

The Future of Gas Utilities Series

TRANSITIONING GAS UTILITIES
TO A DECARBONIZED FUTURE

Part 2 of 3

SEPTEMBER 2021



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Gas Utilities Can Participate in a Decarbonized Future to Mitigate a Potential Death Spiral and Control Customer Costs

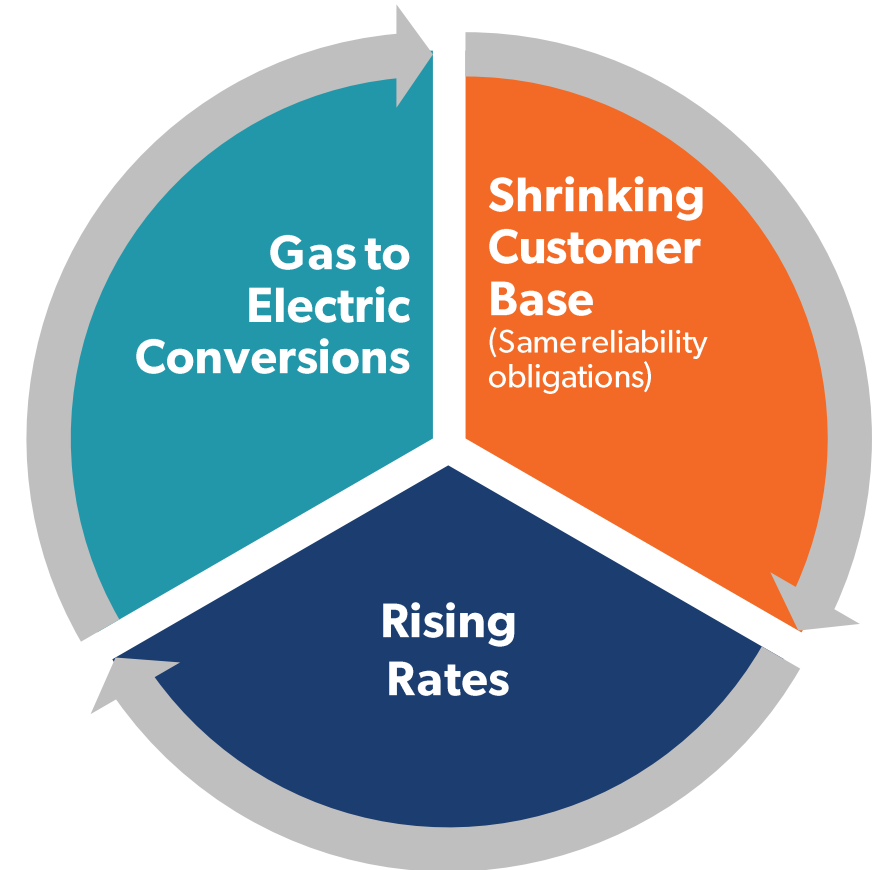
As states pursue degasification policies and homes convert to electric heating, **utilities risk losing customers and load.**

- Nationally, electric heating is outpacing gas heating adoption.
- Technology mandates and policy further accelerate the problem.

Utilities will likely **continue investing in their existing systems for safety and reliability purposes, but need to recover those costs from a shrinking customer base.**

- This puts remaining customers at risk, creating a “death spiral” trend pushing more customers to electrification.
- Up to \$150–180 billion of gas distribution assets could be under-recovered as a result of the transition.

This spiral will increase customer costs and increase energy burdens, especially for low-income and vulnerable populations.



Gas utilities may reverse this problem if they quickly become part of the solution to a decarbonized future.

The Brattle Group's Future of Gas Utilities Presentation Series

The Brattle Group's Future of Gas Utilities building blocks will be presented in a series of three presentations to be released in the summer and fall of 2021.

The Brattle Group's Future of Gas Utilities Series will culminate in a **Symposium**, where industry and Brattle experts will convene to debate key challenges and opportunities facing the gas industry.

The first building block presentation, "Assessing Risk," was released in August 2021. Please see the presentation [here](#).

The remainder of this slide deck will cover the second building block: **Evaluating Strategies**.



Part 2: Evaluating Strategies

The Future of Gas Utilities Series



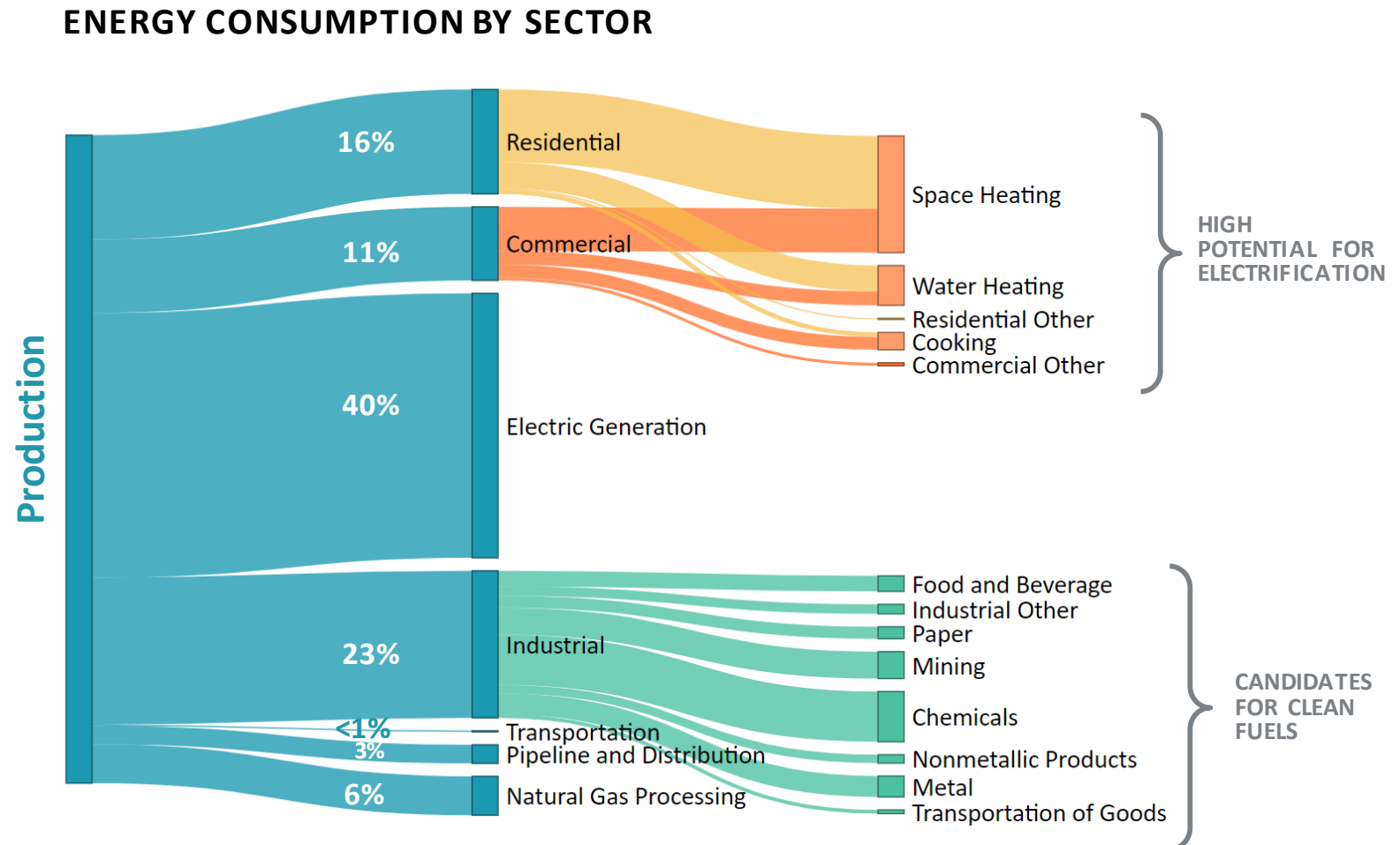
LDC Gas Demand Will Electrify, Some Fuel Demand Will Remain

Almost half of non-electricity gas demand has a high likelihood to be electrified. This makes up most LDC sales. Pace will depend on:

- Costs of equipment and electricity
- Policy mandates
- Consumer response

With current technologies, roughly half of non-electricity gas demand today lacks cost-effective electrification options. Much of this is served directly from wholesale pipelines.

Utilities must plan for decreasing demand while also evolving to meet the needs of future industrial customers in their customer base.



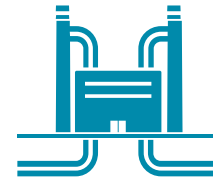
Strategies to Meet Short- and Long-Term Goals

Proactive utilities can play a significant role in organizing and building a clean transition. Access to capital, planning processes, and regulatory oversight position them to plan and implement large infrastructure transitions.

Regulation is strategy. Utilities must work with regulators to establish an updated regulatory framework that incentivizes a transition to a net-zero economy.

Utilities need to **pro-actively establish regulations that incentivize decarbonizing their infrastructure**, and regulations should follow principles that set clear targets, measure process, and allow flexibility.

Five main strategies for utilities to grow revenues while decarbonizing:



Increase Performance of Existing Infrastructure and Reduce Stranded Asset Risk



Own and Rate Base Gas Replacement Infrastructure



Secure Financial Life of Infrastructure



Decarbonize Supply for Future Gas Demand



Long-Term Business Solutions

Planning should start today: Regulations and infrastructure require long lead times. Business and regulatory planning today can enable solutions and mitigate risk.

Well-Designed Regulation Is a Critical Part of Strategy

Good Regulatory Frameworks Enable and Guide
Successful Transitions



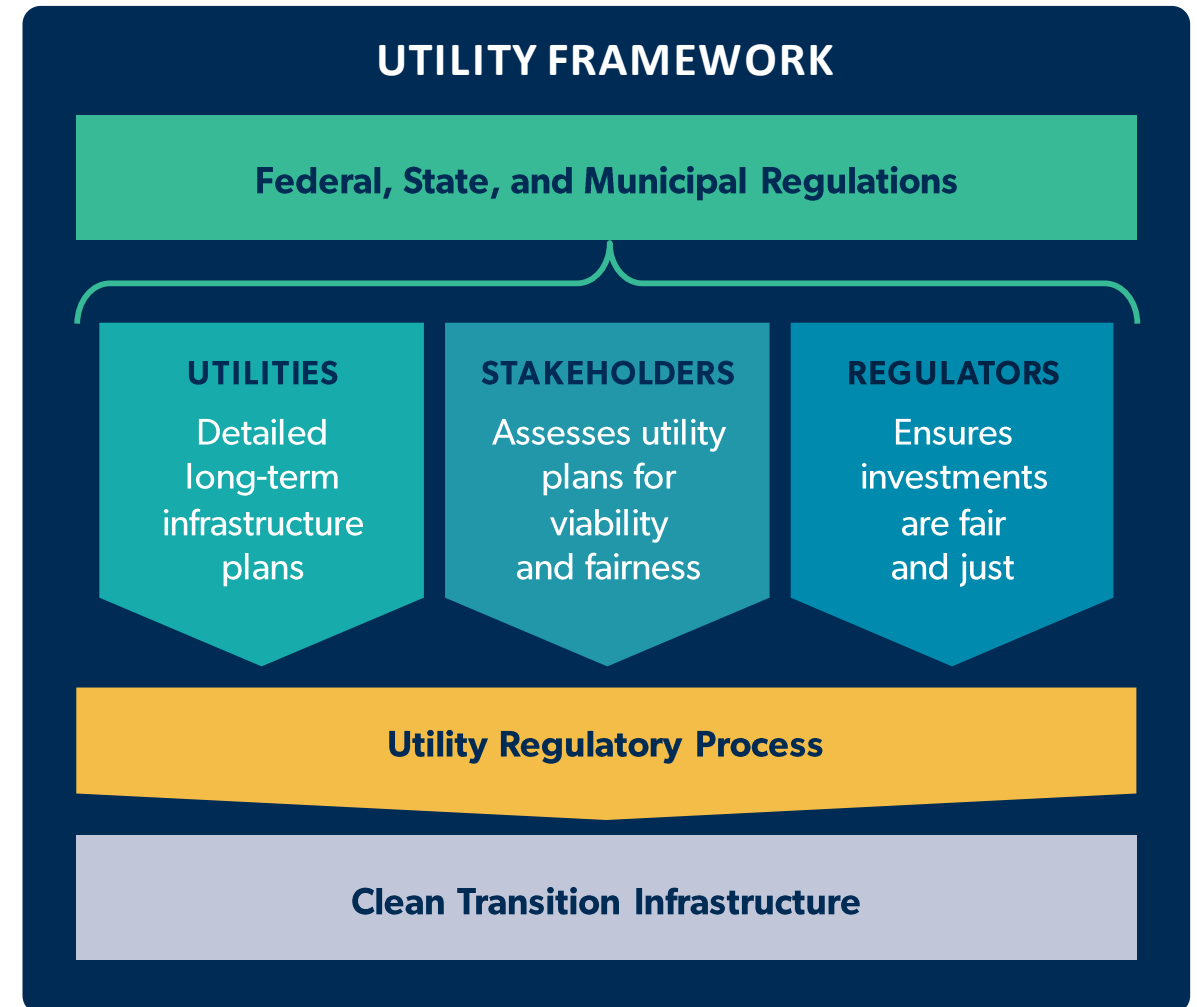
Utilities Are Well-Suited to Help Build Out a Clean Transition

Utilities are intrinsically positioned to plan and implement large infrastructure transitions.

- Utilities already perform **long-term infrastructure planning that considers societal goals and the entire energy system**.
 - Utilities can anticipate infrastructure synergies and solve chicken and egg problems, and plan a holistic infrastructure buildout with long-term payback.
- Utilities have larger access to **capital through financial markets**.

Regulatory innovations are needed for **utilities to invest in a transition**.

- Most jurisdictions do not incentivize planning for a net-zero economy.
- **Regulatory oversight creates opportunity for funding equitable infrastructure expansion** with stakeholder participation and public accountability.
 - Regulations can prioritize equity, affordability, safety, air quality, job creation, and policy objectives.



A New Regulatory Framework Is Critical to Enable a Successful Transition

Regulation is a fundamental part of business strategy.

Utilities must work with regulators to evolve regulation and lead the transition, instead of passively adhering to existing regulation (most of which does not incentivize planning for net-zero).

Guiding principles that can help regulators and utilities establish a new framework:

1

Establish the scope of needs and requirements for utilities to participate more directly in a clean transition by mid-century.

3

Allow utilities and markets **flexibility on how to achieve targets** efficiently.

2

Set clear targets, criteria, and measureable metrics by which progress can be tracked and rewarded, taking care to ensure they also incentivize long-term goals and customer cost reduction.

4

Provide **fair and just incentives to enable utilities to plan** for an uncertain future while managing customer costs, including fair treatment of assets that must be stranded to achieve policy goals.

With these principles, utilities can evaluate strategies to pursue a successful transition (see next section).

Strategies to Meet Targets While Growing Business

Five Strategies Utilities Can Utilize for Success



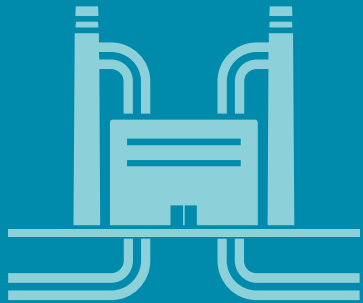
Strategies to Decarbonize While Growing Business

A broader regulatory framework can enable utilities to decarbonize while growing their businesses. The first step is an “all-of-the-above” evaluation of options to identify which are economically and technologically viable and identify where utilities have comparative advantages.

Expanded Regulatory Framework That Enables Solutions



STRATEGIES TO DECARBONIZE WHILE GROWING BUSINESS



ONE

Increase Performance of Existing Infrastructure and Reduce Stranded Asset Risk



TWO

Own and Rate Base Gas Replacement Infrastructure



THREE

Secure Financial Life of Infrastructure



FOUR

Decarbonize Supply for Future Gas Demand



FIVE

Long-Term Business Solutions

Demand-Side Solutions Can Increase Performance of Infrastructure

“Non-pipes” solutions, such as energy efficiency and demand response, can improve performance of infrastructure and avoid costly pipeline solutions.

Regulations should incentivize utilities to make these alternative investments as well as incentivizing investments that could extend useful life of pipeline infrastructure (e.g., use of clean fuels) to avoid stranded costs.

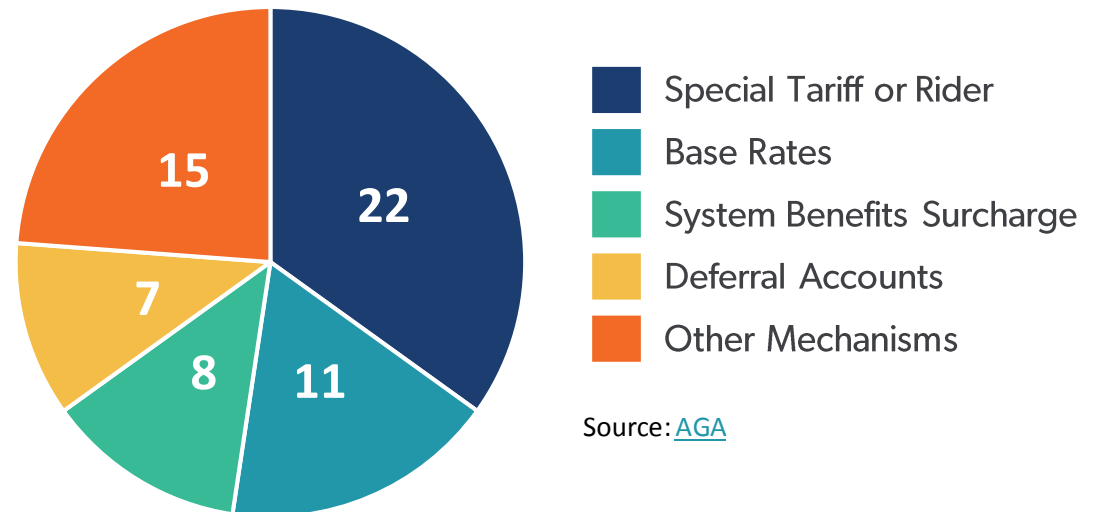
First Steps:

- Evaluate cost effectiveness of non-pipes and leakage prevention and detection solutions in specific jurisdictions.
- Draft tariffs and create programs to incentivize customer participation.

Long-Term Strategy:

- Assess pipe replacement programs that account for future needs.
- Evaluate stranded asset risks and develop physical and financial strategies to decommission some gas pipelines.

TYPES OF GAS ENERGY EFFICIENCY PROGRAM RECOVERY MECHANISMS (NUMBER OF US STATES)



Source: [AGA](#)

NY GAS PLANNING PROCEEDING – STAFF PROPOSAL

- Utilities must incorporate demand-side solutions into their long-term planning to **manage or reduce gas demand**.
- LDC's must **identify opportunities to avoid replacing leak prone pipe** and instead deploy “Non-Pipeline Alternative” investments.

Source: NYS DPS Staff Proposal, 20-G-0131, February 12, 2021.

Own Decarbonized Future Energy Infrastructure

Gas utilities are well positioned to invest in electrification.

- Utilities can provide capital and socialize the cost of long-term and capital intensive investments.
- Returns on their investments can offset declining gas sales to net a cumulative profit.
- Gas utilities will need to figure out how to compete with electric utilities and other entities for investment opportunities.

First Steps:

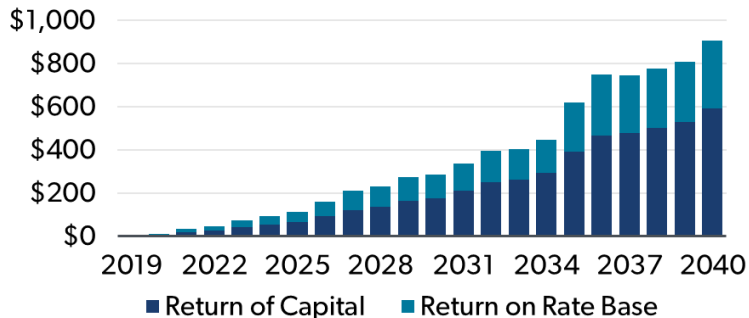
- Estimate gas demand decline and foregone revenue caused by electrification (see Part I).
- Estimate potential rate base from owning residential and commercial electrification infrastructure.
- Develop plan to rate base electrification infrastructure (see Part III).

Long-Term Strategy:

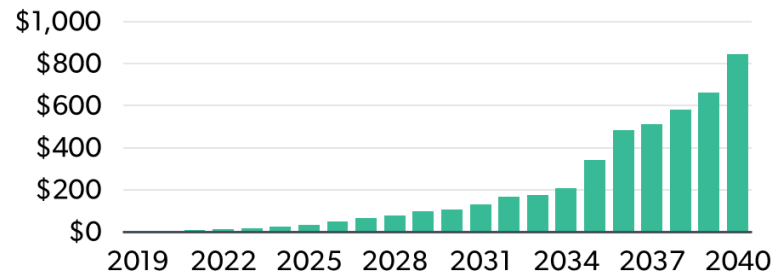
- Evaluate a full suite of electrification infrastructure that can meet economy-wide decarbonization needs.

ESTIMATED IMPACT OF HEAT PUMP INVESTMENT THAT REPLACES GAS DEMAND FOR GENERIC NY UTILITY

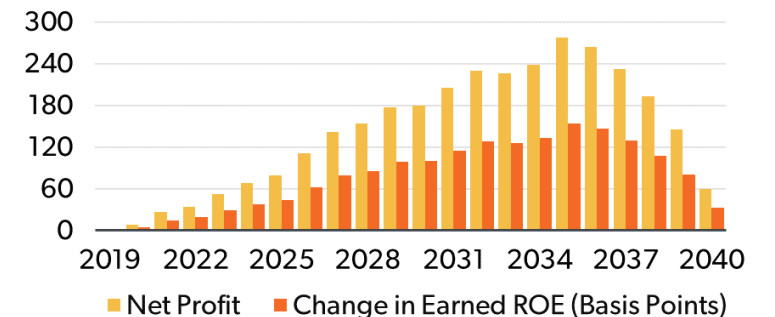
Heat Pump Revenue Requirement (\$M)



Cumulative Forgone Variable Delivery Charges to Customers (\$M)



Net Profit (\$M)



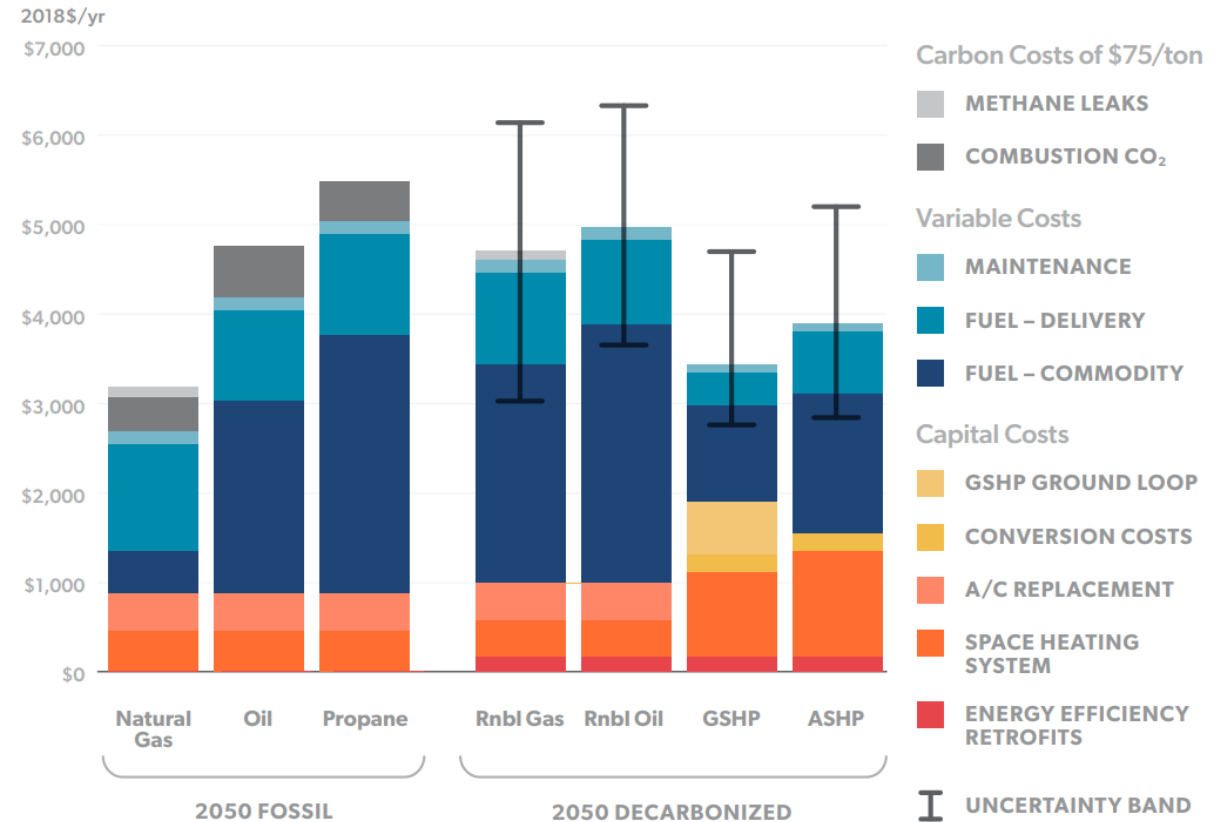
Case Study: Customer Costs of Owning Clean Heating

For the state of Rhode Island, Brattle evaluated solutions to transform the state's heating sector.

We found:

1. For natural gas customers, all decarbonized heating solutions are likely to increase heating costs relative to today. However, within the context of broader decarbonization efforts, total consumer energy expenditures are likely to be similar to today.
2. No single solution is clearly the most cost-effective. This is due to the high uncertainty related to how the costs of all decarbonized heating solutions will evolve over the coming decades.

ANNUALIZED COST OF SPACE HEATING IN 2050, REPRESENTATIVE SINGLE-FAMILY HOME, BOOKEND SCENARIOS



Stranded Asset Treatment Should Enable Transition and Protect Rates

Infrastructure is at risk of being stranded. Utilities need to **minimize stranded asset risk** and pro-actively **secure the financial life of existing assets**.

Innovative recovery mechanisms can levelize and securitize costs to mitigate rate impacts.

Traditional Depreciated Original Cost (DOC) Approach

Recovery of utility asset investment costs is front-loaded early in the service life of the assets.

Depreciation is usually charged in equal installments though the asset's life (on a straight line basis), meaning rate base declines by a constant amount each year.

Levelization

Shifts to pattern of capital cost recovery to reduce or eliminate the DOC front-loading.

Relative to DOC, this form of levelized ratemaking yields slower capital recovery – and hence lower charges – in the early years of an asset's life, which could minimize initial rate impacts.

Securitization

Costs are funded with dedicated bond.

Bonds are repaid over time via non-by passable customer charge.

Utility ROI (or other allowed return) is replaced by bond interest at a very low (often AAA) rate, lowering costs to ratepayers.

Future Demand Requires Clean Fuels

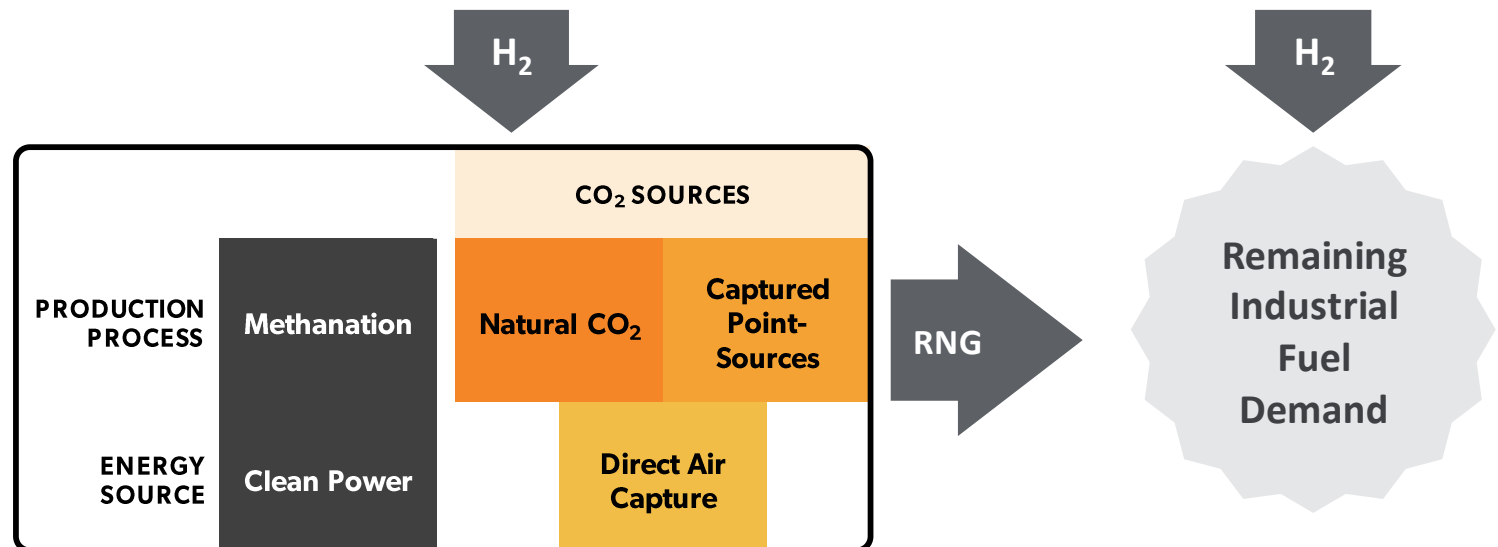
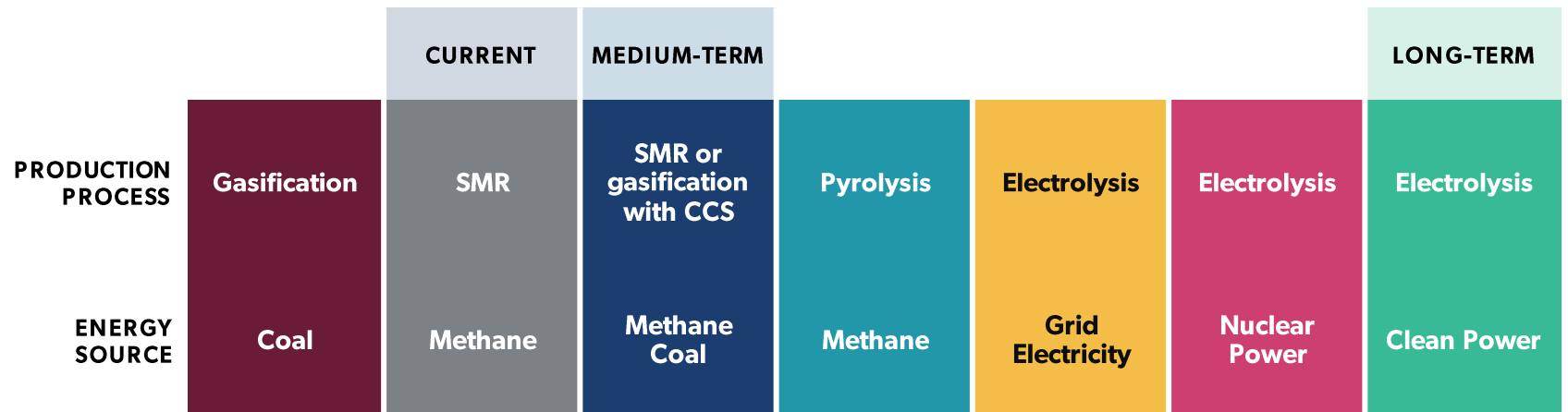
Roughly 30% of non-power gas demand, particularly industrial demand, lacks cost-effective electrification options.

Future gas demand will require low-emitting non-electric gaseous fuels.

Clean fuel options include Hydrogen (H_2) and Renewable Natural Gas (RNG).

- H_2 can be generated using a variety of methods, with varying emission impacts.
- RNG is methane that has either
 1. been captured and collected from an existing source (limited in supply) or
 2. generated using power-to-gas technology.

RAINBOW OF CLEAN FUEL OPTIONS



Clean Fuels Costs Remain Uncertain

Low-emission gas demand will be less than total gas demand today, but its high cost and necessity present an **opportunity to grow rate base with clean fuel supply infrastructure.**

- **Cost uncertainty** makes it impossible to identify the most competitive future fuel.
- **Each fuel has advantages and drawbacks.**
 - While H₂ is cheaper to produce, it will likely need new (or refurbished) infrastructure to transport and new end-use burners.

Utilities can **address this risk with dynamic plans** to determine the most economic choices for their customers as uncertainty is resolved.

First Steps:

- Explore H₂ blending and RNG tariff pilots.
- Identify local RNG generation supply and costs.

Long-Term Strategy:

- Estimate potential future demand for clean fuel.
- Design sustainable rate/tariff for clean fuels.

FUEL COST FORECASTS FOR FOSSIL NG, RNG, AND GREEN H₂



Note: Forecasts are generated by Brattle's clean fuel forecasting tool.

New Business Strategies for Long-Term Growth

Utilities need to **evaluate long-term strategies to diversify their business and understand potential demand, financial return, and risks**, and **create the conditions to favorably develop clean infrastructure options**.

H₂, RNG & CO₂ Management

Gas management and transport is a core competency of gas utilities and will continue to be important. Utilities must evaluate whether they can own new types of infrastructure related to generating and transporting H₂, RNG, and captured CO₂.

Examples:

[SoCalGas' recent \\$2B infrastructure](#) plan boasts goals to increase RNG blending, and [NW Natural's recent IRP](#) explores various RNG supply options.

Electrification Infrastructure

A large portion of home heating gas demand is forecasted to electrify by mid-century. Gas utilities are well positioned to invest in electrification, and long-term planning should balance foregone gas revenues with returns on electrification infrastructure.

Example:

[NSTAR recently got approval](#) to demo a large-scale ground source heat pump to further develop their potential long-term infrastructure investments.

Mergers & Acquisitions

Some combined utilities may see advantages in selling gas business to investors with higher risk tolerances. Other gas utilities may see advantages in merging with electric utilities, or other industrial fuel producers, to synergize full economy decarbonization.

Example:

National Grid [recently announced](#) they will acquire the UK's largest electricity distributor while also selling its majority stake in the UK's gas transmission network.

STRATEGY #5: LONG-TERM BUSINESS SOLUTIONS

Case Study: National Grid US

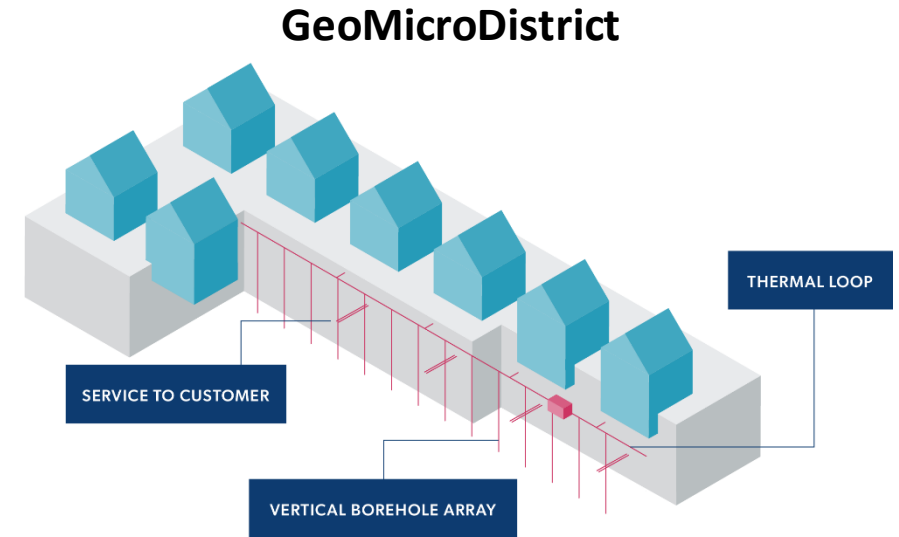
National Grid introduced the Future of Heat (FOH) Program to develop longer-term solutions that fully decarbonize the heating sector and reduce GHG emissions. With an established 2050 net-zero goal, including decarbonizing the gas network, National Grid proposed investment of over \$33 million from 2021–2025.

Proposed new customer products and services include:

- Expanded demand response for residential and small to medium-sized businesses
- A green gas tariff to provide choice to supplement fossil natural gas usage
- Financing for ground-source heat pumps
- Investment in carbon capture and utilization storage, installation, and research

Additionally, National Grid proposed investing in integrating renewable natural gas, hydrogen, and geothermal. This includes:

- Engineering, installing, and owning new RNG interconnections in order to remove a barrier of RNG development in NY
- Developing and deploying 2,600 tons of shared geothermal ground loops (serving ~650 single-family homes)



National Grid recently filed for a Geothermal District Energy Demonstration project in Massachusetts. The project:

- Is sized to **100 tons**, serving 20 5-ton homes within **18 months**
- Will be a **5-year** project with a total cost of **\$15.6 million**
- Is designed to help meet peak day needs and **to avoid replacement of leak-prone pipe**
- Includes a proposal to recover costs through Local Distribution Adjustment Clause (LDAC) tariffs

Source: [HEET](#)

Proactive Analysis Can Identify Strategies and Solutions for Utilities

Clarifying uncertain future pathways requires careful analysis of established and untested strategies. Long-term modeling tools can help evaluate which strategies suit utilities' needs.

Economy Decarbonization Model: Brattle's Decarbonization, Electrification, and Economic Planning (DEEP) tool can help evaluate: How much demand for electrified heat will there be, and how much investment will that require? How much clean fuel demand will there be in 2030? When and how will natural gas utilities be affected?

Distribution System Planning Model: Given the pathways provided by DEEP, how can gas distribution investments, operations, pricing, and financing be altered so that, in the face of the transition, utilities grow?

Such models provide a virtual laboratory for testing strategies – both for choosing a strategy and explaining regulatory preconditions for its success.

Once pathways with the highest probability of success are identified, utilities can evaluate tactics to realize the solutions.

Part 3 of this series will examine the regulatory implementation of strategies.

How Brattle Can Help

Brattle's Unique Interdisciplinary Experience
Provides Holistic Skillset to Guide Transition



Brattle's Expertise Can Tackle Analysis That Spans All Building Blocks



Assess Transition Risks

Analyze how natural gas bans, electrification mandates, and ESG investment trends will impact business risk and cost of capital.

Estimate revenue loss to electrification under different future scenarios.

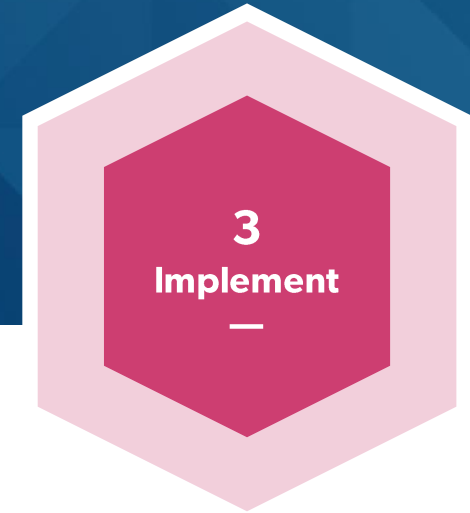
Use system dynamics to identify rate risks and customer feedback effects.



Evaluate Strategy and Solutions

Facilitate strategy workshops to establish transition principles, identify potential business strategies, and determine near- and long-term action items.

Identify revenue potential from owning and rate-basing electrification infrastructure and evaluate rate impacts using system dynamics.



Implement Regulatory Changes

Design and calculate tariffs to incentivize transition and protect customer costs.

DEEP Can Help Utilities Understand Risks and Evaluate Solutions

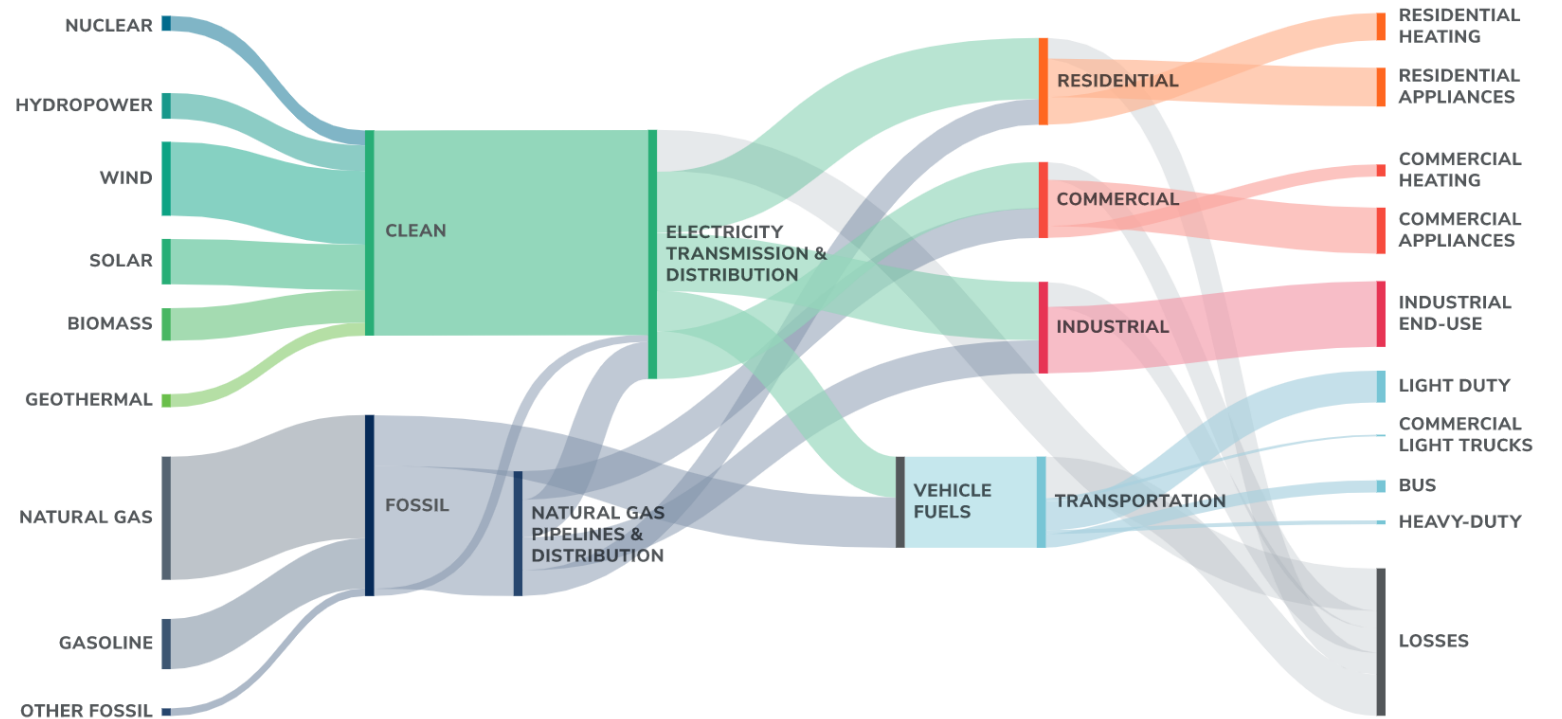
Brattle's **Decarbonization, Electrification & Economic Planning (DEEP) Model** is an energy economy modeling tool that can evaluate:

- The uptake of technologies and impact on gas consumption
- The roles of efficiency, electrification, and fuel-switching
- The utility and customer costs of specific technology pathways

DEEP can evaluate long-term planning impacts and the interactions of:

- Technology adoption
- Decarbonization policies
- Macroeconomic conditions
- Supply and demand

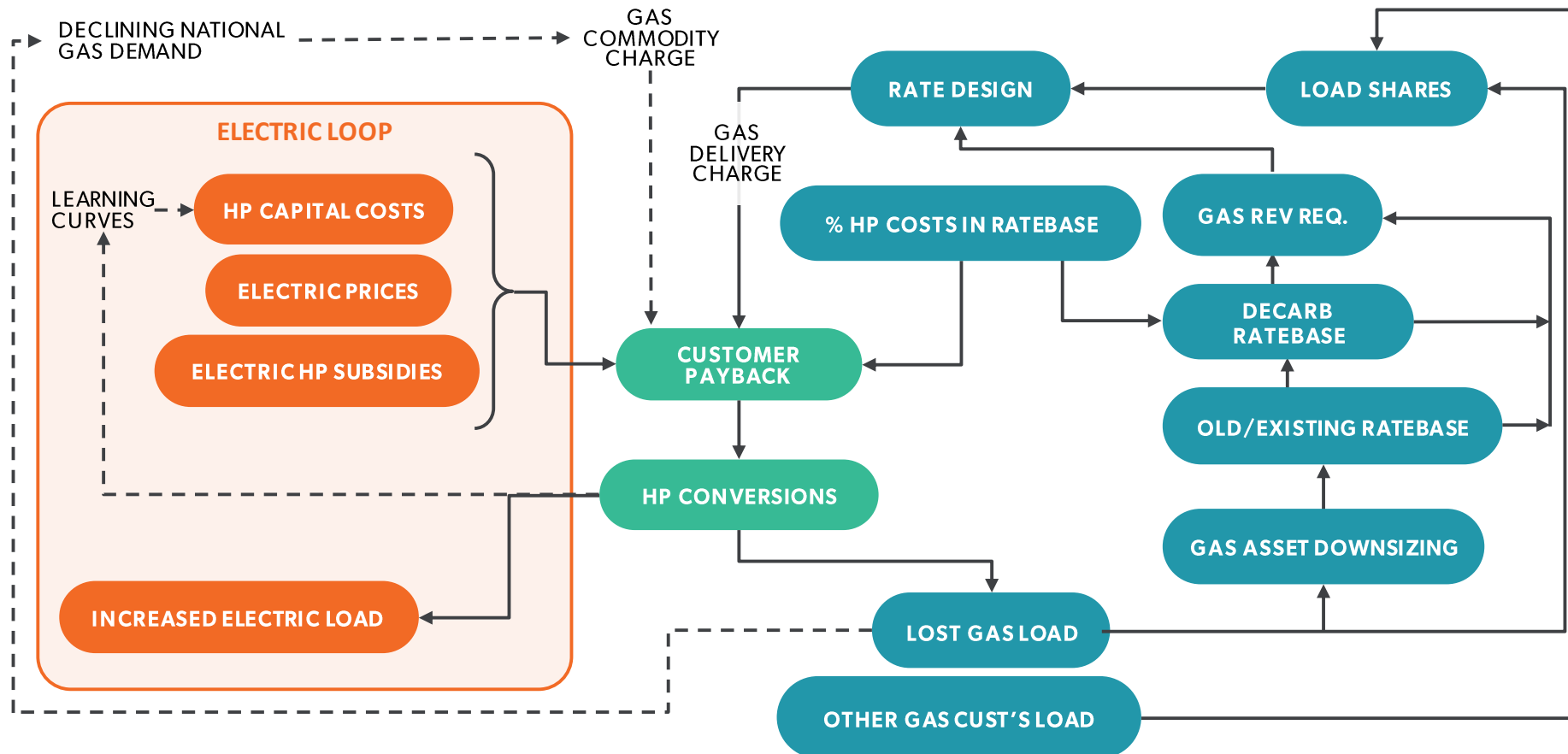
DECARBONIZATION, ELECTRIFICATION & ECONOMIC PLANNING (DEEP) MODEL



The model can be run in (1) **planning mode** and (2) **optimization mode** to meet client-specific needs.

Dynamic Modeling Can Help Utilities Understand Risk and Evaluate Potential Strategies

Brattle's technical and analytical abilities can model pathways for decarbonization and the complex interdependencies both within and between the gas and electric sectors, many of which have not yet been thoroughly studied.



Brattle's **System Dynamics Model** can help utilities analyze the complex feedbacks and interdependencies associated with the transition.

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Clarity in the face of complexity

