

MARYLAND GAS UTILITY SPENDING

projections and analysis

October 2022

DEAR READERS

Policymakers and customers are making long-term decisions about the future of natural gas. Policymakers are deciding what role—if any—gas will play in the State’s effort to meet its climate goals. And every day, customers are deciding what types of appliances will heat their homes, water, and stoves for the next two decades. Making the right decisions depends on access to good information. To make decisions about natural gas, distribution system costs and commodity costs are the two key components of customer gas bills that need to be understood.

This report focuses on the cost impacts of the *distribution system spending*—costs that customers pay utilities for delivering gas—with less emphasis on gas *commodity prices* (which currently are more than double what they were 18 months ago). This focus is appropriate because—unlike gas commodity costs—the cost impact of gas utility distribution system spending is subject to State policies that can control and mitigate those costs.

It should be easy to identify how much gas companies with government-granted franchise monopolies plan to spend on delivering gas; after all, their captive customers pay for it.

But it is not easy.

Utility spending is siloed into different programs and categories of costs, and it is generally subject to regulatory oversight only *after* or shortly before customer dollars are spent. Utilities are also not

generally required to publicly disclose their long-term spending plans—much less engage in any sort of transparent comprehensive planning process that invites public input.

This failure of transparency represents a major regulatory gap that leaves customers and policymakers alike in the dark on how utilities will spend billions of customer dollars in the coming decades.

To identify just how many customer dollars the gas utilities are on track to spend, our office engaged DHInfrastructure to analyze utility filings and relevant Public Service Commission orders, and make reasonable assumptions to project future gas utility spending, and assess what that spending means for residential utility customers. We directed DHInfrastructure to make calculations based on business-as-usual spending, without accounting for spending reductions resulting from State climate policy or otherwise. This business-as-usual assessment is important because the utilities are not proposing to scale back any of their spending; in fact, quite the opposite—Maryland’s gas utilities are accelerating their capital spending and pushing

This report shows that without significant regulatory action, gas utility customers will see substantial and continuing increases in their gas bills in the coming years to pay for accelerating capital spending.

back against efforts to slow it down. This report shows that without significant regulatory action, gas utility customers will see substantial and continuing increases in their gas bills in the coming years to pay for accelerating capital spending. This problem—creating continuing, long-term, significant upward pressure on gas bills—predates and exacerbates the very large increases in gas bills, during 2022 and anticipated for the winter of 2022/3, due to the dramatic recent increases in the gas commodity portion of gas utility bills.

While the projections contained in the following report represent business-as-usual, they are *conservative* about how high gas utility rates may go. The utilities' spending and the customer-bill impacts of that spending, combined with gas commodity prices, could be significantly larger than the report shows for at least three reasons.

1. **Some degree of electrification appears inevitable.** This means the amount of gas moving through the pipes will decline as customers replace their appliances and heating systems with all-electric systems. Since utilities' spending will be recovered among fewer customers and sales, rates for remaining gas customers will increase *more* than reflected in this report.

2. **The pace of gas investments has accelerated in recent years.** But because we do not think the current growth rate can be maintained, as the report explains at Section 2.2, DHInfrastructure modelled slower growth.

3. **The report uses conservative gas commodity prices.** It uses a commodity cost based on the average February gas commodity price for the last five years, which is less than \$0.50/therm for each utility. The model thus shows commodity prices *significantly lower* than gas commodity prices are today. For example, Washington Gas Light's commodity price for residential and general service as we head to press (in September 2022), is \$ 1.1314/therm, more than double the commodity price we model.

For these three reasons, our projections on spending and rates are conservative; actual gas utility spending and gas utility customer bills could be significantly higher than these projections.

We hope this report helps educate stakeholders and policymakers on the significance of unmitigated gas utility spending for Maryland's gas utility customers.



David S. Lapp
People's Counsel

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SECTION ONE

EXECUTIVE SUMMARY

Maryland's Office of People's Counsel (OPC) engaged DHInfrastructure to prepare various projections and analyses on the current trajectory of gas infrastructure investments and corresponding rate impacts of the projected level of investment at the State's three largest gas distribution companies: Baltimore Gas and Electric (BGE), Washington Gas Light (WGL), and Columbia Gas of Maryland (CMD). Using conservative assumptions, the report's findings show that a continuation of the utilities' spending practices means significantly higher costs for gas delivery, resulting in higher bills for most Maryland residential customers.

This report discusses the approach and assumptions used to develop the projections, presents the results of the projections, and then includes a brief written analysis on the results. It also reports on recent historical trends in natural gas distribution and commodity rates based on actual data. Below we summarize the findings.

Maryland's three largest gas companies are currently undertaking massive capital investment programs through STRIDE...

In 2013, the Maryland General Assembly enacted the Strategic Infrastructure Development and Enhancement (STRIDE) law, section 4-210 of the Public Utilities Article, *Annotated Code of Maryland* (section 4-210 or STRIDE statute). The STRIDE statute authorizes Maryland gas utility companies to file and the Public Service Commission to approve infrastructure investment plans and corresponding project cost-recovery schedules.

The statute requires that companies receive PSC approval of their STRIDE plans on five-year cycles. BGE, WGL, and CMD all requested and received approval for initial five-year plans in 2013 and are currently on their second five-year plans that run from 2019 to 2023. Table 1.1 below shows that the utilities complete their STRIDE plans on file with the PSC at different stages, with BGE's extending to its sixth five-year plan running through 2043. This timeline indicates that for some Maryland utilities, STRIDE is still only in the early stages. Based on each of the three company's STRIDE plans, we find that there is upward of \$4,764 million remaining to be invested through STRIDE alone over the next 20-plus years.

Table 1.1: STRIDE Investment Plans of Maryland's Three Largest Gas Utilities (million \$)

	BGE	WGL	CMD	
Total spent STRIDE I (actual 2014-2018)	\$522.73	\$218.50	\$66.19	
Actual/Authorized budget STRIDE II (2019-2023)	\$827.28	\$363.07	\$87.22	
Estimated STRIDE III (2024-2028) budget	\$693.39	\$439.44	\$57.38	
Estimated STRIDE IV (2029-2033) budget	\$803.83	\$194.82	\$0	
Estimated STRIDE V (2034-2038) budget	\$931.86	\$86.35	\$0	
Estimated STRIDE VI (2039-2043) budget	\$1,034.48	\$0	\$0	THREE-COMPANY TOTAL
All-time Total STRIDE I – VI	\$4,813.58	\$1,302.19	\$210.79	\$6,326 million
Future Total = Remaining STRIDE II + STRIDE III to STRIDE VI	\$3,793.70	\$877.71	\$92.94	\$4,764 million

Totals in figures and tables may not add up precisely due to rounding.

...and these companies will continue to make other investments outside of STRIDE well into the future.

Maryland gas utilities are also continuing to invest in other capital asset categories not covered by STRIDE. Our conservative estimate is that if the companies spend on non-STRIDE activities at current levels, there will be another \$29,749 million investments outside of STRIDE between 2022 and 2100. As shown in Table 1.2, the combined STRIDE and non-STRIDE investments are \$34,513 million.

Our conservative estimate is that if the companies spend on non-STRIDE activities at current levels, there will be **another \$29,749 million in investments outside of STRIDE** between 2022 and 2100.

Table 1.2: Maryland Gas Capital Expenditure (CAPEX) Investments, 2022-2100 (million \$)

	STRIDE (2022-2043)	Non-STRIDE (2022-2043)	Non-STRIDE (2044-2100)	Total
BGE	\$3,793.70	\$5,799.14	\$15,005.96	\$24,598.80
CMD	\$92.95	\$235.31	\$609.67	\$937.93
WGL	\$877.71	\$2,255.34	\$5,843.39	\$8,976.45
Total	\$4,764.36	\$8,289.79	\$21,459.02	\$34,513.18

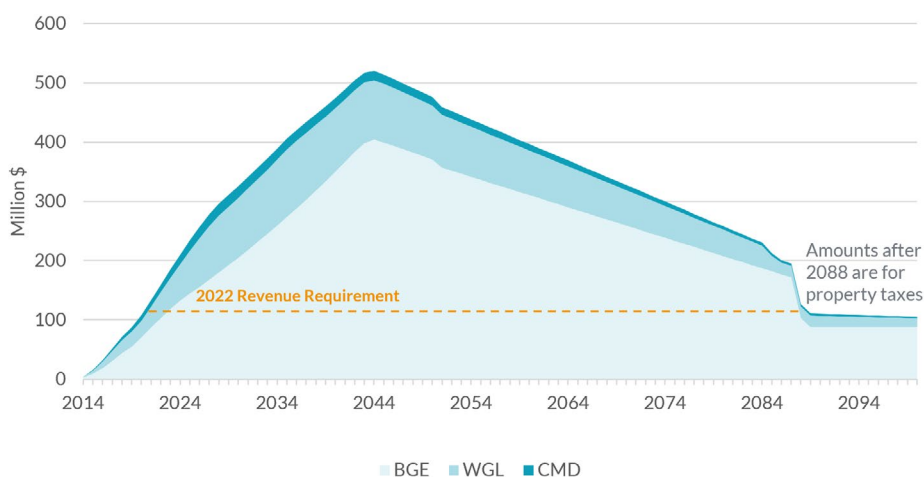
If this pace of investment continues, the capital component of the revenue requirements collected from customers will more than double over the next 25 years...

To understand the impact of our capital investment projections on gas utility rates, we first developed a revenue requirement model that estimated the capital-related components of the revenue requirement. Roughly speaking, the “revenue requirement” consists of the utility’s total revenue needs; the annual revenue requirement is divided by anticipated sales to arrive at the per therm rate that customers pay. (The term is defined in the glossary at the end of this report.) Importantly for customers, the capital investment portion of the revenue requirement accounts for only the costs related to the utilities’ spending on capital expenditures such as depreciation, return on equity, and property taxes; it does not include (a) the utilities’ operational costs nor (b) gas commodity costs that customers pay in their bills.

All utility capital investment enters the utility’s rate base. The rate base is the undepreciated value of utility plant-in-service, composed of the utility’s prior capital investments less accumulated depreciation. It determines the capital investment-related portion of the utility’s revenue requirement (i.e., the annual revenues the utility is authorized to recover from its customers through its rates). Capital investments are recovered from the utility’s customers over time—through a depreciation charge, which is often more than 30 years, and as long as 70 years, depending on the expected life of the asset—until it is fully depreciated. Customers pay both a “return of” investments, in the form of depreciation, and a “return on” investments equal to the utility’s weighted average cost of capital (WACC), which is expressed as a percentage multiplied by the utility’s rate base.¹

The pyramid figure below was made using the revenue requirement model. What makes this figure informative is that it provides context for where the utilities currently are in their overall STRIDE plans. As identified by the orange dotted line, the combined

Figure 1.1: STRIDE Annual Revenue Requirement Pyramid



If STRIDE plans continue as currently constituted, **customers could eventually be paying more than three times** for STRIDE investments than the amounts they are spending today.

¹ The capital-related revenue requirement also includes a tax “gross-up,” including the federal and state income taxes owed if the utility earns its WACC, the property taxes related to the capital investment, and certain other miscellaneous fees.

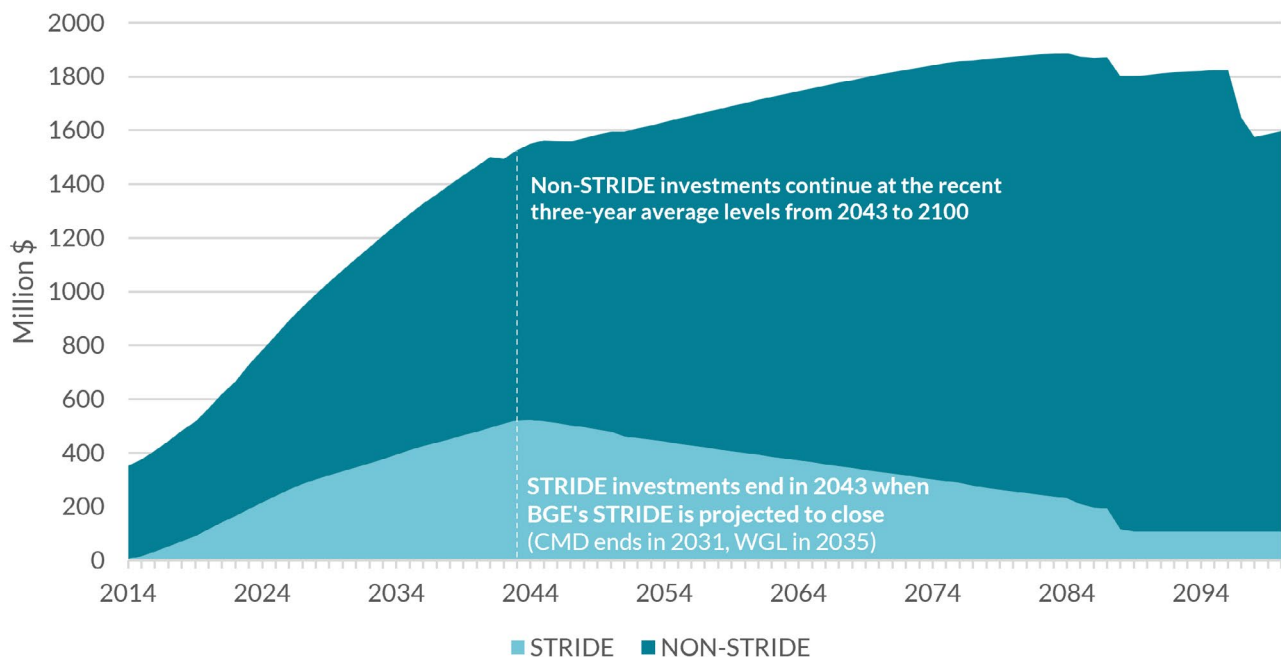
2022 capital investment component of the utilities' revenue requirement of approximately \$160 million across the three STRIDE programs represents a fraction—30 percent—of the \$524.1 million peak in STRIDE revenue requirements that we project for 2044. In other words, if STRIDE plans continue as currently constituted, then Maryland customers could eventually be paying more than **three times** for STRIDE investments than the amounts customers are paying today.

The STRIDE annual revenue requirement amounts (Figure 1.1) represent only a fraction of the total aggregate capital investment-related revenue requirements customers will need to pay to cover utility capital investments made over the next 80 years. The STRIDE and non-STRIDE capital additions we project through 2100 would result in an annual capital revenue requirement for the three utilities exceeding \$1.5 billion by 2043, or **2.3 times** the combined \$667

million in capital investment-related revenue requirements customers are paying through rates in 2022. Put another way, customers today are responsible for paying less than half of the capital investment-related costs that customers will be responsible for in 2043. Figure 1.2 provides both a comparison of the combined non-STRIDE (dark teal) and STRIDE (light teal) capital investment-related revenue requirements across the combined three companies and shows how the total capital investment-related revenue requirements (dark teal + light teal) will evolve over time.

Customers today are responsible for paying less than half of the capital investment-related costs that customers will be responsible for in 2043.

Figure 1.2: Combined Three-Company STRIDE and Non-STRIDE CAPEX Annual Revenue Requirement



...which will result in corresponding increases in base rates charged to customers to cover the rise in rate base.

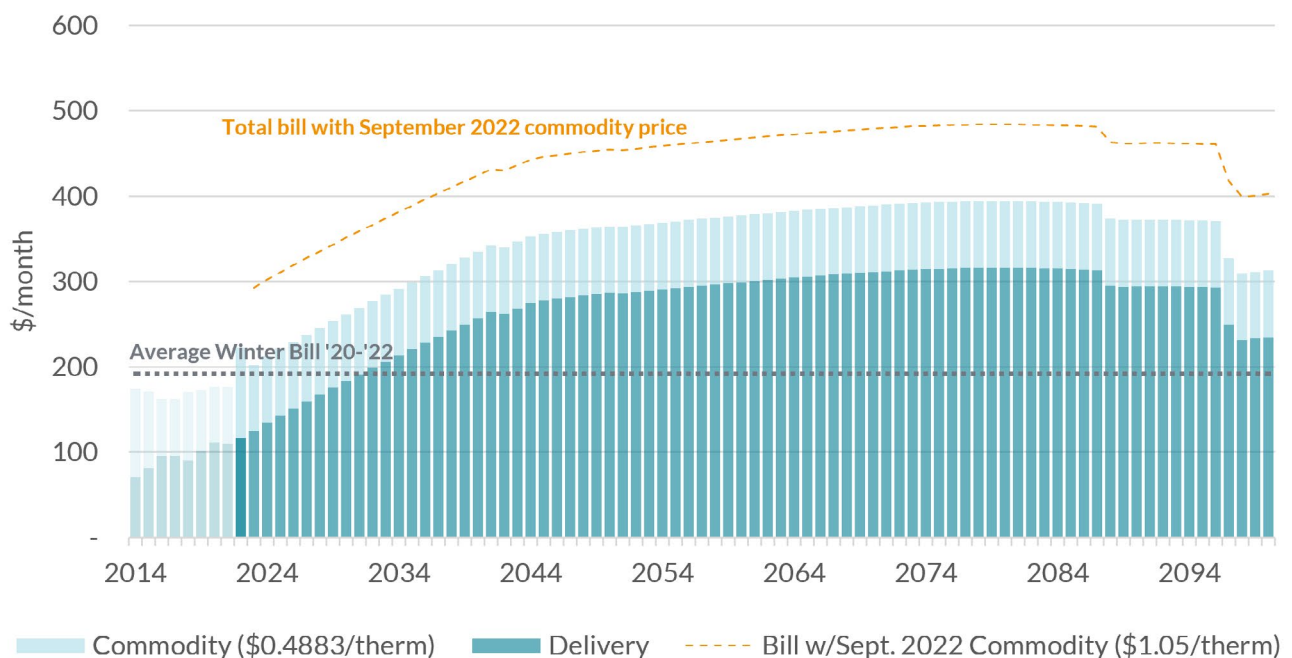
Next, we identified how the capital investments will affect customer rates. This step allocates revenue to the residential heating class of each company using the revenue allocation factors from the most recent STRIDE filings. The billing determinants for customer-months and usage were set based on the revenue calculations in the compliance filing from the most recent rate case for each company. The customer and sales numbers are assumed to remain constant over the evaluation period. Stated otherwise, the projections do *not* account for any migration of gas customers to electric service as a result of electrification policies.

To show the bill impacts over time, we evaluate the typical bill for a winter customer using 160 therms per month in January and February. We use this period because these months tend to be the highest bills for customers.

Figure 1.3 shows that the BGE typical residential customer’s bill will grow from an average of \$192 in 2020-2022 to \$299, a 56 percent increase by 2035, and \$364, a 90 percent increase by 2050. This assumes commodity prices revert back to the five-year averages. If gas prices stay near the current September levels (\$1.05/therm for BGE), then that would add an additional \$90 per month to the typical winter bill.

The BGE typical residential customer’s bill will **increase 56% by 2035.**

Figure 1.3: BGE Typical Winter Bill, 2014-2100



BGE rates for 2021 and 2022 include the Rider 18 offset that was adopted to lower bills in the first two years of the MYRP. This offset amount is removed after 2022.

Figure 1.4 shows that the WGL typical residential customer’s bill will grow from an average of \$160 in 2020-2022 to \$224, a 40 percent increase by 2035, and \$230, a 44 percent increase by 2050. This, too, assumes commodity prices revert back to the five-year averages. If gas prices stay at the September

2022 level (\$1.1314/therm for WGL), then that would add another \$102 per month to the typical winter bill.

Figure 1.5 shows that the CMD typical residential customer bill will grow from an average of \$186 in 2020-2022 to \$270, a 45 percent increase, by 2035 and \$276, a 48 percent increase, by 2050. If commodity prices remain at the September 2022 level

Figure 1.4: WGL Typical Winter Bill, 2014-2100

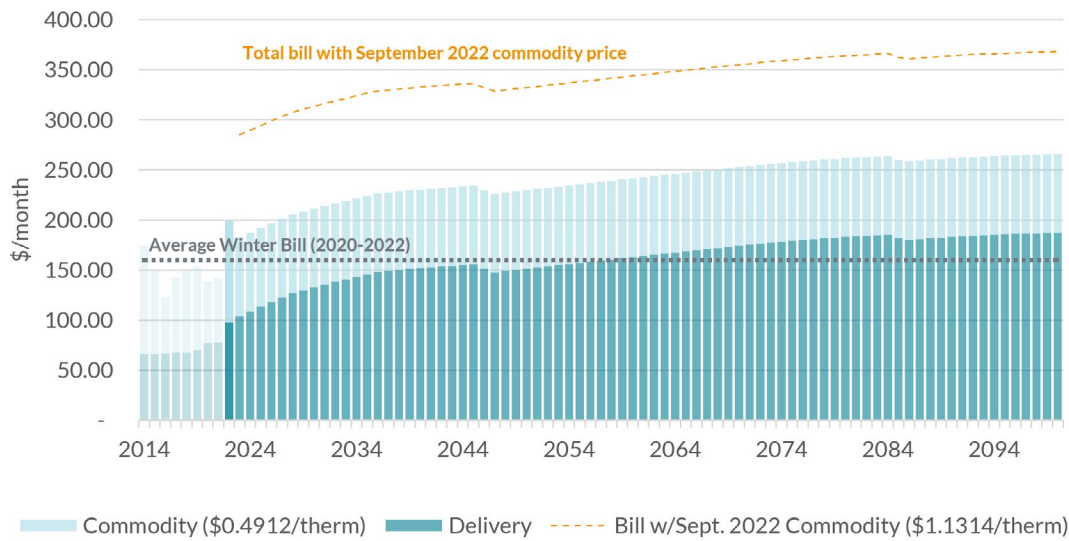
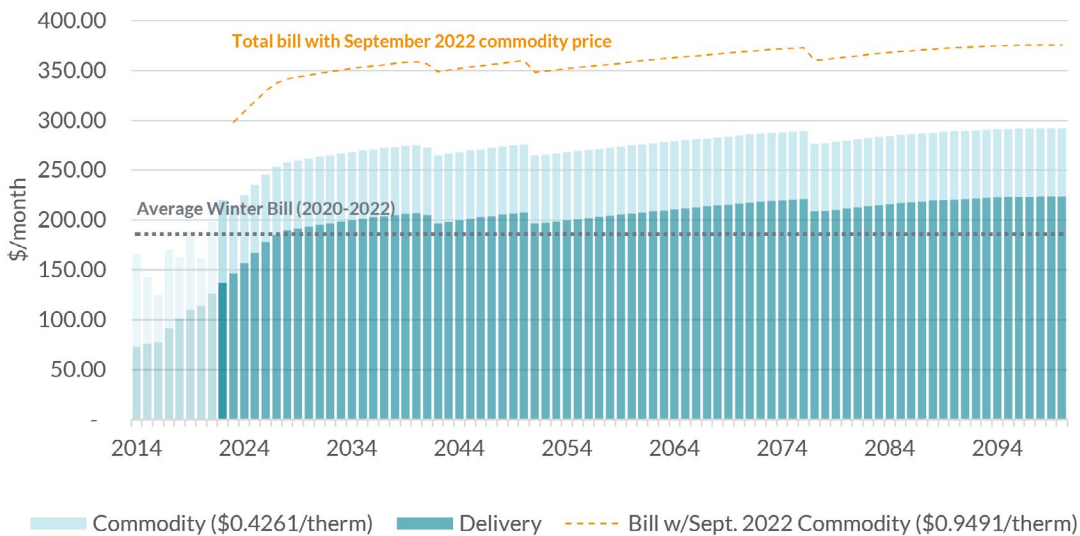


Figure 1.5: CMD Typical Winter Bill, 2014-2100



(\$0.9491/therm for CMD), that would add another \$84 to the typical winter bill.

It is important to recognize that Maryland customers are only at the early stages of paying for STRIDE...

We determined the portion of the total STRIDE costs that have already been recovered through rates and, conversely, what portion of the STRIDE costs remain to be recovered. An investment is being “recovered” through rates until it is fully depreciated. Utilities under rate-of-return regulation receive a “return on” the undepreciated value of an investment in the form

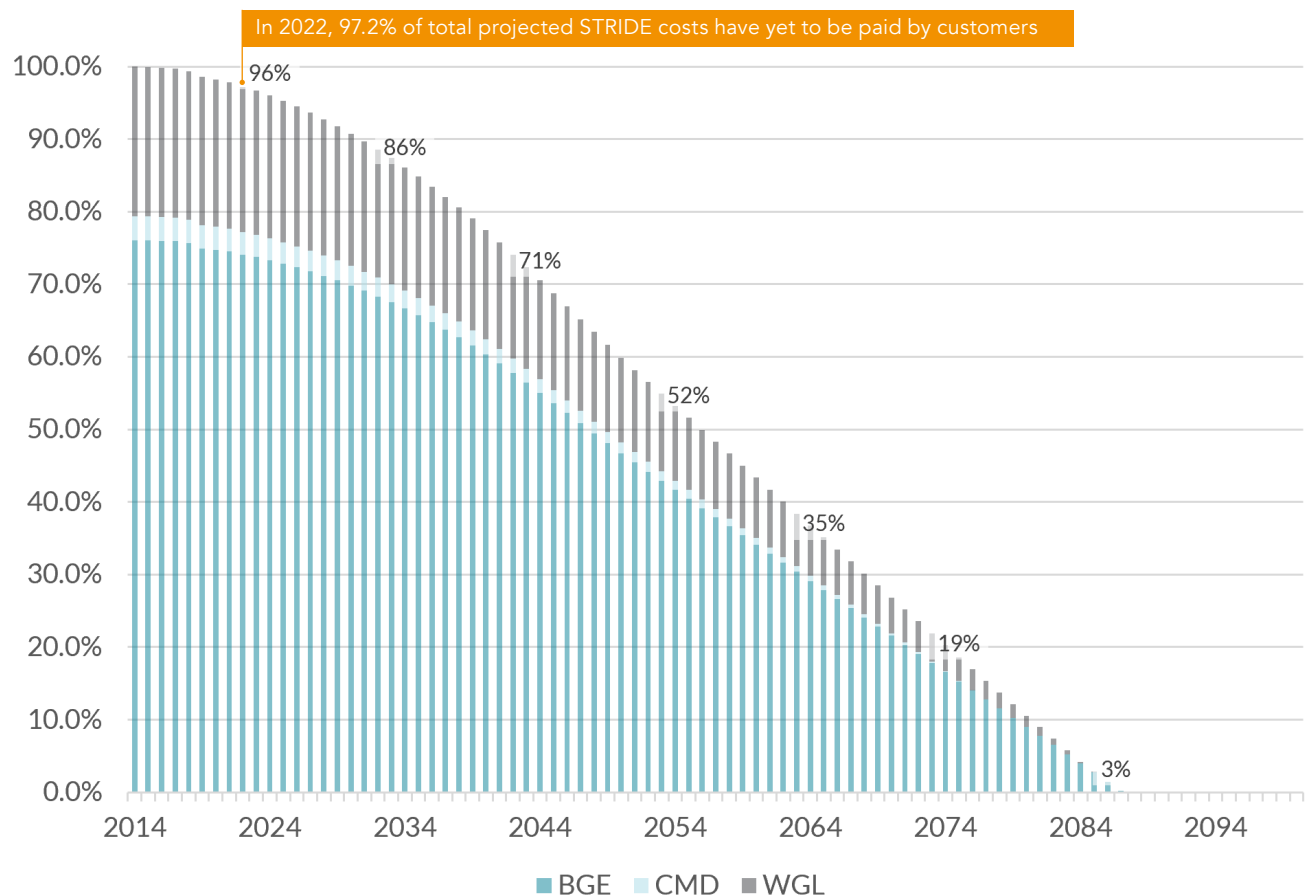
of a return on equity and a “return of” the investment in the form of depreciation expenses. Accordingly, we use cumulative STRIDE depreciation to represent the amounts recovered through rates.

We combined the results of the individual companies into Figure 1.6 to provide a wholistic view of the remaining years that STRIDE costs will be recovered through rates in Maryland. What is important to recognize from this figure is that right now, in 2022,

Right now, in 2022, **only 2.8% of the planned STRIDE costs have been recovered** through rates.

only 2.8% of the planned STRIDE costs have been

Figure 1.6: Amount of STRIDE Cost Recovery Remaining Across Maryland’s 3 Largest Gas Utilities



recovered through rates. STRIDE cost recovery is still at the early stages with Maryland customers expected to be paying off STRIDE costs until 2087.

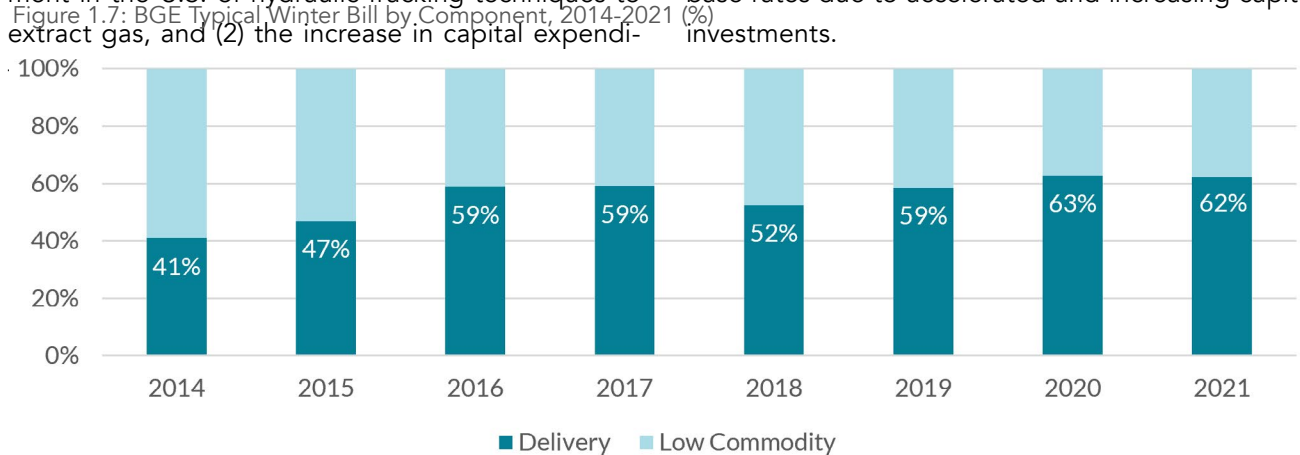
...and the true bill impact of these investments has partially been hidden from customers due to reduced gas prices.

Prior to the increase of gas commodity prices in 2021 and 2022, there had been a trend over the previous decade where the distribution proportion of bills was increasing, while the commodity portion of the bill decreased. This was due to two factors: (1) a drop in commodity prices caused by a large increase in U.S. domestic gas supplies due to the expanded deployment in the U.S. of hydraulic fracking techniques to extract gas, and (2) the increase in capital expendi-

The drop in commodity prices has offset the increase in base rates.

specifically the STRIDE expenditures. The combined effect has been that the drop in commodity prices has offset the increase in base rates. Figure 1.7 shows how a notable flip occurred in 2016: Gas customers began paying more for *delivery* of the gas than for the gas commodity they use, as a proportion of their monthly gas bill.

The increase in gas utilities' distribution prices (or the non-commodity "delivery price") has raised the floor for the total gas bill. When the commodity portion of the gas rate increases, as has happened in 2021 and 2022, customers bear the combined burden of both a return to higher commodity prices and the rise in base rates due to accelerated and increasing capital investments.




SECTION TWO

CAPITAL PROJECTIONS

This section describes the approach we used to develop assumptions for the capital investments that BGE, WGL, and CMD will make from 2022 until 2100. The objective was to develop assumptions that approximate the status quo or current trajectory of each company's investments based on recent history and any capital plans that they have presented in regulatory proceedings.

Our assumptions are based on utility filings with the Public Service Commission or Commission orders. Where we have them, we use the utilities' own projections or assumptions.* If further assumptions are required, we use conservative estimates that are based on analysis of recent rate cases and existing utility plans. All assumptions are explained below.²

Table 2.1 summarizes the results of these capital projections, both by company in total for Maryland's three largest gas utilities. For perspective, the expenditures over the first eight years of STRIDE (2014-2021) by the three utilities have already been \$1,562 million. This table shows that over the remaining duration of STRIDE, the companies anticipate expenditures (\$4,764 million) that are triple what has already been spent on STRIDE. These STRIDE amounts will only be a portion of the overall capital expenditures (CAPEX).

 *The utility-specific data on which this report is based comes from historical, publicly available information or the utility's projections contained in filings with the Public Service Commission or public reports.

To further ensure the accuracy of the general spending trends and customer impacts observed in this report, OPC provided certain data to the three utilities (BGE, WGL, and CMD) and asked them to confirm its accuracy. OPC informed the utilities that the data would be used in documents shared with the public. Both WGL and BGE responded by identifying where certain numbers in their records differed from the numbers DHInfrastructure identified. DHInfrastructure accordingly updated projections and models used for this report to reflect WGL's and BGE's comments. In other cases, each of which is described in detail in this report, DHInfrastructure made all attempts to use the best available public information. For example, because STRIDE projections are based on expenditures rather than plant-in-service, expenditures were used as a close proxy for plant-in-service; as explained in section 2.2.1, this difference has only a *de minimus* impact on our results. Both WGL and BGE emphasized that their willingness to review the data in no way constituted an endorsement of the numbers for any specific use, because they did not know the context in which the numbers would be used. CMD did not respond to OPC's request.

² Nominal dollars are used in this report except for STRIDE long-term projections, for which utility filings include an annual 3% increase that may be intended to reflect inflation.

Table 2.1: Maryland Gas CAPEX Investments, 2022-2100 (million \$)

	STRIDE (2022-2043)	Non-STRIDE (2022-2043)	Non-STRIDE (2044-2100)	Total
BGE	\$3,793.70	\$5,799.14	\$15,005.96	\$24,598.80
CMD	\$92.95	\$235.31	\$609.67	\$937.93
WGL	\$877.71	\$2,255.34	\$5,843.39	\$8,976.45
Total	\$4,764.36	\$8,289.79	\$21,459.02	\$34,513.18

We estimate that if the three companies continue to invest outside of STRIDE at current rates, there will be another \$29,749 million in non-STRIDE investments between 2022 through 2100. In total, based on our assumptions about the current trajectory of investments, we estimate that these three utilities are on track to spend \$34,513 million on gas CAPEX investment from 2022 through 2100.

The remainder of this section describes how these projections were developed. We begin in Section 2.1 with an overview of the STRIDE investment projections by company and then, in Section 2.2, identify the non-STRIDE capital investment assumptions.

2.1. STRIDE Projections

In 2013, the Maryland General Assembly enacted section 4-210 of the Public Utilities Article, *Annotated Code of Maryland* (section 4-210 or STRIDE statute). The STRIDE statute authorized Maryland gas utility companies to file infrastructure investment plans and corresponding project cost-recovery schedules with the Commission for approval. Eligible investments

under STRIDE include infrastructure replacement or improvement projects that meet the following criteria:

- Made on or after June 1, 2013;
- Designed to improve public safety or infrastructure reliability;
- Does not increase the revenue of a gas company by connecting an improvement directly to new customers;
- Reduces or has the potential to reduce greenhouse gas emissions through a reduction in natural gas system leaks; and
- Is not included in the current rate base of the gas company as determined in the gas company's most recent base rate proceeding.³

The statute requires that companies receive approval of their STRIDE plans on five-year cycles. BGE, WGL, and CMD are all on their second five-year plans that run from 2019 to 2023. As part of the filings made to support their second five-year plans, companies also provided updates on their overall STRIDE plans (i.e., the future five-year plans) through either testimony or discovery responses that were used to develop the future STRIDE expenditure projections. These future STRIDE plans continue until the gas utilities have replaced the gas infrastructure targeted by each plan. The subsections below describe each company's STRIDE program and identify the assumptions we used for future STRIDE investments.

Companies anticipate expenditures that are **triple what has already been spent.**

³ Md. Code Ann., Public Utilities Article § 4-210 (a)(3).

Section 4-210 permits companies to begin recovering costs of approved STRIDE investments outside of a rate case through the STRIDE surcharge mechanism. Section 4-210 establishes the rate mechanism to be used to recover eligible costs as a “fixed annual surcharge on customer bills.” This surcharge is capped at \$2 per month for residential customers; for all non-residential customers, the surcharge cap is proportionate to each class’s total distribution revenues as determined in the most recent base rate proceeding. When the Commission approves the investments in the utility’s subsequent rate case and the previous STRIDE investments are allowed into rate base, the surcharge is reset to zero, subject to increasing again to recover the next round of STRIDE-eligible investments until the next base rate case. Thus, aside from the surcharge, customers are also paying for STRIDE investments through the per therm rates they pay (the “base rates”).

Absent the surcharge mechanism, companies would not be able to begin to recover the investment costs of completed projects until these costs are included in rate base in the next base rate proceeding. The time gap between when a project is completed (or “in service”) and when it is reflected in base rates is

known as “regulatory lag.” Cost recovery schedules under the STRIDE statute are initially based on estimated project costs, which are “collectible at the same time the eligible infrastructure replacement is made”⁴ and these costs are reconciled annually. This estimate and reconciliation approach effectively eliminates regulatory lag such that companies receive contemporaneous recovery of STRIDE costs as they are incurred. This elimination of “regulatory lag” is the main mechanism by which STRIDE accelerates the replacement of natural gas infrastructure.

The three companies are all currently operating under their second five-year STRIDE plan. With STRIDE plans running until 2026 for CMD, 2035 for WGL, and 2043 for BGE, it is expected that there will be up to four more five-year cycles of STRIDE. Table 2.2 presents each company’s future STRIDE plans.

It should be noted that the STRIDE investment amounts presented above are STRIDE expenditures, not “plant-in-service.” When utilities invest in capital projects, under traditional rate of return ratemaking, they do not begin to recover these investments until they are “plant-in-service,” which literally means that the equipment is operational and providing service to

Table 2.2: STRIDE Investment Plans of Maryland’s Three Largest Gas Utilities (million \$)

	BGE	WGL	CMD	
Total spent STRIDE I (actual 2014-2018)	\$522.73	\$218.50	\$66.19	
Actual/Authorized budget STRIDE II (2019-2023)	\$827.28	\$363.07	\$87.22	
Estimated STRIDE III (2024-2028) budget	\$693.39	\$439.44	\$57.38	
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Estimated STRIDE V (2034-2038) budget	\$931.86	\$86.35	\$0	
Estimated STRIDE VI (2039-2043) budget	\$1,034.48	\$0	\$0	THREE-COMPANY TOTAL
All-time Total STRIDE I – VI	\$4,813.58	\$1,302.19	\$210.79	\$6,326 million
Future Total = Remaining STRIDE II + STRIDE III to STRIDE VI	\$3,793.70	\$877.71	\$92.94	\$4,764 million

4 Md. Code Ann., Public Utilities Article § 4-210 (d)(3)(ii).

customers. The STRIDE surcharge functions differently by permitting utilities to recover costs when they are incurred, even before they are in service. Because of this different treatment, the amounts reported the STRIDE filings that we rely on to make assumptions about future STRIDE investment are technically expenditures on STRIDE, not plant-in-service. Stated otherwise, the expenditure amounts that we use from the STRIDE filings are slightly different from the STRIDE plant-in-service numbers that would be used in a base rate proceeding. Because the timing difference between expenditures on STRIDE projects is usually just days or weeks (instead of months to years for large utility projects) this assumption has only *de minimus* impact on our overall results.

We next describe in more detail the STRIDE plans of each of Maryland’s three major gas utilities.

2.1.1. BGE

BGE’s STRIDE program is separated into two different sub-programs: Operation Pipeline and Service Replacement Program. The Operation Pipeline program consists of all original asset classes proposed

in BGE’s initial STRIDE plan: cast iron and bare steel main and bare steel and copper services. In 2016, BGE added the Service Replacement Program to specifically address pre-1970 3/4” high pressure steel services.

Table 2.3 summarizes the current long-term plans for BGE’s STRIDE activities based on its most recent public filings. The projected remaining STRIDE expenditures for BGE were forecasted based on a combination of the plans for the remaining two years of the STRIDE II plan (2022 and 2023) and then a steady-state of 48 miles of main replaced each year from 2024 up until 2043, when only 38.2 miles will need to be replaced.⁵ The remaining bare steel and copper services targeted through Operation Pipeline are assumed to be replaced as part of this main replacement work because BGE’s cost estimates for main replacements include the cost of associated service replacement work.

BGE’s estimated cost per mile from its STRIDE II plan is used as the cost basis for the annual budget. We increase the 2023 cost per mile (\$2.63 million/mile) by three percent each year—the same assumption

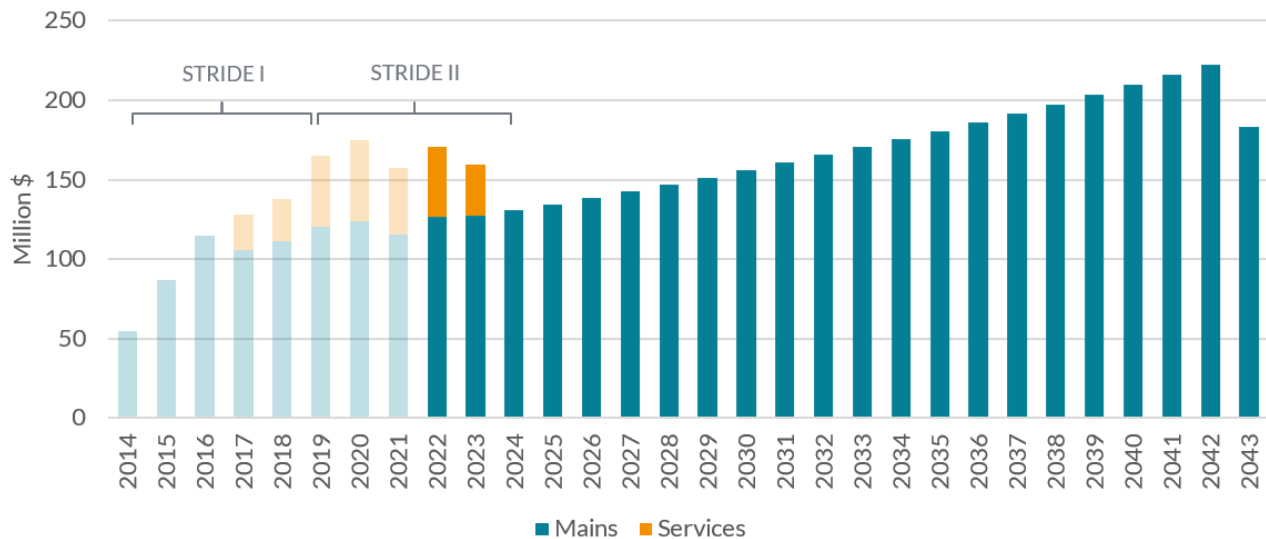
Table 2.3: BGE STRIDE Plans

Program	Asset types	Targeted Infrastructure (STRIDE II plan)	Current Status (2022)	Start Year	End Year
Operation Pipeline	Cast Iron Main	1,216 miles	1,016 miles	2014	2043
	Bare Steel Main	22 miles	14 miles	2014	2028
	Bare Steel Services	63,917 services	53,290 services	2014	2033
	Copper Services	20,251 services	15,600 services	2014	2043
Service Replacement Program	Pre-1970 ¾” High Pressure Steel Services	37,960 services	8,100 services	2016	2023

ⁱ The “Targeted Infrastructure (STRIDE II)” column represents what was reported as remaining work on the system when BGE submitted its STRIDE II plan. The “Current Status” column provides updated information that accounts for the 2021 PHMSA Annual Report and supplemental information from STRIDE filings.

⁵ This plan uses a modified version of the projections that BGE presented for its accelerated STRIDE II plan in response to DR OPC 1-4 in CN 9468 that adjusts the number of miles replaced down from BGE’s projections to the STRIDE II-approved level of 48 miles per year.

Figure 2.1: BGE STRIDE Investment Actual/Projections



BGE used in its STRIDE II plan—and multiplied by the assumed annual replacement miles to arrive at the estimated STRIDE costs. Figure 2.1 shows the projected STRIDE expenditures (2022–2043) along with STRIDE expenditures already incurred (2014–2021). The light-shaded years are historical (actual) investments while the dark-shaded bars are projections.

2.1.2. WGL

WGL's STRIDE program is unique in that it includes both distribution and transmission sub-programs. The STRIDE I plan was initially approved with a service-only program (Program 1) that was split into three components by service material and three main programs focused on specific pipe materials (Programs 2-4). The Commission subsequently approved another WGL distribution program (Program 5) that focused on three other distribution asset categories and five transmission programs.

WGL's initial plan for STRIDE I was to complete replacement of all targeted asset categories over 22 years—by the end of 2025. Despite the expansion

of the programs within STRIDE and regular delays in completing work over the first five years of the program, WGL kept this same overall timeline in its STRIDE II plan. Table 2.4 summarizes the current long-term plans for WGL's STRIDE activities based on its most recent public filings.

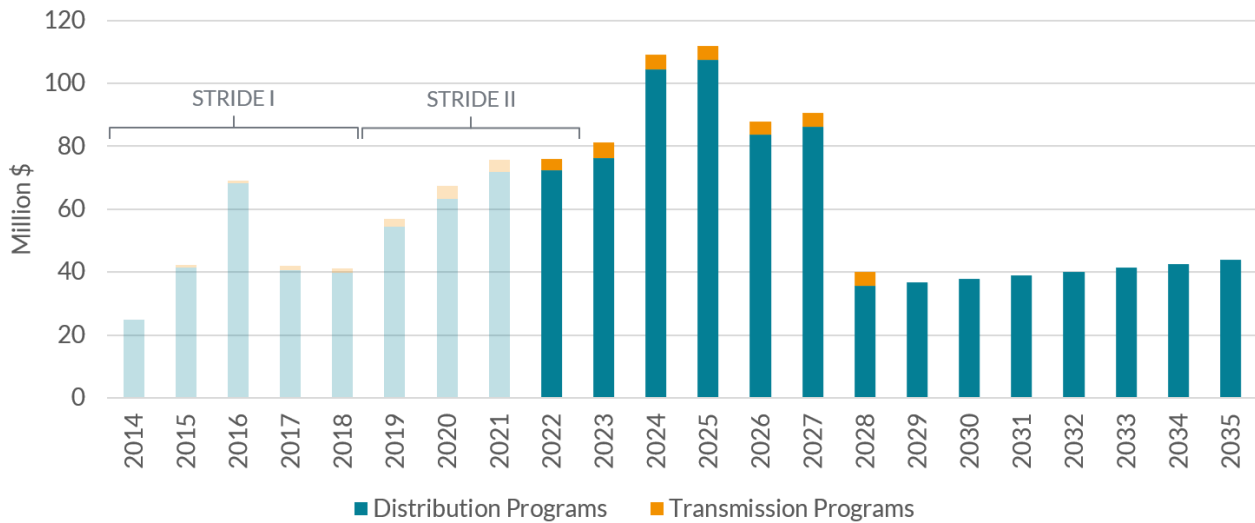
WGL did not provide updated projections of its distribution replacement activities through the end of STRIDE in the STRIDE II docket. Given the complexity created by the number of programs, a more simplistic estimation approach is required. Rather than attempting to develop assumptions for each program, the budget for each distribution program increases by three percent each year until the final year of the program. For example, the budget for Program 2 is \$37.08 million in 2023 and is then estimated to be \$38.2 million in 2024 (3% higher), and the budget for each year increases accordingly until 2027, the final planned year of the program. This approach effectively assumes that the replacement pace that WGL proposed for the final year of STRIDE II (2023) will continue for the duration of each program. We then added an additional 14.7% to the distribution budgets to account for

Table 2.4: WGL STRIDE Plans

Program	Asset Types	Targeted Infrastructure (STRIDE II plan)	Current Status (2022)	Start Year	End Year
Distribution 1A	Bare Steel / Unprotected Services	8,623 services	6,347 services	2014	2026
Distribution 1B	Copper Services	2,871 services	1,884 services	2014	2026
Distribution 1C	Pre-1975 Plastic Services	1,029 services	371 services	2014	2026
Distribution 2	Bare Steel / Unprotected Mains	124.5 miles	81.95 miles	2014	2028
Distribution 3	VMC Mains	392.7 miles	366.7 miles	2014	2035
	VMC Services	25,345 services	20,397 services	2014	2035
Distribution 4	Cast Iron Mains	56.1 miles	40.04 miles	2014	2035
Distribution 5A	Meter Build Up + Risers	113,000 risers	101,262 risers	2015	2035
Distribution 5B	Shallow Main	0.85 miles	0.24 miles	2015	2035
Distribution 5C	Steel Pressure Gauge Lines	1,725 gauge lines	1,194 gauge lines	2015	2035
Transmission 1	Transmission Mains	0 strips	--	--	--
Transmission 2	Remote Control Valves (RCV)	7 RCVs	Unknown	2015	2023
Transmission 3	Block Valves	10 valves	Unknown	2015	2023
Transmission 4	Valve Risers	7 valve risers	Unknown	2015	2019
Transmission 5	Replacements for Inline Inspection (ILI) Tools	3 strips	Unknown	2019	2025

The "Targeted Infrastructure (STRIDE II)" column represents what was reported as remaining work on the system when WGL submitted its STRIDE II plan. The "Current Status" column provides updated information that accounts for the 2021 PHMSA Annual Report and supplemental information from STRIDE filings.

Figure 2.2: WGL STRIDE Investment Actual/Projections



WGL's recent experience that has shown it has spent on average 14.7% more for the replacements completed over the first three years of STRIDE II.

WGL Witness Stuber provided estimates for the transmission programs through 2028 as part of the STRIDE II transmission plan. WGL has not experienced the same level of delays and cost overruns on its transmission projects, so these estimates were used as presented.

Figure 2.2 shows the projected STRIDE expenditures (2022–2035) along with STRIDE expenditures already incurred (2014–2021).

2.1.3. CMD

The STRIDE program that CMD is currently operating under remains relatively the same as the original program approved by the Public Service Commission in Case Number (CN) 9332. CMD's approved first five-year plan included an average replacement of 7.56 miles of bare steel or cast-iron main per year with an

overall target to remove all bare steel and cast-iron main by the end of 2026.⁶ For STRIDE II, CMD agreed to a settlement that set the annual replacement rate of bare steel and cast iron mains at eight miles per year. There was no update in CN 9479 on how this slight increase in replacement rate changed the anticipated STRIDE timeline, so the table below assumes that 2026 is still targeted to be the final year. Table 2.5 summarizes the current long-term plans for CMD's STRIDE activities based on its most recent public filings.

As shown in the table above, CMD has only a few years remaining under its current STRIDE program. At its current replacement pace, CMD will have approximately 17.5 miles of bare steel main to replace at the end of STRIDE II. However, we expect that CMD will need to replace more than 17.5 miles of pipe in the next iteration of its STRIDE plan. CMD's STRIDE projects in recent years have included replacement of high levels of non-leak prone material or "contingent" main that was connected to STRIDE targeted pipe.⁷ For example, in 2021, CMD reported that it

Table 2.5: CMD STRIDE Plans

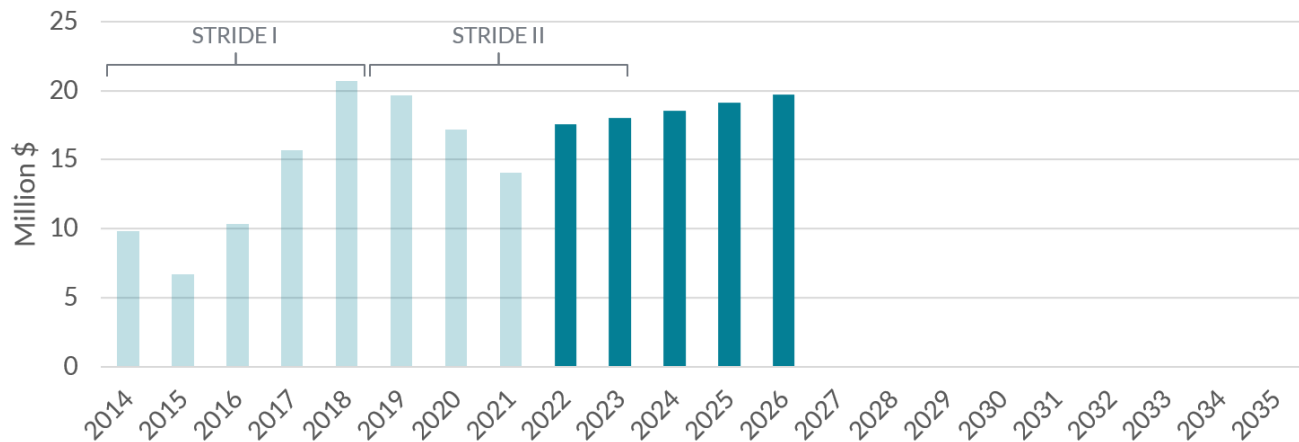
Program	Asset Types	Targeted Infrastructure (STRIDE II plan)	Current Status (2022)	Start Year	End Year
Infrastructure Replacement and Improvement Plan ("IRIS")	Bare Steel Services	3,027 services	1,521 services	2014	2026
	Bare Steel Mains	68.9 miles	33.5 miles	2014	Complete
	Cast/Wrought Iron Mains	2.2 miles	0.0 miles		

ⁱ The "Targeted Infrastructure (STRIDE II)" column represents what was reported as remaining work on the system when CMD submitted its STRIDE II plan. The "Current Status" column provides updated information that accounts for the 2021 PHMSA Annual Report.

⁶ The approved plan was CMD's second attempt to receive approval of its first five year STRIDE plan. The Commission denied CMD's initial proposal in CN 9332 to replace 5.9 miles of bare steel and cast-iron mains per year from 2014 to 2018 because it found that the replacement rate did not represent a material acceleration over its current pace.

⁷ When companies replace materials such as bare steel and cast iron mains that are targeted for removal through STRIDE, there are times when other pipe materials, such as coated steel or plastic mains, are encountered. This other material may be a section of pipe that was previously installed to repair a leak. Companies argue that for efficiency reasons it is more expedient to replace the entire strip of pipe rather than work around the material not targeted for STRIDE. This pipe is commonly called "contingent" main.

Figure 2.3: CMD STRIDE Investment Actual/Projections



had to replace 18.4 miles in total to retire 8.4 miles of bare steel main. Due to the additional costs of removing these 10.1 miles, CMD completed four projects outside of STRIDE (*i.e.*, it is not recovering the costs through the surcharge) in order to complete the eight miles within the budget agreed upon in the CN 9479 settlement. This recent trend of significant “contingent main replacement” led us to assume that the total investment for CMD’s final STRIDE years will include more than just the 17.5 miles of bare steel. For the 2024-2026 investment projections, we assume that CMD will continue its same replacement pace of 8 miles per year.⁸ At that pace, 17.5 miles of main will be replaced along with 6.5 miles of contingent main. The budget is calculated by using the cost per mile (\$2.2 million per mile) used for 2023 grown by three percent each year.

Figure 2.2 shows the projected STRIDE expenditures (2022–2026) along with STRIDE expenditures already incurred (2014-2021).

2.2. Non-STRIDE Capital Projections

We separately analyzed the gas utilities’ capital investments made outside of STRIDE (*i.e.*, “non-STRIDE” investments). Unlike STRIDE expenditures for which utilities must file five-year plans, no statute or PSC action requires gas utilities to publicly disclose their long-term capital expenditure plans outside of a rate case.

This analysis thus began by first attempting to understand the amounts of investments each of the utilities have made outside of STRIDE in recent years. The projections for future non-STRIDE investments are based on the recent historical trend. We gathered the most recent data on plant additions available for each company. For WGL and CMD, this includes the three most recent annual reports submitted to the Maryland PSC.⁹ For BGE, this includes the capital plans submitted in its three-year MYRP. These numbers were then tied to the annual STRIDE investments made in the same year to arrive at an estimate

⁸ Note that initial iterations of the CMD projections had assumed CMD’s STRIDE plan would operate through 2030.

⁹ For CMD, we used the annual reports filed for years 2019-2021. For WGL, we used years 2018-2021 as WGL’s 2021 annual report was unavailable at the time we conducted our analysis.

Table 2.6: Non-STRIDE Investments of Maryland's Three Largest Gas Utilities, 2022-2100 (million \$)

	BGE	WGL	CMD	
Non-STRIDE Year 1	\$255.90	\$116.00	\$8.21	
Non-STRIDE Year 2	\$284.89	\$107.51	\$4.70	
Non-STRIDE Year 3	\$249.00	\$84.04	\$19.18	
Three-Year Average	\$263.26	\$102.52	\$10.70	THREE-COMPANY FUTURE NON-STRIDE TOTAL
Estimated Non-STRIDE Spend 2022-2100	\$20,805.14	\$8,098.74	\$844.98	\$29,749 million

for non-STRIDE investments.¹⁰ Specifically, for each company, we identified the amount of non-STRIDE investments made as the difference between total plant additions and the STRIDE additions. This is represented by the following formula:

$$\text{Non-STRIDE Additions} = \text{Total Utility Plant Additions} - \text{Stride Additions}$$

Once we identified the historical non-STRIDE additions, the next step was to decide what should be used as the assumed rate of future non-STRIDE additions to capital plant. Two possibilities were considered:

Compound. A recent phenomenon in the gas industry is that utility plant-in-service balances are experiencing compound growth each year. Compound growth means that plant grows at a constant rate. This result requires that plant investment levels increase each year. For example, consider a utility with \$1 billion in plant-in-service that makes \$100 million in investments. This amount represents a 10 percent increase in plant-in-service. If that utility were then to make a \$100 million investment the next year, the annual growth would only be 9.09 percent.¹¹ To maintain the same 10 percent annual growth in plant-in-service, the

amount of additions would instead need to increase to \$110 million. One option we considered for estimating non-STRIDE investments was to assume that the level of non-STRIDE investments would be the amount needed to maintain the compound annual growth rate (CAGR) demonstrated over the three-year period between December 31, 2017, and December 31, 2020.

Straight-line. The other approach we considered was to assume that investments outside STRIDE would remain at the same recent levels in perpetuity. We calculated the three-year average level of non-STRIDE additions and then used the result as the constant level of annual future investments. This was called our "straight-line" estimate.

We decided to use the more conservative straight-line assumption for estimating non-STRIDE investments. The compound approach resulted in extremely high levels of investment in the future that did not seem realistic. The straight-line assumptions are likely more realistic but are notably conservative, given that we do not add to the amount each year to account for inflation.

¹⁰ As explained earlier, the historical STRIDE amounts relied on in this report are expenditures, not plant-in-service. The utility plant additions reported in the annual reports are plant-in-service numbers. The consequence of this assumption is that our non-STRIDE capital additions here are understated because actual STRIDE plant-in-service is less than STRIDE expenditures.

¹¹ $\$1.1 \text{ billion} + \$0.1 \text{ billion} / \$1.1 \text{ billion} - 1 = 9.09\%$

The subsections below describe any unique assumptions that needed to be made for each company and then present the estimate of the non-STRIDE investment amount used in the capital projections.

2.2.1. BGE

BGE is currently operating under a multiyear rate plan (MYRP) from 2021 to 2023. We derived the estimate for non-STRIDE investments by using the capital plan submitted in compliance with the Commission’s

decision in CN 9645. Table 2.7 presents the derivation of the non-STRIDE capital investment assumption that is used to determine the average annual in the BGE capital projections.

The combined investment projections for BGE, starting after the MYRP in 2024, represent the STRIDE projections through 2045 plus a base level of \$263.26 million that we maintain for the entire evaluation period. Figure 2.4 shows the results of our capital investment projections for BGE through 2100.

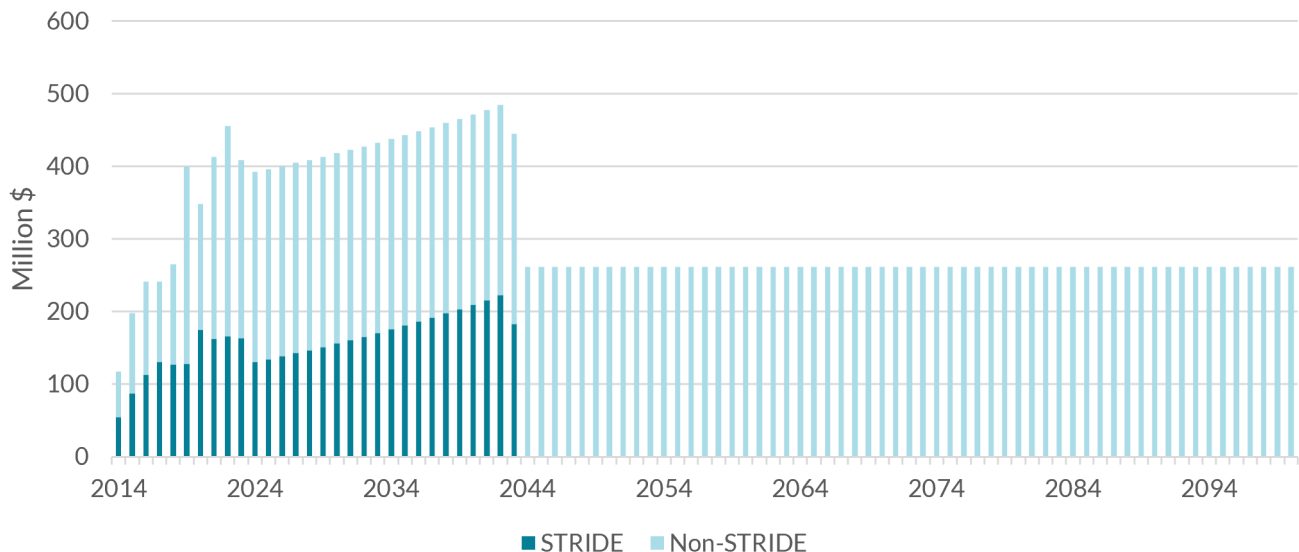
Table 2.7: BGE Non-STRIDE Investment Projections

Line	Description	Source	Projection
1	Plant Additions (2021-2023)	CN 9645, MYRP	\$1,277 million
2	STRIDE Plant Addition (2021-2023)	STRIDE filings	\$487.4 million
3	Non-STRIDE Plant Additions (2021-2023)	Line 1 – Line 2	\$789.8 million
4	Average Annual Non-STRIDE Additions	Line 3 / 3	\$263.26 million

2.2.2. WGL

The same approach was used to develop the non-STRIDE capital projections for WGL with two exceptions. First, WGL uses its FERC Form 2 as the basis of its annual report. The problem this reporting creates is that the FERC Form 2 encompasses WGL’s operations in Maryland, Virginia, and the District of Columbia, which means that much of the information in WGL’s annual report is an aggregate of its three service jurisdictions. While there are Maryland specific entries that identify the number of customers and revenue earned within the Maryland division,

Figure 2.4: BGE Annual Capital Investment Actual/Projections



there is no disaggregation of utility plant or operating expenses by division. This meant that we needed to make assumptions about what amount of utility plant and the utility plant additions were associated with WGL’s Maryland division.¹² Second, because WGL is not operating under a MYRP, the beginning of our projections is 2021, the year after the most recently filed annual report.

We used WGL’s allocated cost-of-service study submitted in its 2020 base rate case (CN 9651) to identify a jurisdictional plant allocation factor to use for assigning a portion of plant additions to Maryland. Table 2.8 presents the derivation of the non-STRIDE capital investment assumption that is used in the WGL capital projections.

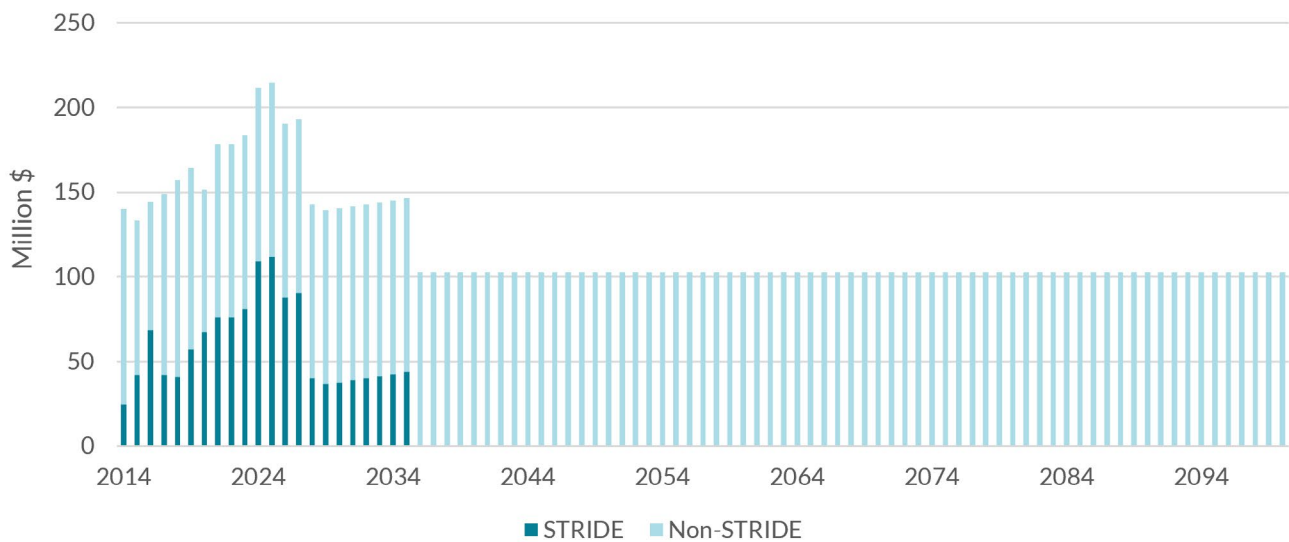
The combined investment projections for WGL, starting in 2021, represent the STRIDE projections

through 2035 plus a base level of \$102.5 million that we maintain for the entire evaluation period. Figure 2.5 shows the results of our capital investment projections for WGL through 2100.

Table 2.8: WGL Non-STRIDE Investment Projections

Line	Description	Note	Projection
1	Total WGL Plant Additions (2018-2020)	Annual Reports	\$1,238 million
2	MD Plant Allocator	CN 9651, Exh. RET-6	38.2%
3	Estimated MD Plant Additions	Line 1 * Line 2	\$473.1 million
4	STRIDE Plant Addition (2018-2020)	STRIDE filings	\$165.6 million
5	Non-STRIDE Plant Additions (2018-2020)	Line 3 – Line 4	\$307.5 million
6	Average Annual Non-STRIDE Additions	Line 3 / 3	\$102.5 million

Figure 2.5: WGL Annual Capital Investment Actual/Projections



12 This decision to use an approximation for the WGL plant in service numbers means that even the historical numbers on revenue requirement and total investments for WGL are estimates.

2.2.3. CMD

Like we did for WGL, to identify CMD’s non-STRIDE investment amounts, we began by looking at its historical investment amounts in the three most recent annual reports. Table 2.9 presents the derivation of the non-STRIDE capital investment assumption that is used in the CMD capital projections.

The combined investment projections for CMD, starting in 2021, represent the STRIDE projections through 2026 plus a base level of \$10.7 million that we maintain for the entire evaluation period. Figure 2.5 shows the results of our capital investment projections for CMD through 2100.

Table 2.9: CMD Non-STRIDE Investment Projections

Line	Description	Note	Projection
1	Plant Additions (2019-2021)	Annual Report	\$83.75 million
2	STRIDE Plant Addition (2019-2021)	STRIDE filings	\$51.66 million
3	Non-STRIDE Plant Additions (2019-2021)	Line 1 – Line 2	\$32.09 million
4	Average Annual Non-STRIDE Additions	Line 3 / 3	\$10.7 million

Figure 2.6: CMD Annual Capital Investment Actual/Projections



SECTION THREE

ANNUAL REVENUE REQUIREMENT PROJECTIONS

This section both describes the approach we took to estimating the revenue requirements related to our capital investment projections and discusses some of the results of this analysis. We begin, in Section 3.1, with an overview of our revenue requirement modeling approach used to project annual revenue requirements. The remaining four parts of this section include a summary of the annual STRIDE revenue requirements calculated using the revenue requirement model (3.2), a summary of the total STRIDE and non-STRIDE capital revenue requirements calculated using the model (3.3), an explanation of how the operating cost component of the annual revenue requirement was calculated (3.4), and the results of the annual revenue requirement projections for each company (3.5).

3.1. Revenue Requirement Model

To understand the impact of our capital investment projections on rates, we first developed a revenue requirement model that estimated the capital-related components of the annual revenue requirement. This model was a modified version of the model used in the testimony we prepared for OPC on BGE's STRIDE II plan in PSC Case No. 9479.

The revenue requirement for the capital investment components included:

- Return on Rate Base
- Depreciation
- Property Taxes
- Gross-up for income taxes, bad debt, franchise taxes, and PSC assessment.

To calculate the annual revenue requirement in future years, we needed to develop certain assumptions on depreciation, retirements, cost of capital, property taxes, and the gross-conversion factor. We relied on a mix of STRIDE filings and annual reports to develop the assumptions. Table 3.1 presents the various assumptions used to calculate the capital-related revenue requirements for each company.

These assumptions are based on the best information we were able to identify that is publicly available. The assumptions may not represent what BGE's own internal records show today, and actual numbers will differ from those generated using our assumptions. The analysis is solely intended to show the general impact that current capital investment trends will have on future revenue requirements and therefore utility customer rates; it does not identify the precise future revenue requirements that will be developed through the regulatory process.

Table 3.1: CAPEX Revenue Requirement Assumptions

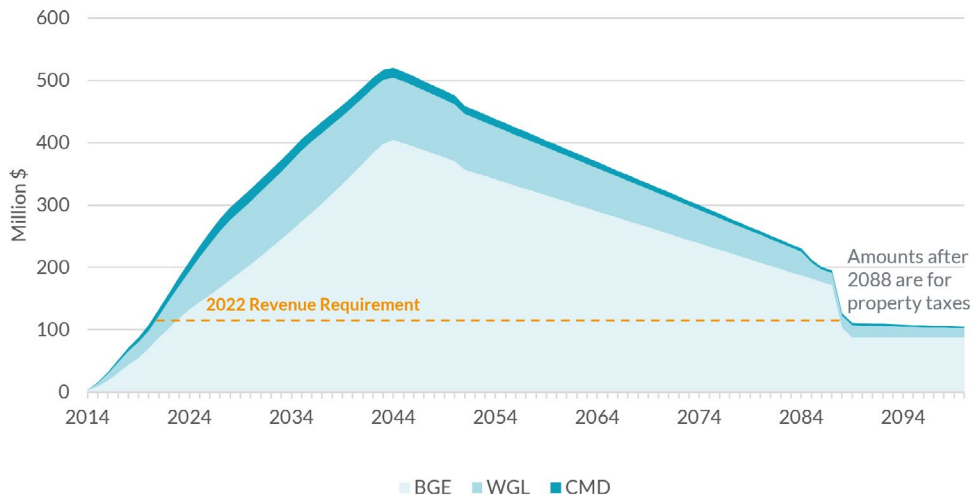
	BGE	WGL	CMD
Depreciation Rates	1.76% (mains)	1.65% (distribution)	1.8% (STRIDE)
	3.54% (services)	1.91% (transmission)	2.35% (non-STRIDE)
	2.76% (non-STRIDE)	2.42% (non-STRIDE)	
Retirement Rate	-3.11% (mains)		-5.0% (STRIDE)
	-1.36% (services)	-2.5%	-2.5% (non-STRIDE)
	-2.50% (non-STRIDE)		
Weighted Average Cost of Capital	6.33%	7.09%	7.16%
Gross-Conversion Factor	70.87%	72.48%	70.35%
Property Tax Rate	1.23%	1.12%	1.23%
Tax Treatment of STRIDE Plant Additions	Tax Repairs: 80% MACRS: 20%	Tax Repairs: 80% MACRS: 20%	Tax Repairs: 80% MACRS: 20%

3.2. STRIDE Revenue Requirement

The pyramid figure below was made using the annual revenue requirement approach described in the previous section. What makes this figure informative is that it provides context for where we currently are in the overall STRIDE plans. As identified by the arrow and dotted line, the combined 2022 revenue

requirement of approximately \$165 million across the three STRIDE programs represents a fraction, 30 percent, of the \$524 million peak in annual STRIDE revenue requirements that we project for 2044. In other words, if STRIDE plans continue as currently constituted, then Maryland customers will eventually be paying more than **three times** for STRIDE investments than they are paying today.

Figure 3.1: STRIDE Annual Revenue Requirement Pyramid



Maryland customers will eventually be paying more than **three times** for STRIDE investments than they are paying today.

3.3. Non-STRIDE Revenue Requirement

The STRIDE revenue requirement in Figure 3.1 represents only a fraction of the capital-related annual revenue requirements customers will need to pay to cover for capital investments over the next 80 years. The STRIDE and non-STRIDE capital additions we project through 2100 would result in a combined annual capital revenue requirement for the three utilities exceeding \$1.5 billion dollars by 2043 or 2.3 times the combined \$667 million in capital revenue requirements customers are paying through rates in 2022. Put another way, customers today are responsible for paying less than half of the capital costs that customers will be responsible for in 2043. Figure 3.2 provides both a comparison of the combined non-STRIDE (dark teal) and STRIDE (light teal) annual capital revenue requirements across the combined three companies and shows how the total annual capital revenue requirements (dark teal + light teal) will evolve over time.

Customers today are responsible for paying **less than half** of the capital costs that customers will be responsible for in 2043.

3.4. Operating Costs Revenue Requirement

Until now, this revenue requirement section has only considered capital-related components. To develop rate projections, we needed to develop assumptions for the level of operating costs included in the annual revenue requirement. Operating cost estimates for the projection period were “reverse-engineered” using a combination of our estimated capital component revenue requirements and the base revenue requirements from the companies’ most recent base rate filings. We used the sum of the base distribution revenue requirement and STRIDE revenue requirement from each company’s most recent rate

Figure 3.2: Combined Three-Company STRIDE and Non-STRIDE Revenue Requirement

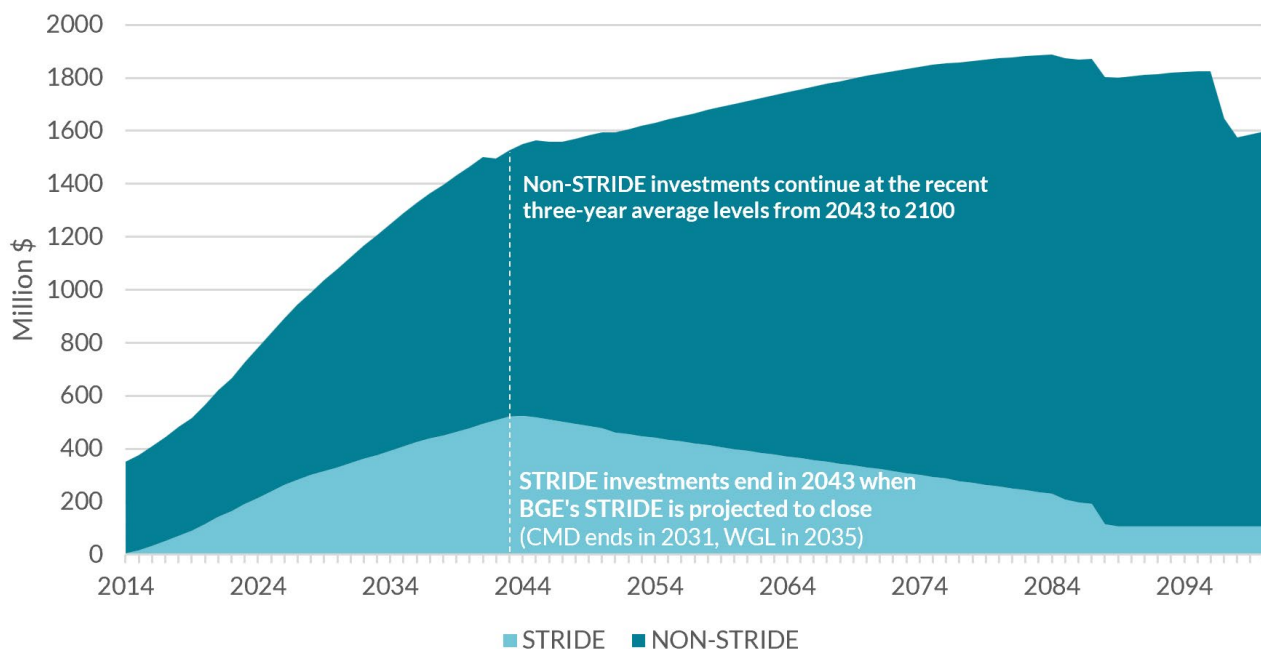


Table 3.2: Operating Cost Revenue Requirement Assumptions

	BGE (CN 9646, Year 3)	WGL (CN 9651)	CMD (CN 9644)
Revenue Requirement	\$651.96 million	\$377.19 million	\$42.30 million
Estimated Capital Revenue Requirement	\$423.65 million	\$254.08 million	\$29.44 million
Operating Revenue Requirement	\$228.31 million	\$123.11 million	\$12.87 million

proceeding and then subtracted our estimated capital revenue requirement to arrive at the estimated operating portion of the revenue requirement. This process is shown in Table 3.2.

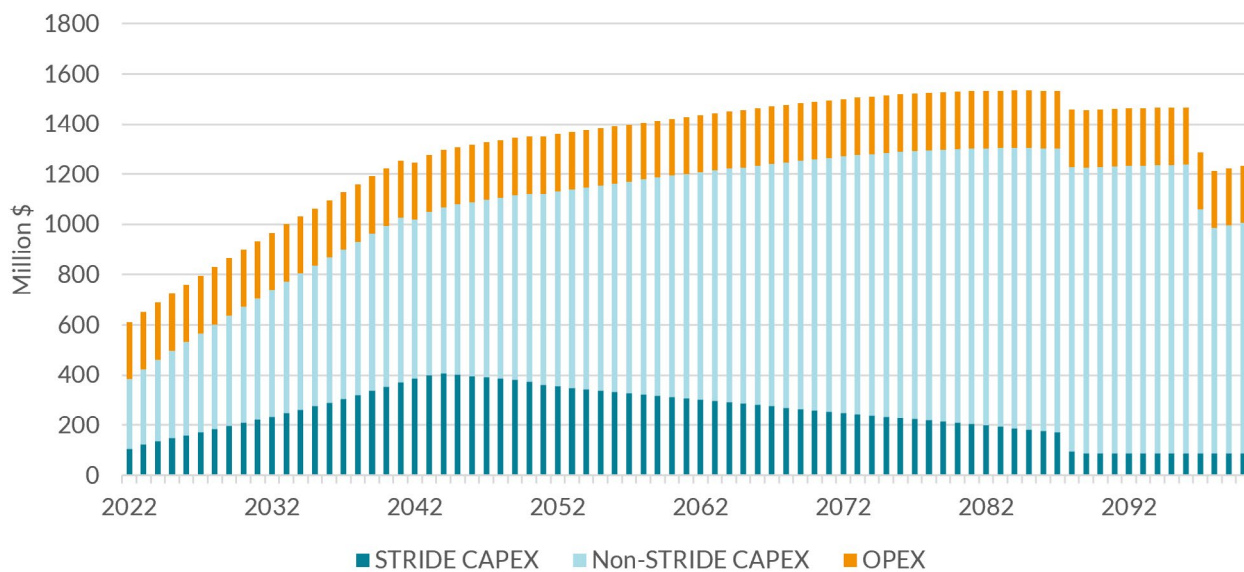
We should emphasize here that we adopt the same operating cost assumptions for every year in the evaluation period; there is no markup for inflation. This approach is consistent with our choice to not grow the non-STRIDE capital investment amounts over time. What this means is that the revenue requirements are in nominal 2022 dollars.¹³

3.5. Annual Revenue Requirement Results

The combination of our STRIDE and non-STRIDE capital revenue requirements and operating expenses represents our annual revenue requirement projections for each company.

Figure 3.3 presents the results of the BGE annual revenue requirement projections. The BGE revenue requirement is projected to peak in 2084 when it reaches \$1.532 billion or 2.3 times the revenue requirement of the third year of its current MYRP.

Figure 3.3: BGE Annual Revenue Requirement Projections



¹³ STRIDE investment assumptions do inherently include inflation to the degree that the companies' cost projections include inflation.

Figure 3.4 presents the results of the WGL annual revenue requirement projections. The WGL annual revenue requirements continue to grow over the evaluation period with no peak and drop like BGE. There is no peak and drop because WGL currently makes more non-STRIDE investments than STRIDE investments. Because WGL's non-STRIDE investments are greater, even when STRIDE ends, WGL is projected to continue making substantial investments. BGE and CMD are currently making a majority of their annual investments through STRIDE such that

when STRIDE ends, there is a drop to the baseline non-STRIDE investments. Should WGL's investment follow our assumptions, then rate base would almost double over the next 80 years.

Figure 3.5 presents the results of the CMD revenue requirement projections. CMD's revenue requirements have periodic drops over the evaluation period as STRIDE investments become fully depreciated, but overall the revenue requirement continues to increase over the entire period.

Figure 3.4: WGL Annual Revenue Requirement Projections

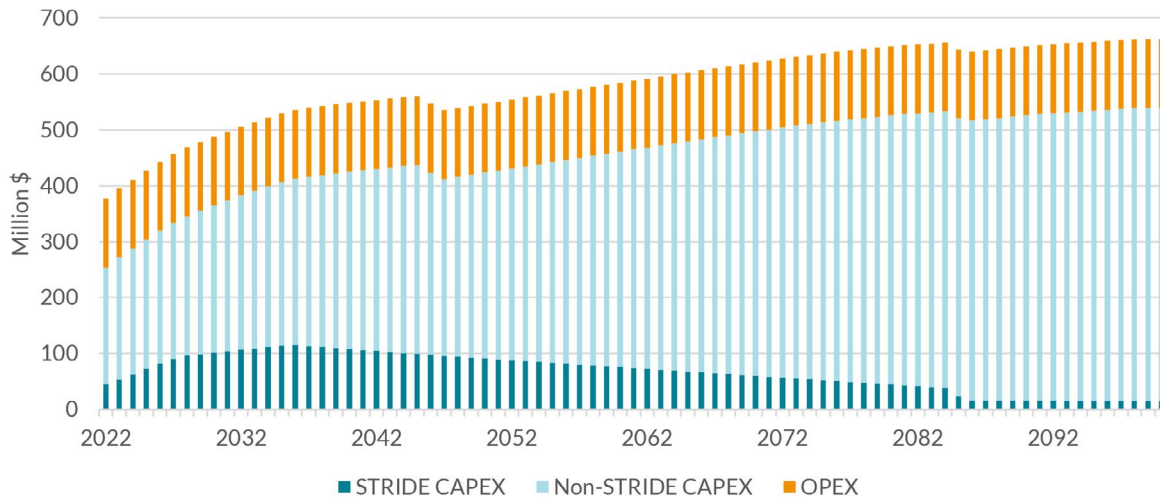
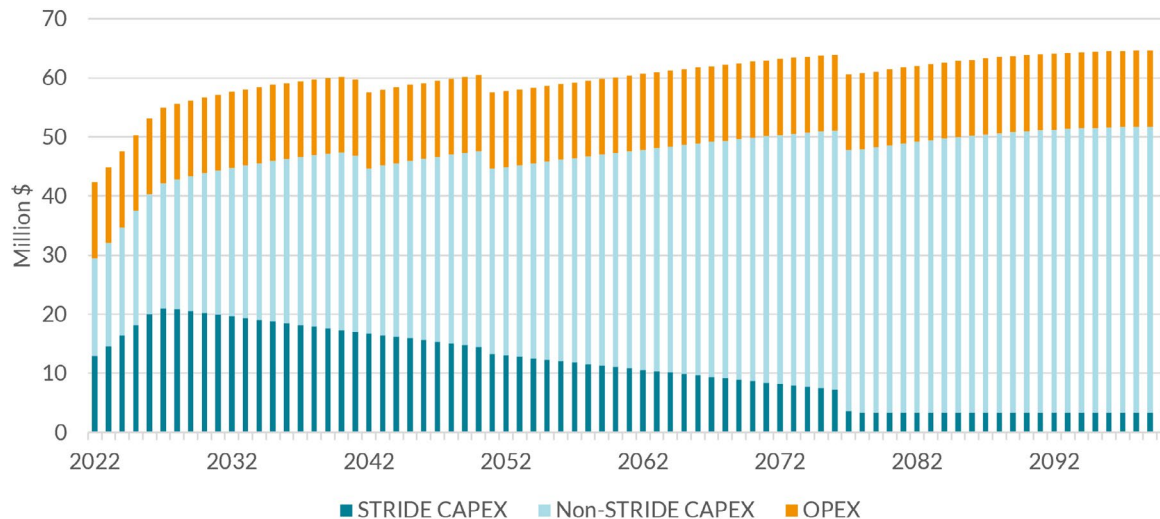


Figure 3.5: CMD Annual Revenue Requirement Projections



The figures above represent the annual amounts that we estimate Maryland’s gas customers are expected to be asked to pay from 2022 through 2100. As illustrated in Figure 3.6, total revenues to be collected from customers over this 79-year period across all three companies are estimated to be \$125 billion. From 2022-2045, Maryland gas customers will be asked to spend \$28.61 billion total.

Total revenues to be collected from customers to pay for capital investments over this 79-year period across all three companies are estimated to be **\$125 billion**.

Figure 3.6: Projected Gas Customer Payments toward CAPEX (billion \$), 2022-2100



SECTION FOUR

RATE IMPACTS

The annual revenue requirement projections—sum of capital and operating cost estimates—described in Section 3 were used to prepare estimates of typical customer bills. This step was done by allocating revenue to the residential heating class of each company using the revenue allocation factors from the most recent STRIDE filings. The billing determinants for customer-months and usage were set based on the revenue proofs in the compliance filing adopting the rates set in the most recent base rate case for each company. It is assumed that the number of customers and sales remain constant over the evaluation period. Stated otherwise, the projections do *not* account for any migration of gas customers to electric as a result of electrification policies or through endogenous migration.

For each year, we allocate the revenue requirement to the residential heating class and then design rates to recover this revenue target. Rate design follows a three-step process:

- First, the STRIDE surcharge is set as a fixed monthly surcharge to recover the “new” or incremental STRIDE revenue requirement for the year. This distinction is possible because the STRIDE and non-STRIDE capital revenue requirements are calculated separately. Put another way, the target STRIDE revenue for any given year (Year n) is the difference between the cumulative STRIDE revenue requirement for Year n minus the cumulative STRIDE revenue requirement for the previous year (Year n-1). This approach is meant to mimic the “rolling” in of STRIDE into base rates over time.
- Next, a Fixed Charge is set. The Fixed Surcharge starts at current level (or 2023 level for BGE) and is then increased by 1 percent each year.
- Finally, all remaining revenue requirement assigned to the residential classes is collected through the volumetric charge.

Table 4.1: Rate Design and Bill Determinant Assumptions

	BGE (CN 9645)	WGL (CN 9651)	CMD (CN 9644)
Customer Class	Schedule D (Residential)	Residential Heating/Cooling	RS (Residential Service)
Residential Revenue Allocation %	66.5%	69.5%	57.3%
Customer-months	7,886,947	5,470,633	367,106
Sales (therms)	445,102,435	358,972,754	23,750,943
Starting Fixed Charge	\$15.25	\$11.55	\$16.00

 Customer-months are the number of bills sent out in a year. This is equal to the number of customers x 12.

We follow the above approach to estimate volumetric and fixed charges for residential customers from 2022 to 2100. To present these results, in the subsections below, we show the monthly bill for a typical customer in winter months. Our typical customer uses 160 therms per month in January or February.¹⁴ The next three subsections provide the results of this typical customer bill analysis for each company.

4.1. BGE

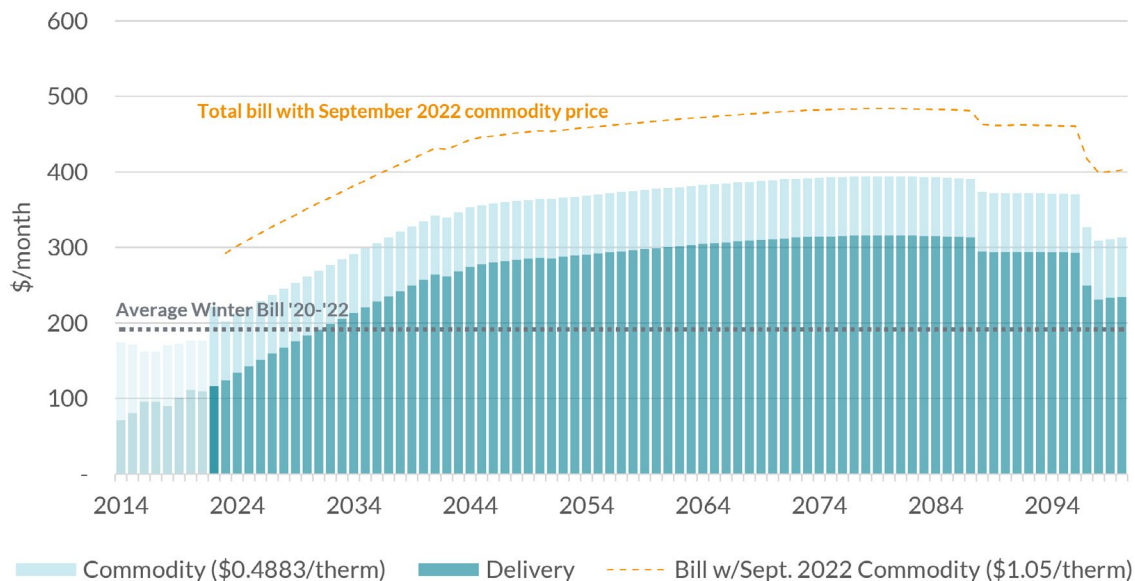
The bill for the typical BGE customer includes both the cost of delivery (fixed base charge, volumetric base charge, STRIDE surcharge) and commodity. Before calculating the typical bill, we needed to develop an assumption for the commodity portion of the bill.

The commodity price we use in the BGE bill analysis is based on the average commodity price charged to BGE’s residential customers in the five proceeding Februarys (2018-2022). For reference, and to provide context for the current jump in natural gas prices, we also show what the future BGE bill would be if prices remain at the September 2022 levels.¹⁵ The commodity price assumptions are shown in Table 4.2.

Table 4.2: BGE Commodity Price Assumptions

Scenario	Definition	Price (\$/therm)
Base Commodity	5-year February commodity average	0.4884
Current Commodity	September 2022 commodity price	1.0500

Figure 4.1: BGE Typical Winter Bill, 2014-2100



i BGE rates for 2021 and 2022 include the Rider 18 offset that was adopted to lower bills in the first two years of the MYRP. This offset amount is removed after 2022.

14 This assumption is based on the average residential gas usage per customer in Maryland for January and February over the last five years. According to the Energy Information Agency (EIA), residential gas consumption in Maryland in the months of January and February has averaged 155.6 million therms for these two months from 2018 to 2022. For the approximately 965,000 residential gas customers in Maryland, this results in an average of 161.17 therms per customer in these two winter months. We round this result to 160 therms for our bill impact analysis.

15 ML#242191 (BGE September 2022 Gas Commodity Price)

The estimated winter bill for a BGE customer from 2022 to 2100 is presented in Figure 4.1. Our projections show that if BGE continues investing in capital at the projected levels, the typical winter bill for a customer using 160 therms/month will grow from an average of \$192 in 2020-2022 to \$299, a 56 percent increase by 2035, and \$364, a 90 percent increase by 2050. These estimates assume commodity prices revert back to the five-year averages. If gas prices stay around the current (2021-2022) levels, then the typical residential customer's winter bill would increase by an additional \$89.86 per month.

4.2. WGL

The commodity prices we use in the WGL bill analysis is based on the average commodity price charged to WGL's residential customers in the five proceeding Februarys (2018-2022). For reference, and to provide context for the jump in natural gas prices in 2022, we also show what the future WGL bill would be if prices

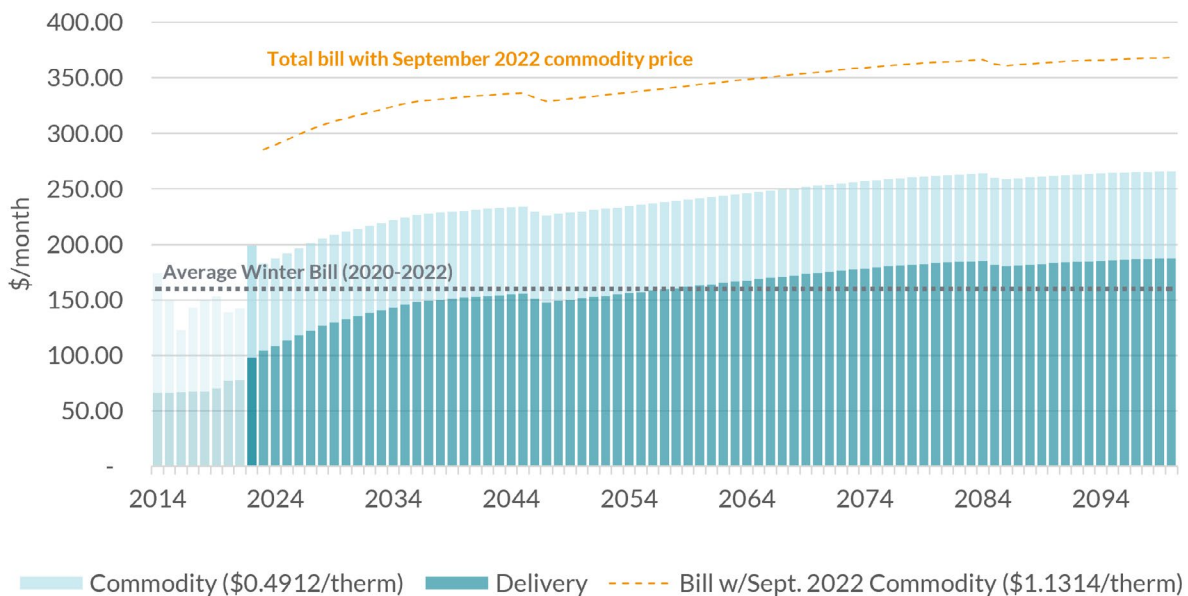
Table 4.3: WGL Commodity Price Assumptions

Scenario	Definition	Price (\$/therm)
Base Commodity	5-year February commodity average	0.4912
Current Commodity	September 2022 commodity price	1.1314

remain at their current levels. These commodity price assumptions¹⁶ are shown in Table 4.3.

The estimated winter bill for a WGL customer from 2022 to 2100 is presented in Figure 4.2. Our projections show that if WGL continues investing in capital at the projected levels, the typical winter bill for a customer using 160 therms/month will grow from an average of \$160 in 2020-2022 to \$224, a 40 percent increase by 2035, and \$230, a 44 percent increase by 2050. If gas commodity prices stay around the September 2022 level, the typical residential customer's winter bill would increase by an additional \$102.43 per month.

Figure 4.2: WGL Typical Winter Bill, 2014-2100



16 ML#241971 (WGL September-October 2022 Purchased Gas Charge).

4.3. CMD

The commodity prices we use in the CMD bill analysis is based on the average commodity price charged to CMD’s residential customers in the five proceeding Februarys (2018-2022). For reference, to provide context for the jump in natural gas prices in 2022, we also show what the future CMD bill would be if prices remain at their current levels.¹⁷ The commodity price assumptions are shown in Table 4.4.

The estimated winter bill for a CMD customer from 2022 to 2100 is presented in Figure 4.1. Our projections show that if CMD continues investing in capital at the projected levels, the typical winter bill for a customer using 160 therms/month will grow from an average of \$186 in 2020-2022 to \$270, a 45 percent

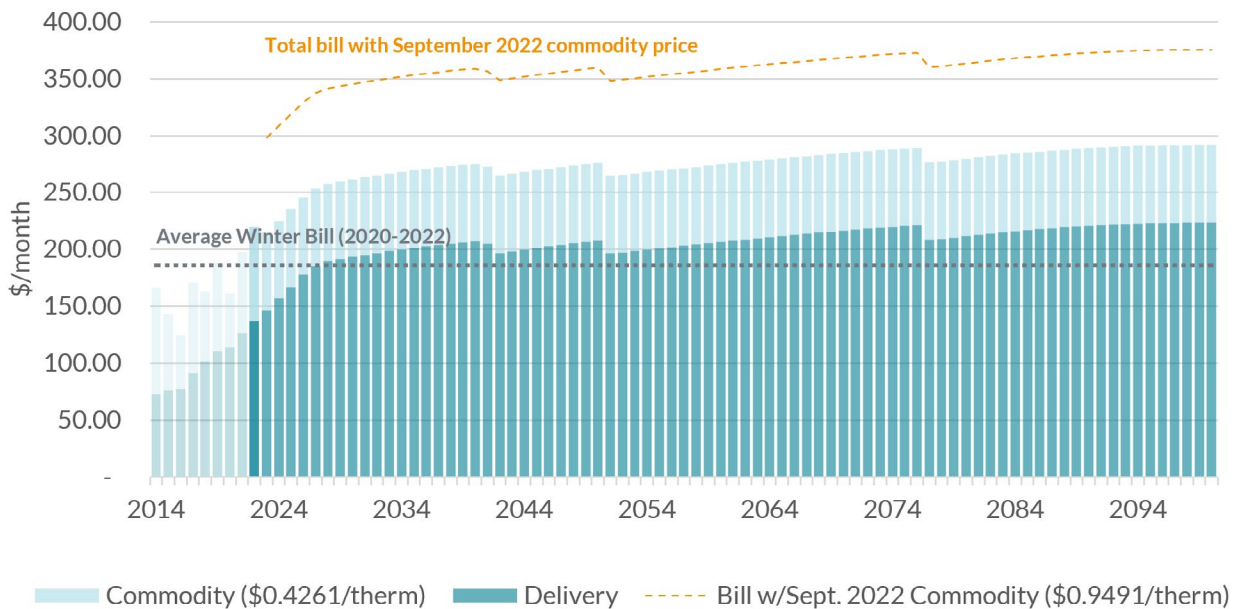
increase by 2035, and \$276, a 48 percent increase by 2050. If gas commodity prices stay around the current (September 2022) levels, the typical residential customer’s winter bill would increase by an additional \$83.69 per month.

Table 4.4: CMD Commodity Price Assumptions

Scenario	Definition	Price (\$/therm)
Base Commodity	5-year February commodity average	0.4261
Current Commodity	September 2022 commodity price	0.9491

The average CMD customer’s winter bill will increase 45% by 2035.

Figure 4.3: CMD Typical Winter Bill, 2014-2100



17 ML#241226 (CMD September 2022 Gas Commodity Price)

SECTION FIVE

OTHER GAS UTILITY COST ANALYSIS

In addition to the core analysis of developing capital cost projections and estimating the bill impact, we performed other analysis for OPC on STRIDE-related issues. The six subsections below discuss the results.

5.1. Recovery of STRIDE Costs

We determined the portion of the total STRIDE costs that have already been recovered through rates and, conversely, what portion of the STRIDE costs remain to be recovered. An investment is being “recovered” through rates until it is fully depreciated. Utilities under rate-of-return regulation receive a “return on” the undepreciated value of an investment, in the form of a return on equity, and a “return of” the investment, in the form of depreciation expenses. Accordingly,

we use cumulative STRIDE depreciation to represent the amounts “recovered” through rates.

The purpose of this exercise is to review the overall rate recovery progress, *i.e.*, progress toward the recovery of all completed and planned STRIDE costs. This meant that we defined the “unrecovered” portion of STRIDE in each year as the sum of the undepreciated completed plant and any remaining STRIDE investment not yet completed.

Figure 5.1: Percentage of STRIDE Costs Remaining to be Recovered by Company

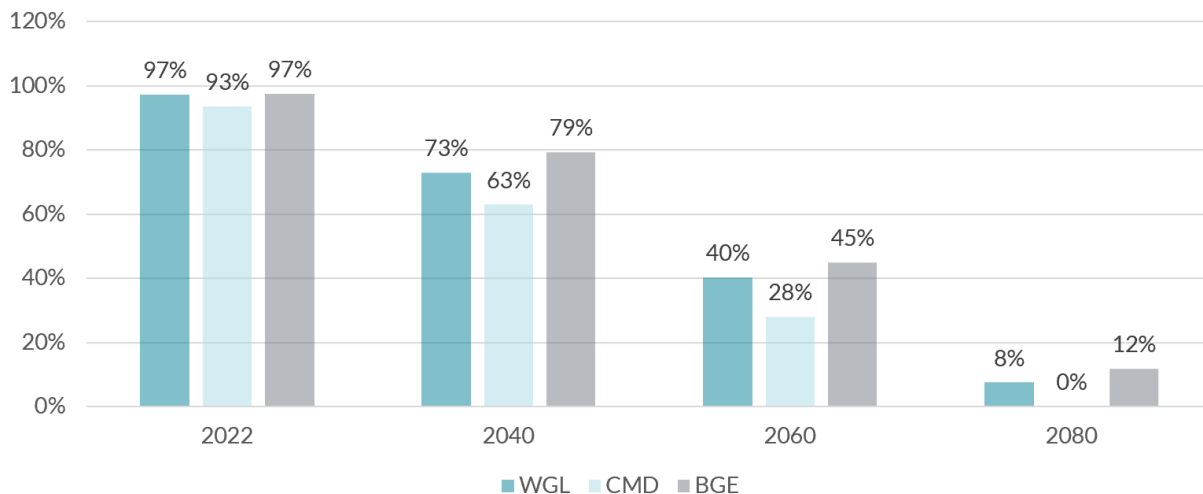


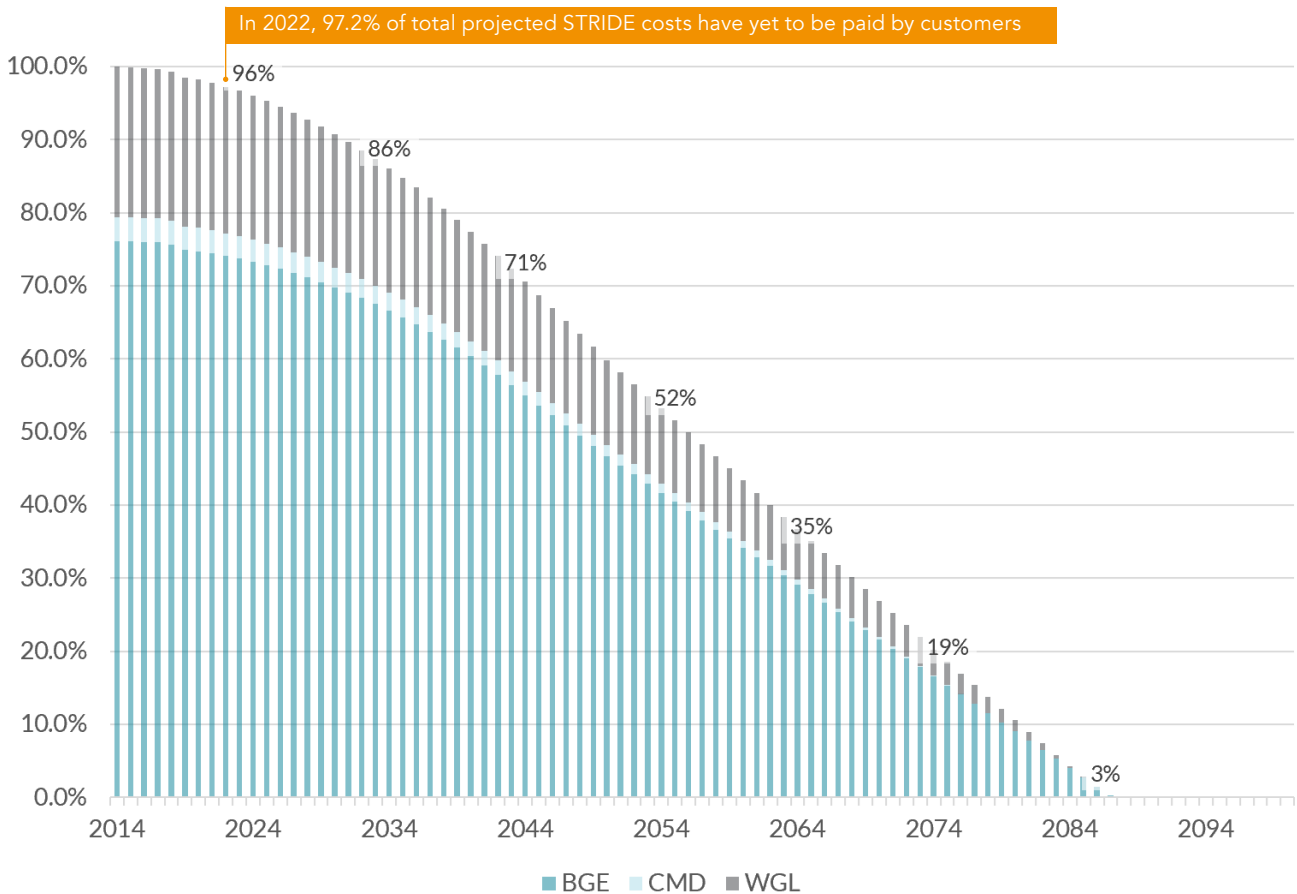
Figure 5.2 shows a snapshot of the progress made periodically by company. Notice that CMD's recovery is faster due to the earlier completion of its STRIDE activities.

We then combined the results of the individual companies into Figure 5.2 to provide a wholistic view of the remaining years that STRIDE costs will be recovered through rates in Maryland. What is important to recognize from this figure is that right now, in 2022, only 2.8% of the planned STRIDE costs have been recovered through rates. STRIDE cost recovery is still at the early stages with Maryland customers expected to be paying off STRIDE costs until 2087.

5.2. Impact of STRIDE on Maintenance Costs

OPC has argued that one of STRIDE's expected benefits should be a reduction in companies' operating costs due to avoided costly leak repairs that no longer need to be addressed. Companies agree that there will be avoided leak repairs but contend this result will not have a corresponding drop in leak repair expenses. BGE has historically made this case in its STRIDE annual audits, where the company notes, "Management does not believe that the STRIDE improvements will result in significant O&M cost savings; however, the infrastructure improvements

Figure 5.2: Percentage of STRIDE Cost Recovery Remaining



are expected to decrease the number of leak repairs that would have otherwise occurred without these improvements.”¹⁸ On the other hand, OPC has maintained that if the arguments in favor of STRIDE are that newer, leak-prone pipes will result in lower leaks, then over time there should be a decrease in leak repair expenses.

To assess whether STRIDE has resulted in operating cost reductions, we evaluated the trend in annual maintenance expenditures on main and services since the programs began.

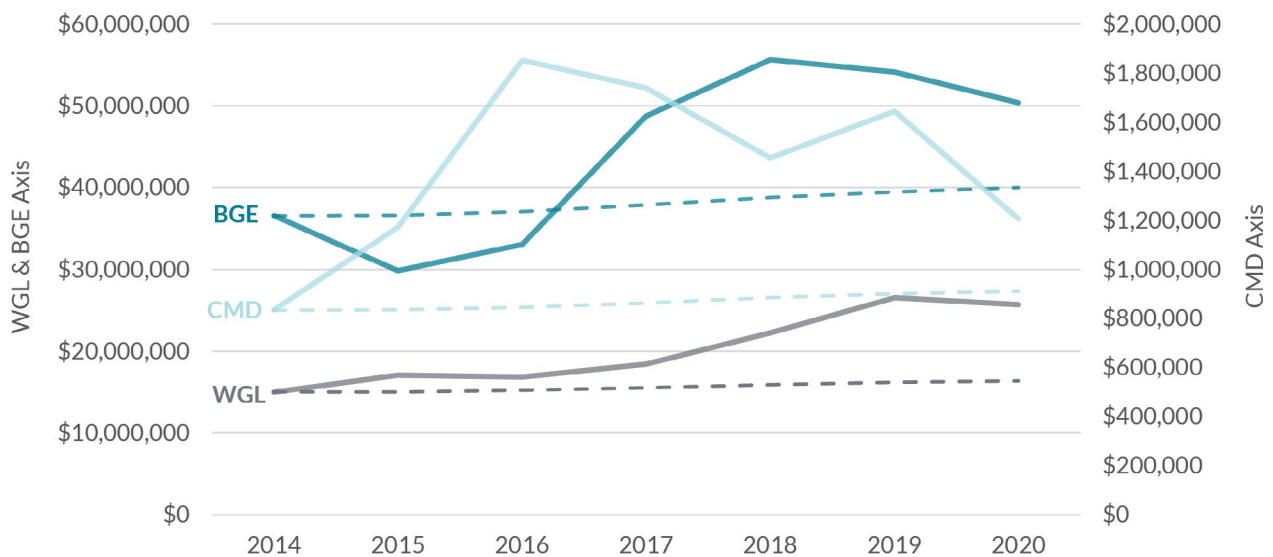
Specifically, we gathered data from each company’s annual reports on two FERC operating cost accounts, Account 887 Mains and Account 892 Services. FERC defines those accounts as follows:

- **Account 887 Mains:** This account shall include the cost of labor, materials used, and expenses incurred in the maintenance of distribution mains, the book cost of which is includible in account 376, Mains.
- **Account 892 Services:** This account shall include the cost of labor, materials used, and expenses incurred in the maintenance of services, the book cost of which is includible in account 380, Services.

The annual amounts spent on main and service maintenance by BGE, CMD, and WGL is shown in the figure below. There is no noticeable decrease in operating

All three companies are spending more on operating costs in 2020 than in 2014 when STRIDE began.

Figure 5.3: Historic Main + Service Maintenance Operating Costs



i Includes maintenance costs in Accounts 887 (Mains) and 892 (Services). Data taken from Annual Reports submitted to MD PSC. WGL costs represent 38.2% of total company costs as an estimate of MD's portion of companywide total.

¹⁸ Maillog #214914, Annual STRIDE Plan Agreed-Upon Procedures Report, April 28, 2017, Appendix 3, Management Footnote to Schedule E.

costs for any company since 2014. The dashed line for each company shows what the cost levels would be if the 2014 levels simply increased at the rate of inflation. Because each of these dashed lines in 2020 is below the actual (solid) line, this shows that even after taking inflation into account all three companies are spending more on operating costs in 2020 than in 2014 when STRIDE began.

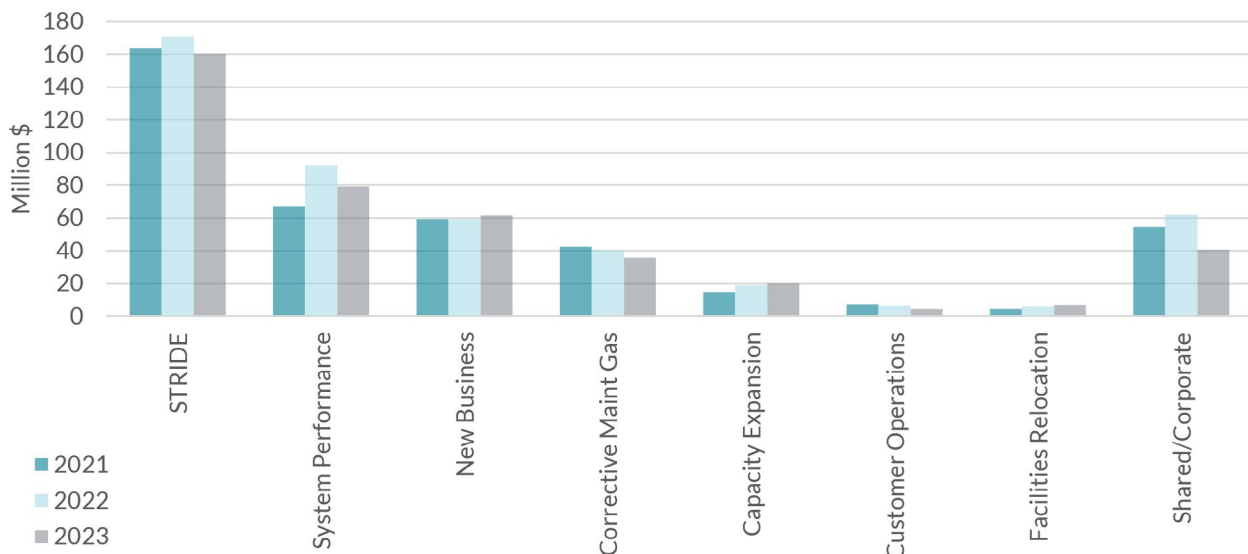
One reasonable interpretation of the results shown above is that the increase in operating costs over inflation from pre-STRIDE levels indicates that customers are not receiving the full benefits intended by STRIDE. The logic is that removing leak-prone or leaking pipes from service results in fewer leak repairs. A more optimistic interpretation of these results is that the operating costs shown here represent a reduction compared to what would have been spent had STRIDE work not been completed. As noted above, this latter interpretation is what the distribution companies contend is correct.

5.3. BGE CAPEX by Category

Within the context of both the gas capital investment discussions and our review of the BGE MYRP capital plans, OPC asked for analysis on the breakdown of BGE’s capital plans into different capital categories. We used BGE’s three-year gas CAPEX plan submitted as part of the CN 9645 compliance filing to develop Figure 5.4. The figure shows the breakdown of capital investment according to BGE’s investment categories. This figure shows that STRIDE (39 percent) continues to be the major focus of BGE’s capital investment activities with System Performance (19 percent) and New Business (14 percent) coming in as the second and third highest investment categories. Notably, Shared/Corporate expenses (a combined 12 percent), which includes categories such as real estate and information technology, are higher than some categories, such as corrective maintenance (9 percent) and capacity expansion (4 percent), which directly address safety and reliability problems.

STRIDE continues to be the major focus of BGE’s capital investment activities.

Figure 5.4: BGE MYRP CAPEX Plans by Category



This level of information was only available for BGE because it is the only gas utility to submit a multi-year rate plan in Maryland.

5.4. Investments in Distribution System Expansion

This report has focused on gas utility capital expenditures. One aspect of the gas distribution companies' capital spending strategies is their plans for new business and capacity expansion. These categories represent investments being made to grow the gas delivery business beyond its current size. We discuss below trends in investment increases in distribution system expansion. This section summarizes our analysis of capacity expansion and new business for BGE and WGL. Data on new business investments and capacity expansion are not publicly available for CMD.

5.4.1. BGE

Information on BGE's new business and capacity expansion plans, as well as historical information, was provided as part of the MYRP proceedings in PSC Case No. 9645. BGE plans to spend \$78.3 million in 2022 on new customer conversions and capacity expansion projects. This is a slight drop in what has been increasing levels of actual and planned investment in system expansion. As shown in Figure 5.5, the investments pursued through MYRP in 2021 and 2023 on system expansion investment (new business + capacity expansion) represent increases over the historical amounts made in 2019 and 2020.

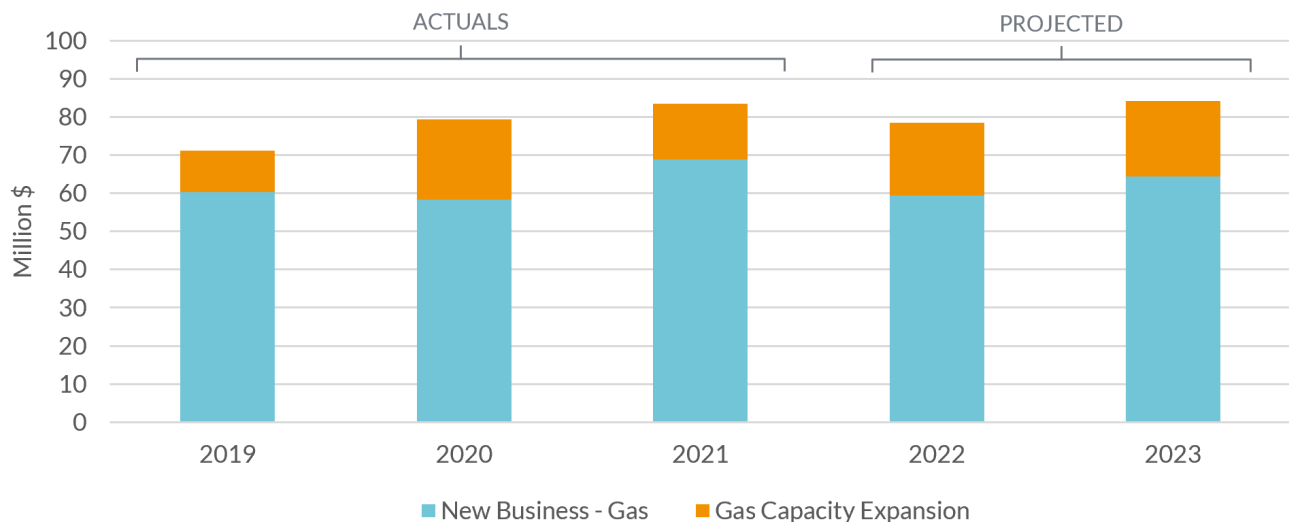
For context, over the three-year MYRP period, BGE plans to spend 20% (\$246 million) of its \$1.2 billion capital budget on capacity expansion and new business projects.

5.4.2. WGL

WGL reports its historic expenditures on new business in its annual financial reports. Plans for future new business investments were included in the compliance filing submitted in PSC Case No. 9651.

BGE plans to spend \$78.3 million in 2022 on new customer conversions and capacity expansion projects.

Figure 5.5: BGE Capital Expenditure on Capacity Expansion and New Business, 2019-2023



A footnote in these reports notes that the “new business” category also includes “certain projects that support the existing distribution system.” We interpret “new business” investments that “support the existing distribution system” to mean expansion of existing system capacity (which BGE’s compliance filing calls “capacity expansion”).¹⁹ The information on WGL’s plans for new business was not available for Maryland alone. Instead, like the information available for total capital investments, the amounts for new business investments are presented in aggregate for all three service jurisdictions. This company-wide information provides insight into WGL’s investment efforts being made to expand its gas distribution business.

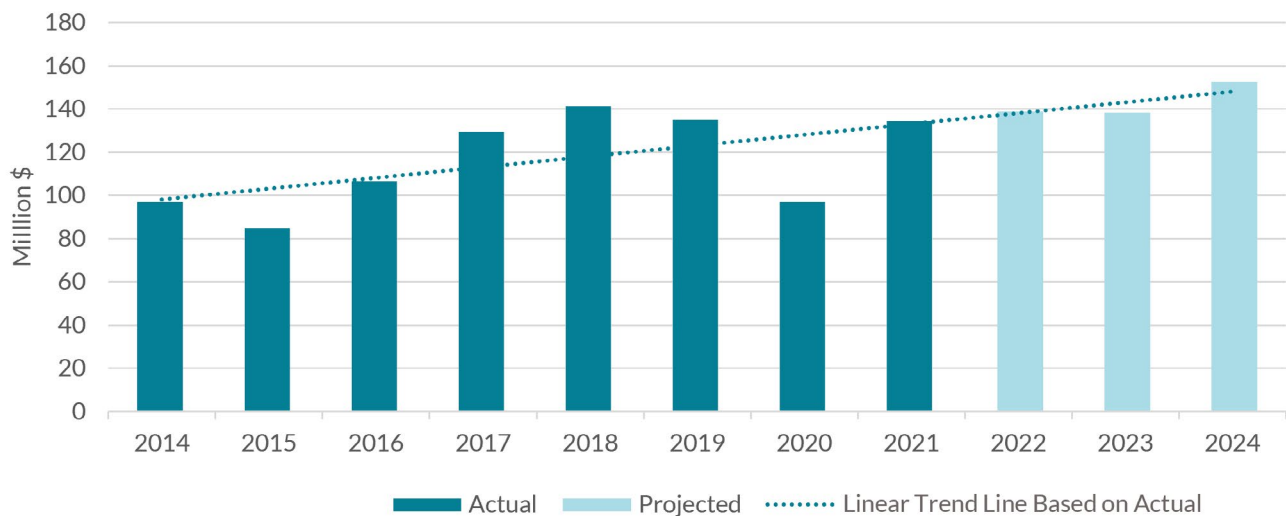
WGL increased its company-wide capital spending on new business from \$97 million in 2014 to \$134.4 million in 2021, with a slight dip in expenditures in 2020 (\$96.9 million), likely a result due to COVID-19 limitations on entry into customer premises. WGL projections for this category promise an increase in

spending in the 2022-2023 period, to \$138.3 million for both years, and a further jump in 2024, reaching \$152.5 million. Figure 5.6 shows an overall upward trend in spending in the new business category in the decade between 2014 and 2024.

In terms of share of total capital expenditures, spending in this category in 2022 is projected to be 26 percent of all capital expenditures. The share is projected to decrease to 23 percent in the 2023-2024 period.

As stated above, these figures for WGL are company-wide, for service territories in Maryland, Virginia, and the District of Columbia. In rate cases, a cost allocator based on each of WGL’s service territory’s gas plant-in-service is used to allocate certain shared investment and operating costs. The most recent cost allocator for plant-in-service shows that Maryland’s share of gas plant-in-service is 38.2%.²⁰ Applying this percentage to WGL’s 2022-23 projected spending means that WGL’s projected Maryland spending on

Figure 5.6: WGL Capital Expenditure on New Business, Actual and Projected (2014-2024)



¹⁹ See page 12 of WGL’s 2021 Financial report: (<https://www.washingtongas.com/-/media/6b201563983c461c8b-d17a2d50e67af3.pdf>)

²⁰ ML#231646, Case No. 9651, WGL Exhibit ABG-1, Schedule AL, page 2, line 28.

new customers and capacity expansion for 2022 and 2023 is about \$52.8 million each year.

5.5. Changes in Bill Composition

Prior to the increase of gas commodity prices in 2020 and 2021, there had been a trend over the previous decade where the distribution portion of bills was increasing, while the commodity portion of the bill decreased or remained relatively constant. We will use BGE as an example to demonstrate this trend. As shown in Figure 5.7, from 2014 to 2020 the overall bill (commodity plus delivery) remained relatively constant from 2014 to 2020 because the decrease in gas commodity prices offset increases in distribution costs.²¹

Over this period a notable flip occurs in 2016: Gas customers begin to pay more to deliver the gas than the gas commodity they use. Figure 5.8 shows the bills from Figure 5.7 broken down into percentage components.

The increase in delivery rates has largely been driven by the capital expenditures, specifically the STRIDE expenditures, addressed in this report. From a customers' perspective, it can be viewed as a positive that improvements in gas extraction have reduced the commodity costs and enabled gas companies to replace leak-prone materials without substantial increases in the total customer bill. The trouble with this perspective is that it ignores the reality that if delivery rates had not increased as rapidly then customers would have paid lower total bills, over this period. Instead of customers saving money from the decrease in commodity costs, gas companies have increased base delivery rates and filled the gap.

Figure 5.7: BGE Typical Winter Bill by Component, 2014-2021 (\$/month)

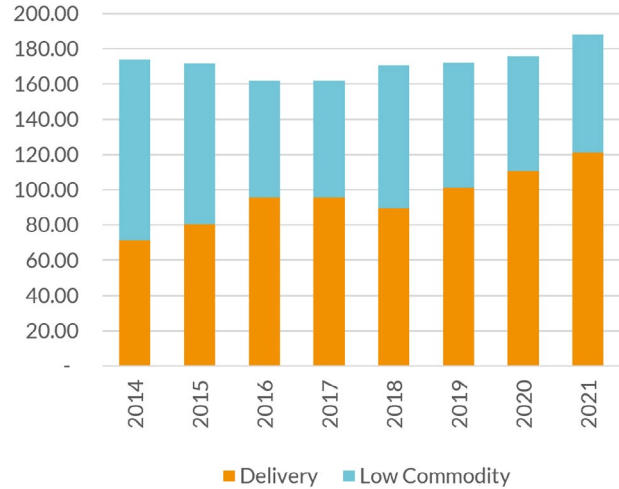
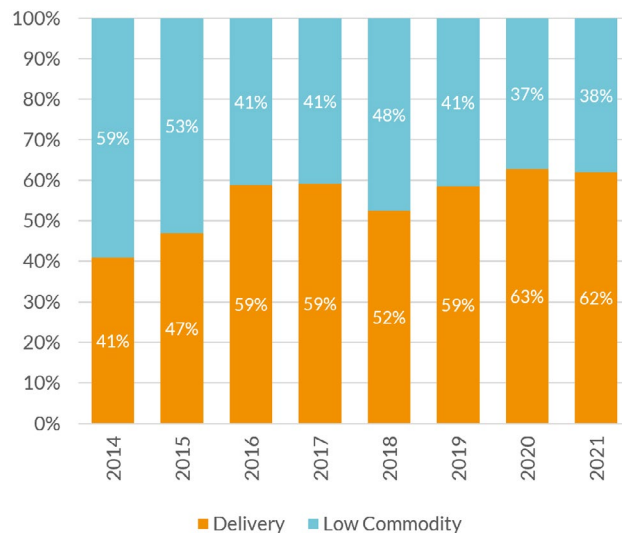


Figure 5.8: BGE Typical Winter Bill by Component, 2014-2021 (%)



If delivery rates had not increased as rapidly, then customers would have paid lower total bills over this period.

²¹ The delivery portion of the bill impact for 2021 reflects the full offset, i.e., the exclusions, of the rate increase approved by the Commission in Order No. 89678 to address the COVID-19 pandemic; the approved increase in the annual revenue requirement of \$54.2 million for 2021 delivery rates will be recovered in future years, with carrying costs.

5.6. Delivery Rates vs. Commodity Prices

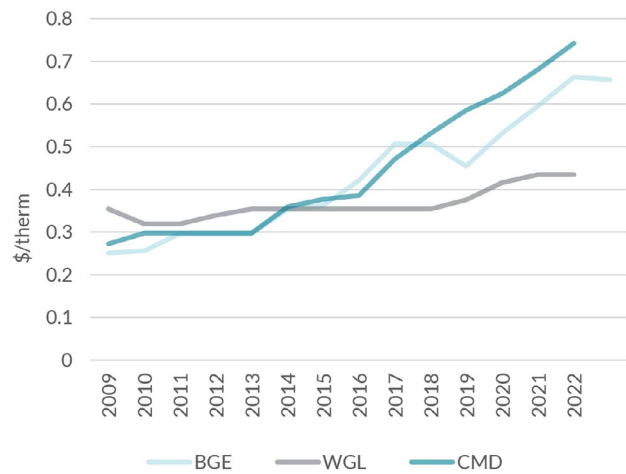
The trend discussed in the previous sections is the result of a period of declining or low-cost gas commodity prices and continued upward pressure from gas utilities on delivery distribution rates. This subsection explores the relationship between the commodity price of gas and the overall costs of gas services.

Delivery charges appear in two separate components of customer rates—a volumetric charge and a demand (or fixed) charge. Steady increases in both the volumetric and fixed portion of delivery rates at the three gas companies from 2009 to 2022 are shown in Figure 5.9 and Figure 5.10.

The steady increase in gas delivery fees has been masked by an unusually prolonged low-price commodity-cost period from 2013 to 2021. Gas prices have historically shown patterns with repeating short (1-2 year) cycles of peaks and troughs in prices. This pattern is evident in the Henry Hub Prices prior to 2013 shown in the figure below where prices routinely dropped but then returned to levels around the previous high mark. This pattern contrasts with the eight-year period between 2013 and 2021 when prices fell and did not return close to the February 2013 levels until February 2021. That gas commodity market now, in 2022, appears to have returned to the era of high price volatility.

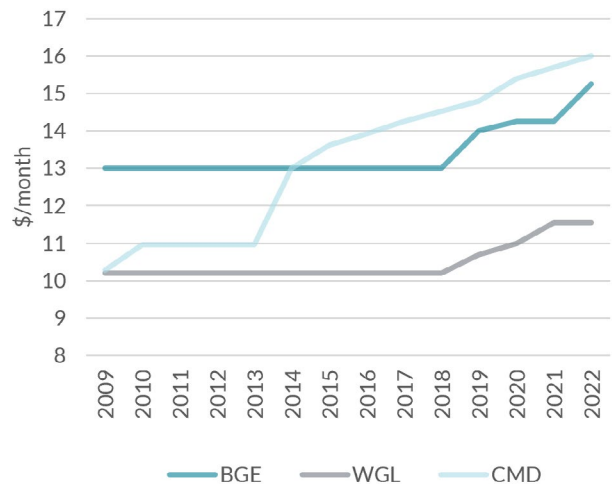
We emphasize this point on gas volatility and the rising cost of gas delivery because price is one of the main factors used by gas companies to promote the continued transition of customers to natural gas away from fuel oil. Versions of the moniker “clean and affordable natural gas” are a common phrase used on gas company websites²² and regulatory filings.

Figure 5.9: Volumetric Delivery (\$/therm) rates, 2009-2022



WGL has a three-block decreasing volumetric rate structure where customers are charged decreasingly lower rates for the first 45 therms, next 135 therms (45-180 therms), and all other usage above 180 therms. The volumetric rate in the figure is a weighted average rate calculated using an assumed 130 therm per month.

Figure 5.10: Fixed Charges (\$/month), 2009-2022



The steady increase in gas delivery fees has been masked by an unusually prolonged low-price commodity-cost period from 2013 to 2021

²² See the websites of BGE (<https://www.bge.com/SafetyCommunity/Education/Pages/BGENaturalGas.aspx>) and WGL (<https://www.washingtongas.com/safety-education/education/about-natural-gas>).

Figure 5.11: Henry Hub Gas Spot Price, January 2009-May 2022



Source: <https://www.eia.gov/dnav/ng/hist/rngwhhdm.htm>

For example, BGE justified the budget for new business conversions in its MYRP by identifying the “problem statement” intended to be addressed by new business projects—customers wanting to switch from existing electric, propane, or oil to “more cost efficient, natural gas.”²³ It is true that drops in commodity prices over the last decade have, at times, made gas a more affordable energy option for some customers. But utility marketing language overlooks the fact that the low commodity prices over this period masked the reality that gas is prone to extremes in price volatility, just like fuel oil.

The volatility of gas prices contrasts with electricity, as shown in Figure 5.12. This figure uses data on electricity and gas end-user prices tracked by the Bureau of Labor and Statistics (BLS). Evident in this figure is that between 2009 and 2022, there is greater variability in the price paid by customers for gas than electricity. Statistically, the volatility in prices

Gas is prone to extremes in price volatility.

The volatility in prices residential customers paid for gas was around **three times greater** than the volatility in electricity prices over this period.

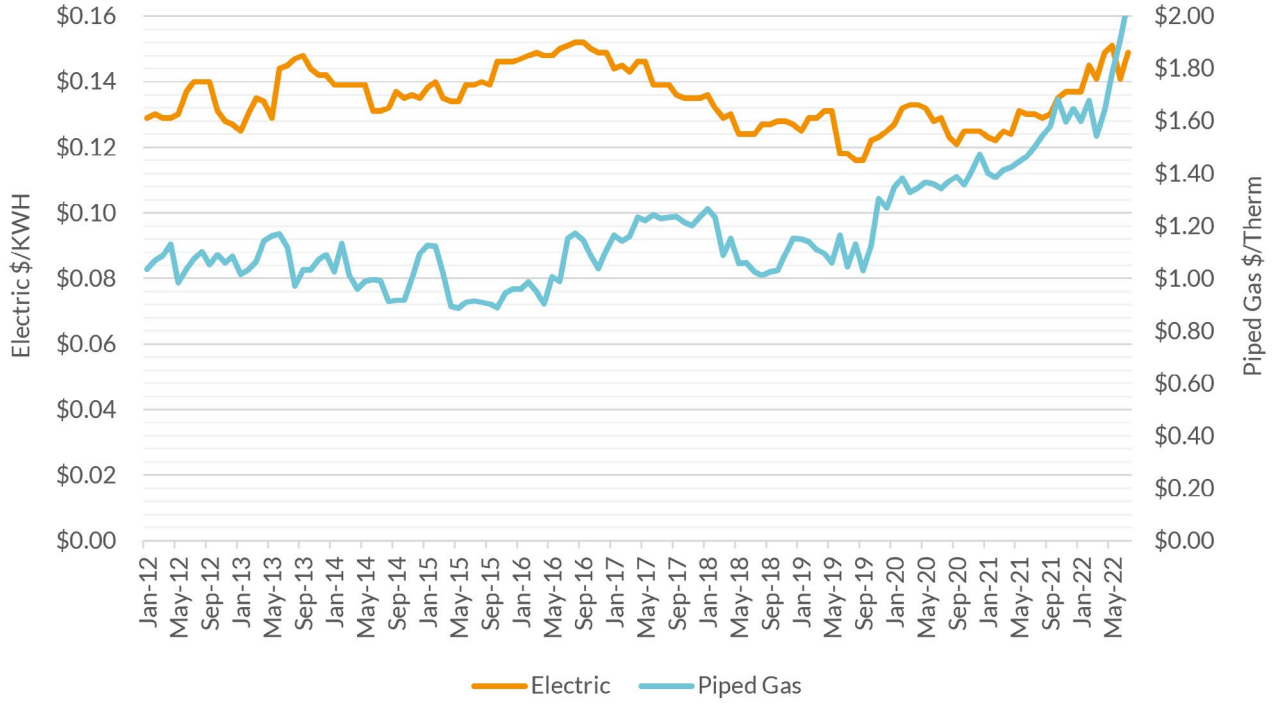
residential customers paid for gas was around three times greater than the volatility in electricity prices over this period.²⁴

Setting aside the issue of volatility, the recent increases in gas prices also show that the proposition that gas is “the more affordable” energy source might be more marketing than reality. To better compare the changes in electricity and gas prices, we indexed the prices using a baseline. In Figure 5.13 below, the January 2012 prices for gas and electricity are used as baselines (January 2012 = 1) and then

²³ Case No. 9645, ML# 233739 at page 46.

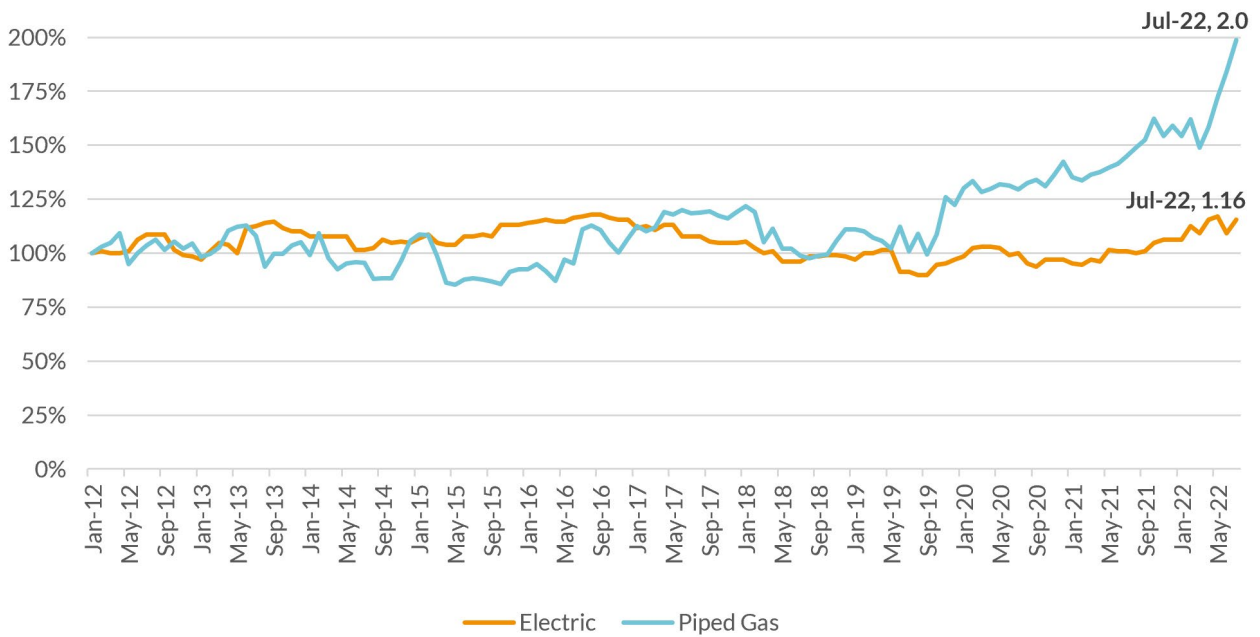
²⁴ Volatility was estimated by calculating the coefficient of variation (CV = standard deviation / mean) of gas and electricity prices over the evaluation period. The CV of gas prices was 0.18 and the CV of electricity prices was 0.06.

Figure 5.12: BGE Residential Electricity and Gas Prices, January 2012-May 2022



i Price data on Baltimore electricity and gas prices from Bureau of Labor Statistics (BLS)

Figure 5.13 Indexed BGE Electricity and Gas Prices, January 2012-May 2022 (index = January 2012)



i Price data on Baltimore electricity and gas prices from Bureau of Labor Statistics (BLS)

every subsequent monthly indicator represents the relationship between that month's price and the baseline price (Monthly price / January 2012 price). What comes across in this figure is that electricity prices have stayed relatively around the same levels since 2012. Prices are 16 percent higher in May 2022 from ten years earlier. On the other hand, gas prices have increased rapidly in the last three years and are now double prices in January 2012. This result exemplifies the combined effect of the end of low-cost gas and the rise in delivery charges over this same period.

Gas companies may argue that it is unfair to use the current high prices as a comparison given the market conditions due to the combined effects of pandemic-driven supply constraints and the war in Ukraine. Regardless of recent gas commodity price spikes, the figure above shows the general trend starting in 2019 of natural gas prices increasing faster than electricity end-user prices.

GLOSSARY AND ACRONYMS

Term	Definition	Source
Commodity rate	The unit rate charged for each unit of gas actually purchased under a contract.	New York State Public Service Commission. "Glossary of Terms Used by Utilities and Their Regulators". Available at: https://www.dps.ny.gov/glossary.html .
Depreciation	The loss in service value not restored by current maintenance and incurred in connection with the consumption or prospective retirement of property in the course of service from causes against which the carrier is not protected by insurance, and the effect of which can be forecast with a reasonable approach to accuracy	"18 CFR Ch. I, Pt. 352." <i>Code of Federal Regulations</i> . Available from: https://www.ferc.gov/sites/default/files/2020-06/18cfr352.pdf . Accessed 6 July 2022.
Rate Base	The net investment of a utility in property that is used to serve the public; this includes the original cost net of depreciation, adjusted by working capital, deferred taxes, and various regulatory assets—the term is often misused to describe the utility revenue requirement	Lazar, J. (2016). <i>Electricity Regulation in the US: A Guide</i> . Second Edition. Montpelier, VT: The Regulatory Assistance Project. Retrieved from https://www.raponline.org/knowledge-center/electricity-regulation-in-the-us-a-guide-2/ .
Return on Equity	The rate of earnings realized by a utility on its shareholders' assets, calculated by dividing the earnings available for dividends by the equity portion of the rate base.	New York State Public Service Commission. "Glossary of Terms Used by Utilities and Their Regulators". Available at: https://www.dps.ny.gov/glossary.html .
Revenue Requirement	The annual revenues that the utility is entitled to collect (as modified by adjustment clauses). It is the sum of operation and maintenance expenses, depreciation, taxes, and a return on rate base. In most contexts, revenue requirement and cost of service are synonymous.	Lazar, J. (2016). <i>Electricity Regulation in the US: A Guide</i> . Second Edition. Montpelier, VT: The Regulatory Assistance Project. Retrieved from https://www.raponline.org/knowledge-center/electricity-regulation-in-the-us-a-guide-2/ .
Stranded Assets	Assets that have suffered from unanticipated or premature write-downs, devaluation or conversion to liabilities.	Lloyd's. 2017. "Stranded Assets." Available at: https://www.lloyds.com/strandedassets .

Acronyms

BGE	Baltimore Gas & Electric	MYRP	Multi-year rate plan
CAPEX	capital expenditures	PHMSA	Pipeline and Hazardous Materials Safety Administration
CAGR	compound annual growth rate	PSC	Public Service Commission
CMD	Columbia Gas of Maryland	STRIDE	Strategic Infrastructure Development and Enhancement (Public Utilities Article, Ann. Code of Md., § 4-210)
CN	Case Number	VMC	vintage mechanically coupled
OPC	Office of People's Counsel	WACC	weighted average cost of capital
MACRS	Modified Accelerated Cost Recovery System	WGL	Washington Gas Light

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