DECARBONIZATION AND THE NATURAL GAS INDUSTRY

What is the Price Impact?

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Policies to address climate change have been a growing area of discussion across the globe. As new technologies have made reductions in greenhouse gas emissions more feasible, agreements and government actions have moved toward more significant reductions in these emissions.

In the U.S., the president's April 2021 announcement of a goal to reduce greenhouse gas emissions to half of 2005 levels by 2030 provides a direction for federal policy.[1] However, legislative action to date has been limited. While uncertainty remains at the federal level, more definitive policies have been established at the state level in different parts of the country.

Multiple states, including New York, California, and Massachusetts have established targets for significant reductions in economy-wide greenhouse gas emissions. New York has established a limit on statewide greenhouse gas emissions of 40% of 1990 levels by 2030 and 85% by 2050.[2] California has set goals to reduce greenhouse gas emissions to 40% below 1990 levels by 2030 and be carbon neutral by 2045.[3] Massachusetts aims to achieve net-zero carbon emissions by 2050, with potential pathways to reach this goal detailed in the recent publication "Massachusetts 2050 Decarbonization Roadmap."[4]

These emission reduction targets are generally economy-wide and can transform a variety of industries, including transportation, manufacturing, power generation, and residential heating. While it is uncertain how and to what extent each industry will be affected, natural gas utilities could be impacted. Because the combustion of natural gas produces carbon dioxide emissions, climate policies in these states could lead to changes in how gas utilities operate. Such changes could range from repurposing or modifying portions of distribution systems to incorporate other renewable fuels to the migration of gas customers to other energy sources, such as electric heat pumps for residential heating. While the industry's future is uncertain and will depend on factors such as policy decisions by regulators and customer choices, these potential changes will likely impact the price of natural gas delivery to residences and businesses for use in heating, appliances, and various business processes.

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How Natural Gas Rates are Determined

Natural gas distribution companies and many other utilities in the U.S. are regulated monopolies for which prices are established by state jurisdictional utility commissions. Prices are based on what is referred to as a utility's revenue requirement, reflecting the overall costs of a company's operations. This includes providing the opportunity to earn a return on, and of, the capital investments made by a utility to construct and maintain its infrastructure, including pipelines and other assets that deliver gas. Once the revenue requirement is established, these costs are allocated to different classes of customers to develop the prices paid for the delivery of natural gas.[5]

One of the more significant factors in establishing the revenue requirement is depreciation expense (or the return of capital), which represents the allocation of the capital costs of a company's assets to each period of service over their useful lives. Because the actual useful lives of assets currently in service will not be known until the future when they are retired (useful lives for assets in service today may or may not be consistent with the lives experienced by similar assets in the past) estimating depreciation expense is, by its nature, a forecast of the future. This means that establishing the price to deliver natural gas is determined in part by expectations of what will occur over many decades in the future. Under traditional utility rate making, utilities recover the full cost of their investments over their service lives. Annual depreciation expense is a component of the revenue requirement, meaning that depreciation expense directly impacts prices charged to customers in the near term. Additionally, the accumulated depreciation reduces the total level of investment left to recover through depreciation; it also reduces the balance on which companies earn a return on their assets. This means depreciation expense has both short-term and long-term effects on the prices utilities charge customers.

Many gas assets have historically had relatively long service lives. For example, gas mains typically have service lives of 50 years or more. Statewide greenhouse gas emissions targets have the potential to significantly impact the useful lives of gas utility assets. Additionally, these policies could reduce gas demand or a reduced customer base, spreading the costs of building and maintaining gas infrastructure over a smaller number of customers. Both of these impacts mean that greenhouse gas emissions targets can impact the price of natural gas distribution to customers. In this white paper, we provide analyses to examine how these policy and technology changes may impact utility prices over the next 30 years. We also consider how regulatory decisions made when establishing utility rates interact with these changes and mitigate potential future price increases. While our intent is not to advocate for a specific approach, this analysis helps to illustrate both the short- and long-term tradeoffs when establishing natural gas distribution prices in the context of the potential impact of state climate policies. Further, it shows that higher depreciation expense today – and potentially higher near-term prices – can lower the overall cost to customers from now through 2050. It also can reduce the risk of more significant price increases for a potentially smaller, but perhaps more captive, customer base in the future.

Model of Price Impacts

Our analysis is based on a typical capital cost profile, useful lives, and rate of return for a gas distribution utility with approximately one million customers. Three scenarios were analyzed based on different approaches to determining depreciation expense. Based on our cost assumptions,[6] we modeled the depreciation and customer price impacts resulting in a 50% reduction in gas demand by 2050.

The depreciation approaches analyzed include:

Scenario 1: The first scenario delays the recognition of the impact of greenhouse gas emissions reduction on depreciation expense. A 45-year average remaining life, consistent with the company's historical experience, is used initially but then gradually shortened each time a depreciation study is performed. Estimates of service lives are updated approximately every five years. The straight-line method is used for depreciation, in which capital costs are allocated in equal amounts to each year of the service lives of the company's assets.[7]

Scenario 2: For the second scenario, the average remaining life is shortened to 30 years to better align with 2050 carbon emissions targets. The straight-line method is used for depreciation.

Scenario 3: For the third scenario, the average remaining life is shortened to 30 years and the production method is used. The units of production method allocate costs in proportion to production (or consumption) rather than equal amounts each year. With a decline in gas consumption of 50% by 2050, this method results in higher depreciation in the near term when compared to the straight-line method but lower depreciation in the later years.

For our model, we assumed a 50% reduction in gas demand would lead to a 50% reduction in the number of gas customers.[8] We note that our analysis is not intended to suggest that such reductions in demand or customer counts are the most probable, or even likely, future state; we sought to assess the financial impact on utilities and customers of such a scenario to help to inform policy decisions.

Our analysis is based on a typical capital cost profile, useful lives, and rate of return for a gas distribution utility with approximately one million customers.

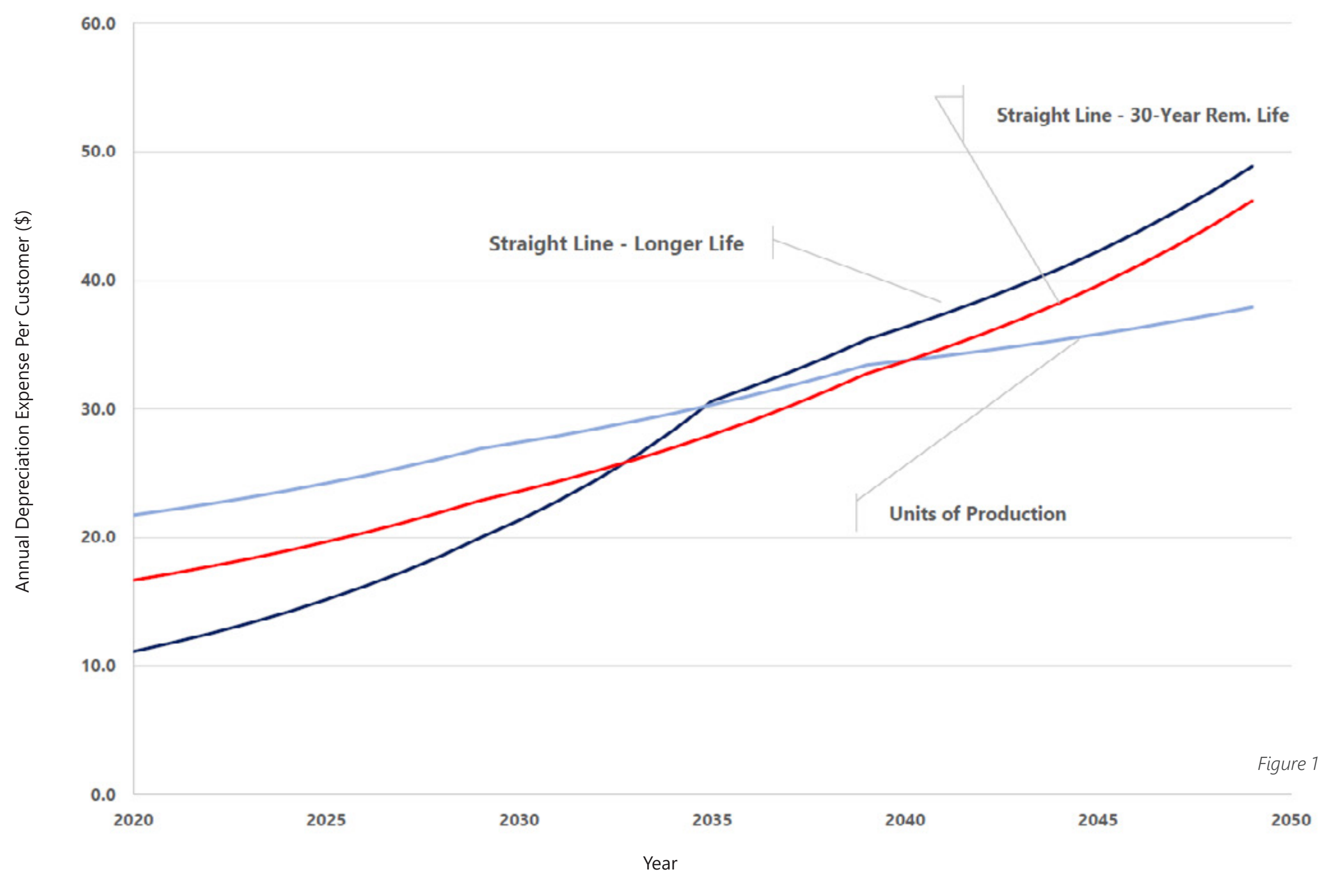

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Figure 1: Annual Depreciation Expense Per Customer - ($)

Figure 1 shows that depreciation using the units of production approach, outlined in Scenario 3, initially results in higher depreciation expense on a per-customer basis, but over the long term produces a more equal distribution of depreciation expense on a per-customer basis.

Long-Term Price Impact

Figure 1 shows the annual depreciation expense per customer for the three modeled scenarios. Due to capital replacements of aging infrastructure over time and the incremental costs that result from these replacements, depreciation expense increases for each scenario on a per-customer basis.[9] However, both Scenario 1 and Scenario 2 (i.e., both of the straight-line method scenarios) increase more significantly over time, whereas the units of production scenario result in a more gradual increase each year on a per-customer basis.

The figure shows that depreciation using the units of production approach (Scenario 3) initially results in higher depreciation expense on a per-customer basis. However, over the time period we analyzed, we found more equal distribution of depreciation expense per customer when the number of customers declines significantly. Further, Scenario 1 shows that delaying the recognition of the impact on depreciation of shorter lives and declining demand results in lower depreciation expense initially but ultimately results in a sharper increase over time. The cost per customer is highest in 2050 for Scenario 1, when compared to either Scenario 2 or 3, and for Scenario 1 depreciation expense increases nearly five-fold on a per-customer basis by 2050.

As noted previously, depreciation expense impacts prices for customers in both the short-term and long-term because it reduces both the balance left to recover through depreciation and the rate base on which a utility has an opportunity to earn a return on its investment. Figure 2 illustrates the impact on both depreciation expense and the return on rate base, on a per-customer basis, for each scenario through 2050.

For Scenarios 1 and 2, the combined cost of depreciation expense and the return on rate base increases significantly on a per-customer basis. This is most pronounced for Scenario 1, in which customers in 2050 pay more than twice as much on a per-customer basis as those in 2020. In contrast, while Scenario 3 results in higher costs initially, there is a more gradual increase, and costs in 2050 are only moderately higher than those in 2020. Because the units of production method allocate costs in proportion to gas consumption, costs are spread more evenly over the full 30-year period on a per-customer basis.

Conclusion

The analysis presented here highlights important policy considerations as states consider how to achieve long-term emissions reduction targets. When there is the potential for significant technology or policy-driven change, higher costs today can mean lower costs in the future and a more equitable share of costs overall. In contrast, lower costs today can lead to higher costs in the future. It should be noted that this analysis shows only the impact on depreciation and the return on rate base. A decline in demand or customers could increase in other costs on a per-customer basis.[10] Further, using the gas distribution system for different fuel types, such as methane blended with hydrogen, could mean higher commodity prices or additional infrastructure investments, which would also mean higher prices for future customers.

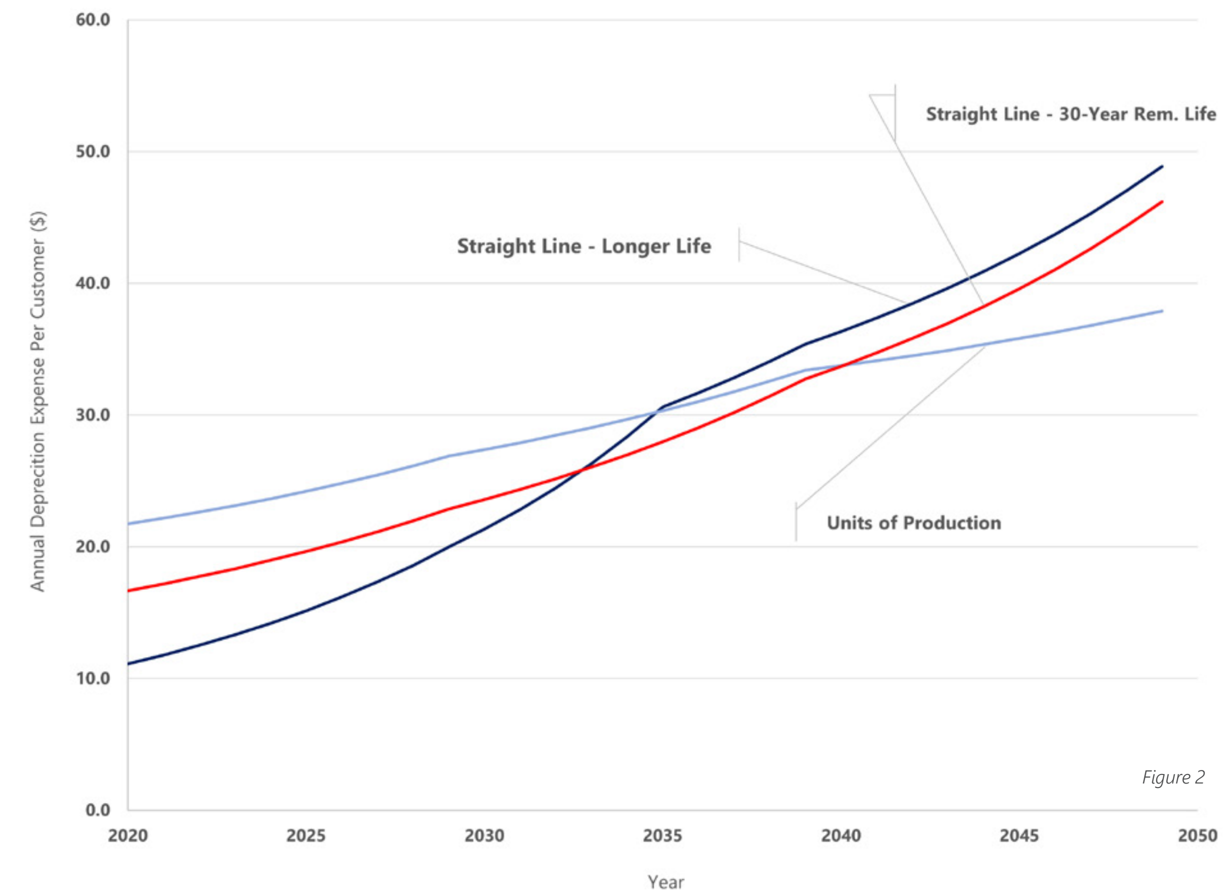

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Figure 2: Average Annual Cost Per Customer ($) – Depreciation Expense and Return on Rate Base

Figure 2 illustrates the impact on both depreciation expense and the return on rate base, on a per-customer basis, for each scenario through 2050.

While it's unclear how we will attain significant greenhouse gas emission targets, it is clear that related policies will cause changes to many industries.

We note that the scenarios illustrated above are based on a hypothetical case in which gas demand declines by 50%. The future is far from certain and our analysis is not intended to convey that our modeling reflects the most likely future state of the natural gas industry. There is a wide range of potential outcomes, with significantly smaller or larger declines in demand possible. Utility commissions in California, New York, and Massachusetts have initiated regulatory proceedings to assess the impact of greenhouse gas emissions targets on the natural gas industry. These proceedings may provide more clarity about the industry's path forward in these jurisdictions.[11] However, to the extent that such policy results in significant reductions in gas demand or a decline in the number of gas customers, our analysis illustrates the potential impact on prices paid by gas customers resulting from different capital recovery approaches adopted by regulators.

Understanding the short- and long-term tradeoffs regarding price impacts can help policymakers and regulators in essential ways. While it's unclear how we will attain significant greenhouse gas emission targets, it is clear that related policies will cause changes to many industries. For natural gas utilities, such impacts would likely result in the need for higher depreciation expense as natural gas assets must be recovered through depreciation more quickly than under "business-as-usual" conditions. Importantly, this does not mean that gas systems will go away, but rather that infrastructure will be either retired or replaced more rapidly than in the past as the usage of a gas system evolves.

Second, while higher depreciation expense today has the short-term impact of higher prices paid by customers, over the long term higher depreciation can help mitigate the potential for much higher price increases in the future. This scenario is perhaps analogous to saving for retirement – starting to save earlier means a more moderate impact on your annual budget while waiting to begin saving becomes more costly over time and could even mean that you will not have enough saved to retire.

Additionally, delaying recognition of the impacts of policy and technology changes will not affect all customers equally. If reductions in gas demand and customer counts do occur, this will not only impact gas prices but will also have an impact on cost equity among different generations of customers. If the recognition of higher depreciation is delayed, then future customers may have to pay a higher share of the costs, whereas customers who leave the system and switch their energy usage will have paid a smaller share. Our modeling suggests that addressing these considerations is best done sooner rather than later to allow sufficient time to implement policy decisions in as equitable a manner as possible and mitigate long-term price increases and potential harm to future gas customers.

Endnotes

1. https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/
2. https://www.dec.ny.gov/energy/99223.html
3. https://calepa.ca.gov/climate/
4. https://www.mass.gov/info-details/ma-decarbonization-roadmap
5. Other aspects natural gas prices, such as the commodity price and the interstate transmission of natural gas, are either regulated at the federal level or based on market-based prices, depending on customer-specific and jurisdictional factors.
6. Our assumptions include a $350 million rate base in 2020, total future depreciation accruals of $500 million in 2020 (including the cost to retire assets in the future), that the company's historical experience would support a 45-year remaining life, annual growth in capital investments that decline over time, and an 8% rate of return on rate base.
7. The straight-line method is used in the vast majority of regulatory ratemaking proceedings.
8. We note that this assumption is not necessarily what will occur. Consumption could decline on a per-customer basis, meaning that a 50% decline in emissions would not represent a proportional decline in the number of customers.
9. A company's total balance of capital assets in service often increases over time as new assets are added, and older assets are replaced. As a result, the total depreciation expense also often increases over time.
10. For example, operations and maintenance costs could increase on a per-customer basis if these costs decline less rapidly (or even increase) than the decline in customers.
11. For additional information on these proceedings, reference websites or Docket Numbers: Massachusetts - D.P.U. 20-80 or https://www.mass.gov/orgs/department-of-public-utilities; California - (R.) 20-01-007 https://www.cpuc.ca.gov/gasplanningoir/; New York - https://www.dec.ny.gov/energy/99223.html.

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