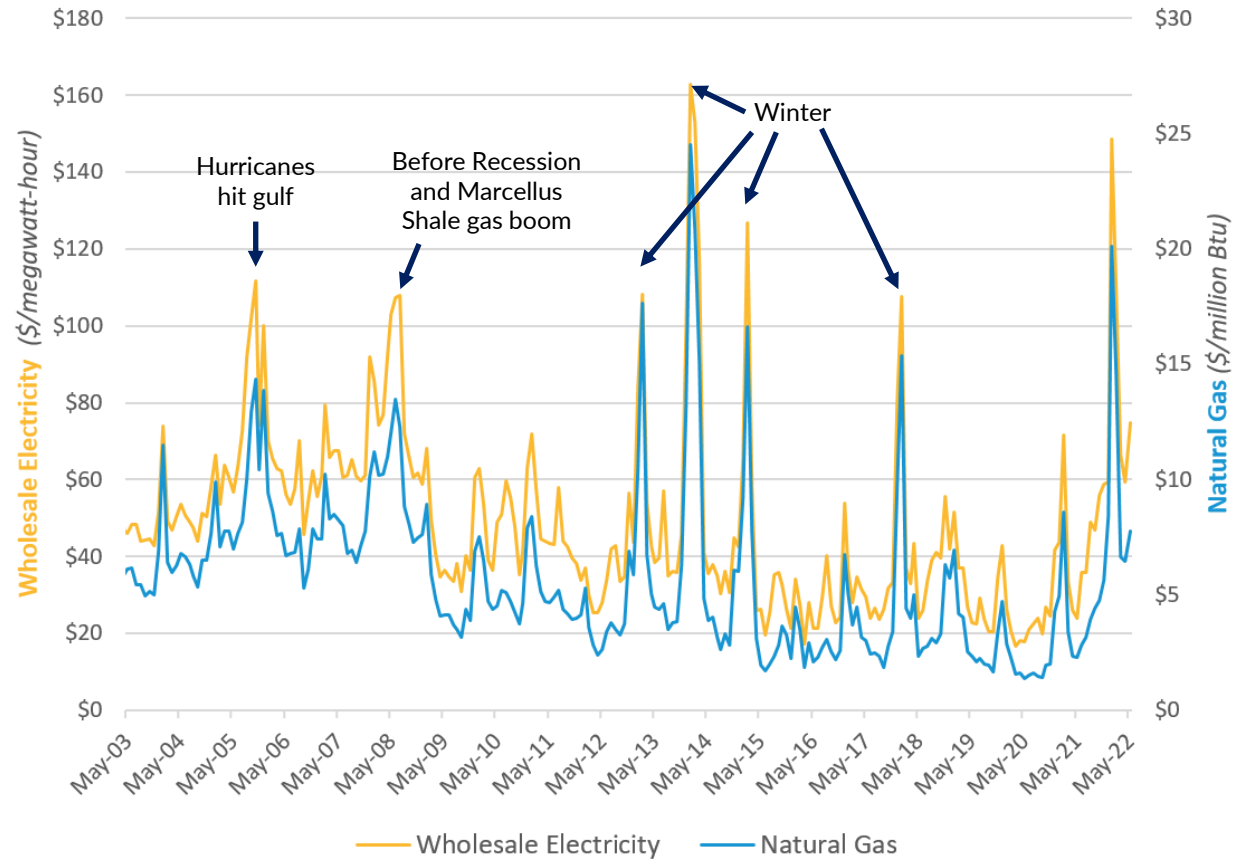


The region currently gets most of its energy supply from natural gas

Natural Gas and Wholesale Electricity

Monthly average natural gas and wholesale electricity prices at the New England hub

Shows that there is strong relationship between natural gas prices and wholesale electricity prices

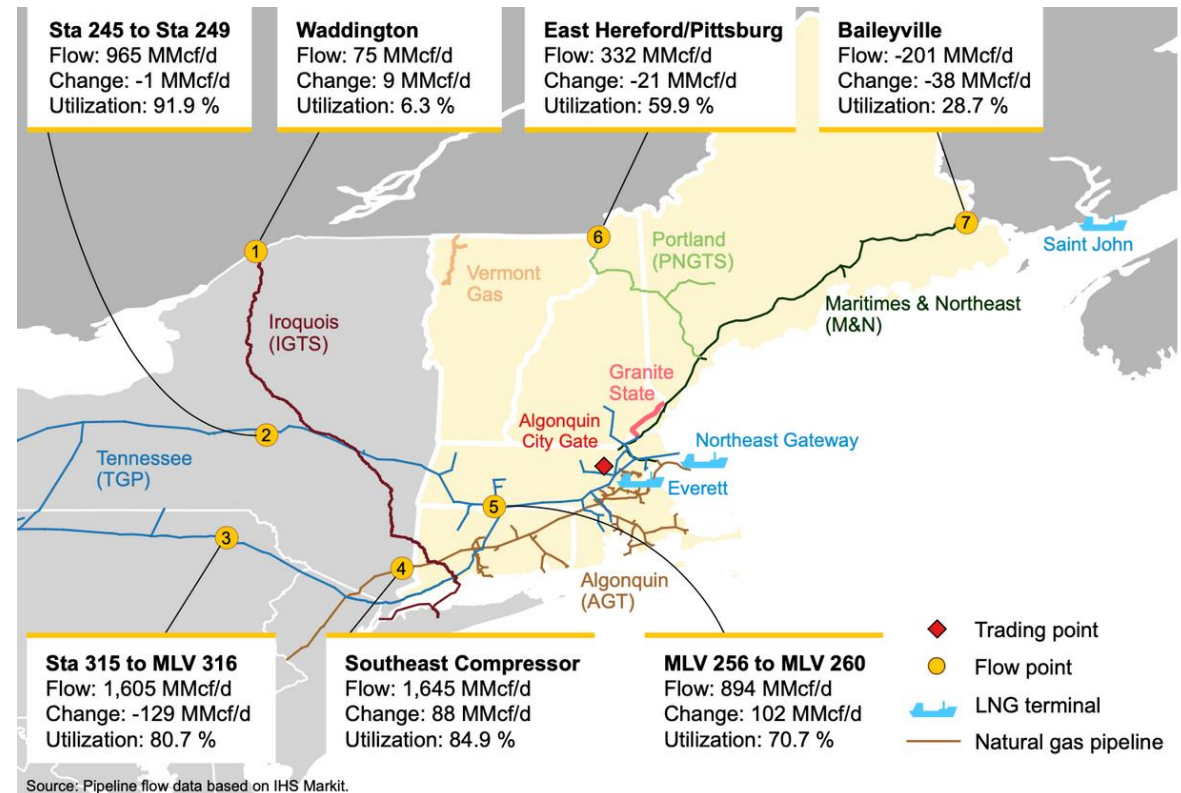


Electric Reliability Risks

Regional natural gas infrastructure has not kept up with demand

Sourced to the west are constrained during cold weather, LNG from the east helps to counter pipeline constraints

Gas flows counter to prevailing pipeline constraints, unlike fuel oil



Reducing the Carbon Intensity of Gas – Approaches & Benefits

Nikki Bruno & Eric Soderman – Eversource Energy

Mike Borea, Rob Whelan, Martin Cilloniz Milberg, & Bengt Anderson – Avangrid

Al Burgender – Linde

Richard Meyer – American Gas Association

Christopher J. O’Neill – International Brotherhood of Boilermakers

Click on an agenda section heading
to jump to the relevant slides

(speaker order may vary)

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Eversource

CT Comprehensive Energy Strategy Technical Session # 7

The Benefits of Decarbonizing Gas & Existing Gas Infrastructure

December 8, 2022

Decarbonization Pathways



Leak Reduction

Near Term

- Emission Leaks
- Pilot Alternatives (Geothermal)
- Continued Gas Energy Efficiency
- Demand Response Programs



Renewable NG

Mid Term

- Cleaner Physical Gas
- Electrification



Power to Gas



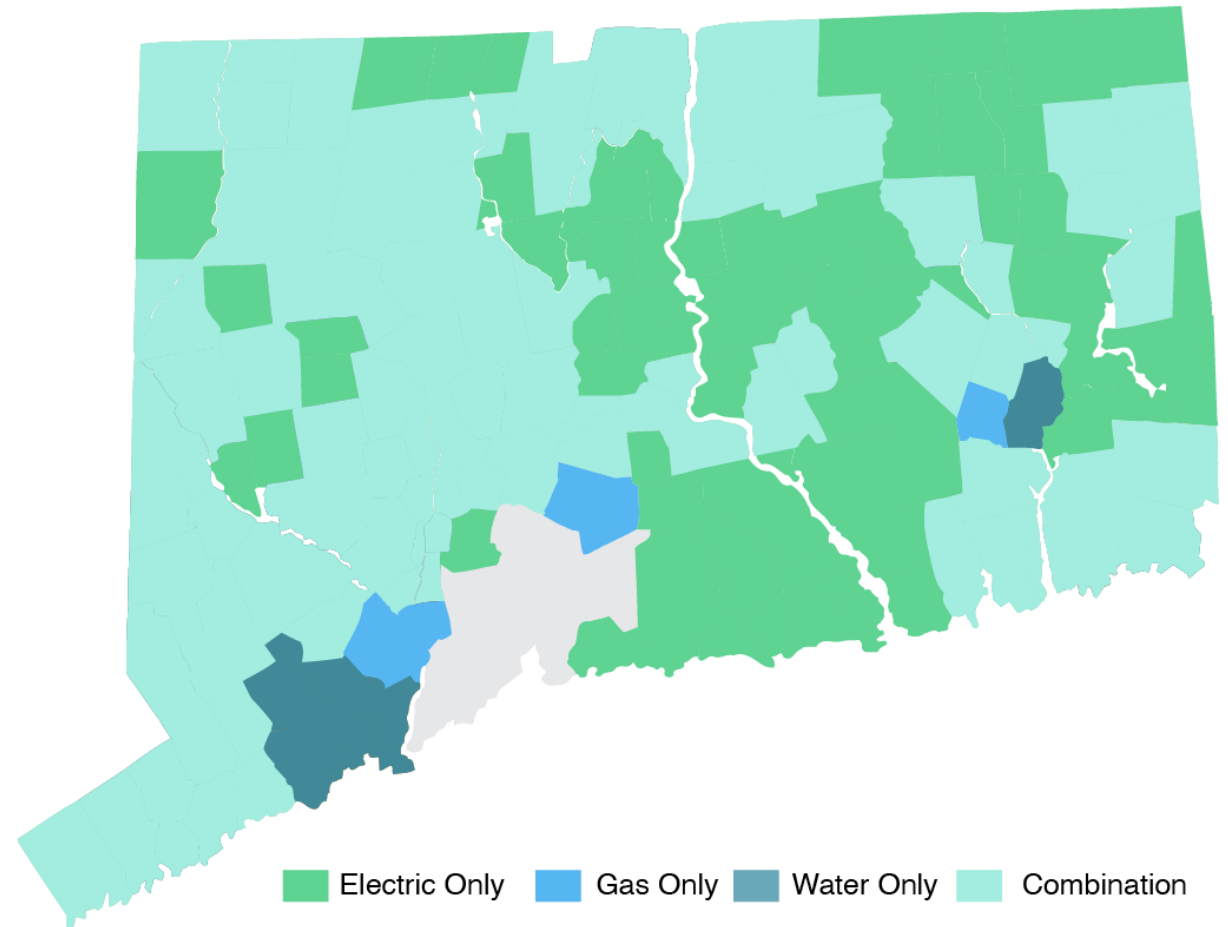
Hydrogen

Future

- Energy Storage
- Integration of Renewables
- System Asset Utilization
- Electrification

What are the benefits to decarbonization?

- **Reducing demand**
 - Gas Demand Response Pilot
- **Customer choice**
- **Faster pace for environmental gains**
- **Reliability**
- **Workforce Transition**
- **Managing affordability**



Avangrid



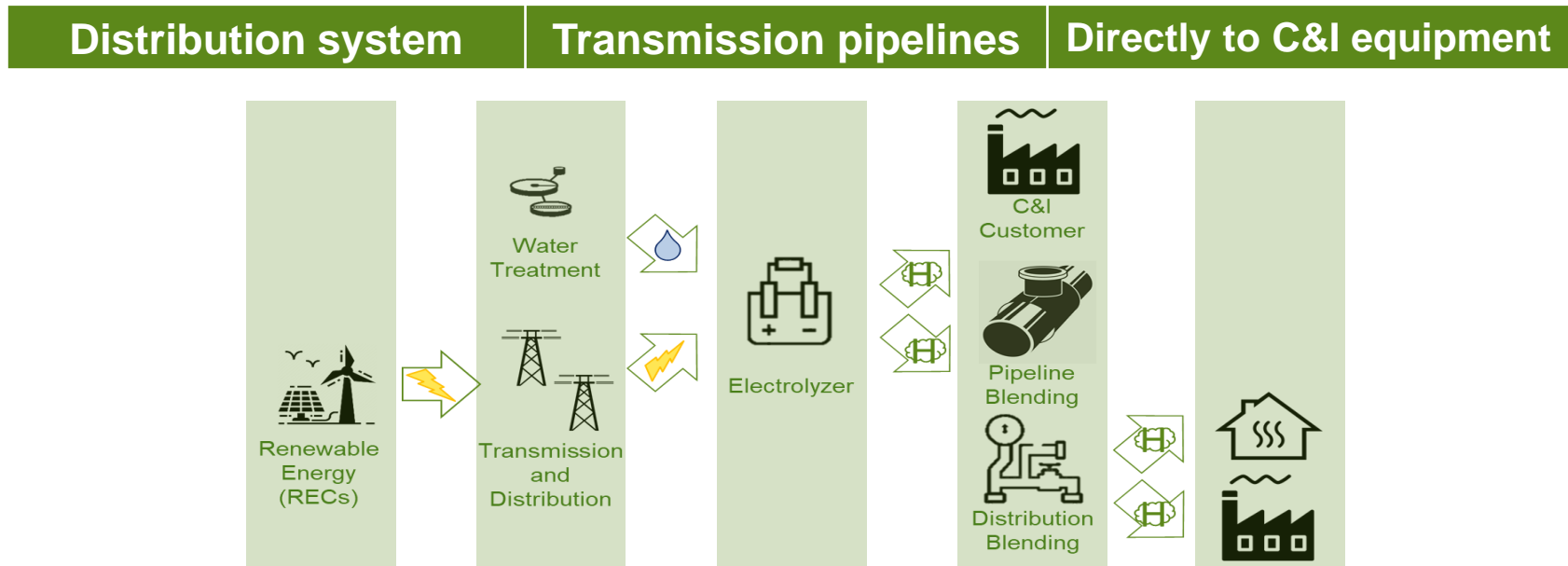
Presented by: Mike Borea, Martin Cilloniz
Milberg, Bengt Anderson & Rob Whelan

December 8, 2022

Approaches and Benefits of Reducing the Carbon Intensity of Gas

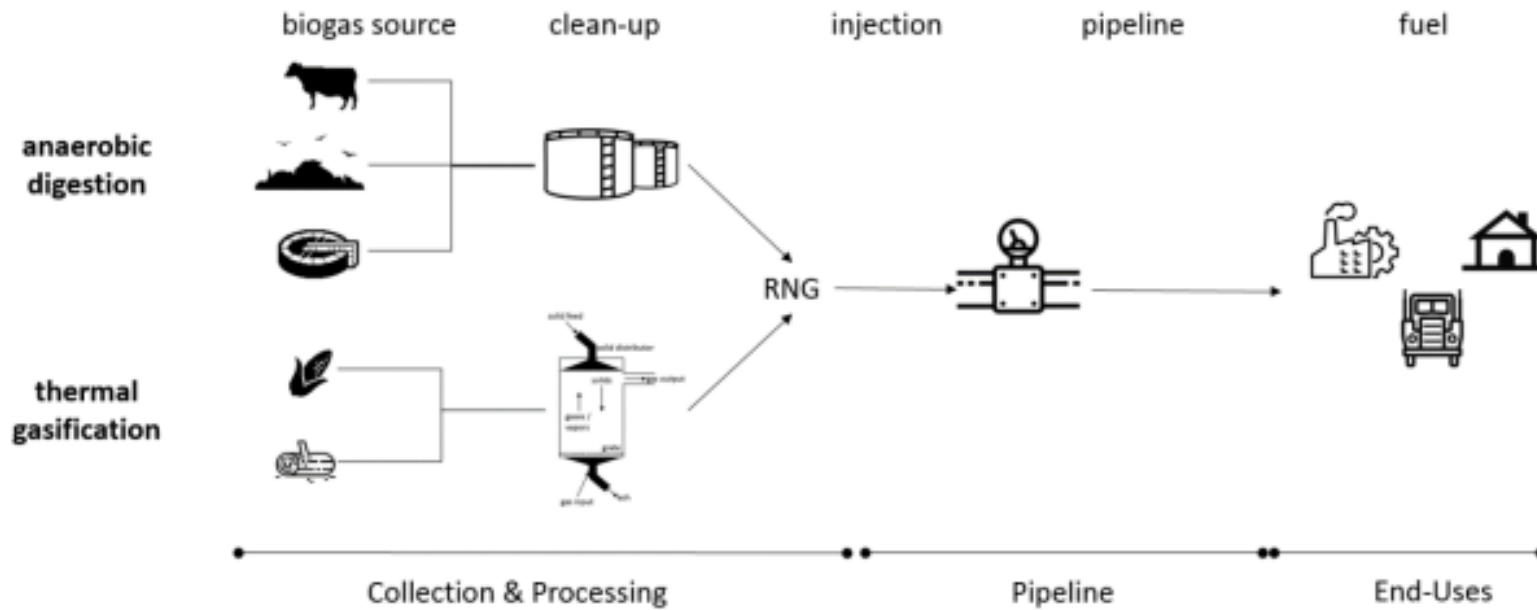
- Natural Gas has already had a large effect on emissions reduction.
- Safety and reliability are foundational requirements.
- Customer Choice should continue to be preserved
- The path to decarbonization is a balanced approach

- **Connecticut** has the potential to become the **US Capital of Hydrogen Economy**.
- **Connecticut** is the home to major fuel cell/electrolyzer **technology providers**.
- **Connecticut** has a large pipeline of **offshore wind** resources to be connected to its electric system.
- Avangrid has the **resources** and **expertise** to enable **Connecticut** to reach its full potential spearheading the hydrogen economy in the US.
- Avangrid could deploy electrolyzers in **Connecticut** that will be powered with clean energy to produce carbon free hydrogen, blend with natural gas and mobilize it within existing infrastructure:



- **Renewable Natural Gas (RNG)**

- The biogas comes from a variety of sources
- Considered carbon-negative
- Low carbon fuel standard (LCFS) incentive programs provide additional economic drivers



- **Carbon Capture**
 - Utilize existing infrastructure
 - Hard to abate sources
- **Pipe Replacement**
 - Cast Iron / Bare Steel
 - Aging infrastructure
 - Preparation for alternative fuels
- **Building Energy Efficiency**
 - Equipment Upgrades
 - Weatherization

The objectives of Avangrid Gas DR Pilots

- Shave peak demand and reduce the need for marginal gas supplies
- Alleviate temporary physical pipeline constraints in low pressure areas
- Reduce amount of pipeline capacity needed to be purchased
- Reduce emissions by reducing overall gas usage

The goals of Avangrid Gas DR Pilot

- Understand the magnitude of net load reduction that customers can provide based on 3 different gas DR strategies
- Test the feasibility of incentivizing customers to provide net reductions of natural gas
- Collect information on successful customer use reduction strategies
- Inform the process of setting program incentive levels
- Test baseline methodologies
- Provide data on reliability and repeatability of total reductions during events, as an input to Avangrid's peak day gas demand forecasting process



Thank You

Linde



State of Connecticut

Approach To Reducing Carbon Intensity Of Natural Gas

Al Burgunder
Director: Clean Hydrogen
Linde Inc.
Danbury, CT

Making our world more productive

Linde Business Confidential



An Introduction



- The leading industrial gases and engineering company
- Formed in 2019 with the merger of Linde AG and Praxair, Inc – two world-class companies with nearly 140 years of shared history and successful achievements
- Group Sales ~\$32 B

One Linde

Uniting with a shared Vision, Mission and Strategic Direction, and demonstrating our Values and Behaviors in everything we do

2 million+ customers

Establishing a more diverse and balanced portfolio

100+

countries

Enabling strong, complementary positions in all key geographies and end markets

~80,000

employees

Achieving our full potential, individually and collectively

~\$15 millions

charitable giving and sponsorships in 2018

Supporting our communities through contributions and employee volunteerism

6,500+




active patent assets worldwide

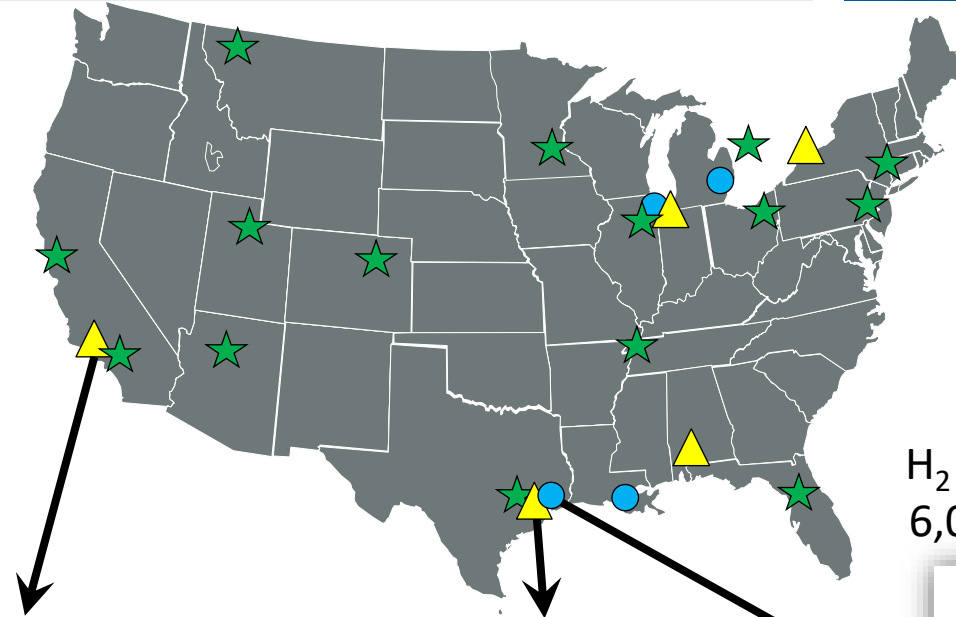
Leading with innovative products, solutions and technologies



Major North American Hydrogen Supplier



-  5 hydrogen liquefiers
More than 150 MTPD
-  4 hydrogen pipeline networks
-  15 gas hydrogen trans fill stations
180 bar & 500 bar capability



Linde Green™ Hydrogen Available

- From all Linde liquid hydrogen production locations
- Can “Green Up” to any requirement



* Present delivery mechanism uses diesel-based fuels

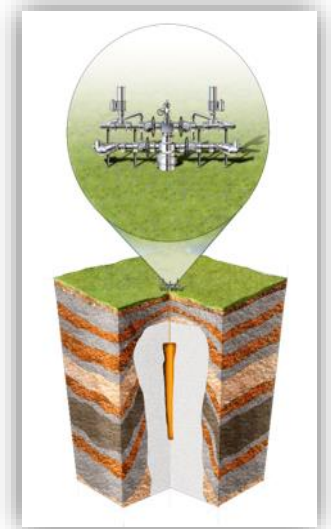


Green H₂ from
Landfill RNG
Ontario, CA



NEW! 30 MTPD LH₂
LaPorte, TX

H₂ Storage Cavern
6,000 MT Storage

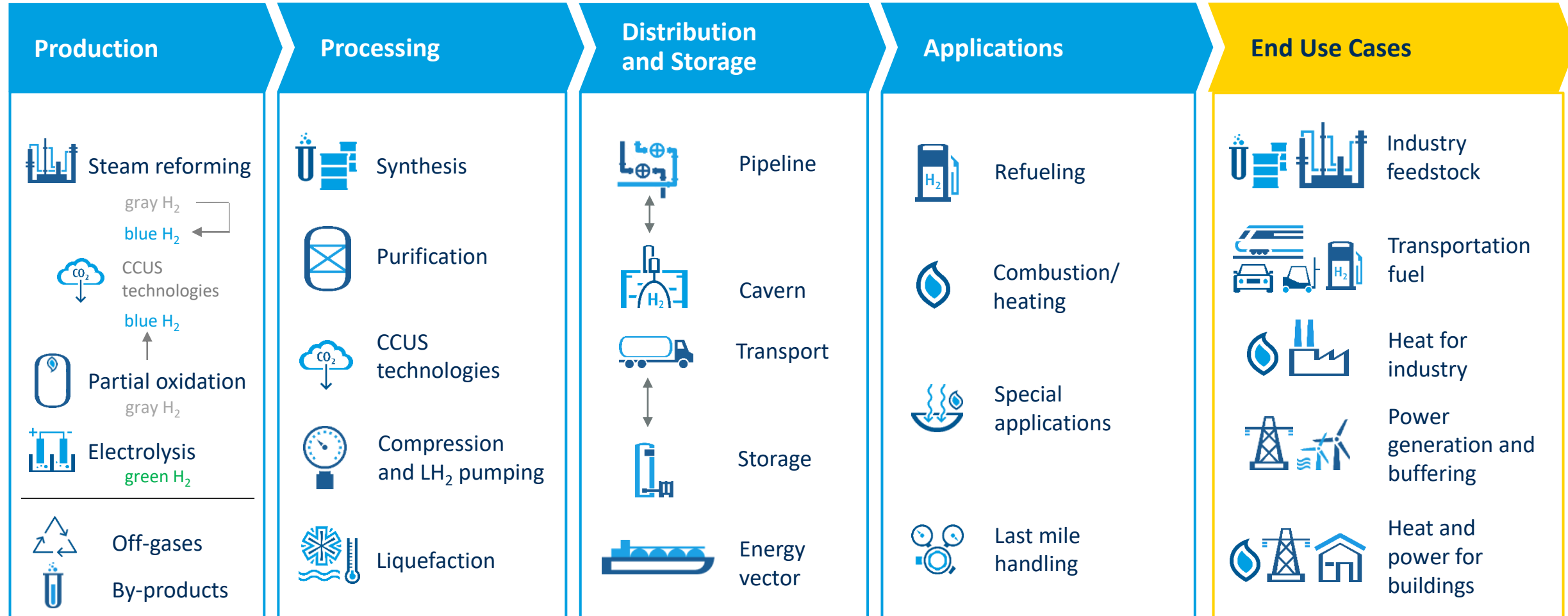


Linde's Hydrogen Value Chain

Technology elements for all steps available

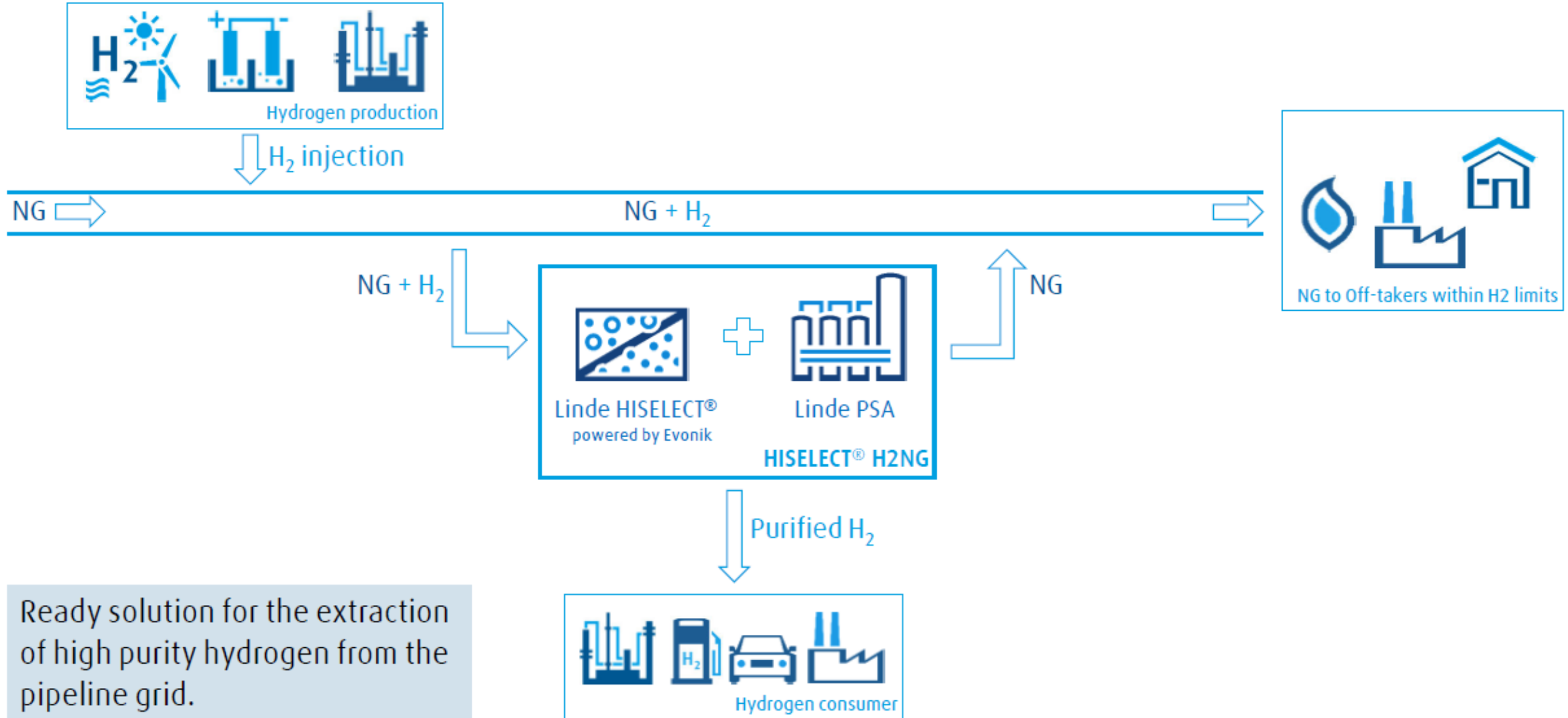


Linde's hydrogen value chain

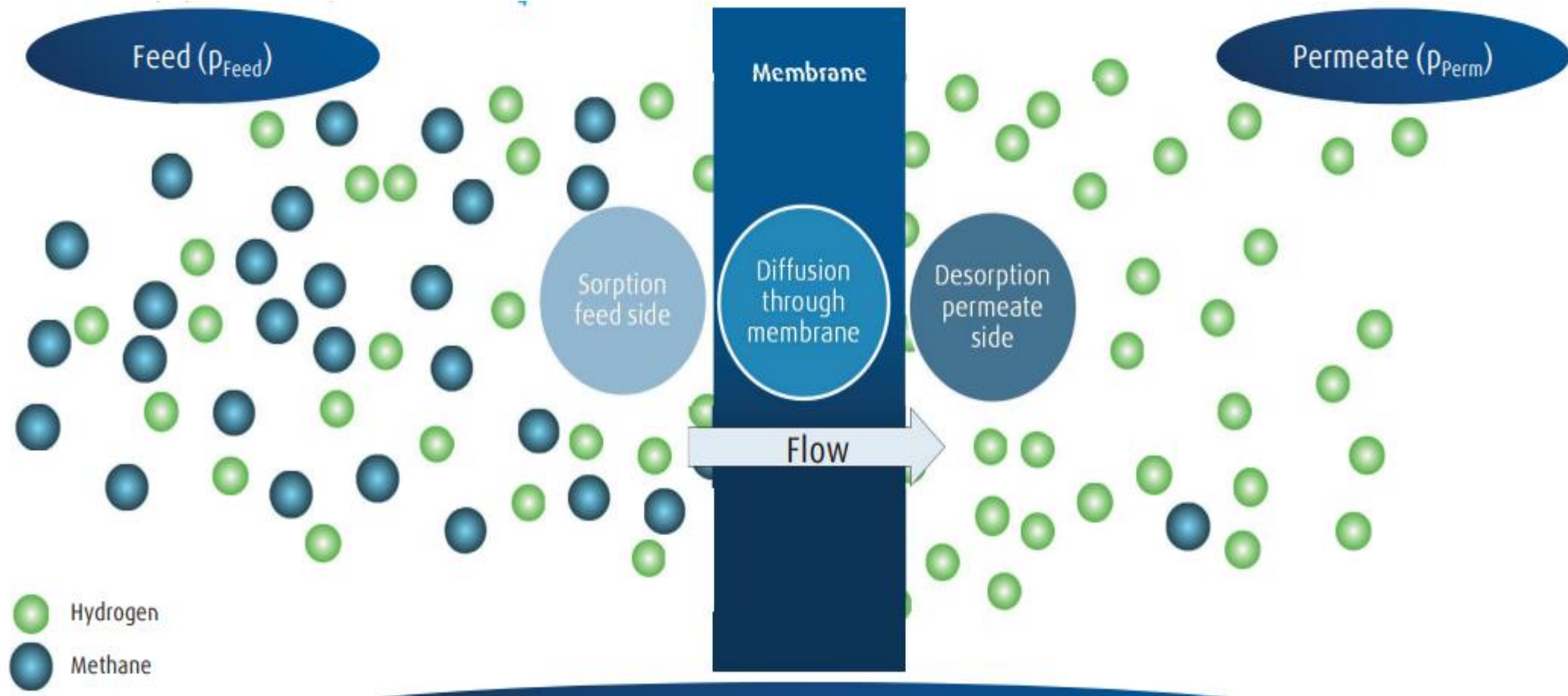


Hydrogen Extraction from Hydrogen Blended Natural Gas by HISELECT® H2NG.

Basic Concept.



Ready solution for the extraction of high purity hydrogen from the pipeline grid.



Strategic Partnership between Evonik & Linde



Leveraging synergies by integrating the HISELECT® powered by Evonik high-performance membranes into Linde's gas processing technology portfolio

Demonstration Project: Dormagen, Germany



World's first real-scale pilot plant for extracting H₂ from natural gas pipelines using membrane technology in Dormagen, Germany.

Think hydrogen



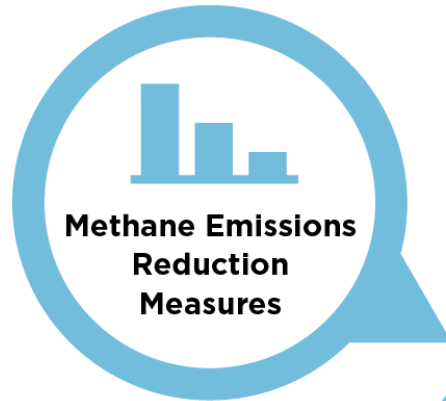
Think Linde

American Gas Association

**NET-ZERO
EMISSIONS
OPPORTUNITIES
FOR GAS UTILITIES**

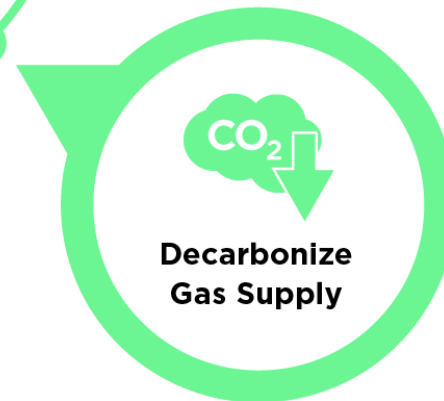
There are many gas utility solutions to reducing emissions

- Differentiated Gas
- Leak Detection and Repair Programs
- More Accurate Emissions Measurement
- Replacement of Higher Emitting Pipe and Equipment
- Operational and Maintenance Measures



- Expansion of Gas Energy Efficiency Programs
- Building Envelope Improvements
- Emerging Highly Efficient Gas Technologies

- Carbon Capture and Sequestration
- Direct Air Capture
- Greenhouse Gas Emissions Offsets



- Renewable Natural Gas
- Hydrogen Blending
- Methanated Hydrogen
- Dedicated Hydrogen Infrastructure

Net-Zero Emissions Opportunities for Gas Utilities

An American Gas Association Study
prepared by ICF



Project Objectives and Approach

- Evaluates the wide array of opportunities for gas utilities to achieve net-zero greenhouse gas emissions goals
- Provides in-depth assessment of illustrative pathways to achieve net-zero greenhouse gas emissions for gas utility customers by 2050
- Identify policy and regulatory actions to accelerate net-zero ambitions through gas infrastructure and technologies

Summary

The study finds that gas utilities and infrastructure:

- Play crucial and enduring roles in pathways to net-zero
- Can meet net-zero GHG emissions targets
- Ability to store and transport large amounts of energy to meet seasonal and peak energy use are valuable resources
- Can increase the likelihood of successfully reaching net-zero targets while minimizing customer impacts



**Decarbonization
planning and
implementation
must support
five key tenets**

Safety

Affordability

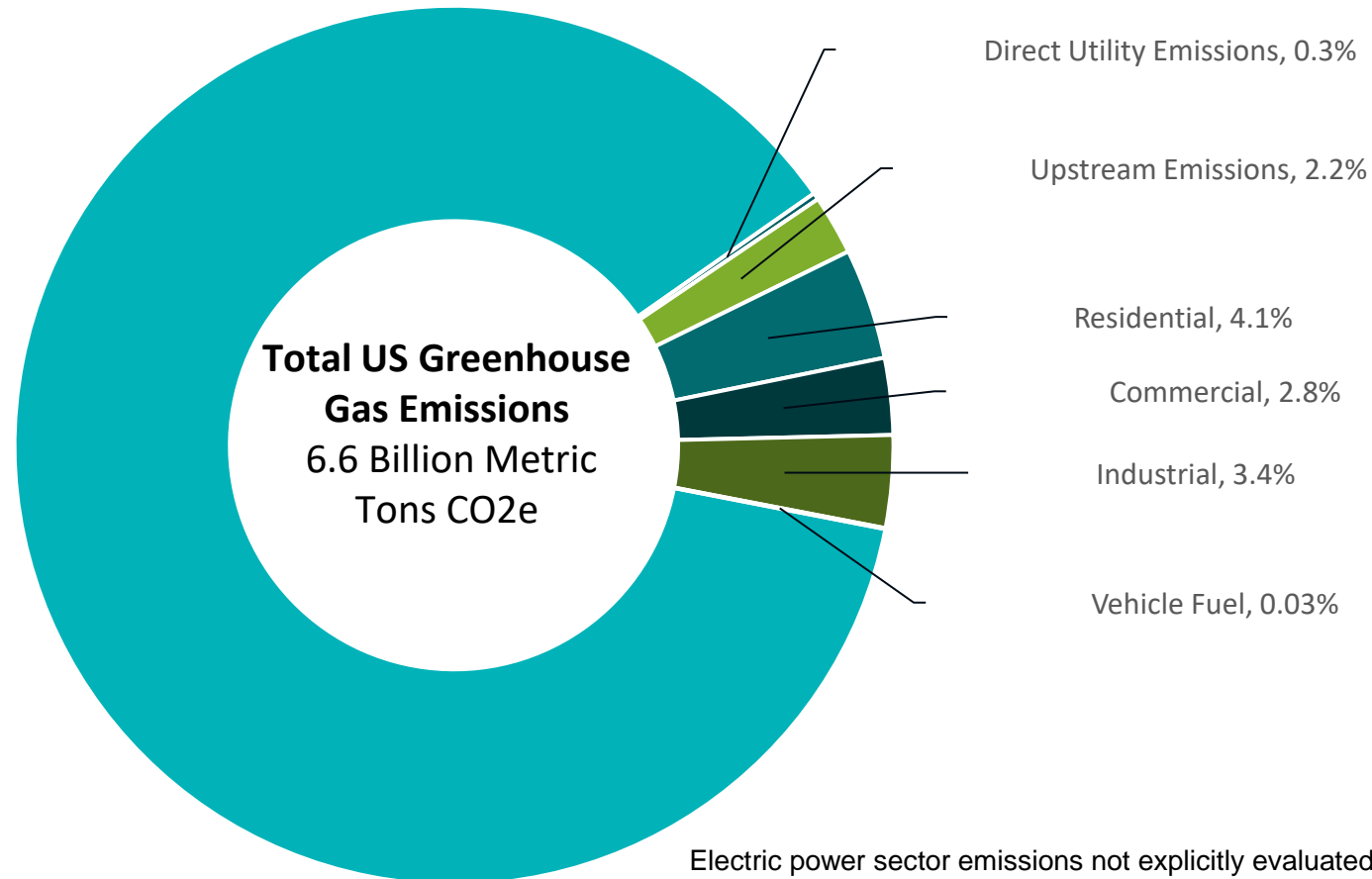
Reliability

Resilience

Feasibility

Gas Utility Associated GHG Emissions: 13% of total U.S. GHGs.

Gas Utility Associated GHG Emissions by Category 2019



Electric power sector emissions not explicitly evaluated in study
Source: EPA, EIA

Gas Customer Decarbonization Pathways

Each illustrative pathway reaches net-zero emissions for gas utility customers by 2050

Gas Energy Efficiency Focus

Significant demand reductions from gas heat pumps, utility efficiency programs, and building shell retrofits.

Hybrid Gas-Electric Heating Focus

Coordinated gas and electric infrastructure planning and optimization through use of hybrid gas-electric integrated heating systems.

Mixed Technology Approach

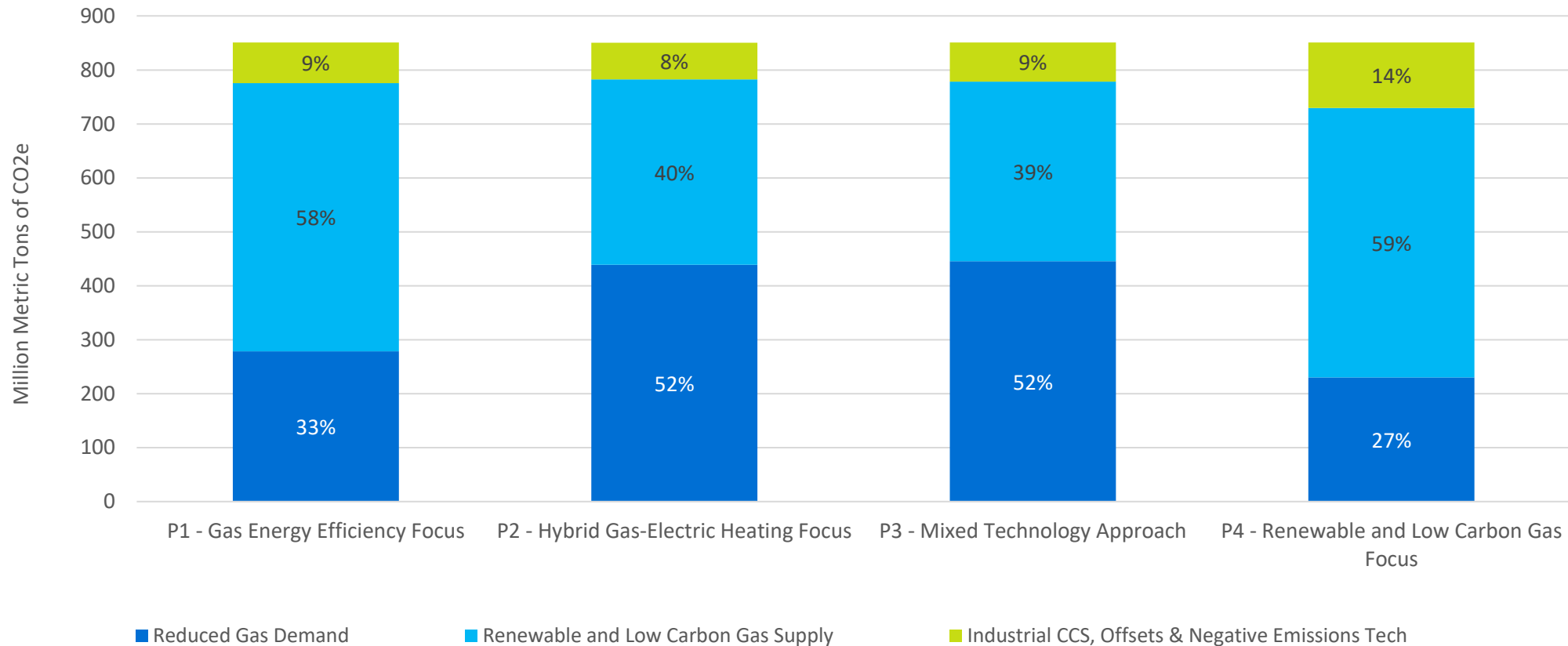
“All of the above” scenario with fuel-neutral policy where customers choose from a range of applications.

Renewable and Low-Carbon Gas Focus

Prioritizes the decarbonization of the energy supply and limit impacts on customers to make major changes in energy equipment and infrastructure.

The relative contribution of measures varies by pathway, showcasing a diversity of potential approaches

Summary of Types of 2050 Emission Reductions



Assumptions and Other Considerations

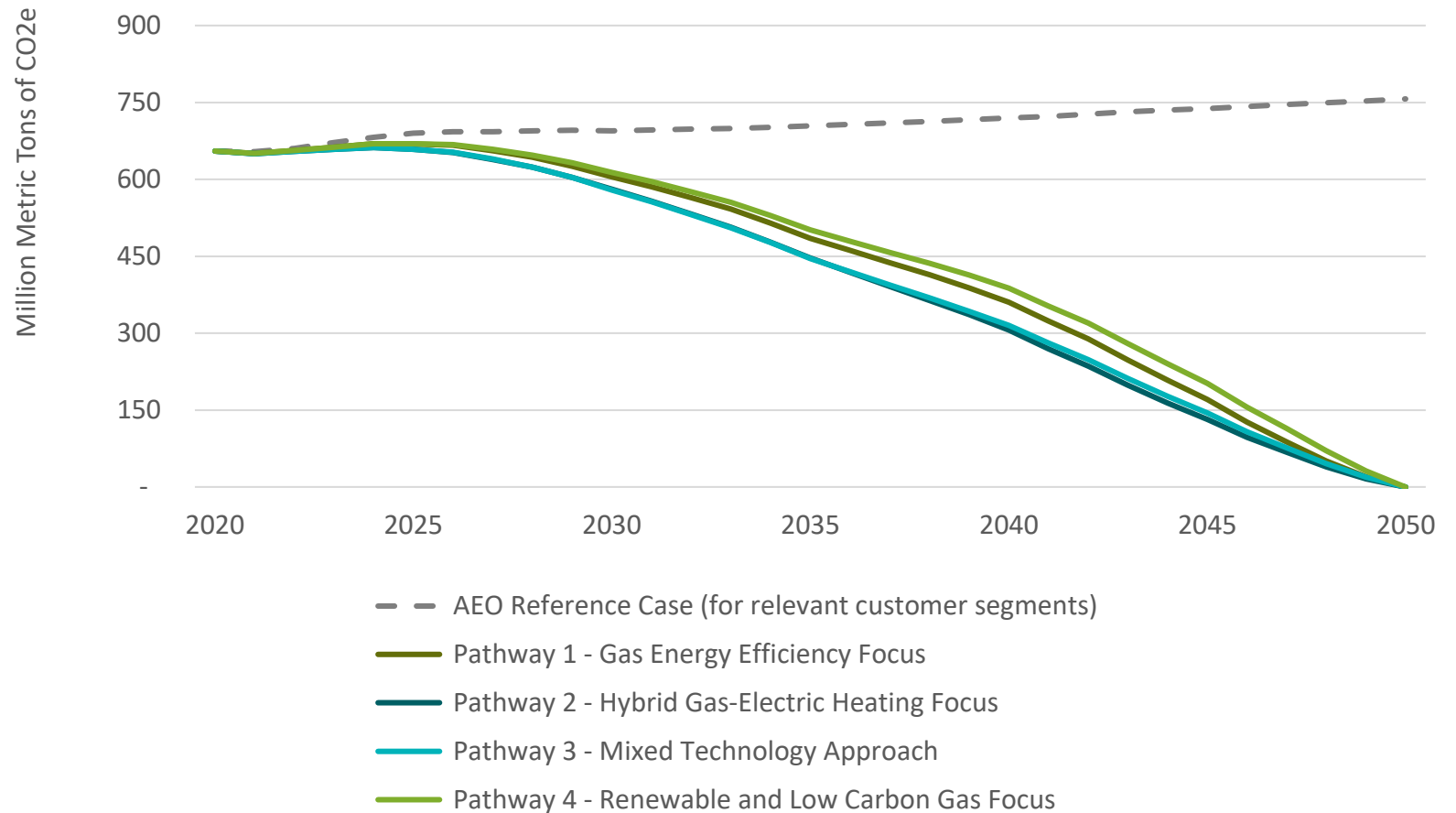


- Baseline - EIA Annual Energy Outlook 2021 (Ref Case)
- Net-zero requirements assumed economy-wide
 - Power generation & transportation not modeled
- Customer pathways include end-use sectors served by gas utilities
 - LNG exports not included
 - Propane / electric / fuel oil customers not modeled
- National-level results
- Costs must be based on highly-local factors outside analysis scope

Every pathway was designed to achieve net-zero greenhouse gas emissions.

- Emphasis was placed on developing pathways showcasing a diversity of scenarios
- There are many potential pathways to net-zero that include gas utility solutions and infrastructure.
- The number of natural gas customers grow in all pathways

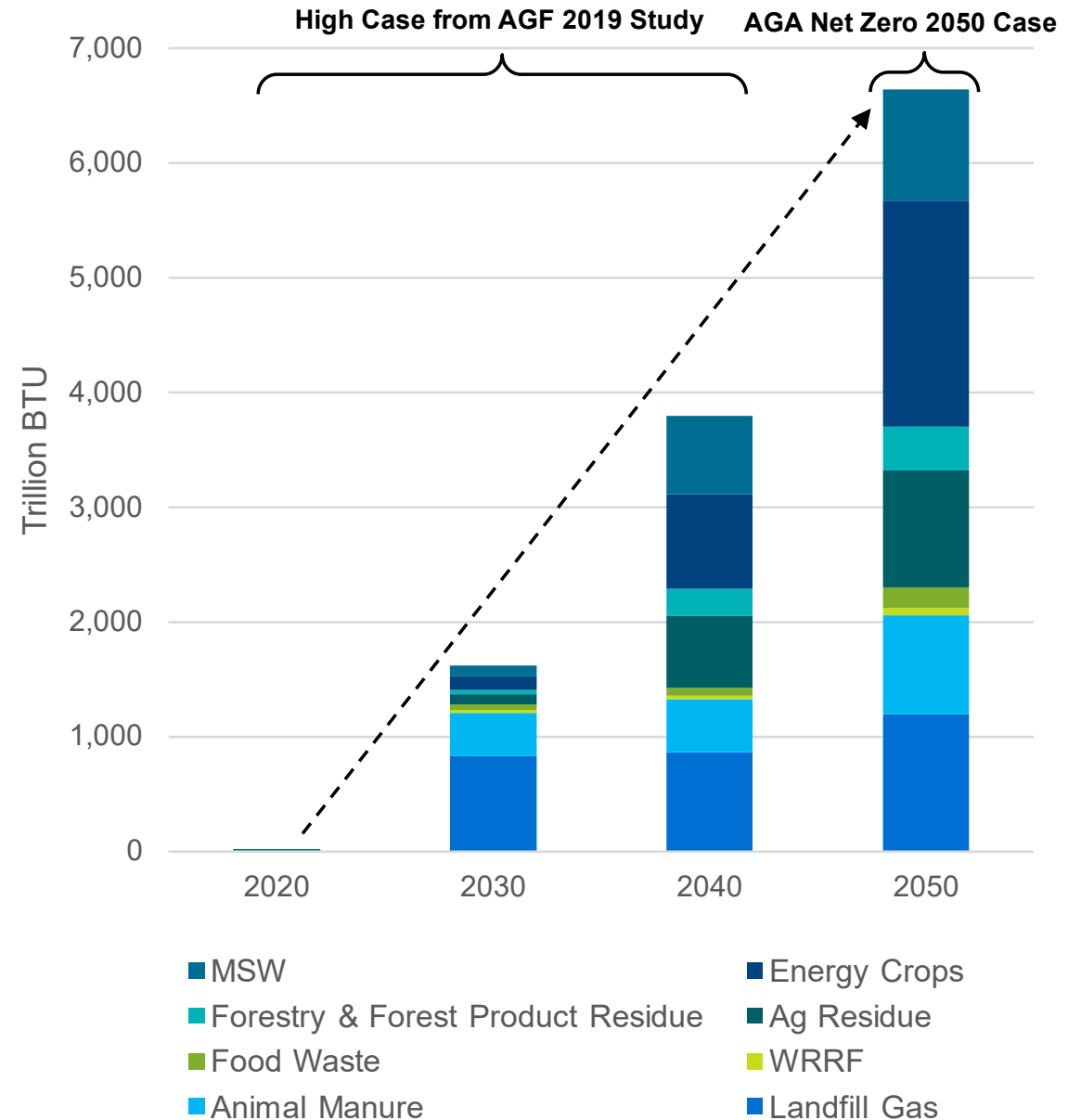
U.S. Gas Utility Customer Emission Reduction Pathways



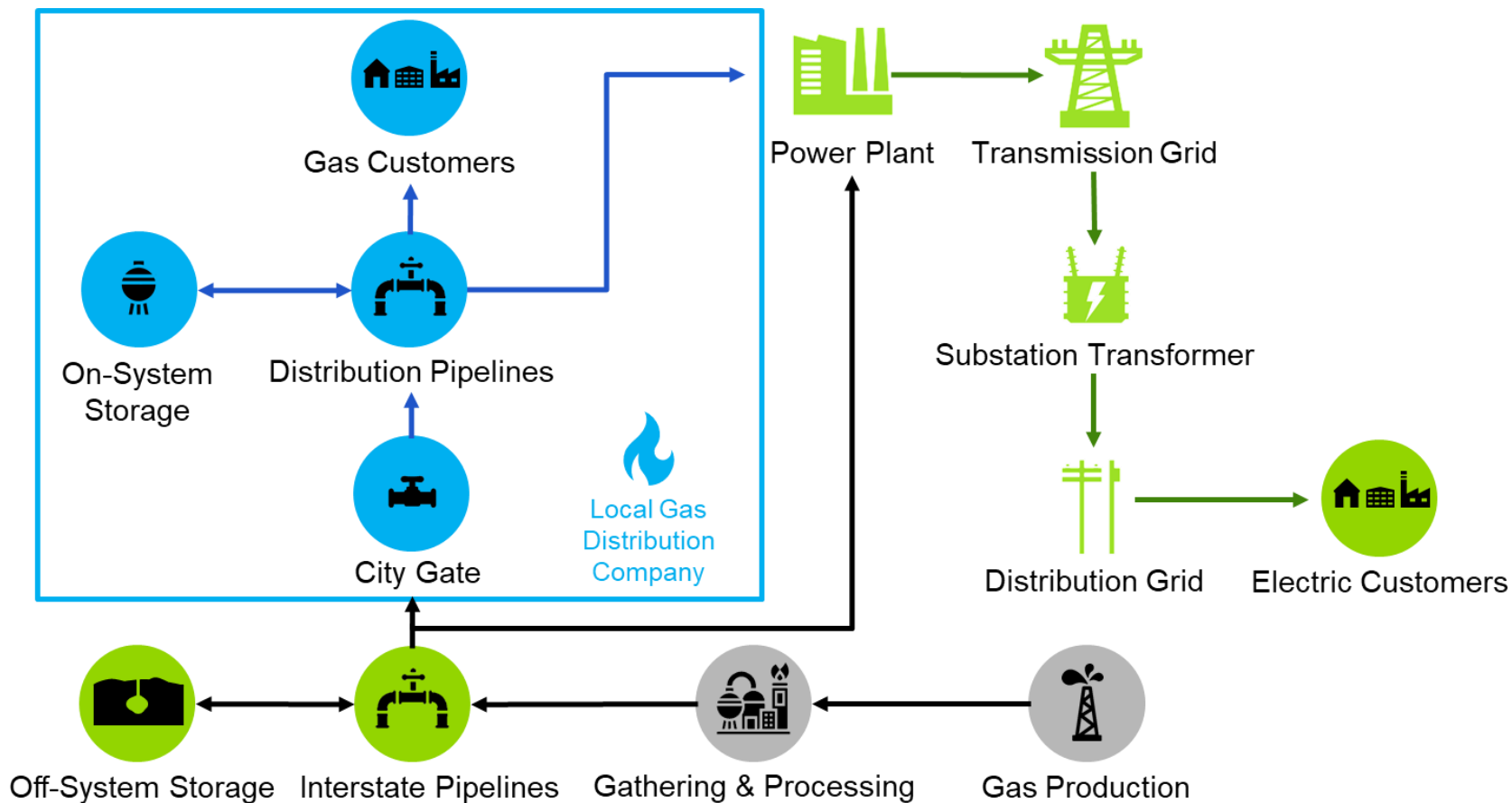
All pathways studied incorporate a significant expansion of renewable natural gas (RNG) and hydrogen

- The renewable natural gas and low-carbon supply mix is underpinned by a significant resource potential expansion compared with the American Gas Foundation (2019) study
- Low-carbon fuels technology are evolving rapidly.
- RNG resource development is a key strategy to unlocking gas decarbonization opportunities.

Comparison of 2040 and 2050 Cases for RNG Supply



An integrated approach to decarbonization is needed that leverages the gas and electricity systems



**Stakeholders
should
consider gas
decarbonization
strategies**

Value in multiple approaches

Leverage existing infrastructure

Reduce transition costs and complexity

Maintain flexibility to respond to changes in technology or the market

Leveraging both gas and electric systems lowers risks

Supportive policy and regulatory approval will be essential for gas utilities to achieve net-zero emissions.

- Expanded Utility **Energy Efficiency** and Demand-Side Management Programs
- Create Market Structures and Incentivize Demand for **Renewable and Low Carbon Gases**
- Coordinated **Gas and Electric Planning**
- **Utility Regulatory Updates**
- Address Cost Allocation and **Consumer Equity Issues**
- Considering methods to compensate gas customers for **system cost savings**

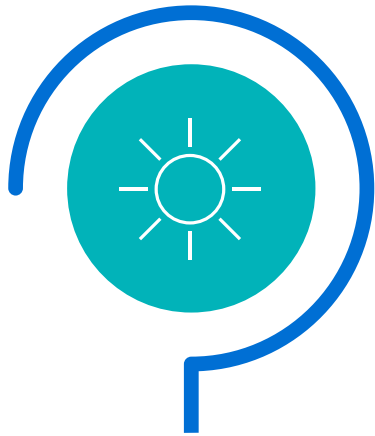




Other Key Findings

- Expanded energy efficiency, renewable fuels, and methane emissions mitigation are no-regrets actions
- Large amounts of renewable and low-carbon electricity and gases, and negative emissions technologies, will be required
- Increased RD&D and coordination with the electric sector unlock more decarbonization measures
- Supportive policy and regulatory approval will be essential

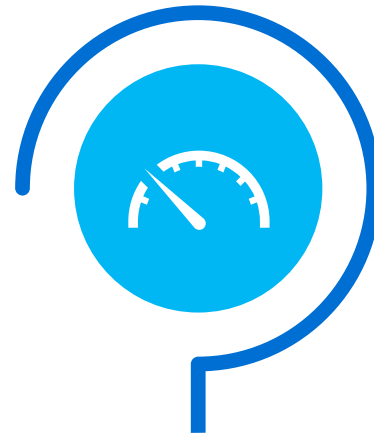
Additional community and customer benefits of gas utility strategies to decarbonization



**Reduction
in air
pollution**



**Increased
economic
development**



**Consumer
energy
savings**



**More
consumer
options**

Questions?

International Brotherhood of Boilermakers

**CONNECTICUT DEEP
METHANE/NATURAL GAS
DISTRIBUTION PLANNING & POLICIES
SESSION 7
DECEMBER 8, 2022**

**PRESENTED BY: INTERNATIONAL BROTHERHOOD OF BOILERMAKERS
INTERNATIONAL REPRESENTATIVE CHRISTOPHER O'NEILL
CONTACT INFORMATION:
CONEILL@BOILERMAKERS.ORG**

HISTORY

SINCE 1880, The International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers, and Helpers, have successfully contributed to the decarbonization of both the air quality in the United States, as well as around the world. We have a rich history of putting the environment as our number one priority, while keeping our members hard at work fulfilling the American dream.

~ C. O'Neill

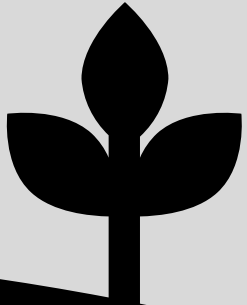
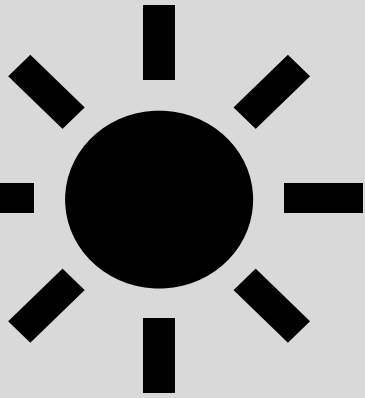


CURRENT BOILERMAKER EMPLOYMENT

- Boilermakers are employed throughout the State of Connecticut at many facilities. Our employment being much higher during spring and fall planned outages servicing power plant upgrades and regular maintenance.
- Our best employment in the state is through large new construction projects, that are completed utilizing Project Labor Agreements.
- Due to work being limited in Connecticut and throughout New England, a majority of our members seek work in the Great Lakes area and Mid-West where work opportunities are much greater.

PROVIDING JOBS WITH

CLEAN ENERGY



INVESTMENT

Procure projects through state agencies & private investors for development

WORK FORCE DEVELOPMENT

Utilize CT State Building Trades Training Institute (BTTI) and employment programs implemented by the DOL

GOOD PAYING JOBS

Keeping the residents of Connecticut at work by employing a properly trained & licensed workforce with the use of PLA's

CLEANER FUTURE

Continue to be a state that is the example of clean, reliable, & sustainable energy.

THE CHALLENGE



**MAINTAINING
BASE LOAD
POWER**



**HAVING AFFORDABLE
ENERGY RATES**



**REDUCING THE
CARBON FOOTPRINT
OF CONNECTICUT**



**CLEAN UP
EXSITING ASSETS**



**RENEWABLE
TECHNOLOGY COMES
AT A COST**



**CHOOSING
ALTERNATIVES THAT
DRIVE RENEWABLE
ENERGY**

HYDROGEN DEVELOPMENT

- North American Hydrogen market is being shaped by the Hydrogen Hub challenge from the DOE. Various states are collaborating as they vie for more than US\$ 8 Billion in Federal Dollars to assist in establishing four (4) domestic Hydrogen Hubs.
- The government is also establishing production goals to be met by 2030.
- A major consortium has been established in the Northeast and includes the states of New York, New Jersey, Connecticut and Massachusetts. The consortium is comprised of 37 organizations including Plug Power, Con Ed, Cummins, Invenergy, Nucor and others.
- The Hydrogen initiative is currently reviewing consortiums pursuing Hydrogen Hub development and involve Boilermaker and other Building Trade affiliated contractors as the initiative unfolds.
- All industries are seeking cleaner ways to deploy fleet vehicles as well as production of product for economic growth, keeping a clean future in mind.



Cement



Manufacturing



Shipbuilding



Steel Production

HYDROGEN PRODUCTION BY CATEGORIES

Information provided here identifies the “Colors of Hydrogen”, and the explanation of the production of Hydrogen in a diversified energy market.



RENEWABLES THAT WILL BE THE FACE OF OUR FUTURE

THE FIX



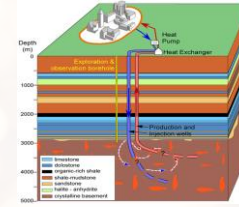
**THE
COVERSION**



SOLAR



HYDRO



**GEO-
THERMAL**



WIND

DIVERSIFIED ENERGY MARKET



**NATURAL
GAS**



BIOFUELS



**SOLID WASTE
RECYCLING**



NUCLEAR



**CARBON
CAPTURE**

- The energy transition to hydrogen or even wind and solar will continue to be a challenge until we have the proper infrastructure in place to handle the base load power that is needed for everyday consumption, whether it be standard rate payers, municipalities, or manufacturing facilities throughout the state.
- Renewable energy comes at a cost, and we need to be mindful when electrifying end users and making the demand for electricity even higher.
- I believe holding existing power generation providers to higher standards of supplying clean energy could be implemented, until adequate renewable energy is readily available.
- This can be done by requiring more emission control quality or using “Flex Fuels”, such as a combination of Natural Gas and Hydrogen or even the use of Ammonia in gas turbines.
- Collaboration with companies like Plug Power, Linde, Fuel Cell Energy, etc., will be able to provide realistic solutions while building out our clean future.
- Looking at all forms of power producing energy is key! Having a diversified energy market and meeting the goals of Connecticut’s carbon reduction can be met by equalizing all energy fuels.

TRANSITIONING TO HYDROGEN

BOILERMAKERS ERECT HYDROGEN STORAGE SPHERES FOR PLUG POWER IN ALABAMA, NY

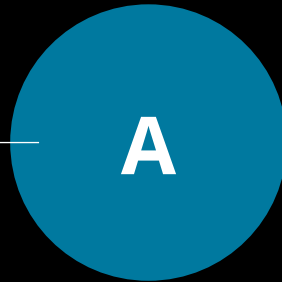


BOILERMAKERS

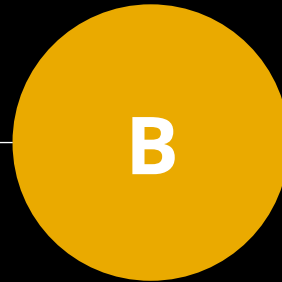


CONNECTICUT'S PLAN FORWARD

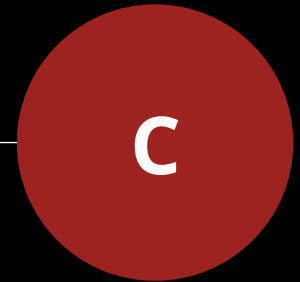
The topic is apart of almost every conversation with those of us in the United States energy industry and we all have the same questions. What renewable sources to transition too while still providing power. Where will renewable energy sites be developed, and when is the biggest question of them all. We all know that the energy transition is upon us, but WHEN will we begin to shape our future, and build the bridge to put Connecticut renewable energy plan to work.



WHAT



WHERE



WHEN

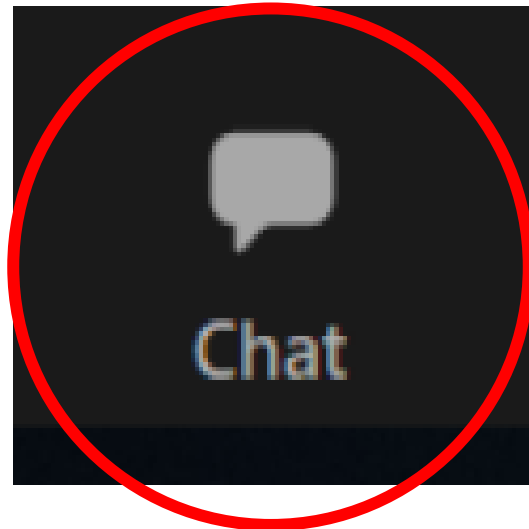
CONNECTICUT DEEP METHANE/NATURAL GAS DISTRIBUTION PLANNING & POLICIES

Q & A

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Questions



At the conclusion of each panel DEEP will hold a brief question and answer period.

If you have a question for a presenter, please drop it into the chat to **Jeff Howard**. DEEP will pose as many questions as time allows to the speakers. Clarifying questions will be prioritized. Leading questions will not be accepted.

Lunch Break

(we'll restart at 1:00 p.m. ET)

BUREAU OF ENERGY AND
TECHNOLOGY POLICY

