The Future of Gas Utilities Series

TRANSITIONING GAS UTILITIES TO A DECARBONIZED FUTURE

Part 3 of 3

NOVEMBER 2021

Brattle

Agenda

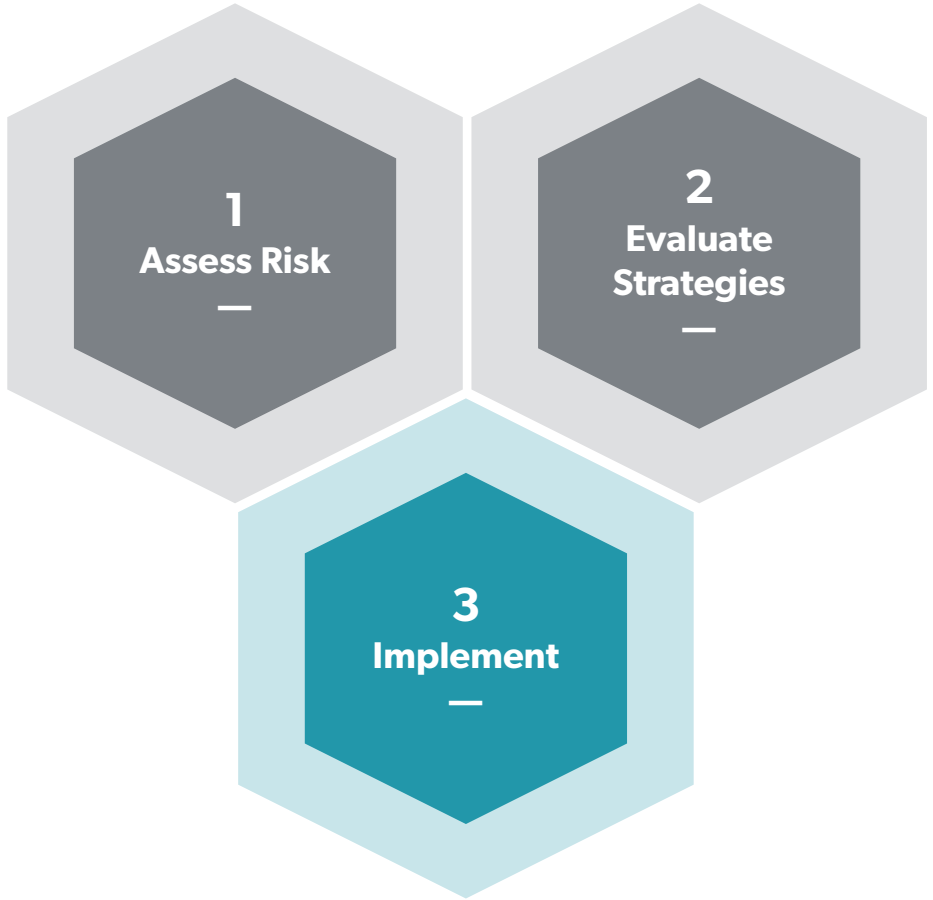
The Brattle Group's Future of Gas Utilities Presentation Series

The Brattle Group's Future of Gas Utilities building blocks are presented in a series of three presentations 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, and the second, "Evaluating Strategies," was released in September 2021.

The remainder of this slide deck will cover the third building block: **Implementing Regulations.**



Put Solutions into Action with a 3-Step Action Plan

Access to capital, system planning processes, and regulatory oversight put utilities in position to plan and implement large infrastructure transitions. **Securing regulatory support is imperative**. Implementing any solution pathway requires a long-term view that considers system economics and short-run requirements in context of a utility's political, regulatory, and competitive circumstances.

1. SHORT TERM **Pilot Projects and Experimentation**	2. MEDIUM TERM **Bridge Solutions**	3. LONG TERM **New Ways of Doing Business**
TODAY, utilities should request that regulators approve pilot projects for demand-side programs and demonstrations of emerging alternative gas technologies.	**OVER THE NEXT 10 YEARS,** utilities should work with regulators and stakeholders to expand traditional cost-of-service regulation to accommodate new planning criteria, participation rules, and pricing for achieving decarbonization goals.	**LONGER TERM,** pilot technologies and exploratory services can become full-fledged business lines for gas local distribution companies (LDCs) operating in a rapidly decarbonizing future.

Begin Today by Exploring Demonstration and Pilot Projects

Green Tariff

Provide alternative fuel tariff options where customers elect to pay a higher rate for a certain level of RNG or hydrogen blended into the delivered fuel. This is similar to renewables-based green tariff options offered by electric utilities.

Example: For an extra fee, FortisBC residential and business customers can choose an RNG blend amount. The utility then injects an equivalent amount of RNG into the distribution system.

Non-Pipeline Solutions

Explore and pursue complementary demand-side solutions that help avoid the major infrastructure upgrades that would be otherwise needed to meet demand.

Example: New York's Public Service Commission authorized Con Edison to invest $170 million in demand-side solutions, including energy efficiency and demand response programs to defer pipeline investments.

Technology Demonstration

Seek regulatory permission for technology demonstration to assess the economic and technical suitability and viability of different technologies, business models, and customer engagement methods.

Example: Peoples Gas received approval from Florida regulators to partner with a dairy farm to build, own, and operate an RNG. The project would collect waste from 6,500 cows, producing 105,000 MMBtu of RNG.

Pilot projects should have key performance metrics. Full-scale deployment should commence once metrics are met.

Case Study: Oregon Utilities and PUC

In 2019, Oregon passed SB 98, which established voluntary RNG portfolio targets to encourage the development of RNG and leverage the natural gas system to reduce GHG emissions. Through a program initiated by the Oregon Public Utility Commission (PUC):

- Utilities can **blend RNG or hydrogen** into existing gas supply to meet targets of 5% in 2020, increasing to 30% in 2050.
- Utilities can invest in and own equipment to bring raw biogas and landfill gas up to pipeline quality. They can own the connections to the local gas distribution system.

Gas utilities may propose an automatic adjustment mechanism to recover prudently-incurred qualified capital investments in an expedited manner.

Oregon regulators recently approved Northwest Natural's RNG procurement contracts.

Separately, Northwest Natural is also working with a local water utility and Bonneville Environmental Foundation to explore the development of a first-of-its-kind renewable hydrogen facility.

Use Enhanced Regulation to Mitigate Risks and Align Incentives

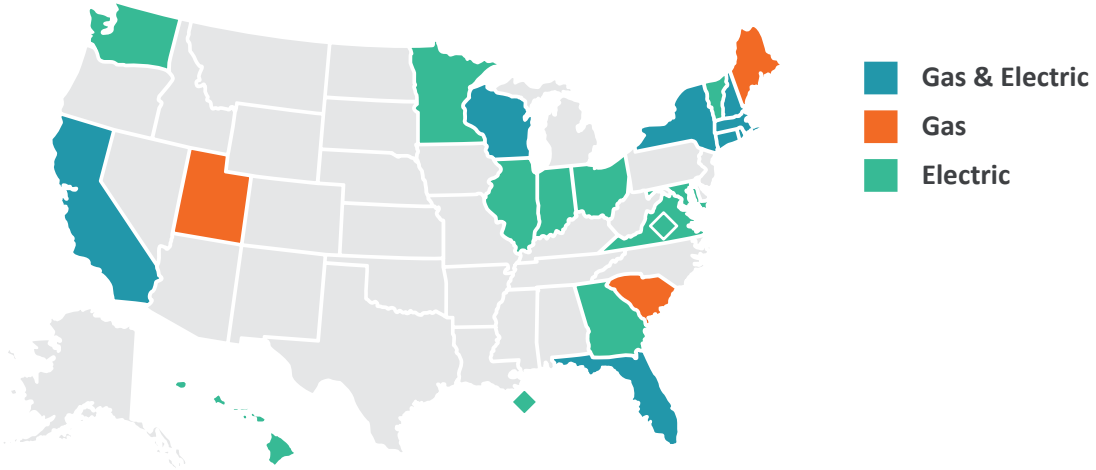
Traditionally, utilities have used alternative regulations to meet safety, reliability, and cost-effectiveness goals. Now, those concepts can be extended to opening new roles and incentives for gas companies to foster the decarbonization of energy infrastructure by:

- **Aligning utility incentives** by decoupling utility revenues from sales and rationalizing cost recovery for necessary fixed system improvements.
- **Formally establishing priorities and metrics** supplementing cost minimization.
- **Revised pricing** to match and/or encourage expected shifting time patterns, quantities, and shares of usage.
- Enabling utilities to plan **more flexibly and over a longer time horizon**.

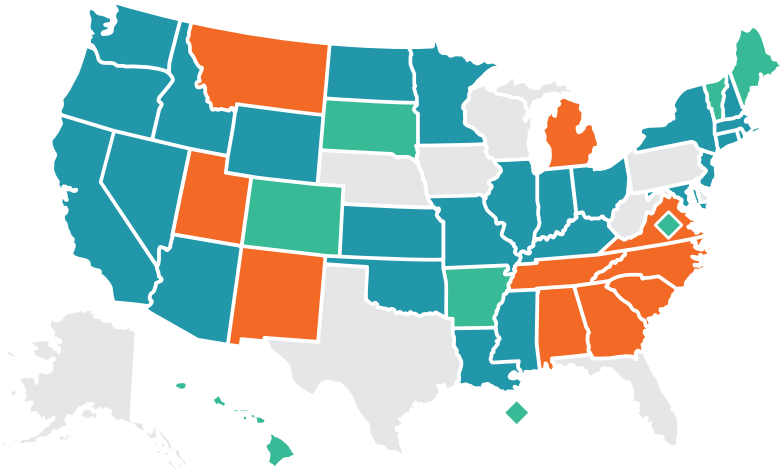
Other mechanisms include marginal cost-based rates, pricing of gas-co-induced CO_2 savings, and customer financing assistance.

The enhanced regulatory framework serves as an enabling platform, not a substitute for long-term strategy.

MULTI-YEAR RATE PLANS IN THE US



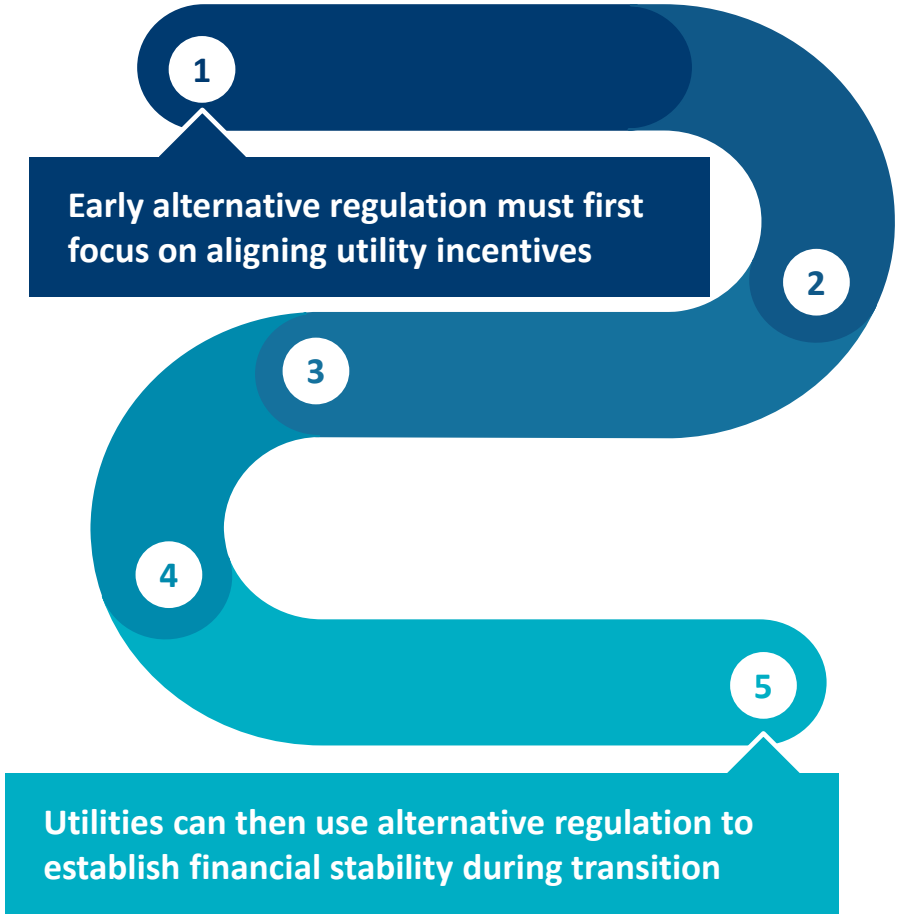
DECOUPLING MECHANISMS IN THE US



Source: Data from S&P 500 as of March 2020 combined with Brattle review of regulatory decisions and orders as of October 2021. A state is included if one of its utilities has implemented the measure, or implementation is required by state law.

A Smooth Transition Begins with Where You Are Today

Enhanced regulatory measures are **critical** to bridging the transition from pilot projects to long-term business lines. These steps can help secure regulatory support for investing in new technologies and for taking on new roles. **Utilities will need to quickly leverage that support** into paradigm-shifting regulatory strategies.



1. **PROGRAM COST RECOVERY**
   Allows the utility to recover costs associated with the implementation of decarbonization programs.
2. **DECOUPLING/LOST REVENUE ADJUSTMENT MECHANISM**
   The utility recovers fixed costs that were not collected due to lower natural gas sales levels driven by demand-side programs (e.g., energy efficiency and demand response).
3. **RATE OF RETURN INCENTIVES**
   The utility capitalizes its spending on demand-side/decarbonization programs similar to how it rate bases supply-side expenditures, earning an authorized rate of return on these expenditures.
4. **SHARED NET BENEFITS**
   Cost savings from decarbonization programs are shared between the customers and the utility.
5. **PERFORMANCE INCENTIVE MECHANISMS (PIMS)**
   Allows utility to earn a higher rate of return as incentive for meeting a pre-determined performance goal (typically associated with energy efficiency or demand response programs on the electric side).

New Business Lines Require Paradigm-Shifting Changes

After establishing a stable regulatory framework to begin implementing these new business lines, gas utilities will need to imminently pursue regulatory pathways to meet the pressing demand of decarbonization:

Update evaluation metrics for new investments A

Update traditional cost-benefit frameworks to include broader system and societal benefits and costs.

Gain permission to selectively own non-delivery assets B

Just as electric utilities have been allowed to own electric vehicle infrastructure in some jurisdictions, gas utilities can propose owning non-gas assets that will help decarbonize sectors (e.g., for low-to-moderate income customers or those in dense urban areas) with new energy delivery systems, such as electric heat pumps, RNG generation assets, hydrogen generation and transport infrastructure, and CO_2 capture and storage.

Coordinate decarbonization efforts with electric business or electric utilities C

Scale the wall that traditionally separates electric and gas business and operations to coordinate and deploy the most cost-effective options to decarbonize buildings.

Expand to less regulated markets where utilities can facilitate market development D

Utilities have a unique knowledge base for using regulation to manage complex infrastructure systems, making them a natural sponsor to facilitate early or targeted market development in unregulated and underdeveloped areas, such as by reducing market frictions, addressing equity concerns, or offering alternative financing programs and investment incentives (as discussed in the following slides).

A New Kind of Partnership between Gas and Electric Utilities

Increased coordination between gas and electric utilities, and between gas utilities and technology providers, is needed to ensure decarbonization is achieved in a cost-effective manner.

- Optimizing decarbonization of buildings on a system-level that includes both electric and gas end uses will lead to more economy-wide efficient solutions.
- Hydro-Québec and Énergir's proposed dual-energy program presents an innovative approach to partnership between electric and gas utilities.

Likewise, combination or adjacent utilities should evaluate what kind of coordination is needed across their electric and gas businesses in order to accelerate their decarbonization progress and minimize customer total energy costs (instead of separate gas and electric costs) while ensuring competition.

- Cross-business coordination and initiatives may require regulatory approval.

Québec approved a $125 million fund to deploy dual energy systems that run on both electricity and natural gas.

Buildings of participating customers are heated with Hydro-Québec electricity most of the time, but Énergir supplies natural gas on very cold days during winter peak periods.

Hydro-Québec will pay Énergir in a rate structure that reflects the peak value that the latter provides and the volume of gas converted (and remains converted)

The partnership will offset 540,000 tonnes of CO_2 equivalent by 2030, with a $1.5 billion cost savings relative to an all-electric scenario over 10 years.

Similar customer energy management partnerships can help to pursue energy efficiency solutions and adopt decarbonizing technology.

Source: Press Release (English) and Énergir and Hydro-Quebec Joint Filing (R-4169-2021) (French)

Design Market Mechanisms to Incentivize Investments in Thermal Renewable Energy

No holistic policy mechanism exists today to incentivize investments in renewable thermal energy.

- Renewable Portfolio Standards (which generate Renewable Energy Credits, or "RECs") were not designed to accommodate the pressing need to decarbonize thermal heat, but thermal heat's avoided CO_2 is worth comparable support.
- Widening of the scope of the REC market could boost investments in alternative fuels, but a market mechanism designed specifically for converting thermal energy resources may be more impactful.

A Thermal Renewable Energy Credit (or T-REC) policy would compensate investments in clean infrastructure and incentivize technical solutions in the most efficient areas.

- For example, an industrial natural gas user currently has no incentive to invest in alternative fuels or related equipment.
- A T-REC program would compensate such a user for the expenses needed to reduce the carbon emissions of their operations, providing a financial incentive for the user to lower their carbon footprint.

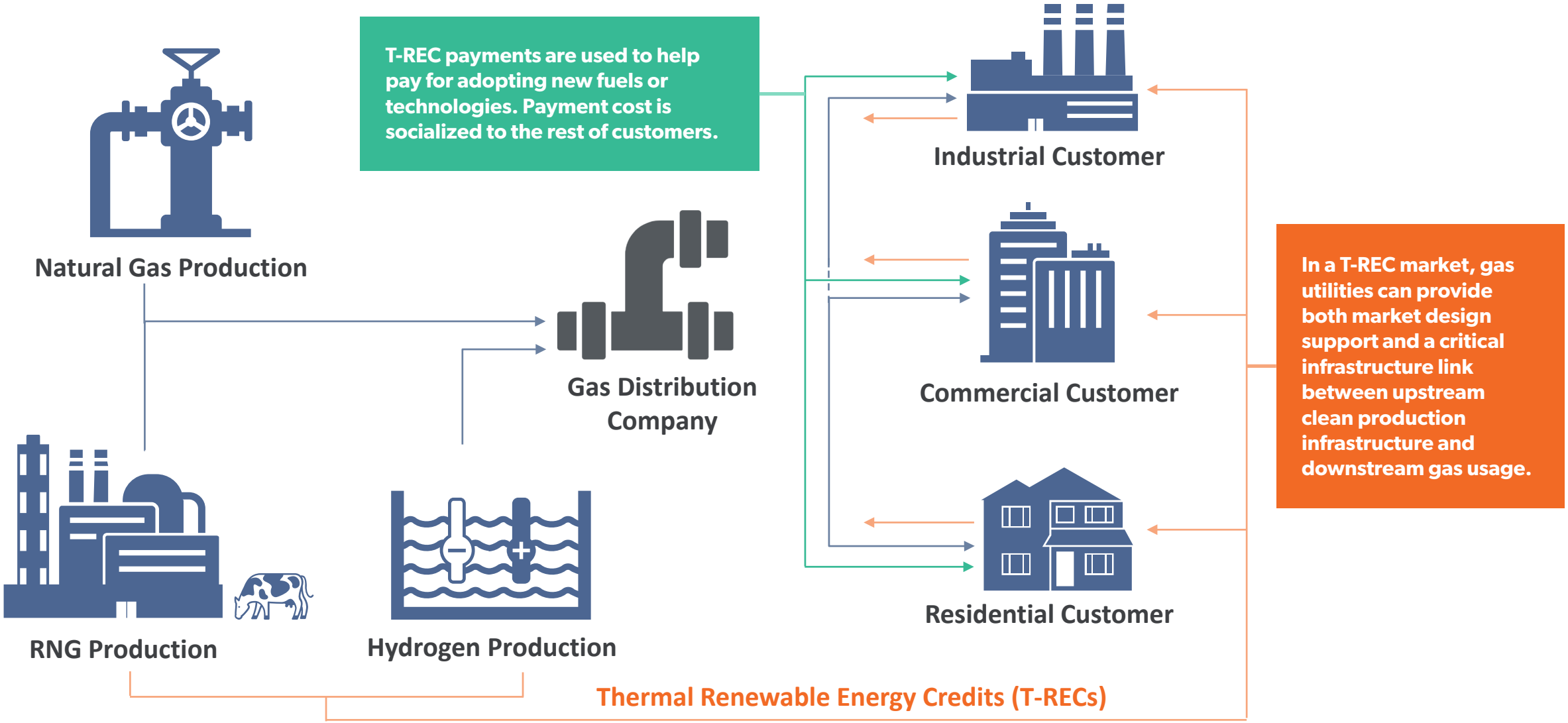
MAJOR POLICY TO SUPPORT RENEWABLE NATURAL GAS

RNG qualifies as an advanced fuel under the federal **Renewable Fuel Standard** (RFS) program, receiving credits when used as a transportation fuel. Depending on the feedstock and market conditions, the RFS credit ranges between $4–$12/MMBtu.

California and Oregon's **Low-Carbon Fuel Standard** (LCFS) market-based programs aim to reduce the carbon intensity of transportation fuels sold in the states. The programs incent the production and use of low-carbon fuels by through a credit system. The California's LCFS offers more credit for RNG derived from food waste and animal waste ($20–$74/MMBtu).

Source: Cyrs, T., J. Feldmann, and R. Gasper (2020). "Renewable Natural Gas as a Climate Strategy: Guidance for State Policymakers." Working Paper. Washington, DC: World Resources Institute.

T-RECs as a Market Incentive for Investments in Alternative Gas



How Brattle Can Help

Brattle's Unique Interdisciplinary Experience Provides a 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 evaluate end-use programs that prioritize decarbonization.

Identify and evaluate enhanced regulatory mechanisms to incentivize transition and protect customer costs.

Assess feasibility and effectiveness of new business models and partnerships.

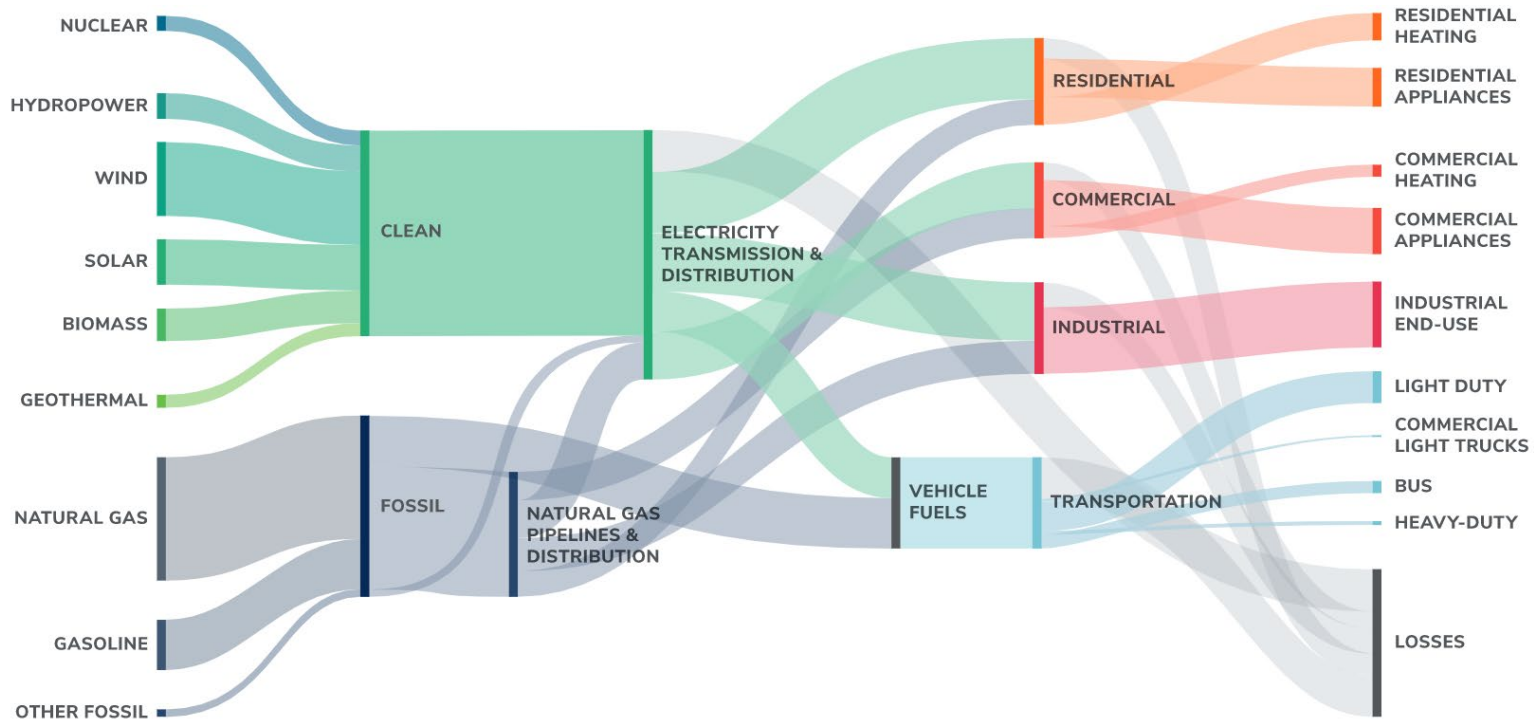
DEEP Can Help Utilities Understand Risks and Evaluate Solutions

Brattle's **Decarbonized Energy Economy Planning (DEEP) Model** helps utilities and policymakers assess the roles of efficiency, electrification, and fuel-switching in developing and assessing a multi-sector strategy to achieve a decarbonized energy economy.

DEEP is designed to evaluate the interactions of:

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

DECARBONIZATION, ELECTRIFICATION & ECONOMIC PLANNING (DEEP) MODEL



DEEPmodel

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

DEEP – Illustrative Results

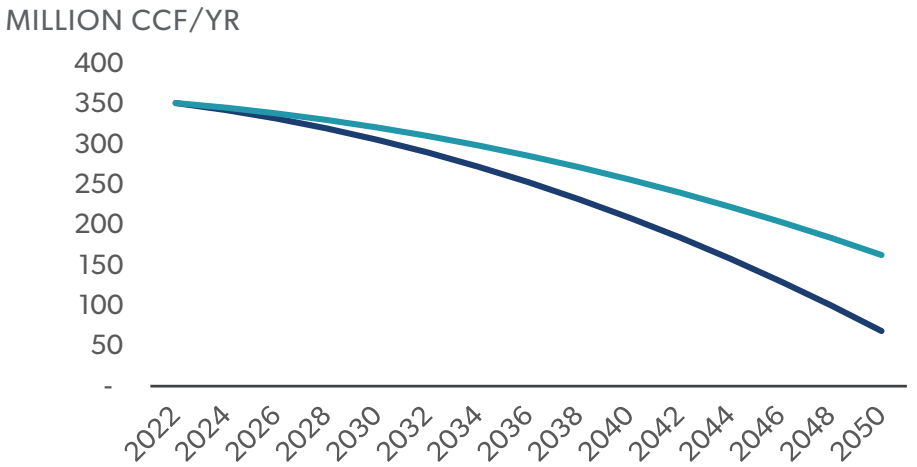
DEEP is an energy economy modeling tool that can help planners evaluate:

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

The model can operate in two modes:

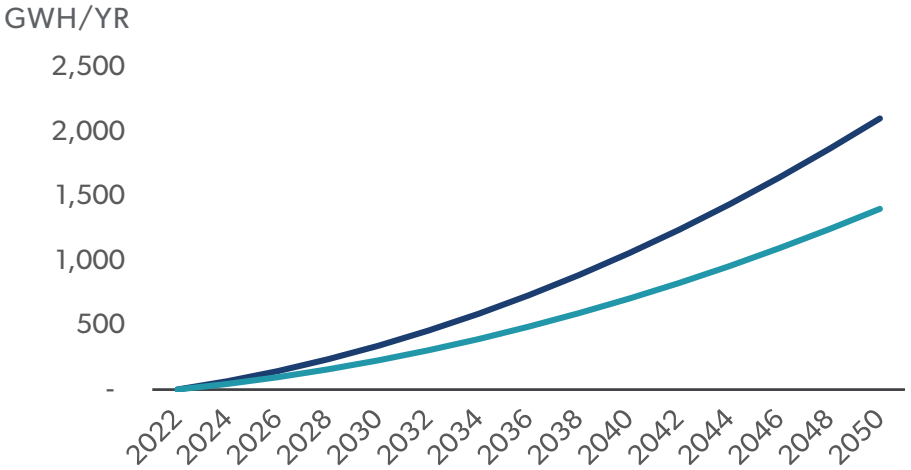
- **Planning Mode:** Pathways are considered based on equipment stock rollover, technology mandates, and decarbonization policies to produce economy-wide representation of decarbonization pathways.
- **Optimization Mode:** Supply curves of electrification, clean fuel, and fuel switching are used to determine optimal technology deployment pathways to meet policy targets and bespoke regional constraints.

NATURAL GAS DEMAND WITH ELECTRIFICATION



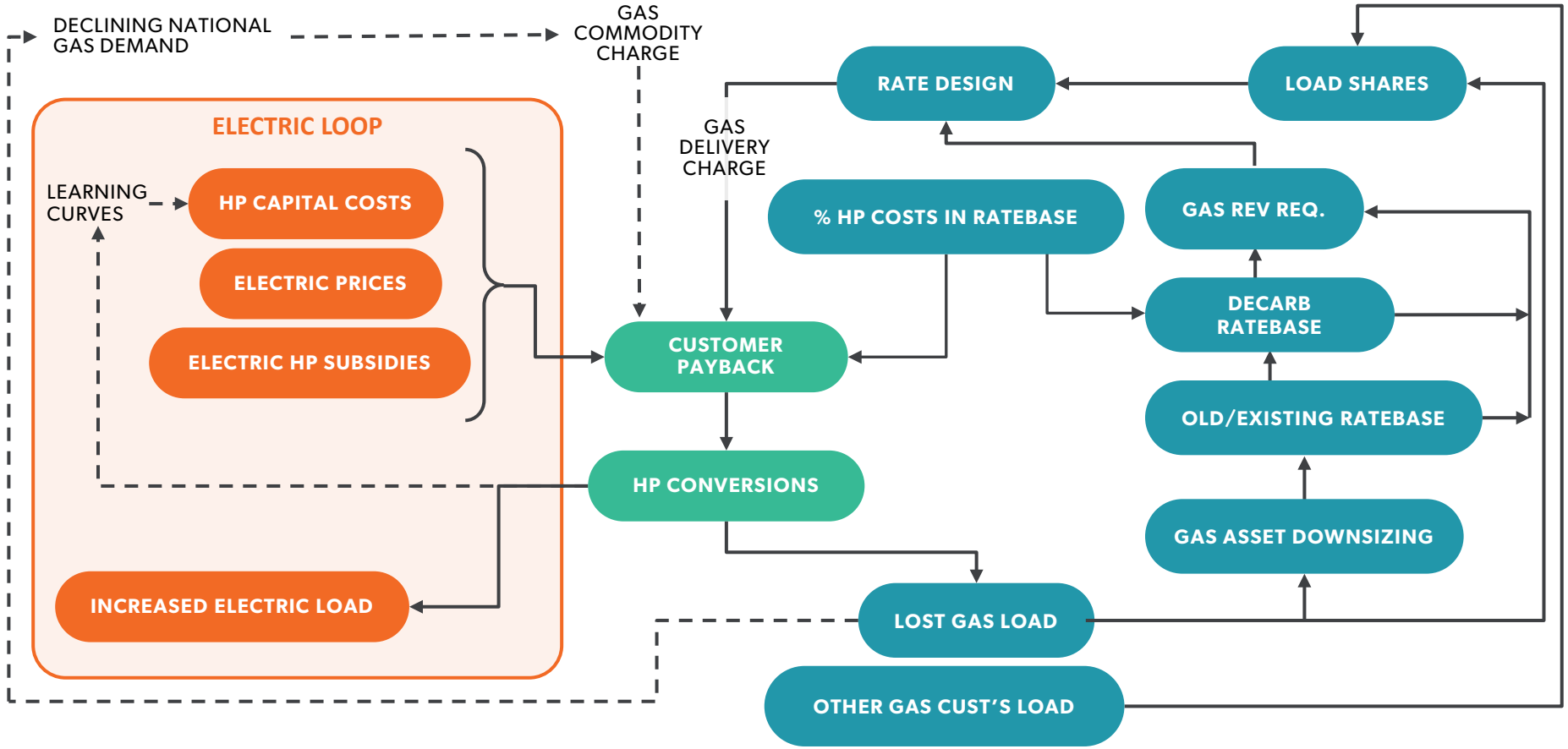
DEEPmodel

ELECTRICITY DEMAND GROWTH WITH ELECTRIFICATION



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.

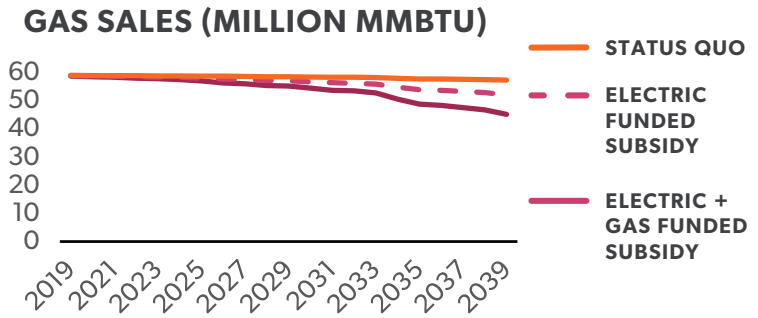
System Dynamic Modeling – Illustrative Results

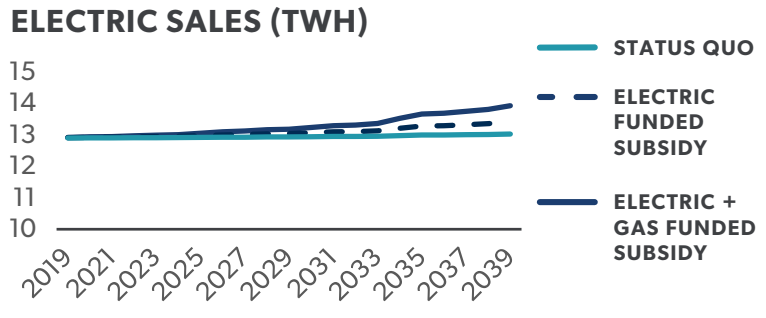
System dynamics (SD) modeling allows users to dynamically assess the effects of electrification and decarbonization on ratepayers and utility finances, under different customer adoption, technology costs, alternative rate designs, revenue trackers, and public or utility sponsored incentives. Metrics include:

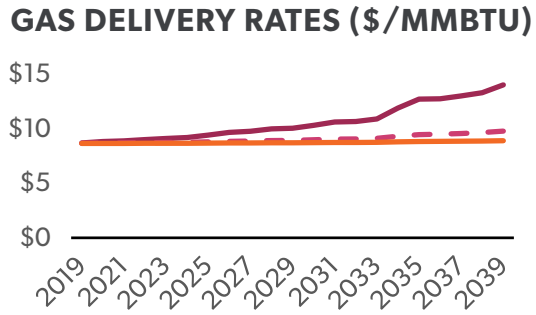
- Participating and other customers' load shapes, growths, and rates
- RoE, net income, rate base, and cash flow
- Policy attainment

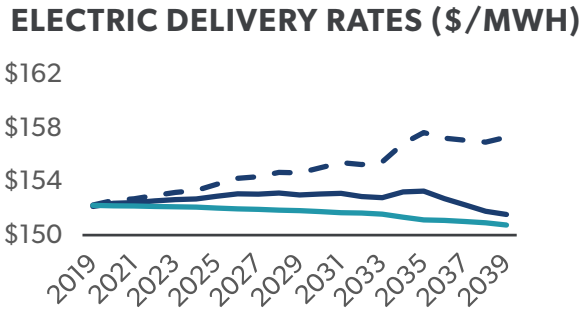
The model simulates parallel gas and electric systems with overlapping customers:

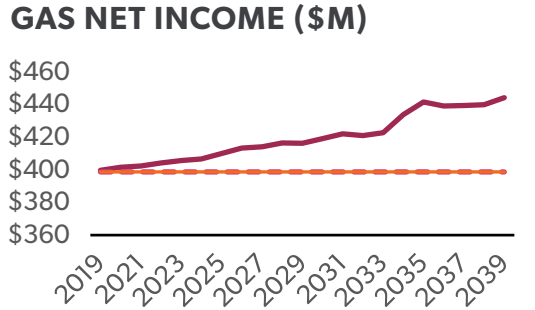
- **Gas Utility:** Sales decrease due to electrification, but possible offsets from decarbonization infrastructure sponsorship
- **Electric Utility:** Pace and type of electric decarbonization activity largely determines gas sales at risk

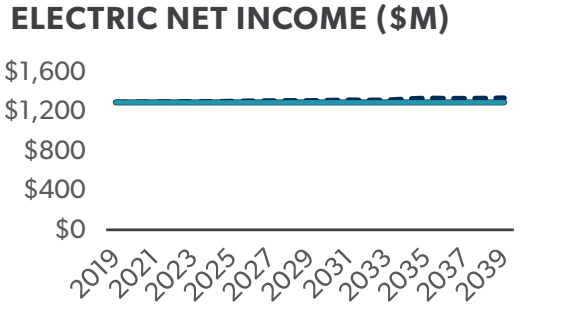












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Clarity in the face of complexity

Brattle