STATE OF ILLINOIS

ILLINOIS COMMERCE COMMISSION

Northern Illinois Gas Company d/b/a Nicor Gas Company	)	
	)	Docket No. 17-XXXX
Proposed general increase in gas rates.	)	

Direct Testimony of

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Principal, The Brattle Group

On behalf of Northern Illinois Gas Company
d/b/a Nicor Gas Company

March 10, 2017

Nicor Gas Ex. 11.0

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LIST OF EXHIBITS

I. INTRODUCTION AND QUALIFICATIONS

Q. Please state your name, occupation, and business address.

A. My name is Bente Villadsen and I am a Principal of The Brattle Group, whose business address is 44 Brattle Street, Cambridge, Massachusetts 02138.

Q. Please summarize your professional qualifications.

A. I have more than 16 years of experience working with regulated utilities on cost of capital and related matters. My practice focuses on cost of capital, regulatory finance, and accounting issues. I have testified or filed expert reports on cost of capital before state regulatory bodies as well as before the Bonneville Power Administration, the Surface Transportation Board, the Alberta Utilities Commission, and the Ontario Energy Board. I have also provided white papers or other non-testimonial analyzes concerning cost of capital to the British Columbia Utilities Commission, the Canadian Transportation Agency, the Ontario Energy Board as well as to European and Australian regulators. I have also testified or filed testimony on regulatory accounting issues before the Federal Energy Regulatory Commission ("FERC"), the Michigan Public Service Commission as well as in international and U.S. arbitrations and regularly provide advice to utilities on regulatory matters as well as risk management. I hold a Ph.D. from Yale University's School of Management with a concentration in accounting, and a BS/MS in Economics and Mathematics from University of Aarhus in Denmark. Nicor Gas Exhibit ("Ex") 11.1 contains more information on my professional qualifications as well as a list of my prior testimonies.

II. PURPOSE AND SUMMARY OF CONCLUSIONS

Q. What are the purpose and primary conclusions of your testimony?

A. The Northern Illinois Gas Company d/b/a Nicor Gas Company ("Nicor Gas") has asked in the context of its request for a general update of its rates that I determine its cost of equity—*i.e.*, the rate of return that capital markets would require for an equity investment in Nicor Gas. I find that an allowed return on equity ("ROE") of 10.7 percent is reasonable, taking into account the characteristics of Nicor Gas and the competing opportunities for investment in the equity markets. An overall return on rate base based on such an ROE, taking into account Nicor Gas' projected 2018 test year capital structure of approximately 54.206 percent equity and 45.794 percent debt, fairly reflects Nicor Gas' overall costs of capital in the test year.

Additionally, in accordance with the ICC's Order in Docket No. 15-0558, I was asked by Nicor Gas to opine on "the impact, if any, of Nicor Gas' affiliation with Southern Company ("Southern") and its other subsidiaries on the cost of capital of Nicor Gas."[1] Applying fundamental principles of finance, I find that Nicor Gas' cost of equity capital is independent of and unaffected by its changed corporate parentage. With respect to the debt financing, I likewise find no indication that Southern's acquisition of (Nicor Gas' previous direct corporate parent) AGL Resources Inc. ("AGL Resources") has adversely impacted Nicor Gas' ability to raise debt capital at reasonable cost.

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[1] ICC Order in Docket No. 15-0558, Appendix A, issued June 7, 2016.

Q. Would you please summarize the analysis and considerations that lead to these conclusions?

A. To determine the cost of capital for Nicor Gas, I selected, based on objective criteria, a sample of publicly-traded natural gas utilities that are subject to rate regulation and calculated the cost of equity for the sample using standard models and methods such as the Capital Asset Pricing Models ("CAPM"), the Discounted Cash Flow ("DCF") models and a Risk Premium model. Applying each of these models to my proxy group companies, I derived the following ranges of reasonable ROE estimates for a generic gas utility with 54.206 percent equity, which inform my decision to recommend an allowed ROE of 10.7 percent for Nicor Gas.

Return on Equity Summary	
CAPM-Based Methods	10.0% - 11.0%
DCF-Based Methods	9.4% - 11.0%
Implied Risk Premium	10.1% - 10.3%
Reasonable Range	10¼ - 10¾ percent
Recommended ROE	10.7%

It is important to note that the ranges incorporate the results for the three estimation methods, and also include alternative inputs and formulations for the CAPM and DCF estimation methods.

The consideration of multiple estimation methods is an essential practice when estimating the cost of equity capital. As my colleague, Professor Stewart C. Myers has eloquently advised:

> Use more than one model when you can. Because estimating the opportunity cost of capital is difficult, only a fool throws away useful information.[2]

It is especially important to heed this advice amidst the current economic conditions, since the unprecedented sustained low interest rate environment and elevated risk aversion among investors can affect the results from various standard models in different ways. The Illinois Commerce Commission ("Commission" or "ICC") has recognized this; I note that as recently as December 2016, the Commission considered the results from methods I employ here to determine the allowed ROE for a rate-regulated utility.[3] Therefore, my range of estimates from multiple models is consistent with financial best practices as well as the Commission's reliance multiple methods. I further note that my recommended 10.7 percent return on equity is within the range of both my CAPM and DCF estimates.

Considering the relative merits of the multiple models and eliminating atypical outlying high and low-end results that are unduly influenced by unrepresentative data, I evaluate these results as indicating a reasonable return on equity for local gas distribution utilities in the range of 10 to 11 percent. The midpoint of the suggested by the model estimates is approximately 10.5 percent, which I believe is representative of the required return on equity for an otherwise representative local gas distribution utility with a capital

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[2] Stewart C. Myers, "On the Use of Modern Portfolio Theory in Public Utility Rate Cases: Comment," *Financial Management*, Autumn 1978, p. 67.

[3] ICC Order in Docket 16-0093 re. Illinois-American Water Company, issued December 13, 2016, (ICC Order 16-0093), pp. 48-67.

structure matching that requested by Nicor Gas in this proceeding. I therefore recommend that Nicor Gas receive an allowed ROE between 10¼ and 10¾ percent.

That range and its midpoint, however, do not reflect any consideration of risk factors or financial circumstances that pertain specifically to Nicor Gas. In Section VI below, I discuss such Nicor Gas-specific risk and return considerations—including its accelerating capital expenditure requirements and uncompensated equity flotation costs—and summarize the role those factors play in informing my recommended point estimate of 10.7 percent for Nicor Gas' allowed ROE. It is my opinion that this fairly estimates the market required rate of return on Nicor Gas' equity during the test year.

Q. Are you sponsoring any exhibits to your direct testimony?

A. Yes. I am sponsoring the following four Exhibits, which I have attached to this testimony:

- Exhibit 11.1: Resume of Dr. Bente Villadsen
- Exhibit 11.2: Technical Appendix
- Exhibit 11.3: Implied Risk Premium Model Calculations
- Exhibit 11.4: Cost of Equity Estimate Calculations (Note that this is a group exhibit containing several tables and schedules and supporting materials)

III. APPROACH TO ESTIMATING THE COST OF CAPITAL

A. PRELIMINARY COMMENTS

Q. What are the guiding standards that define a just and reasonable allowed rate of return on rate-regulated utility investments?

A. Perhaps the seminal guidance on this topic was provided by the U.S. Supreme Court in the *Hope* and *Bluefield* cases[4], which found that:

1. The return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks;[5]
2. The return should be reasonably sufficient to assure confidence in the financial soundness of the utility; and
3. The return should be adequate, under efficient and economical management for the utility to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties.[6]

Q. How have you conducted your cost of equity analysis?

A. As stated above, the standard for establishing a fair rate of return on equity requires that a regulated utility be allowed to earn a return equivalent to what an investor could expect to earn on an alternative investment of equivalent risk. Therefore, my approach to estimating the cost of equity for Nicor Gas focuses on measuring the expected returns required by investors to invest in companies that face business and financial risks comparable to those faced by Nicor Gas. Because the models I rely upon most heavily

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4 *Bluefield Water Works & Improvement Co. v. Public Service Com'n of West Virginia*, 262 U.S. 679 (1923) ("*Bluefield*"), and *Federal Power Com'n v. Hope Natural Gas Co.*, 320 U.S. 591 (1944) ("*Hope*").

5 *Hope*, 320 U.S. at 603.

6 *Bluefield*, 262 U.S. at 680.

require market data, my consideration of comparable companies is restricted to those that have publicly traded stock.

To this end, I selected a sample of regulated gas utilities that are comparable in business risk to Nicor Gas, to which I applied widely-accepted objective quantitative methodologies—specifically the CAPM and DCF approaches—to estimate the return that investors require to provide capital for those utilities. As an indicator of the targeted returns of entities which will compete with Nicor Gas for investor capital, I have also analyzed the ROEs authorized for natural gas utilities in U.S. regulatory jurisdictions in the form of an implied risk premium analysis. The CAPM, DCF, and Implied Risk Premium[7] approaches are all are widely used in the utility and ratemaking setting including in recent filings before the ICC. I also reviewed certain business and financial risk factors pertaining specifically to Nicor Gas and compared those to the characteristics of my sample.

The cost of equity for the CAPM and DCF based models are derived from market data that reflect the capital that investors hold in the sample companies. I consider the impact of any difference between the financial risk inherent in those cost of equity

[7] The Implied Risk Premium methodology relies on the evaluation of decades of market data by regulatory agencies and uses statistical techniques to assess how those allowed returns vary with respect to the level of risk-free interest rates. It is essentially a meta-analysis of existing regulatory review of years of market data. Importantly, my analysis employs all of the gas utility rate case data tracked by SNL Financial, without filtering or excluding items from the database. I use the phrase "Implied Risk Premium" to distinguish this approach from the broader category of "risk premium" approaches, which can refer variously to asset pricing models such as the CAPM or to approaches that simply add a flat historical average risk premium (unadjusted for the impact of interest rates) to a current bond yield.

estimates and the capital structure used to determine Nicor Gas' return. See Section V.D for a detailed discussion of the methods I use to account for differences in financial risk.

To arrive at my final ROE recommendation, I considered (i) the ranges of my cost of equity numbers, (ii) the current state of the economy and capital markets, (iii) the financial risk differences between Nicor Gas and the sample, and (iv) the business risks and specific financial circumstances of Nicor Gas relative to that of the sample. Based upon my analyses of these factors, I determined that a reasonable ROE for Nicor Gas should fall between 10¼ and 10¾ percent if it is regulated using a capital structure including 54.206 percent equity. I recognize that there will typically be a range of reasonable returns, but based on my analyses and assessments, I recommend an allowed ROE of 10.7 percent. That recommendation both falls within the reasonable range of returns for the more general class of local gas distribution companies with comparable financial leverage and takes into account factors that influence where Nicor Gas' return should fall within that range.

Q. How does the return on equity factor into the determination of an overall cost of capital for ratemaking purposes?

A. For ratemaking purposes, the allowed return on equity is a component in the determination of the overall return on the capital used to finance rate base. Importantly, the return on equity is multiplied by the equity balance in the regulatory capital structure to determine the equity portion of the total weighted average cost of capital (the regulatory "WACC") of the utility which, in turn, is applied to the rate base.

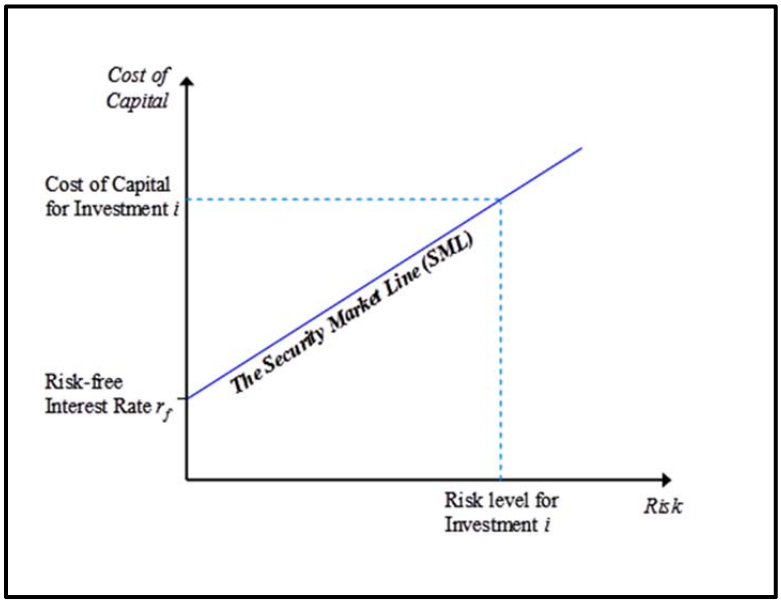
B. COST OF CAPITAL AND RISK

Q. How is the "cost of capital" defined?

A. The cost of capital is defined as the expected rate of return in capital markets on alternative investments of equivalent risk. The cost of capital is a type of opportunity cost: it represents the rate of return that investors could expect to earn elsewhere without bearing more risk. "Expected" is used in the statistical sense: the mean of the distribution of possible outcomes. The terms "expect" and "expected," as in the definition of the cost of capital itself, refer to the probability-weighted average over all possible outcomes.

The definition of the cost of capital recognizes a tradeoff between risk and return that can be represented by the "security market risk-return line" or "Security Market Line" for short. This line is depicted in Figure 1 below. The higher the risk, the higher the cost of capital required.

Figure 1: **The Security Market Line**



Q. Why is the cost of capital relevant in rate regulation?

A. The "cost of capital" is the return that investors expect to earn on investments of comparable risk.[8] The fact that investors (in aggregate) require a certain return to compensate them for a given level of risk determines (via the operation of capital markets) the cost at which companies can raise capital. Consequently, the cost of capital is set forth in the *Hope* and *Bluefield* cases as a relevant factor for determining the return that a utility company should receive—and provide to its investors—on its invested capital.

Q. What does this mean from an economic perspective?

A. From an economic perspective, rate levels that give investors a fair opportunity to earn the cost of capital are the lowest levels that fully compensate investors for the risks they bear. A utility's ability to attract capital and maintain its financial integrity requires that the combined equity return and equity ratio be such that not only is the expected return commensurate with that of other enterprises, but it also meets the expectations of credit market participants.

More important for customers, however, are the broader economic consequences of providing an inadequate return to the company's investors. In the short run, deviations from the expected rate of return on the rate base from the cost of capital may seemingly create a "zero-sum game"—investors gain if customers are overcharged, and customers gain if investors are shortchanged. In the longer term, inadequate returns are likely to

[8] *See* Stewart C. Myers, "The Application of Finance Theory to Public Utility Rate Cases," *The Bell Journal of Economics & Management Science,* 3:58-97 (1972).

cost customers—and society generally—far more than may be saved in the short run. Inadequate returns lead to inadequate investment, whether for maintenance or for new plant and equipment. Without access to investor capital, the company may be forced to forego opportunities to maintain, upgrade, and expand its systems and facilities in ways that decrease long run costs. Indeed, the cost to consumers of an undercapitalized industry can be far greater than any short-run gains from shortfalls in the cost of capital. This is especially true in capital-intensive industries (such as the water, electric and gas utility industry), which feature systems that decay over relatively long time horizons. Such long-lived infrastructure assets cannot be repaired or replaced overnight, because of the time necessary to plan and construct the facilities, and because of the difficulty of financing very large increases to rate base within a reasonable rate structure. Thus, it is in the customers' interest not only to make sure the expected return of the investors does not exceed the cost of capital, but also that the expected return does not fall short of the cost of capital.

C. THE IMPACT OF RISK ON THE COST OF CAPITAL

Q. How, in summary, do you factor in risk when determining the cost of capital?

A. To ensure that the publicly traded sample companies for which I perform DCF and CAPM estimates have comparable business risk to Nicor Gas, I looked to traded entities whose business is primarily focused on regulated natural gas utility operations. I structured my analysis to account for differences in financial leverage among the sample utilities, and for differences in the levels of financial risk imposed by the market value capital structures of the sample companies and the regulatory capital structure used to set Nicor Gas' revenue requirement. To determine where in the reasonable range of cost of

equity estimates Nicor Gas' allowed ROE should be situated, I compared the business risk of Nicor Gas to that of the sample utilities.

Q. Why is capital structure important for the determination of the cost of equity?

A. The equity holders in a company with higher levels of debt face more financial risk to their equity investment and therefore require a higher return on equity than would equity holders in an otherwise identical company with lower levels of debt financing.[9] This is because debt holders are paid prior to equity holders, who as the owners of the firm have only the residual claim of its assets. Practically, in dissolution, everyone else eats their fill before equity holders come to the table. Even without financial distress, equity holders receive what is left—which may be either a profit or a loss—after fixed payments are made to satisfy debt folders. Consequently, increased debt financing increases equity risk (in the form of amplified variability of returns) associated with the residual claim.

There are several ways in which the impact of financial risk can be taken into account in an analysis of cost of equity. One way is to determine the overall (after-tax) weighted-average cost of capital for the sample using the equity and debt percentages as the weight assigned to the cost of equity and debt. This overall cost of capital primarily depends on the business risk of the sample companies, having been adjusted on an apples-to-apples basis for differences in (market value) leverage among the companies. If the overall cost of capital is constant between the estimate obtained for the sample and the entity to which it is applied in this case—the capital structure used to set the

[9] Robert S. Hamada, "Portfolio Analysis, Market Equilibrium and Corporate Finance," *The Journal of Finance,* 24:13-31 (March 1969).

company's allowed return on rate base—then the allowed ROE that appropriately reflects the financial risk of the regulated entity can be determined. This approach assumes that the after-tax weighted-average cost of capital is constant for a range that spans the capital structures used to estimate the cost of equity and the regulatory capital structure.[10]

Another common textbook approach was developed by Professor Hamada, who estimated the cost of equity using the CAPM and made comparisons between companies with different capital structures via "unlevering" and "relevering" adjustments to the market beta. Specifically, in the Hamada approach, I use the estimated beta to calculate what beta would be associated with a 100 percent equity financed firm. This is the so-called "all-equity", "unlevered", or "assets" beta, which can then be re-levered to determine the equity beta associated with the regulatory capital structure. In Section V.D and the technical appendix to this testimony (Nicor Ex. 11.2), I provide additional explanation of the methods used to account for financial risk when estimating the cost of capital.

Q. What capital structure do you use in your cost of capital analyses?

A. I recommend that the Commission use Nicor Gas' 2018 test year capital structure. The forward looking capital structure is consistent with the notion that the cost of capital is forward-looking and with the fact that rates will go into effect in 2018. To further ensure consistency, I rely on a risk-free rate that is applicable to 2018. The test year capital structure of Nicor Gas includes 54.206 percent equity / 45.794 percent debt, including

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[10] *See also* the discussion in Jonathan Berk & Peter DeMarzo, *Corporate Finance*, 3rd Edition, 2014, p. 490.

short-term debt.[11] I find the use of a 2018 test year capital structure reasonable as this period coincides with the time that rates will go in to effect. My cost of equity estimate uses forward-looking inputs so that all cost of capital parameters is estimated for a consistent time period.

It is a common first step to rely on a sample of comparable companies to estimate the cost of equity for companies with comparable business risks, and the use of a sample is absolutely required, where the subject utility itself issues no equity for which there is a publicly traded market. However, this is only the first step in determining the cost of equity for a specific company, because any one company may face larger business, financial, or regulatory risks than the sample. Step two is an assessment of the risk associated with the target entity—Nicor Gas in this case. Therefore, if Nicor Gas' rate base is financed at a lower equity percentage than the sample companies, an adjustment needs to be made for the added risk in Nicor Gas' capital structure.

It is important to keep in mind that the portion of the total dollar return on rate base attributable to equity investment is calculated as the allowed ROE multiplied by the equity component of rate base. So as illustrated below, the cost to customers would be the same if the capital structure includes 60 percent equity with a ROE of 10 percent or if a capital structure includes 50 percent equity with an ROE of 12 percent.

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[11] Direct Testimony of Elizabeth W. Reese, Nicor Gas Ex. 2.0.

Figure 2: Example Illustrating Customer Cost Associated with Equity Returns

		Scenario A	Scenario B
Equity Percentage	[a]	60.0%	50.0%
Rate Base	[b]	$1,000	$1,000
Allowed ROE	[c]	10.0%	12.0%
Cost to Customers	[d] = [a] x [b] x [c]	$60	$60

IV. IMPACT OF ECONOMIC AND CAPITAL MARKET CONDITIONS ON THE COST OF EQUITY

A. INTEREST RATES

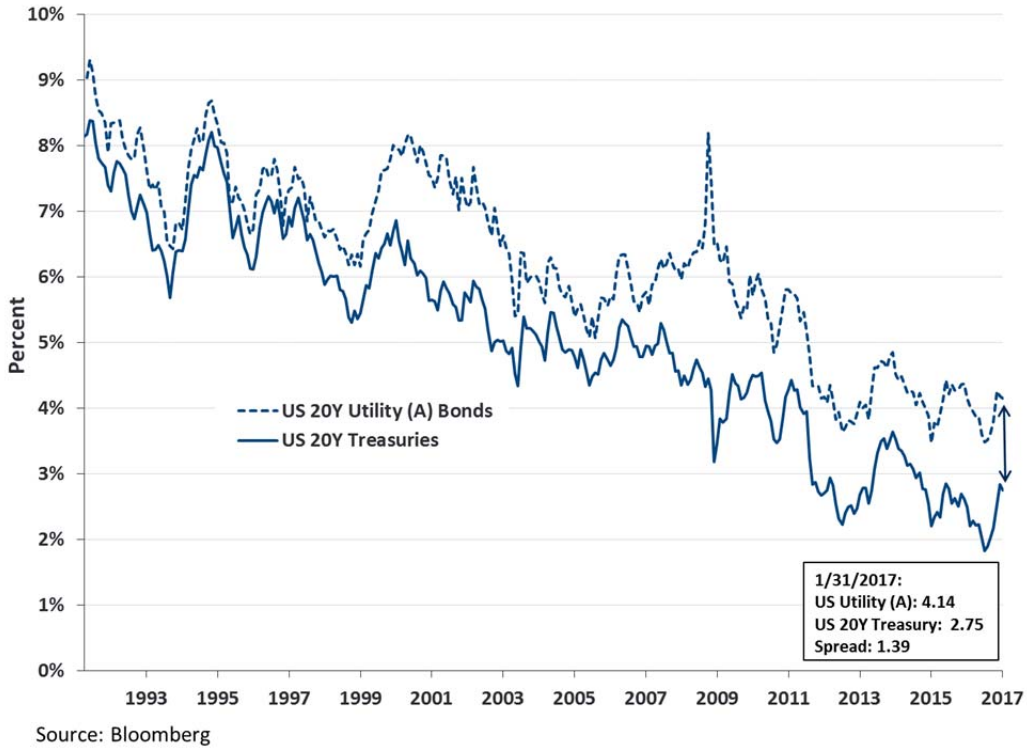
Q. What are the relevant developments regarding interest rates?

A. Interest rates—including and perhaps especially government bond yields—have remained at very low levels in the years since the great financial crisis of 2008. However, yields have increased substantially recently and are forecasted to continue on an upward trend through and including the test year. Those interest rate increases are not just my subjective prediction, but are anticipated by the market and reflected, for example, in derivative asset prices and yield curves. Additionally, the spread between utility bond yields and government bond yields of the same maturity has been and remains elevated relative to its historical levels. This is true whether the historical average level is over the long run or a more recent period.

Figure 3 below shows the development in A rated utility and government bond yields of the same general maturity from 1991 to today.[12] It is evident that the yield spread (the difference between the yield on A rated utility bonds and government bonds of the same maturity) has increased relative to its historical average.

Figure 4 graphs the spread between A rated utility bonds and government bond yields directly, and also shows the average spread over the entire period (for which data is available) prior to the financial crisis. This graph clearly illustrates the sustained elevation in the yield spread since the onset of the great financial crisis.

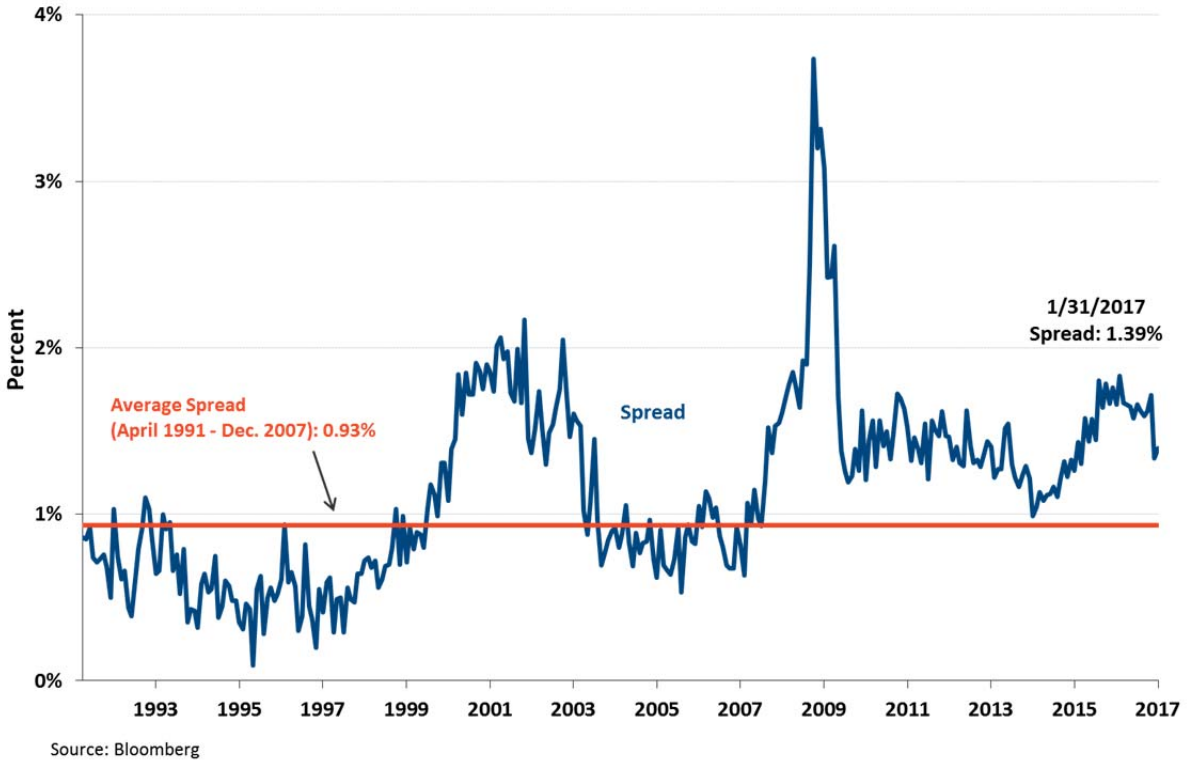
Figure 3: A Rated Utility and Government Bond Yields



[12] For clarity "A rated" reference bonds in the range of A- through A+ and "BBB rated" refer to bonds in the range of BBB- through BBB+. The majority of gas distribution utilities are in the A- range. Note that the Bloomberg utility bond indices used here first reported data in April 1991.

Note that since early July 2016, the 20-year government bond yield has increased by more than 50 percent; from 1.82 percent in July 2016 to 2.84 percent at the end of 2016.

Figure 4: Spread between A Rated Utility and 20-Year Government Bond Yield



Q. How does the current spread between utility and government bond yields compare to the historical spread?

A. As shown in Figure 3 and Figure 4 above, the spread between A rated utility bond yields and government bond yields has increased. As of January 31, 2017, the spread stood at 1.39 percent, which is over 40 basis points higher than the long-term average level prior to the 2008-09 financial crisis.

Q. How are interest rates expected to trend going forward?

A. Blue Chip Economic Indicators expects that the yield on 10-year Treasury Notes will increase to 3.10 percent by 2018.[13] These expectations are consistent with the recent increase in the Federal Reserve's monetary policy, where the Federal Reserve increased the Federal Funds rate in December 2016 and the expectation is that further increases will occur in 2017.[14] The downward pressure on Government bond yields, which has been impacted by the Federal Reserve's quantitative easing program and general stimulation of the U.S. economy.[15] These factors and have kept government bond yields low since the financial crisis and only recently have the rates started to increase both absolutely and relative to the yield on utility or corporate bonds.

Q. How do the unusual low interest rates impact the cost of equity analysis?

A. There are several ways in which the current interest rate environment affects the cost of equity analysis. First and most directly, the CAPM utilizes as one of its inputs a measure of the risk-free rate (*see* Figure 1). I used the yield on a U.S. government bond as a proxy for the risk-free rate. The estimated cost of equity using the CAPM increases (decreases) by 1 percent when the relied upon risk-free rate (*e.g.*, the government bond rate) increases (decreases) by 1 percent. Therefore, to the extent that the government bond rate is driven by the monetary policy of the time rather than market factors, so is the CAPM

13 Blue Chip Economic Indicators, January 2017.

14 Federal Reserve Press Release, December 14, 2016. It is also consistent with the forecast from, for example, Consensus Economics, which expect the 10-year government bond yield will increase to 3 percent by early 2017. Source: Consensus Economics February 2017.

15 For a summary of the magnitude of the Federal Reserve's purchase program, *see*, for example, Bloomberg, "The Fed Eases Off," September 16, 2015.

estimate. Importantly, if the government bond rate is downward (upward) biased, then the CAPM estimate will be downward (upward) biased. When that is the case, it is necessary to take the downward bias in the government bond rate into account to avoid biasing the CAPM estimate of the cost of equity.

Second, if the spread between the yield on utility (or corporate) bonds and government bonds (the "yield spread") widens, it indicates that the premium that investors require for holding securities other than government bonds has increased. Thus, there is evidence that the market equity risk premium has increased. A higher than normal yield spread is one indication of the higher risk premiums currently prevailing in capital markets. Investors consider a risk-return tradeoff (like the one displayed in Figure 1 above) and select investments based upon the desired level of risk. Higher yield spreads reflect the fact that the return on corporate debt is higher relative to government bond yields than is normally the case, even for regulated utilities. Because equity is more risky than debt, this means that the spread between the cost of equity and government bond yields must also be higher; *i.e.*, the premium required to invest in equity (the Market Risk Premium or "MRP") rather than government bonds has increased. If this fact is not recognized, then the traditional cost of capital estimation models will underestimate the cost of capital prevailing in the capital markets.

Third, in times of economic uncertainty (such as the present) investors seek to reduce their exposure to market risk. This precipitates a so-called "flight to safety," wherein demand for low-risk government bonds rises at the expense of demand for stocks. If yields on bonds are extraordinarily low, however, any investor seeking a higher expected return must choose alternative investments such as stocks, real estate,

gold, or collectibles. Of course, all of these investments are riskier than government bonds, and investors demand a risk premium (perhaps an especially high one in times of economic uncertainty) for investing in them. But short of accepting meager returns, investors simply have few alternatives to returning to the stock market. Utility stocks may have experienced the "flight to safety" phenomenon to a larger degree than other stock because they traditionally have paid a substantial portion of their earnings as dividends. Therefore, investors who have sought income from their investments and found government bonds too unattractive may have accepted a higher risk and invested in utility stock with the goal of receiving periodic dividend payments.

My analysis considers the possibility that the current elevated level of the yield spread results either from government bond yields being artificially depressed due to monetary policy[16] or from elevation in the premium demanded by investors to take on risk (*i.e.*, an elevated market risk premium). To avoid double-counting, I account for the impact on model inputs implied these two alternative explanations in two separate scenarios.

Q. What are the implications of elevated yield spreads to the cost of equity?

A. The increase in the yield spread indicates that (i) the current long-term government bond yields are depressed relative to their normal levels and / or (ii) investors are demanding a premium higher than the historical premium to hold securities that are not risk free. The

[16] As of January 4, 2017, the Federal Reserve held approximately $1.7 trillion of mortgage-backed securities, whereas the magnitude was less than $0.5 trillion in mid-2009. *See* Federal Reserve Statistical Release H.4.1 "Factors Affecting Reserve Balances, releases dated January 5, 2017 and July 2, 2009. Available at https://www.federalreserve.gov/releases/h41/

353 latter is an indication that the market equity risk premium may be elevated relative to its
354 historical level. Regardless of the interpretation, the consequence is that if the cost of
355 equity is estimated using the current risk-free rate and a market equity risk premium
356 based on historical average data, the estimate will be downward biased. Hence, it is
357 necessary to "normalize" the risk-free rate **or** take into account the current (rather than
358 historical) market equity risk premium.[17]

359 **Q. Please explain the impact of an increase in investors' required risk premium?**

360 A. Investors dislike risk and demand a price to assume it. As a result, for any given level of
361 risk, investors demand to earn an appropriate return to be induced to invest. On top of
362 that, however, we must also consider changes in the degree of "risk aversion" in the
363 market. An increase in risk aversion means not only that investors demand a greater
364 return for greater risk, but that investors now require a higher return for any given level
365 of risk

[17] I note that if a combination interpretation is used, it becomes important to make sure that the overall (total) "normalization" takes into account the elevated yield spread once and only once. I therefore consider two scenarios in my CAPM analysis. In Scenario I, the risk-free rate is increased by the abnormal increase in the yield-spread to take into account the elevated yield spread. This scenario is consistent with the interpretation that the current government bond yield is artificially downward suppressed. In Scenario II, the MRP is increased by an amount that is consistent with the interpretation that the increase in the yield spread is due to an increase in the premium investors require to hold assets other than those that are risk-free. Importantly, I use the historical MRP in Scenario I and the 2018 forecast risk-free rate in Scenario II, so that no scenario considered allows for both a normalization of the risk-free rate and an increase in the MRP.

Q. What evidence exists that the return premium demanded by investors for taking risk is higher than it was prior to the 2008-09 financial crisis?

A. Substantial economic literature conducted post-financial crisis concluded that the Market Risk Premium ("MRP") had declined relative to its historical average during the pre-crisis period. However, since the start of the financial crisis, financial data services such as Bloomberg have found that the expected market risk premium is higher than before the financial crisis and at least as high as its historical average. For example, Bloomberg's expected Market Risk Premium exceeds the historical average Market Risk Premium and currently stands at about 7.1 percent over 10-year bonds, while the historical arithmetic average Market Risk Premium from 1926 to 2015 is 6.9 percent (over long-term government bonds).[18]

Q. Is there other evidence that the Market Risk Premium has increased since the 2008-09 financial crisis?

A. Yes. A recently updated analysis by Duarte and Rosa of the Federal Reserve of New York aggregates the results of many models of the required Market Risk Premium in the U.S. and tracks them over time. This analysis finds a very high Market Risk Premium in recent years.

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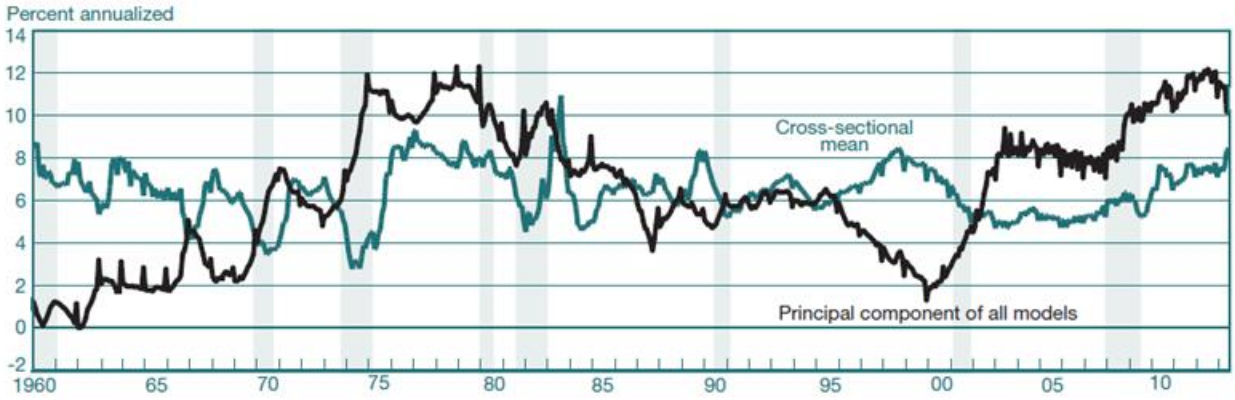
[18] Bloomberg and Duff & Phelps, "*2016 Valuation Handbook: Guide to Cost of Capital*," 2016, pp. 3-31. The text that updates this data to year-end 2017 is not available at the time of writing.

The analysis estimates the Market Risk Premium that results from a range of models each year from 1960 through the present.[19] The analysis then reports the average as well as the first principal component of results.[20] The analysis finds that the models used to determine the risk premium are converging to provide more comparable estimates and that the average annual estimate of the Market Risk Premium was at an all-time high in 2013. These estimates are reasonably consistent with those obtained from Bloomberg and the consistent elevation of the Market Risk Premium over the historical average indicates that the elevated level is persistent. Figure 5 below shows Duarte and Rosa's summary results.

Figure 5
Duarte and Rosa's Chart 3
Market Risk Premium Principal Component and Cross-Sectional Mean of Models



[19] Fernando Duarte and Carlo Rosa, "The Equity Risk Premium: A Review of Models*," Federal Reserve Bank of New York*, December 2015 (Duarte & Rosa 2015).

[20] Duarte & Rosa emphasize the "first principal component" of the 20 models. This means that the authors used statistics to compute the weighted average combination of the models that captures the most variability among the 20 models over time.

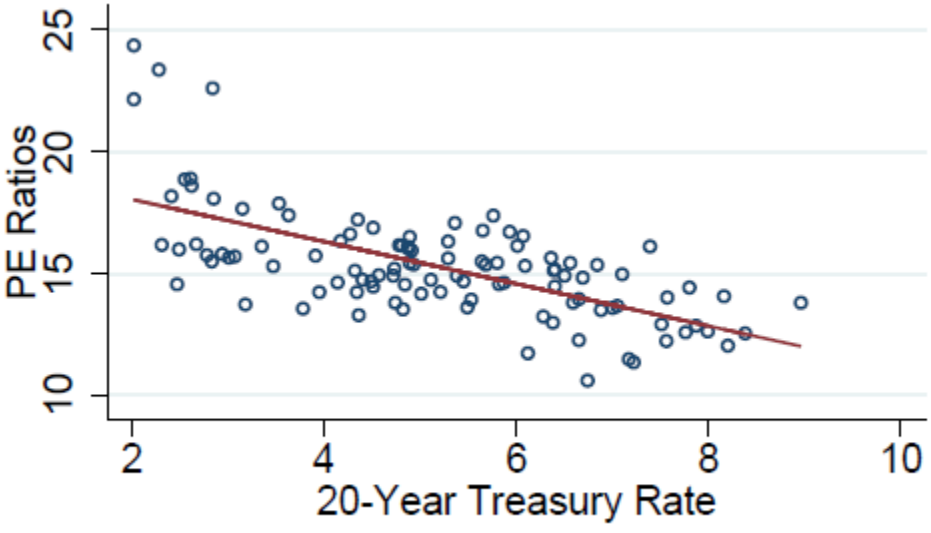
Q. Are there other reasons why, in your view, investors are facing market uncertainty?

A. Yes. It is as of now unclear what the newly elected government in the U.S. will seek to or be able to successfully implement in the form of tax policy, environmental policy, and energy policy in general. While political uncertainty is always present, the current levels are atypical. In Europe, the timing and form of the Brexit has yet to be determined, and there are renewed worries over Greece's debt. Lastly, the continued turmoil in the Middle East could impact the global economy in ways that are unpredictable.

Q. Are there other features of financial markets that are currently unusual?

A. Yes. The current level of many companies' (including gas utilities') Price-to-Earnings ("P/E") ratio is higher than what has been experienced historically. Empirically, the P/E ratio increases when interest rates decline. This effect is shown in Figure 6 below using gas utilities' quarterly P/E ratios from 1990 to today.

Figure 6
Relationship Between Average Gas Utility PE Ratio and 20-Year Treasury Bond Yield



Source: Bloomberg L.P. (quarterly data from 1990 to 2016)

Q. How is the relationship between the P/E ratio and the 20-year government bond yield relevant to your analysis?

A. The dividend yield, which is calculated as Dividends divided by Price (D/P), is closely related to the P/E ratio as dividends are paid out of earnings. If the P/E ratio is very high (low), then the Earnings-to-Price ratio is low (high) and so is the dividend yield (D/P). The average gas utility pays a bit over 60 percent of its earnings as dividends, so if the P/E ratio increases from, for example, 18 to 20 (11 percent), then the Earnings / Price ratios declines by about 0.6 percentage points (from 1/18 = 5.6 percent to 1/20 = 5.0 percent) and the dividend yield declines by 0.36 percentage points (60 percent × 0.6 percent). Therefore, if the 20-year government bond yield is artificially depressed and expected to increase, then the dividend yield is likely also artificially depressed and expected to increase. Consequently, the results from the standard dividend discount models estimated in the current environment of high P/E ratios and low interest rates are likely to underestimate the cost of equity that will prevail going forward as interest rates rise.

Q. What do you conclude from this information?

A. The increase in the spread between the yield on utility and government bonds indicates that the premium investors require to hold assets that are not risk-free has increased. Likewise, the recent trends in preferred equity yields confirm that the premium on assets other than government bonds has increased. Similarly, the forecasted Market Risk Premium is consistent with a relative high Market Risk Premium. These factors point to a relatively high degree of investor risk aversion and the premium that investors required to hold assets that are not risk-free is elevated. Similarly, the very low risk-free rate are

likely to have led to higher P/E ratios due to the flight to quality discussed above and consequently lower than "normal" dividend yields. All of this must be taken into account when selecting certain inputs to the CAPM and DCF models, and when evaluating the results of these models for reasonableness.

B. IMPACT ON ROE ESTIMATION

Q. Please summarize how the economic developments discussed above have affected the ROE and debt that investors require?

A. Utilities rely on investors in capital markets to provide funding to support their capital expenditure program and efficient business operations, and investors consider the risk return tradeoff in choosing how to allocate their capital among different investment opportunities. It is therefore important to consider how investors view the current economic conditions; including the plausible development in the risk-free rate and the current Market Risk Premium.

These investors have been dramatically affected by the credit crisis and ongoing market volatility, so there are reasons to believe that their risk aversion remains elevated relative to pre-crisis periods.

Likewise, the effects of the Federal Reserve's monetary policy have artificially lowered the risk-free rate. As a result, yield spreads on utility debt, including top-rated instruments, have remained elevated. The evidence presented above demonstrates that the equity risk premium is higher today than it was prior to the crisis for all risky investments. This is true even for investments of lower-than-average risk, such as the equity of regulated utilities.

Q. Does your analysis consider the current economic conditions?

A. Yes. In implementing the CAPM and Implied Risk Premium models, I took into account two scenarios that consider the increased yield spread as being (i) a downward bias in the risk-free rate, or (ii) an elevation of the Market Risk Premium. Specifically, I relied on two sets of inputs for the CAPM: I considered the elevated spread between utility and government bond yields and either (i) move the risk-free rate towards a normalized risk-free rate to reflect the currently downward bias of the yields and combine that with the historical Market Risk Premium, or (ii) rely on Blue Chip's 2018 government bond yield forecast for the risk-free rate and combine that with a Market Risk Premium that reflects strong evidence that risk premiums are elevated relative to their long-term historical average.[21] For the DCF, I considered the impact on the dividend yield from the discussion above as an indication that the estimates may be downward biased, so that the lowest estimates likely do not reflect the true cost of equity.

Q. What does your analysis imply about the 2018 test year capital structure for Nicor Gas?

A. Interest rates over the past few years have been anomalously low. As discussed above, multiple factors including the Fed's bond purchase program and a "flight to safety" placed downward pressure on interest rates following the credit crisis in 2008-2009. During this time of persistent lower interest rates, Nicor Gas maintained a substantially

[21] If the yield spread were to return to the level before the financial crisis, it would, everything else equal, be appropriate to consider the forecasted risk-free rate for the period during which rates will be in effect along with the historical average MRP.

larger than normal short-term debt balance. However, those times are ending and Nicor Gas executives now face not only higher interest rates but the risk that it will be more difficult to lock in favorable rates on long-term debt. Multiple economic forecasts and derivatives now indicate that interest rates will significantly increase starting in the near future. Therefore, it makes sense for Nicor Gas to decrease its exposure to interest rate fluctuation and to take advantage of remaining opportunities to issue favorably priced long-term debt by returning to a capital structure that has a level of short-term debt similar to what it has had in the past and similar to levels typically used by regulated utilities. Given the long-lived nature of Nicor Gas' assets and the economic indicators, I find it appropriate that Nicor Gas is decreasing its share of short-term debt in its capital structure by the 2018 test year.

V. ANALYZING THE COST OF EQUITY

A. SAMPLE SELECTION

Q. How do you identify sample companies?

A. To select a comparable sample of gas utilities, I began with the universe of publicly traded gas utilities as classified by Value Line.[22] This resulted in an initial group of 20 companies. From this group, I kept those that are Regulated (at least 80 percent of assets are regulated) or Mostly Regulated (50-79 percent of assets are regulated) according to each company's most recent 10-K. In addition, I require that the selected companies have five years of data available and do not have non-investment grade bond

[22] The 20 companies are from *Value Line Investment Analyzer*.

ratings or unique features that render price data meaningless or difficult to interpret.[23] I exclude companies with unique circumstances that may bias the cost of capital estimation such as substantial merger or acquisitions, dividend cuts or other unique factors (*e.g.*, substantial litigation) over the period I use for estimation (*i.e.*, five years in the case of the betas employed in my CAPM analysis). Specifically, companies that have recently been the subject of a proposed or completed acquisition or merger larger than 25 percent of their market capitalization were excluded, as were entities that had announced dividend cuts and companies with non-investment grade bond ratings.

Q. What specific consideration did you give to the recent acquisition of WGL Holdings by AltaGas Limited?

A. I note that this transaction was announced in January 2017,[24] while the capital market data and growth rate estimates used in my analyses were obtained as of December 31, 2016. Therefore, this transaction could not directly impact my results. However, I am also aware that market speculation about WGL as a potential acquisition target existed starting in late November of 2016,[25] although no specific proposed transactions were announced. Consequently, while I have retained WGL Holdings as a member of my gas utility sample, I also estimated results for a subsample that excludes WGL.

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[23] I see no such companies in the gas sample, but in other industries there are entities that trade infrequently due to their small size or narrow ownership.

[24] AltaGas Press Release, "AltaGas Statement on Potential Transaction," January 12, 2017 acknowledged discussions with an un-named party, WGL Press Release, "WGL Holdings Inc. to be Acquired by AltaGas Ltd. in $6.4 Billion Transaction," January 25, 2017 officially announced the transaction.

[25] Bloomberg News Article, "WGL Weighs Sale After Interest From Spain's Iberdrola," dated November 29, 2016. https://www.bloomberg.com/news/articles/2016-11-29/wgl-said-to-weigh-sale-after-interest-from-spain-s-iberdrola.

Q. What are the characteristics of the Gas Utility Sample?

A. The Gas Utility Sample comprises natural gas distribution utilities whose primary source of revenues and majority of assets are subject to regulation. The final sample consists of the 7 gas utilities listed in Figure 7 below. These companies own regulated gas utility subsidiaries in many states. Therefore, the Gas Utility Sample is broadly representative of the regulated gas distribution industry from a business risk perspective. I have also considered a Gas Utility Subsample, which excludes Chesapeake Utilities[26] and WGL Holdings.

Figure 7 reports the sample companies' annual revenues for the most recent four quarters as of Q4, 2016 and also report the market capitalization, credit rating, beta and growth rate. The 2016 annual revenue as well as the market cap was obtained from Bloomberg as were the recent credit rating and growth estimate. Betas were obtained from Value Line and compared to estimates from Bloomberg.

[26] Chesapeake Utilities owns significant gas transmission and electric distribution assets, while slightly less than 50% of its assets are dedicated to natural gas distribution. This makes Chesapeake Utilities somewhat less of a "pure play" natural gas utility than the other sample companies, although I still consider it generally comparable to Nicor Gas in terms of business risk. To isolate any potential bias from including Chesapeake Utilities' more diversified business profile in my sample, I exclude it from the subsample.

Figure 7
U.S. Natural Gas Distribution Utility Sample

Company	Subsample	Annual Revenues (USD million)	Regulated Assets	Market Cap. 2016 Q4 (USD million)	Betas	S&P Credit Rating (2016)	Long Term Growth Est.
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Atmos Energy	*	$3,224	M	$7,778	0.70	A	6.3%
Chesapeake Utilities		$462	D	$1,104	0.65	A	7.8%
New Jersey Resources	*	$1,978	M	$3,119	0.80	A	5.3%
Northwest Nat. Gas	*	$673	R	$1,661	0.65	A+	7.0%
South Jersey Inds.	*	$964	M	$2,719	0.80	BBB+	5.8%
Southwest Gas	*	$2,504	R	$3,606	0.75	BBB+	6.4%
WGL Holdings Inc.		$2,346	M	$3,985	0.75	A+	5.1%
Average		$1,736		$3,425	0.73		6.3%

Sources and Notes:
[1]: Denotes companies used in the CAPM and DCF subsamples.
[2]: Bloomberg as of December 31, 2016. Most recent four quarters.
[3]: See Exhibit 11.4, Table No. BV-2. Key:
R - Regulated (More than 80% of assets regulated).
M - Mostly Regulated (50%-80% of assets regulated).
D - Diversified (Less than 50% of assets regulated).
[4]: See Exhibit 11.4, Table No. BV-3 Panels A through G.
[5]: See Exhibit 11.4, Supporting Schedule # 1 to Table No. BV-10.
[6]: S&P Credit Ratings from Research Insight as of 2016 Q4.
[7]: See Exhibit 11.4, Table No. BV-5.

Q. How does the Gas Utility Sample compare to Nicor Gas?

A. The Gas Utility Sample consists of 7 companies that generally have credit ratings[27] in the range of BBB+ through A+, which is consistent with that of Nicor Gas. The annual revenues for Nicor Gas are in line with those of the majority of the comparable companies.

To assess whether the results were impacted by WGL's acquisition (even if the public announcement occurred after my analysis) or if the relatively diversified

[27] Chesapeake Utilities does not have an issuer credit rating from S&P. For purposes of my analysis, I assigned it the sample average rating of A-.

operations of Chesapeake affected the model results for those companies, I also considered a subsample that excluded those two companies.

Finally, while the sample companies are investor-owned and publicly traded companies, Nicor Gas is a subsidiary of Southern, which is traded on the NYSE with the ticker symbol SO.

B. CAPITAL STRUCTURE

Q. What regulatory capital structure do you recommend for Nicor Gas in this proceeding?

A. I recommend that the Commission base rates on the actual forecast regulatory capital structure consisting of 54.206 percent equity and 45.794 percent debt.[28] I note that the debt percentage includes short-term debt and that this capital structure includes slightly more equity than the book capital structures of the average sample company, which average 52.6 percent equity.

C. THE CAPM BASED COST OF EQUITY ESTIMATES

Q. Please briefly explain the CAPM.

A. In the CAPM the collective investment decisions of investors in capital markets will result in equilibrium prices for all risky assets such that the returns investors expect to receive on their investments are commensurate with the risk of those assets relative to the market as a whole. The CAPM posits a risk-return relationship known as the Security

[28] Direct Testimony of Elizabeth W. Reese, Nicor Gas Ex. 2.0.

Market Line (*see* Figure 1), in which the required expected return on an asset is proportional to that asset's relative risk as measured by that asset's so-called "beta."

More precisely, the CAPM states that the cost of capital for an investment, S (*e.g.*, a particular common stock), is given by the following equation:

$$r_s = r_f + \beta_s \times MRP \qquad (1)$$

where r_S is the cost of capital for investment S;

r_f is the risk-free interest rate;

β_S is the beta risk measure for the investment S; and

MRP is the market equity risk premium.

The CAPM is a "risk-positioning model" that relies on the empirical fact that investors price risky securities to offer a higher expected rate of return than safe securities. It says that an investment whose returns do not vary relative to market returns should receive the risk-free interest rate (that is the return on a zero-risk security, the y-axis intercept in Figure 1), whereas the market receives the risk-free rate plus the Market Risk Premium. Further, it says that the risk premium of a security over the risk-free rate equals the product of the beta of that security and the Market Risk Premium: the risk premium on a value-weighted portfolio of all investments, which by definition has average risk.

1. Inputs to the CAPM

Q. What inputs does your implementation of the CAPM require?

A. As demonstrated by equation (1), estimating the cost of equity for a given company requires a measure of the risk-free rate of interest and the Market Risk Premium, as well

as a measurement of the stock's beta. There are many methodological choices and sources of data that inform the selection of these inputs. I discuss these issues, along with the finance theory underlying the CAPM, in Exhibit 11.2. I performed multiple CAPM calculations corresponding to distinct "scenarios" reflecting different values of the inputs. This allowed me to derive a range of reasonable estimates for the cost of equity capital implied by each of my samples.

Q. What values did you use for the risk-free rate of interest?

A. I used the yield on a 20-year Government Bond as the risk-free asset for purposes of my analysis. Recognizing the fact that the cost of capital set in this proceeding will be in place over the next several years, I rely on a forecast of what Government bond yields will be one year out. Specifically, Blue Chip predicts that the yield on a 10-year Government Bond will be 3.1 percent by 2018.[29] I use year-end 2018 as the benchmark as rates are expected to be in effect well beyond that date. I adjust this value upward by 50 basis points, which is my estimate of the representative maturity premium for the 20-year over the 10-year Government Bond.[30] This gives me a lower bound on the risk-free rate of 3.60 percent.

I also considered a scenario in which the appropriate risk-free rate of interest is 4.00 percent, which adds a portion of the increase in yield spread to the risk-free rate to take the downward pressure on the government bond yield into account. An alternative is

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[29] Blue Chip Economic Indicators, January 2017.

[30] This maturity premium is estimated by comparing the average excess yield on 20-year versus 10-year Government Bonds over the period January 1990 through December 2016, using data from Bloomberg.

to increase the Market Risk Premium to reflect the widening of the yield spread.[31] The baseline Government bond yield of 3.60 percent conservatively uses the forecasted yield for 2018 and reflects that Government bond yields are expected to increase substantially going forward.

Q. What values did you use for the Market Risk Premium?

A. Like the cost of capital itself, the Market Risk Premium is a forward-looking concept. It is by definition the premium above the risk-free interest rate that investors can *expect* to earn by investing in a value-weighted portfolio of all risky investments in the market. The premium is not directly observable, and must be inferred or forecasted based on known market information. One commonly used method for estimating the Market Risk Premium is to measure the historical average premium of market returns over the income returns on government bonds over some long historical period. *Duff and Phelps* performs such a calculation of the Market Risk Premium. The average market risk premium from 1926 to the present (2015) is 6.9 percent.[32] I used this value of the Market Risk Premium in one input scenario to my CAPM analyses. However, investors may require a higher or lower risk premium, reflecting the investment alternatives and aggregate level of risk aversion at any given time. As explained in Section III, there is substantial evidence that investors' level of risk aversion remains elevated relative to the time before the global financial crisis and ensuing recession that commenced in 2008. In recognition of this

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[31] As of January 2017, the spread between A rated utility and government bond yields was elevated by 42 basis points relative to the historical norm, so I apply 40 basis points as an upward adjustment to the risk-free interest rate.

[32] Duff & Phelps, "2016 Valuation Handbook: Guide to Cost of Capital," pp. 3-31.

evidence, together with forward-looking measurements of the expected Market Risk Premium that are higher than the long-term historical average, I also performed CAPM calculations using 7.9 percent for the Market Risk Premium.[33]

Q. What is the basis for stating that the current Market Risk Premium is higher than its historical average?

A. That conclusion is supported by both academic research and empirical market data. Academic articles that were written in the late 1990s or early 2000s often found that the U.S. Market Risk Premium at the time was lower than the its historical average based on various forward-looking models, such as market-wide versions of the DCF model. A recent article by Duarte and Rosa of the Federal Reserve of New York summarizes many of these models and also estimates the Market Risk Premium from the models each year from 1960 through the present.[34] The authors find that the models are converging to provide more consensus around the estimate and that the average annual estimate of the Market Risk Premium is consistent with the academic literature and with forward-looking estimates such as Bloomberg's. Their analysis shows that the U.S. Market Risk Premium was lower than its long-term historical average in the early 2000s, but is currently at an all-time high. Chart 3 from Duarte & Rosa 2015 was reproduced in Figure 5, which shows the average estimated Market Risk Premium (over 30-day T-bills) for 20 models.

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[33] Bloomberg currently forecast the U.S. MRP at 7.1 percent over a 10-year Government bond, while the average for 2016 was 7.6 percent over the 10-year Government bond. At the same time, the increase in yield spread indicates an elevation in the MRP that is well above 1 percent, so 7.9 percent over a 20-year government bond is a reasonable second benchmark. *See* Exhibit 11.2 for details.

[34] Fernando Duarte and Carlo Rosa, "The Equity Risk Premium: A Consensus of Models," *Federal Reserve Bank of New York*, December 2015 (Duarte & Rosa 2015).

These findings are broadly consistent with the forward-looking Market Risk Premium's calculated by Bloomberg albeit a bit higher even after downward adjustment for the maturity premium. I also note that the approximately 40 basis points elevation in the yield spread indicate a substantial elevation in the Market Risk Premium.[35] However, I conservatively relied on the historical average Market Risk Premium of about 6.9 percent and a forward-looking Market Risk Premium of 7.9 percent in my CAPM analysis.[36]

Q. What betas did you use for the companies in your sample?

A. I evaluated both Value Line and Bloomberg betas, which are estimated using five years of weekly data, as inputs. I found the two sources to produce betas which were very similar on average. I use Value Line betas in this analysis, but also note that the use of Bloomberg betas would not significantly affect my estimation results.

2. The Empirical CAPM

Q. Did you use any other CAPM-based model?

A. Yes. Empirical research has shown that the Empirical Capital Asset Pricing Model ("ECAPM") tends to perform better as low-beta stocks tend to have higher risk premiums than predicted by the CAPM and high-beta stocks tend to have lower risk premiums than

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[35] *See* Villadsen WP 3 for details.

[36] Following the evidence in standard finance textbooks, I rely on the arithmetic average for the historic MRP. *See, e.g.,* Brealey, Myers and Allen, "Principles of Corporate Finance," 11th Edition, 2014 pp. 162-163, and Ross, Westerfield and Jaffe, "Corporate Finance," 10th Edition, 2013, pp. 322-323. Reliance on an arithmetic historic average is also consistent with Order No. U-08-157(10)/U-08-158(10).

predicted.[37] A number of variations on the original CAPM theory have been proposed to explain this finding, but the observation itself can also be used to estimate the cost of capital directly, using beta to measure relative risk by making a direct empirical adjustment to the CAPM.

The second variation on the CAPM that I employed makes use of these empirical findings. It estimated the cost of capital with the equation,

$$\boldsymbol{r_S = r_f + \alpha + \beta_S \times (MRP - \alpha)} \qquad (2)$$

where $\boldsymbol{\alpha}$ is the "alpha" adjustment of the risk-return line, a constant, and the other symbols are defined as for the CAPM (*see* equation (2) above).

This model is referred to as the ECAPM. The alpha adjustment has the effect of increasing the intercept but reducing the slope of the Security Market Line in Figure 1, which results in a Security Market Line that more closely matches the results of empirical tests. In other words, the ECAPM produces more accurate predictions of eventual realized risk premiums than does the CAPM.

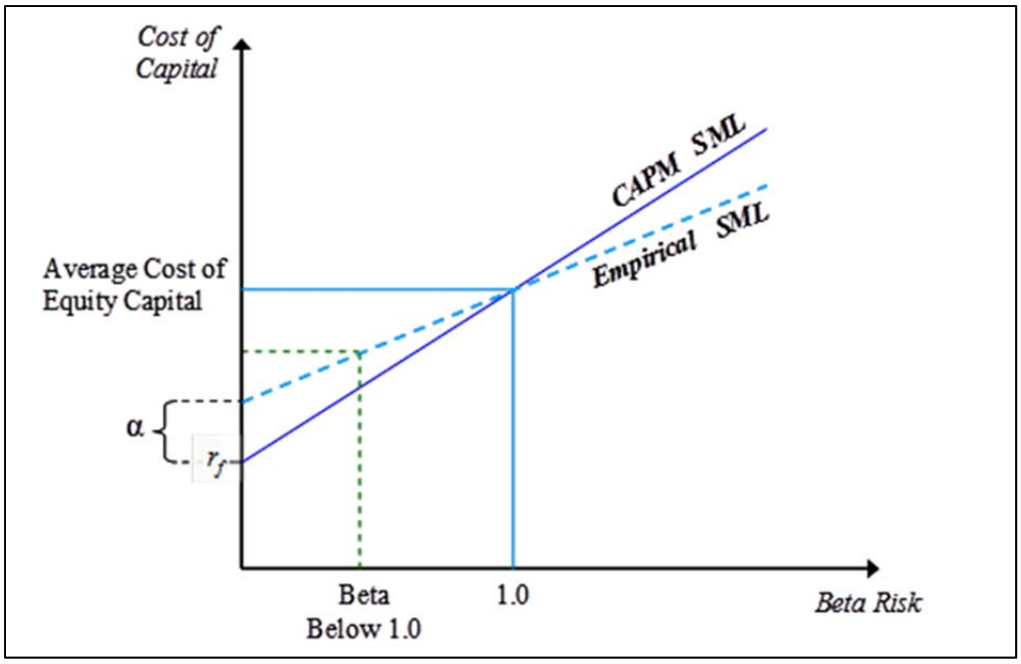
Q. Why do you use the ECAPM?

A. The ECAPM is based on recognizing that the actual observed risk-return line is flatter and has a higher intercept than that predicted by the CAPM. The alpha parameter (α) in the ECAPM adjusts for this fact, which has been established by repeated empirical tests of the CAPM. Figure A-3 in Exhibit 11.2 provides a list of empirical studies that have

[37] *See* Exhibit 11.2 for references to relevant academic articles.

tested the CAPM and also provides documentation for the magnitude of the adjustment, (α).

Figure 8: **The Empirical Security Market Line**



3. Inputs Used in the CAPM Based Models

Q. Please summarize the parameters of the scenarios and variations you considered in your CAPM and ECAPM analyses.

A. The parameters for the two scenarios are displayed in Figure 9 below. The basis for using the scenarios is the empirical observation that the yield spread is higher than normal as is the forecasted Market Risk Premium. The increased yield spread could reflect the increase in the Market Risk Premium or downward pressure on the yield of government bonds due to a flight to quality or other factors. Therefore, I used the unadjusted forecast risk-free rate with a higher estimate of the Market Risk Premium, and the unadjusted historical average Market Risk Premium with the increased estimate of the risk-free interest rate as illustrated in Figure 9. This is a conservative approach as it is

plausible that both downward pressure on the risk-free rate and upward pressure on the Market Risk Premium could simultaneously occur. Scenario 1 normalizes the risk-free rate and uses a historical Market Risk Premium while Scenario 2 uses an unadjusted forecast of the risk-free rate and a forecasted Market Risk Premium. Because I did not simultaneously normalize both the government bond rate and the Market Risk Premium, my estimates are more likely to be downward than upward biased.

Figure 9: **Parameters Used in CAPM-based Models**

	Scenario 1	Scenario 2
Risk-Free Interest Rate	4.0%	3.6%
Market Equity Risk Premium	6.9%	7.9%

D. FINANCIAL RISK AND THE COST OF EQUITY

Q. Are differences in financial leverage important to the estimation of the cost of equity?

A. Yes. Both the CAPM and the DCF models rely on market data to estimate the cost of equity for the sample companies, so the results reflect the value of the capital that investors hold during the estimation period (market values). The allowed ROE is applied to Nicor Gas' rate base, which could be financed with a different portion of debt than the sample companies. Taking differences in financial leverage into consideration does not change the value of the rate base, but it does consider the fact that the more debt a company has, the higher is the financial risk associated with an equity investment. To see this I constructed a simple example below, where only the financial leverage of a company varies. I assumed the return on equity is 11 percent at a 50 percent equity

capital structure and determine the return on equity that would result in the same overall return if the percentage of equity in the capital structure were reduced to 45 percent.

Figure 10
Illustration of Impact of Financial Risk on Allowed ROE

		Company A (50% Equity)	Company B (45% Equity)
Rate Base	[a]	$1,000	$1,000
Equity	[b] = [a] x Equity Share	$500	$450
Debt	[c] = [a] - [b]	$500	$550
Total Cost of Capital (@ 8%)	[d] = [a] x 8%	$80.00	$80.00
Cost of Debt (@ 5%)	[e] = [c] x 5%	$25.00	$27.50
Allowed Return on Equity	[f] = [d] - [e]	$55.00	$52.50
Implied ROE	[g] = [f] / [b]	11.0%	11.7%

Figure 10, above, illustrates how financial risk affects returns and also the allowed ROE. The overall return remains the same for Company A and B at $80. But Company B with the lower equity share and higher financial leverage must earn a higher percentage ROE in order to maintain the same overall return. This higher percentage allowed ROE represents the increased risk to equity investors caused by the higher degree of financial leverage.

The principle illustrated in Figure 10 is exemplary of the adjustments I performed to account for differences in financial risk when conducting estimates of the cost of equity applicable to Nicor Gas.

Q. Please describe the methods you use to take differences in financial risk into account.

A. A common issue in regulatory proceedings (and business valuation in general) is how to apply data from a benchmark set of comparable securities when estimating a fair return

on equity for the target/regulated company. It may be tempting to simply estimate the cost of equity capital for each of the sample companies (using one of the above approaches) and average them. After all, the companies were chosen to be comparable in their business risk characteristics, so why would an investor necessarily prefer equity in one to the other (on average)?

The problem with this argument is that it ignores the fact that underlying asset risk (*i.e.*, the risk inherent in the lines of business in which the firm employs its assets) for each company is typically divided between debt and equity holders. The firm's debt and equity are therefore financial derivatives of the underlying asset return, each offering a differently structured claim on the cash flows generated by those assets. Even though the risk of the underlying assets may be comparable, a different capital structure splits that risk differently between debt and equity holders. The relative structures of debt and equity claims are such that higher degrees of debt financing increase the variability of returns on equity, *even when the variability of asset returns remains constant*. As a consequence, otherwise identical firms with different capital structures will impose different levels of risk on their equity holders. Stated simply, increased leverage adds financial risk to a company's equity.[38]

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[38] I refer to this effect in terms of *financial risk* because the additional risk to equity holders stems from how the company chooses to finance its assets. In this context financial risk is distinct from and independent of the *business risk* associated with the manner in which the firm deploys its cash flow generating assets. The impact of leverage on risk is conceptually no different than that faced by a homeowner who takes out a mortgage. The equity of a homeowner who finances his home with 90% debt is much riskier than the equity of one who only finances with 50% debt.

To develop an intuition for the manner in which financial leverage affects the risk of equity, it is helpful to consider a concrete example. Figure 11 and Figure 12 below demonstrate the impact of leverage on the risk and return for equity by comparing equity's risk when a company uses no debt to finance its assets, and when it uses a 50-50 capital structure (*i.e.*, it finances 50 percent of its assets with equity and 50 percent with debt). For illustrative purposes, the figures assume that the cash flows will be either $5 or $15 and that these two possibilities have the same chance of occurring.

Figure 11: All Equity Capital Structure

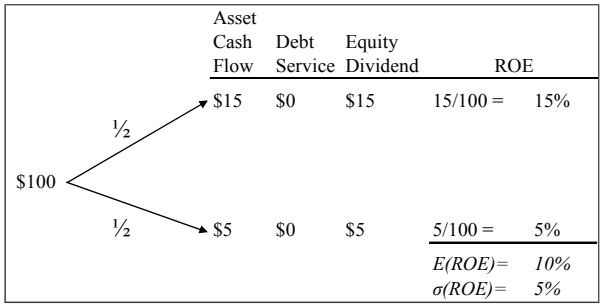
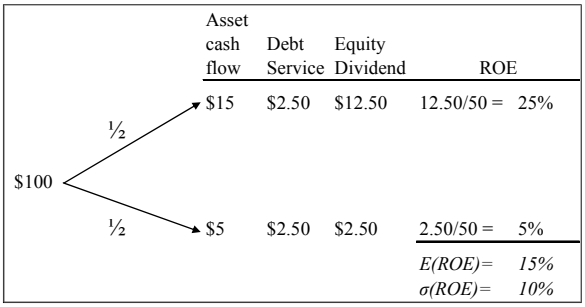


Figure 12: 50/50 Capital Structure



In the figures, $E(ROE)$ indicates the mean return and $\sigma(ROE)$ represents the deviation of returns from that mean. This simple example illustrates that the introduction of debt increases both the mean (expected) return to equity holders and the variance of that return, even though the firm's expected cash flows—which are a property of the line of business in which its assets are invested—are unaffected by the firm's financing choices. The "magic" of financial leverage is not magic at all—leveraged equity investors can only earn a higher return because they take on greater risk.

Q. Can you summarize the methods used to account for differences in financial risk?

A. Yes. Because several different approaches are discussed in finance textbooks, I use three common approaches to span the plausible range of outcomes. First, if the companies in a

sample are comparable in terms of the systematic risks of the underlying assets, then the overall cost of capital of each company should be about the same across companies (except for sampling error), so long as they do not use extreme leverage or no leverage. Thus, within a range of capital structures, the weighted average cost of capital will be the same for the sample used to estimate the cost of capital and for Nicor Gas. Second, alternative approaches based on the work of Professor Hamada account for the impact of financial risk by examining the impact of leverage on beta, which inherently means working within the CAPM framework. Hamada adjustment procedures—so-named for Professor Robert S. Hamada who contributed to their development[39]—are ubiquitous among finance practitioners when using the CAPM to estimate discount rates. In my CAPM analysis I employ two varieties of Hamada adjustments to beta: one that directly incorporates taxes and one that does not.

The theoretical and methodological details of these financial risk adjustment procedures are explained in the Technical Appendix (Nicor Ex. 11.2) to my testimony, and the mechanics of their implementation are shown in my workpapers and in Nicor Ex. 11.4.

[39] Hamada, R.S., "The Effect of the Firm's Capital Structure on the Systematic Risk of Common Stock," *The Journal of Finance*, 27(2), 1971, pp. 435-452.

Q. Can you summarize the results from applying the CAPM-based methodologies?

A. Yes. The results, adjusted to Nicor Gas' capital structure, are presented in Figure 13 below.[40]

Figure 13: **Gas Utility Sample CAPM-Based Results**

	Full Sample	Subsample
Range of Estimates	9.8% - 11.4%	9.8% - 11.3%
Reasonable Range	10% - 11%	10% - 11%

The CAPM estimated cost of equity for a gas utility with 54.206 percent equity has a somewhat wide dispersion, but a reasonable range is approximately 10 to 11.

E. THE DCF BASED ESTIMATES

1. Single- and Multi-Stage DCF Models

Q. Can you describe the DCF approach to estimating the cost of equity?

A. The DCF model attempts to estimate the cost of capital for a given company directly, rather than based on its risk relative to the market as the CAPM does. The DCF method simply assumes that the market price of a stock is equal to the present value of the dividends that its owners expect to receive. The method also assumes that this present value can be calculated by the standard formula for the present value of a cash flow—literally a stream of expected "cash flows" discounted at a risk-appropriate discount rate. When the cash flows are dividends, that discount rate is the cost of equity capital:

[40] Tables and supporting schedules detailing my cost of capital calculations for Gas Utility sample are contained in Exhibit 11.4.

$$P_0 = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \cdots + \frac{D_T}{(1+r)^T} \quad (6)$$

Where P_0 is the current market price of the stock;

D_t is the dividend cash flow expected at the end of period t;

T is the last period in which a dividend cash flow is to be received; and

r is the cost of equity capital.

Importantly, this formula implies that if the current market price and the pattern of expected dividends are known, it is possible to "solve for" the discount rate, $\boldsymbol{r}$ that makes the equation true. In this sense, a DCF analysis can be used to estimate the cost of equity capital implied by the market price of a stock and market expectations for its future dividends.

Many DCF applications assume that the growth rate will remain constant forever, so the formula can be rearranged to estimate the cost of capital. Specifically, the implied DCF cost of equity can then be calculated using the well-known "DCF formula" for the cost of capital:

$$r = \frac{D_1}{P_0} + g = \frac{D_0}{P_0} \times (1 + g) + g \quad (7)$$

where D_0 is the current dividend, which investors expect to increase at rate g by the end of the next period, and over all subsequent periods into perpetuity.

Equation (7) says that if equation (6) holds, the cost of capital equals the expected dividend yield plus the (perpetual) expected future growth rate of dividends. I refer to this as the single-stage DCF model; it is also known as the Gordon Growth model.[41]

Q. Are there different versions of the DCF model?

A. Yes. There are many alternative versions, notably (i) multi-stage models, (ii) models that use cash flow rather than dividends, or versions that combine aspects of (i) and (ii).[42] One such alternative expands the Gordon Growth model to three stages. In the multistage model, earnings and dividends can grow at different rates, but must grow at the same rate in the final, constant growth rate period.[43]

A common implementation of the multi-stage DCF is to assume that companies grow their dividend for five years at the forecasted company-specific rate of earnings growth, the growth then transitioning to over the next five years toward a forecast of the growth rate of the overall economy (*i.e.*, the long-term GDP growth rate forecasted to be in effect 10 years or more into the future). While variations of this model have historically been used many of its features are problematic in the current environment. In particular: (i) The current dividend yield may be lower than expected going forward for the reasons discussed in Figure 6 above, and (ii) the current GDP forecast is much lower than its historical average. Thus, the combination of these two elements is likely to lead

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41 The Gordon Growth model is among the models the ICC has reviewed in the past.

42 The Surface Transportation Board uses a cash flow based model with three stages. *See*, for example, Surface Transportation Board Decision, "STB Ex Parte No. 664 (Sub-No. 1)," Decided January 23, 2009. Confirmed in STB Docket EP No. 664 (Sub-No. 2), October 31, 2016.

43 *See* Exhibit 11.2 for further discussion of the various versions of the DCF model, as well as the details of the specific versions I implement in this proceeding.

to unusually low DCF estimates of the cost of equity. As a result, I believe the result merits less weight than the Gordon growth model discussed above.

Q. What are the relative strengths and weaknesses of the DCF versus CAPM based methodologies for estimating the cost of equity capital?

A. Current market conditions affect all cost of capital estimation models to some degree, but the DCF model has at least one advantage over the CAPM-based models as it includes contemporaneous stock prices and forward-looking growth, whereas the CAPM relies on historical data to estimate systematic risk and (in some cases) the market risk premium.

2. DCF Inputs and Results

Q. What growth rate information did you use?

A. I looked to a sample of investment analysts' forecasted earnings growth rates for companies in my samples. I used investment analyst forecasts of company-specific growth rates sourced from *Value Line* and Thomson Reuters *IBES*. For the multi-stage version, I also use Blue Chip growth forecasts.

Additionally, I relied on the dividend yields of the companies, which I estimate using the most recently available dividend information and the average of the last 15 days of stock prices. As the single largest advantage of the DCF model is that is uses current market information, I find it is important to use a relatively short time period to determine the dividend yield—yet to avoid the bias caused by using any one day. I believe a 15-day average accomplishes that goal. Because the stock prices of utilities currently are higher than they historically have been and because some companies engage in share buybacks,

the dividend yield underestimates the yield on cash distributions to investors. I have not adjusted for this in my calculations and therefore believe my estimates to be conservative.

Q. Please address the input data in the DCF model.

A. The Gordon Growth / single-stage DCF models require forecast growth rates that reflect investor expectations about the pattern of dividend growth for the companies over a sufficiently long horizon, but estimates are typically only available for three to five years.

One issue with the data is that it includes solely dividend payments as cash distributions to shareholders, while some companies also use share repurchases to distribute cash to shareholders. To the extent that companies in my samples use share repurchases, the DCF model using dividend yields will under estimate the cost of equity for these companies. While there are companies in my sample that have engaged in share buybacks in the past, the magnitude is currently not large.

A second issue is that the flight to quality has resulted in higher than usual stock prices for gas utilities and hence lower than usual dividend yields. As a result, the dividend yield may be downward biased. The multi-stage DCF model additionally requires a measure of the long-term expected GDP growth. While I commonly report the results from using the Blue Chip forecasted GDP growth, the current GDP growth forecast is substantially below what historically has been the case. I therefore also

calculate the multi-stage DCF using the historical GDP growth to assess the potential downward bias in the multi-stage DCF using Blue Chip forecasted growth.[44]

Q. What are the DCF based cost of equity estimates for the samples?

A. The results are presented in Figure 14 below.[45]

Figure 14: Range of DCF Results for Gas Utility Sample[46]

	Full Sample	Subsample
Range of Estimates	8.6% - 11.0%	8.8% - 11.0%

I believe that the simple DCF is a much more reasonable estimate at the current time than is the multi-stage DCF. The multi-stage DCF is impacted by both the very low dividend yield and low GDP rate, so I believe it deserves limited weigh. As a result, I find that a reasonable range for the DCF results is about 9.4 to 10.4 percent, which were derived as the subsample lower bound plus 60 basis point to the higher bound minus 60 basis points. In my judgment, it is appropriate to "narrow the range" of DCF estimates in this manner so as to recognize the potential biases from the two versions of the DCF. The single-stage DCF assumes that individual company growth rates will persist forever, which may not be appropriate if 3-5 year growth exceeds the perpetual growth rate potential of the larger economy. Conversely, as noted above, the multi-stage version of the DCF is

[44] I obtained data on the historical GDP growth from the Federal Reserve's FRED system: https://fred.stlouisfed.org/series/GDP/downloaddata

[45] Tables and supporting schedules detailing my cost of capital calculations are included in Nicor Ex. 11.4.

[46] I note that while the lower bound of my DCF based cost of equity range of estimates is determined using the Blue Chip forecasted GDP growth in the multi-stage model, using a long-term historical level of GDP growth (*e.g.*, the approximately 4.75 percent annual average GDP growth rate that has occurred over the most recent 30 years) would result in a cost of equity estimate of 9.3 percent for the full sample (9.5 percent for the subsample). I believe 9.5 percent represents a more reasonable lower bound for the DCF results, as opposed the numbers I derive using the unusually low current forecast from Blue Chip.

currently estimated using a lower-than typical estimate of long-term GDP growth (4.10 percent, compared to estimates in the range of 4.5 percent provided in recent years, and average annual historical GDP growth of 6.5 percent in the time-series maintained by the Federal Reserve Bank of St. Louis); this low forecast likely introduces a downward bias in the multi-stage DCF results by a non-trivial amount.

Q. How do you interpret the results of your DCF analyses?

A. The DCF model estimates a wide range from 8.6 percent to 11.0 percent, but I note that the combined impact of the elevated P/E ratios and the low GDP growth render the multi-stage DCF downward biased. In addition, there are cash distributions to shareholders other than dividends; *e.g.*, share buybacks. The presence of such un-accounted for cash distributions would bias the estimation results. This, however, appears to be of minor importance for the relied upon gas utilities. However, the midpoint estimate is downward biased due to the elevated P/E ratio and if the Gordon Growth model is assigned a higher weight, the DCF results support an ROE towards the upper end of the reasonable range shown of the estimated ROEs in Figure 14.

F. THE IMPLIED RISK PREMIUM MODEL ESTIMATES

Q. Did you estimate the cost of equity that results from an analysis of risk premiums implied by ROE's that were derived in past utility rate cases?

A. Yes. In this type of analysis, which I am calling the "implied risk premium model" to avoid potential confusion with more a broader set of approaches that are often categorized under the label of "risk premium" approaches, the cost of equity capital for utilities is estimated based on the historical relationship between ROE's derived in in past

utility rate cases and the risk-free rate of interest at the time the ROE's were derived. These estimates add a "risk premium" implied by this relationship to the relevant (prevailing or forecast) risk-free interest rate:

$$Cost\ of\ Equity = r_f + Risk\ Premium$$

Q. What are the merits of this approach?

A. First, it estimates the cost of equity from regulated entities as opposed to publicly-traded holding companies, so that the relied upon figure is directly applicable to a rate base. Second, the allowed returns are clearly observable to market participants, who will use this one data input to make investment decisions, so that the information is at the very least a good check on whether the return is comparable to that of other investments. Third, I analyze the spread between the allowed ROE at a given time and the then-prevailing interest rate to ensure that I properly consider the interest rate regime at the time the ROE was awarded. This implementation ensures that I can compare allowed ROE granted at different times and under different interest rate regimes.

Q. How did you use rate case data to estimate the risk premiums for your analysis?

A. The rate case data from 1990-2016 is derived from Regulatory Research Associates. ("RRA")[47] Using this data I compared (statistically) the average allowed rate of return on equity granted by U.S. state regulatory agencies in gas utility rate cases to the average

[47] SNL Financial as of January, 2017.

20-year Treasury bond yield that prevailed in each quarter.[48] In doing so, I use all available data from RRA. I calculated the allowed utility "risk premium" in each quarter as the difference between allowed returns and the Treasury bond yield, since this represents the compensation for risk allowed by regulators. Then I used the statistical technique of ordinary least squares ("OLS") regression to estimate the parameters of the linear equation:

$$Risk\ Premium\ =\ A_0\ +\ A_1\ \times\ (Treausury\ Bond\ Yield) \qquad (8)$$

I derived my estimates of A_0 and A_1 using standard statistical methods (OLS regression) and find that the regression has a high degree of explanatory power in a statistical sense ($R^2 = 0.829$) and the parameter estimates, $A_0 = 8.46$ percent and $A_1 = -0.554$, are statistically significant. The negative slope coefficient reflects the empirical fact that regulators grant smaller risk premiums when risk-free interest rates (as measured by Treasury bond yields) are higher. This is consistent with past observations that the premium investors require to hold equity over government bonds increases as government bond yields decline. In the regression described above the risk premium declined by less than the increase in Treasury bond yields. Therefore, the allowed ROE on average declined by less than 100 basis points when the government bond yield declined by 100 basis points. Based on this analysis, I find that the risk premium model

[48] I rely on the 20-year government bond to be consistent with the analysis using the CAPM to avoid confusion about the risk-free rate. While it is important to use a long-term risk-free rate to match the long-lived nature of the assets, the exact maturity is a matter of choice.

results applied using current treasury yields are consistent with an ROE of 10.07 to 10.25 percent for the average gas utility.[49]

Q. What conclusions did you draw from your risk premium analysis?

A. While risk premium models based on historical allowed returns are not underpinned by fundamental finance principles in the manner of the CAPM or DCF models, I believe this analysis, especially given the large body of data behind it, can provide useful benchmarks for evaluating whether the estimated ROE is consistent with recent practice. My implied risk premium model cost of equity estimates demonstrate that the results of my DCF and CAPM analyses are in line with the actions of utility regulators. Because the risk premium analysis as implemented takes into account the interest rate prevailing during the quarter the decision was issued, it provides a useful benchmark for the cost of equity in any interest environment.

VI. NICOR GAS' SPECIFIC CHARACTERISTICS AND THE COST OF EQUITY

A. RISK COMPARISON OF NICOR GAS TO SAMPLE COMPANIES

Q. How does Nicor Gas compare to the sample companies in terms of business risk?

A. Nicor Gas is a rate-regulated natural gas utility company. As discussed above, I selected publicly-traded sample companies that have a high proportion of their assets dedicated to rate-regulated natural gas utility operations. Thus, by virtue of being engaged in the same

[49] The 10.1 percent is consistent with the forecasted risk-free rate, while the 10¼ percent is consistent with the normalized risk-free rate.

line of business as the sample companies, Nicor Gas faces comparable business risk compared to those companies.

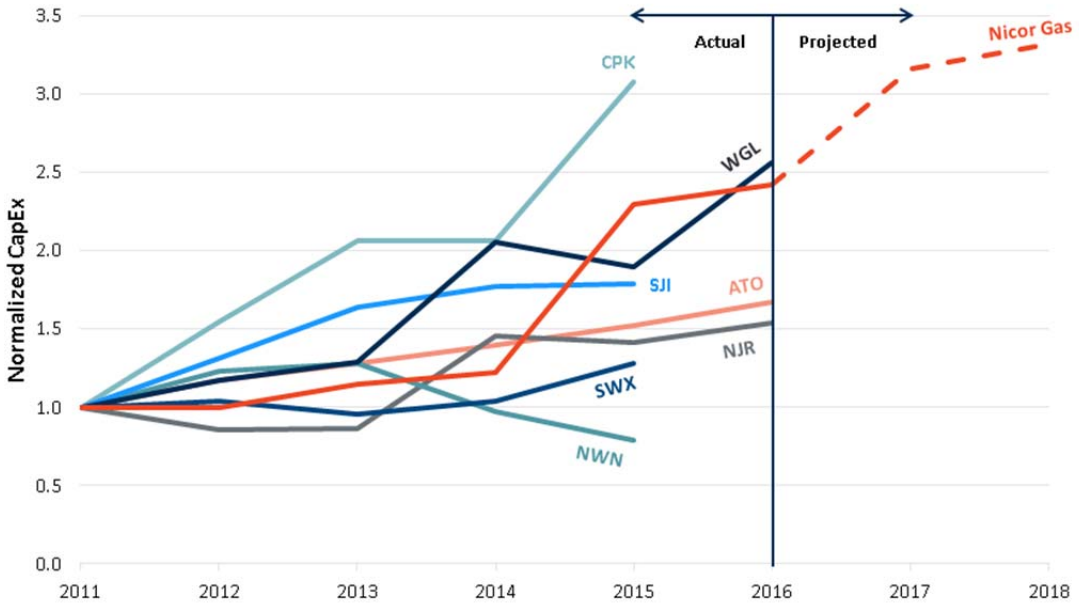
However, Nicor Gas has recently incurred substantial—and substantially increased—capital expenditures as it updates its distribution system. Nicor Gas has spent $476.9 million and $502.7 million on capital expenditure programs in 2015 and 2016, respectively.[50] The large capital expenditure program increases the risk associated with Nicor Gas, because it imposes a higher degree of fixed costs and thereby increases its "operating leverage."

Q. Have Nicor Gas' capital expenditures increased more substantially than those of the natural gas utility companies in your sample?

A. Yes. While the natural gas utility industry in general is facing increased capital spending requirements to repair and replace aging distribution infrastructure, Nicor Gas' expenditures have increased more rapidly than those of the proxy group companies. This is illustrated in Figure 15 below, which compares the trajectory of capital expenditures for Nicor Gas and the sample companies, with each company's spending indexed to its 2011 levels.

[50] Schedule B-5; Nicor Gas Capital Spend 2011-2015, MEM 1.03 Supp. Ex. 1, ICC Docket No. 15-0558.

Figure 15
Recent and Forecasted Capital Expenditure Growth
For Nicor Gas and Natural Gas Sample Companies



Source: Capital IQ and Nicor Gas.

As the figure demonstrates, Nicor Gas' capital expenditures have growth faster between 2011 and 2015 / 2016 than any members of the sample except Chesapeake Utilities and WGL Holdings (which are the two companies I exclude from my subsample). This growth is driven primarily by the steep increase in 2015 and 2016 associated with the onset of QIP spending.[51] Furthermore, Nicor Gas' expected capital spending in 2017 and 2018 continues the trend of rapid increase. This means Nicor Gas' increased capital spending requirements are at the high end of the sample group.

[51] Direct Testimony of Patrick E. Whiteside, Nicor Gas Ex. 6.0; Nicor Gas Ex. 6.1.

Q. How does increased capital expenditure and operating leverage increase business risk?

A. Increased capital expenditure increases fixed costs (*e.g.*, depreciation) and the higher fixed costs are relative to revenue, the higher is the company's operating leverage. As illustrated in Figure 16, operating leverage increases the company's exposure to income fluctuations. In the example below, I consider two utilities: Utility A and Utility B. Each utility as a benchmark expects revenues of $1,000 and total costs (fixed and variable) of $900. However, while fixed costs are only 40% of Utility A's revenue, they make up 60% of Utility B's revenue. At the same time, variable costs are 50% of revenues for Utility A but only 30% of revenues for Utility B. In the top panel of Figure 16, the expected outcome is shown and illustrate that both entities expect to earn a net income of $100.

However, if revenues decline by 10% as shown in the bottom panel of the figure, Utility B will experience a greater shock to its income (equity return) than Utility A. This is because variable costs can be expected to decline in proportion to revenue, but fixed costs are just that—fixed. Therefore a degree of operating leverage (*i.e.*, a higher proportion of fixed costs in the cost structure) increases risk to equity holders all else equal. This is important in the context of determining Nicor Gas' allowed ROE because the Company's high and increasing level of capital expenditure amplifies operating leverage, making the Company's income (and therefore its equity return) more volatile.

Figure 16
Illustration of Risk Imposed by Operating Leverage

		Utility A	Utility B
Revenue	[a]	$1,000	$1,000
Variable Costs	[b]	($500)	($300)
Fixed Costs	[c]	($400)	($600)
Net Income	[d] = sum([a]:[c])	$100	$100
As Revenue and Variable Costs Decline by 10%...			
Revenue	[e] = [a] x (90%)	$900	$900
Variable Costs	[f] = [b] x (90%)	($450)	($270)
Fixed Costs	[g] = [c]	($400)	($600)
Net Income	[h] = sum([e]:[g])	$50	$30
Decline in Income	[i] = [h] - [d]	($50)	($70)
Percentage Decline in Income	[j] = [i] / [d]	-50%	-70%

Q. Have you compared Nicor Gas' degree of operating leverage to that of the sample companies?

A. Yes. Figure 17 below presents the ratio of revenue to gross property plant and equipment ("PP&E" or "plant") for Nicor Gas and the sample companies in several recent years. This ratio provides a measure of operating leverage, with a lower ratio representing greater leverage. Two things are clear from the table. First, operating leverage for natural gas utilities has increased recently, as one would expect based on their increasing capital spending requirements. For example, the average sample company generated approximately 70 cents of revenue for each dollar of plant assets in service in 2011, but was able to generate less than 50 cents per dollar of PP&E in 2015.[52] Second, Nicor Gas

[52] Each individual sample company has exhibited this downward trend in revenue per unit of plant, and it has continued into 2016—at least for those companies that had issued their 2016 10-Ks at the time of writing.

exhibits a higher degree of operating leverage than the average sample company, and (as expected based on its substantially increased capital spending) has seen a significant drop in revenue per gross PP&E since 2014. Indeed, in 2015, Nicor Gas generated only 29 cents of revenue per dollar of plant assets—nearly 30% lower than the sample average, and lower than every sample company except for Northwest Natural Gas.

Figure 17
Operating Leverage Comparison
Nicor Gas and Gas Utility Sample Companies

		Revenue / Gross PP&E					
		2011	2012	2013	2014	2015	2016
		[1]	[2]	[3]	[4]	[5]	[6]
Atmos Energy	[a]	0.61	0.47	0.52	0.57	0.37	0.33
Chesapeake Utilities	[b]	0.67	0.56	0.55	0.56	0.43	
New Jersey Resources	[c]	1.65	1.20	1.58	1.52	0.87	0.66
Northwest Nat. Gas	[d]	0.31	0.26	0.26	0.25	0.23	
South Jersey Inds.	[e]	0.48	0.36	0.32	0.34	0.32	
Southwest Gas	[f]	0.37	0.36	0.34	0.35	0.38	
WGL Holdings Inc.	[g]	0.74	0.62	0.59	0.61	0.50	0.41
Sample Average	[h]	0.69	0.55	0.59	0.60	0.44	0.47
Nicor Gas	[i]				0.47	0.29	0.25

Sources and Notes:
[1] - [6]: Capital IQ.
[h]: Average([a] - [g])
[i]: Provided by Nicor Gas.

Q. What do you conclude from your analysis of Nicor Gas' capital expenditures and operating leverage relative to the natural gas utilities sample?

A. I conclude that Nicor Gas is exposed to a higher than average level of risk based on operating leverage when compared to the sample companies. This is because its substantial and accelerating capital spending program leads it to generate less revenue per unit of investment in fixed plant assets. Because these fixed costs—unlike variable

costs—cannot be avoided if sales decrease for some reason (and conversely do not increase when sales increase), Nicor Gas is exposed to greater likelihood of variability in its cash flows correlated with economic ups and downs. This equates to higher systematic risk for which investors require compensation in the form of higher expected returns.

Q. Are there any other Nicor Gas-specific considerations relevant to determination of its allowed ROE?

A. Yes. I am informed by Nicor Gas that it incurred flotation costs associated with its equity issuances that have never been recovered in rates.[53] These costs took the form of underwriting fees paid at the time the shares were issued, and amounting to just over 2.5 percent (on average) of the proceeds raised by the issuances.[54] The effect of these fees is that only $97.5 out of every $100 raised in equity issuances was actually available to fund Nicor Gas' rate base, with the other 2.5 percent representing a necessary cost associated with financing investment and operations. Since these costs were not recovered as expenses at the time they were incurred, they should appropriately be recovered via an adjustment to the return on equity going forward.

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[53] Direct Testimony of Elizabeth W. Reese, Nicor Gas Ex. 2.0; Final Order at 94, ICC Docket No. 04-0779 (September 20, 2004); Nicor Gas Ex. 24.0, Ruschau Rebuttal, ICC Docket No. 08-0363 (the Company agreed to withdraw its request to recover these costs in order to narrow the issues, while preserving its right to recover such costs in the future).

[54] *See* Schedule D-5 (The precise share of proceeds spent on flotation costs averaged over the four specific issuances was 2.54 percent) Contemporaneous documents associated with each issuance for which there are unrecovered issuance expense are provided by Nicor Gas as part of its workpapers in support of Schedule D-5 and are also included in Schedule D-6.

Q. How can Nicor Gas' ROE be adjusted to allow recovery of equity issuance costs?

A. A standard approach to adjusting the allowed ROE to provide recovery of all past equity issuance costs can be implemented via a straightforward adjustment to the single-stage DCF model. In place of the standard single-stage DCF formula (equation 7), the following formula is used.

$$r = \frac{D_1}{P_0(1-f)} + g$$

where f is the percentage of proceeds lost to underwriting fees or other flotation costs. This formula recognizes that if shares trade at (for example) $100, but 2.5 percent of the proceeds of the initial issuance of those shares was spent on underwriting fees, only $\$100 \times (1 - 0.025) = \$97.5$ represents value invested in cash-flow generating assets. Therefore it is relative to this "adjusted" price—not the nominal market price—that investors' required return should be measured.

Comparing the flotation cost-adjusted formula to the standard DCF formula for values of the dividend yield, growth rate, and financial leverage that are representative of the natural gas utility sample (*see* Figure 18 below), I find that 10 basis points is an appropriate ROE adjustment to allow recovery of costs amounting to 2.5 percent of equity issuance proceeds.

Figure 18
Representative Flotation Cost Adjustment

		Without Flotation Cost Adjustment	With Flotation Cost Adjustment
[1]		[2]	[3]
Flotation cost share of issuance proceeds	[a]		2.54%
Dividend Yield (D1/P0)	[b]	2.50%	2.57%
Growth Rate	[c]	6.50%	6.50%
Simple DCF Cost of Equity	[d]	9.00%	9.07%
Equity to Market Value Ratio	[e]	0.700	0.700
Debt to Market Value Ratio	[f]	0.300	0.300
Implied Marginal Cost of Debt	[g]	4.4%	4.4%
Tax Rate	[h]	40%	40%
Simple DCF Overall Cost of Capital	[i]	7.09%	7.14%
Nicor Gas's Regulatory Equity %	[j]	0.542	0.542
Nicor Gas's Regulatory Debt %	[k]	0.458	0.458
Nicor Gas's Implied Marginal Cost of Debt	[l]	4.3%	4.3%
Implied Cost of Equity	[m]	10.90%	10.99%

Sources and Notes:
[3,a]: Nicor Gas
[3,b] = [2,b] / (1 - [3,a])
[b]-[c],[e]-[h]: Representative sample value. See Ex. 11.4, Table No. BV-7.
[d] = [b] + [c]
[i] = [e]*[d] + [f]*[g]*(1 - [h])
[j]-[l]: Nicor Gas capital structure. See Ex. 11.4, Table No. BV-8.
[m] = ([i] - [k]*[l]*(1 - [h]) / [j]

B. RECOMMENDED ALLOWED ROE FOR NICOR GAS

Q. Please summarize your ROE evidence.

A. Based on my application of standard cost of capital models to a representative sample (and sub-sample) of publicly-traded natural gas utility companies—with appropriate adjustments for differences in financial leverage I derived the range of cost of equity estimates displayed in Figure 19 below.

Figure 19: Range of ROE Estimates for Gas LDCs

	Sub-sample Range	Reasonable Range
CAPM	9.8% - 11.3%	10% - 11%
DCF	8.8% - 11.0%	9.4% - 10.4%
Risk Premium	10.1% - 10.3%	10.1% - 10.3%
Reasonable Range	10 ¼ - 10 ¾ percent	

***** Derived as lower bound plus 0.6 percent to upper bound minus 0.6 percent

Based on my assessment of the merits of the various models and their results as affected by prevailing economic and capital market conditions, I find that an ROE in the range of 10¼ to 10¾ percent is reasonable for the gas distribution utilities when applied to a 2018 test-year capital structure with 54.206 percent equity. I further note that the primary methods relied upon, such as the CAPM and DCF, are similar to those used in Nicor Gas' previous ratemaking proceedings.

Q. What do you recommend for Nicor Gas' allowed return on equity?

A. I recommend an allowed ROE of 10.7 percent for Nicor Gas. That figure is near the high end of my recommended range of 10¼ to 10¾ percent for the cost of equity of a typical sample natural gas utility with Nicor Gas' business risk and financial leverage. My determination that the Company should earn an ROE near the high end—rather than at the midpoint (about 10.5 percent)—of that range is based on (i) my conclusion that Nicor Gas' accelerating capital expenditure program and commensurate increased operating leverage causes it to have somewhat higher risk than the sample companies, and (ii) my recommendation that Nicor Gas be allowed an upward adjustment of approximately 10 basis points to account for unrecovered flotation costs associated with past equity issuances.

VII. NICOR GAS' ACQUISITION AND THE COST OF CAPITAL

Q. In evaluating the cost of capital for Nicor Gas, did you consider whether the acquisition of Nicor Gas has impacted its cost of capital?

A. Yes. As required in the ICC's Order in Docket No. 15-0558 I analyzed "the impact, if any, of Nicor Gas' affiliation with Southern Company and its other subsidiaries on the cost of capital of Nicor Gas."[55] Because Nicor Gas is financed partly with equity and partly with debt, I considered the impact, if any, on both sources of capital. I first observe that the cost of capital is determined by risk of the assets and not by the owner—a fundamental principle I took into account by using a sample of comparable local gas distribution utilities to derive the cost of equity. Second, because I understand it to be ICC practice to apply an embedded cost of debt when setting rates for Nicor Gas and other regulated utilities, I studied composition of Nicor Gas' debt financing as well as developments in its credit ratings.

Q. What finance principles are relevant to the question of whether Nicor Gas' acquisition by Southern affected its cost of capital?

A. As explained above in Section III, the cost of capital for a company or business represents the minimum expected return required by capital market participants to invest in that venture or in an alternative investment of equivalent risk. Importantly, it is the risk associated with a particular project or business venture—*not* the risk of the company (or other ownership entity) undertaking the project—determines what investors'

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[55] ICC Order in Docket No. 15-0558, Appendix A, issued June 7, 2016.

(equivalent risk) alternatives are, and thus determines the risk-appropriate expected return they require to invest in the venture. Professors Brealey, Myers, and Allen articulate this fundamental principle succinctly in their seminal corporate finance textbook *Principles of Corporate Finance*, stating that, "[*t]he opportunity cost of capital depends on the use to which that capital is put,"* and "[t]he true cost of capital depends on project risk, not on the company undertaking the project."[56]

The intuition behind this principal can be illustrated by way of an example. Suppose a company whose primary business is oil exploration and production purchases a building to house some of its corporate offices, and decides to lease out some of the unused space to other businesses. The company has made an investment in the commercial real estate business, and the profit it can expect to generate from this business is that corresponding to the risks inherent in the commercial real estate market—not the oil exploration and production industry.

While the contrast may be somewhat less stark in the case of Southern's ownership of Nicor Gas, the concept holds just as true. In addition to owning Nicor Gas and several other natural local gas distribution utilities via its 2016 acquisition of AGL Resources (now called Southern Company Gas), Southern owns several vertically integrated rate-regulated electric utility operating companies in the southeastern United States, as well as Southern Power, an operating subsidiary that "constructs, acquires, owns, and manages power generation assets, including renewable energy projects, and

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[56] Richard A. Brealey, Stewart C. Myers, and Franklin Allen, *Principles of Corporate Finance*, 11th Edition (2014) pp. 219-220.

sells electricity at market-based rates in the wholesale market."[57] Each of these entities will have a cost of capital that corresponds to the risks of the assets in the specific line of business in which it operates.

Q. What are the implications of this principal for the determination of Nicor Gas' cost of capital in a regulatory context?

A. A near-universal practice in rate-of-return regulation in the United States (and elsewhere) is that the rate requirement for the regulated entity should be determined by treating that entity on a stand-alone basis. In other words, the cost of capital is determined for—and based on the characteristics of—the specific utility that is the subject of regulation, rather than for some other corporate entity that owns or is otherwise affiliated with the subject utility. This aligns with the finance principle outlined above as well the enduring precedents established in the *Hope* and *Bluefield* decisions. To implement this principle, I selected a sample of comparable local gas distribution utility companies to estimate the cost of equity for Nicor Gas—hence attempting to capture the risk of the underlying assets and the line of business in which they are used.

Q. Are there any practical nuances of rate-regulation that could make it possible for changes in ownership to affect Nicor Gas' cost of debt?

A. Yes. Nicor Gas (like most rate regulated utilities in the U.S.) recovers the "embedded cost of debt," which reflects the actual interest payments (as well as issuance cost, and any discounts or premia) that Nicor Gas will incur during the test period. The

[57] Southern's 2016 SEC Form 10-K, p. II-145 (Note 13 to Consolidated Financial Statements, titled "Segment and Related Information")

determination of the amount is based on the specific debt issuances (including past issuances) that will be outstanding during the test period. Consequently, the potential exists for Nicor Gas' embedded cost of debt to have changed as the result of a merger or acquisition if the ownership change lead to a restructuring of the Company's debt securities.

Q. Is it the case that Southern's 2016 acquisition of AGL Resources caused changes in the debt financing of Nicor Gas?

A. No. A study and comparison of AGL Resources' 2015 SEC Form 10-K and Southern Company Gas' 2016 SEC Form 10-K suggests that Nicor Gas' debt financing policy was unchanged by the acquisition, and that specific changes in Nicor Gas' debt securities during 2016 resulted from the maturing of certain long-term debt, rather than any restructuring by its new owners. Moreover, these annual reports indicate that the debt financing policy for Nicor Gas—a policy which appears to have survived the acquisition unchanged—treats Nicor Gas' debt securities as separate and segregated from bond issuances, credit facilities, and commercial paper programs used to finance the other gas utilities owned by Southern Company Gas. For example, Southern Company Gas' 2016 10-K states

> Southern Company Gas' 100% -owned subsidiary, Southern Company Gas Capital, was established to provide for certain of Southern Company Gas' ongoing financing needs through a commercial paper program, the issuance of various debt, hybrid securities, and other financing arrangements. Southern Company Gas fully and unconditionally guarantees all debt issued by Southern Company Gas Capital and the gas facility revenue bonds issued by Pivotal Utility Holdings. **Nicor Gas is**

not permitted by regulation to make loans to affiliates or utilize Southern Company Gas Capital for its financing needs.[58]

Nicor Gas' parent company annual reports—both before and after the Southern acquisition—also make specific statements regarding the restriction and segregation of Nicor Gas' long-term borrowing (in the form of first mortgage bonds secured by its assets) and short-term borrowings (in the form of bank credit facilities and commercial paper programs).[59]

Given that Nicor Gas' assets are financed by debt securities restricted to that purpose, and that Nicor Gas cannot receive financing from its parent or affiliate entities, it would be difficult to see how any changes in Nicor Gas' embedded cost of debt could be attributed directly to the change of ownership during 2016.

Q. What about any impact the acquisition may have had on Nicor Gas' credit ratings?

A. Credit ratings by the major credit ratings agencies (*e.g.*, S&P, Moody's, and Fitch) contribute substantially to the Company's ability to raise debt capital and the terms under which it can do so. While any changes in Nicor Gas' credit ratings around the time of the merger would not directly affect its embedded cost of debt, such changes could influence any new debt securities it might issue going forward, and so could be considered relevant to the question of how the acquisition affected its cost of capital.

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[58] Southern's 2016 SEC Form 10-K, p. II-625 (Note 6 to Financial Statements of Southern Company Gas and Subsidiary Companies, titled "Financing") (emphasis added). AGL Resources' 2015 10-K contains an analogous statement, at p. 83 (Note 9 to Consolidated Financial Statements, titled "Debt and Credit Facilities").

[59] *See* Southern's 2016 SEC Form 10-K, pp. II-626 and II-627 and AGL Resources' 2015 SEC Form 10-K, pp. 83-84.

A review of credit rating agency reports since the August 24, 2015 announcement of Southern's acquisition of AGL Resources reveals that the transaction was likely neutral to slightly positive from the standpoint of Nicor Gas' credit ratings. On the day of the announcement Moody's affirmed its long-term and short-term issuer ratings for both Nicor Gas and AGL Resources, stating that "[t]he acquisition by Southern does not impact the fundamentals of AGL [Resources] and Nicor Gas' credit profiles. We expect AGL [Resources] to continue to execute its capital investment program…."[60]

Similarly, Fitch affirmed Nicor Gas' ratings and outlook on announcement of the merger, even while placing Southern on "negative watch" and AGL Resources on "positive watch." Fitch stated that it "expects Nicor Gas' credit metrics to remain strong for its rating category with sufficient headroom to absorb potential regulatory concessions required for merger approval," but also noted that "[a]n upgrade at AGL [Resources] as a result of this transaction will not warrant a positive rating action at [Nicor Gas] due to the expected low level of synergy benefits for Nicor and relatively restrictive Illinois regulations."[61]

S&P, which emphasizes a "group" approach to determining ratings for affiliated entities, viewed the merger announcement as a positive for AGL Resources and its subsidiaries, including Nicor Gas, ultimately upgrading the long-term issuer ratings for

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[60] Moody's Rating Action: "Moody's affirms AGL Capital and Nicor Gas; outlooks stable," issued August 24, 2015.

[61] Fitch Ratings: "Fitch Places Southern on Negative Watch & AGL on Positive Watch Following Acquisition Announcement," issued August 24, 2015.

those subsidiaries from BBB+ to A- upon the closing of the transaction.[62] However, S&P's ratings justifications did not take explicit account of the fact that Nicor Gas' debt is restricted and segregated from that of the other affiliates.

Q. What do you conclude regarding the impact, if any, on Nicor Gas' cost of capital of its affiliation with Southern?

A. Under standard regulatory principles and the implementation hereof (*e.g.*, reliance on a comparable sample), there is no impact on the cost of equity. Further, because Nicor Gas' debt financing is (and was) separate from that of the other gas utility companies that make up Southern Company Gas (formerly AGL Resources), any changes in its embedded cost of debt during 2016 cannot reasonably be attributed to the acquisition transaction. This finding is supported by the fact that the major credit rating agencies do not perceive material changes to Nicor Gas' credit profile as a result of the Southern / AGL Resources merger.

Q. Does this conclude your direct testimony?

A. Yes.

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[62] S&P Global RatingsDirect: "AGL Resources Inc. And Subs Rating Raised to 'A-' on Close of Acquisition By Southern Co.; Outlook Negative," issued June 30, 2016.