

**BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO**

In the Matter of the Application of)	
Columbia Gas of Ohio, Inc. for Authority)	
to Amend its Filed Tariffs to Increase the	)	Case No. 21-637-GA-AIR
Rates and Charges for Gas Services and)	
Related Matters.)	
)	
In the Matter of the Application of)	
Columbia Gas of Ohio, Inc. for Approval	)	Case No. 21-638-GA-ALT
of an Alternative Form of Regulation.)	
)	
In the Matter of the Application of)	
Columbia Gas of Ohio, Inc. for Approval)	
of a Demand Side Management Program	)	Case No. 21-639-GA-UNC
for its Residential and Commercial)	
Customers.)	
)	
In the Matter of the Application of)	
Columbia Gas of Ohio, Inc. for Approval	)	Case No. 21-640-GA-AAM
to Change Accounting Methods.)	

**SUPPLEMENTAL DIRECT TESTIMONY OF KARL RÁBAGO
ON BEHAF OF ENVIRONMENTAL LAW & POLICY CENTER**

November 14, 2022

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1 **I. BACKGROUND AND QUALIFICATIONS**

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

3 A. My name is Karl R. Rábago. I am principal of Rábago Energy, LLC, a Colorado limited
4 liability company. My business address is 2025 E. 24th Avenue, Denver, Colorado.

5 **Q. Who are you testifying on behalf of in this proceeding?**

6 A. I am testifying on behalf of Environmental Law and Policy Center (ELPC).

7 **Q. Please summarize your experience and expertise in the field of electric utility
8 regulation.**

9 A. I have worked for more than 30 years in the electricity industry and related fields. I am
10 actively involved in a wide range of electric utility issues across the United States. My
11 previous employment experience includes Commissioner with the Public Utility
12 Commission of Texas, Deputy Assistant Secretary with the U.S. Department of Energy,
13 Vice President with Austin Energy, Executive Director of the Pace Energy and Climate
14 Center, Managing Director with the Rocky Mountain Institute, and Director with AES
15 Corporation, among others. A detailed resume is attached as Exhibit ELPC-Rábago-1.

16 **Q. Do you have any specific experience relating to rate making and rate design?**

17 A. Yes. As a public utility commissioner for the Public Utility Commission of Texas, I
18 reviewed and made decisions on hundreds of rate applications by investor-owned,
19 cooperative, and publicly-owned electric and telephone utilities. As an electricity sector
20 executive, I have led or advised in the formulation of rate designs of many types and have
21 proposed and overseen application of rates for a variety of services. As a law professor, I
22 have taught the principles of rate making to law students. As an expert witness, I have
23 reviewed and testified in regulatory commission proceedings on the merits of scores of

1 rate proposals from investor-owned, cooperative, and publicly owned electric utilities. I
2 have written and published articles on rate design, especially as it relates to distributed
3 energy resources.

4 **Q. Do you have any specific experience regarding energy justice,¹ especially as relates**
5 **to low- and moderate-income customers?**

6 A. Yes. I have written, spoken publicly, and worked with groups focused on energy justice
7 and access to clean energy resources for thirty years. As a public utility commissioner, I
8 co-authored, with commission staff, a paper on low-income electric ratepayer services for
9 presentation at a National Association of Regulatory Utility Commissioners (NARUC)
10 conference. As a commissioner, I also made decisions about low-income electricity and
11 telephone service rates. I am a founding member of the board of the Center for Resource
12 Solutions, a non-governmental organization that offers a certification program featuring
13 the Green-e® label to provide consumers with a trustworthy indicator of environmental
14 value in voluntary green power markets. As a utility executive, I have overseen
15 deployment of both federally-funded and core utility-funded weatherization programs for
16 low-income customers, as well as energy efficiency programs tailored to reach low-
17 income electricity customers. In my work at the AES Corporation, I supported regulatory

¹ The term “energy justice” is often expressed as “energy equity” and has the same meaning. Energy justice refers to the goal of achieving equity in both social and economic participation in the energy system, while also remediating burdens on those historically harmed by the energy system. Energy justice is essential to achieving a just transition to a low-carbon, regenerative energy economy, and is focused on fairness and equity and the avoidance and remediation of policy and regulation that create or advance improper or unfair discrimination in design or effect. Energy justice is characterized by the advancement of energy democracy, the alleviation of energy insecurity, the reduction of energy burdens, and the alleviation of energy poverty, including clean energy poverty. *See generally*, S. Baker, S. DeVar & S. Prahash, *The Energy Justice Workbook, Section 1 – Defining Energy Justice*, Initiative for Energy Justice (Dec. 2019), available at: <https://iejusa.org/wp-content/uploads/2019/12/The-Energy-Justice-Workbook-2019-web.pdf>.

1 affairs teams at utilities on rate making issues in countries with large low-income
2 populations, including Cameroon, in Central and South America, and the Ukraine. I
3 served as a member of the board of the Texas Ratepayers Organization to Save Energy, a
4 non-profit organization advocating low-income consumer issues and energy efficiency
5 programs. I have submitted expert testimony in dozens of regulatory proceedings on
6 shared and community solar programs, fixed customer charges, return on equity,
7 minimum bills, and other issues.

8 **Q. Have you ever testified before the Public Utilities Commission of Ohio**
9 **(Commission) or other regulatory agencies?**

10 A. I submitted testimony in Commission Case Nos. 14-1693-EL-RDR, 14-1297-EL-SSO,
11 and 16-1852-EL-SSO, also on behalf of ELPC. In the past ten years, I have submitted
12 testimony, comments, or presentations in proceedings in Alabama, Arkansas, Arizona,
13 California, Colorado, Connecticut, District of Columbia, Florida, Georgia, Guam,
14 Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Massachusetts, Michigan,
15 Minnesota, Mississippi, Missouri, Nevada, New Hampshire, New York, North Carolina,
16 Ohio, Pennsylvania, Puerto Rico, Rhode Island, Texas, Vermont, Virginia, Washington,
17 and Wisconsin. I have also testified before the U.S. Congress and have been a participant
18 in comments and briefs filed at several federal agencies and courts. A listing of my
19 previous testimony is attached as Exhibit ELPC-Rábago-2.

20 **II. PURPOSE OF TESTIMONY AND RECOMMENDATION**

21 **Q. What is the purpose of your testimony?**

22 A. My testimony explains why the Commission, based on the standard that it applies in
23 reviewing such proposals, should reject the proposed non-unanimous settlement as

1 memorialized in the Stipulation and Recommendation (Stipulation) entered into among
2 the signatory parties in this proceeding.

3 **Q. What is your understanding of the approach that the Commission has previously**
4 **adopted in reviewing a non-unanimous stipulation instead of requiring a full and**
5 **public hearing on the issues prior to entering an order?**

6 A. The Commission is not bound by any settlement proposed by the parties. The
7 Commission has stated that the ultimate issue for its consideration is whether the
8 agreement is reasonable and should be adopted.² Further, in considering the
9 reasonableness of a proposed non-unanimous settlement stipulation, the Commission has
10 used the following three criteria:³

- 11 • Is the settlement a product of serious bargaining among capable, knowledgeable
12 parties?
- 13 • Does the settlement, as a package, benefit ratepayers and the public interest?
- 14 • Does the settlement package violate any important regulatory principle or practice?

15 **Q. Have you reviewed the proposed settlement terms, the supporting testimony, and**
16 **other relevant materials in this case?**

17 A. Yes.

18 **Q. What issues did you focus on in your review of the proposed settlement?**

19 A. My testimony focuses on the proposed fixed customer charges for the Small General
20 Service (SGS) rate, which applies to residential and other small customers. In addition, I

² *In re Ohio Energy Company*, Case No. 20-585-EL-AIR, et al., Opinion and Order (Nov. 17, 2021) at ¶ 95.

³ *Id.*

1 address the proposal to eliminate substantial portions of the utility-funded demand-side
2 management (DSM) programs.

3 **Q. Why do you focus on those issues?**

4 A. According to the U.S. Energy Information Administration (EIA), and as shown in Figure
5 KRR-1, below, the price of gas delivered to residential customers has skyrocketed this
6 year, nearly quadrupling through July of 2022.⁴ The EIA forecasts that gas prices during
7 the winter of 2022-23 will be 37% higher than the year before, and if temperatures
8 average 10% colder than normal, gas prices could be 50% higher than the year before.⁵
9 Increased commodity prices for gas will hit Ohioans hard this winter, especially as
10 inflation takes huge bites out of household budgets.⁶ According to Company data, the
11 average residential customer bill for the first nine months of 2022 was \$95.38, which
12 greatly exceeds the full year average residential bills of \$77.56, \$66.05, and \$71.41 for
13 2021, 2020 and 2019 respectively.⁷ These impacts will hurt low-wealth customers and
14 those on fixed incomes the hardest. The excessive fixed customer charges proposed by
15 the Company and supported by the Stipulation and settling parties are economically
16 regressive—they disproportionately burden those least able to afford them—and are
17 unjustified as a matter of sound rate making and regulatory principles. Contrary to
18 regulatory common sense and the experience and practice across the nation, the
19 Stipulation meets the increased costs of gas and growing energy burdens for Ohioans
20 with a proposal to eliminate efficiency programs for all customers except those qualifying

⁴ https://www.eia.gov/dnav/ng/ng_pri_rescom_a_EPG0_PRS_DMcf_m.htm

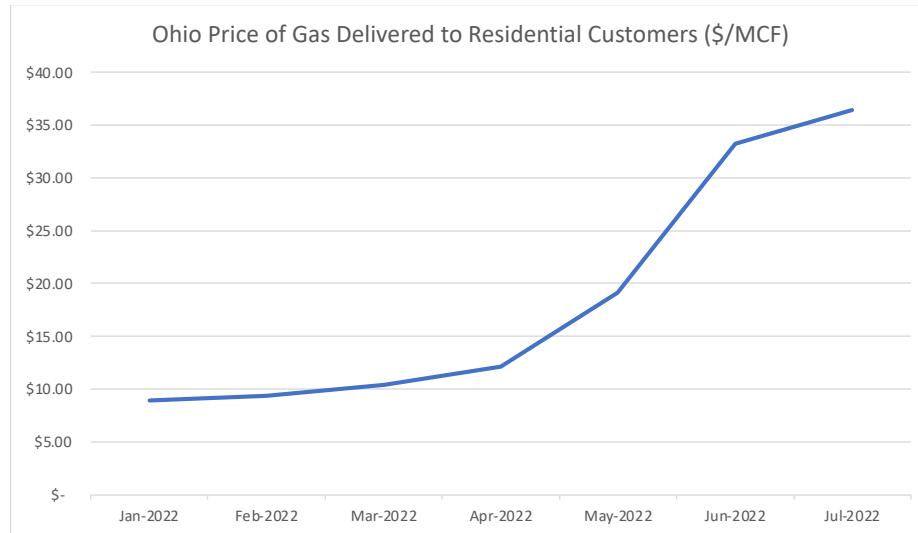
⁵ <https://www.eia.gov/outlooks/steo/report/winterfuels.php>

⁶ See Company Response to ELPC Int.-1-1 Att. A at Line 18

⁷ *Id.*

1 for Warm Choice. The proposed fixed customer charge settlement terms are, very simply,
2 cruel, unjust, and unnecessary.

5 Figure KRR-1: Ohio Residential Delivered Gas Prices, 2022



6
7 **Q. And what is your conclusion based on your review of the proposed fixed customer**
8 **charges and DSM program reductions reflected in the Stipulation?**

9 A. I conclude that the proposed settlement, as set forth in materials submitted by the settling
10 parties, and as to the proposed fixed customer charges and DSM program reductions, is
11 not reasonable and fails to meet the standard established in Commission precedent. First,
12 there is no objective and verifiable evidence that the proposed settlement is the result of
13 serious bargaining. Second, the excessively regressive fixed customer charges and
14 substantial reduction in efficiency programs means that the settlement, as a package, is
15 inconsistent with the public interest. Third, the fixed customer charges proposed in the
16 settlement are inconsistent with the principles of sound rate making and important
17 regulatory principles.

1 **Q. What is your recommendation to the Commission based on your review of the**
2 **Stipulation?**

3 A. I recommend that the Commission reject the Stipulation and proposed settlement as a
4 package and proceed with a full hearing on the merits. Short of a rejection of the full
5 Stipulation, the Commission should order a redesign of base rates to recover demand-
6 driven fixed costs through volumetric rates, a reduction in the ROE consistent with the
7 reduced financial risk faced by the Company, elimination of the moratorium on new
8 DSM programs, and reinstatement of all DSM programs proposed by the Company and
9 other parties.

10 **III. THE “SERIOUS BARGAINING” TEST**

11 **Q. Is there evidence in the Stipulation and proposed settlement, or in the supporting**
12 **testimony, that supports a Commission finding that the proposed fixed customer**
13 **charges for residential customers or the elimination of DSM programs are a product**
14 **of “serious bargaining?”**

15 A. No. The testimony supporting the Stipulation and proposed settlement from various
16 settling parties is conclusory and contains no objective evidence that the proposed SGS
17 fixed customer charges or the dramatic reductions in residential DSM programs resulted
18 from serious bargaining.

19 **Q. What do the settling parties assert?**

20 A. The settling parties assert that the settlement reflects lower rates than the Company asked
21 for.⁸ But that doesn’t prove in any way that serious bargaining led to the changes in the

⁸ Lipthrott (PUCO) Direct Testimony at p. 4 line 10 through p.7 line 6; Adkins (OCC) Supp. Testimony at p. 6, line 3 through p. 10, line 20.

1 settlement. In my thirty years of experience, I have seldom seen a utility ask for just what
2 they want, especially if settlement is likely. Indeed, the Company proposed SGS fixed
3 customer charges that would reach \$80 per customer per month.⁹ Serious bargaining is
4 not required to move a utility from an outrageous position, and I see no evidence in the
5 Stipulation, proposed settlement, or supporting testimony that would support a
6 Commission finding that the fixed customer charges proposed for residential customers,
7 or even the settlement as a whole, resulted from such negotiations.

8 **Q. Can you point to any evidence that serious bargaining did not occur?**

9 A. Yes. On page three of the Stipulation, at footnote 3, it states that: “OCC and NOPEC are
10 not taking a position with regard to the use of fixed charges and the lack of volumetric
11 charges for the Small General Service class base rates and rider rates.”¹⁰ It is
12 inconceivable to me that the Office of Consumer Counsel would take no position on such
13 an impactful rate element, leading me to conclude that no serious bargaining on the
14 interactive issues at work in this case took place, or that at least two major stakeholders—
15 OCC and NOPEC—were not engaged on the full range of issues during the course of the
16 settlement negotiations.

17 **Q. Why is it significant that OCC and NOPEC took no position on the fixed charges**
18 **proposed in the settlement?**

19 A. It is significant because a general rate case is about many interlocking pieces. In this
20 proposed settlement, the parties propose that the Company be authorized to collect rates
21 based on 2021 revenue requirements of \$923,592,000.¹¹ While the settlement proposal

⁹ Exhibit ELPC-Rábago-3, Fortney (OCC) Direct Testimony at p. 8, lines 6-9.

¹⁰ Joint Stipulation and Recommendation (JSR), at p. 3, fn. 3.

¹¹ JSR, at App. A, p. 1.

1 filings and supporting testimony do not provide detailed numbers that support easy
2 comparison,¹² I estimate that more than seventy percent of the Company's total annual
3 revenue requirements will be collected through fixed monthly customer charges.¹³ Again,
4 any settlement discussions involving serious bargaining among the parties on fixed
5 charges and how they impact the proposed rates must account for this fact. Ignoring 70%
6 of the revenue requirement is not serious bargaining.

7 **Q. Are there other reasons to question whether serious bargaining occurred based on**
8 **the settlement proposal package and the role that fixed charges play in the overall**
9 **rate case financials?**

10 A. Yes. The Stipulation proposes a return on equity (ROE) of 9.60% for the Company. In my
11 experience this is very high ROE for a monopoly service provider that charges customers
12 under straight fixed-variable (SFV) rates, and where about 70% of revenues are
13 guaranteed through fixed customer charges. The Company has little market risk, and
14 more importantly, has little or no real revenue risk, due to the rate structure proposed in
15 the settlement. The settling parties even agreed to a dramatic reduction in the scope of the
16 Company's DSM programs, which further reduces the risk that it will not realize its
17 allowed revenue requirement. OCC witness Zhu summarized this point, stating, "The
18 most important factor in determining the required rate of return of cost of equity ("ROE")
19 of a utility is risk,"¹⁴ and appropriately recommended an ROE of 8.65%,¹⁵ a full 95 basis

¹² See, e.g., Company Response to ELPC-1-10, stating an objection to quantifying the fixed charges to be paid by customers under the proposed rates based on speculation and the fact that the Company "cannot know all of the inputs that determine total fixed customer charges."

¹³ Assuming \$38.62 per customer per month and about 16.6 million bills per year, per Company Response to ELPC Int.-1-1 Att. A; and an annual revenue requirement of \$932,592,000.

¹⁴ Exhibit ELPC-Rábago-4, Zhu (OCC) Direct Testimony at p. 13, lines 1-2.

¹⁵ *Id.* at p. 95, line 3.

1 points below the level agreed to by the signatory parties. A proposal evidencing serious
2 bargaining would provide evidence that rate design was evaluated as part of a whole
3 package, along with ROE and other aspects of the rate increase request. There is no
4 evidence that there was such serious bargaining on these and other issues.

5 **Q. Is there other evidence that is inconsistent with a conclusory assertion that the**
6 **settlement proposal was the product of serious bargaining?**

7 A. Yes. First, PUCO Witness Bremer states that the Staff did not even review rate design as
8 part of their review of the Company's application.¹⁶ Absent a review of the key element
9 of residential rates, it is impossible to conclude that Staff engaged in serious bargaining
10 on the proposed settlement as a package. Second, the fixed residential customer charges
11 that the Company's parent holding company, NI Source has proposed or that have been
12 proposed or ordered in other jurisdictions are dramatically lower than those in the
13 Stipulation.

14 **Q. What residential customer charges has NI Source or have other parties proposed in**
15 **other cases, and what outcomes have resulted?**

16 A. The Company's affiliates have proposed dramatically lower residential customer charges
17 in Indiana, Maryland, Kentucky, Pennsylvania, and Virginia. And in these states, serious
18 bargaining, and advocacy and decisions in the public interest have supported much lower
19 residential customer charges than those proposed by the parties in this proceeding.

- 20 • In Indiana, Northern Indiana Public Service Company (NIPSCO), proposed to
21 increase its residential fixed monthly customer charge from \$14.00 to \$24.50.¹⁷

22 Representing consumers, the Indiana Office of Utility Consumer Counsel

¹⁶ Bremer (PUCO) Response Testimony at p. 2, line 15 through p. 3, line 8.

¹⁷ Indiana Util. Reg. Comm'n Order of Jul. 27, 2022, Cause No. 45621, at p. 17.

recommended an increase only to \$15.75.¹⁸ The parties in that case settled on \$16.50, which the Indiana Utility Regulatory Commission found in the public interest.¹⁹

- In its pending rate application before the Maryland Public Service Commission, Columbia Gas of Maryland has proposed an increase in the residential per customer monthly system charge from \$16.00 to \$18.94.²⁰
- The Parties in the Columbia Gas of Kentucky case agreed in a stipulation that Columbia's customer charge for residential service shall increase by \$3.75 from \$16.00 per billing period to \$19.75 per billing period, which is a reduction from the original proposed customer charge of \$29.20.²¹
- In a case for Columbia Gas Pennsylvania, Columbia proposed to increase the customer charges for residential customers from \$16.75 to \$25.47 per month.²² The Pennsylvania Commission staff proposed a residential customer charge of \$20.61 per month. However, the requested increase was opposed by the Pennsylvania Consumer Advocate and other parties.²³ As part of the Partial Settlement, the Joint Petitioners agreed that the residential customer charge will remain at the current rate of \$16.75/month for Columbia's Pennsylvania affiliate, and the Administrative Law Judge reviewing the proposal agreed that leaving the fixed customer charge unchanged is in the public interest.²⁴

¹⁸ *Id.*

¹⁹ *Id.* at p. 25.

²⁰ *Columbia Gas of Maryland, Inc.*, P.S.C. Md. No. 12 at 28th Revised Sheet No. 60.

²¹ Joint Stipulation, Settlement, Agreement and Recommendation, Kentucky Public Service Commission, Case No. 2021-00183 at p. 7

²² ALJ Recommended Decision, Pennsylvania Public Utility Commission, R-2022-3031211 at p. 40

²³ *Id.*

²⁴ *Id.*

- In its application to raise rates in Virginia,²⁵ Columbia Gas has proposed an increase in the monthly residential fixed charge from \$16.00 to \$21.00.²⁶ Table KRR-1, below, summarizes this data.

Table KRR-1: NI Source Subsidiary Fixed Charge Comparison

State/Gas Utility	Prior / Current Charge	Proposed Charge (\$/cust/mo)	Percent Difference from Proposed Settlement	Outcome (Final / Pending)	Percent Difference from Proposed Settlement
Ohio – Columbia Gas ²⁷	\$16.75	\$39.00 (avg)	0%		0%
Indiana – NIPSCO	\$14.00	\$24.50	-37%	\$16.50 (Final)	-58%
Maryland – Columbia Gas	\$16.00	\$18.94	-51%	Pending	
Kentucky – Columbia Gas	\$16.00	\$29.20	-25%	\$19.75	-49%
Pennsylvania – Columbia Gas	\$16.75	\$25.47	-35%	\$16.75	-57%
Virginia – Columbia Gas	\$16.00	\$21.00	-46%	Pending	

Q. What conclusions do you draw from this data?

A. Both the Company's proposal and proposed settlement in this case are wildly out of sync with both affiliate proposals and seriously bargained-for outcomes in other states, as well as inconsistent with customer charges agreed to be or determined to be in the public interest in some of those states. In addition, where serious bargaining occurs, substantial reductions in fixed customer charges are the result. These observations comport with my

²⁵ Virginia SCC Case No. PUR-2022-00036.

²⁶ Direct Testimony of Candice Lash on Behalf of Columbia Gas of Virginia, Inc. before the Virginia SCC, Case No. PUR-2022-00036 at CL-2, p. 1 of 3.

²⁷ Adkins (OCC) Supp. Testimony at p. 7, lines 5-19.

1 experience in many cases and settlements, as a Commissioner, a party, and an expert
2 witness.

3 **Q. Do the proposed settlement terms square with the positions taken by the Company**
4 **in its application in this case?**

5 A. The Company appears to have presented a case that sought far more in rates than it
6 needed to move forward and provide adequate service. The supporting testimony of
7 Company Witness Thompson, OCC Witness Adkins, and PUCO Staff Witness Lipthratt
8 demonstrate major differences between the Company's asks and its willingness to
9 settle.²⁸ However, there is no probative and substantial evidence that allows the
10 Commission to determine whether the differences were the product of the Company
11 relinquishing unreasonable positions or compromising in the course of serious
12 bargaining. The difference itself proves nothing. If a utility asks for more revenue than it
13 really needs and settles for less than that amount, that fact does not constitute "evidence."
14 Evidence to support the "serious bargaining" element is missing.

15 **Q. Does the proposed settlement differ from the positions of non-utility parties as set**
16 **forth in pre-filed direct testimony?**

17 A. Yes. The OCC, in particular, presumably expended considerable public funds to address
18 the problems of high fixed customer charges through the testimony of witnesses
19 Fortney²⁹ and Colton.³⁰ The OCC appears to have abandoned this testimony and this
20 issue in the settlement negotiations.

²⁸ Thompson (Columbia Gas) Supp. Testimony; Lipthratt (PUCO) Direct Testimony at p. 4 line 10 through p.7 line 6; Adkins (OCC) Supp. Testimony at p. 6, line 3 through p. 10, line 20.

²⁹ Exhibit ELPC-Rábago-3, Fortney (OCC) Direct Testimony at p. 7-21.

³⁰ See generally Exhibit ELPC-Rábago-5, Colton (OCC) Direct Testimony.

1 **Q. Are you saying that the Commission should determine whether a settlement**
2 **proposal satisfies the “serious bargaining” test based solely on whether a party joins**
3 **a settlement that is inconsistent with asserted positions?**

4 A. Absolutely not. Major differences between positions taken in initial testimony and
5 settlement terms are evidence that serious bargaining may not have occurred, especially
6 when those differences are observed among parties charged with advocating for the
7 public interest. Such differences should be addressed in the proposed settlement to
8 provide the Commission with evidence that the serious bargaining test has been met.
9 Without such a supporting explanation, evidence that a party signed a stipulation that
10 differs from a stated position is not evidence of anything except that difference. The test
11 is not whether the settlement differs from the application or the pre-filed testimony. The
12 test is whether the settlement was the product of serious bargaining.

13 **Q. What should the “serious bargaining” test seek to establish?**

14 A. Settlement proposals, and especially non-unanimous settlement proposals like that in this
15 case, offer administrative savings, but at the risk of due process compromises. There is no
16 public record of how minority positions are aired or accorded fair consideration; there is
17 no public record of whether the process of composing a comprehensive outcome for the
18 issues kept the public interest front and center. Evidence of serious bargaining can help
19 overcome these risks if, and only if, the evidence supports a conclusion that the proposed
20 disposition of the issues reflects a result like that which would have occurred from a fully
21 contested public proceeding. Evidence from the parties about why the specific elements
22 of the proposal advance a view of the public interest, about what tradeoffs were made,
23 and about why positions were modified in the face of negotiations would all help.

1 **Q. Is there any evidence in the proposed settlement or in the supporting testimony**
2 **from settling parties that explains these differences, or that would objectively**
3 **support a determination that the dramatically higher proposed fixed charges in the**
4 **proposed settlement are justified?**

5 A. No. As a result, I conclude that the Stipulation and supporting testimonies fail to provide
6 the Commission with a sound basis for finding that the proposed settlement was the
7 product of serious bargaining.

8 **IV. THE “PUBLIC INTEREST” TEST**

9 **Q. How has the Commission articulated the “public interest” test used in evaluating the**
10 **reasonableness of proposed settlements?**

11 A. The Commission evaluates the proposed settlement and supporting testimony to
12 determine whether “the stipulation, as a package, benefit[s] ratepayers and the public
13 interest.”³¹

14 **Q. What evidence would support a determination that the stipulation, as a package,**
15 **benefits rate payers and the public interest?**

16 A. Even a fully litigated rate case proceeding is unlikely to resolve every issue to the
17 satisfaction of every party. As a result, the public interest test should evaluate whether the
18 negotiation produced quantifiable and objective benefits that accrue to ratepayers in
19 particular, and to the public interest at large. The outcome should square with broader
20 state public policy objectives and because of the important role utilities play, the
21 economy of Ohio and the interests of present and future Ohioans, whether ratepayers or

³¹ *In re Ohio Energy Company*, Case No. 20-585-EL-AIR, et al., Opinion and Order (Nov. 17, 2021) at ¶ 109.

1 not. Outcomes in the public interest must be fair and just, and inspire confidence in
2 regulatory processes, especially where, as in this case, the negotiations that produced the
3 proposed settlement are not reviewable in a public process. The benefits and burdens
4 should be distributed fairly, and in accord with widely accepted principles of public
5 interest rate making. While the grievances of a single party about the outcome of
6 settlement negotiations may not justify a rejection or modification of a proposed
7 settlement, neither does the mere fact that some parties agreed with the utility on an
8 outcome constitute even prima facie evidence that the proposed outcome advances the
9 interests of rate payers and the public interest. And while administrative economy
10 benefits the Commission and its Staff, the fact that a settlement saves time and money is
11 not, itself sufficient evidence that the proposal is reasonable, beneficial, and in the public
12 interest.

13 **Q. What is your view about whether the proposed settlement, especially as to fixed**
14 **customer charges and the energy efficiency program reductions proposed, benefits**
15 **rate payers and the public interest?**

16 A. The proposed settlement, as a package, is contrary to the interests of ratepayers and the
17 public. As previously discussed, the proponents of the settlement would have the
18 Commission measure the outcomes in the Stipulation almost entirely based on whether
19 they deviate favorably from the requests initially filed by the Company. The public
20 interest, in my opinion is not satisfied by whether a monopoly has been denied some
21 measure of rent-seeking behavior. Rather, regulation succeeds according to a different
22 standard—whether the regulatory process has resulted in an outcome that would have
23 been achieved had the monopolist faced the forces of true and efficient market

1 competition. Mitigating monopoly overreach is not enough, because the Commission
2 would never have allowed that in a fully contested hearing. This applies equally to testing
3 whether the Stipulation violates regulatory principles or practices. Even worse, this
4 proposed settlement contravenes public policy and the public interest in several important
5 ways.

6 **Q. How is the Stipulation and proposed settlement contrary to the interests of**
7 **customers and the public?**

8 A. I have already pointed out that there is no evidence that the proposed ROE in this
9 settlement takes adequate account of the substantially reduced revenue recovery risk
10 faced by the Company under the SFV construct. The ROE is therefore certainly too high,
11 adding costs to rate payers and adding unjust economic burden to low-wealth customers
12 in particular. Money paid to Wall Street stockholders as unnecessary and excessive profits
13 is money that cannot create local economic benefits, especially when customers are
14 burdened by excessive and regressive customer charges for an essential energy service,
15 and it is inflationary, adding to broader economic problems for all of Ohio.

16 **Q. How do the proposed fixed customer charges deny benefits to rate payers and the**
17 **public interest?**

18 A. As the schedule “E-5” calculations of customer bill impacts show,³² the proposed fixed
19 charges are economically regressive. Nothing in the Stipulation changes the fact that
20 increases in fixed charges burden low users, who are more likely to be low-wealth
21 customers, more than they burden high users that actually drive demand-related costs.
22 That is, they impose burdens on customers who can least afford added burdens.³³

³² Exhibit ELPC-Rábago-5, Colton (OCC) Direct Testimony at p. 7.

³³ See *Id.* at p. 8, line 1 through p. 25, line 8.

1 Customers that contribute very little to cost causation are forced to pay costs they did not
2 cause, and to subsidize higher users. Low cost causers tend to be lower-wealth customers
3 while high cost causers tend to be wealthier. Not only is this regressive outcome unjust as
4 a matter of distributional justice, it is also short-sighted when considering the impacts that
5 bill arrearages and uncollectible accounts have on all customers, and on the economy of
6 Ohio as a whole.³⁴ OCC witnesses Fortney and Colton address these issues in great detail
7 in their testimony.³⁵ As explained later in this testimony, regressive and excessive fixed
8 customer charges violate fundamental principles of rate making in the public interest,
9 such as fair allocation of costs to cost causers and design of rates to encourage efficient
10 use of energy.

11 **Q. Why is efficient use of energy services in the public interest?**

12 A. Efficient use of energy services supports affordability and economic efficiency generally,
13 and rate design that encourages efficient use is simply fairer. Efficient competitive
14 markets reduce societal economic and material waste and minimize burdens imposed on
15 society at large, such as those resulting from so-called economic externalities—impacts
16 not reflected in the price of goods sold. Efficient use of energy means marginal energy
17 spending goes to highest and best uses. All of these economic, rate payer, and public
18 interest benefits are frustrated by inefficient rate design that deviates from marginal cost
19 pricing—as is the case with artificially high fixed customer charges for services for which
20 cost causation correlates with level or amount of use. It is therefore reasonable and

³⁴ *Id.* at p. 26, line 8 through p. 42, line 10.

³⁵ Exhibit ELPC-Rábago-3, Fortney (OCC) Direct Testimony at p. 20; Exhibit ELPC-Rábago-5, Colton (OCC) Direct Testimony at p. 7.

1 appropriate for the Commission to ask, in addressing the public interest test, whether the
2 proposed settlement advances efficient use of gas by the Company's customers.

3 **Q. Does the Stipulation and proposed settlement advance efficient use of gas?**

4 A. No. The unreasonably high fixed charges proposed in the settlement would have a
5 substantial negative impact on customer uptake of energy efficiency and even beneficial
6 electrification measures in homes and businesses. When a residential customer is forced
7 to pay a "cover charge" of about \$40 per month (and rising to \$58) just for a subscription
8 to gas service and before even using a fraction of a therm, that leaves little household
9 budget for gas efficiency measures.³⁶ Moreover, if low-wealth customers are required to
10 pay for infrastructure investments driven by wealthier high users of gas, confidence in
11 regulation and the Commission is weakened, energy assistance budgets are strained,
12 uncollectible balances and service shutoffs increase, and the public interest is
13 compromised.

14 **Q. What kind of price signals do high fixed charges send, and how is the public interest**
15 **impacted?**

16 A. In addition to reducing the economic benefits to customers resulting from more efficient
17 use of gas, the high fixed charges proposed in the settlement encourage additional waste.
18 In short, there is little reason for a customer to be efficient in volumetric use when there
19 will be no real benefit in bill savings. High fixed charges send inefficient price signals to
20 customers, and that means the proposed settlement fails to provide important benefits to

³⁶ See Exhibit ELPC-Rábago-5, Colton (OCC) Direct Testimony at p. 64, line 5 through p. 68, line 10.

1 rate payers. As OCC witness Fortney succinctly stated, “The price signal that [the
2 proposed fixed charge] sends to consumers is ‘usage doesn’t matter.’”³⁷

3 **Q. Do high fixed charges send price signals to other market actors?**

4 A. Yes. Automatically recovering fixed cost investments through fixed charges sends
5 inefficient price signals to the utility as well. It tells them that there is little or no reason
6 to be prudent, judicious, or efficient in planning and executing infrastructure spending.
7 The approach insulates the utility from the kind of pressure to keep costs low that it
8 would feel if it operated in a competitive market and it therefore reflects a failure of
9 sound regulation and a violation of important regulatory principles and practices, as
10 discussed in the next section of this testimony. Moreover, improper allocation of fixed
11 costs, including those driven by demand, to fixed charges distorts the economics faced by
12 non-utility efficiency services providers, stifles the growth of non-utility markets for
13 energy services, and puts a regulatory thumb on the scales of relative market power
14 among monopoly and competitive service providers.

15 **Q. Does charging fixed charges for fixed costs send better price signals to customers?**

16 A. No. There is no economic logic in the proposition that fixed charges for fixed costs
17 improves economic efficiency. No credible economic authority has ever supported the
18 idea that economic efficiency is improved when price structure mimics cost structure.
19 Marginal demand drives new fixed costs, so good rate design sends economically
20 efficient price signals with variable volumetric charges.

21 **Q. Are fixed charges appropriate for fixed costs because fixed costs are “sunk” and**
22 **essentially non-varying?**

³⁷ Exhibit ELPC-Rábago-3, Fortney (OCC) Direct Testimony at p. 17, lines 18-19. *See also* Exhibit ELPC-Rábago-5, Colton (OCC) Direct Testimony at p. 48, line 5 through p. 57, line 12.

1 A. No. Treating all fixed costs as sunk ignores the fact that customer demand impacts the
2 useful life, maintenance costs, and replacement costs for fixed cost investments.
3 Moreover, the implication that customers can impact sunk costs with changes in their
4 level or pattern of use confounds the purposes of cost allocation and rate design. The cost
5 allocation process is supposed to ensure that customers bear the costs that they create.
6 Rate design is intended to ensure efficient use of the service. Fixed charges for all fixed
7 costs violates cost causation principles and high fixed charges encourage inefficient use.

8 **Q. Why is it important to ensure fairness for both utilities and competitive service**
9 **providers?**

10 A. Utilities are granted protected monopolies to the extent that this deviation from free
11 market principles is necessary and appropriate as a means to protect and advance the
12 public interest. Economic regulation in the public interest means constantly searching for
13 opportunities to introduce competition into the market for energy services, and vigilance
14 against allowing monopolies to exert undue market power in markets that can sustain
15 competition.

16 **Q. Don't high fixed charges result in lower volumetric rates?**

17 A. Of course they do, but that is not a feature, it is a “bug” of high fixed charge rate design.
18 Residential customers pay bills—and volumetric rates are only an input into the
19 calculation. Moreover, shifting costs to the fixed portion of the bill frustrates the price
20 signals that volumetric rates provide, as I have already explained.

21 **Q. How does the proposed reduction of energy efficiency program efforts and spending**
22 **in the Stipulation factor into the evaluation of ratepayer and public interest benefits**
23 **that would result from the Stipulation and proposed settlement?**

1 A. The proposed Stipulation includes substantial reductions in DSM programs—the outright
2 elimination of non-income qualified utility DSM programs—that the Company proposed
3 as part of its application.³⁸ If approved by the Commission, not only would the stipulation
4 enshrine an anti-competitive rate structure but it would also eliminate essential tools for
5 customers to manage their gas bills—DSM programs. High fixed charges weaken the
6 economic incentive to use gas efficiently, so any proposed rate case outcome that relies
7 on high fixed charges rate design must also include robust and *increased* energy
8 efficiency programs for all customers, especially low-wealth customers. As proposed, the
9 reduction in rate payer and public interest benefits from the settlement means the
10 proposal strikes a double blow against customers and the public interest, and fails the
11 Commission’s public interest test.

12 **Q. Was the reduction in DSM programs what the Company wanted?**

13 A. I don’t know, but I do know that the Company and other gas utilities have identified
14 DSM as consistent with Ohio state energy policy, good for non-utility market
15 development, and good for customers—a public interest win. As Company Witness Poe
16 explained in proposing the Company’s award-winning DSM program in this case,
17 “Columbia’s DSM programs and team members continue to be recognized for their
18 leadership in the field of energy efficiency as the state, regional and national levels. These
19 awards and recognition are a testament to Columbia’s focus on implementing best
20 practices to market and deliver effective programs to customers.”³⁹ Standing alone, and
21 especially in combination with the high fixed charges, the proposed reductions in DSM

³⁸ Thompson (Columbia Gas) Supp. Testimony at p. 1.

³⁹ Exhibit ELPC-Rábago-6, Poe (Columbia Gas) Direct Testimony at p. 5.

1 programs in the Stipulation means the Commission should not approve the proposed
2 settlement.

3 **V. THE “REGULATORY PRINCIPLES AND PRACTICES” TEST**

4 **Q. Does the Commission apply any specific sub-elements to its third test element that a
5 settlement should not violate any important regulatory principle or practice?**

6 A. The Commission looks to component parts of a proposed settlement to determine whether
7 the Stipulation violates any important regulatory principle or practice.

8 **Q. Where should the evaluation start?**

9 A. In my opinion, the appropriate place to start is with the time-honored “Principles of
10 Public Utility Rates.”

11 **Q. What are the Principles of Public Utility Rates?**

12 A. The Principles of Public Utility Rates are a broad statement of generally accepted criteria
13 for sound rate making. For nearly 60 years, James Bonbright’s treatise entitled
14 “Principles of Public Utility Rates” has stood as a foundational reference for evaluation
15 of rate making proposals and approaches.⁴⁰ The following articulation of the Bonbright
16 principles⁴¹ is useful in general and in reviewing the Company’s rate proposals:

- 17 • Rates should be characterized by simplicity, understandability, public
18 acceptability, and feasibility of application and interpretation.
- 19 • Rates should be effective in yielding total revenue requirements.
- 20 • Rates should support revenue and cash flow stability from year to year.

⁴⁰ James C. Bonbright, *Principles of Public Utility Rates* (Columbia Univ. Press 1961), available at: <https://www.raponline.org/knowledge-center/principles-of-public-utility-rates/>.

⁴¹ This summary was derived from J. Totten, *Tariff Development II: Rate Design for Electric Utilities*, Briefing for NARUC/INE Partnership (Feb. 1, 2008), <https://pubs.naruc.org/pub.cfm?id=538EA65C-2354-D714-5107-44736A60B037> (last visited Mar. 25, 2022).

- 1 • Rate levels should be stable in themselves, with minimal unexpected changes that
- 2 are seriously averse to existing customers.
- 3 • Rates should be fair in apportioning costs of service among different consumers.
- 4 • Rate design and application should avoid undue discrimination.
- 5 • Rates should advance economic efficiency, promote the efficient use of energy,
- 6 and support market growth for competing products and services.

7 As they have for decades in hundreds if not thousands of rate proposals across the
8 country and around the world, the Bonbright Principles provide a useful starting point in
9 this proceeding. In addition to themselves being simple, understandable, acceptable, free
10 from controversy in interpretation, stable, and non-discriminatory, the principles provide
11 the foundation for competent and substantial evidence that utilities must provide to
12 establish that proposed rates are grounded in actual revenue requirements, an honest and
13 comprehensive assessment of the costs to serve customers, and are themselves consistent
14 with principles of energy justice.

15 **Q. Bonbright’s Principles were set out in 1961, more than six decades ago. Are they still**
16 **valid?**

17 A. Yes, the core principles remain valid. Many things have changed since Bonbright
18 published his work, but the principles still undergird utility regulation in the 21st century.
19 The tools and metrics of economic efficiency require attention to far more factors than
20 the price revealed solely by a century-old approach to cost-of-service accounting—
21 though this is still a sound starting point. There is important work to do in ensuring that
22 public utility rates impacting low-wealth customers serve and support the public interest,
23 including public policy objectives. In order to advance economic efficiency, these policy

objectives should be internalized into the rate design process, not externalized as social programs. There are several modern adaptations of Bonbright's principles that the Company and the Commission should rely upon in reviewing the underlying methods and foundation for the Company's proposed rates, and to ensure that equitable cost-of-service based rates are in place for all customers.⁴²

Q. Utility rates should be characterized by simplicity, understandability, public acceptability, and feasibility of application and interpretation. Do the proposed SGS fixed charges violate this principle?

A. Yes. The Stipulation continues the unfair, confusing, and hard-to-understand practice of imposing identical fixed charges on customers largely without regard to usage level and contribution to cost causation. In addition, the Stipulation continues a years-long unnecessary reliance on riders, few of which even have names that customers can understand. As with the base charges, the rider charges are applied on a per customer basis even though they vary primarily with the level of usage.

Q. Rates should be effective in yielding total revenue requirements. Do the proposed SGS fixed charges violate this principle?

A. No. As I previously explained, the rate design proposed practically guarantees the monopoly will collect its rents free from competitive forces or cost discipline. There are better ways to provide the Company with a reasonable opportunity to earn a return of and on its investments—volumetric rate recovery of demand-driven infrastructure costs would improve price signals to all market participants.

⁴² Exhibit ELPC-Rábago-7, K. Rábago & R. Valova, *Revisiting Bonbright's Principles of Public Utility Rates in a DER World*, The Electricity Journal, Vol. 31, Issue 8, pp. 9-13 (Oct. 2018), available at: <https://peccpubs.pace.edu/getFileContents.php?resourceid=43bdf87a9063c34>.

1 **Q. Rates should support revenue and cash flow stability from year to year. And rates**
2 **should be stable in themselves, with minimal unexpected charges that are seriously**
3 **averse to existing customers. Do the proposed SGS fixed charges violate these**
4 **principles?**

5 A. The proposed rates will work very well for the utility, but customers will pay the price in
6 ever-increasing fixed charges for base rates and riders.

7 **Q. Rates should be fair in apportioning costs of service among different customers. And**
8 **rate design should avoid undue discrimination. Do the proposed SGS fixed charges**
9 **violate these principles?**

10 A. Yes. As already explained, and addressed in more detail below, the proposed SGS fixed
11 charges violate the principle of cost-based rates. The principle of cost-based rates, in
12 which cost creation is reflected in rates, is perhaps the best known and most important
13 rate making principle. It is important to note that there is no economic or rate making
14 principle that states that rate design must mirror cost structure, of course. The notion of
15 recovering all demand-related fixed costs—costs that vary directly with the intensity of
16 usage—through a per-customer fixed charge guarantees inequitable cross subsidies and
17 rates that are inconsistent with the public interest and economic efficiency. The proposed
18 Stipulation rates are unjustly uneconomic and regressive in impact. They codify a cross
19 subsidy from low users and lower-wealth customers to higher-use and wealthier
20 customers.

21 **Q. Rates should advance economic efficiency, promote the efficient use of energy, and**
22 **support market growth for competing products. Do the proposed SGS fixed charges**
23 **violate this principle?**

1 A. Yes. As explained above, in my testimony relating to the Commission’s public interest
2 test, the proposed rates violate the principle of economic efficiency, promotion of
3 efficient use, and support for competing products and services.

4 **Q. Is there evidence in this proceeding that addresses the rate making defects in the**
5 **proposed fixed customer charges in the Stipulation?**

6 A. Yes. OCC witness Fortney, who has significant experience as a member of the
7 Commission Staff,⁴³ provided extensive testimony on the issues, and, in light of the
8 Commission’s stated policy goals, recommended that the Commission approve rates for
9 residential customers that would recover fixed costs through a combination of fixed and
10 variable (volumetric) charges. Mr. Fortney approached the issue from a utility pricing and
11 rate making principles position, explaining: ⁴⁴

12 Modern utility pricing theory is primarily concerned with the development of
13 optimal tariff design, which over the years has become dominated by a form of
14 pricing referred to as a “two-part tariff,” sometimes referred to more technically
15 as a non-linear (or non-uniform) pricing approach. Once a class revenue
16 requirement is established, the goal for regulators should be one that sets the most
17 appropriate rates based upon various efficiency and equity considerations.
18 Balancing the weight of how costs are recovered between fixed rates, variable
19 rates, and block rates are all integrated parts of that process.

20 Costs can be instructive in establishing a baseline upon which prices may be set,
21 but costs need not serve as the sole or exclusive basis for rates in order for them to
22 be set optimally (i.e., fixed charges do not need to strictly equal fixed costs,
23 variable rates need not strictly equal variable costs). Unfortunately, the “fixed
24 charge-equals-fixed cost” philosophy gets repeated so often that it can often
25 drown out meaningful discussions about other equally important
26 considerations/principles in setting rates in imperfect markets.

⁴³ ELPC-Rábago-3, Fortney (OCC) Direct Testimony at p. 2, lines 1-13.

⁴⁴*Id.* at p. 13, line 9 through p. 14, line 14, fn. 10 (citing Report of the review of the Application to Increase Rates of Aqua Ohio, Inc., February 11, 2022, Section 5, Rate and Tariff Review, Larkin & Associates and Acadian Consulting Group.), fn 11 (Charging for Distribution Utility Services: Issues in Rate Design, December 2000: Weston, R. (2000). Charging for Distribution Utility Services: Issues in Rate Design. Montpelier, VT: Regulatory Assistance Project, p.39).

1 These considerations/principles include assuring that the utility has an opportunity
2 to recover its authorized revenue requirement, assuring that the overall allowed
3 revenue requirement is reasonably allocated across all customer classes and rate
4 groups, assuring that the selected rate design is equitable and reasonable, and that
5 rates be set in a fashion that facilitates customer understanding, continuity of
6 rates, and minimal customer impacts.

7 Utilities and regulators should be cautious before adopting a particular method of rate
8 design on the basis of what may be a superficial appeal. And more important, is the
9 concern that a costing method, once adopted, becomes the predominant and
10 unchallenged determinant of rate design.

11 Mr. Fortney goes on to explain that the approach proposed in the settlement offers bill
12 stability benefits that can be obtained through customer choice and not mandated rate
13 design based on accounting classification of costs.⁴⁵ In addition, Mr. Fortney points out
14 that the high fixed charges that include demand-driven infrastructure costs violates the
15 time-honored principle that fixed charges should be reserved for costs that vary
16 exclusively or almost exclusively with customer count.⁴⁶

17 **Q. Is there a way to recover demand-related costs that would be consistent with cost**
18 **causation?**

19 A. Yes. A rate design that collects demand-related costs through volumetric charges assigns
20 cost responsibility more fairly to cost causers.

21 **Q. What do you conclude from this review of whether the proposed fixed customer**
22 **charges violate any important regulatory principle or practice?**

23 A. The proposed Stipulation fails this test as well.

⁴⁵ *Id.* at p. 13, line 18 through p. 14, line 2; p. 15, lines 6-11.

⁴⁶ *Id.* at p. 15, lines 13-21.

VI. CONCLUSION AND RECOMMENDATION

Q. What is your conclusion based on your review of the proposed fixed customer charges and DSM program reductions reflected in the Stipulation?

A. I conclude that proposed settlement, as set forth in materials submitted by the settling parties, and as to proposed fixed customer charges and DSM program reductions, is not reasonable and fails to meet the standard established in Commission precedent. First, there is no objective and verifiable evidence that the proposed settlement is the result of serious bargaining. Second, the excessively regressive fixed customer charges and substantial reduction in efficiency programs means that the settlement, as a package, is inconsistent with public interest. Third, the fixed customer charges proposed in the settlement are inconsistent with the principles of sound rate making.

Q. What is your recommendation to the Commission based on your review of the Stipulation?

A. I recommend that the Commission reject the Stipulation and proposed settlement as a package and proceed with a full hearing on the merits. Short of a rejection of the full Stipulation, the Commission should order a redesign of base rates to recover demand-driven fixed costs through volumetric rates, a reduction in the ROE consistent with the reduced financial risk faced by the Company, elimination of the moratorium on new DSM programs, and reinstatement of all DSM programs proposed by the Company and other parties.

Q. Does this conclude your testimony?

A. Yes.

Karl R. Rábago

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Nationally recognized leader and innovator in electricity and energy law, policy, and regulation. Experienced as a regulatory expert, utility executive, research and development manager, sustainability leader, senior government official, educator, and advocate. Law teaching experience at Pace University Elisabeth Haub School of Law, University of Houston Law Center, and U.S. Military Academy at West Point. Military veteran.

Employment

RÁBAGO ENERGY LLC

Principal: July 2012—Present. Consulting practice dedicated to providing business sustainability, expert witness, and regulatory advice and services to organizations in the clean and advanced energy sectors. Prepared and submitted testimony in more than 35 jurisdictions and 140 electricity and gas regulatory proceedings. Recognized national leader in development and implementation of innovative “Value of Solar” alternative to traditional net metering. Additional information at rabagoenergy.com.

- Chairman of the Board, Center for Resource Solutions (1997-present). CRS is a not-for-profit organization based at the Presidio in California. CRS developed and manages the Green-e Renewable Electricity Brand, a nationally and internationally recognized branding program for green power and green pricing products and programs. Past chair of the Green-e Governance Board.
- Director, Solar United Neighbors (2018-present).
- Advisor, Commission Shift (2021-present).
- Director, Texas Solar Energy Society (2022-present).

PACE ENERGY AND CLIMATE CENTER, PACE UNIVERSITY ELISABETH HAUB SCHOOL OF LAW

Senior Policy Advisor: September 2019—September 2020. Part-time advisor and staff member. Provide expert witness, project management, and business development support on electric and gas regulatory and policy issues and activities.

Executive Director: May 2014—August 2019. Leader of a team of professional and technical experts and law students in energy and climate law, policy, and regulation. Secured funding for and managed execution of regulatory intervention, research, market development support, and advisory services. Taught Energy Law. Provided learning and development opportunities for law students. Additional activities:

- Former Director, Alliance for Clean Energy – New York (2018-2019).
- Former Director, Interstate Renewable Energy Council (IREC) (2012-2018).
- Former Co-Director and Principal Investigator, Northeast Solar Energy Market Coalition (2015-2017). The NESEMC was a US Department of Energy’s SunShot Initiative Solar Market Pathways project. Funded under a cooperative agreement between the US DOE and Pace University, the NESEMC worked to harmonize solar market policy and advance supportive policy and regulatory practices in the northeast United States.

Karl R. Rábago

AUSTIN ENERGY – THE CITY OF AUSTIN, TEXAS

Vice President, Distributed Energy Services: April 2009—June 2012. Executive in one of the largest public power electric utility serving more than one million people in central Texas. Responsible for management and oversight of energy efficiency, demand response, and conservation programs; low-income weatherization; distributed solar and other renewable energy technologies; green buildings program; key accounts relationships; electric vehicle infrastructure; and market research and product development. Executive sponsor of Austin Energy's participation in an innovative federally-funded smart grid demonstration project led by the Pecan Street Project. Led teams that successfully secured over \$39 million in federal stimulus funds for energy efficiency, smart grid, and advanced electric transportation initiatives. Additional activities included:

- Director, Renewable Energy Markets Association. REMA is a trade association dedicated to maintaining and strengthening renewable energy markets in the United States.
- Membership on Pedernales Electric Cooperative Member Advisory Board. Invited by the Board of Directors to sit on first-ever board to provide formal input and guidance on energy efficiency and renewable energy issues for the nation's largest electric cooperative.

THE AES CORPORATION

Director, Government & Regulatory Affairs: June 2006—December 2008. Director, Global Regulatory Affairs, provided regulatory support and group management to AES's international electric utility operations on five continents. Managing Director, Standards and Practices, for Greenhouse Gas Services, LLC, a GE and AES venture committed to generating and marketing voluntary market greenhouse gas credits. Government and regulatory affairs manager for AES Wind Generation. Managed a portfolio of regulatory and legislative initiatives to support wind energy market development in Texas, across the United States, and in many international markets.

JICARILLA APACHE NATION UTILITY AUTHORITY

Director: 1998—2008. Located in New Mexico, the JANUA was an independent utility developing profitable and autonomous utility services that provide natural gas, water utility services, low-income housing, and energy planning for the Nation. Authored "First Steps" renewable energy and energy efficiency strategic plan with support from U.S. Department of Energy.

HOUSTON ADVANCED RESEARCH CENTER

Group Director, Energy and Buildings Solutions: December 2003—May 2006. Leader of energy and building science staff at a mission-driven not-for-profit contract research organization based in The Woodlands, Texas. Responsible for developing, maintaining and expanding upon technology development, application, and commercialization support programmatic activities, including the Center for Fuel Cell Research and Applications; the Gulf Coast Combined Heat and Power Application Center; and the High-Performance Green Buildings Practice. Secured funding for major new initiative in carbon nanotechnology applications in the energy sector.

- President, Texas Renewable Energy Industries Association. As elected president of the statewide business association, led and managed successful efforts to secure and implement significant expansion of the state's renewable portfolio standard as well as other policy, regulatory, and market development activities.

Karl R. Rábago

- Director, Southwest Biofuels Initiative. Established the Initiative as an umbrella structure for a number of biofuels related projects.
- Member, Committee to Study the Environmental Impacts of Windpower, National Academies of Science National Research Council. The Committee was chartered by Congress and the Council on Environmental Quality to assess the impacts of wind power on the environment.
- Advisory Board Member, Environmental & Energy Law & Policy Journal, University of Houston Law Center.

CARGILL DOW LLC (NOW NATUREWORKS, LLC)

Sustainability Alliances Leader: April 2002—December 2003. Integrated sustainability principles into all aspects of a ground-breaking bio-based polymer manufacturing venture. Responsible for maintaining, enhancing and building relationships with stakeholders in the worldwide sustainability community, as well as managing corporate and external sustainability initiatives.

- Successfully completed Minnesota Management Institute at University of Minnesota Carlson School of Management, an alternative to an executive MBA program that surveyed fundamentals and new developments in finance, accounting, operations management, strategic planning, and human resource management.

ROCKY MOUNTAIN INSTITUTE

Managing Director/Principal: October 1999—April 2002. Co-authored “Small Is Profitable,” a comprehensive analysis of the benefits of distributed energy resources. Provided consulting and advisory services to help business and government clients achieve sustainability through application and incorporation of Natural Capitalism principles.

- President of the Board, Texas Ratepayers Organization to Save Energy. Texas R.O.S.E. is a non-profit organization advocating low-income consumer issues and energy efficiency programs.
- Co-Founder and Chair of the Advisory Board, Renewable Energy Policy Project-Center for Renewable Energy and Sustainable Technology. REPP-CREST was a national non-profit research and internet services organization.

CH2M HILL

Vice President, Energy, Environment and Systems Group: July 1998—August 1999. Responsible for providing consulting services to a wide range of energy-related businesses and organizations, and for creating new business opportunities in the energy industry for an established engineering and consulting firm. Completed comprehensive electric utility restructuring studies for the states of Colorado and Alaska.

PLANERGY

Vice President, New Energy Markets: January 1998—July 1998. Responsible for developing and managing new business opportunities for the energy services market. Provided consulting and advisory services to utility and energy service companies.

ENVIRONMENTAL DEFENSE FUND

Energy Program Manager: March 1996—January 1998. Managed renewable energy, energy efficiency, and electric utility restructuring programs. Led regulatory intervention activities in Texas and California. In Texas, played a key role in crafting Deliberative Polling processes. Participated in national environmental and energy advocacy networks, including the Energy

Karl R. Rábago

Advocates Network, the National Wind Coordinating Committee, the NCSL Advisory Committee on Energy, and the PV-COMPACT Coordinating Council. Frequently appeared before the Texas Legislature, Austin City Council, and regulatory commissions on electric restructuring issues.

UNITED STATES DEPARTMENT OF ENERGY

Deputy Assistant Secretary, Utility Technologies: January 1995–March 1996. Manager of the Department's programs in renewable energy technologies and systems, electric energy systems, energy efficiency, and integrated resource planning. Supervised technology research, development and deployment activities in photovoltaics, wind energy, geothermal energy, solar thermal energy, biomass energy, high-temperature superconductivity, transmission and distribution, hydrogen, and electric and magnetic fields. Managed, coordinated, and developed international agreements. Supervised development and deployment support activities at national laboratories. Developed, advocated, and managed a Congressional budget appropriation of approximately \$300 million.

STATE OF TEXAS

Commissioner, Public Utility Commission of Texas. May 1992–December 1994. Appointed by Governor Ann W. Richards. Regulated electric and telephone utilities in Texas. Co-chair and organizer of the Texas Sustainable Energy Development Council. Vice-Chair of the National Association of Regulatory Utility Commissioners (NARUC) Committee on Energy Conservation. Member and co-creator of the Photovoltaic Collaborative Market Project to Accelerate Commercial Technology (PV-COMPACT).

LAW TEACHING

Professor for a Designated Service: Pace University Elisabeth Haub School of Law, 2014-2019. Non-tenured member of faculty. Taught Energy Law. Supervised a student intern practice.

Associate Professor of Law: University of Houston Law Center, 1990–1992. Full time, tenure track member of faculty. Courses taught: Criminal Law, Environmental Law, Criminal Procedure, Environmental Crimes Seminar, Wildlife Protection Law.

Assistant Professor: United States Military Academy, West Point, New York, 1988–1990. Member of the faculty in the Department of Law. Honorably discharged in August 1990, as Major in the Regular Army. Courses taught: Constitutional Law, Military Law, and Environmental Law Seminar.

LITIGATION

Trial Defense Attorney and Prosecutor, U.S. Army Judge Advocate General's Corps, Fort Polk, Louisiana, January 1985–July 1987. Assigned to Trial Defense Service and Office of the Staff Judge Advocate.

NON-LEGAL MILITARY SERVICE

Armored Cavalry Officer, 2d Squadron 9th Armored Cavalry, Fort Stewart, Georgia, May 1978–August 1981. Served as Logistics Staff Officer (S-4). Managed budget, supplies, fuel, ammunition, and other support for an Armored Cavalry Squadron. Served as Support Platoon Leader for the Squadron (logistical support), and as line Platoon Leader in an Armored Cavalry Troop. Graduate of Airborne and Ranger Schools. Special training in Air Mobilization Planning and Nuclear, Biological and Chemical Warfare.

Karl R. Rábago

Formal Education

LL.M., Environmental Law, Pace University School of Law, 1990: Curriculum designed to provide breadth and depth in study of theoretical and practical aspects of environmental law. Courses included: International and Comparative Environmental Law, Conservation Law, Land Use Law, Seminar in Electric Utility Regulation, Scientific and Technical Issues Affecting Environmental Law, Environmental Regulation of Real Estate, Hazardous Wastes Law. Individual research with Hudson Riverkeeper Fund, Garrison, New York.

LL.M., Military Law, U.S. Army Judge Advocate General's School, 1988: Curriculum designed to prepare Judge Advocates for senior level staff service. Courses included: Administrative Law, Defensive Federal Litigation, Government Information Practices, Advanced Federal Litigation, Federal Tort Claims Act Seminar, Legal Writing and Communications, Comparative International Law.

J.D. with Honors, University of Texas School of Law, 1984: Attended law school under the U.S. Army Funded Legal Education Program, a fully funded scholarship awarded to 25 or fewer officers each year. Served as Editor-in-Chief (1983–84); Articles Editor (1982–83); Member (1982) of the Review of Litigation. Moot Court, Mock Trial, Board of Advocates. Summer internship at Staff Judge Advocate's offices. Prosecuted first cases prior to entering law school.

B.B.A., Business Management, Texas A&M University, 1977: ROTC Scholarship (3–yr). Member: Corps of Cadets, Parson's Mounted Cavalry, Wings & Sabers Scholarship Society, Rudder's Rangers, Town Hall Society, Freshman Honor Society, Alpha Phi Omega service fraternity.

Karl R. Rábago

Selected Publications

- “Climate Change Law: An Introduction,” contributing author (Introduction to Energy Law), Elgar (2021).
- “Distributed Generation Law,” contributing author, American Bar Association Environment, Energy, and Resources Section (August 2020)
- “National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources,” contributing author, National Energy Screening Project (August 2020)
- “Achieving 100% Renewables: Supply-Shaping through Curtailment,” with Richard Perez, Marc Perez, and Morgan Putnam, PV Tech Power, Vol. 19 (May 2019).
- “A Radical Idea to Get a High-Renewable Electric Grid: Build Way More Solar and Wind than Needed,” with Richard Perez, The Conversation, online at <http://bit.ly/2YjnM15> (May 29, 2019).
- “Reversing Energy System Inequity: Urgency and Opportunity During the Clean Energy Transition,” with John Howat, John Colgan, Wendy Gerlitz, and Melanie Santiago-Mosier, National Consumer Law Center, online at www.nclc.org (Feb. 26, 2019).
- “Revisiting Bonbright’s Principles of Public Utility Rates in a DER World,” with Radina Valova, The Electricity Journal, Vol. 31, Issue 8, pp. 9-13 (Oct. 2018).
- “Achieving very high PV penetration – The need for an effective electricity remuneration framework and a central role for grid operators,” Richard Perez (corresponding author), Energy Policy, Vol. 96, pp. 27-35 (2016).
- “The Net Metering Riddle,” Electricity Policy.com, April 2016.
- “The Clean Power Plan,” Power Engineering Magazine (invited editorial), Vol. 119, Issue 12 (Dec. 2, 2015)
- “The ‘Sharing Utility:’ Enabling & Rewarding Utility Performance, Service & Value in a Distributed Energy Age,” co-author, 51st State Initiative, Solar Electric Power Association (Feb. 27, 2015)
- “Rethinking the Grid: Encouraging Distributed Generation,” Building Energy Magazine, Vol. 33, No. 1 Northeast Sustainable Energy Association (Spring 2015)
- “The Value of Solar Tariff: Net Metering 2.0,” The ICER Chronicle, Ed. 1, p. 46 [International Confederation of Energy Regulators] (December 2013)
- “A Regulator’s Guidebook: Calculating the Benefits and Costs of Distributed Solar Generation,” co-author, Interstate Renewable Energy Council (October 2013)
- “The ‘Value of Solar’ Rate: Designing an Improved Residential Solar Tariff,” Solar Industry, Vol. 6, No. 1 (Feb. 2013)
- “Jicarilla Apache Nation Utility Authority Strategic Plan for Energy Efficiency and Renewable Energy Development,” lead author & project manager, U.S. Department of Energy First Steps Toward Developing Renewable Energy and Energy Efficiency on Tribal Lands Program (2008)
- “A Review of Barriers to Biofuels Market Development in the United States,” 2 Environmental & Energy Law & Policy Journal 179 (2008)
- “A Strategy for Developing Stationary Biodiesel Generation,” Cumberland Law Review, Vol. 36, p.461 (2006)
- “Evaluating Fuel Cell Performance through Industry Collaboration,” co-author, Fuel Cell Magazine (2005)

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“Applications of Life Cycle Assessment to NatureWorks™ Polylactide (PLA) Production,” co-author, Polymer Degradation and Stability 80, 403-19 (2003)

“An Energy Resource Investment Strategy for the City of San Francisco: Scenario Analysis of Alternative Electric Resource Options,” contributing author, Prepared for the San Francisco Public Utilities Commission, Rocky Mountain Institute (2002)

“Small Is Profitable: The Hidden Economic Benefits of Making Electrical Resources the Right Size,” co-author, Rocky Mountain Institute (2002)

“Socio-Economic and Legal Issues Related to an Evaluation of the Regulatory Structure of the Retail Electric Industry in the State of Colorado,” with Thomas E. Feiler, Colorado Public Utilities Commission and Colorado Electricity Advisory Panel (April 1, 1999)

“Study of Electric Utility Restructuring in Alaska,” with Thomas E. Feiler, Legislative Joint Committee on electric Restructuring and the Alaska Public Utilities Commission (April 1, 1999)

“New Markets and New Opportunities: Competition in the Electric Industry Opens the Way for Renewables and Empowers Customers,” EEBA Excellence (Journal of the Energy Efficient Building Association) (Summer 1998)

“Building a Better Future: Why Public Support for Renewable Energy Makes Sense,” Spectrum: The Journal of State Government (Spring 1998)

“The Green-e Program: An Opportunity for Customers,” with Ryan Wiser and Jan Hamrin, Electricity Journal, Vol. 11, No. 1 (January/February 1998)

“Being Virtual: Beyond Restructuring and How We Get There,” Proceedings of the First Symposium on the Virtual Utility, Kluwer Press (1997)

“Information Technology,” Public Utilities Fortnightly (March 15, 1996)

“Better Decisions with Better Information: The Promise of GIS,” with James P. Spiers, Public Utilities Fortnightly (November 1, 1993)

“The Regulatory Environment for Utility Energy Efficiency Programs,” Proceedings of the Meeting on the Efficient Use of Electric Energy, Inter-American Development Bank (May 1993)

“An Alternative Framework for Low-Income Electric Ratepayer Services,” with Danielle Jaussaud and Stephen Benenson, Proceedings of the Fourth National Conference on Integrated Resource Planning, National Association of Regulatory Utility Commissioners (September 1992)

“What Comes Out Must Go In: The Federal Non-Regulation of Cooling Water Intakes Under Section 316 of the Clean Water Act,” Harvard Environmental Law Review, Vol. 16, p. 429 (1992)

“Least Cost Electricity for Texas,” State Bar of Texas Environmental Law Journal, Vol. 22, p. 93 (1992)

“Environmental Costs of Electricity,” Pace University School of Law, Contributor–Impingement and Entrainment Impacts, Oceana Publications, Inc. (1990)

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Date	Proceeding	Case/Docket #	On Behalf Of:
Dec. 21, 2012	VA Electric & Power Special Solar Power Tariff	Virginia State Corporation Commission Case # PUE-2012-00064	Southern Environmental Law Center
May 10, 2013	Georgia Power Company 2013 IRP	Georgia Public Service Commission Docket # 36498	Georgia Solar Energy Industries Association
Jun. 23, 2013	Louisiana Public Service Commission Re-examination of Net Metering Rules	Louisiana Public Service Commission Docket # R-31417	Gulf States Solar Energy Industries Association
Aug. 29, 2013	DTE (Detroit Edison) 2013 Renewable Energy Plan Review (Michigan)	Michigan Public Utilities Commission Case # U-17302	Environmental Law and Policy Center
Sep. 5, 2013	CE (Consumers Energy) 2013 Renewable Energy Plan Review (Michigan)	Michigan Public Utilities Commission Case # U-17301	Environmental Law and Policy Center
Sep. 27, 2013	North Carolina Utilities Commission 2012 Avoided Cost Case	North Carolina Utilities Commission Docket # E-100, Sub. 136	North Carolina Sustainable Energy Association
Oct. 18, 2013	Georgia Power Company 2013 Rate Case	Georgia Public Service Commission Docket # 36989	Georgia Solar Energy Industries Association
Nov. 4, 2013	PEPCO Rate Case (District of Columbia)	District of Columbia Public Service Commission Formal Case # 1103	Grid 2.0 Working Group & Sierra Club of Washington, D.C.
Apr. 24, 2014	Dominion Virginia Electric Power 2013 IRP	Virginia State Corporation Commission Case # PUE-2013-00088	Environmental Respondents
Apr. 25, 2014	North Carolina Utilities Commission 2014 Avoided Cost Case - Direct	North Carolina Utilities Commission Docket # E-100, Sub. 140	Southern Alliance for Clean Energy
May 7, 2014	Arizona Corporation Commission Investigation on the Value and Cost of Distributed Generation	Arizona Corporation Commission Docket # E-00000J-14-0023	Rábago Energy LLC (invited presentation and workshop participation)
Jun. 2, 2014	North Carolina Utilities Commission 2014 Avoided Cost Case – Response (Corrected)	North Carolina Utilities Commission Docket # E-100, Sub. 140	Southern Alliance for Clean Energy
Jun. 20, 2014	North Carolina Utilities Commission 2014 Avoided Cost Case – Rebuttal	North Carolina Utilities Commission Docket # E-100, Sub. 140	Southern Alliance for Clean Energy

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Jul. 23, 2014	Florida Energy Efficiency and Conservation Act, Goal Setting – FPL, Duke, TECO, Gulf	Florida Public Service Commission Docket # 130199-EI, 130200-EI, 130201-EI, 130202-EI	Southern Alliance for Clean Energy
Sep. 19, 2014	Ameren Missouri's Application for Authorization to Suspend Payment of Solar Rebates	Missouri Public Service Commission File No. ET-2014-0350, Tariff # YE-2014-0494	Missouri Solar Energy Industries Association
Aug. 6, 2014	Appalachian Power Company 2014 Biennial Rate Review	Virginia State Corporation Commission Case # PUE-2014-00026	Southern Environmental Law Center (Environmental Respondents)
Aug. 13, 2014	Wisconsin Public Service Corp. 2014 Rate Application	Wisconsin Public Service Commission Docket # 6690-UR-123	RENEW Wisconsin and Environmental Law & Policy Center
Aug. 28, 2014	WE Energies 2014 Rate Application	Wisconsin Public Service Commission Docket # 05-UR-107	RENEW Wisconsin and Environmental Law & Policy Center
Sep. 18, 2014	Madison Gas & Electric Company 2014 Rate Application	Wisconsin Public Service Commission Docket # 3720-UR-120	RENEW Wisconsin and Environmental Law & Policy Center
Sep. 29, 2014	SOLAR, LLC v. Missouri Public Service Commission	Missouri District Court Case # 14AC-CC00316	SOLAR, LLC
Jan. 28, 2016 (date of CPUC order)	Order Instituting Rulemaking to Develop a Successor to Existing Net Energy Metering Tariffs, etc.	California Public Utilities Commission Rulemaking 14-07-002	The Utility Reform Network (TURN)
Mar. 20, 2015	Orange and Rockland Utilities 2015 Rate Application	New York Public Service Commission Case # 14-E-0493	Pace Energy and Climate Center
May 22, 2015	DTE Electric Company Rate Application	Michigan Public Service Commission Case # U-17767	Michigan Environmental Council, NRDC, Sierra Club, and ELPC
Jul. 20, 2015	Hawaiian Electric Company and NextEra Application for Change of Control	Hawai'i Public Utilities Commission Docket # 2015-0022	Hawai'i Department of Business, Economic Development, and Tourism
Sep. 2, 2015	Wisc. PSCo Rate Application	Wisconsin Public Service Commission Case # 6690-UR-124	ELPC
Sep. 15, 2015	Dominion Virginia Electric Power 2015 IRP	Virginia State Corporation Commission Case # PUE-2015-00035	Environmental Respondents
Sep. 16, 2015	NYSEG & RGE Rate Cases	New York Public Service Commission Cases 15-E-0283, -0285	Pace Energy and Climate Center

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Oct. 14, 2015	Florida Power & Light Application for CCPN for Lake Okeechobee Plant	Florida Public Service Commission Case 150196-El	Environmental Confederation of Southwest Florida
Oct. 27, 2015	Appalachian Power Company 2015 IRP	Virginia State Corporation Commission Case # PUE-2015-00036	Environmental Respondents
Nov. 23, 2015	Narragansett Electric Power/National Grid Rate Design Application	Rhode Island Public Utilities Commission Docket No. 4568	Wind Energy Development, LLC
Dec. 8, 2015	State of West Virginia, et al., v. U.S. EPA, et al.	U.S. Court of Appeals for the District of Columbia Circuit Case No. 15-1363 and Consolidated Cases	Declaration in Support of Environmental and Public Health Intervenor in Support of Movant Respondent-Intervenors' Responses in Opposition to Motions for Stay
Dec. 28, 2015	Ohio Power/AEP Affiliate PPA Application	Public Utilities Commission of Ohio Case No. 14-1693-EL-RDR	Environmental Law and Policy Center
Jan. 19, 2016	Ohio Edison Company, Cleveland Electric Illuminating Company, and Toledo Edison Company Application for Electric Security Plan (FirstEnergy Affiliate PPA)	Public Utilities Commission of Ohio Case No. 14-1297-EL-SSO	Environmental Law and Policy Center
Jan. 22, 2016	Northern Indiana Public Service Company (NIPSCO) Rate Case	Indiana Utility Regulatory Commission Cause No. 44688	Citizens Action Coalition and Environmental Law and Policy Center
Mar. 18, 2016	Northern Indiana Public Service Company (NIPSCO) Rate Case – Settlement Testimony	Indiana Utility Regulatory Commission Cause No. 44688	Joint Intervenor – Citizens Action Coalition and Environmental Law and Policy Center
Mar. 18, 2016	Comments on Pilot Rate Proposals by MidAmerican and Alliant	Iowa Utility Board NOI-2014-0001	Environmental Law and Policy Center
May 27, 2016	Consolidated Edison of New York Rate Case	New York Public Service Commission Case No. 16-E-0060	Pace Energy and Climate Center
Jun. 21, 2016	Federal Trade Commission: Workshop on Competition and Consumer Protection Issues in Solar Energy - Invited workshop presentation	Federal Trade Commission - Solar Electricity Project No. P161200	Pace Energy and Climate Center
Aug. 17, 2016	Dominion Virginia Electric Power 2016 IRP	Virginia State Corporation Commission Case # PUE-2016-00049	Environmental Respondents

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Aug. 17, 2016	Dominion Virginia Electric Power 2016 IRP	Virginia State Corporation Commission Case # PUE-2016-00049	Environmental Respondents
Sep. 13, 2016	Appalachian Power Company 2016 IRP	Virginia State Corporation Commission Case # PUE-2016-00050	Environmental Respondents
Oct. 27, 2016	Consumers Energy PURPA Compliance Filing	Michigan Public Service Commission Case No. U-18090	Environmental Law & Policy Center, “Joint Intervenors”
Oct. 28, 2016	Delmarva, PEPCO (PHI) Utility Transformation Filing – Review of Filing & Utilities of the Future Whitepaper	Maryland Public Service Commission Case PC 44	Public Interest Advocates
Dec. 1, 2016	DTE Electric Company PURPA Compliance Filing	Michigan Public Service Commission Case No. U-18091	Environmental Law & Policy Center, “Joint Intervenors”
Dec. 16, 2016	Development of New Alternative Net Metering Tariffs - Rebuttal of Unitil Testimony	New Hampshire Public Utilities Commission Docket No. DE 16-576	New Hampshire Sustainable Energy Association (“NHSEA”)
Jan. 13, 2017	Gulf Power Company Rate Case	Florida Public Service Commission Docket No. 160186-EI	Earthjustice, Southern Alliance for Clean Energy, League of Women Voters-Florida
Jan. 13, 2017	Alpena Power Company PURPA Compliance Filing	Michigan Public Service Commission Case No. U-18089	Environmental Law & Policy Center, “Joint Intervenors”
Jan. 13, 2017	Indiana Michigan Power Company PURPA Compliance Filing	Michigan Public Service Commission Case No. U-18092	Environmental Law & Policy Center, “Joint Intervenors”
Jan. 13, 2017	Northern States Power Company PURPA Compliance Filing	Michigan Public Service Commission Case No. U-18093	Environmental Law & Policy Center, “Joint Intervenors”
Jan. 13, 2017	Upper Peninsula Power Company PURPA Compliance Filing	Michigan Public Service Commission Case No. U-18094	Environmental Law & Policy Center, “Joint Intervenors”
Mar. 10, 2017	Eversource Energy Grid Modernization Plan	Massachusetts Department of Public Utilities Case No. 15-122/15-123	Cape Light Compact
Apr. 27, 2017	Eversource Rate Case & Grid Modernization Investments	Massachusetts Department of Public Utilities Case No. 17-05	Cape Light Compact
May 2, 2017	AEP Ohio Power Electric Security Plan	Public Utilities Commission of Ohio Case No. 16-1852-EL-SSO	Environmental Law & Policy Center

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Jun. 2, 2017	Vectren Energy TDSIC Plan	Indiana Utility Regulatory Commission Cause No. 44910	Citizens Action Coalition & Valley Watch
Jul. 26, 2017	Vectren Energy 2018-2020 Energy Efficiency Plan	Indiana Utility Regulatory Commission Cause No. 44927	Citizens Action Coalition
Jul. 28, 2017	Vectren Energy 2016-2017 Energy Efficiency Plan	Indiana Utility Regulatory Commission Cause No. 44645	Citizens Action Coalition
Aug. 1, 2017	Interstate Power & Light (Alliant) 2017 Rate Application	Iowa Utilities Board Docket No. RPU-2017-0001	Environmental Law & Policy Center, Iowa Environmental Council, Natural Resources Defense Council, and Solar Energy Industries Assoc.
Aug. 11, 2017	Dominion Virginia Electric Power 2017 IRP	Virginia State Corporation Commission Case # PUR-2017-00051	Environmental Respondents
Aug. 18, 2017	Appalachian Power Company 2017 IRP	Virginia State Corporation Commission Case # PUR-2017-00045	Environmental Respondents
Aug. 23, 2017	Pennsylvania Solar Future Project	Pennsylvania Dept. of Environmental Protection - Alternative Ratemaking Webinar	Pace Energy and Climate Center
Aug. 25, 2017	Niagara Mohawk Power Co. d/b/a National Grid Rate Case	New York Public Service Commission Case # 17-E-0238, 17-G-0239	Pace Energy and Climate Center
Sep. 15, 2017	Niagara Mohawk Power Co. d/b/a National Grid Rate Case	New York Public Service Commission Case # 17-E-0238, 17-G-0239	Pace Energy and Climate Center
Oct. 20, 2017	Missouri PSC Working Case to Explore Emerging Issues in Utility Regulation	Missouri Public Service Commission File No. EW-2017-0245	Renew Missouri
Nov. 21, 2017	Central Hudson Gas & Electric Co. Electric and Gas Rates Cases	New York Public Service Commission Case # 17-E-0459, -0460	Pace Energy and Climate Center
Jan. 16, 2018	Great Plains Energy, Inc. Merger with Westar Energy, Inc.	Missouri Public Service Commission Case # EM-2018-0012	Renew Missouri Advocates
Jan. 19, 2018	U.S. House of Representatives, Energy and Commerce Committee	Hearing on "The PURPA Modernization Act of 2017," H.R. 4476	Rábago Energy LLC

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Jan. 29, 2018	Joint Petition of Electric Distribution Companies for Approval of a Model SMART Tariff	Massachusetts Department of Public Utilities Case No. 17-140	Boston Community Capital Solar Energy Advantage Inc. (Jointly authored with Sheryl Musgrove)
Feb. 21, 2018	Joint Petition of Electric Distribution Companies for Approval of a Model SMART Tariff	Massachusetts Department of Public Utilities Case No. 17-140 - Surrebuttal	Boston Community Capital Solar Energy Advantage Inc. (Jointly authored with Sheryl Musgrove)
Apr. 6, 2018	Narragansett Electric Co., d/b/a National Grid Rate Case Filing	Rhode Island Public Utilities Commission Docket No. 4770	New Energy Rhode Island ("NERI")
Apr. 25, 2018	Narragansett Electric Co., d/b/a National Grid Power Sector Transformation Plan	Rhode Island Public Utilities Commission Docket No. 4780	New Energy Rhode Island ("NERI")
Apr. 26, 2018	U.S. EPA Proposed Repeal of Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 82 Fed. Reg. 48,035 (Oct. 16, 2017) – "Clean Power Plan"	U.S. Environmental Protection Agency Docket No. EPA-HQ-OAR-2016-0592	Karl R. Rábago
May 25, 2018	Orange & Rockland Utilities, Inc. Rate Case Filing	New York Public Service Commission Case Nos. 18-E-0067, 18-G-0068	Pace Energy and Climate Center
Jun. 15, 2018	Orange & Rockland Utilities, Inc. Rate Case Filing	New York Public Service Commission Case Nos. 18-E-0067, 18-G-0068 – Rebuttal Testimony	Pace Energy and Climate Center
Aug. 10, 2018	Dominion Virginia Electric Power 2018 IRP	Virginia State Corporation Commission Case # PUR-2018-00065	Environmental Respondents
Sep. 20, 2018	Consumers Energy Company Rate Case	Michigan Public Service Commission Case No. U-20134	Environmental Law & Policy Center
Sep. 27, 2018	Potomac Electric Power Co. Notice to Construct Two 230 kV Underground Circuits	District of Columbia Public Service Commission Formal Case No. 1144	Solar United Neighbors of D.C.
Sep. 28, 2019	Arkansas Public Service Commission Investigation of Policies Related to Distributed Energy Resources	Arkansas Public Service Commission Docket No. 16-028-U	Arkansas Audubon Society & Arkansas Advanced Energy Association
Nov. 7, 2018	DTE Detroit Edison Rate Case	Michigan Public Service Commission Case No. U-20162	Natural Resources Defense Council, Michigan Environmental Council, Sierra Club

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Mar. 26, 2019	Guam Power Authority Petition to Modify Net Metering	Guam Public Utilities Commission Docket GPA 19-04	Micronesia Renewable Energy, Inc.
Apr. 4, 2019	Community Power Network & League of Women Voters of Florida v. JEA	Circuit Court Duval County of Florida Case No. 2018-CA-002497 Div: CV-D	Earthjustice
Apr. 16, 2019	Dominion Virginia Electric Power 2018 IRP – Compliance Filing	Virginia State Corporation Commission Case # PUR-2018-00065	Environmental Respondents
Apr. 25, 2019	Georgia Power 2019 IRP	Georgia Public Service Commission Docket No. 42310	GSEA & GSEIA
May 10, 2019	NV Energy NV GreenEnergy 2.0 Rider	Nevada Public Utilities Commission Docket Nos. 18-11015, 18-11016	Vote Solar
May 24, 2019	Consolidated Edison of New York Electric and Gas Rate Cases – Misc. Issues	New York Public Service Commission Case Nos. 19-E-0065, 19-G-0066	Pace Energy and Climate Center
May 24, 2019	Consolidated Edison of New York Electric and Gas Rate Cases – Low- and Moderate-Income Panel	New York Public Service Commission Case Nos. 19-E-0065, 19-G-0066	Pace Energy and Climate Center
May 30, 2019	Connecticut DEEP Shared Clean Energy Facility Program Proposal	Connecticut Department of Energy and Environmental Protection Docket No. 19-07-01	Connecticut Fund for the Environment
Jun. 3, 2019	New Orleans City Council Rulemaking to Establish Renewable Portfolio Standards	New Orleans City Council Docket No. UD-19-01	National Audubon Society and Audubon Louisiana
Jun. 14, 2019	Consolidated Edison of New York Electric and Gas Rate Cases – Rebuttal Testimony	New York Public Service Commission Case Nos. 19-E-0065, 19-G-0066	Pace Energy and Climate Center
Jun. 24, 2019	Program to Encourage Clean Energy in Westchester County Pursuant to Public Service law Section 74-a; Staff Investigation into a Moratorium on New Natural Gas Services in the Consolidated Edison Company of New York, Inc. Service Territory	New York Public Service Commission Case Nos. 19-M-0265, 19-G-0080	Earthjustice and Pace Energy and Climate Center
Jul. 12, 2019	Application of Virginia Electric and Power Company for the Determination of the Fair Rate of Return on Common Equity	Virginia State Corporation Commission Case # PUR-2019-00050	Virginia Poverty Law Center

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Jul. 15, 2019	New Orleans City Council Rulemaking to Establish Renewable Portfolio Standards – Reply Comments	New Orleans City Council Docket No. UD-19-01	National Audubon Society and Audubon Louisiana
Aug. 1, 2019	Interstate Power and Light Company – General Rate Case	Iowa Utilities Board Docket No. RPU-2019-0001	Environmental Law & Policy Center and Iowa Environmental Council
Aug. 19, 2019	Consolidated Edison of New York Electric and Gas Rate Cases – Surrebuttal	New York Public Service Commission Case Nos. 19-E-0065, 19-G-0066	Pace Energy and Climate Center
Aug. 21, 2019	Connecticut Department of Energy and Environmental Protection and Public Utility Regulatory Authority Joint Proceeding on the Value of Distributed Energy Resources - Comments	Connecticut Department of Energy and Environmental Protection/Public Utility Regulatory Authority Docket No. 19-06-29	Connecticut Fund for the Environment and Save Our Sound
Sep. 10, 2019	Interstate Power and Light Company – General Rate Case - Rebuttal	Iowa Utilities Board Docket No. RPU-2019-0001	Environmental Law & Policy Center and Iowa Environmental Council
Sep. 18, 2019	Connecticut Department of Energy and Environmental Protection and Public Utility Regulatory Authority Joint Proceeding on the Value of Distributed Energy Resources – Comments and Response to Draft Study Outline	Connecticut Department of Energy and Environmental Protection/Public Utility Regulatory Authority Docket No. 19-06-29	Connecticut Fund for the Environment, Save Our Sound, E4theFuture, NE Clean Energy Council, NE Energy Efficiency Partnership, and Acadia Center
Sep. 20, 2019	Connecticut Department of Energy and Environmental Protection and Public Utility Regulatory Authority Joint Proceeding on the Value of Distributed Energy Resources – Participation in Technical Workshop 1	Connecticut Department of Energy and Environmental Protection/Public Utility Regulatory Authority Docket No. 19-06-29 http://www.ctn.state.ct.us/ctnplayer.asp?odID=16715	Connecticut Fund for the Environment and Save Our Sound
Oct. 4, 2019	Connecticut Department of Energy and Environmental Protection and Public Utility Regulatory Authority Joint Proceeding on the Value of Distributed Energy Resources – Participation in Technical Workshop 2	Connecticut Department of Energy and Environmental Protection/Public Utility Regulatory Authority Docket No. 19-06-29 http://www.ctn.state.ct.us/ctnplayer.asp?odID=16766	Connecticut Fund for the Environment and Save Our Sound
Oct. 15, 2019	Electronic Consideration of the Implementation of the Net Metering Act (KY SB 100)	Kentucky Public Service Commission Case No. 2019-00256	Kentuckians for the Commonwealth & Mountain Association for Community Economic Development

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Oct. 15, 2019	New Orleans City Council Rulemaking to Establish Renewable Portfolio Standards – Comments on City Council Utility Advisors’ Report	New Orleans City Council Docket No. UD-19-01	National Audubon Society and Audubon Louisiana, Vote Solar, 350 New Orleans, Alliance for Clean Energy, PosiGen, and Sierra Club
Oct. 17, 2019	Indiana Michigan Power Co. General Rate Case	Michigan Public Service Company Case No. U-20359	Environmental Law & Policy Center, The Ecology Center, the Solar Energy Industries Association, and Vote Solar
Dec. 4, 2019	Alabama Power Company Petition for Certificate of Convenience and Necessity	Alabama Public Service Commission Docket No. 32953	Energy Alabama and Gasp, Inc.
Dec. 5, 2019	In the Matter of Net Metering and the Implementation of Act 827 of 2015	Arkansas Public Service Commission Docket No. 16-027-R	National Audubon Society and Arkansas Advanced Energy Association
Dec. 6, 2019	Proposed Revisions to Vermont Public Utility Commission Rule 5.100	Vermont Public Utility Commission Case No. 19-0855-RULE	Renewable Energy Vermont (“REV”)
Jan. 15, 2020	Puget Sound Energy General Rate Case	Washington Utilities and Transportation Commission Docket Nos. UE-190529 & UG-190530	Puget Sound Energy
Feb. 11, 2020	Application of Entergy Arkansas, LLC for a Proposed Tariff Amendment: Solar Energy Purchase Option – Direct Testimony	Arkansas Public Service Commission Docket No. 19-042-TF	Arkansas Advanced Energy Association
Mar. 17, 2020	Application of Entergy Arkansas, LLC for a Proposed Tariff Amendment: Solar Energy Purchase Option – Surrebuttal Testimony	Arkansas Public Service Commission Docket No. 19-042-TF	Arkansas Advanced Energy Association
Jun. 16, 2020	PECO Energy Default Supply Plan V – Direct Testimony	Pennsylvania Public Utility Commission Docket No. P-2020-3019290	Environmental Respondents / Earthjustice
Jun. 24, 2020	Consumers Energy Company General Rate Case – Direct Testimony	Michigan Public Service Commission Case No. U-20697	Joint Clean Energy Organizations / Environmental Law & Policy Center
Jul. 14, 2020	Consumers Energy Company General Rate Case – Rebuttal Testimony	Michigan Public Service Commission Case No. U-20697	Joint Clean Energy Organizations / Environmental Law & Policy Center
Jul. 23, 2020	PECO Energy Default Supply Plan V – Surrebuttal Testimony	Pennsylvania Public Utility Commission Docket No. P-2020-3019290	Environmental Stakeholders / Earthjustice

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Sep. 15, 2020	Dominion Virginia Electric Power 2020 IRP – Direct Testimony	Virginia State Corporation Commission Case # PUR-2020-00035	Environmental Respondents
Sep. 18, 2020	Avoided Cost Proceeding for Georgia Power – Direct Testimony	Georgia Public Service Commission Docket No. 4822	Georgia Solar Energy Industries Association, Inc.
Sep. 29, 2020	Madison Gas and Electric – General Rate Case – Affidavit in Opposition to Electric Rates Settlement	Wisconsin Public Service Commission Docket No. 3270-UR-123	Sierra Club
Sep. 30, 2020	Madison Gas and Electric – General Rate Case – Gas Rates	Wisconsin Public Service Commission Docket No. 3270-UR-123	Sierra Club
Oct. 2, 2020	Duke Energy Florida Petition for Approval of Clean Energy Connect Program	Florida Public Service Commission Docket No. 20200176-EI	League of United Latin American Citizens of Florida
Oct. 2, 2020	Ameren Illinois – Investigation re: Calculation of Distributed Generation Rebates	Illinois Commerce Commission Docket No. 20-0389	Joint Solar Parties
Dec. 9, 2020	Arkansas – In the Matter of a Rulemaking to Adopt an Evaluation, Measurement, and Verification Protocol and Propose M&V Amendments to the Commission’s Rules for Conservation and Energy Efficiency Programs; In the Matter of the Continuation, Expansion, and Enhancement of Public Utility Energy Efficiency Programs in Arkansas	Arkansas Public Service Commission Docket Nos. 10-100-R, 13-002-U	Arkansas Advanced Energy Association
Dec. 22, 2020	Appalachian Power Company 2020 Virginia Clean Economy Act Compliance Plan	Virginia State Corporation Commission Case No. PUR-2020-00135	Environmental Respondent
Jan. 4, 2021	Dominion Virginia Electric Power Company Clean Economy Compliance Plan	Virginia State Corporation Commission Case No. PUR-2020-00134	Environmental Respondent
Feb. 5, 2021	Ameren Illinois – Investigation re: Calculation of Distributed Generation Rebates - Rebuttal	Illinois Commerce Commission Docket No. 20-0389	Joint Solar Parties
Feb. 15, 2021	Kentucky Power Company General Rate Case	Kentucky Public Service Commission Case No. 2020-00174	Joint Intervenors – Mountain Association, Kentuckians for the Commonwealth, Kentucky Solar Energy Society

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Mar. 2, 2021	Dominion Virginia Electric Power Company Rider RGGI Proposal	Virginia State Corporation Commission Case No. PUR-2020-00169	Environmental Respondent
Mar. 5, 2021	Kentucky Utilities Company and Louisville Gas and Electric Company General Rate Cases	Kentucky Public Service Commission Case Nos. 2020-00349, 2020-00350	Joint Intervenors – Mountain Association, Kentuckians for the Commonwealth, Kentucky Solar Energy Society
Apr. 5, 2021	Docket to Review the Efficacy and Fairness of the Net Metering and Interconnection Rules – Comments	Mississippi Public Service Commission Docket No. 2021-AD-19	Entegry Energy Partners, LLC & Audubon Delta / National Audubon Society
Apr. 13, 2021	Petition of Guam Power Authority for Creation of a New Energy Storage Rate – Comments of Micronesia Renewable Energy, Inc.	Guam Public Utilities Commission Docket No. 20-09	Micronesia Renewable Energy, Inc.
May 25, 2021	Petition of Episcopal Diocese of Rhode Island for Declaratory Judgment on Transmission System Costs and Related “Affected System Operator” Studies	Rhode Island Public Utility Commission Docket No. 4981	Episcopal Diocese of Rhode Island
Jun. 21, 2021	Petition for Rate Increase by Florida Power & Light Company – Direct Testimony	Florida Public Service Commission Docket No. 20210015-EI	Florida Rising, Inc., League of United Latin American Citizens of Florida, and Environmental Confederation of Southwest Florida, Inc.
Jun. 22, 2021	Application of Consumers Energy Company for Authority to Increase Its Rates for the Generation and Distribution of Electricity and Other Relief	Michigan Public Service Commission Case No. U-20963	The Environmental Law and Policy Center (EPLC)
Jun. 28, 2021	Pennsylvania Public Utility Commission v. PECO Energy Company (GRC)	Pennsylvania Utility Commission Docket No. R-2021-3024601	Clean Energy Advocates
Jul. 12, 2021	Application of Consumers Energy Company for Authority to Increase Its Rates for the Generation and Distribution of Electricity and Other Relief – Rebuttal	Michigan Public Service Commission Case No. U-20963	The Environmental Law and Policy Center (EPLC)
Jul. 28, 2021	Application of Shenandoah Valley Electric Cooperative for a General Increase in Rates	Virginia State Corporation Commission Case No. PUR-2021-00054	Solar United Neighbors of Virginia (SUN-VA)
Aug. 5, 2021	Kentucky Utilities Company and Louisville Gas and Electric Company General Rate Cases – Supp. Proceeding on Net Energy Metering	Kentucky Public Service Commission Case Nos. 2020-00349, 2020-00350	Joint Intervenors – Mountain Association, Kentuckians for the Commonwealth, Kentucky Solar Energy Society

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Sep. 2, 2021	Madison Gas & Electric Co. – General Rate Case	Wisconsin Public Service Commission Docket No. 3270-UR-124	Sierra Club
Sep. 3, 2021	Dominion Virginia Electric Power Company – Triennial Rate Review – Direct Testimony on ROE	Virginia State Corporation Commission Case No. PUR-2020-00169	
Sep. 13, 2021	Petition for Rate Increase by Florida Power & Light Company – Settlement Testimony	Florida Public Service Commission Docket No. 20210015-EI	Florida Rising, Inc., League of United Latin American Citizens of Florida, and Environmental Confederation of Southwest Florida, Inc.
Sep. 20, 2021	Madison Gas & Electric Co. – General Rate Case – Surrebuttal Testimony	Wisconsin Public Service Commission Docket No. 3270-UR-124	Sierra Club
Sep. 27, 2021	Dakota Energy Cooperative, Inc. v. East River Electric Power Cooperative, Inc. and Basin Electric Power Cooperative – Expert Report	US. District Court, District of South Dakota (Southern Division) Case 4:20-CV-04192-LLP	Dakota Energy Cooperative, Inc.
Oct. 5, 2021	In the Matter of establishing regulations for a shared solar program pursuant to § 56-594.3 of the Code of Virginia	Virginia State Corporation Commission Case No. PUR-2020-00125	Coalition for Community Solar Access
Nov. 1, 2021	Dakota Energy Cooperative, Inc. v. East River Electric Power Cooperative, Inc. and Basin Electric Power Cooperative – Surrebuttal Expert Report	US. District Court, District of South Dakota (Southern Division) Case 4:20-CV-04192-LLP	Dakota Energy Cooperative, Inc.
Nov. 16, 2021	Petition of Virginia Electric and Power Company for approval of the RPS Development Plan, approval & certification of proposed CE-2 Solar Projects pursuant to § 56-580 D and 56-46.1 of the Code of Virginia	Virginia State Corporation Commission Case No. PUR-2021-00146	Appalachian Voices
Mar. 1, 2022	In the Matter of establishing regulations for a multi-family shared solar program pursuant to § 56-585.1:12 of the Code of Virginia	Virginia State Corporation Commission Case No. PUR-2020-00125	Appalachian Voices

Testimony Submitted by Karl R. Rábago

(as of 25 October 2022)

Mar. 29, 2022	Review of Duke Energy Carolina, LLC & Duke Energy Progress, LLC Joint Application for Approval of NEM Tariff Revisions and Recommendations for Investigation of Costs and Benefits of Customer-Sited Generation – Expert Report	North Carolina Utilities Commission Docket No. E-100, Sub. 180	Environmental Working Group
Mar. 30, 2022	Ameren Illinois Company Petition for Approval of Performance and Tracking Metrics Pursuant to 220 ILCS 5/16-108.188(e) – Direct Testimony	Illinois Commerce Commission Docket No. 22-0063	Joint Solar Parties
Apr. 6, 2022	Commonwealth Edison Company Petition for the Establishment of Performance Metrics under Section 16-108.18(e) of the Public Utilities Act	Illinois Commerce Commission Docket No. 22-0067	Joint Solar Parties
May 6, 2022	Review of Duke Energy Carolina, LLC & Duke Energy Progress, LLC Joint Application for Approval of NEM Tariff Revisions and Recommendations for Investigation of Costs and Benefits of Customer-Sited Generation – Reply Report	North Carolina Utilities Commission Docket No. E-100, Sub. 180	Environmental Working Group
May 25, 2022	Ameren Illinois Company Petition for Approval of Performance and Tracking Metrics Pursuant to 220 ILCS 5/16-108.188(e) – Rebuttal Testimony	Illinois Commerce Commission Docket No. 22-0063	Joint Solar Parties
May 27, 2022	Review of Duke Energy Carolina, LLC & Duke Energy Progress, LLC Joint Application for Approval of NEM Tariff Revisions and Recommendations for Investigation of Costs and Benefits of Customer-Sited Generation – Surreply Report	North Carolina Utilities Commission Docket No. E-100, Sub. 180	Environmental Working Group

Testimony Submitted by Karl R. Rábago

(as of 25 October 2022)

Jun. 6, 2022	Commonwealth Edison Company Petition for the Establishment of Performance Metrics under Section 16-108.18(e) of the Public Utilities Act – Rebuttal Testimony	Illinois Commerce Commission Docket No. 22-0063	Joint Solar Parties
Jun. 22, 2022	In the Matter of Austin Energy Base Rate Case Filing Dated April 18, 2022	City of Austin Hearing Examiner	Sierra Club, Public Citizen, and Solar United Neighbors
Oct. 3, 2022	In the Matter of the Application of Northern States Power Company for Authority to Increase Rates for Electric Service in Minnesota	Minnesota Public Utilities Commission Docket No. E002/GR-21-630.	Just Solar Coalition
Oct. 13, 2022	Verified Petition of Vote Solar of Distributed Energy Resource Systems in Wisconsin – Rebuttal	Wisconsin PSC Docket No. 9300-DR-106	Vote Solar
Oct. 21, 2022	Verified Petition of Vote Solar of Distributed Energy Resource Systems in Wisconsin - Surrebuttal	Wisconsin PSC Docket No. 9300-DR-106	Vote Solar

OCC EXHIBIT NO. _____

**BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO**

In the Matter of the Application of)
Columbia Gas of Ohio, Inc. for Authority)
to Amend its Filed Tariffs to Increase the) Case No. 21-637-GA-AIR
Rates and Charges for Gas Services and)
Related Matters.)

In the Matter of the Application of)
Columbia Gas of Ohio, Inc. for Approval) Case No. 21-638-GA-ALT
of an Alternative Form of Regulation.)

In the Matter of the Application of)
Columbia Gas of Ohio, Inc. for Approval)
of a Demand Side Management Program) Case No. 21-639-GA-UNC
for its Residential and Commercial)
Customers.)

In the Matter of the Application of)
Columbia Gas of Ohio, Inc. for Approval) Case No. 21-640-GA-AAM
to Change Accounting Methods.)

**DIRECT TESTIMONY
OF
ROBERT B. FORTNEY**

On Behalf of
Office of the Ohio Consumers' Counsel
65 East State Street, Suite 700
Columbus, Ohio 43215

May 13, 2022

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ATTACHMENTS

Attachment RBF-1 Fortney Testimony History
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*Direct Testimony of Robert B. Fortney
On Behalf of Office of the Ohio Consumers' Counsel
PUCO Case No 21-637-GA-AIR, et al.*

1 **I. INTRODUCTION**

2

3 ***Q1. PLEASE STATE YOUR NAME, ADDRESS AND POSITION.***

4 ***A1.*** My name is Robert B. Fortney. My business address is 65 East State Street, Suite
5 700, Columbus, Ohio 43215. I am a Rate Design and Cost of Service Analyst for
6 the Office of the Ohio Consumers' Counsel ("OCC").

7

8 ***Q2. WHAT ARE YOUR RESPONSIBILITIES AS A RATE DESIGN AND COST***
9 ***OF SERVICE ANALYST?***

10 ***A2.*** I am responsible for investigating utility applications regarding rate and tariff
11 activities such as tariff language, cost of service studies, revenue distribution, cost
12 allocation, and rate design that impact the residential consumers of Ohio. My
13 primary focus is to make recommendations to protect residential consumers from
14 unreasonable and unjustified utility rate increases and unfair regulatory practices.

15

16 ***Q3. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND.***

17 ***A3.*** I earned a Bachelor of Science degree in Business Administration from Ball State
18 University in Muncie, Indiana in 1971. I earned a Master of Business
19 Administration degree from the University of Dayton in 1979.

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1 ***Q4. PLEASE SUMMARIZE YOUR PROFESSIONAL EXPERIENCE AS IT***
2 ***RELATES TO UTILITY REGULATION.***

3 ***A4.*** From July 1985 to August 2012, I was employed by the Public Utilities
4 Commission of Ohio (“PUCO”). During that time, I held a number of positions
5 (e.g., Rate Analyst, Rate Analyst Supervisor, Public Utilities Administrator) in
6 various divisions and departments that focused on utility applications regarding
7 rates and tariff issues. In August 2012, I retired from the PUCO as a Public
8 Utilities Administrator, Chief of the Rates and Tariffs Division, which focused on
9 utility rates and tariff matters. The role of that division was to investigate and
10 analyze the rate- and tariff-related filings and applications of the electric, gas, and
11 water utilities regulated by the PUCO and to make Staff recommendations to the
12 PUCO regarding those filings. I joined the OCC in December of 2015 as a Rate
13 Design and Cost of Service Analyst

14
15 ***Q5. HAVE YOU PREVIOUSLY SUBMITTED TESTIMONY BEFORE THE***
16 ***PUCO?***

17 ***A5.*** Yes. When I worked at the PUCO, I testified on numerous occasions to advocate
18 to the PUCO the positions of the PUCO Staff. Over the course of my career at the
19 PUCO, I often recommended to the PUCO cost allocation methodologies needed
20 to develop a reasonable distribution of utility revenues. I also was responsible for
21 recommending reasonable rate designs needed to recover the revenue
22 requirement, by class of service and in total.

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1 In addition, I have submitted testimony for OCC in several proceedings since
2 joining its staff. A list of proceedings that I have submitted testimony to the
3 PUCO is provided in Attachment RBF-1
4

5 **II. PURPOSE OF TESTIMONY**
6

7 ***Q6. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS***
8 ***PROCEEDING?***

9 ***A6.*** The purpose of my testimony is to explain and support OCC's position protecting
10 residential consumers as it relates to the Application of Columbia Gas of Ohio,
11 Inc, ("Columbia") for an Increase in Electric Distribution Rates ("Application")
12 filed in case No. 21-637-GA-AIR, et al.
13

14 Specifically, I will explain and support OCC/NOPEC'S Objection Nos. 2, 3, 23,
15 24, 25 and 26¹ pertaining to recommendations made by the PUCO Staff in the
16 Staff Report ("Staff Report") filed in this proceeding on April 6, 2022.² Those
17 recommendations are primarily related to the distribution of any revenue increase
18 to the different rate classes and the fixed delivery charge for the Small General
19 Service ("SGS") class.

¹ Objections to the PUCO Staff's Report of Investigation by the Office of the Ohio Consumers' Counsel (May 6, 2022).

² Staff's Report of Investigation (April 6, 2022).

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1 **III. OCC/NOPEC'S OBJECTIONS TO STAFF REPORT**

2

3 **OCC/NOPEC Objection No. 2**

4

5 ***Q7. WHY DOES OCC OBJECT TO THE FOLLOWING STAFF REPORT***
6 ***LANGUAGE AT PAGE 7: "AS SHOWN ON SCHEDULE A-1 STAFF***
7 ***RECOMMENDS AN APPROXIMATE REVENUE INCREASE IN THE***
8 ***RANGE OF \$35,197,000 TO \$57,554,000. THIS REPRESENTS AN***
9 ***INCREASE OF 3.98 PERCENT TO 6.34 PERCENT OVER TEST YEAR***
10 ***OPERATING REVENUE."***

11 **A7.** This is a miscalculation by Staff on Line 12 of its Schedule A-1.³ The Staff
12 erroneously used the proposed revenue requirement instead of the Test Year
13 Operating Revenue as the divisor in its calculation of the Net Increase percent.
14 This understates the magnitude of the rate increase proposed by Columbia and
15 recommended in the Staff Report. The correct percentages should be: Applicant
16 Proposed = 27.07%; Staff Lower Bound = 4.14%; and Staff Upper Bound =
17 6.77%. This results in an increase of 5.45% at the Staff midpoint.

³ Staff Report at 59.

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1 **OCC/NOPEC Objection No. 23**

2

3 ***Q8. DOES OCC OBJECT TO THE STAFF'S RECOMMENDATION AT PAGE 38***
4 ***THAT COLUMBIA RERUN THE COST OF SERVICE STUDY ("COSS") TO***
5 ***INCLUDE STAFF'S RECOMMENDATIONS (AND THAT THE MODIFIED***
6 ***COSS BE USED AS A BASIS FOR RATE DESIGN)?***

7 ***A8.*** No.

8

9 ***Q9. THEN, TO WHAT ABOUT THAT RECOMMENDATION DOES OCC***
10 ***OBJECT?***

11 ***A9.*** The recommendation does not go far enough in explaining how it (the rerun of the
12 COSS) should be accomplished. The Staff should have further recommended to
13 the PUCO: (A) a time frame for the rerun to be provided, (B) how or when the
14 OCC and other intervening parties could respond to any Staff recommendations
15 based on the modified COSS, and (C) an extension of the procedural schedule
16 based on Columbia providing a modified COSS. In general, it is reasonable to
17 provide the intervening parties the opportunity and the time to respond to any
18 recommendations the Staff may make based upon a revised COSS.

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OCC/NOPEC Objection No. 24

Q10. WHY DOES OCC OBJECT TO THE STAFF'S FINDING ON PAGE 37 OF THE STAFF REPORT WHICH STATES "THE APPLICANT'S PROPOSAL REFLECTS A REASONABLE MOVEMENT TOWARD THE COST TO SERVE EACH [CUSTOMER] CLASS IDENTIFIED BY THE APPLICANT'S COSS AT THE APPLICANT'S PROPOSED COST TO SERVE."

A10. Given that Staff also found that "The interclass subsidies identified by the Applicant's COSS could change substantially when taking Staff's recommendations into account,"⁴ Staff should have further found that it would await the results of the modified COSS before making a recommendation regarding the allocation of any revenue increase to consumers.

Q11. DOES OCC HAVE A RECOMMENDATION REGARDING THE ALLOCATION OF ANY REVENUE INCREASE TO CONSUMERS?

A11. Yes. While moving towards cost of service is a reasonable goal, given the inadequacy of the COSS, the most logical distribution of any base distribution revenue increase would be a levelized, across-the-board increase to all customer classes. Depending on the revenue requirement found to be reasonable in this proceeding, the percentage increases in base distribution revenues for all classes should be equal.

⁴ Staff Report at 38.

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OCC/NOPEC Objection Nos. 3 & 25

***Q12. WHAT IS THE CURRENT DELIVERY CHARGE FOR THE SGS
(RESIDENTIAL CONSUMERS) RATE CLASS?***

A12. The current Delivery Charge for the SGS rate class is \$16.75/month. At the time of filing of the Application, the Infrastructure Replacement Program Rider (“IRP”) fixed charge for the SGS rate class was a fixed charge of \$11.98/month and the Capital Expenditure Program Rider (“CEP”) fixed charge for the SGS rate class was \$5.92/month. This totals \$34.65/month. While there are other considerations (e.g. the Infrastructure Development Rider and gross receipts taxes), for the purpose of comparison, I consider \$34.65/month to be the current fixed delivery charge for the SGS rate class.

***Q13. WHAT IS COLUMBIA’S PROPOSED DELIVERY CHARGE TO
RESIDENTIAL CONSUMERS?***

A13. Columbia proposes to roll the current IRP and CEP into the delivery charge and increase the current \$34.65/month to \$46.31/month.⁵ Furthermore, Columbia proposes to renew the IRP and CEP Riders (which will begin at zero) and continue to recover the applicable costs, subject to caps, in the future. By 2027, if Columbia’s projected monthly fixed charge rate caps were implemented, the monthly fixed IRP charge for residential consumers (Small General Service class)

⁵ Staff Report at 39.

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will be \$10.87, and the monthly fixed CEP charge will be \$15.89. Another OCC witness, Kerry Adkins, will discuss OCC's Objections to those proposals. But as proposed by Columbia, the monthly fixed Delivery Charge for the SGS class (residential consumers) would be \$73.07/month (\$46.31 + \$10.87 + \$15.89) by 2027. On top of this, Columbia is proposing a Federal Mandate Rider that by 2027 could reach an additional \$7.00/month. If the application was approved as filed, a consumer taking service on the SGS rate class would be paying in excess of \$80.00/month, even if the consumer doesn't use a molecule of gas. This is not just and reasonable.

Q14. WHAT IS YOUR UNDERSTANDING OF STAFF'S RECOMMENDATION REGARDING THE FIXED DISTRIBUTION CHARGE FOR THE SMALL GENERAL SERVICE CONSUMERS?

A14. Staff has recommended significant modifications to the IRP, CEP, and Federal Mandate Riders (*see* OCC witness Kerry Adkins' testimony) and the overall revenue requirement (*see* OCC witness Bion Ostrander's testimony) that may reduce the rates proposed by Columbia.

However, while not explicitly stated, it appears to me that Staff is recommending that a full Straight Fixed Variable ("SFV") rate design continue to be utilized as the rate design for the Small General Service ("SGS") class. By a full SFV rate design, I mean that the entire base distribution revenue assigned to the SGS class would be recovered through a fixed charge. The level of that charge would be

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1 determined based upon the base distribution revenue requirement, the class
2 allocation methodology found to be reasonable in this proceeding, the level of any
3 applicable riders, and the number of bills in the class.

4
5 ***Q15. DO YOU AGREE WITH THAT RECOMMENDATION?***

6 ***A15.*** No. Columbia has proposed a SFV rate design in this proceeding. Staff has
7 recommended that a SFV rate design concept continue to be utilized for the SGS
8 class. Staff made this recommendation regarding the rate design for residential
9 consumers (SGS rate class) in spite of the fact that it also recommended “[t]he
10 IRP and CEP rider rate designs for GS and LGS rate classes should not be wholly
11 fixed monthly fees. The rates could be designed at a percentage of the customer’s
12 base distribution charge or a combination of fixed and volumetric rates” and
13 “[c]ustomers within these rate classes are not homogenous. Customers who use
14 less gas have been paying the same rider rates as customers that use more gas,
15 leading to higher bill increases for the lower use customers.”⁶

16
17 Staff should also have made the same findings for the SGS class because the same
18 unfairness in SFV rate design is also true for the SGS (residential) class.

⁶ Staff Report at 40.

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1 **Q16. HAS THE COMMISSION OPINED ON THIS SUBJECT BEFORE?**

2 **A16.** Yes. The Commission considered and adopted a modified SFV rate design for all
3 four major natural gas utilities in Ohio: In re Duke Energy Ohio, Case No. 07-
4 589-GA-AIR {Duke Rate Case), Opinion and Order (May 28, 2008); In re
5 Dominion East Ohio, Case No. 07- 829-GA-AIR (DEO Rate Case), Opinion and
6 Order (Oct. 15, 2008); In re Columbia Gas of Ohio, Case No. 08-72-GA-
7 AIR(Columbia Rate Case), Opinion and Order (Dec. 3, 2008); and In re Vectren
8 Energy Delivery of Ohio, Case No. 07-1080-GA-AIR (VEDO Rate Case),
9 Opinion and Order (Jan. 7, 2009).

10

11 However, the Commission has also indicated that “any interested party will have
12 a full and fair opportunity to address whether the proposed SFV should be
13 implemented and to raise any other issues specific to the Companies’ service
14 territories.”⁷ Additionally, the PUCO noted in another proceeding that “nothing in
15 the Order precludes any party from commenting on or presenting evidence
16 regarding a specific rate design that is proposed as part of a utility’s distribution
17 rate case by the utility, Staff or any other party”⁸ While both cases are electric-
18 related in nature, I believe they should be generically applied to all utilities.

19

20 I am providing comments that raise some legitimate issues that the PUCO should
21 consider. It is time to reconsider and modify the SFV rate design given the

⁷ PUCO Case No. 14-1297-EL-SSO, Opinion and Order at 94 (March 21, 2016).

⁸ PUCO Case No. 10-3126-EL-UNC, Second Entry on Rehearing at 5 (December 4, 2013).

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1 considerable changes in the level of monthly fixed charges being collected
2 and the other factors which I will explain in my testimony.

3
4 ***Q17. ARE YOU MAKING ANY RECOMMENDATIONS REGARDING THE***
5 ***STAFF RECOMMENDATION REGARDING THE SFV RATE DESIGN?***

6 ***A17.*** Yes, I am recommending that the PUCO reject the full SFV proposal as proposed
7 by the Staff Report in this case. For the reasons I will expand upon, I recommend
8 that the PUCO reconsider its policy goal of requiring SFV distribution rates for
9 residential natural gas customers. It should weigh the testimony and evidence
10 filed in individual cases. The base distribution revenue requirement for the SGS
11 class should be recovered partially through a fixed charge and partially through a
12 volumetric charge.

13
14 ***Q18. WHAT IS YOUR UNDERSTANDING OF THE PUCO'S POLICY GOALS***
15 ***REGARDING SFV RATE DESIGN?***

16 ***A18.*** Based on my review of the PUCO Opinion and Order in several cases, it is my
17 understanding that the PUCO has found that the SFV rate design would produce
18 more stable bills for customers, that bills would be easier to understand, that the
19 SFV rate design would produce a more accurate price signal, and that the SFV

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1 rate design would assure a more equitable allocation of distribution system costs
2 to cost-causers.⁹
3

4 ***Q19. WHY SHOULD THE PUCO RECONSIDER ITS POLICY GOAL?***

5 ***A19.*** I am not going to pretend that this is a cut-and-dried issue and that it is obvious
6 that the PUCO is just plain wrong. The literature on this subject is voluminous,
7 both pro and con (*see* Attachment RBF-2 for a sample listing of the literature). I
8 am also not going to point out what other specific states have done (some utility
9 regulators have implemented SFV, some have rejected the idea, some have been
10 in the middle). When I was a PUCO staff member, I was never fond of citing
11 what other state commissions were doing. I was most concerned that the PUCO
12 did the right thing for Ohio consumers.
13

14 Furthermore, I am not going to argue that a SFV rate design is “bad” for all
15 residential consumers. In fact, almost by definition, while low-use consumers are
16 negatively impacted by a SFV rate design, high-use consumers benefit from it. I
17 am going to point out what I see as potential flaws in the thinking that has led to
18 SFV rates being a policy goal.

⁹ Specifically, *see* PUCO Case No. 07-589-GA-AIR, Duke Rate Case, Opinion and Order at 17-19 (May 28, 2008); Case No. 07-829-GA-AIR, DEO Rate Case, Opinion and Order at 22-24 (October 15, 2008); Case No. 08-072-GA-AIR, Columbia Rate Case, Opinion and Order at 19-20 (December 3, 2008); and Case No. 07-1080-GA-AIR VEDO Rate Case, Opinion and Order at 11-14 (January 7, 2009).

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1 Lastly, it is important to remember that a SFV rate design, whether it be full or
2 partial, is revenue neutral. That is, the rate design does not affect the total revenue
3 allocated to the consumers classes, but it does have intra-class repercussions.
4 Again, in this case, Columbia has proposed a “full” SFV rate design for the SGS
5 class.

6
7 ***Q20. WHAT IS YOUR UNDERSTANDING OF THE DEVELOPMENT OF AN***
8 ***“OPTIMAL” TARIFF DESIGN FOR UTILITY CONSUMERS?***

9 ***A20.*** Modern utility pricing theory is primarily concerned with the development of
10 optimal tariff design, which over the years has become dominated by a form of
11 pricing referred to as a “two-part tariff,” sometimes referred to more technically
12 as a non-linear (or non-uniform) pricing approach. Once a class revenue
13 requirement is established, the goal for regulators should be one that sets the most
14 appropriate rates based upon various efficiency and equity considerations.
15 Balancing the weight of how costs are recovered between fixed rates, variable
16 rates, and block rates are all integrated parts of that process.

17
18 Costs can be instructive in establishing a baseline upon which prices may be set,
19 but costs need not serve as the sole or exclusive basis for rates in order for them to
20 be set optimally (i.e., fixed charges do not need to strictly equal fixed costs,
21 variable rates need not strictly equal variable costs). Unfortunately, the “fixed
22 charge-equals-fixed cost” philosophy gets repeated so often that it can often

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1 drown out meaningful discussions about other equally important
2 considerations/principles in setting rates in imperfect markets.

3
4 These considerations/principles include assuring that the utility has an opportunity
5 to recover its authorized revenue requirement, assuring that the overall allowed
6 revenue requirement is reasonably allocated across all customer classes and rate
7 groups, assuring that the selected rate design is equitable and reasonable, and that
8 rates be set in a fashion that facilitates customer understanding, continuity of
9 rates, and minimal customer impacts.¹⁰

10
11 Utilities and regulators should be cautious before adopting a particular method of
12 rate design on the basis of what may be a superficial appeal. And more important,
13 is the concern that a costing method, once adopted, becomes the predominant and
14 unchallenged determinant of rate design.¹¹

15
16 The PUCO adopted a modified SFV rate design for all four major natural gas
17 utilities in Ohio because (A) the SFV rate design will produce more stable bills
18 for customers; (B) the SFV rate design would be easier to understand; (C) the

¹⁰ Report of the review of the Application to Increase Rates of Aqua Ohio, Inc., February 11, 2022, Section 5, Rate and Tariff Review, Larkin & Associates and Acadian Consulting Group.

¹¹ Charging for Distribution Utility Services: Issues in Rate Design, December 2000: Weston, R. (2000). Charging for Distribution Utility Services: Issues in Rate Design. Montpelier, VT: Regulatory Assistance Project, p.39.

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1 SFV would produce a more accurate price signal; (D) the SFV rate design would
2 assure a more equitable allocation of distribution system costs to cost causers.

3

4 ***Q21. DOES A SFV RATE DESIGN PRODUCE MORE STABLE BILLS FOR***
5 ***CONSUMERS?***

6 ***A21.*** Consumer bills that include a revenue neutral SFV rate design may be less
7 volatile than those based strictly on consumption. However, it is generally
8 preferable that individual consumers make their own consumption decisions. If a
9 consumer wants year-around stable natural gas bills, the consumer can opt to
10 enroll in budget billing with its natural gas company. It should be the consumer's
11 choice how to best manage its utility payments.

12

13 And, yes, high fixed charges as part of a SFV rate design can stabilize utility
14 revenues in the near term and are easy to administer. This approach, however,
15 deviates from the long-established rate design principles holding that only
16 consumer-specific costs (those that actually change with the number of consumers
17 served) properly belong in fixed monthly fees. The fixed charge for residential
18 service should not exceed the consumer-specific charges attributable to an
19 incremental customer. For most residential consumers, this is the cost of a service
20 line, the portion of the meter costs directly related to billing for usage, plus the
21 cost of periodic billing and collection.

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1 **Q22. IS A SFV RATE DESIGN EASIER TO UNDERSTAND?**

2 **A22.** I think the PUCO has mistaken “ease of calculation” with “ease of
3 understandability.” I have worked with utility rates for over 33 years now, and I
4 still don’t understand why a consumer who lives in a 5,000 square foot house,
5 heats with gas, has a gas water heater and a multitude of gas appliances should
6 pay the same distribution bill as a consumer living in a 500 square foot apartment
7 with gas heat. A fixed charge is no easier to understand than a rate per kWh that
8 charges a set amount for each MCF used. In fact, since that is how many items are
9 purchased (on a per unit basis), a usage charge is, quite probably, easier to
10 understand for the consumer (i.e. the fewer units consumed the lower the charge).

11

12 Investments in distribution plant are made to provide a supply of natural gas, and
13 the costs should be recovered in proportion to how much of that natural gas a
14 consumer uses. A 5,000 sq. ft. home, which heats by natural gas, has a gas water
15 heater and multiple gas appliances requires more local distribution system
16 capacity than a 500 sq. ft. efficiency apartment. Given a choice between the fixed
17 charge and the variable charge, the volumetric charge is the more appropriate
18 mechanism for those capacity costs. If they are allocated to the fixed charge, the
19 signal is that all residential consumers require the same amount of system
20 capacity, regardless of the size of the residence (or, the size of the connected
21 load). Size does matter.

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1 The complexity of today's utility bills is not due to the consumer charge and the
2 volumetric charges, it is due to the multiple riders to which each consumer is
3 subjected.

4
5 ***Q23. DOES A SFV RATE DESIGN PRODUCE A MORE ACCURATE PRICE***
6 ***SIGNAL TO CONSUMERS?***

7 ***A23.*** In its Opinion and Order of March 31, 2016 in Case No. 14-1297-EL-SSO, the
8 PUCO opined that implementation of SFV rate design removes disincentives to
9 electric utilities to promote energy efficiency. That is also true in the gas industry.
10 But that is only half the story. Increasing fixed charges can significantly reduce
11 incentives for consumers to reduce consumption through energy efficiency,
12 distributed generation, or other means. By reducing the value of a kWh saved or
13 self-generated, a higher fixed charge directly reduces the incentive that consumers
14 have to lower their bills by reducing consumption. There are many reasons a
15 consumer might have low energy usage – they may have energy efficient
16 appliances, they may be conscientious in avoiding the wasteful use of electricity,
17 or they may be located in smaller homes or apartments and therefore impose
18 lower distribution costs on the grid.¹² The price signal that a SFV rate design
19 sends to consumers is “usage doesn’t matter.” Fixed, recurring, unavoidable
20 charges tell a consumer little about the costs that his or her consumption imposes

¹² Fixed Charges and Utility Customers, Prepared for Consumers Union by Synapse Energy Economics, 2016, p.14. www.consumersunion.org; www.synapse-energy.com/fixed_charges_factsheet.

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1 on the system. In fact, they offer consumers no information at all about the
2 scarcity and costs of distribution capacity.

3
4 One of the most important and effective tools that any regulator has to promote
5 efficient use of energy (including gas) is by developing rates that send proper
6 pricing signals to conserve and utilize resources efficiently.¹³ Pricing structures
7 that are weighted heavily on fixed charges are much more inferior from a
8 conservation and energy efficiency standpoint than pricing structures that require
9 consumers to incur more costs with additional consumption.¹⁴ Stated more
10 simply, those consumers who conserve or are otherwise more energy efficient, or
11 those who use less of the commodity for any reason, should pay less than those
12 who use more.

13
14 ***Q24. DOES THE SFV RATE DESIGN ASSURE A MORE EQUITABLE***
15 ***ALLOCATION OF DISTRIBUTION SYSTEM COSTS TO COST CAUSERS?***

16 ***A24.*** The rationale behind the policy that the fixed costs of an energy distribution
17 company should be recovered through fixed monthly charges is incorrect.¹⁵ In

¹³ State of Indiana Cause Nos. 44576 & 4602 re: Indianapolis Power & Light Company: Verified Direct Testimony of Glenn A Watkins – Public Exhibit No. 14 On Behalf of the Indiana Office of Utility Consumer Counselor, July 27, 2015, p.60.

¹⁴ State of Indiana Cause Nos. 44576 & 4602 re: Indianapolis Power & Light Company: Verified Direct Testimony of Glenn A Watkins – Public Exhibit No. 14 On Behalf of the Indiana Office of Utility Consumer Counselor, July 27, 2015.

¹⁵ Charging for Distribution Utility Services: Issues in Rate Design, December 2000: Weston, R. (2000). Charging for Distribution Utility Services: Issues in Rate Design. Montpelier, VT: Regulatory Assistance Project. P.42.

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1 reality, distribution costs are NOT permanently fixed: investment in distribution is
2 constant and growing, and unavoidable.¹⁶ Inevitably, the utility will have to make
3 new capital investments; load growth may require new generating equipment or
4 distribution lines to be upgraded;¹⁷ and investments will be made for reliability
5 purposes and to replace existing systems.¹⁸

6
7 Furthermore, proper pricing should reflect the Utility's long-run costs, wherein all
8 costs are variable or volumetric in nature, and users requiring more of the Utility's
9 products or services should pay more than the consumers who use less of the
10 same products and services. In fact, in its Entry of December 29, 2010 in Case
11 No. 10-3126-EL-UNC, page 5, the PUCO stated: "Finally, we are cognizant of
12 our own obligation to initiate programs that will promote and encourage
13 conservation of energy and a reduction in the growth rate of energy consumption,
14 promote economic efficiencies, **and take into account long-run incremental**
15 **costs.**" A SFV rate design takes into account only historic sunk costs and does
16 nothing to recognize the long-run incremental costs.

¹⁶ Charging for Distribution Utility Services: Issues in Rate Design, December 2000: Weston, R. (2000). Charging for Distribution Utility Services: Issues in Rate Design. Montpelier, VT: Regulatory Assistance Project, p. 7.

¹⁷ Caught in a Fix: The problem with Fixed Charges for Electricity, Prepared for Consumers Union, February 9, 2016 by Synapse Energy Economics, Inc.: Whited, Melissa; Woolf, Tim; Daniel, Joseph (February 9, 2016). Caught in a Fix: The problem with Fixed Charges for Electricity, Prepared for Consumers Union, February 9, 2016 by Synapse Energy Economics, Inc., Cambridge, MA., p.23.

¹⁸ Charging for Distribution Utility Services: Issues in Rate Design, December 2000: Weston, R. (2000). Charging for Distribution Utility Services: Issues in Rate Design. Montpelier, VT: Regulatory Assistance Project, p. 32.

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1 Investments in distribution plant are made to provide a supply of electricity and/or
2 natural gas, and the costs should be recovered in proportion to how much of that
3 electricity or gas a customer uses. Given a choice between the fixed charge and
4 the variable charge, the volumetric charge is the more appropriate mechanism for
5 those capacity costs. If they are allocated to the fixed charge, the signal is that all
6 residential consumers require the same amount of system capacity, regardless of
7 the size of the residence (or, the size of the connected load).

8
9 Those who make greater use of the network should bear a proportionately greater
10 share of its costs and pay usage-based rates because those who use more of the
11 service should cover proportionately more of its costs.

12
13 ***Q25. ARE THERE ANY OTHER REASONS FOR THE COMMISSION TO RE-***
14 ***EVALUATE ITS SFV RATE DESIGN POLICY?***

15 ***A25.*** Residential consumers who use less energy will experience the greatest
16 percentage jumps in their gas bills if the fixed charge is raised because bills are
17 based less on usage and more on a flat fee structure. The larger the consumer
18 charge, the lower the percentage increase in bills for above-average use
19 consumers. There are many reasons a consumer might have low energy usage –
20 they may have energy efficient appliances, they may be conscientious in avoiding
21 the wasteful use of energy, or they may also reside in smaller homes or
22 apartments and therefore impose lower distribution costs on the grid. Consumers

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1 should not be penalized for being efficient, conservative and environmentally
2 responsible.

3
4 **OCC/NOPEC Objection No. 26**

5
6 ***Q26. SHOULD THE STAFF REPORT HAVE MADE A***
7 ***RECOMMENDATION MODIFYING THE REFUND LANGUAGE IN***
8 ***CURRENT TARIFFS?***

9 ***A26.*** Yes. The Staff Report should have proposed modifications to the refund
10 language in order to better protect consumers.

11
12 Specifically, OCC objects because the current refund language is weak in
13 protecting consumers. Columbia does have “refund” language in some of
14 its tariffs as follows: “RECONCILIATION ADJUSTMENT: This Rider is
15 subject to annual reconciliation or adjustment, including but not limited to,
16 increases or refunds. Such annual reconciliation or adjustment shall be
17 limited to the incremental twelve-month period of CEP Investment upon
18 which the rates were calculated, if determined to be unlawful,
19 unreasonable, or imprudent by the Commission in the docket those rates
20 were approved or by the Supreme Court of Ohio.” (Current Columbia Gas
21 Tariff, 6th Revised Sheet, No.30d).

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1 The Staff Report should have recommended the existing refund language
2 be revised to read “RECONCILIATION ADJUSTMENT: This Rider is
3 subject to annual reconciliation or adjustment, including but not limited to,
4 increases or refunds as a result of the Rider being declared unlawful by the
5 Supreme Court of Ohio or the Public Utilities Commission of Ohio. Such
6 annual reconciliation or adjustment shall be limited to the incremental
7 twelve-month period of CEP Investment upon which the rates were
8 calculated, if determined to be unlawful, unreasonable, or imprudent by
9 the Commission in the docket those rates were approved or by the
10 Supreme Court of Ohio.” (Current Columbia Gas Tariff, 6th Revised
11 Sheet, No.30d)). The language proposed should be in all tariffs and riders
12 (including current and proposed) making them subject to refund.

13
14 ***Q27. DOES THIS CONCLUDE YOUR TESTIMONY?***

15 ***A27.*** Yes. However, I reserve the right to incorporate new information that may
16 subsequently become available. I also reserve the right to supplement my
17 testimony in the event Columbia, the PUCO Staff or other parties submit new or
18 corrected information in connection with this proceeding.

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing *Direct Testimony of Robert B. Fortney on behalf of Office of the Ohio Consumers' Counsel* has been served upon those persons listed below via electronic service this 13th day of May 2022.

/s/ Angela D. O'Brien
Angela D. O'Brien
Assistant Consumers' Counsel

The PUCO's e-filing system will electronically serve notice of the filing of this document on the following parties:

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Robert Fortney
Proceedings with Testimony Submitted to the Public Utilities Commission of Ohio

Company	Docket No.	Date
Cleveland Electric Illuminating Company	85-675-EL-AIR	1986
Cleveland Electric Illuminating Company	86-2025-EL-AIR	1987
Toledo Edison Company	86-2026-EL-AIR	1987
Ohio Edison Company	87-689-EL-AIR	1987
Cleveland Electric Illuminating Company	88-170-EL-AIR	1988
Toledo Edison Company	88-171-EL-AIR	1988
Ohio Edison Company	89-1001-EL-AIR	1990
Cincinnati Gas & Electric Company	91-410-EL-AIR	1991
Columbus Southern Power Company	91-418-EL-AIR	1992
Cincinnati Gas & Electric Company	92-1464-EL-AIR	1993
Ohio Power Company	94-996-EL-AIR	1994
Toledo Edison Company	94-1987-EL-CSS	1995
Cleveland Electric Illuminating Company	94-1964-EL-CSS	1995
Toledo Edison Company	95-299-EL-AIR	1995
Cleveland Electric Illuminating Company	95-300-EL-AIR	1996
All Electric Companies (Rulemaking Proceeding)	96-406-EL-COI	1998
Cleveland Electric Illuminating Company	97-358-EL-ATA	1998
Toledo Edison Company	97-359-EL-ATA	1998
Cleveland Electric Illuminating Company	97-1146-EL-COI	1998
Toledo Edison Company	97-1147-EL-COI	1998
FirstEnergy	96-1211-EL-UNC	1998
Columbus Southern Power Company	01-1356-EL-ATA	2002
Columbus Southern Power Company	01-1357-EL-AAM	2002
Rulemaking Proceeding	01-2708-EL-COI	2002
FirstEnergy	01-3019-EL-UNC	2002
Ohio Power Company	01-1358-EL-ATA	2002
Ohio Power Company	01-1359-EL-AAM	2002
The Dayton Power and Light Company	02-0570-EL-ATA	2003
Dayton Power and Light Company	02-2364-EL-CSS	2003
Dayton Power and Light Company	02-2879-EL-AAM	2003
Dayton Power and Light Company	02-2779-EL-ATA	2003
FirstEnergy Corporation	03-2144-EL-ATA	2004
Cincinnati Gas & Electric Company	03-0093-EL-ATA	2004
Cincinnati Gas & Electric Company	03-2079-EL-AAM	2004
Cincinnati Gas & Electric Company	03-2081-EL-AAM	2004
Monongahela Power Company	04-0880-EL-UNC	2004

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Monongahela Power Company	05-0765-EL-UNC	2005
Dayton Power and Light Company	05-0276-EL-AIR	2005
FirstEnergy	07-0551-EL-AIR	2008
FirstEnergy	08-0936-EL-SSO	2008
FirstEnergy	08-0935-EL-SSO	2008
Ormet Primary Aluminum Corporation	09-0119-EL-AEC	2009
Cleveland Electric Illuminating Company	08-1238-EL-AEC	2009
Columbus Southern Power Company	09-0516-EL-AEC	2009
FirstEnergy	10-0388-EL-SSO	2010
FirstEnergy	10-0176-EL-ATA	2011
Columbus Southern Power Company	11-0346-EL-SSO	2011
Ohio Power Company	11-0348-EL-SSO	2011
Columbus Southern Power Company	10-0343-EL-ATA	2011
Ohio Power Company	10-0344-EL-ATA	2011
AEP Ohio	10-2376-EL-UNC	2011
AEP Ohio	10-2929-EL-UNC	2011
AEP Ohio	11-4921-EL-RDR	2011
FirstEnergy	12-1230-EL-SSO	2012
AEP Ohio	14-1693-EL-RDR	2015
Aqua	16-0907-WW-AIR	2016
Dayton Power and Light Company	16-0395-EL-SSO	2017
AEP Ohio	16-1852-EL-SSO	2017
Dayton Power and Light Company	15-1830-EL-AIR	2018
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Smart Rate Design for a Smart Future, Appendix D: The Specter of Straight Fixed/Variable Rate Designs and the Exercise of Monopoly Power, July 2015: Lazar, J. (2015). Smart Rate Design for a Smart Future, Appendix D: The Specter of Straight Fixed/Variable Rate Designs and the Exercise of Monopoly Power. Montpelier, VT: Regulatory Assistance Project.

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Moving Toward Demand-Based Residential Rates, Scott J. Rubin, NASUCA Annual Meeting, Austin, TX, November 10, 2015. [NASUCA = National Association of State Utility Consumer Advocates.]

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Rate Design for a Distributed Grid, Solar Energy Industries Association.

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Unjust, Unreasonable, and Unduly Discriminatory: Electric Utility Rates and the Campaign Against Rooftop Solar, Art Peskoe, Harvard Environmental Policy Initiative, February 1, 2016.

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Bill Effects of Demand-Based Rates on Commonwealth Edison Residential Customers; Jeff Zethmayr: Energy Policy, Energy Daily: July 2016

OCC EXHIBIT NO. _____

**BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO**

In the Matter of the Application of)	
Columbia Gas of Ohio, Inc. for Authority)	
to Amend its Filed Tariffs to Increase the	)	Case No. 21-637-GA-AIR
Rates and Charges for Gas Services and)	
Related Matters.)	
In the Matter of the Application of)	
Columbia Gas of Ohio, Inc. for Approval	)	Case No. 21-638-GA-ALT
of an Alternative Form of Regulation.)	
In the Matter of the Application of)	
Columbia Gas of Ohio, Inc. for Approval)	
of a Demand Side Management Program	)	Case No. 21-639-GA-UNC
for its Residential and Commercial)	
Customers.)	
In the Matter of the Application of)	
Columbia Gas of Ohio, Inc. for Approval	)	Case No. 21-640-GA-AAM
to Change Accounting Methods.)	

**DIRECT TESTIMONY
OF
ZHEN ZHU, Ph.D.**

**On Behalf of
Office of the Ohio Consumers' Counsel
And
Northeast Ohio Public Energy Council
65 East State Street, Suite 700
Columbus, Ohio 43215**

May 13, 2022

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Mr. Zhu Sponsors the Following Exhibits:

Exhibit ZZ-1	Professional Resume of Dr. Zhen Zhu
Exhibit ZZ-2	Long-Term and Short-Term Interest Rates
Exhibit ZZ-3	Capital Structure
Exhibit ZZ-4	IBES Growth Rate
Exhibit ZZ-5	Nominal GDP Growth
Exhibit ZZ-6	DCF Model
Exhibit ZZ-7	Market Risk Premium
Exhibit ZZ-8	CAPM Model
Exhibit ZZ-9	The Risk Premium Model

Exhibit ZZ-10

Moul's Risk Premium and Interest Rate

Exhibit ZZ-11

The Hamada Beta Adjustment and the Cost
of Capital for the Regulated Utilities

*Direct Testimony of Zhen Zhu
On Behalf of Office of the Ohio Consumers' Counsel
and Northeast Ohio Public Energy Council
PUCO Case No 21-637-GA-AIR, et al.*

1 **I. INTRODUCTION**

2

3 ***Q1. PLEASE STATE YOUR NAME, POSITION, AND BUSINESS ADDRESS.***

4 ***A1.*** My name is Zhen Zhu. I am a Managing Consultant. My business address is 5555
5 North Grand Blvd., Oklahoma City, Oklahoma 73112.

6

7 ***Q2. BY WHOM ARE YOU EMPLOYED?***

8 ***A2.*** I am employed by C. H. Guernsey & Company. I am also the Dr. Michael
9 Metzger Chair Professor of Economics at the University of Central Oklahoma.

10

11 ***Q3. WHAT IS YOUR EDUCATIONAL BACKGROUND?***

12 ***A3.*** I have a B.A. in Business Administration from Renmin University in China, an
13 M.A. in Economics from Bowling Green State University, and a Ph.D. in
14 Economics from the University of Michigan.

15

16 ***Q4. PLEASE DESCRIBE YOUR PROFESSIONAL BACKGROUND.***

17 ***A4.*** From 2000 to present, I have been an Economist, Consultant, Senior Consultant
18 and Managing Consultant with C.H. Guernsey & Company. From 1994 to 2000, I
19 was an Assistant Professor of Economics at the University of Oklahoma. From
20 2000 to present, I have been an Assistant Professor, Associate Professor,
21 Department Chairperson, and the Dr. Michael Metzger Chair Professor of
22 Economics at the University of Central Oklahoma. I have performed many

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On Behalf of Office of the Ohio Consumers' Counsel
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PUCO Case No 21-637-GA-AIR, et al.*

1 academic and applied studies of the energy market and of regulatory policy, along
2 with studies of international financial markets and commodity markets. Please
3 refer to Exhibit ZZ-1 for a list of my more recent publications and studies.
4

5 ***Q5. WHAT IS YOUR EXPERIENCE REGARDING UTILITY REGULATION?***

6 ***A5.*** As a consultant, I have performed a variety of research studies and provided direct
7 testimony, support, and engagement in many projects related to gas and electric
8 utility regulatory matters. I have provided analysis and testimony in gas and
9 electric utility cost of capital cases. I have also provided testimonies on issues
10 related to Integrated Resource Planning, natural gas prices, and load forecasts
11 before several regulatory agencies.
12

13 ***Q6. BEFORE WHAT REGULATORY COMMISSIONS HAVE YOU TESTIFIED***
14 ***AS AN EXPERT WITNESS?***

15 ***A6.*** I have testified before the Michigan Public Service Commission, Georgia Public
16 Service Commission, Oklahoma Corporation Commission, South Carolina Public
17 Service Commission and Vermont Public Utility Commission.
18

19 ***Q7. HAVE YOU TESTIFIED BEFORE THE PUBLIC UTILITIES***
20 ***COMMISSION OF OHIO ("PUCO")?***

21 ***A7.*** No, I have not.

*Direct Testimony of Zhen Zhu
On Behalf of Office of the Ohio Consumers' Counsel
and Northeast Ohio Public Energy Council
PUCO Case No 21-637-GA-AIR, et al.*

1 **Q8. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?**

2 **A8.** I am testifying on behalf of the Office of the Ohio Consumers' Counsel ("OCC")
3 and the Northeast Ohio Public Energy Council ("NOPEC").
4

5 **Q9. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

6 **A9.** I was asked by OCC and NOPEC to provide a recommendation regarding a just
7 and reasonable rate of return (or cost of capital) for Columbia Gas of Ohio
8 ("Columbia" or "Columbia Gas") in this proceeding. My focus will be on setting
9 a reasonable cost of equity or return on equity ("ROE") for Columbia. In addition,
10 I will provide an independent evaluation of the PUCO Staff's recommendations
11 regarding the cost of capital issues included in the Staff Report.¹ I will explain
12 and support OCC/NOPEC Objections 17-22. Additionally, I will assess the ROE
13 determination supported by Mr. Paul Moul in his direct testimony on behalf of
14 Columbia.²

¹ *In the Matter of the Application of Columbia Gas of Ohio, Inc. for Authority to Amend its filed Tariffs to Increase the rates and Charges for Gas Services and Related Matters*, Case No. 21-637-GA-AIR et al., (Application), Staff Report (April 6, 2022), (Staff Report).

² Prefiled Direct Testimony of Paul Moul (July 14, 2021).

*Direct Testimony of Zhen Zhu
On Behalf of Office of the Ohio Consumers' Counsel
and Northeast Ohio Public Energy Council
PUCO Case No 21-637-GA-AIR, et al.*

II. SUMMARY AND RECOMMENDATIONS

***Q10. WHAT IS YOUR UNDERSTANDING OF THE RATE OF RETURN ISSUE
IN THIS PROCEEDING?***

A10. Columbia Gas of Ohio (“Columbia” or “Utility”) is a local distribution gas utility in the State of Ohio that is subject to the regulatory and rate setting authority of the PUCO. Columbia serves more than 1.4 million consumers in 60 of 88 counties in Ohio. Columbia is a subsidiary of NiSource Inc. Columbia filed an application to increase its rates and for approval of an alternative rate plan, as well as to change accounting methods on June 30, 2021.

My analysis of a just and reasonable ROE for Columbia, based on sound economic and regulatory principles, indicate that Columbia’s required ROE or cost of equity should be no higher than 8.65%.

Columbia has an embedded cost of debt of 4.49%³, which I accept. Columbia also requested a capital structure of 50.60% equity and 49.40% debt based on the actual equity-debt structure, which I do not oppose. Therefore, given the capital structure, cost of debts, and cost of equity, my recommended overall cost of capital is 6.59%. In my opinion, this is a just and reasonable rate of return for

³ Columbia’s cost of debt was 4.67% at the time of filing. The cost of debt has been lowered to 4.49% due to the refinancing of debt on 11/2021. See COH 20211 Rate Case - Schedule A-E actual update.xlsx SchD-2B.

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1 Columbia under current market condition and Columbia's current business and
2 financial risk.

3
4 This rate of return is lower than that proposed by Columbia (7.76%),⁴ and also
5 lower than the Staff proposed range of 6.88% to 7.39%.⁵ Adopting this rate of
6 return will protect Columbia's consumers from paying more than reasonable rates
7 for gas distribution service.

8
9 Columbia provided a prefiled direct testimony by its cost of capital witness Mr.
10 Paul Moul. Mr. Moul provided the analyses of return on equity (ROE) under the
11 current market conditions and suggested that the Company should be afforded an
12 opportunity to earn a ROE of 10.95% with the weighted average cost of 7.85%.⁶

13
14 The PUCO Staff ("Staff") also presented its analysis of Columbia's rate of return
15 (cost of capital) and made recommendations concerning the cost of the capital
16 issues. The Staff accepted the cost of debt and capital structure as requested by
17 Columbia and recommended an ROE in a range of 9.04% to 10.05%, with an

⁴ Columbia's originally proposed cost of capital was 7.85% at the time of the filing, before the refinancing of a debt in November 2021.

⁵ The Staff Report of Investigation in the Cases No(s). 21-0637-GA-AIR, 21-0638-GA-ALT, 21-0639-GA-UNC, 21-0640-GAAAM, April 6, 2022, page 26.

⁶ Prepared Direct Testimony of Paul Moul, page 1, lines 28-30. 7.78% was before the adjustment of the cost of debt to 4.49% by Columbia.

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1 average ROE value of 9.54%. The Staff proposed a range of 6.88% to 7.39% for
2 Columbia's rate of return.

3

4 ***Q11. PLEASE DESCRIBE THE ORGANIZATION OF YOUR TESTIMONY?***

5 ***A11.*** First, I provide a summary of my analysis and recommendation regarding a just
6 and reasonable rate of return for Columbia in this proceeding. Second, I describe
7 the regulatory standard in setting the cost of capital and the general principles in
8 estimating the cost of capital. Third, I examine the current state of the economy
9 and capital markets because economic and capital market conditions set up the
10 environment for firms (including regulated utilities) to operate, thus influencing
11 the cost of capital.

12

13 Fourth, I present my analysis and recommendation of a just and reasonable rate of
14 return for Columbia. I describe the capital structure and cost of debt of Columbia
15 and provide evidence to support my recommendations regarding capital structure
16 and cost of debt. Next, I detail the calculation of the cost of equity by using
17 several generally accepted methodologies. Specifically, I calculate the Company's
18 cost of equity by applying a two-step Constant Growth Discounted Cash Flow
19 ("DCF") model and Capital Asset Pricing Model ("CAPM") to a group of proxy
20 companies. I also provide a form of risk premium ("RP") analysis using the past
21 authorized ROE and interest rate. After carrying out these calculations, I provide

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1 my summary evaluations regarding the Company's cost of capital and comment
2 on the 10.95% ROE as requested by the Company.

3
4 Fifth, I explain and support the OCC and NOPEC Objections to the rate of return
5 recommendations included in the Staff Report. Finally, I discuss my assessment
6 of the rate of return proposed by Columbia and the methodology and data used by
7 its witness, Mr. Paul Moul to support Columbia's requested rate of return.

8

9 ***Q12. PLEASE SUMMARIZE YOUR METHODOLOGY IN ANALYZING A***
10 ***REASONABLE RATE OF RETURN FOR COLUMBIA.***

11 ***A12.*** In making my recommendation of a reasonable rate of return for Columbia, I
12 reviewed Columbia's financial conditions including the cost of debt and capital
13 structure. I calculated the cost of equity for a group of comparable companies
14 based on several different models. The models I used include a Constant Growth
15 Discounted Cash Flow ("DCF") model. I used a two-step methodology that
16 considers a long-term Earnings Per Share ("EPS") growth rate as represented by
17 Gross Domestic Product ("GDP") growth rate.

18

19 In addition, I calculated the required cost of capital based on the Capital Asset
20 Pricing Model ("CAPM") model. In applying the CAPM model, I used a measure
21 of market risk premium obtained by applying a two-step forward-looking DCF
22 model to companies in the S&P 500 market index to generate an expected market

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1 return, and then subtracting interest rate from the expected market return. Then I
2 obtained the ROE by adding a long-term interest rate to the adjusted risk premium
3 which is the product of beta and market risk premium. Finally, I used a form of
4 bond yield plus market risk premium model to calculate another measurement of
5 ROE to support my cost of capital recommendation.

6

7 ***Q13. PLEASE DESCRIBE THE STAFF REPORT'S COST OF EQUITY***
8 ***ANALYSIS.***

9 ***A13.*** The Staff used only two models: a non-constant DCF model and a CAPM model.
10 While I am in a general agreement with the Staff's methodology, some specific
11 aspects of the model assumptions and data used in the Staff's applications are
12 questionable and invalid, which will lead to upward biased ROE estimates and
13 increase the financial burden of Columbia's consumers without any justification.

14

15 ***Q14. PLEASE DESCRIBE THE METHODOLOGIES AND RESULTS OF***
16 ***COLUMBIA'S COST OF EQUITY ANALYSIS.***

17 ***A14.*** Columbia's witness, Mr. Paul Moul, employed several models including a
18 constant DCF models, CAPM models with historical and forward-looking market
19 RPs, a RP model based on the historical relationship between RP (as measured by
20 the difference between large company stock returns and corporate bond yield) and
21 the interest rate, and a comparable earnings (CE) model to support his cost of
22 equity recommendation.

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Mr. Moul made many questionable and unreasonable assumptions about various models and applied questionable adjustments to the ROE models and estimates including the Hamada beta adjustment, leverage adjustment and flotation costs. I will point out the major differences in his and my methodologies and provide arguments why many of Mr. Moul's assumptions are invalid and erroneous thus leading to upward-biased ROE estimates.

Q15. PLEASE SUMMARIZE YOUR RATE OF RETURN AND COST OF EQUITY RECOMMENDATIONS.

A15. Table 1 below shows that the range of cost of equity (or ROE) generated from my three models (DCF, CAPM and RP) is from 8.36% to 9.08% (based on average), with an average mean value of 8.63%, an average median of 8.59%, and an average midpoint of 8.69% from three models. In my opinion, under the current market condition, an ROE of 8.65% is just and reasonable and I recommend the PUCO adopt the 8.65% ROE for Columbia.

Table 1: Summary of ROE					
Model	DCF	CAPM	Average of DCF and CAPM	RP	Average of DCF, CAPM
Lower End	6.57%	7.87%	7.22%		
Upper End	9.72%	9.80%	9.76%		
Median	8.60%	8.09%	8.34%	9.08%	8.59%
Average	8.36%	8.45%	8.41%	9.08%	8.63%
Midpoint	8.14%	8.83%	8.49%	9.08%	8.69%

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Columbia has an embedded cost of debt of 4.49%, which I accept. Columbia also requested a capital structure of 50.60% equity and 49.40% debt based on the actual equity-debt structure. Based on my analysis of capital structure of comparable companies, I recommend accepting Columbia's proposed capital structure. Therefore, given the capital structure, cost of debts, and cost of equity, my recommended overall cost of capital is 6.59%. Table 2 below shows the summary of recommended overall cost of capital.

Table 2: Overall Cost of Capital			
	Ratio	Cost	Weighted Average Cost of Capital
Debt	49.40%	4.49%	2.22%
Equity	50.60%	8.65%	4.38%
Total	100%		6.59%

Q16. ARE YOU SPONSORING ANY EXHIBITS?

A16. Yes, I am sponsoring the following exhibits:

- Exhibit ZZ-1:** Dr. Zhen Zhu's resume
- Exhibit ZZ-2:** Long-term and short-term interest rates
- Exhibit ZZ-3:** Capital structure
- Exhibit ZZ-4:** IBES earnings growth estimate
- Exhibit ZZ-5:** Nominal GDP growth
- Exhibit ZZ-6:** DCF model

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- 1 **Exhibit ZZ-7:** Market risk premium
- 2 **Exhibit ZZ-8:** CAPM model
- 3 **Exhibit ZZ-9:** Risk premium model
- 4 **Exhibit ZZ-10:** Moul's Risk Premium and interest rate
- 5 **Exhibit ZZ-11:** The Hamada Beta adjustment and the cost of capital
- 6 for the regulated utilities

7

8 ***Q17. DID YOU OR SOMEONE UNDER YOUR DIRECT SUPERVISION***

9 ***PREPARE THESE EXHIBITS?***

10 ***A17.*** Yes.

11

12 **III. REGULATORY STANDARD IN SETTING A JUST AND REASONABLE**

13 **RATE OF RETURN**

14

15 ***Q18. WHAT IS THE PURPOSE OF ESTABLISHING A RATE OF RETURN***

16 ***WHEN SETTING A UTILITY'S RATES?***

17 ***A18.*** The purpose of a rate of return, also commonly called "cost of capital" or

18 "opportunity cost of capital," is to compensate investors who have committed

19 capital to finance the plant and equipment necessary for utility service to

20 customers. Investors commit these funds in anticipation of earning a return on

21 their investment that is consistent with that of other investment alternatives with

22 comparable risks.

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1 This regulatory standard is well-recognized and was addressed by the U.S.
2 Supreme Court in the cases of *Bluefield Water Works & Improvement Co.* (1923)
3 and *Hope Natural Gas Co.* (1944). It provides the utility an opportunity to earn a
4 rate of return sufficient to: (1) fairly compensate capital currently invested in the
5 utility; (2) enable the utility to attract new capital on reasonable terms; and (3)
6 maintain the utility's financial integrity.

7
8 ***Q19. DOES THE REGULATORY STANDARD INCLUDE GUIDELINES ON***
9 ***SETTING A COMPANY'S RATES?***

10 ***A19.*** Yes. Utilities are a natural monopoly. If left unregulated, companies in the utility
11 industry have every incentive to charge consumers prices that maximize the
12 company's profit. The amount of product that a utility would provide to the
13 consumers would be at a level that is lower than socially optimum, and the price
14 will be higher than the price level of a perfectly competitive industry. Thus, utility
15 firms are typically regulated by jurisdictional authorities.

16
17 The jurisdictional authorities set rules to make sure that consumers will be able to
18 obtain services at reasonable rates and consumers will not be charged too high a
19 price. In the meantime, utilities would still earn a fair return for their investors,
20 and they can make investments for the long-term benefit of the consumers.

21 Standards have been set from these guidelines:

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- 1 1. The most important factor in determining the required rate of
2 return of cost of equity ("ROE") of a utility is risk. Utilities face
3 smaller degrees of risk compared to most other businesses; a
4 utility's return, therefore, should be lower than other riskier
5 businesses.
- 6 2. Utilities should earn returns comparable to other businesses with
7 similar degrees of risk in order to maintain their financial
8 soundness, including maintaining their credit standing, and
9 attracting capital for investment.

10
11 These guidelines ensure that utility consumers receive adequate and reliable
12 utility service at a reasonable price and companies make reasonable returns on
13 their investment. In any setting, investors should receive the minimum, not
14 excessive, level of required return as consumers' welfare needs to be considered
15 as well.

16
17 ***Q20. IS YOUR RECOMMENDATION OF THE REQUIRED RATE OF RETURN***
18 ***BASED ON THESE REGULATORY STANDARDS?***

19 ***A20.*** Yes, my estimation of the required rate of return and ROE is based on these
20 standards. I recommend the PUCO authorize a rate of return and ROE based on
21 the required market return so a regulated utility can maintain its financial

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1 integrity. In the meantime, utility consumers can obtain the service at a reasonable
2 cost.

3

4 ***Q21. WHAT ANALYTICAL METHODOLOGY DO YOU EMPLOY IN THIS CASE***
5 ***TO ANALYZE COLUMBIA GAS' COST OF CAPITAL?***

6 ***A21.*** Columbia Gas is not an independent, publicly traded company. It is a subsidiary
7 of NiSource, Inc. which means that Columbia Gas' financial condition is not
8 regularly reported and reflected in the financial markets. However, the standard
9 cost of capital analysis still applies – potential investors will consider the expected
10 financial returns on an investment in comparison to the market returns on other
11 available alternatives.

12

13 Columbia operates in the general economic and industry environment in the U.S.;
14 thus its financial performances are also related to the overall economic and
15 industry performances. For this reason, my analysis was broad in scope. I studied
16 the underlying economic environment, Federal Reserve policy, the investors'
17 likely expectation of future returns, and the utility industry's expected returns in
18 the current market.

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1 ***Q22. HOW DID YOU TAKE MARKET RISKS INTO ACCOUNT WHEN***
2 ***PERFORMING THE COST OF CAPITAL ANALYSIS FOR COLUMBIA***
3 ***GAS?***

4 ***A22.*** I utilized standard DCF, CAPM, and RP methodologies to evaluate the risks and
5 returns of a group of comparable companies. In particular, the CAPM model and
6 the RP model take the market risk explicitly into consideration. Financial theory
7 suggests that investors are compensated for bearing systematic market risks, but
8 not individual company risks. Even though it can be argued that Columbia Gas
9 may face some unique risks, as every company does, it is the systematic market
10 risk (such as risks associated with market-wide environmental policies,
11 regulations, general capital market, economic conditions, etc.) Columbia faces
12 that should be taken into consideration.

13
14 This risk-reward principle is the basis for the analysis of required cost of capital
15 for the company, as in other industries. In addition, the RP methodology
16 recognizes an empirical relationship between interest rate and a RP based on the
17 utilities' authorized ROE and market interest rate. I will go over the detailed
18 methodologies in later sections.

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1 ***Q23. DO YOU BELIEVE ANY OF THE MODELS YOU USED ARE BETTER***
2 ***THAN THE OTHERS?***

3 ***A23.*** Economic models are theories describing the real world. The models have their
4 underlying assumptions and focus more on specific aspects of the markets than
5 others. As market conditions are complicated, it is difficult for any single
6 economic/financial model to capture all aspects of the expected returns of the
7 investors. In this sense, a combination of models gives a better measurement of
8 the expected returns of the investors.

9
10 The recent Federal Energy Regulatory Commission ("FERC") Opinion No. 569-A
11 clearly recognizes this need to incorporate more than one model to determine the
12 expected ROE: "We continue to find that ROE determinations should consider
13 multiple models, both to capture the variety of models used by investors and to
14 mitigate model risk."⁷ I agree with this FERC's policy statement regarding the
15 setting of a just and reasonable cost of equity.

16
17 ***Q24. DID YOU SELECT A PROXY GROUP FOR THE ESTIMATION OF THE***
18 ***COMPANY'S RETURN ON EQUITY?***

19 ***A24.*** Yes, Columbia is a subsidiary of NiSource and it is not publicly traded. A
20 conventional approach for companies like Columbia is to select a proxy group of
21 comparable companies, which would enable a reliable analysis for companies of

⁷ FERC Opinion N0. 569-A Order on Rehearing (Issued May 21, 2020), par 43.

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1 comparable risk. Therefore, I have selected a group of gas utility companies that
2 are similar to the target company, Columbia, that are engaged in gas distribution
3 business.

4
5 **Q25. WHAT CRITERIA DID YOU RELY ON TO SELECT THE GROUP OF**
6 **COMPARABLE COMPANIES WHEN YOU PERFORMED THE ANALYSIS**
7 **OF THE COST OF CAPITAL FOR COLUMBIA GAS?**

8 **A25.** I selected gas distribution utilities that are representative of the risk characteristics
9 of Columbia Gas. I selected companies that are publicly traded and whose main
10 business is gas distribution and selling to end-users. The starting list is comprised
11 of the gas utility companies by *Value Line*. I avoided companies that were
12 involved in merger and acquisition activities during the study period as the stocks
13 of those companies might be evaluated by investors differently than under market
14 conditions in the absence of the mergers and acquisitions. Analysts typically
15 would exclude companies that had reduced or halted dividend payment and
16 companies that have negative dividend growth projections for the DCF analysis; I
17 used the same set of the companies for both the DCF and CAPM analysis.

18
19 **Q26. WHY DID YOU USE VALUE LINE-LISTED COMPANIES AS A STARTING**
20 **POINT FOR THE SELECTION OF THE COMPARABLE COMPANIES?**

21 **A26.** *Value Line* represents a respected, broadly available, and specialized source of
22 financial information. In addition, *Value Line* provides an independent source of

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information for the investment community because it does not have any financial interest in the companies it covers.

Q27. PLEASE LIST THE GROUP OF GAS DISTRIBUTION UTILITIES THAT YOU INCLUDED FOR THE PROXY GROUP.

A27. I selected 7 regulated gas utilities – see Table 3 below. For the convenience of comparison, I have also listed the proxy group by Mr. Moul. Mr. Moul included a total of 8 companies in the group. As I will show later, the difference in the selection of the proxy group company does not lead to significant differences in the ROE estimates. The difference in my ROE results and Mr. Moul's is mainly due to differences in other model methodologies and assumptions.

Table 3: Proxy Group	
Zhu Sample	Moul Sample
Atmos Energy Corp	Atmos Energy Corp
New Jersey Resources	New Jersey Resources
NiSource	Chesapeake Utilities
N.W. Natural	N.W. Natural
One Gas Inc	One Gas Inc
South Jersey Industries	South Jersey Industries
Spire Inc	Spire Inc
	Southwest Gas

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IV. THE ECONOMIC CONDITION AND COST OF CAPITAL

***Q28. COULD YOU EXPLAIN HOW ECONOMIC CONDITIONS CAN AFFECT
THE COST OF CAPITAL OF COLUMBIA GAS AT THE PRESENT TIME?***

A28. The most relevant economic variables to the cost of capital are interest rate and expected inflation, as both are critical factors considered by investors to set their expected returns when making investment decisions. As in standard economic theory, what matters to investors is the real return. Both the interest rate and expected inflation influence the real return on investment directly.

In the current economic environment, both interest rate (especially the short-term interest rate) and expected inflation are influenced by Federal Reserve economic policies and its accompanying actions in the financial market to achieve its set objectives, even though economic variables can be influenced by monetary policy to different degrees.

***Q29. WHAT ARE THE FEDERAL RESERVE'S OBJECTIVES AND ACTIONS IN
AN ECONOMIC CYCLE?***

A29. In the past, at the onset of and during the recession, the Federal Reserve provided mostly short-term credit to add liquidity to the market to counteract the effect of recession. In the early period of the recovery from the 2008-2009 recession, the Federal Reserve continued its accommodative monetary policy as the

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1 unemployment level was still higher than the objective set by the Federal Reserve.

2 For example, the Federal Reserve stated in its July 2013 Monetary Policy Report:⁸

3 *With unemployment still well above normal levels and inflation*
4 *below its longer-run objective, the Federal Open Market*
5 *Committee ("FOMC") has continued its highly accommodative*
6 *monetary policy this year by maintaining its forward guidance*
7 *with regard to the target for the federal funds rate and continuing*
8 *its program of large-scale asset purchases.*

9 The Federal Reserve's monetary easing has injected a large amount of liquidity to
10 the financial market.

11

12 The Federal Reserve started to scale back its quantitative easing ("QE"), or
13 accommodative monetary policy, due to improvement in labor market conditions
14 in 2014. As the U.S. economy continued to cruise through expansion, the Federal
15 Reserve has changed its policy stance from being accommodative to tightening. In
16 2019 however, the Federal Reserve cut interest rates three times to fend off
17 possible slowdowns in the U.S. economy brought on by the trade wars between
18 China and the United States.

19

20 ***Q30. WHAT ARE SOME OF THE MAJOR CONSEQUENCES OF THE***
21 ***FEDERAL RESERVE'S RECENT POLICIES SINCE 2019?***

22 ***A30.*** The injection of a large amount of liquidity into the financial market since 2019
23 has caused short-term interest rates to fall to a historically low level as during the

⁸ http://www.federalreserve.gov/monetarypolicy/mpr_20130717_part2.htm.

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1 period between 2008 and 2015. In addition, the short-term interest rates are
2 cyclical as they respond to the Federal Reserve's monetary policy manipulations,
3 but the long-term interest rate is significantly less so.

4
5 I illustrate the changes in interest rates in Exhibit ZZ-2.

6
7 Exhibit ZZ-2 shows that the short-term interest rate, in this case the 3-month T-
8 bill yield, fluctuated in response to business cycle and the monetary policy
9 change. For example, at the onset of the last recession, when the Federal Reserve
10 adopted quantitative ease, the short-term interest rate dropped precipitously to a
11 level that was almost zero; however, the long-term interest rate, in this case the
12 30-year T-Bond yield, continued its downward trend. One can hardly see the
13 cyclical behavior in the long-term interest rate as in the short-term interest rate.
14 However, through all its movement, a downward trend in the long-term interest
15 rate is clearly observable. Up until 2019, the Federal Reserve started to relax its
16 QE policy, the short-term interest rate responded by going up from almost 0.0%
17 to over 2% before declining again as the Federal Reserve started to cut interest
18 rates to offset the impact of Covid-19 on the U.S. economy.

19
20 However, the long-term interest rate shows no obvious sign of responding to the
21 Federal Reserve's monetary policy changes. As we can observe from Exhibit ZZ-
22 2, the short-term interest rate dropped again to almost 0% in the beginning of

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1 2021 while the long-term interest rate inched up and moved in the opposite
2 direction of the short-term interest rate change.

3

4 ***Q31. WHAT IS THE CONSEQUENCE OF THE FEDERAL RESERVE***
5 ***MONETARY POLICY ON INFLATION RATE AND WHAT IS THE***
6 ***FEDERAL RESERVE'S POSITION ON INFLATION RATE?***

7 ***A31.*** Another possible consequence of the Federal Reserve's monetary accommodation
8 policy is inflation. If the monetary policy does not tighten in a timely fashion in
9 response to economic expansion, then it creates an upward pressure on inflation;
10 however, there is no evidence of expected inflation rate change, and the market
11 expectation of inflation is quite stable during the recovery period of last recession.
12 For example, the Federal Reserve September 20, 2017 Statement⁹ reported:

13 On a 12-month basis, overall inflation and the measure
14 excluding food and energy prices have declined this year and
15 are running below 2 percent. Market-based measures of
16 inflation compensation remain low; survey-based measures of
17 longer-term inflation expectations are little changed, on
18 balance.
19

20 The Federal Reserve continued to pursue the same set of policies towards
21 employment and inflation. In its November 5, 2020 Press Release, the Federal
22 Reserve Board stated¹⁰:

23 The Committee seeks to achieve maximum employment and
24 inflation at the rate of 2 percent over the longer run. With
25 inflation running persistently below this longer-run goal, the

⁹ <https://www.federalreserve.gov/newsevents/pressreleases/monetary20170920a.htm>.

¹⁰ <https://www.federalreserve.gov/newsevents/pressreleases/monetary20201105a.htm>.

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1 Committee will aim to achieve inflation moderately above 2
2 percent for some time so that inflation averages 2 percent over
3 time and longer-term inflation expectations remain well
4 anchored at 2 percent. The Committee expects to maintain an
5 accommodative stance of monetary policy until these
6 outcomes are achieved.

7 In its April 28, 2021 Statement¹¹, the Federal Reserve Board reiterated the same
8 language exactly, signaling that the policy stance of the Federal Reserve will not
9 change and the inflation target is maintained at exactly the same level. Despite the
10 fact that inflation rate has increased significantly due to supply constraints and
11 Russian invasion of Ukraine more recently, I believe the Federal Reserve will
12 continue to focus on maintaining employment and price level stability.

13
14 ***Q32. HOW WILL THE CONSEQUENCES OF THE FEDERAL RESERVE'S***
15 ***POLICY CONCERN INVESTORS?***

16 ***A32.*** Investors are concerned about their investment returns. The Federal Reserve
17 increased the money supply to add liquidity to the financial market, but it will
18 need to decrease the money supply in order to drain the liquidity and reduce
19 inflation pressure. A reduction in the money supply will cause short-term interest
20 rates to increase, as is the case for the period of late 2015 until late 2019. It is also
21 shown in Exhibit OCC-2. However, investors focus on long-term interest rate as
22 investments in the utility industry are long term.

¹¹ <https://www.federalreserve.gov/newsevents/pressreleases/monetary20210428a.htm>.

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1 **Q33. WHEN THE FEDERAL RESERVE TIGHTENS MONEY SUPPLY AND**
2 **SHORT-TERM INTEREST RATE INCREASES, DO THE REQUIRED**
3 **RETURNS FOR INVESTORS INCREASE?**

4 **A33.** Not necessarily. There are two kinds of interest rates in the marketplace: short-
5 term interest rates and long-term interest rates. In the case of determining required
6 returns for investors, it is the long-term interest rates that matter. Investors in the
7 utility industry face long-term investment decisions rather than short-term
8 investment decisions. In this consideration, how the short-term interest rates fare
9 is less relevant to them.

10
11 As the Federal Reserve tightens the money supply, interest rates generally will
12 increase; however, the Federal Reserve policies that were used to counteract
13 business cycles are generally considered short-term policies and they mainly
14 influence short-term interest rates. As I discussed above, the short-term interest
15 rates are very responsive to the Federal Reserve policy, while the long-term
16 interest rates (such as 30-year T-Bond yield) are not responsive to the QE policy
17 or tightening monetary policy. The opposite movements in the short-term interest
18 rate and long-term interest rate since mid-2021 in Exhibit OCC-2 demonstrate just
19 that. For this reason, it is not expected that the countercyclical monetary policy
20 will have much effect on the long-term interest rates, and thus, the required return
21 on capital.

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1 It is critically important to note that the long-term interest rates have been
2 declining, irrespective of the monetary policy during the business cycles. And,
3 again, it is the long-term interest rates that matter to investors. Therefore, the
4 current monetary policy, or the future monetary policy that targets short-term
5 economic fluctuations, has little effect on the required return on equity. It is
6 erroneous to argue that an interest rate increase leads to higher required cost of
7 capital without distinguishing between short-term interest rates and long-term
8 interest rates.

9

10 ***Q34. ARE THERE ANY REASONS FOR THE STEADY DECLINE IN THE***
11 ***LONG-TERM INTEREST RATES IN THE LAST 40 YEARS?***

12 ***A34.*** Yes, many economic factors have contributed to the long-term decline of long-
13 term interest rates. Professors and Economists Obstfeld and Tesar, in an article
14 they wrote when they were serving on the Council of Economic Advisers under
15 President Obama, have summarized these factors succinctly. They named the
16 following factors whose effects on interest rates are likely to be transitory:

- 17 • Fiscal, monetary, and exchange rate policies;
18 • Inflation risk and the term premium; and
19 • Private-sector deleveraging.

20 They also named some factors that are likely longer-lived:

- 21 • Lower long-run growth in output and productivity;
22 • Shifting demographics;

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- The global saving glut;
- Shortage of safe assets; and
- Tail risks and “unknown unknowns.”

In conclusion, they suggest “there is no definitive answer to how long current long-term interest rates will persist and whether they will settle at levels below those previously expected. Most factors, however, suggest that long-term interest rates will be lower in the long run compared with their levels before the financial crisis.”¹²

Q35. HOW HAS THE FEDERAL RESERVE RESPONDED TO COVID-19?

A35. Since its outbreak in Wuhan, China on December 31, 2019 and subsequent identification as the Covid-19 virus, commonly referred to as the Coronavirus, hundreds of millions of people worldwide have been infected and millions of people have died unfortunately. The economic impact of the virus has been staggering as well to say the least.

The impact of Covid-19 on the U.S. financial markets has been severe. Since all-time highs in February 2020, the Dow Jones Industrial Average, NASDAQ Composite, and S&P 500 Index have declined approximately 27%, 25%, and

¹² Maurice Obstfeld and Linda Tesar, “The decline in long-term interest rate,” whitehouse.gov, 2015.
<https://obamawhitehouse.archives.gov/blog/2015/07/14/decline-long-term-interest-rates>.

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1 30%, respectively. As a result, the U.S. equity markets have lost \$11.5 trillion in
2 capitalization since peaking in February 2020. In April 2020, the U.S.
3 unemployment rate reached 14.7%, followed by gradual declines in subsequent
4 months (*see* Figure 1 below). As of March 2022, the unemployment rate has
5 declined to roughly the pre-pandemic levels, however.

6
7 As a result of the Covid pandemic, the U.S. economy suffered significantly with
8 steep GDP declines. The GDP declined in the second quarter of 2020 at an annual
9 rate of 32.9% as restaurants and retailers closed their doors in a desperate effort to
10 slow the spread of the virus. This decline was more than three times as sharp as
11 the previous record — 10% in 1958 — and nearly four times more than the worst
12 quarter during the Great Recession.

13
14 On March 15, 2020, and in response to the Covid-19 virus risk, the Federal
15 Reserve Open Market Committee decided to lower the target range for the federal
16 funds rate to 0% to 0.25%. The Committee expects to maintain this target range
17 until it is confident that the economy has weathered recent events and is on track
18 to achieve its maximum employment and price stability goals.

19
20 The supply chain problems caused the shortage of supplies in many sectors of the
21 economy. Along with the quantitative ease, the U.S. inflation rate started to
22 increase to a 40-year high. Annual inflation rate in the U.S. increased to 7.9% in
23 February of 2022, the highest since January of 1982. As the market was expecting

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1 the inflation to be peaking, Russian invasion of Ukraine pushed up energy prices
2 to the highest level in several years. The geopolitical event, along with the
3 continued supply constraint, strong demand and labor shortages are likely to
4 continue to put upward pressure on general price level.

5

6 In faces of the higher inflation rate, the Federal Reserve has switched to monetary
7 tightening with the first increase in short term rate target announced on March 16,
8 2022:

9 The Committee seeks to achieve maximum employment and
10 inflation at the rate of 2 percent over the longer run. With
11 appropriate firming in the stance of monetary policy, the Committee
12 expects inflation to return to its 2 percent objective and the labor
13 market to remain strong. In support of these goals, the Committee
14 decided to raise the target range for the federal funds rate to 1/4 to
15 1/2 percent and anticipates that ongoing increases in the target range
16 will be appropriate. In addition, the Committee expects to begin
17 reducing its holdings of Treasury securities and agency debt and
18 agency mortgage-backed securities at a coming meeting.¹³
19

20 The above message suggests that the Federal Reserve still maintains its long-term
21 objective of employment and price stability. The long-term inflation rate is still
22 targeted at 2%. To achieve this objective, a series of increases in federal funds
23 rate target will be needed. Even though the timing of achieving these objectives is
24 not certain, I believe that the long-term inflation rate will be returning to a more
25 normal level despite the short-term pressure for higher inflation.

¹³ <https://www.federalreserve.gov/newsevents/pressreleases/monetary20220316a.htm>.

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**Q36. HOW HAS COVID-19 IMPACTED THE CAPITAL MARKET AND THE
REQUIRED RETURNS ON EQUITY OF UTILITY COMPANIES?**

A36. The utility industry and the capital market in general have been affected significantly by the Covid-19 pandemic. There are at least several changes that have impacted the required returns on capital.

The utility bond yield and spread increased noticeably at the breakout of the pandemic. The following chart shows that both the yields and the spread increased significantly in March of 2020; however, the bond market has stabilized since as both the utility bond yield and spread have declined to the pre-pandemic levels up to the end of 2021 followed by the increase in the bond yield in more recent months (*see* Figure 2 below). As a matter of fact, the spread, the measure of relative risks between the bonds of different grade, has declined to a level that is slightly lower than the spread before the onset of the pandemic, signaling the recognition of a more stable market by the investors.

In addition, utility stock prices have declined and rebounded since March 2020. Figure 3 below shows the Dow Jones utility index for the last year. There was a sharp decline in utility stock prices in March of 2020, followed by volatilities in the stock prices with the index hovering around 800. This has implications concerning the dividend yield as dividend yield is a part of return on equity in the DCF model. As stock prices decline with no changes in the dividend payout,

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1 utility companies' dividend yields would increase; however, the stock prices of
2 the utility stocks have surpassed the pre-pandemic levels as recent as March 2022.
3 This would lead to lower dividend yields, causing the expected return to utilities
4 equity to be lower holding everything else constant. However, as dividend yield
5 decreases, utility stocks' earnings growth prospect usually improves. Therefore, it
6 is premature to conclude that the investors flocking to utility stocks would lower
7 the required ROE.

8

9 ***Q37. DO YOU THINK THE MARKET RISKS FACED BY THE UTILITY***
10 ***INDUSTRY HAVE INCREASED AS WELL?***

11 ***A37.*** One measure of the utility company stock price risk is the association of its stock
12 price fluctuation with market price movement; this is measured by the so-called
13 beta. Figure 4 shows the beta value change for each gas utility company in *Value*
14 *Line* group before and during the pandemic. The average value of beta before the
15 pandemic was 0.61 as of February 2020 while the average value in early October
16 2020 was 0.88, a substantial increase in the risk of the utility stocks. The average
17 beta value continued to stay high, and it was 0.88 as of March 2022. In my
18 opinion, the substantial increase in these beta values is only temporary and the
19 measured beta values will return to a more normal level after the effect of the
20 pandemic rolls out of the five-year regression period that is used to obtain the beta
21 values.

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1 **Q38. WHAT IS THE IMPLICATION OF THE INCREASE IN BETA VALUE IN**
2 **DETERMINING THE UTILITIES' ROE?**

3 **A38.** Financial theory suggests that investors are compensated for bearing risks. Beta is
4 an accepted measurement of risk. When beta values are higher during the
5 pandemic, the ROE estimated by the CAPM model will be higher. I argue that the
6 currently high beta values are temporary and will show that there is evidence that
7 beta values will decline in a longer term. In other words, we would expect beta
8 values to return to the more normal levels when the initial effect of the pandemic
9 dissipates.

10

11 **Q39. WHY DO YOU SUGGEST THAT THE HIGHER BETA VALUES ARE**
12 **TEMPORARY?**

13 **A39.** The Covid-19 pandemic is an unprecedented episode in many ways. As I have
14 shown earlier, the pandemic has increased the risks of the gas utilities as shown
15 by the increased yield spread, and decreased stock prices of the utility firms as
16 well as other companies in general. We also have shown, since then, that the
17 utility yield spread has returned to pre-pandemic levels (Figure 2) and the utility
18 stock index has returned and surpassed the pre-pandemic level as well (Figure 3).
19 This suggests that the increased riskiness of the utility stocks should have
20 declined. However, the average beta value of gas utility stocks today still remain
21 elevated at about the same level in October 2020.

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1 In Figure 5, I show that the average gas utility stock beta sometimes increases in
2 anticipation and/or at the onset of the changing economic conditions, and it would
3 decline afterwards. For example, around the time of the 2007-2008 economic
4 recession, gas utility beta value increased to a new high level. However, the beta
5 value declined during the economic recovery and when the economy returned to
6 the more normal levels. In comparison, this time the Covid pandemic was largely
7 an unexpected event that carried a tremendously negative impact never seen
8 before, which caused the beta value to increase substantially in a very short time
9 period.

10
11 ***Q40. HOW DID YOU ESTIMATE THE GAS UTILITY BETA SHOWN IN***
12 ***FIGURE 5?***

13 ***A40.*** I followed the method adopted by *Value Line* to produce the beta values for each
14 of the companies in my proxy group. Due to the fact that several companies do
15 not have stock prices going back to 1973, I have only included 5 gas utilities in
16 my estimation (NiSource, Northwest Natural, Southwest Gas, Spire and UGI).
17 However, as every gas utility experienced the same pattern of change in beta,
18 these companies are representative enough to show the changes in beta value for
19 the whole industry.

20
21 *Value Line* “derive(s) the Beta coefficient from a regression analysis of the
22 relationship between weekly percentage changes in the price of a stock and

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1 weekly percentage changes in the NYSE Composite Index over a period of five
2 years.”¹⁴ To replicate the *Value Line* estimation of beta, I downloaded stock price
3 data for the gas utilities and the NYSE Composite Index for the period of January
4 1, 1973 to the end of December 2021. I then calculated the weekly percentage
5 changes of the stock prices (returns) and ran a regression of the stock returns on
6 the composite index return. I ran the regression for a five-year period with the
7 period ending on December 31 of each year, and I ran the regression once a year
8 for the period of 1978 to 2021 for each company. Therefore, in my notation, the
9 beta for 2021 is the beta value at the beginning of 2022 or at the end of 2021,
10 obtained from the regression using the sample data for the period of January 1,
11 2017 to December 31, 2021. The rest of the beta values were obtained the same
12 way.

13
14 There was a gradual increase in the beta value before 2007 followed by declines
15 for more than 10 years during the period of economic recovery and growth. The
16 gradual increase in the beta value before 2007 reflected the market’s perception of
17 risk increase over time. The large spike in the beta value for 2020 (covering the
18 period of 2016 through the end of 2020) captured the sudden increase in the
19 volatility or the risk of utility stocks as the pandemic was not anticipated.

20 Figure 5 also shows that the gas utility beta value fluctuated around an
21 unobservable mean value. This is what is called mean reversion. The average

¹⁴ https://www.valueline.com/tools/educational_articles/stocks/using_beta.aspx#.YKXTlqhKhPZ.

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1 value of beta for the 44-year period including the high beta years of 2020 and
2 2021 is 0.69.

3
4 The high beta values for 2020 (five years data including 2016 through end of
5 2020) and 2021 (five-year data covering the period of 2017 to 2021) are not
6 normal and do not represent the risks faced by the utility industry correctly. Using
7 the current beta values will bias ROE upward, rendering the ROE estimates
8 unreliable and excessive.

9

10 ***Q41. DO YOU HAVE ANY DIRECT EVIDENCE OF CURRENT BETA VALUES***
11 ***BEING ABNORMAL? MAYBE THE RISKS OF THE GAS UTILITIES ARE***
12 ***PERMANENTLY HIGHER DUE TO THE PANDEMIC?***

13 ***A41.*** The currently elevated beta value is 0.88, higher than the 44-year historical
14 average value of 0.69. However, I do not believe the risks of the gas utilities are
15 permanently higher. I will show next that the currently high beta is the artifact of
16 the beta regression by *Value Line* or any other financial services that generate and
17 report beta values using the same approach in performing beta regressions. As I
18 have stated earlier, the *Value Line* regression coefficient is obtained by running a
19 5-year regression. The inclusion of the highly volatile period of 2020 pandemic
20 year in the regression has influenced the beta estimate significantly. However, the
21 risk of the gas utility has declined from the initial high level right upon the impact

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1 of the pandemic in 2020, but the beta values still remain high. The high beta value
2 was the result of the regression including the 2020 time period,

3
4 ***Q42. HOW WOULD THE DATA FROM A SPECIFIC TIME PERIOD AFFECT***
5 ***THE REGRESSION COEFFICIENT?***

6 ***A42.*** Regression is a statistical method that estimates an *average* relationship
7 between/among variables, in this case, the relationship between the stock return of
8 a utility company and the stock return of a market index. Just like calculating the
9 average value, a large value in a dataset can influence the average value
10 significantly. The large value will have a smaller influence on the average value if
11 the number of observations in the dataset is large. To dilute the impact of a large
12 value (or an abnormal time period), beta regressions are done on a longer time
13 period such as five years. However, the impact of the large value on the average
14 value will not disappear unless the large value is no longer included in the dataset.

15
16 Similarly, the pandemic in 2020 is a special event that lasted longer than just a
17 few days. It has influenced the beta estimate very significantly in the same way as
18 described above about a large value. Including a period of 5-years in the
19 regression is expected to damp the impact of any particular year better than a
20 regression with a shorter period. However, unless the abnormal period of
21 pandemic 2022 rolls out the regression period, estimated beta value will be high
22 even if the risk of the utility stocks has returned to a more normal level. In this

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1 sense, the currently high beta values do not reflect the true risk of the utility
2 stocks.

3
4 ***Q43. DO YOU HAVE EVIDENCE THAT THE RISKS OF THE UTILITY***
5 ***COMPANIES HAVE RETURNED TO A MORE NORMAL LEVEL?***

6 ***A43.*** Yes, I do. I have performed regressions with different lengths of the sample
7 period to show the impact of pandemic 2020 on the beta estimate. Figure 6 above
8 shows the impact of inclusion of the 2020 data in each regression. The first three
9 numbers show the beta values obtained from a five-year regression (2015-2019,
10 2016 – 2020, and 2017-2021). Without the 2020 pandemic data, the beta value
11 from the regression for period ending December 2019 is only 0.60. The beta
12 values for years ending 2020 and 2021 increased to 0.87 and 0.89, respectively
13 when the time period included year 2020. When I ran the two-year regressions,
14 these three numbers became 0.72, 0.956, and 0.952. The beta values from the last
15 two-year regressions increased significantly. The reason for that is the second set
16 of regressions only covered a shorter period of two years, and the 2020 pandemic
17 year data had a much larger impact (having a weight of 1/2) on the regression
18 results compared to the five-year regression where year 2020 only carried a 1/5
19 weight. When I ran the one-year regression, the three numbers became 0.63, 0.98
20 and 0.69, respectively. The beta value for year ending 2021 dropped significantly
21 to 0.69 when the 2020 pandemic period was not included in the regression
22 anymore.

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1 This suggests that the unsettling market condition of year 2020 right after the
2 breakout of the Covid virus was extremely abnormal and it distorted the normal
3 relationship between utility stocks and the overall market. It shows that the
4 market risk of the utility stocks increased substantially as the estimated beta value
5 increased significantly. However, the increase in risk is only transitory with the
6 impact occurring only for 2020. Now the market has started to return to a more
7 normal condition,¹⁵ but the five-year regression by *Value Line* still has the 2020
8 data “contaminating” the regression relationship. The five-year regression instead
9 of a shorter period regression by *Value Line* was intended to lessen the influence
10 of some anomalies in the data during the sample period. However, in this case, it
11 has created a very undesirable adverse effect in the presence of an extreme
12 abnormality.

13
14 The decline in the measured one-year beta value to the level close to the pre-
15 pandemic level is proof that the utility stock risks have declined to the pre-
16 pandemic levels. It also reflects the market’s perception of utility’s ability to deal
17 with the impact of the pandemic. Utilities can manage the risk associated with the
18 pandemic through existing recovery mechanisms. Rate cases and the creation of
19 deferred regulatory assets can be expected by the utilities to collect the lost cash
20 flows.

¹⁵ Mr. Moul, the Company’s cost of capital witness, also agreed that the market fundamentals have begun to return to more normal levels. See Prepared Direct Testimony of Paul Moul, page 2, lines 16-18.

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**Q44. WHAT ADJUSTMENT IS NEEDED TO CORRECTLY REFLECT THE RISK
OF THE GAS UTILITY INDUSTRY AFTER THE PANDEMIC?**

A44. I believe it is very important to mitigate the impact of the incorrect indication of the riskiness of the utilities by the current beta values. As the current values of the beta reported by information providers including *Value Line* are biased upward in measuring the utility risks at this time, I correct the bias by averaging the beta value before the pandemic and the beta value as reported now. The average beta value calculated this way is 0.74 (*see Exhibit ZZ-8*), which is still slightly higher than the historical average of 0.69. I believe the beta value of 0.74 reflects the true state of the utility stock riskiness with respect to the overall market movement much better than the unadjusted average beta value of 0.88.

**V. OCC/NOPEC'S RECOMMENDATION OF A JUST AND REASONABLE
RATE OF RETURN FOR COLUMBIA**

CAPITAL STRUCTURE AND COST OF DEBT

Q45. WHAT IS COLUMBIA GAS' PROPOSED CAPITAL STRUCTURE?

A45. The Company proposed a capital structure of 49.40% debt and 50.60% equity is based on the actual capital structure of the company.

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1 ***Q46. DO YOU AGREE WITH THE COMPANY'S PROPOSED CAPITAL***
2 ***STRUCTURE?***

3 ***A46.*** I have studied the capital structure of the comparable companies. Exhibit ZZ-3
4 presents the equity ratio of the companies for the past 10 years as well as the
5 expected equity ratio by *Value Line*. The equity ratio of 50.60% is slightly higher
6 than the average value of the equity ratio but is within a reasonable range of the
7 values for the proxy group. I consider 50.60% equity to be consistent with the
8 industry norm, so I accept the Company's proposed capital structure.

9

10 ***Q47. WHAT IS COLUMBIA'S COST OF DEBT?***

11 ***A47.*** Columbia Gas' cost of debt is 4.49%. As this is the cost of the debt of the
12 Company at the filing date, I accept this embedded cost.

13

14 ***Q48. WHAT MEASURES OF COST OF COMMON STOCK EQUITY HAVE YOU***
15 ***USED TO CALCULATE THE COMPANY'S COST OF CAPITAL?***

16 ***A48.*** I used three common methods of cost of equity calculations, namely, the DCF
17 method, the CAPM model, and the RP model. The first two methods examine an
18 individual company's financial information. I also use the RP method to obtain
19 the equity premium for the whole gas utility capital market. All three methods are
20 market based and they are recognized methods used in cost of capital
21 proceedings.

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The DCF method is based on anticipation of a company's future earnings and growth opportunities, so one requirement for the selection of the company is that company needs to pay dividends to equity owners. The CAPM model is based on the risk premium concept. Both the DCF and CAPM models take into account the investors' understanding and expectation of the economic environment, at present and in the future, and the current industry and company-specific information. The RP model utilizes the negative empirical relationship between interest rate and the expected risk premium which is the difference between the expected return (one representation is the utility's authorized ROE) and interest rate.

THE DISCOUNTED CASH FLOW MODEL

Q49. PLEASE DEFINE AND EXPLAIN THE DCF METHODOLOGY FOR MEASURING THE COST OF COMMON EQUITY.

A49. The DCF method calculates the required return for an investor as follows:

$$K = \frac{D}{P} + g$$

where: K = cost of common equity
 D = expected next-period dividend per share
 P = price per share and
 g = growth rate of dividends, or alternatively, common stock earnings.

In the equation, "K" is the required rate of return on investment by investors. It is also the discount rate that is used to convert the future cash flows from the investment into the present value. "D" is the expected next-period amount of

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1 dividend paid to equity holders. "P" is the current market price of the common
2 stock, representing the current valuation of the company by the market. So "D/P"
3 is the expected next-period dividend yield on the company's common stock. And
4 "g" is the expected growth rate of the dividend or earnings.

5

6 ***Q50. WHAT DOES THE COST OF EQUITY CALCULATED FROM DCF***
7 ***REPRESENT?***

8 ***A50.*** The DCF method, as cited in the most common form, generates an estimate of the
9 return required for an investor to measure against alternative investment
10 opportunities. This represents the minimal return in order for a company to attract
11 and maintain investment in the company's common equity. It represents the
12 investor's expectation based on available current market information.

13

14 ***Q51. WHAT FORMS OF THE DCF MODEL HAVE YOU USED IN***
15 ***CALCULATING THE COST OF EQUITY?***

16 ***A51.*** When the DCF model is used to calculate required return on equity, the
17 appropriate EPS growth rate must be used because the model looks at the
18 perpetual EPS growth rate. The constant growth DCF model is a standard DCF
19 model used in practically all cost of capital proceedings. The correct use of the
20 growth rate is essential to the correct valuation of the required return using the
21 constant growth DCF model. I used a two-step DCF model to estimate ROE
22 which I will explain more in the next section.

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1 **Q52. WHAT STOCK PRICE DID YOU USE IN YOUR CONSTANT GROWTH**
2 **DCF MODEL?**

3 **A52.** I have reviewed and used the six-month average of stock prices. Stock prices vary
4 on a daily basis. The use of a six-month average reduces the impact of price
5 volatility and reasonably represents the normal market condition concerning the
6 value of the stock. As the market price can be volatile on a daily basis, I first
7 calculated the average of monthly highs and lows as the monthly price. A six-
8 month average limits the impact of abnormal stock price fluctuations. This
9 method of calculating the average stock price is also the method adopted by
10 FERC. The sample period I used for the stock prices runs from October 1, 2021
11 through March 31, 2022.

12

13 **Q53. HOW DID YOU CALCULATE DIVIDEND YIELD?**

14 **A53.** The dividend yield is calculated as the ratio of expected dividend at the end of the
15 first period to the stock price at the beginning of the period. I collected the
16 quarterly dividend for the same six-month period with the ending date matching
17 the ending date of the stock price. I annualized the quarterly dividend by
18 multiplying the quarterly dividend by 4. Then for each month, I calculated the
19 dividend yield by dividing the annual dividend by the monthly stock price. The
20 dividend yield for the six-month period is the average of the monthly dividend
21 yield during the period. In the DCF model, dividend yield is the expected next-

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1 period dividend. I multiplied the dividend yield by one half of the expected
2 dividend growth rate to reflect the fact that the dividend is paid quarterly.
3

4 ***Q54. WHAT GROWTH RATE INFORMATION DID YOU USE IN THE***
5 ***CALCULATION OF THE ROE?***

6 ***A54.*** The stock price and dividend information are known to the investors; however,
7 the expected dividend growth rate is not directly observable and needs to be
8 estimated. Investors project the dividend growth rate based on all available
9 information; therefore, I have chosen the projected 3-5-year EPS growth rate by
10 Institutional Brokers Estimate System ("IBES"). The IBES provides some of the
11 most comprehensive financial information in business investment. IBES projected
12 growth rates represent a consensus of multiple analysts, including some of the
13 analysts included in First Call and Zacks. The IBES source of projected earnings
14 is widely used by the market and is publicly available. The IBES growth rates are
15 reported in Exhibit ZZ-4.
16

17 ***Q55. DID YOU USE IBES PROJECTED EPS GROWTH RATE AS THE FINAL***
18 ***FORM OF EARNINGS GROWTH RATE?***

19 ***A55.*** No, I did not adopt the IBES earnings forecast as the final estimate of the earnings
20 growth rate, and I have only used the IBES projected earnings growth rate in
21 projecting the expected dividend yield at the end of the first period. As IBES
22 earnings forecast is typically not of very long term – 3 to 5 years maximum - I

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1 also used the long-term growth rate to correctly calculate the earnings growth rate
2 in the long term. To obtain a more reliable measure of EPS growth in the long
3 term, I have used a weighting scheme known as the two-step DCF method.

4
5 ***Q56. WHAT IS THE TWO-STEP DCF METHOD?***

6 ***A56.*** In the two-step method, relatively short-term earnings growth forecasts, such as
7 IBES projections, are obtained first. In the second step, the constant growth rate
8 (g) is augmented by a measure of the long-term growth, and then the overall
9 earnings growth rate is the weighted average of relatively short-term growth rate
10 projection and the long-term growth projection. In this sense, the two-step
11 constant growth DCF model is equivalent to a multi-stage DCF model that
12 assumes different growth rates for different stages of a utility's life.

13
14 ***Q57. WHAT IS THE LONG-TERM GROWTH RATE YOU USED AND HOW DID***
15 ***YOU DETERMINE THE WEIGHTS?***

16 ***A57.*** I used the GDP growth rate as the measure of the long-term growth rate. In
17 perpetuity, the value of the stock market should grow at the same rate as the
18 economy grows. The two sources of the expected growth I used are: [1] Energy
19 Information Administration, Annual Energy Outlook ("AEO") 2022 and [2]
20 Social Security Administration, 2022 OASDI Trustees Report. These two sources
21 are frequently cited in cost of capital proceedings. For example, FERC requires
22 the calculation of the EPS growth rate incorporating these two sources of long-
23 term economic projections in addition to the projections by IHS Global Insight.

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When calculating the expected future earnings growth rate, I used the weights of 2/3 and 1/3 for the IBES growth rate and the GDP growth rate respectively. The detailed calculation of the long-term growth rate is shown in Exhibit ZZ-5. My assessment of the long-term economic growth, based on most recent available information from these sources, is 4.27%.

Q58. PLEASE SUMMARIZE YOUR ROE RESULT BASED ON THE CONSTANT GROWTH DCF MODELS.

A58. After adding the expected dividend yield to expected earnings growth rate for the two-step DCF model, I obtained a ROE of 8.60% based on the median and 8.36% based on the average value. Exhibit ZZ-6 shows the calculation of the ROE by the DCF model, and the table below (Table 4) summarizes the result of the DCF model. I also presented the ROE result based on the Moul sample. The results are similar based on the two samples. This suggests that the proxy group selection is not the major source of the difference between the ROE result I obtained and the result Mr. Moul obtained. I will address the methodological issues of Mr. Moul in later sections.

Table 4: DCF ROE results			
	Zhu Sample		Moul Sample
	DCF		DCF
Min	6.57%		6.57%
Max	9.72%		9.72%
Median	8.60%		8.60%
Average	8.36%		8.42%
Midpoint	8.14%		8.14%

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THE CAPITAL ASSET PRICING MODEL

Q59. PLEASE DESCRIBE THE CAPM METHOD IN THE CALCULATION OF THE COST OF COMMON EQUITY.

A59. The CAPM method is based on the analysis of risks. There are two types of risks to consider; one is the kind of risk that investors can diversify away or reduce by combining different investments into a portfolio, the other is the market risk an investor cannot reduce by diversification. Therefore, the CAPM method is a risk premium model based on the calculation of the risk differential between investments on the market portfolio and the individual stock. The calculation of the required rate of return on the company's stock is as follows:

$$K = R_F + \beta (R_M - R_F)$$

Where: K = the required return.
 R_F = the risk-free rate.
 R_M = the required overall market return; and
 β = beta, a measure of a given security's risk relative to that of the overall market.

The idea of calculating the required return on the individual investment from CAPM is to find the equivalent return for an investor based on the relative risk of the investment as compared to the alternative investment opportunities. Here, the alternative investment opportunity is usually assumed to be the market portfolio.

This is a model that suggests investors should be compensated for bearing risks.

Typically, the risk-free rate is a benchmark investment on which investors can be

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1 compensated for not bearing any risks. The benchmark risk-free rates are typically
2 Treasury security yields. The market return is the return on all other available
3 investment alternatives to the investor. This is typically a rate generated from a
4 relevant market index. The risk of the firm's common stock is reflected in the beta
5 of the company, which measures the relative stock price volatility of the company
6 compared to the overall market.

7
8 Therefore, the CAPM model has two general components: one is the risk-free
9 rate, and the other is the company RP, which is the product of the company's beta
10 and market risk premium (" $\beta \times \text{MRP}$ "). The market risk premium (" MRP ") is the
11 difference between the expected market return and the risk-free rate (" $R_M - R_F$ ").

12

13 ***Q60. PLEASE EXPLAIN YOUR CAPM CALCULATIONS.***

14 ***A60.*** I used the 30-year T-Bond yield as the benchmark risk-free rate. I obtained the
15 base beta for the comparable companies from *Value Line*. Finally, I developed a
16 measure of market risk premium based on the DCF model applied to S&P 500
17 dividend paying companies.

18

19 ***Q61. PLEASE DESCRIBE THE RISK-FREE RATE.***

20 ***A61.*** I used the six-month average yield on 30-year T-Bonds. As utility investments are
21 usually long term, and a longer-term Treasury bond would reflect the market
22 condition better for the investments. The yield reflects all market information

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1 known to investors at the time including the possibility of future interest rate
2 increase. A 6-month average is used to mitigate the impact of T-bond yield
3 volatility and it also matches the time period for the stock dividend yields. The
4 30-year T-Bond yield is a best measure of the required return on risk-free
5 instrument.

6

7 ***Q62. PLEASE EXPLAIN THE BETA OF THE COMPARABLE COMPANIES.***

8 ***A62.*** Betas measure the connection between the company's stock volatility and the
9 overall market volatility. Many professional financial services, including *Value*
10 *Line*, provide the estimate of the company beta. As it is generally known that a
11 raw beta obtained from the regression of the company stock returns on market
12 returns tends to move toward 1, *Value Line* has adjusted its estimated beta
13 accordingly (the so-called Blume adjustment). The *Value Line* beta values are
14 appropriately estimated to measure the company's stock price variations
15 compared to the overall market index in normal economic conditions. Therefore,
16 the product of the company's beta and market risk premium is supposedly to
17 produce the company's RP.

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1 **Q63. YOU STATED EARLIER THAT THE MOST RECENT BETA VALUES**
2 **FROM VALUE LINE ARE TOO HIGH AND MAY NOT REFLECT THE**
3 **NORMAL RISK OF THE UTILITY STOCKS. HOW DID YOU CORRECT**
4 **THIS PROBLEM?**

5 **A63.** As I explained earlier, the current gas utility beta values from *Value Line* are too
6 high, not reflecting the true risk of the gas utility stocks. The estimates of beta are
7 heavily influenced by the transitory impact of the Covid pandemic mostly during
8 year 2020. As the economy started to return to normal, beta values of the gas
9 utilities should have declined from the abnormally high levels. As I explained in
10 an earlier section, *Value Line* calculates the beta value based on data for a five-
11 year period, thus it will take some time for the pandemic effect to be transitioned
12 out in the time-series regression. I have also shown that the beta from a one-year
13 regression (excluding the period of 2020) has already gone down to almost the
14 pre-pandemic levels. Therefore, the elevated current betas from the five-year
15 regressions as reported by *Value Line* and other professional services are an
16 artifact of the regression estimation, so the beta as reported does not reflect the
17 true risk of the utility stocks. For this reason, I have calculated the average value
18 of beta for each company based on the beta value as of March 2022 and February
19 2020.

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1 **Q64. PLEASE DESCRIBE YOUR ANALYSIS OF MARKET RISK PREMIUM.**

2 **A64.** As the CAPM model estimates the expected ROE, the market risk premium
3 should be the expected equity market return over the risk-free rate. The estimate
4 of the market equity risk premium is perhaps the most contentious issue for the
5 financial market; however, there are generally accepted ways to estimate the
6 equity risk premium. One method is to obtain the expected market return via DCF
7 method. Many jurisdictional authorities, including FERC, accept the market
8 return calculated using a DCF method. A very important feature of this
9 methodology is that it generates a market risk premium that is forward looking.
10 Some analysts including Mr. Moul use historical market risk premiums. However,
11 historical risk premiums are backward looking.

12

13 **Q65. PLEASE EXPLAIN WHAT MARKET INDEX YOU HAVE USED.**

14 **A65.** I have used the S&P 500 index to represent the overall equity market. After
15 obtaining the name of the companies included in the market index, I have
16 excluded the companies that do not pay dividends and the companies that have
17 negative projected earnings growth rates and growth rates higher than 20%. If a
18 company has a negative earnings growth rate, it will not be sustainable in the long
19 run. Similarly, it is not possible for a company to have an earnings growth rate of
20 20% forever; therefore, I have eliminated those companies from the list. The final
21 sample included more than 300 companies, which is large enough to represent the
22 broad spectrum of the businesses in the U.S. economy.

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1 ***Q66. WHY DID YOU EXCLUDE NON-DIVIDEND PAYING COMPANIES FROM***
2 ***THE CALCULATIONS?***

3 ***A66.*** The DCF model is based on the premise that a company's value is based on the
4 stream of future dividends to the investors. The model breaks down if no dividend
5 is issued to the investors. In other words, the DCF model cannot be applied to
6 companies that do not issue dividends. The expected market return is then the
7 weighted average of individual company returns (ROE derived from the DCF
8 model) with the market capitalization being the weight.

9
10 ***Q67. DID YOU USE A ONE-STEP DCF MODEL OR A TWO-STEP DCF MODEL***
11 ***TO OBTAIN THE INDIVIDUAL COMPANY'S ROE?***

12 ***A67.*** I used a two-step DCF model to calculate the ROE of an individual company. A
13 weighted growth rate by the short-term and long-term growth rate can better
14 capture the nature of the expected long-term dividend growth rate. I used the
15 IBES projected earnings growth rate as the short-term expected earnings growth
16 rate and the weighted value of IBES projected earnings growth and expected GDP
17 growth rate as the long-term growth rate.

18
19 ***Q68. WHAT IS YOUR ESTIMATED MARKET RISK PREMIUM?***

20 ***A68.*** My estimated market return is 10.65% and market risk premium is 8.64% by the
21 two-step DCF method. These results are presented in Exhibit ZZ-7. Please note
22 that the estimated market risk premium is likely on the high side compared to the

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1 estimates from other sources.¹⁶ One of the reasons could be that it ignores the
2 returns of the companies in the S&P 500 index that do not issue dividends.
3 However, it is a forward-looking measure that meets the requirement of the
4 CAPM model.

6 **Q69. WHAT IS YOUR ESTIMATED ROE BASED ON THE CAPM MODEL?**

7 **A69.** I used the following method to obtain the estimates of the ROE: I applied the
8 market risk premium obtained from the two-step DCF model to each comparable
9 company's beta to obtain beta-adjusted company RP and then added to the risk-
10 free rate. Then I calculated the average and median of the individual company's
11 ROE based on the CAPM model. The final result of ROE in Exhibit OCC-ZZ-8
12 shows the application and the results of the method.

13 Table 5 below shows the summary of the CAPM model result.

Table 5: CAPM ROE results			
	Zhu Sample		Moul Sample
	CAPM		CAPM
Min	7.87%		7.87%
Max	9.80%		10.22%
Median	8.09%		8.62%
Average	8.45%		8.78%
Midpoint	8.83%		9.05%

¹⁶ Aswath Damodaran, "Equity Risk Premiums (ERP): Determinants, Estimation, and Implications – The 2022 Edition", table 25. <https://pages.stern.nyu.edu/~adamodar/>.

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1 The median from the calculation is 8.09%, and the mean value ROE estimate is
2 8.45%. The use of the current beta values without adjustment would have led to a
3 much higher but incorrect ROE estimate. My use of average beta value mitigated
4 the problem, leading to a much more reasonable estimate of required ROE. Again,
5 table 5 shows the ROE results based on the Moul sample.

6

7 **THE RISK PREMIUM MODEL**

8

9 ***Q70. PLEASE DESCRIBE THE PRINCIPAL IDEA BEHIND THE RP MODEL.***

10 ***A70.*** The RP model is based on the idea that equity owners or stockholders require
11 higher returns than the bond holders who simply hold less risky bonds. Therefore,
12 this risk-reward relationship reflects the basic principle in financial economics.
13 The ROE is then equal to bond yield plus a form of expected RP which is the
14 difference between expected returns of the stocks and bond yield.

15

16 ***Q71. HOW CAN THIS MODEL BE ESTIMATED TO GENERATE EXPECTED***
17 ***ROE?***

18 ***A71.*** There are many versions of the RP models, depending on the stock returns and
19 interest rates used. One typical form of the risk premium is measured by the
20 difference between a utility's authorized ROE and a particular kind of long-term
21 interest rate, frequently being the 30-year bond yield. The relationship between
22 equity risk premium and bond yield is empirically obtained through regression of

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1 risk premium on bond yield. Then, the estimated regression equation coefficients
2 are used to obtain the expected ROE given the bond yield.

3

4 ***Q72. PLEASE EXPLAIN HOW YOU OBTAINED THE RP DATA AND HOW YOU***
5 ***EMPIRICALLY ESTIMATED THE RELATIONSHIP BETWEEN RISK***
6 ***PREMIUM AND INTEREST RATE.***

7 ***A72.*** I used the authorized ROEs from past gas utility rate cases since 1980 to represent
8 the expected returns and then subtracted the long-term interest rate, in this case,
9 the 30-year Treasury bond yield, to generate the RP. I have included only past rate
10 cases of fully integrated and distribution gas utilities in my sample. I have
11 included both fully litigated and settled cases. The inclusion of the settled cases or
12 not does not make any material difference as the obtained ROEs are essentially
13 the same using either the fully litigated sample or litigated plus settled sample.
14 Then I regressed the risk premium on interest rate to obtain the relationship
15 between the RP and the interest rate. In order to capture the interest rate for the
16 rate case as closely as possible, I have averaged the 30-year T-Bond yield for the
17 period of each rate case, i.e., from the filing date to the decision date. This
18 estimated relationship has been utilized to estimate the risk premium given the
19 current interest rate. I have calculated the average length of a typical rate case and
20 my result revealed that the average period is about 9 months. I then used the
21 average T-Bond yield during the last 9 months (up to March 2022) as the interest

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1 rate. The estimated RP then is added to the interest rate to yield the expected
2 ROE.

3

4 ***Q73. USING THE CURRENT 30-YEAR BOND YIELD, WHAT IS YOUR***
5 ***ESTIMATE OF ROE PER RP METHOD?***

6 ***A73.*** My estimated RP is 7.04%. *See* Exhibit OCC-ZZ-9. With the 9-month average
7 30-year T-Bond yield at 2.04%, my estimate of the ROE using the risk premium
8 method is 9.08%.

9

10 **VI. OCC/NOPEC OBJECTIONS TO THE STAFF REPORT REGARDING**
11 **RATE OF RETURN**

12

13 **OCC/NOPEC Objection No. 17**

14

15 ***Q74. WHAT IS THE STAFF REPORT'S RECOMMENDATIONS REGARDING***
16 ***THE RATE OF RETURN FOR COLUMBIA?***

17 ***A74.*** The Staff recommended accepting the capital structure and cost of debt of
18 Columbia Gas as filed. The Staff also recommended a cost of equity of 9.05% to
19 10.05%.

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1 ***Q75. DO YOU AGREE WITH THE STAFF REPORT'S RECOMMENDATIONS?***

2 ***A75.*** I agree with the recommendations regarding the cost of debt and capital structure.

3 However, I do not agree with the Staff's assessment of the cost of equity for
4 Columbia Gas.

5

6 ***Q76. WHY DO YOU DISAGREE WITH THE STAFF'S ANALYSIS AND***
7 ***RECOMMENDATION ON COST OF EQUITY?***

8 ***A76.*** I believe the Staff utilized some questionable assumptions in modeling the cost of
9 equity for Columbia Gas, which leads to higher than market required return on
10 equity, thus increasing the financial burdens of the Columbia Gas' consumers.

11

12 ***Q77. PLEASE IDENTIFY THE ASSUMPTIONS THE STAFF USED THAT ARE***
13 ***QUESTIONABLE OR UNREASONABLE.***

14 ***A77.*** The Staff first selected a proxy group for Columbia Gas. Then the Staff employed
15 two models, a multi-stage DCF model and a CAPM model to estimate the market
16 requirement ROE. In selecting a proxy group, the Staff used the S&P peer
17 company selection tool, which includes all utilities in the U.S. based on the
18 selection on several criteria including the beta, bond rating, dividend yield and
19 earnings before interest, taxes, depreciation and amortization, and market
20 capitalization.

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1 In carrying out the DCF analysis, the Staff employed a multi-stage DCF model
2 with short term growth rate modeled by the 3-5 years analyst projections by
3 Yahoo Finance, Zack's and Value Line, and long-term earnings growth rate
4 proxied by historical GNP growth rate. The Staff generated a ROE of 9.6% from
5 the DCF model.

6
7 The Staff utilized the average of the Standard & Poor's betas of the comparable
8 companies, which was 0.8 and an estimate of the market risk premium from
9 Fairness Finance. The risk-free rate is the weighted average of 10-year and 30-
10 year monthly T-bond yields for the period of September 1, 1991 to September 1,
11 2021. The interest rate was calculated to be 4.35%. The Staff's calculation of
12 ROE is 9.32%.

13
14 Finally, the Staff adjusted the ROE estimate from the DCF model and CAPM
15 model by a factor of 1.00871, which also reflects a 3.5% issuance cost, to allow
16 for an issuance and other costs.

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1 **OCC/NOPEC Objection No. 18**

2

3 ***Q78. DO YOU AGREE WITH THE SELECTION OF THE COMPARABLE***
4 ***GROUP BY THE STAFF?***

5 ***A78.*** No, I do not. Columbia Gas is a gas distribution company and the companies in
6 the proxy group should be gas utilities that reflect the same operational
7 characteristics. The Staff's selection included seven companies such as
8 CenterPoint Energy, Pinnacle West Capital Corporation, OGE Energy
9 Corporation, CMS Energy Corporation, Ameren Corporation, Evergy and Atmos
10 Energy Corporation. These companies are generally classified as electric utilities
11 except for Atmos Energy. Even though all these companies are utilities in a
12 broader sense, a proxy group based on gas utilities would be expected to generate
13 more precise ROE estimates.

14

15 **OCC/NOPEC Objection No. 21**

16

17 ***Q79. WHAT ISSUES DO YOU HAVE WITH STAFF'S DCF MODELING?***

18 ***A79.*** There are a couple of issues. One is the choice of the earnings projections. The
19 Staff used three sources: Yahoo Finance, Zack's and *Value Line*. Yahoo Finance
20 and Zack's include the estimates of some of the same analysts, and *Value Line's*
21 projections are updated less frequently (every 3 months). I believe Yahoo Finance

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1 would be sufficient to represent the analyst projections with more updated
2 information.

3
4 The more serious problem is with the Staff's choice of long-term earnings growth
5 rate. The Staff is correct in assuming the economic growth rate to be the expected
6 long-term dividend growth rate. However, the Staff used the historical economic
7 growth rate represented by the GNP growth rate for the period of 1929 to 2020.

8 The cost of capital is the market required return on capital for the future
9 investment of the utilities in this case, therefore, it should be forward looking.
10 Historical GNP or GDP growth rate only reflects what has happened in the past
11 and the past does not necessarily reflect the current or future market and
12 economic conditions. Therefore, it is inappropriate to use historical growth rate in
13 this context.

14
15 The historical GNP growth rate during the sample period of the Staff is 6.41%,
16 which is too high for the future given the expected economic condition in the U.S.
17 In calculating the 6.41% annual growth rate, the Staff used the arithmetic growth
18 formula – i.e., calculate the annual growth rate and then average over all the
19 annual growth rate. However, this approach has a well-known problem of over-
20 stating the growth rate when growth rate varies quite a bit during the sample
21 period. The correct calculation is to obtain the geometric growth rate, which is

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1 5.9%. However, even 5.9% is still not representative of the future GNP/GDP
2 growth rate.

3
4 It is well-known that the U.S. economy experienced a slowdown in economic
5 growth in the last several decades. As I have explained earlier in my testimony,
6 the U.S. real GDP growth rate has been declining over the years. From 1970 to
7 2020, the U.S. real GDP grew at a rate of 2.66%, while that rate for the period of
8 1980-2020 and 1990 to 2020 has declined to 2.53% and 2.27% respectively. The
9 growth rate for the period of 2000 to 2020 dipped to 1.69%. The historical GDP
10 growth rate of 6.41% does not appear to be consistent with the more recent trend
11 in GDP growth. The most recent expected GDP growth rate for the U.S. is around
12 4.25% (*see* Exhibit ZZ-5).

13

14 **OCC/NOPEC Objections No. 19 and No. 20**

15

16 ***Q80. WHAT ISSUES DO YOU HAVE WITH THE STAFF'S CAPM ANALYSIS?***

17 ***A80.*** I have several issues with the Staff's analysis of ROE by the CAPM model. First,
18 the Staff should have discounted the current value of the beta. Second, the Staff
19 should not used the historical interest rate from 1991 to 2021, which is too
20 different from the interest rate under the current capital market condition.

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1 Regarding the first issue, as I have argued earlier in this testimony, the unadjusted
2 beta values from professional services misrepresent the true risk of the utilities as
3 the still elevated beta values are an artifact of including the abnormal 2020
4 pandemic in the 5-year beta regressions. The Staff should have used the historical
5 average of betas or adjusted the beta values like I have done.

6
7 Regarding the interest rate issue, I believe the Staff should have just used the most
8 recent market interest rate in the calculation of CAPM ROEs. The historical
9 interest rate of 4.35% as used by the Staff is too high to reflect the current and
10 expected capital market conditions. As I have shown in my Exhibit ZZ-2, the
11 long-term interest rates have been declining in the last 30-40 years. The last time
12 when we had a 4.5% long-term interest rate was about 15 years ago and the
13 interest rate has been on the decline since then.

14

15 **OCC/NOPEC Objection No. 22**

16

17 ***Q81. DO YOU HAVE ISSUES WITH THE STAFF'S INCLUSION OF OTHER***
18 ***COSTS?***

19 ***A81.*** Yes, I do. The Staff applied a factor of 1.00871 to accommodate issuance cost and
20 other costs. The Staff did not justify the inclusion of these costs. Even if an
21 adjustment for equity issuance and other costs were allowed, the Staff
22 inappropriately increased the cost of common equity by using a hypothetical and

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1 generic issuance cost factor of 3.5%. The Staff Report has not explained why this
2 generic issuance cost factor is reasonable or why it should be applied in this
3 proceeding. In addition, there is no demonstration in the Staff Report that
4 Columbia is likely to incur these costs in the near future or the magnitude of these
5 costs. The addition of arbitrary and unproven equity issuance and other costs will
6 unnecessarily and unreasonably increase the cost of gas services to Columbia's
7 consumers.

8
9 ***Q82. WHAT WOULD BE THE ROE NUMBERS FROM THE STAFF ANALYSIS***
10 ***IF THESE INCORRECT ASSUMPTIONS AND DATA WERE***
11 ***CORRECTED?***

12 ***A82.*** If we used the current interest rate (6-month average 30-year T-bond yield) of
13 2.1%, along with the adjusted beta value of 0.74, and the Staff's 6.21% market
14 risk premium, the Staff's ROE from the CAPM model would be about 6.7%,
15 instead of 9.32%. The DCF model ROE should be lowered by about 70 to 100
16 basis points, leading to a ROE below 9% based on the Staff approach.
17 Therefore, in my opinion, even though the Staff's recommended ROE is lower
18 than what Columbia has requested, it is still too high and unjustified by the
19 current economic and capital market conditions.

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VII. A CRITICAL REVIEW OF COLUMBIA'S PROPOSED ROE AND RATE OF RETURN

Q83. WHAT IS THE ROE THAT COLUMBIA IS REQUESTING?

A83. Columbia is seeking an 10.95% ROE, which is based on its cost of capital witness Mr. Paul Moul's recommendations. The table below shows the ROE estimates from Mr. Moul's various models:

Table 6: Summary of Mr. Moul's ROE Estimates	
DCF:	11.37%
RP:	10.50%
CAPM:	12.51%
CE:	12.15%

The average ROE from these models is 11.63%, the median is 11.76%, and the midpoint is 11.51%.

Q84. DO YOU AGREE WITH MR. MOUL'S ROE RECOMMENDATION?

A84. No. I do not agree with Mr. Moul's ROE recommendation.

Mr. Moul, in arriving at the recommended ROE values, has made many questionable and unreasonable assumptions that bias the ROE estimate upward. To carry out the calculations using these models, he has made many assumptions that I believe are inappropriate, unreflective of the current market conditions. These calculated ROE values are simply too high. If the recommended ROE is

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1 authorized, it will lead to a return for Columbia to exceed the market required
2 return and lead to unjust and unreasonable charges to Columbia's costumers.
3

4 ***Q85. CAN YOU LIST THE MAJOR QUESTIONABLE AND ERRONEOUS***
5 ***ASSUMPTIONS THAT MR. MOUL MADE?***

6 ***A85.*** There are many issues in Mr. Moul's analysis of the ROE for Columbia. Among
7 some of the major problems are: (1) his inconsistent use of proxy groups for
8 different methods, (2) the use of forecasted interest rate, (3) lack of long-term
9 growth in the DCF model, (4) mixed use of historical values and forward-looking
10 variables, (5) inclusion of size premium and flotation costs, (6) the application of
11 the so-called Hamada adjustment, and (7) use of book value instead of market
12 value returns, and so on.

13
14 Many of his assumptions and approaches are seriously flawed and thus lead to
15 very much upward biased ROE results. For example, Mr. Moul's RP approach is
16 based on a hypothetically negative relationship between risk premium and interest
17 rate. It is normally observed that there is a valid empirical relationship between
18 appropriately constructed risk premium and interest rate. However, due to the
19 errors in his measurement of the risk premium and interest rate, there is no valid
20 negative relationship between the risk premium and interest rate in his data.

21 Without checking whether the empirical relationship is valid or not, Mr. Moul

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1 built his ROE estimate based on the non-existent relationship and made a
2 recommendation anyway.
3

4 ***Q86. WHAT COMPARABLE GROUP COMPANIES DO YOU THINK ARE***
5 ***APPROPRIATE IN MODELING THE ROE FOR COLUMBIA?***

6 ***A86.*** Columbia is a gas distribution company. The comparable group should have
7 similar operational and financial characteristics and similar degree of risks. The
8 non-utility companies in Mr. Moul's sample for his CE method are not regulated
9 and they operate in a different environment and are not comparable to gas utilities
10 such as Columbia.
11

12 Mr. Moul has selected a group of 8 gas companies as his gas group: Atmos,
13 Chesapeake Utilities, New Jersey Resources, Northwest Natural, ONE Gas, South
14 Jersey Industries, Southwest Gas and Spire. He showed that Columbia has a
15 degree of risk that is comparable to the gas group,¹⁷ which I concur. I have
16 selected a similar group of gas companies as Mr. Moul has selected.
17

18 My sample differs from Mr. Moul's sample by three companies: I have excluded
19 Chesapeake Utilities and Southwest Gas due to M&A considerations. Mr. Moul
20 excluded NiSource, the parent company of Columbia, due to the reason that "its
21 capital structure is atypical for a gas distribution utility and is therefore

¹⁷ Prepared Direct Testimony of Paul Moul, page 11, lines 15-23.

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1 unreflective of the financial risk of the gas distribution utility industry”.¹⁸
2 NiSource’s equity ratios in recent years are slightly above 30%. However, Mr.
3 Moul did include another company South Jersey Industries that has a similar
4 equity ratio in his gas group sample (*see* Exhibit ZZ-3 for equity ratios of the gas
5 group companies).

6

7 ***Q87. CAN YOU DESCRIBE MR. MOUL’S APPROACH WITH THE DCF***
8 ***MODEL?***

9 ***A87.*** Mr. Moul used the standard DCF approach based on the Gordon growth model.
10 The ROE or expected market return on equity is the sum of the two parts:
11 dividend yield and expected growth. Mr. Moul’s dividend yield/adjusted dividend
12 yield come very close to what I have estimated based on the current company
13 dividend yield and expected dividend growth rate. However, Mr. Moul employed
14 a relatively short-term dividend growth rate proxied by the projected 3-to-5-year
15 earnings growth rate as the long-term sustainable growth rate. Mr. Moul further
16 made a so-called leverage adjustment to his DCF model result, and finally added a
17 flotation cost to arrive at the cost of equity of 11.54%, even though he did not
18 adopt that number as the DCF ROE. Instead, Mr. Moul chose 11.37% (exclusive
19 of the flotation cost as the estimated ROE from the DCF model). The table below
20 summarizes Mr. Moul’s ROE from the DCF model:

¹⁸ Columbia Gas’ response to the OCC’s third set of interrogatories dated October 27, 2021, response to OCC set 3, no. 6.

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1

Table 7: Mr. Moul's DCF Model Result	
Dividend yield:	3.69%
Expected growth rate:	6.75%
Leverage adjustment:	0.93%
Flotation cost factor:	1.015
Total ROE:	11.54%

2

3 ***Q88. DO YOU AGREE WITH MR. MOUL REGARDING THE PROJECTION OF***
4 ***THE 3-5 YEAR EARNINGS GROWTH RATE AS THE LONG-TERM***
5 ***SUSTAINABLE GROWTH RATE?***

6 ***A88.*** I do not agree with the view that the projections of growth rate at an investment
7 horizon of three to five years represent the long-term growth prospect of the
8 equity market. As Mr. Moul explained in his testimony, there are several stages to
9 the overall growth of the company's dividend streams: the initial "growth stage",
10 the final stage that the firm's dividend is assumed to grow steadily "the steady-
11 state stage", and a period between the initial growth stage and the final steady-
12 state stage "transition stage").¹⁹ The DCF model considers the infinite number of
13 dividend streams for the future. Even though individual investors do not expect to
14 hold an investment indefinitely,²⁰ ignoring long-term growth would bias the
15 required return upward.

¹⁹ Prepared direct testimony of Paul Moul, page 16.

²⁰ *Ibid*, page 17, lines 24-25.

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1 When investors make investments of a relatively short-term span, they look at the
2 return over the investment period. The return over a short-term investment period
3 has two components – one is the dividend payment for the same short-term period
4 (maybe three to five years), and the other component is the expected price change
5 which involves the price of the asset at the end of the short-term investment
6 period. The price of the asset at the end of the short-term investment involves the
7 stream of the future dividend payments, which will ultimately be determined by
8 the long-term growth rate of the dividend. In this sense, ignoring the long-term
9 dividend growth is simply a mistake in applying the DCF model.

10

11 ***Q89. MR. MOUL SUGGESTED THAT LONG-TERM GROWTH WAS NOT***
12 ***CONSIDERED BY INVESTORS WHEN MAKING INVESTMENT***
13 ***DECISIONS, BY STATING “INDEED, IF INVESTORS REQUIRED***
14 ***FORECASTS BEYOND FIVE-YEARS IN ORDER TO PROPERLY VALUE***
15 ***COMMON STOCKS, THEN IT WOULD BE REASONABLE TO EXPECT***
16 ***THAT SOME INVESTMENT ADVISORY SERVICE WOULD BEGIN***
17 ***PUBLISHING THAT INFORMATION FOR INDIVIDUAL STOCKS IN***
18 ***ORDER TO MEET THE DEMANDS OF THE MARKETPLACE.” DO YOU***
19 ***AGREE WITH THIS STATEMENT?***

20 ***A89.*** I do not agree with the statement in his testimony that “indeed, if investors
21 required forecasts beyond five-years in order to properly value common stocks,
22 then it would be reasonable to expect that some investment advisory service

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1 would begin publishing that information for individual stocks in order to meet the
2 demands of the marketplace.”²¹

3
4 I believe this statement is simply false as lacking of long-term forecast of
5 dividend growth, even if that is true, does not prove that investors are not
6 considering long-term growth information. Investors may look at other
7 information on long term-term growth when making their investment decisions.
8 In the steady state, a business cannot growth faster than the rate at which the
9 economy is growing. Therefore, long-term growth rate is often proxied by the
10 GDP growth rate in rate setting proceedings. For example, FERC uses GDP
11 growth rate as the proxy for long-term dividend growth rate. So did the Staff for
12 this case. Investors could have been using the short-term growth projections such
13 as the IBES growth rate projections as well as the GDP projections in making
14 investment decisions.

15
16 There are many sources of GDP growth rate projections such as the two sources I
17 have provided from EIA and SSA. Professional services such as Blue Chip
18 Financial Forecast also provide long term economic growth projections. Using the
19 logic Mr. Moul applied, the existence of long-term growth projections by
20 government agencies and professional services provides the evidence that
21 investors look at long-term growth rate when making investment decisions.

²¹ *Ibid*, page 17, lines 38-page 18, line 2.

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1 Therefore, excluding the long-term growth rate by Mr. Moul is simply erroneous.
2 In addition, as the growth rate in the initial “growth stage” is usually higher than
3 the growth rate in the “steady-state stage,” ignoring the long-term growth in the
4 DCF model biases the ROE estimate upward.

5

6 ***Q90. WHAT 3-5 YEAR EARNINGS GROWTH PROJECTION DID MR. MOUL***
7 ***UTILIZE?***

8 ***A90.*** Mr. Moul used the 3-5 year earnings growth projections from three sources:
9 IBES/First Call, Zack’s and Value Line. The average growth rates from the three
10 sources are 4.99%, 5.45% and 7.06%, respectively. ²² Mr. Moul then picked a
11 number 6.75% as the projected earnings growth rate. There is no reason given as
12 to why Mr. Moul picked a rate that is closer to the higher end of the numbers,
13 rather than the average value.

14

15 ***Q91. DO YOU BELIEVE MR. MOUL’S SELECTION OF THE PROJECTED***
16 ***GROWTH RATE IS APPROPRIATE OR REASONABLE?***

17 ***A91.*** No, I do not believe his selection method is appropriate. While these three sources
18 appear to provide the projection of the earnings growth, there are some issues in
19 utilizing them in the way Mr. Moul took. IBES and Zack’s surveys cover the
20 projection of some of the same analysts; *Value Line* projection is not from a

²² *Ibid*, PRM-9.

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1 survey, as it only reflects the opinion of one analyst (*Value Line* itself). In
2 addition, it only updates once every 3 months.
3
4 Furthermore, the average projected values from IBES/First Call and Zack's are
5 not directly comparable as Zack's average does not cover all the utilities covered
6 by IBES/First Call. The Table below shows the projected 3-5 year earnings
7 growth from Mr. Moul's sample. Note the average growth rate from Zack's is
8 5.45% based on five utilities, which is not directly comparable to the average
9 from IBES which was based on all 7 companies. Projections on two companies in
10 Zack's list are not available. The same two companies in the IBES sample have
11 some of the lowest growth values. Assuming analysts projected the growth rate
12 similarly, the two companies without the projected growth rate from the Zack's
13 list should have lower than average projected growth rates. Therefore, the average
14 value (5.45%) from Zack's may be lower than the average value Mr. Moul
15 provided if these two companies had projected growth rates. For this reason,
16 Zack's growth rate should not be included in the analysis.

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Table 8: Projected EPS Growth - Moul Sample			
Gas Group	I/B/E/S		Value Line
	First	Zacks	Earnings
	Call		Per Share
Atmos Energy Corp (ATO)	7.00%	7.30%	7.00%
Chesapeake Utilities Corp (CPK)	4.74%	N/A	8.50%
New Jersey Resources Corporation (NJR)	6.00%	6.00%	1.50%
Northwest Natural Holding Company (NWN)	3.10%	N/A	5.50%
ONE Gas Inc (OGS)	5.00%	5.00%	6.50%
South Jersey Industries Inc (SJI)	4.40%	4.40%	10.50%
Southwest Gas Holdings Inc (SWX)	4.00%	5.00%	8.00%
Spire Inc. (SR)	5.70%	5.00%	9.00%
Average	4.99%	5.45%	7.06%
Source: Prepared Direct Testimony of Paul Moul, PRM-9			

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The projections from *Value Line* is substantially higher than the projections from IBES and Zack's which are based on projections of multiple analysts. If the *Value Line*'s forecast is to be included, it should afford less weight. Even if we give the equal weight to IBES and *Value Line*, the average value of IBES's 4.99% and *Value Line*'s 7.06% would generate an average of 6.03%, which is more than 70 basis points lower than Mr. Moul's 6.75%, a number that is chosen arbitrarily and without any statistical or economic support by Mr. Moul. As the projected earnings growth rate goes into the ROE calculation in the DCF model directly, Mr. Moul's DCF analysis exaggerates the required return by at least 70 basis points from the projected growth rate alone.

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1 **Q92. DID MR. MOUL MAKE ANY OTHER ADJUSTMENTS TO HIS DCF**
2 **MODEL RESULT?**

3 **A92.** Yes, Mr. Moul made a so-called leverage adjustment to his “raw” DCF result. The
4 leverage adjustment amounts to 0.93%. In addition, he also added a flotation cost
5 on top of that. The flotation cost factor is 1.5%, adding 0.17% to the required
6 return on equity for his proxy group companies.

7
8 **Q93. WHY DID MR. MOUL ADD A LEVERAGE ADJUSTMENT?**

9 **A93.** According to Mr. Moul, there are two related reasons for the adjustments. One is
10 that the market value of the utilities’ equity is higher than the book value equity,
11 and the other is that the market required return on equity is applied to book value
12 capital structure in this rate proceeding.

13
14 **Q94. DO YOU AGREE WITH HIS LEVERAGE ADJUSTMENT?**

15 **A94.** I do not agree with Mr. Moul’s leverage adjustment for several reasons. First,
16 there is no market value capital structure; and investors rely on book value capital
17 structure for investment decisions. Financial services including *Value Line* only
18 report book value capital structure. Only book value capital structure is filed with
19 Security Exchange Commission. Second, there is only one leverage for each
20 company, and any adjustment in the leverage is not justified. I also explained in a
21 later section that the leverage adjustment by the Hamada equation by Mr. Moul is
22 incorrect, as the Hamada formula Mr. Moul relied on to make the so-called

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1 leverage adjustment is based only on market value capital structure. However, Mr.
2 Moul was using book value capital structure in the unleveraging-releveraging
3 process, which is theoretically incorrect, as Professor Scott Linn and I have
4 pointed out in Exhibit ZZ-11.

5
6 Utilities' market value equity is higher than the book value equity precisely
7 because utilities are earning more returns on book value equity than market
8 required. This should be easy to understand: A utility's expected return on equity
9 is higher than required, thus driving investors to buy the stocks of the utility. As
10 the result, the market value is driven higher than the book value.

11 Perhaps it is due to these reasons, to my knowledge, there are no jurisdictional
12 authorities that have adopted the leverage adjustment.

13
14 I believe there are sound practical reasons for the commissions not to accept the
15 adjustment. Commissions would face a regulatory dilemma if the leverage
16 adjustment is adopted: based on the leverage adjustment approach, a utility that
17 has a higher market to book value will see a higher return to an already high
18 return. On the flip side of it, a utility will see a decrease to its already low returns
19 if the utility has a market value lower than the book value. In this sense, the
20 leverage adjustment is illogical.

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1 ***Q95. WHAT IS THE FUNDAMENTAL REASON BEHIND MR. MOUL'S***
2 ***LEVERAGE ADJUSTMENT?***

3 ***A95.*** I believe Mr. Moul proposed the leverage adjustment because the current practice
4 of rate setting for utilities is the application of the market required returns on book
5 value capital structure.

6

7 ***Q96. IS THIS PRACTICE OF APPLYING BOOK VALUE CAPITAL STRUCTURE***
8 ***ACCEPTED BY UTILITY JURISDICTIONAL AUTHORITIES?***

9 ***A96.*** Yes, it is generally accepted. As a matter of fact, the use of the book value capital
10 structure for determining allowed return was firmly established by the U.S.
11 Supreme Court in its seminal decision of *Federal Power Commission v. Hope*
12 *Natural Gas Company*, 320 US 591 (1944).

13

14 ***Q97. DO YOU BELIEVE A FLOTATION COST ADJUSTMENT IS JUSTIFIED?***

15 ***A97.*** I do not believe flotation cost adjustment to utility ROE is justified. Flotation
16 costs are the costs related to the sale of new issues of company common stocks,
17 including the preparation, filing, underwriting of the new issuance, and other
18 related costs. There are several reasons why flotation costs should not be included
19 to increase the return on equity. Columbia has not identified any stock issuance
20 costs of its parent and it is not fair for the utility's consumers to pay for something
21 that is not identifiable. Columbia's consumers should not bear the burden of its
22 parent company's previous issuance of stocks if there is any. If the Company has

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experienced flotation costs, it would already be included in the Company's expense schedule. As a matter of fact, the flotation cost is the difference between what the investors pay for a company's stock and what the company receives – there is no cost to be recovered. The capital market should have already factored in the transaction costs as the underwriting fees are known to the investors. Investors should have already considered this information when pricing the stocks they are purchasing, and they should not be compensated twice.

Q98. CAN YOU DESCRIBE THE RP METHOD THAT MR. MOUL USED TO ESTIMATE THE ROE FOR COLUMBIA GAS?

A98. Mr. Moul's ROE from the RP model has three components: an interest rate of 3.75% represented by the long-term A-rated public utility bond yield, a risk premium of 6.75% and a flotation cost of 0.17% for a total of 10.67% ROE. In the final recommendation of the ROE, the 0.17% flotation cost was not included, so the RP ROE is 10.5%. See below for a summary of the ROE from Mr. Moul's RP model:

Table 9: Mr. Moul's RP Model Result	
Interest rate:	3.75%
RP:	6.75%
Flotation cost:	0.17%
Total:	10.67%

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1 **Q99. DO YOU HAVE ANY MAJOR ISSUES WITH RESPECT TO MR. MOUL'S**
2 **RP MODEL?**

3 **A99.** I have two major issues with Mr. Moul's RP model, in addition to the more
4 general issue of inclusion of the flotation cost which I addressed earlier.

5
6 **Q100. CAN YOU EXPLAIN WHAT ISSUES YOU DO HAVE?**

7 **A100.** The first issue is with Mr. Moul's method to obtain the interest rate, and the
8 second has to do with the way to obtain the risk premium. Mr. Moul's long term
9 A-rate utility bond yield was obtained by adding a 1% spread between the A-rated
10 utility bond yield and 30-year T-bond yield to the forecasted interest rate (Blue
11 Chip forecast of 30-year T-bond yield). Mr. Moul's risk premium was determined
12 by a casual description of the relationship between risk premium and interest rate.
13 The interest rate Mr. Moul used was the long-term government bond; however,
14 the risk premium was the difference between large stock returns and long-term
15 corporate bond. Therefore, there are at least three specific problems with Mr.
16 Moul's way to the RP modeling.

- 17 1. The forecasted interest rate should not be used as the interest rate,
18 in general. This issue also arises in Mr. Moul's application of
19 CAPM model.
- 20 2. The equity risk premium was obtained from the difference between
21 large stock returns and long-term corporate bond, but then the risk
22 premium was added to the interest rate represented by the utility

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1 bond yield, a different interest rate. This is a mismatch here. The
2 estimate of the ROE my Mr. Moul's method is not a return of a
3 utility, but a return of a large stock.

- 4 3. Mr. Moul chose a risk premium of 6.75 without giving convincing
5 reasons why such a number was chosen. The risk premium-interest
6 rate relationship was not established by a rigorous statistical
7 method. As a matter of the fact, there is no statistically significant
8 relationship between the risk premium and interest rate as defined
9 by Mr. Moul, and thus it fails to be the basis for Mr. Moul to
10 estimate the risk premium.

11
12 ***Q101. WHY DO YOU THINK THE FORECASTED INTEREST RATES SHOULD***
13 ***NOT BE THE INTEREST RATES USED IN THE MODEL?***

14 ***A101.*** Even though the model requires the expected future interest rates, in my opinion,
15 the best forecast of the future interest rates is the current interest rates. I believe
16 the interest rates are extremely difficult to forecast and the interest rate forecasts
17 from the past have been shown to perform poorly. The alternative to the interest
18 rate forecast is to use the current market interest rate as what the market expects
19 about the future interest rate.

20
21 There is serious doubt that these interest rate forecasts can outperform a simple
22 forecast of interest rates by using the current market interest rate. The bond

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1 markets are efficient; as the result, the best expected future interest rate is the
2 current market interest rate.

3

4 ***Q102. PLEASE EXPLAIN WHY CURRENT INTEREST RATES ARE THE BEST***
5 ***FORECASTS OF THE EXPECTED INTEREST RATES.***

6 ***A102.*** Financial information comes into marketplace randomly and the interest rate goes
7 up or down with equal chances. Nobody can systematically get ahead by guessing
8 what is going to happen in the marketplace. This leads to a phenomenon called
9 “random walk.” When a financial variable such as the interest rate follows a
10 random walk, it implies that the best forecast of its future behavior is its
11 immediate past. In this case, the immediately past available information is the
12 latest interest rate or the current interest rate observable in the market.

13

14 ***Q103. WHAT SUPPORT DO YOU HAVE FOR THE CLAIM THAT THE BEST***
15 ***FORECAST OF INTEREST RATE IS THE CURRENT INTEREST RATE?***

16 ***A103.*** There have been doubts about the predictability of long-term interest rates for a
17 long time. As early as 1979, Professor Pesando provided reasons why it is not
18 surprising for economic models to underperform the random walk forecast of
19 interest rate.²³ The random walk forecast of interest rate is the current market
20 interest rate.

²³ James. E. Pesando, “On the random walk characteristics of short- and long-term interest rates in an efficient market,” *Journal of Money, Credit and Banking*, 1979, vol. 11, 457–66.

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1 In a more recent study, Baghestani, Arzaghi, and Kaya (2015) documented
2 evidence of model blue chip predictions being inferior to random walk models.²⁴
3 In a more extensive study of U.S. interest rate forecasts, Spiwoks, Bedke and
4 Hein (2008), after a study of 136 forecasting series with 13,800 forecast data,
5 showed empirical evidence that the random walk model dominated the forecasts
6 series.²⁵ In the article, they stated: "Not one of the forecast time series proved to
7 be unbiased. In the majority of cases, information from the past was not
8 efficiently integrated into the forecasts. The sign accuracy is significantly better
9 than random walk forecasts in only a very few of the forecast time series." What
10 this passage suggests is that the professional forecast of interest rates
11 systematically over- or under-projected the movement of the interest rate ("not
12 unbiased"). The majority of the forecasts could not even predict the direction of
13 movement correctly, not to mention the magnitude of the interest rate movement.
14

15 ***Q104. HOW HAS THE PAST FORECAST OF INTEREST RATE FARED?***

16 ***A104.*** The long-term interest rate has been declining, so many would project that the
17 interest rate will eventually rise again. However, this kind of projection has not
18 been doing well. In 2015, Obstfeld and Tesar²⁶ presented the chart below of 10-

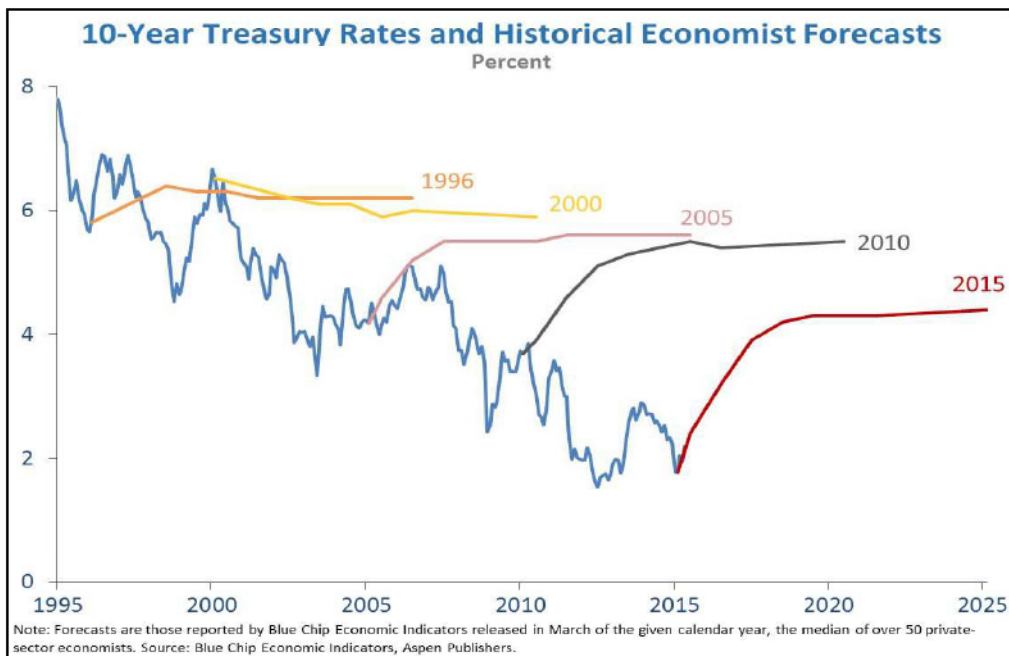
²⁴ Hamid Baghestani, Mohammad Arzaghi and Ilker Kaya, "On the accuracy of Blue Chip forecasts of interest rates and country risk premiums," *Applied Economics*, 2015, Vol. 47, No. 2, 113–122, <http://dx.doi.org/10.1080/00036846.2014.959656>.

²⁵ Spiwoks, Markus; Bedke, Nils; Hein, Oliver, "Forecasting the Past: The Case of US Interest Rate Forecasts," *Financial Markets and Portfolio Management* Vol. 22, Iss. 4, (December 2008): 357-379.

²⁶ M. Obstfeld and L. Tesar, (2015). "The Decline in Long-Term Interest Rates." <https://obamawhitehouse.archives.gov/blog/2015/07/14/decline-long-term-interest-rates>.

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1 year Treasury rates and historical forecasts which showed consistently high
2 interest rate forecasts despite the fact that the interest rate was declining over
3 time.



4
5
6 ***Q105. IS IT TRUE EVERYONE IS EXPECTING THE FEDERAL RESERVE TO***
7 ***TIGHTEN MONETARY POLICY TO FIGHT HIGH INFLATION RATE SO***
8 ***THE INTEREST RATE WILL BE HIGHER IN THE FUTURE?***

9 ***A105.*** First, I need to point out again that Federal Reserve monetary policy targets short-
10 term interest rate. It does not necessarily lead to changes in the long-term interest
11 rate trend. Second, if everyone is expecting the Federal Reserve to increase the
12 interest rate in the future, the market would have reacted to this expectation
13 already. That is, the current interest rate should have already incorporated the
14 future rate increase information. If it meant to increase upon the expected

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1 monetary policy, it would have already increased. It is like when one expects a
2 stock price to increase in the future, she/he would have bought the stock upon
3 her/his expectation. The action of the buying would have caused the stock price to
4 increase already. It is unimaginable that the investor would wait until later to buy
5 the stock at the time of actual price increase. This is again essentially the concept
6 of market efficiency.

7
8 It is generally regarded that the U.S. financial markets including the bond markets
9 where interest rates are determined are very efficient. When bond markets are
10 efficient, only unexpected information flow would lead the interest rate to change,
11 let the information be that the Federal Reserve would increase interest rate more
12 times than the market already expected due to the toughness of the high inflation
13 to subside, or fewer times than market expected as the recessionary effect of the
14 monetary tightening might be too fast and too large. Unfortunately, nobody can
15 predict what is going to happen to the interest rate in the future.

16
17 ***Q106. DO YOU THINK THE RISK PREMIUM MR. MOUL CALCULATED***
18 ***REPRESENTS THE RISK PREMIUM OF THE GAS UTILITIES?***

19 ***A106.*** No, I do not believe Mr. Moul estimated the gas utility risk premium correctly.
20 His method of obtaining the risk premium is wrong.

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1 Mr. Moul calculated the risk premium as the difference between the average
2 returns from large company common stocks and the long-term corporate bonds.
3 Then he guessed, not estimated, the relationship between the risk premium and
4 interest rate, and then added a risk premium to a different interest rate – long-term
5 government bond yield to obtain the expected returns. There are several problems
6 with this approach. The first is he just simply picked a number without any
7 statistical or empirical support. Secondly, a different interest rate is used in
8 obtained the expected risk premium, which is a mismatch and incorrect. It is well-
9 known that in estimating the risk premium relationship, the same interest rate
10 should be used. The following example illustrates the idea. Risk premium is
11 defined as the stock return minus the interest rate (rate 1), and then the anticipated
12 interest rate (rate 1) is added back to the expected risk premium to obtain the
13 anticipated stock return. The interest rate should be the same in this estimation.
14 However, Mr. Moul used the corporate bond yield as the first interest rate (rate 1)
15 and then government bond yield (rate 2) as the second interest rate. Therefore, it
16 is not clear what we are obtaining as the result.

17
18 In addition, the task in this case is to estimate the required return on a utility's
19 return, so we should use the equity risk premium of the utility stocks. However,
20 Mr. Moul used the returns of the large common stocks, thus the risk premium he
21 calculated (if correctly) would represent the risk premium of large companies, not
22 the gas utilities.

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1 ***Q107. WHY DO YOU BELIEVE MR. MOUL'S RISK PREMIUM AND INTEREST***
2 ***RATE RELATIONSHIP IS NON-EXISTENT AND THUS THERE IS NO***
3 ***BASIS FOR MR. MOUL'S RISK PREMIUM ESTIMATE?***

4 ***A107.*** Even if Mr. Moul has defined the risk premium and the relationship between risk
5 premium and interest rate correctly, his data shows that there is no empirical
6 relationship between the risk premium he constructed and the interest rate he
7 chose. Exhibit ZZ-10 shows that in the scatter plot of the risk premium and long-
8 term government bond yield, the points are scattered all over the place, indicating
9 no negative relationship, which is contrary to what Mr. Moul suggested in his
10 testimony.²⁷ A formal test also indicates so. The R square from a regression of
11 risk premium on the interest rate as Mr. Moul calculated shows the percentage of
12 the variation in the dependent variable (risk premium) to be explained by the
13 independent variable (interest rate).

14
15 If a variable explains the other variable perfectly, the R square would be equal to
16 1 or 100%. If a variable does not explain the other variable at all, then R square
17 would be equal to 0. The R square from the regression of Mr. Moul's risk
18 premium on his interest rate variable yielded a R square of 0.00275, virtually
19 zero. This result confirms the impression one would get from the visual inspection
20 of the scatter plot in Exhibit ZZ-10. Furthermore, the coefficient to the
21 government bond yield variable is not statistically significant, meaning that the

²⁷ Prepared Direct Testimony of Paul Moul, page 25, lines 21-26.

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1 interest rate variable – long-term government bond yield has nothing to do with
2 the risk premium as measured by Mr. Moul. There it lacks a valid basis for Mr.
3 Moul to calculate the ROE based on the RP model.
4

5 ***Q108. CAN YOU SUMMARIZE THE RESULT OF YOUR ANALYSIS OF MR.***
6 ***MOUL'S RISK PREMIUM MODEL?***

7 ***A108.*** Mr. Moul's risk premium model employed an incorrect measure of interest rate,
8 an incorrect measure of risk premium, and his data indicates no valid relationship
9 between the risk premium and interest rate – a basis for him to build the expected
10 return on equity. Thus, his RP model is fundamentally flawed, and his ROE result
11 is totally invalid. I recommend the Commission to totally disregard his RP
12 analysis.
13

14 ***Q109. CAN YOU DESCRIBE MR. MOUL'S CAPM APPROACH AND THE ROE***
15 ***RESULT?***

16 ***A109.*** Mr. Moul employed the standard CAPM model with some twists of his own. The
17 risk-free rate he employed is the forecasted interest rate. He obtained betas of the
18 companies from *Value Line* but then he adjusted them by the Hamada formula to
19 achieve the so-called Hamada Leverage Adjustment. The market risk premium
20 was obtained as the average of the historical risk premium for the period of 1926-
21 2021 and the forecasted risk premium based on Value Line returns and a return by
22 applying the DCF model to the S&P 500 companies. Finally, he applied a size

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1 premium of 1.02% to arrive at an ROE of 12.51% before adding a flotation cost
2 of 0.17%. As for the DCF and RP models, he did not include the flotation cost in
3 his final ROE recommendation. See below for a summary of Mr. Moul's CAPM
4 model result:

Table 10: Mr. Moul's CAPM Model Result	
Risk free rate:	2.75%
Beta:	0.98
Market risk premium:	8.92%
Size premium:	1.02%
Flotation cost:	0.17%
Total ROE:	12.68%

5

6 ***Q110. WHAT PROBLEMS DO YOU SEE IN MR. MOUL'S CAPM ANALYSIS?***

7 ***A110.*** There are several major problems in Mr. Moul's CAPM analysis, including the
8 use of the forecasted interest rate, the use of pandemic affected raw *Value Line*
9 beta, the application of the Hamada beta adjustment, the employment of the
10 historical market risk premium, the inclusion of a size premium and flotation cost.
11 My analysis of Mr. Moul's CAPM analysis will focus on the issues other than the
12 forecast interest rate. I have already argued earlier that the correct use of the
13 interest rate in any of the models should be the actual interest rate, not the
14 forecasted interest rate. In addition, I have already argued that there is no
15 justification for the inclusion of a flotation cost.

16

17 ***Q111. WHAT BETA SHOULD BE USED IN THE CAPM ANALYSIS?***

18 ***A111.*** As I argued earlier in this testimony, the estimation of the raw beta from *Value*
19 *Line* or any other professional services is affected by the inclusion of the

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1 pandemic 2020 period and the high beta value is the artifact of the 5-year
2 regression to obtain the beta estimate. The risks of the utility companies with
3 respect to the market have returned to a more normal level, thus the use of the raw
4 beta value inflates the estimates of market required ROE. The beta value should
5 be adjusted as I did in my analysis.

6

7 ***Q112. CAN YOU EXPLAIN WHAT THE HAMADA LEVERAGE ADJUSTMENT***
8 ***IS?***

9 ***A112.*** Professor Hamada, once the dean of the famed Booth College of Business at the
10 University of Chicago, was the first to derive the relation between a company's
11 stock's beta and the company's market value debt/equity ratio. Specifically he
12 shows that beta increases as the market debt/equity ratio increases. Hamada
13 defines two different betas for a company's stock. One beta is what we usually
14 obtain from the investment services such as *Value Line*, and this beta is called the
15 levered beta as it is derived from the market data reflecting the company's
16 existing capital structure, that is, its market value debt/equity ratio. In contrast,
17 suppose the same company used no debt financing, then the corresponding beta
18 would be what we would observe for an unlevered (no debt financing) company,
19 and is typically referred to as the unlevered beta. The levered beta exceeds the
20 unlevered beta when the company uses debt financing.

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1 Some cost of capital witnesses, especially the ones on behalf of utilities, advocate
2 the use of the Hamada Leverage Adjustment. The Hamada equation is then used
3 in rate proceedings to adjust the unlevered beta using the book value debt/equity
4 ratio. If the book value of equity is less than the total market value of equity,
5 which is typical nowadays, the Hamada adjustment will lead to a beta that is
6 inflated more than it should be, and consequently a required return on equity
7 computed using the CAPM that is larger than it should be.

8
9 I have provided an explanation of the Hamada adjustment and the reasons why
10 the adjustment is not valid in an article (Exhibit ZZ-11) that I coauthored with
11 Professor Scott Linn. The article is forthcoming in the next issue of *Energy*
12 *Forum* by International Association for Energy Economists.

13

14 ***Q113. CAN YOU BRIEFLY EXPLAIN WHY THE HAMADA ADJUSTMENT AS***
15 ***APPLIED BY MR. MOUL IS NOT VALID?***

16 ***A113.*** There are at least two problems associated with the Hamada adjustment as applied
17 in the rate proceedings. Mr. Moul, like other proponents of the adjustment, argues
18 that there are two financial risks associated with the company, one is reflected in
19 the book value capital structure and another one is reflected in the market value
20 capital structure. However, there is only one financial risk for any company, and
21 that is reflected in the beta value based on the market information such as the

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1 *Value Line* beta. Second, the process of unlevering and relevering as described by

2 Mr. Moul is simply incorrect. Mr. Moul explains:²⁸

3 “To develop a CAPM cost rate applicable to a book-value
4 capital structure, the *Value Line* (market value) betas have
5 been unleveraged and re-leveraged for the book value common
6 equity ratio using the Hamada formula.”
7

8 However, as Professor Linn and I explained in the article, the Hamada formula
9 was developed using the market value capital structure concept. Applying a book
10 value capital structure in the adjustment process renders the whole adjustment
11 invalid. There is simply no place for book value capital structure in the Hamada
12 equation.

13
14 Furthermore, as we have explained in the article, the Hamada adjustment process
15 assumes, even if we are using the correct market value debt/equity ratio, that the
16 beta of the company's debt is zero. This assumption is simply not strictly met,
17 although academic studies that present estimates of bond betas generally find that
18 they are small but nevertheless positive. Thus the formula is invalid for any
19 levering or unlevering operations in general if the company's debt beta is not zero
20 or the risk is systematic. As the result, the so-called Hamada Leverage
21 Adjustment is not valid at all.

²⁸ Prepared Direct Testimony of Paul Moul, page 27, lines 20-23.

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**Q114. MR. MOUL APPLIED A HISTORICAL MARKET RISK PREMIUM IN HIS
CAPM ANALYSIS. DO YOU AGREE WITH HIS APPROACH?**

A114. No, I do not agree with his historical approach. Using a historical relationship between the market return and bond yield is erroneous as the ROE is an ex-ante concept that represents investors expected required market return on investment. The market risk premium should be the expected market risk premium for the future, not the past market risk premium, as the past can be significantly different from the current and future market conditions. In a discussion of forecasted versus historical earnings growth, Mr. Moul said “while history cannot be ignored, it is already factored into the analysts’ forecast of earnings growth,”²⁹ and “hence, there is no need to count historical growth rates a second time, because historical performance is already reflected in analysts’ forecasts which reflect an assessment of how the future will diverge from historical performance.”³⁰ Even though Mr. Moul was talking about historical and forecasted earnings growth, the same principle applies in the context of historical and forecasted market risk premium.

In addition, the historical market return in Mr. Moul’s analysis utilized arithmetic growth instead of the geometric growth formula. It is well known that the arithmetic growth formula applied in a dataset that contains multiple years’ data biases upward the growth rate or return significantly. A simple example could

²⁹ Prepared Direct Testimony of Paul R. Moul on behalf of Eastern Gas Transmission and Storage, Inc. before the Federal Energy Regulatory Commission, page 20, lines 17-18.

³⁰ *Ibid*, page 20, lines 20-23.

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1 illustrate this idea. Suppose we have a stock price of \$100 for the first year, and
2 then it drops to \$50 in the second year followed by a return to \$100 in the third
3 year. The arithmetic growth rate would be an annual average of 25% $((-50\% +$
4 $100\%)/2 = 0.25\%)$. However, the correctly calculated annual growth rate should
5 be 0%. Thus, Mr. Moul's calculation of returns exaggerates the historical returns.

6

7 ***Q115. MR. MOUL ALSO INCORPORATED A SIZE PREMIUM FOR THE CAPM***
8 ***ANALYSIS RESULT. WHY DO YOU THINK THE SIZE PREMIUM IS A***
9 ***NOT REASONABLE ADDITION TO THE ROE OF COLUMBIA GAS?***

10 ***A115.*** Mr. Moul adopted the size premium from the SBBI yearbook. However, the size
11 premium calculated in the SBBI yearbook relied on historical data and has many
12 known errors. SBBI assumes a rebalanced portfolio which has a return that is
13 biased upward. In addition, there is a survival bias in the SBBI dataset as only the
14 successful companies are included in the dataset as performance-poor companies
15 may not survive, which leads to exaggerated market returns.

16

17 Furthermore, there is no evidence that the size premium, if there is any, could be
18 found in the utility industry. In a study of the utility size premium versus
19 industrial firm size premium, Professor Annie Wong failed to find any significant
20 size effect for utility stocks while she found some size effect for the industrial

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1 companies.³¹ She also explained the findings based on the characteristics of the
2 utility and industrial firms. The utilities have similar information environment
3 while industrials do not as utilities are heavily regulated and follow similar
4 accounting procedures. In addition, a utility's earnings are predetermined to a
5 certain degree. I believe her finding and explanation are very reasonable as the
6 size premium of smaller companies usually hinges on the fact that investors often
7 have less publicly available information on small firms than large firms. For the
8 utility industry, the information environment is different from that of industrial
9 companies. For this reason, I believe there is no justification for the size premium
10 added to the ROE for Columbia Gas as the addition of a small firm premium
11 biases the ROE upward so it should not be allowed.

12
13 ***Q116. CAN YOU EXPLAIN MR. MOUL'S COMPARABLE EARNINGS***

14 ***APPROACH?***

15 ***A116.*** Mr. Moul chose a set of non-regulated companies as the proxy group and
16 employed the *Value Line* data on earnings. He chose a historical value of 12.00%
17 and an average forecasted rate of return of 12.3%. His ROE from the CE model is
18 12.15%.

³¹ Annie Wong, "Utility stocks and the size effect: an empirical analysis," Journal of Midwest Finance Association, 1993, pp 95-101.

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1 ***Q117. WHAT ARE YOUR MAIN OBJECTIONS TO MR. MOUL'S CE***
2 ***APPROACH?***

3 ***A117.*** I have two issues. One is the use of the non-regulated proxy group. As regulated
4 utilities have different operating characteristics and regulatory environment from
5 the non-regulated industries, it is difficult to characterize the risks faced by these
6 businesses. In a non-regulated, competitive industry, firms can enter and exit
7 without any constraints. However, a utility does not have that degree of freedom.
8 In a non-regulated industry, firms can set their own prices and choose the best
9 pricing strategy. However, a regulated utility cannot set their rates at will.

10

11 On the other side, non-regulated businesses are responsible for the results of their
12 investment decisions, while a regulated utility can have the rate of return on their
13 investment largely set by the jurisdictional authorities, thus the risks associated
14 with investment are a lot lower than faced by non-regulated industries. For this
15 reason, in rate setting proceedings, the convention is to choose proxy groups
16 based on the type of utility, i.e., gas utilities for a gas utility company and electric
17 utilities for an electric utility company.

18

19 ***Q118. WHAT IS YOUR OTHER MAIN OBJECTION?***

20 ***A118.*** My other main objection is that the ROE for a utility is a required return on
21 capital determined in the marketplace. It is a market value concept. However, the
22 rate of return as obtained by Mr. Moul in his CE approach is the rate of return on

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1 book value, not market value, equity. This approach is problematic as investors
2 require a fair return on market value of equity, not book value, because investors
3 cannot buy stocks at book value. Precisely for this reason, FERC has rejected CE
4 or Expected Earnings models as a method to estimate the market required return
5 on equity. FERC stated:

6 The Commission explained that the return on book value is not
7 indicative of what return an investor requires to invest in the
8 utility's equity or what return an investor receives on the equity
9 investment, because those returns are determined with respect to
10 the current market price that an investor must pay in order to invest
11 in the equity. Specifically, the Commission found that the
12 Expected Earnings model measures returns on book value, without
13 consideration of what market price an investor would have to pay
14 to invest in the relevant company, so it does not accurately
15 measure the investor's expected returns on its investment, and,
16 therefore, has been "thoroughly discredited"³².
17

18 **VIII. CONCLUSIONS**

19

20 ***Q119. COULD YOU PLEASE STATE THE OVERALL CONCLUSION OF YOUR***
21 ***ANALYSIS?***

22 ***A119.*** My analysis suggests that the Company's requested capital structure is consistent
23 with the capital structure of the proxy group. The cost of debt is based on the
24 Company's actual cost of debt. I recommend the Commission to accept the
25 requested capital structure and cost of debt. In addition, my analysis suggests that
26 Columbia is a company whose overall risk is about the same as the average risk of

³² FERC Opinion No. 569-A, Order on Rehearing, (Issued May 21, 2020). Para 117, page 51.

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1 the proxy group companies. Based on my analysis of the ROE based on three
2 models, the DCF, the CAPM and RP models, I recommend to the Commission to
3 authorize a ROE that is around 8.65%. I then provided an analysis of the Staff
4 ROE estimation and provided evidence to suggest that the Staff has erred on
5 several critical assumptions of the DCF and CAPM models, thus, the Staff's ROE
6 recommendation is higher than the market required return for Columbia. In the
7 last sections of my analysis, I showed that Mr. Moul's ROE analysis for
8 Columbia is seriously flawed and leads to upward-biased ROE estimate, and thus
9 his ROE results should be disregarded by the Commission.

10

11 ***Q120. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY AT THIS TIME?***

12 ***A120.*** Yes, it does. However, I reserve the right to incorporate new information that
13 may subsequently become available. I also reserve the right to supplement my
14 testimony in the event Columbia, the PUCO Staff or other parties submit new or
15 corrected information in connection with this proceeding.

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing *Direct Testimony of Zhen Zhu on behalf of Office of the Ohio Consumers' Counsel and Northeast Ohio Public Energy Council* has been served upon those persons listed below via electronic service this 13th day of May 2022.

/s/ Angela D. O'Brien
Angela D. O'Brien
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The PUCO's e-filing system will electronically serve notice of the filing of this document on the following parties:

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Ph.D., Economics, University of Michigan, 1994
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Dr. Zhu is an Economist specializing in the areas of cost of capital and cost of service analysis for electric and gas utilities. He has provided analyses and support in many public utility (both electric and gas) cost-of-capital cases and cost of service cases. He has been providing consulting services on behalf of the State Water Project of California (an Intervenor) in the Southern California Edison, Pacific Gas & Electric, and San Diego Gas & Electric Transmission Formula rate cases. More recently, he has been involved with providing consulting services to the Duke Energy Progress rate case intervention for the US Army, among others. He has also presented cost of capital direct testimony and rebuttal testimony in the rate case of Dominion Energy South Carolina on behalf of the US Army, and cost of capital direct testimony in the Vermont Gas Systems rate case in 2021 on half of Vermont Department of Public Service.

Dr. Zhu also specialized in areas such as load forecasting, natural gas market analysis and modeling, gas price and underground storage forecasting, risk management and hedging strategy, financial analysis of merger potential, and other economic and statistical analyses. He has performed various studies regarding natural gas market risk management, price and volatility determination, market efficiency, and the analysis of gas pipelines. He has also performed numerous power price analyses, load analyses, weather normalization, and demand and energy forecasts for electric IOUs and cooperatives, evaluation of solar energy projects, corporate merger activities, stock market and foreign exchange market volatility, and financial market deregulation. Dr. Zhu has been instrumental in successfully modeling the storage injections and withdrawals from the U.S. natural gas reservoirs and the impact of these net supply changes on natural gas prices. Dr. Zhu and other Guernsey economists have received national recognition for successfully modeling the prices of natural gas in the physical market and at many trading hubs used in pricing natural gas in today's markets.

Dr. Zhu has testified in cases before several public service commissions regarding cost of capital, long-term demand and load forecasts, fuel price projections, and other issues.

Dr. Zhu is also Dr. Michael Metzger Endowed Chair and Professor of Economics at the University of Central Oklahoma.

Dr. Zhu teaches Master's level Energy Finance courses (Energy Valuation and Investment, Trading, and Risk Management) for the Mewbourne School of Petroleum and Geological Engineering and International Finance, Trade, and other courses for Advanced Programs at the University of Oklahoma.

SPECIFIC EXPERIENCE:

Natural Gas

Dr. Zhu has developed and maintains natural gas futures contract pricing models and natural gas storage models. He has also developed and maintained natural gas pricing models for multiple delivery points for a large Texas-based electric distribution cooperative and several other cooperatives. Dr. Zhu devised hedging strategies for several utilities and has done extensive study of natural gas price and natural gas markets.

Cost of Capital

Dr. Zhu has provided testimony and support in many gas and electric utility cost of capital cases.

Dr. Zhu provided cost of capital testimony in the rate case of Vermont Gas Systems on behalf of Vermont Department of Public Service in 2021.

Dr. Zhu provided cost of capital testimony in the rate case of Green Mountain Power on behalf of Vermont Department of Public Service in 2022.

Dr. Zhu was a ROE expert on a rate case of Columbia Gas Transmission LLC on behalf of Ohio Consumers Counsel before FERC in 2021

Dr. Zhu also serves as a cost of capital consultant for Ohio Consumers Counsel on the Columbia Gas of Ohio rate case in 2022.

Dr. Zhu also serves as a cost of capital consultant for Ohio Consumers Counsel on the Eastern Gas Transmission and Storage rate case before FERC in 2022.

Dr. Zhu served as a ROE expert in the rate case of Dominion Energy South Carolina, and submitted direct and rebuttal testimonies before the South Carolina Public Service Commission on behalf of the US Army and other Executive Agencies.

Dr. Zhu has assisted Department of Defense on Duke Energy Progress rate case in North Carolina on cost of capital and capital structure issues, DOCKET NO. E-2, SUB 1219, 2019-2020.

Dr. Zhu has assisted clients in Illinois on cases pending at FERC on ROE issues based on the new FERC ROE methodology.

Dr. Zhu has been providing consulting services, specifically related to capital structure and return on equity, to and on behalf of the State Water Project of California (an Intervenor) in the Southern California Edison, Pacific Gas & Electric, and San Diego Gas & Electric Transmission Formula rate cases. Teaming with legal counsel, Dr. Zhu represents and negotiates on behalf of client at settlement conferences conducted at FERC in Washington DC.

Dr. Zhu testified on cost of capital on behalf of Michigan Attorney General's Office before Michigan Public Service Commission in the Matter of the Application of Indiana Michigan Power Company for authority to increase its rates in the sale of electricity energy and for approval of depreciation accrual rates and other related matters, Case No. U-18370, 2017.

In addition, Dr. Zhu has studied the connection of the U.S. economy and U.S. gas and electric utility return on equities, and the determination of the ROE. The studies have been published in trade, industrial, and academic journals.

Load Forecasting & Statistical Analysis, and other Financial and Economic Analysis

Dr. Zhu examined factors determining future fuel prices and loads, and then provided expert testimony services related to fuel prices and load forecasts for the following projects:

Dr. Zhu testified on energy and demand forecasts, and fuel price forecast issues before the Georgia Public Service Commission in Georgia Power Company's application for Approval of its 2007 Integrated Resource Plan, Docket No. 24505-U, 2007.

Dr. Zhu presented expert testimony before the Oklahoma Corporation Commission on fuel cost/pricing issues, providing rebuttal testimony before the Corporation Commission of the State of Oklahoma, in the Application of Blue Canyon Windpower II, LLC for establishment of purchased power rates and a purchase power contract with DUKE – Public Service Company of Oklahoma, pursuant to PURPA, Cause No. PUD 20030063, 2004.

Dr. Zhu presented expert testimony before the South Carolina Public Service Commission Docket No. 2008-196-E: "Combined Application of SCE&G for the Construction and Operation of a Nuclear Facility in Jenkinsville, S. Car." regarding load forecast and fuel forecast issues.

Dr. Zhu has performed numerous studies of financial markets and published extensively in financial economics, energy economics and other economics/finance fields.

Dr. Zhu studied the impact of government regulation on stock price volatilities using the event study methodology and the study was published in Journal of Financial Services Review and many other journals.

Dr. Zhu has used many time series models to study the financial prices including exchange rates, stock prices, and natural gas futures prices and so on. The studies have been published in many leading academic journals.

Other Consulting Experience

Dr. Zhu developed and maintained Guernsey's LDC, DisCo, and GenCo stock price indices, developed fuel cost and hedging strategies for utilities, and developed and maintains load forecast models.

Dr. Zhu has been involved in the inventory forecast system development, merger intervention projects for gas and electric utilities, integrated resource planning projects, survey design and statistical analysis, weather normalization studies and many others.

Previous Professional Experience:

Dr. Zhu has served as an Assistant Professor of Economics at The University of Oklahoma, a Research Fellow of Financial Research Institute at the University of Missouri, and as an Instructor and Teaching Assistant in the Department of Economics at the University of Michigan.

SELECTED RECENT PUBLICATIONS AND PROFESSIONAL PAPERS

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PROFESSIONAL ACTIVITIES / HONORS:

Barnabas Fellow, UCO, 2011-2012

Distinguished Paper Award, Association of Public and Business Administration, 2008

Faculty Research Merit Award, UCO, 2007, 2009, 2011

OSEHE-EPSCor Summer grant Writing Institute, UCO, 2008

Faulty Incentive Awards, Graduate College, UCO, 2007, 2008, 2009

McGraw-Hill Irwin Distinguished Paper Award, Southwestern Society of Economists, 2006.

Marquis' Who's Who in American Education, 2003.

Research Fellow, Financial Research Institute, University of Missouri, 2001, 2002.

Hauptman Fellow, University of Central Oklahoma, 2001.

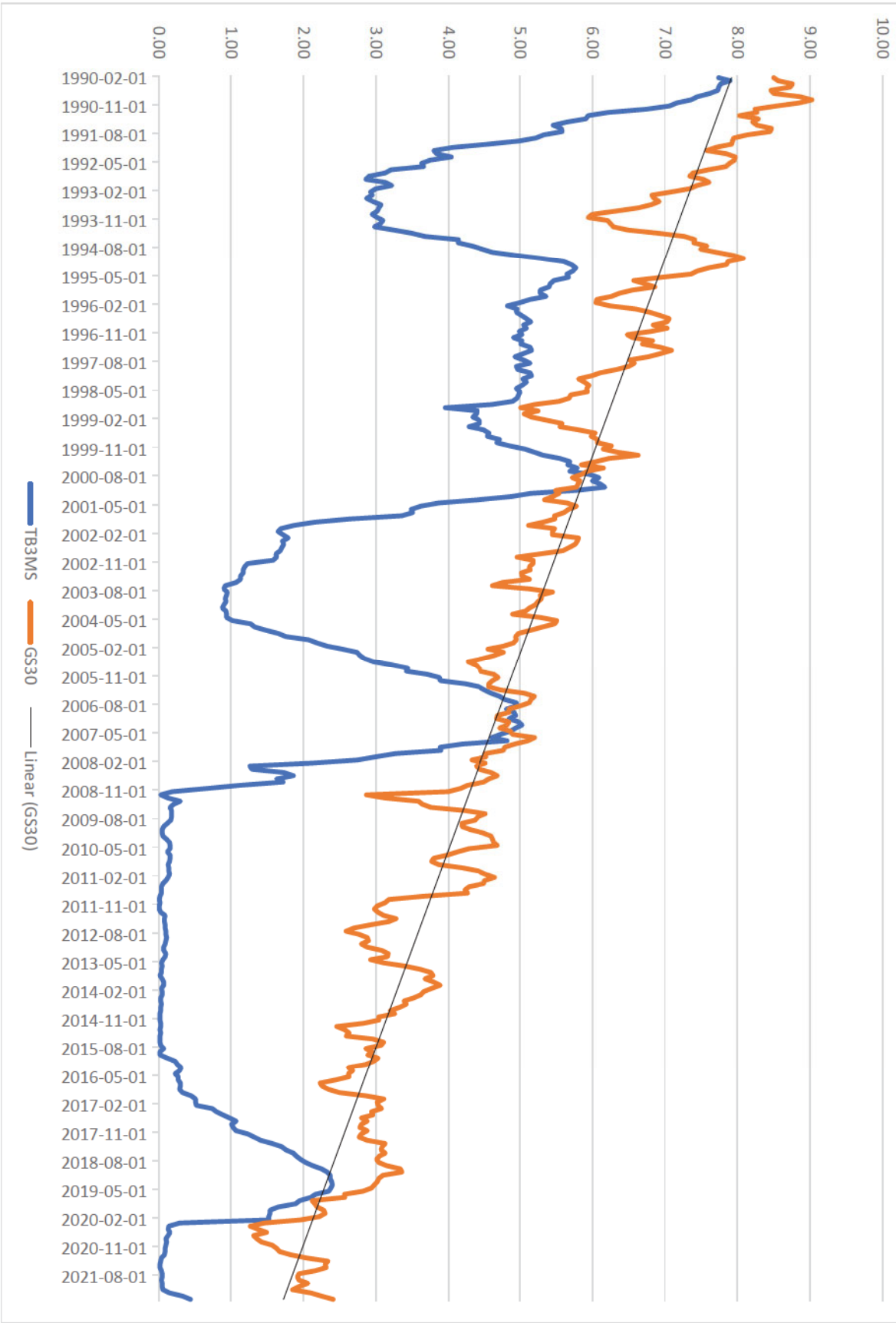
Distinguished Researcher Award, College of Business, University of Central Oklahoma, 2002.

Marquis Who's Who in America: Finance and Industry, 1999

ODE Professor of the Year, 1997-1998, University of Oklahoma

Member, American Finance Association, International Association for Energy Economists

3-Month T-Bill Rate and 30-Year T-Bond Rate



		Common Equity Ratio														Expected		
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2025-2027		
1	Atmos Energy Corp ATO	54.6	50.6	54.7	51.2	55.7	56.5	61.3	56	65.7	62	60	61.6	60	60	60		
2	New Jersey Resources NJR	62.8	64.5	60.8	63.4	61.8	56.8	52.3	55.4	54.6	50.2	44.9	43	42.5	43	42.5		
3	NiSource NI	45.3	44.4	44.9	43.7	43.1	39.3	40.2	36.5	37.9	36.9	32.9	34	35	36	41.5		
4	N.W. Natural NWN	53.9	52.7	51.5	52.4	55.2	57.5	55.6	52.1	51.9	51.8	50.8	51	53.5	55.5	55.5		
5	One Gas Inc OGS	0	0	0	0	59.9	60.5	61.3	62.2	61.4	62.3	58.5	38.5	40	42	48		
6	South Jersey Industries SJI	62.6	59.5	55	54.9	52	50.8	61.5	51.5	37.6	40.8	37.4	36	36	37	39.5		
7	Spire Inc SR		61.1	63.9	53.4	44.9	47	49.1	50	54.3	49.7	46.1	43.2	43	44	45		
Average		46.53	47.54	47.26	45.57	53.23	52.63	54.47	51.96	51.91	50.53	47.23	43.90	44.29	45.36	47.43		
Median		54.25	52.7	54.7	52.4	55.2	56.5	55.6	52.1	54.3	50.2	46.1	43	42.5	43	45		

Exhibit ZZ-4
IBES Growth Rate
Page 1 of 1

Company		Earning Growth Estimates
		IBES
1 Atmos Energy Corp	ATO	7.30%
2 New Jersey Resources	NJR	6.00%
3 NiSource	NI	3.52%
4 N.W. Natural	NWN	4.60%
5 One Gas Inc	OGS	2.90%
6 South Jersey Industries	SJI	5.20%
7 Spire Inc	SR	4.30%
Average		4.83%

Projected earnings growth rates were obtained from Finance.yahoo.com as of April 11, 2022
List was based on the February 25, 2022 issue of Value Line

Exhibit ZZ-5
Nominal GDP Growth
Page 1 of 1

Nominal GDP (\$ Billion)			Compounded Annual Growth Rate
	2023	2050	
<hr/>			
[1]. EIA			
Real GDP	20,862	36,652	
GDP Deflator	1.231	2.2730	
	25,681	83,310	4.45%
[2]. SSA Trustees Report	24,815	73,006	4.08%
Average Projected GDP Growth Rate			4.27%
<hr/>			

[1]. Energy Information Administration, Annual Energy Outlook 2022 (Jan 2022)

[2]. Social Security Administration, 2022 OASDI Trustees Report, Table VI.G6-Selected Economic Variables

Exhibit ZZ-6
Constant Growth DCF
Page 1 of 1

DCF Analysis						
		[1]	[2]	[3]	[4]	[5]
	Company	Dividend Yield	Earnings Growth Rate	Adjusted Dividend Yield	Projected Earnings Growth Rate	ROE (Two-Step DCF)
1	Atmos Energy Corp	2.62%	7.30%	2.71%	6.29%	9.00%
2	New Jersey Resources	3.53%	6.00%	3.64%	5.42%	9.06%
3	NiSource	3.29%	3.52%	3.35%	3.77%	7.12%
4	N.W. Natural	4.02%	4.60%	4.11%	4.49%	8.60%
5	One Gas Inc	3.17%	2.90%	3.21%	3.36%	6.57%
6	South Jersey Industries	4.71%	5.20%	4.83%	4.89%	9.72%
7	Spire Inc	4.07%	4.30%	4.15%	4.29%	8.44%
	Min	2.62%	2.90%	2.71%	3.36%	6.57%
	Max	4.71%	7.30%	4.83%	6.29%	9.72%
	Median	3.53%	4.60%	3.64%	4.49%	8.60%
	Average	3.63%	4.83%	3.72%	4.64%	8.36%
	Midpoint	3.66%	5.10%	3.77%	4.82%	8.14%

[1]. 6-month average dividend yield Oct 1 to Mar 31 2022

[2] IBES projected earnings growth rate

[3] Dividend yield adjusted by growth rate, = [1]*(1+0.5*[2])

[4]. Long term earnings growth based on IBES Earnings growth projection*2/3+GDP growth rate*1/3

[5] [1]+[2]

symbol	Security	Market Capitalization (billion)	Forward Dividend Yield	Trailing Dividend Yield	Projected Next 5 Year Earnings Growth Rate by IBES (%)	Adjusted Dividend Yield	Adjusted EPS Growth	ROE by DCF	Weighted ROE	Check Sum
MMM	3M	84.34	4.04	3.95	7.15	4.091	6.190	10.281	0.04512	0.00439
AOS	A. O. Smith	10.26	1.65	1.56	8	1.622	6.757	8.379	0.00447	0.00053
ABT	Abbott	206.19	1.54	1.49	12.12	1.580	9.503	11.084	0.11891	0.01073
ABBV	AbbVie	279.81	3.52	3.32	2.57	3.363	3.137	6.499	0.09462	0.01456
ABMD	Abiomed	14.16	N/A	0	5.84					
ACN	Accenture	205.19	1.18	1.16	12.58	1.233	9.810	11.043	0.11790	0.01068
ATVI	Activision Blizzard	62.701	0.59	0.59	16.45	0.639	12.390	13.029	0.04250	0.00326
ADM	ADM	50.11	1.8	1.69	2.9	1.715	3.357	5.071	0.01322	0.00261
ADBE	Adobe	220.33	N/A	0	14.38					
ADP	ADP	89.29	1.96	1.78	13.71	1.902	10.563	12.465	0.05791	0.00465
AAP	Advance Auto Parts	13.03	2.81	1.55	15.25	1.668	11.590	13.258	0.00899	0.00068
AES	AES	15.62	2.66	2.54	7.35	2.633	6.323	8.957	0.00728	0.00081
AFL	Aflac	41.39	2.48	2.05	3.16	2.082	3.530	5.612	0.01209	0.00215
A	Agilent Technologies	40.27	0.6	0.57	13.6	0.609	10.490	11.099	0.02325	0.00210
AIG	AIG	50.39	2.07	2.04	30.69					
APD	Air Products	52.16	2.74	2.54	11.2	2.682	8.890	11.572	0.03141	0.00271
AKAM	Akamai	18.67	N/A	0	12					
ALK	Alaska Air Group	6.81	N/A	0	-23.4					
ALB	Albemarle	24.38	0.76	0.76	29.83					
ARE	Alexandria	30.43	2.42	2.32	0.1	2.321	1.490	3.811	0.00603	0.00158
ALGN	Align	34.44	N/A	0	43.25					
ALLE	Allegion	9.99	1.45	1.23	10.37	1.294	8.337	9.630	0.00501	0.00052
LNT	Alliant Energy	15.13	2.85	2.69	6.1	2.772	5.490	8.262	0.00650	0.00079
ALL	Allstate	38.15	2.48	2.36	-4					
GOOGL	Alphabet (Class A)	1.83	N/A	0	20					
GOOG	Alphabet (Class C)	1.83	N/A	0	20					
MO	Altria	96.71	6.75	6.6	5.36	6.777	4.997	11.774	0.05924	0.00503
AMZN	Amazon	1.66	N/A	0	34.8					
AMCR	Amcor	16.98	4.19	4.15	6.95	4.294	6.057	10.351	0.00914	0.00088
AMD	AMD	185.39	N/A	0	29.9					
AEE	Ameren	22.97	2.65	2.48	7.4	2.572	6.357	8.928	0.01067	0.00120
AAL	American Airlines Group	10.52	N/A	0	-105.1					
AEP	American Electric Power	48.44	3.25	3.15	6.1	3.246	5.490	8.736	0.02202	0.00252
AXP	American Express	127.5	1.09	0.9	23.13					
AMT	American Tower	106.68	2.39	2.17	16.01	2.344	12.097	14.440	0.08015	0.00555
AWK	American Water	28.28	1.54	1.51	8.3	1.573	6.957	8.529	0.01255	0.00147
AMP	Ameriprise Financial	33.52	1.49	1.44	26.39					
ABC	AmerisourceBergen	31.69	1.21	1.17	10.34	1.230	8.317	9.547	0.01574	0.00165
AME	Ametek	30.64	0.65	0.59	-1.2					
AMGN	Amgen	133.27	3.28	2.98	7.13	3.086	6.177	9.263	0.06423	0.00693
APH	Amphenol	44.46	1.06	0.86	10.5	0.905	8.423	9.328	0.02158	0.00231
ADI	Analog Devices	83.28	1.84	1.78	14.71	1.911	11.230	13.141	0.05694	0.00433
ANSS	Ansys	26.73	N/A	0	11.42					
ANTM	Anthem	117.51	1.11	0.98	12.88	1.043	10.010	11.053	0.06758	0.00611
AON	Aon	67.13	0.65	0.63	14.21	0.675	10.897	11.571	0.04042	0.00349
APA	APA Corporation	N/A	1.23	0.58	26.2					
AAPL	Apple	2.78	0.52	0.51	14.85	0.548	11.323	11.871	0.00172	0.00014
AMAT	Applied Materials	116.1	0.75	0.73	16.53	0.790	12.443	13.234	0.07994	0.00604
APTV	Aptiv	34.15	N/A	0	49.34					
ANET	Arista	40.98	N/A	0	17.66					

AIZ	Assurant	10.33	1.52	1.49	17.7	1.622	13.223	14.845	0.00798	0.00054
T	AT&T	166.25	8.96	8.96	3.66	9.124	3.863	12.987	0.11234	0.00865
ATO	Atmos Energy	15.48	2.38	2.24	7.6	2.325	6.490	8.815	0.00710	0.00081
ADSK	Autodesk	45.06	N/A	0	26.7					
AZO	AutoZone	39.15	N/A	0	14					
AVB	AvalonBay Communities	33.74	2.6	2.63	2.54	2.663	3.117	5.780	0.01015	0.00176
AVY	Avery Dennison	13.56	1.65	1.62	7.77	1.683	6.603	8.286	0.00585	0.00071
BKR	Baker Hughes	35.84	1.99	1.92	50.9					
BLL	Ball	29.36	0.88	0.77	14.78	0.827	11.277	12.104	0.01849	0.00153
BAC	Bank of America	347.51	1.95	1.81	23.89					
BBWI	Bath & Body Works	11.67	1.6	0.92	13.96	0.984	10.730	11.714	0.00711	0.00061
BAX	Baxter	38.78	1.45	1.41	11.38	1.490	9.010	10.500	0.02119	0.00202
BDX	Becton Dickinson	74.58	1.33	1.28	6	1.318	5.423	6.742	0.02616	0.00388
WRB	Berkley	17.32	0.53	0.52	9	0.543	7.423	7.967	0.00718	0.00090
BRK.B	Berkshire Hathaway	769.04	N/A	0	23.3					
BBY	Best Buy	22.37	3.64	3.09	7.9	3.212	6.690	9.902	0.01153	0.00116
BIO	Bio-Rad	16.96	N/A	0	17.8					
TECH	Bio-Techne	16.86	0.3	0.3	15	0.323	11.423	11.746	0.01030	0.00088
BIIB	Biogen	30.81	N/A	0	-9.2					
BLK	BlackRock	111.97	2.65	2.24	11.53	2.369	9.110	11.479	0.06688	0.00583
BK	BNY Mellon	41.75	2.63	2.51	14.92	2.697	11.370	14.067	0.03056	0.00217
BA	Boeing	109.84	N/A	0	20.17					
BKNG	Booking Holdings	88.31	N/A	0	43.16					
BWA	BorgWarner	8.98	1.82	1.82	20.07					
BXP	Boston Properties	19.32	3.18	3.18	7	3.291	6.090	9.381	0.00943	0.00101
BSX	Boston Scientific	60.35	N/A	0	15.06					
BMJ	Bristol Myers Squibb	155.59	3.05	2.82	5	2.891	4.757	7.647	0.06191	0.00810
AVGO	Broadcom	249.6	2.74	2.57	14.74	2.759	11.250	14.009	0.18194	0.01299
BR	Broadridge	17.58	1.7	1.61	11.8	1.705	9.290	10.995	0.01006	0.00091
BRO	Brown & Brown	19.38	0.6	0.55	13.22	0.586	10.237	10.823	0.01091	0.00101
BF.B	Brown-Forman	31.05	1.16	1.12	7.01	1.159	6.097	7.256	0.01172	0.00162
CHRW	C.H. Robinson	13.25	2.1	1.99	12.3	2.112	9.623	11.736	0.00809	0.00069
CDNS	Cadence	43.79	N/A	0	15.4					
CZR	Caesars Entertainment	16.49	N/A	0	27.5					
CPB	Campbell's	12.97	3.44	3.44	1.78	3.471	2.610	6.081	0.00410	0.00067
COF	Capital One	54.36	1.79	1.49	45.9					
CAH	Cardinal Health	15.73	3.4	3.45	5.1	3.538	4.823	8.361	0.00684	0.00082
KMX	CarMax	16.04	N/A	0	16.4					
CCL	Carnival	22.17	N/A	0	9.95					
CARR	Carrier	39.68	1.26	1.1	12.01	1.166	9.430	10.596	0.02188	0.00206
CTLT	Catalent	18.8	N/A	0	15.8					
CAT	Caterpillar	119.06	2	1.96	20.48					
CBOE	Choe	12.29	1.67	1.56	5.03	1.599	4.777	6.376	0.00408	0.00064
CBRE	CBRE	29.69	N/A	0	11					
CDW	CDW	23.55	1.15	0.97	13.1	1.034	10.157	11.190	0.01371	0.00123
CE	Celanese	15.29	1.92	1.92	-2.22					
CNC	Centene	48.06	N/A	0	10.69					
CNP	CenterPoint Energy	18.64	2.3	2.19	1.8	2.210	2.623	4.833	0.00469	0.00097
CDAY	Ceridian	10.33	N/A	0	12					
CERN	Cerner	27.45	1.15	0.99	13.52	1.057	10.437	11.494	0.01642	0.00143
CF	CF Industries	21.47	1.16	1.16	62.7					
CRL	Charles River	14.07	N/A	0	16.94					
SCHW	Charles Schwab	169.98	0.89	0.8	21.7					
CHTR	Charter Communications	107.23	N/A	0	32.03					
CVX	Chevron	323.02	3.42	3.2	8.45	3.335	7.057	10.392	0.17465	0.01681

CMG	Chipotle Mexican Grill	43.22	N/A	0	29.02					
CB	Chubb	89.78	1.5	1.51	28.48					
CHD	Church & Dwight	23.58	1.07	1.04	7.83	1.081	6.643	7.724	0.00948	0.00123
CI	Cigna	75.93	1.88	1.68	11.15	1.774	8.857	10.630	0.04200	0.00395
CINF	Cincinnati Financial	21.14	2.1	1.91	14.39	2.047	11.017	13.064	0.01437	0.00110
CTAS	Cintas	38.31	0.95	0.9	11	0.950	8.757	9.706	0.01935	0.00199
CSCO	Cisco	226.32	2.71	2.72	7.14	2.817	6.183	9.000	0.10598	0.01178
C	#REF!	111.15	3.62	3.62	-0.66					
CFG	Citizens	20.32	3.24	3.24	-2.76					
CTXS	Citrix	12.73	1.47	1.46	2.2	1.476	2.890	4.366	0.00289	0.00066
CLX	Clorox	16.71	3.42	3.38	-3.53					
CME	CME Group	88.7	1.62	1.46	8.34	1.521	6.983	8.504	0.03925	0.00462
CMS	CMS Energy	19.6	2.75	2.57	7.4	2.665	6.357	9.022	0.00920	0.00102
KO	Coca-Cola	261.83	2.91	2.78	7.24	2.881	6.250	9.131	0.12439	0.01362
CTSH	Cognizant	47.71	1.19	1.09	11.49	1.153	9.083	10.236	0.02541	0.00248
CL	Colgate-Palmolive	61.89	2.52	2.43	6.64	2.511	5.850	8.361	0.02692	0.00322
CMCSA	Comcast	210.89	2.29	2.15	14.31	2.304	10.963	13.267	0.14558	0.01097
CMA	Comerica	12.24	2.91	2.91	-10.7					
CAG	Conagra Brands	14.44	3.89	3.66	1.66	3.690	2.530	6.220	0.00467	0.00075
COP	ConocoPhillips	135.63	1.36	1.68	12.79	1.787	9.950	11.737	0.08283	0.00706
ED	Con Edison	31.85	3.51	3.45	2	3.485	2.757	6.241	0.01034	0.00166
STZ	Constellation Brands	39.94	1.33	1.35	9.6	1.415	7.823	9.238	0.01920	0.00208
CEG	Constellation Energy	16.66	1.15	0	N/A					
COO	CooperCompanies	20.64	0.01	0.01	10	0.011	8.090	8.101	0.00870	0.00107
CPRT	Copart	29.66	N/A	0	22.3					
GLW	Corning	31.75	2.88	2.56	22.14					
CTVA	Corteva	41.72	0.98	0.96	22.39					
COST	Costco	247.95	0.57	0.57	11.25	0.602	8.923	9.525	0.12289	0.01290
CTRA	Coterra	21.24	1.89	2.37	74.49					
CCI	Crown Castle	74.95	3.39	3.15	12.4	3.345	9.690	13.035	0.05083	0.00390
CSX	CSX	79.28	1.09	1.03	15.79	1.111	11.950	13.061	0.05388	0.00412
CMI	Cummins	29.63	2.79	2.69	10.72	2.834	8.570	11.404	0.01758	0.00154
CVS	CVS Health	139.39	2.07	1.88	5.97	1.936	5.403	7.339	0.05323	0.00725
DHI	D.R. Horton	27.83	1.14	1.05	10.95	1.107	8.723	9.831	0.01424	0.00145
DHR	Danaher	204.63	0.35	0.29	16.87	0.314	12.670	12.984	0.13825	0.01065
DRI	Darden	16.72	3.32	3.16	29.22					
DVA	DaVita	10.53	N/A	0	13.37					
DE	Deere & Co.	132.38	0.97	0.9	15.01	0.968	11.430	12.398	0.08539	0.00689
DAL	Delta Air Lines	23.18	N/A	0	-23.7					
XRAY	Dentsply Sirona	10.77	1.02	0.87	10.73	0.917	8.577	9.493	0.00532	0.00056
DVN	Devon	40.96	6.5	3.2	17.23	3.476	12.910	16.386	0.03492	0.00213
DXCM	DexCom	43.61	N/A	0	31.2					
FANG	Diamondback	25.31	1.68	1.36	11	1.435	8.757	10.191	0.01342	0.00132
DLR	Digital Realty	38.87	3.55	3.37	23.19					
DFS	Discover	31.52	1.79	1.68	56.42					
DISCA	Discovery (Series A)	13.56	N/A	0	5.95					
DISCK	Discovery (Series C)	13.56	N/A	0	20					
DISH	Dish	16.52	N/A	0	-26.57					
DIS	Disney	250.59	N/A	0	40.96					
DG	Dollar General	50.56	0.99	0.76	10.85	0.801	8.657	9.458	0.02488	0.00263
DLTR	Dollar Tree	34.93	N/A	0	17.87					
D	Dominion Energy	66.16	3.24	3.06	6.37	3.157	5.670	8.827	0.03039	0.00344
DPZ	Domino's	14.19	1.12	0.96	11.78	1.017	9.277	10.293	0.00760	0.00074
DOV	Dover	22.74	1.27	1.27	14.5	1.362	11.090	12.452	0.01473	0.00118
DOW	Dow	46.53	4.42	4.37	59.79					

DTE	DTE	24.6	2.77	3.04	6	3.131	5.423	8.555	0.01095	0.00128
DUK	Duke Energy	82.25	3.67	3.63	5.85	3.736	5.323	9.060	0.03877	0.00428
DRE	Duke Realty	21.44	2	1.91	6	1.967	5.423	7.391	0.00824	0.00112
DD	DuPont	38.95	1.71	1.57	13.73	1.678	10.577	12.254	0.02483	0.00203
DXC	DXC Technology	7.89	N/A	0	29.1					
EMN	Eastman	14.1	2.75	2.56	12.31	2.718	9.630	12.348	0.00906	0.00073
ETN	Eaton	60.91	2.02	1.97	18.61	2.153	13.830	15.983	0.05065	0.00317
EBAY	eBay	32.67	1.58	1.25	11.65	1.323	9.190	10.513	0.01787	0.00170
ECL	Ecolab	49.74	1.16	1.1	15.63	1.186	11.843	13.029	0.03372	0.00259
EIX	Edison International	25.36	4.18	3.91	5.35	4.015	4.990	9.005	0.01188	0.00132
EW	Edwards Lifesciences	66.61	N/A	0	15.19					
EA	Electronic Arts	35.05	0.54	0.53	23.16					
EMR	Emerson	57.79	2.11	2.06	10.46	2.168	8.397	10.564	0.03177	0.00301
ENPH	Enphase	25.47	N/A	0	15.6					
ETR	Entergy	22.51	3.58	3.36	5.9	3.459	5.357	8.816	0.01033	0.00117
EOG	EOG Resources	72.32	2.48	1.6	11.75	1.694	9.257	10.951	0.04121	0.00376
EPAM	EPAM	17.44	N/A	0	24.9					
EFX	Equifax	28.89	0.66	0.66	14.1	0.707	10.823	11.530	0.01733	0.00150
EQIX	Equinix	64.21	1.74	1.62	37					
EQR	Equity Residential	32.87	2.84	2.71	6.5	2.798	5.757	8.555	0.01463	0.00171
ESS	Essex	21.87	2.62	2.45	7.9	2.547	6.690	9.237	0.01051	0.00114
EL	Estée Lauder Companies	98.07	0.87	0.8	14.86	0.859	11.330	12.189	0.06220	0.00510
ETSY	Etsy	18.1	N/A	0	39.45					
RE	Everest	11.46	2.1	2.07	62.29					
EVRG	Evergy	14.94	3.5	3.26	5.12	3.343	4.837	8.180	0.00636	0.00078
ES	Eversource	29.17	2.99	2.78	7.1	2.879	6.157	9.035	0.01371	0.00152
EXC	Exelon	42.83	3.04	3.36	8.5	3.503	7.090	10.593	0.02361	0.00223
EXPE	Expedia Group	29.12	N/A	0	22.8					
EXPD	Expeditors	17.14	1.12	1.13	-15.4					
EXR	Extra Space Storage	25.97	2.57	2.28	6	2.348	5.423	7.772	0.01050	0.00135
XOM	ExxonMobil	351.94	4.13	4.1	12.54	4.357	9.783	14.140	0.25893	0.01831
FFIV	FS	12.44	N/A	0	8.7					
FDS	FactSet	15.85	0.78	0.79	10	0.830	8.090	8.920	0.00736	0.00082
FAST	Fastenal	32.85	2.16	1.95	6.33	2.012	5.643	7.655	0.01308	0.00171
FRT	Federal Realty	9.2	3.64	3.56	6.7	3.679	5.890	9.569	0.00458	0.00048
FDX	FedEx	58.35	1.33	1.32	19.33	1.448	14.310	15.758	0.04784	0.00304
FITB	Fifth Third Bank	31.32	2.62	2.44	-2.98					
FRC	First Republic	29.57	0.53	0.53	16.93	0.575	12.710	13.285	0.02044	0.00154
FE	FirstEnergy	24.82	3.55	3.48	-6.6					
FIS	FIS	58.17	1.95	1.6	13.67	1.709	10.537	12.246	0.03706	0.00303
FISV	Fiserv	64.42	N/A	0	15.54					
FLT	Fleetcor	18.71	N/A	0	16					
FMC	FMC	16.52	1.58	1.44	8	1.498	6.757	8.254	0.00709	0.00086
F	Ford	66.79	2.38	0.61	74.15					
FTNT	Fortinet	51.69	N/A	0	17.49					
FTV	Fortive	21.66	0.46	0.45	37.89					
FBHS	Fortune Brands	10.53	1.44	1.34	9.3	1.402	7.623	9.026	0.00494	0.00055
FOXA	Fox Corporation (Class A)	22	1.18	1.14	6	1.174	5.423	6.598	0.00755	0.00114
FOX	Fox Corporation (Class B)	22	1.29	1.24	9.2	1.297	7.557	8.854	0.01013	0.00114
BEN	Franklin Templeton	13.67	4.2	4.06	1.86	4.098	2.663	6.761	0.00481	0.00071
FCX	Freeport-McMoRan	72.46	1.17	0.58	28.9					
AJG	Gallagher	34.22	1.23	1.14	11.6	1.206	9.157	10.363	0.01845	0.00178
GRMN	Garmin	22.34	2.29	2.3	10.78	2.424	8.610	11.034	0.01283	0.00116
IT	Gartner	23.82	N/A	0	18.3					
GE	GE	103.23	0.34	0.34	47.3					

GNRC	Generac	20.25	N/A	0	8					
GD	General Dynamics	66.56	2.09	1.95	10.95	2.057	8.723	10.780	0.03733	0.00346
GIS	General Mills	38.74	3.07	3.03	5.03	3.106	4.777	7.883	0.01589	0.00202
GPC	Genuine Parts	18.1	2.79	2.54	4.6	2.598	4.490	7.088	0.00668	0.00094
GILD	Gilead	73.79	4.94	4.82	-0.68					
GL	Globe Life	9.88	0.83	0.77	10.31	0.810	8.297	9.106	0.00468	0.00051
GPN	Global Payments	37.81	0.74	0.69	18.18	0.753	13.543	14.296	0.02812	0.00197
GM	GM	63.61	N/A	0	14.7					
GS	Goldman Sachs	114.05	2.38	1.93	11.41	2.040	9.030	11.070	0.06569	0.00593
GWW	Grainger	25.8	1.29	1.26	15.38	1.357	11.677	13.034	0.01750	0.00134
HAL	Halliburton	34.21	1.27	0.46	62.7					
HIG	Hartford (The)	23.51	2.15	1.97	13	2.098	10.090	12.188	0.01491	0.00122
HAS	Hasbro	11.83	3.3	3.2	17.7	3.483	13.223	16.707	0.01028	0.00062
HCA	HCA Healthcare	78.71	0.86	0.74	14.42	0.793	11.037	11.830	0.04845	0.00410
PEAK	Healthpeak	17.98	3.55	3.5	2.9	3.551	3.357	6.907	0.00646	0.00094
HSIC	Henry Schein	12.05	N/A	0	18.56					
HSY	Hershey's	42.64	1.71	1.59	8.85	1.660	7.323	8.984	0.01993	0.00222
HES	Hess	32.9	1.41	0.92	55.36					
HPE	Hewlett Packard Enterprise	22.06	2.82	2.74	11.83	2.902	9.310	12.212	0.01402	0.00115
HLT	Hilton	41.43	N/A	0	272.53					
HOLX	Hologic	18.76	N/A	0	1.7					
HD	Home Depot	326.31	2.41	2.2	14.6	2.361	11.157	13.517	0.22950	0.01698
HON	Honeywell	131.85	2.01	1.91	10.54	2.011	8.450	10.461	0.07176	0.00686
HRL	Hormel	27.21	2.07	1.96	8.5	2.043	7.090	9.133	0.01293	0.00142
HST	Host Hotels & Resorts	13.11	0.16	0	28.4					
HWM	Howmet Aerospace	15.39	0.22	0.11	32.25					
HPQ	HP	39.74	2.6	2.09	10.07	2.195	8.137	10.332	0.02136	0.00207
HUM	Humana	54.58	0.66	0.64	14.26	0.686	10.930	11.616	0.03299	0.00284
HII	Huntington Ingalls Industries	8.14	2.32	2.23	13.6	2.382	10.490	12.872	0.00545	0.00042
HBAN	Huntington National Bank	21.66	4.1	3.94	-2.15					
IEX	IDEX	14.72	1.11	1.11	12	1.177	9.423	10.600	0.00812	0.00077
IDXX	Idexx Laboratories	45.16	N/A	0	24.2					
ITW	Illinois Tool Works	65.51	2.3	2.23	11.03	2.353	8.777	11.130	0.03794	0.00341
ILMN	Illumina	53.35	N/A	0	1					
INCY	Incyte	17.06	N/A	0	15					
IR	Ingersoll Rand	20.12	0.16	0.04	18.8	0.044	13.957	14.000	0.01466	0.00105
INTC	Intel	196.56	2.83	2.68	3.38	2.725	3.677	6.402	0.06547	0.01023
ICE	Intercontinental Exchange	75.79	1.13	0.98	9.97	1.029	8.070	9.099	0.03588	0.00394
IBM	IBM	115.38	5.08	4.99	16.5	5.402	12.423	17.825	0.10701	0.00600
IP	International Paper	16.8	4.09	4.32	19.2	4.735	14.223	18.958	0.01657	0.00087
IPG	Interpublic Group International Flavors & Fragrances	13.84	3.22	2.96	5.6	3.043	5.157	8.200	0.00590	0.00072
IFF		32.12	2.47	2.41	4.62	2.466	4.503	6.969	0.01165	0.00167
INTU	Intuit	130.5	0.59	0.55	16.7	0.596	12.557	13.153	0.08931	0.00679
ISRG	Intuitive Surgical	98.85	N/A	0	19.11					
IVZ	Invesco	9.91	3.08	3.08	7.4	3.194	6.357	9.551	0.00492	0.00052
IPGP	IPG Photonics	5.98	N/A	0	25.4					
IQV	IQVIA	42.06	N/A	0	18.22					
IRM	Iron Mountain	15.11	4.71	4.64	6.44	4.789	5.717	10.506	0.00826	0.00079
JBHT	J.B. Hunt	22.04	0.76	0.56	28.04					
JKHY	Jack Henry & Associates	13.7	1.04	0.95	14	1.017	10.757	11.773	0.00839	0.00071
J	Jacobs	17.53	0.66	0.61	12.33	0.648	9.643	10.291	0.00939	0.00091
JNJ	Johnson & Johnson	458.45	2.42	2.37	6.05	2.442	5.457	7.898	0.18840	0.02385
JCI	Johnson Controls	45.49	2.11	1.74	19.54	1.910	14.450	16.360	0.03872	0.00237
JPM	JPMorgan Chase	419.06	2.82	2.68	7.21	2.777	6.230	9.007	0.19638	0.02180

JNPR	Juniper Networks	11.32	2.36	2.19	9.35	2.292	7.657	9.949	0.00586	0.00059
K	Kellogg's	20.9	3.75	3.68	2.42	3.725	3.037	6.761	0.00735	0.00109
KEY	KeyCorp	21.82	3.31	3.14	-1.55					
KEYS	Keysight	28.45	N/A	0	10.2					
KMB	Kimberly-Clark	40.64	3.86	3.79	8.22	3.946	6.903	10.849	0.02294	0.00211
KIM	Kimco Realty	14.84	3.15	2.79	4.6	2.854	4.490	7.344	0.00567	0.00077
KMI	Kinder Morgan	41.09	5.9	5.66	-3.62					
KLAC	KLA	52.56	1.15	1.06	20.7					
KHC	Kraft Heinz	46.84	4.14	4.07	-1.37					
KR	Kroger	40.98	1.47	1.42	5.53	1.459	5.110	6.569	0.01401	0.00213
LHX	L3Harris	49.28	1.74	1.58	41.8					
LH	LabCorp	25.38	N/A	0	-12.49					
LRCX	Lam Research	74.07	1.08	1.01	15.93	1.090	12.043	13.134	0.05062	0.00385
LW	Lamb Weston	7.96	1.71	1.64	10.75	1.728	8.590	10.318	0.00427	0.00041
LVS	Las Vegas Sands	29.16	N/A	0	265.7					
LDOS	Leidos	14.57	1.34	1.29	7.2	1.336	6.223	7.560	0.00573	0.00076
LEN	Lennar	24.47	1.81	1.36	23.7					
LLY	Lilly	270.65	1.36	1.18	6.37	1.218	5.670	6.888	0.09699	0.01408
LNC	Lincoln Financial	11.28	2.57	2.52	35.7					
LIN	Linde	156.03	1.47	1.33	N/A					
LYV	Live Nation Entertainment	25.89	N/A	0	80.3					
LKQ	LKQ Corporation	12.93	2.2	0.55	33.5					
LMT	Lockheed Martin	118.67	2.49	2.34	8.2	2.436	6.890	9.326	0.05758	0.00617
L	Loews Corporation	15.86	0.38	0.38	14.03	0.407	10.777	11.183	0.00923	0.00083
LOW	Lowe's	146.15	1.5	1.41	14.45	1.512	11.057	12.569	0.09557	0.00760
LUMN	Lumen	11.12	9.18	8.77	-19.7					
LYB	LyondellBasell	34.18	4.2	4.12	1.55	4.152	2.457	6.609	0.01175	0.00178
MTB	M&T Bank	23.09	2.67	2.45	5.69	2.520	5.217	7.736	0.00929	0.00120
MRO	Marathon Oil	18.69	1.08	0.84	10.63	0.885	8.510	9.395	0.00914	0.00097
MPC	Marathon Petroleum	44.94	2.82	2.82	24.05					
MKTX	MarketAxess	13.11	0.8	0.75	13.88	0.802	10.677	11.479	0.00783	0.00068
MAR	Marriott International	54.86	N/A	0	135.51					
MMC	Marsh & McLennan	81.72	1.29	1.25	7.6	1.298	6.490	7.788	0.03311	0.00425
MLM	Martin Marietta	23.44	0.64	0.6	17.97	0.654	13.403	14.057	0.01714	0.00122
MAS	Masco	12.8	2.14	1.88	15.4	2.025	11.690	13.715	0.00913	0.00067
MA	Mastercard	341.16	0.56	0.52	24.69					
MTCH	Match Group	29.22	N/A	0	16					
MKC	McCormick	25.72	1.51	1.39	7.2	1.440	6.223	7.663	0.01026	0.00134
MCD	McDonald's	175.58	2.3	2.17	12.97	2.311	10.070	12.381	0.11310	0.00914
MCK	McKesson	44.94	0.62	0.57	12.96	0.607	10.063	10.670	0.02495	0.00234
MDT	Medtronic	142.42	2.37	2.28	12.16	2.419	9.530	11.949	0.08854	0.00741
MRK	Merck	201.54	3.43	3.2	9.42	3.351	7.703	11.054	0.11592	0.01049
FB	Meta	581.03	N/A	0	18.5					
MET	MetLife	57.28	2.74	2.67	5.02	2.737	4.770	7.507	0.02237	0.00298
MTD	Mettler Toledo	30.9	N/A	0	17.8					
MGM	MGM Resorts	18.19	0.02	0.02	-383					
MCHP	Microchip	41.02	1.31	1.1	20.5					
MU	Micron	84.71	0.26	0.26	25.21					
MSFT	Microsoft	2.25	0.82	0.78	17.4	0.848	13.023	13.871	0.00162	0.00012
MAA	Mid-America Apartments	23.44	2.12	1.99	7	2.060	6.090	8.150	0.00994	0.00122
MRNA	Moderna	72.03	N/A	0	16.8					
MHK	Mohawk Industries	8.86	N/A	0	1.5					
MOH	Molina Healthcare	19.47	N/A	0	20.52					
TAP	Molson Coors	11.4	2.9	1.26	2.42	1.275	3.037	4.312	0.00256	0.00059
MDLZ	Mondelez International	84.38	2.28	2.16	8.25	2.249	6.923	9.172	0.04027	0.00439

MPWR	Monolithic Power Systems	21.57	0.61	0.49	25					
MNST	Monster Beverage	41.32	N/A	0	14.01					
MCO	Moody's	60.46	0.85	0.75	13.12	0.799	10.170	10.969	0.03451	0.00315
MS	Morgan Stanley	164.56	3.04	2.65	100.36					
MOS	Mosaic	25.02	0.66	0.39	-10.5					
MSI	Motorola Solutions	38.15	1.36	1.26	14.27	1.350	10.937	12.287	0.02439	0.00198
MSCI	MSCI	39.92	0.79	0.74	13.9	0.791	10.690	11.481	0.02385	0.00208
NDAQ	Nasdaq	28.63	1.24	1.2	9.52	1.257	7.770	9.027	0.01345	0.00149
NTAP	NetApp	19.41	2.33	2.31	8.8	2.412	7.290	9.702	0.00980	0.00101
NFLX	Netflix	166.26	N/A	0	16.86					
NWL	Newell Brands	9.36	4.2	4.12	5.37	4.231	5.003	9.234	0.00450	0.00049
NEM	Newmont	62.54	2.81	2.79	N/A					
NWSA	News Corp (Class A)	12.94	0.89	0.89	21.06					
NWS	News Corp (Class B)	12.94	0.87	0.87						
NEE	NextEra Energy	162.06	1.88	1.83	9.07	1.913	7.470	9.383	0.07912	0.00843
NLSN	Nielsen	8.35	1.07	1.08	5.3	1.109	4.957	6.065	0.00264	0.00043
NKE	Nike	210.31	0.88	0.87	15.34	0.937	11.650	12.587	0.13773	0.01094
NI	NiSource	12.26	3.02	2.87	3.52	2.921	3.770	6.691	0.00427	0.00064
NDSN	Nordson	13.27	0.9	0.79	13	0.841	10.090	10.931	0.00755	0.00069
NSC	Norfolk Southern	66.47	1.75	1.47	13.32	1.568	10.303	11.871	0.04106	0.00346
NTRS	Northern Trust	24.03	2.4	2.35	12.15	2.493	9.523	12.016	0.01502	0.00125
NOC	Northrop Grumman	69.77	1.38	1.34	4.8	1.372	4.623	5.995	0.02176	0.00363
NLOK	NortonLifeLock	15.97	1.78	1.77	12.4	1.880	9.690	11.570	0.00961	0.00083
NCLH	Norwegian Cruise Line Holdings	8.09	N/A	0	-24.13					
NRG	NRG Energy	8.79	3.78	3.58	37.9					
NUE	Nucor	39.6	1.27	1.09	37.75					
NVDA	Nvidia	706.57	0.06	0.06	30.74					
NVR	NVR	16.21	N/A	0	4.8					
NXPI	NXP	48.2	1.84	1.18	16.83	1.279	12.643	13.923	0.03492	0.00251
ORLY	O'Reilly Automotive	45.84	N/A	0	16.6					
OXY	Occidental Petroleum	55.89	0.89	0.07	23.64					
ODFL	Old Dominion	36.15	0.38	0.25	24.81					
OMC	Omnicom Group	17.25	3.33	3.27	10.6	3.443	8.490	11.933	0.01071	0.00090
OKE	Oneok	30.78	5.18	5.18	9.86	5.435	7.997	13.432	0.02151	0.00160
ORCL	Oracle	214.49	1.57	1.57	10.24	1.650	8.250	9.900	0.11049	0.01116
OGN	Organon	8.96	3.17	1.6	-5					
OTIS	Otis	32.48	1.24	1.19	11.68	1.259	9.210	10.469	0.01769	0.00169
PCAR	Paccar	30.57	1.53	1.51	23.17					
PKG	Packaging Corporation of America	14.29	2.56	2.56	16.4	2.770	12.357	15.127	0.01125	0.00074
PARA	Paramount	24.51	2.49	2.49	-4.31					
PH	Parker	36.84	1.42	1.37	11.4	1.448	9.023	10.471	0.02007	0.00192
PAYX	Paychex	45.23	2.05	2.02	12.37	2.145	9.670	11.815	0.02780	0.00235
PAYC	Paycom	20.73	N/A	0	25.4					
PYPL	PayPal	133.57	N/A	0	17.32					
PENN	Penn National Gaming	7.1	N/A	0	239.5					
PNR	Pentair	9.3	1.51	1.44	8.8	1.503	7.290	8.793	0.00425	0.00048
PBCT	People's United Financial	9.06	3.37	3.37	10.74	3.551	8.583	12.134	0.00572	0.00047
PEP	PepsiCo	226.17	2.6	2.57	7.72	2.669	6.570	9.239	0.10872	0.01177
PKI	PerkinElmer	22.29	0.16	0.16	44.8					
PFE	Pfizer	294.76	3.04	2.96	103.09					
PM	Philip Morris International	141.42	5.4	5.24	8.42	5.461	7.037	12.497	0.09196	0.00736
PSX	Phillips 66	44.9	4.54	4.32	13	4.601	10.090	14.691	0.03432	0.00234
PNW	Pinnacle West	8.32	4.47	4.4	0.1	4.402	1.490	5.892	0.00255	0.00043
PXD	Pioneer Natural Resources	61.89	2.15	0.9	15.75	0.971	11.923	12.894	0.04152	0.00322

PNC	PNC Financial Services	80.62	2.54	2.44	-3.8					
POOL	Pool Corporation	18.48	0.71	0.69	17	0.749	12.757	13.505	0.01299	0.00096
PPG	PPG Industries	30.4	1.82	1.75	16.6	1.895	12.490	14.385	0.02275	0.00158
PPL	PPL	19.77	2.93	6.02	-16.2					
PFG	Principal	18.49	3.56	3.32	14	3.552	10.757	14.309	0.01377	0.00096
PG	Procter & Gamble	361.53	2.3	2.22	6.84	2.296	5.983	8.279	0.15574	0.01881
PGR	Progressive	66.68	0.34	1.63	-10.1					
PLD	Prologis	116.35	2.03	1.6	-6.05					
PRU	Prudential	43.97	4.03	3.81	3.25	3.872	3.590	7.462	0.01707	0.00229
PEG	PSEG	33.54	3.23	2.99	2.5	3.027	3.090	6.117	0.01068	0.00175
PTC	PTC	12.53	N/A	0	11.35					
PSA	Public Storage	64.54	2.14	2.13	17	2.311	12.757	15.068	0.05060	0.00336
PHM	PulteGroup	10.78	1.35	1.28	9.2	1.339	7.557	8.896	0.00499	0.00056
PVH	PVH	5.61	0.18	0	-6.04					
QRVO	Qorvo	13.63	N/A	0	12.4					
PWR	Quanta	18.44	0.21	0.19	16.6	0.206	12.490	12.696	0.01218	0.00096
QCOM	Qualcomm	172.28	1.72	1.7	14.68	1.825	11.210	13.035	0.11684	0.00896
DGX	Quest Diagnostics	17.01	1.86	1.72	-13.82					
RL	Ralph Lauren	8.28	2.34	1.73	80.15					
RJF	Raymond James	21.94	1.24	1.01	8.54	1.053	7.117	8.170	0.00933	0.00114
RTX	Raytheon Technologies	150.86	2.01	1.97	16.2	2.130	12.223	14.353	0.11266	0.00785
O	Realty Income	39.56	4.31	4.14	14.1	4.432	10.823	15.255	0.03140	0.00206
REG	Regency Centers	11.63	3.61	3.48	9.1	3.638	7.490	11.128	0.00673	0.00061
REGN	Regeneron	72.64	N/A	0	-16					
RF	Regions	21.27	2.95	2.82	25.1					
RSG	Republic Services	40.97	1.4	1.33	8.59	1.387	7.150	8.537	0.01820	0.00213
RMD	ResMed	34.07	0.69	0.68	25.5					
RHI	Robert Half	12.89	1.47	1.3	11.6	1.375	9.157	10.532	0.00706	0.00067
ROK	Rockwell Automation	31.42	1.6	1.55	11.21	1.637	8.897	10.534	0.01722	0.00163
ROL	Rollins	16.46	1.18	0.99	8.2	1.031	6.890	7.921	0.00678	0.00086
ROP	Roper	48.79	0.53	0.49	7.5	0.508	6.423	6.932	0.01760	0.00254
ROST	Ross	31.71	1.35	1.25	35.8					
RCL	Royal Caribbean Group	19.24	N/A	0	58.7					
SPGI	S&P Global	140.79	0.82	0.74	14.2	0.793	10.890	11.683	0.08558	0.00733
CRM	Salesforce	209	N/A	0	15.13					
SBAC	SBA Communications	34.59	0.73	0.69	189.32					
SLB	Schlumberger	59.93	1.2	1.2	36.4					
STX	Seagate	20.01	3.03	2.93	25.02					
SEE	Sealed Air	10.01	1.15	1.1	12.07	1.166	9.470	10.636	0.00554	0.00052
SRE	Sempra Energy	50.32	2.82	2.7	4.3	2.758	4.290	7.048	0.01845	0.00262
NOW	ServiceNow	113.59	N/A	0	26.1					
SHW	Sherwin-Williams	64.52	0.92	0.88	14.65	0.944	11.190	12.134	0.04074	0.00336
SBNY	Signature Bank	18.82	0.74	0.74	6.32	0.763	5.637	6.400	0.00627	0.00098
SPG	Simon	42.72	5.01	4.44	8.6	4.631	7.157	11.788	0.02620	0.00222
SWKS	Skyworks	21.86	1.63	1.55	12.7	1.648	9.890	11.538	0.01312	0.00114
SJM	Smucker	14.12	2.96	2.89	1.61	2.913	2.497	5.410	0.00397	0.00073
SNA	Snap-on	11.07	2.72	2.48	5	2.542	4.757	7.299	0.00420	0.00058
SEDG	SolarEdge	18.04	N/A	0	30.86					
SO	Southern Company	72.93	3.72	3.69	6.47	3.809	5.737	9.546	0.03622	0.00379
LUV	Southwest Airlines	25.39	N/A	0	-21					
SWK	Stanley Black & Decker	23.09	2.18	2.11	10.77	2.224	8.603	10.827	0.01301	0.00120
SBUX	Starbucks	99.18	2.24	2.13	11.4	2.251	9.023	11.275	0.05818	0.00516
STT	State Street	32.02	2.53	2.42	13.39	2.582	10.350	12.932	0.02154	0.00167
STE	Steris	23.04	0.71	0.68	10	0.714	8.090	8.804	0.01055	0.00120
SYK	Stryker	96.45	1.05	0.96	11.2	1.014	8.890	9.904	0.04970	0.00502

SIVB	SVB Financial	33.48	N/A	0	8					
SYF	Synchrony	18.94	2.4	2.45	35.92					
SNPS	Synopsys	48.45	N/A	0	16.2					
SYF	Sysco	40.81	2.32	2.3	51.22					
TMUS	T-Mobile	155.95	N/A	0	70.07					
TROW	T. Rowe Price	33.4	3.19	2.87	12.6	3.051	9.823	12.874	0.02237	0.00174
TTWO	Take-Two Interactive	17.24	N/A	0	14.63					
TPR	Tapestry	9.91	1.95	1.3	16.5	1.407	12.423	13.831	0.00713	0.00052
TGT	Target	100.22	1.64	1.44	14.02	1.541	10.770	12.311	0.06420	0.00521
TEL	TE Connectivity	42.07	1.69	1.51	10.36	1.588	8.330	9.918	0.02171	0.00219
TDY	Teledyne	21.26	N/A	0	23.27					
TFX	Teleflex	15.42	0.39	0.39	11	0.411	8.757	9.168	0.00736	0.00080
TER	Teradyne	18.92	0.35	0.33	14.16	0.353	10.863	11.217	0.01104	0.00098
TSLA	Tesla	1.03	N/A	0	37.15					
TXN	Texas Instruments	165.27	2.49	2.27	10	2.384	8.090	10.474	0.09006	0.00860
TXT	Textron	15.92	0.11	0.11	23.57					
TMO	Thermo Fisher Scientific	223.49	0.21	0.18	10.87	0.190	8.670	8.860	0.10302	0.01163
TJX	TJX Companies	70.95	1.68	1.68	12	1.781	9.423	11.204	0.04136	0.00369
TSCO	Tractor Supply	26.18	1.58	0.9	13.6	0.961	10.490	11.451	0.01560	0.00136
TT	Trane Technologies	35.71	1.71	1.51	22.29					
TDG	TransDigm	36.65	N/A	0	24.3					
TRV	Travelers	43.86	1.88	1.87	8.94	1.954	7.383	9.337	0.02131	0.00228
TRMB	Trimble	17.45	N/A	0	10					
TFC	Truist	77.32	3.22	3.12	1.24	3.139	2.250	5.389	0.02168	0.00402
TWTR	Twitter	30.42	N/A	0	80					
TYL	Tyler Technologies	17.7	N/A	0	10					
TSN	Tyson	31.07	2.12	2.1	7.5	2.179	6.423	8.602	0.01391	0.00162
USB	U.S. Bank	82.94	3.22	3.1	10.26	3.259	8.263	11.522	0.04972	0.00432
UDR	UDR	17.75	2.65	2.51	-34.21					
ULTA	Ulta Beauty	21.1	N/A	0	43.63					
UAA	Under Armour (Class A)	7.65	N/A	0	55					
UA	Under Armour (Class C)	7.65	N/A	0	21.8					
UNP	Union Pacific	170.49	1.71	1.56	16.77	1.691	12.603	14.294	0.12680	0.00887
UAL	United Airlines	13.48	N/A	0	-129.1					
UNH	UnitedHealth Group	473.49	1.13	1.09	14.51	1.169	11.097	12.266	0.30218	0.02464
UPS	United Parcel Service	186.9	2.82	1.86	14.03	1.990	10.777	12.767	0.12415	0.00972
URI	United Rentals	25.59	N/A	0	20.22					
UHS	Universal Health Services	10.76	0.54	0.54	11.42	0.571	9.037	9.608	0.00538	0.00056
VLO	Valero	39.11	4.03	4.07	23					
VTR	Ventas	24.03	2.87	2.88	-19.7					
VRSN	Verisign	23.34	N/A	0	8					
VRSK	Verisk	33.49	0.6	0.55	10.07	0.578	8.137	8.714	0.01518	0.00174
VZ	Verizon	213.96	5	4.95	2.88	5.021	3.343	8.365	0.09312	0.01113
VRTX	Vertex	63.17	N/A	0	11.8					
VFC	VF Corporation	21.64	3.48	3.43	44.76					
VTRS	Viatris	13.16	4.41	4.13	-1.7					
V	Visa	464.9	0.69	0.63	17.95	0.687	13.390	14.077	0.34050	0.02419
VNO	Vornado Realty Trust	8.69	4.62	4.62	17.33	5.020	12.977	17.997	0.00814	0.00045
VMC	Vulcan Materials	23.55	0.87	0.79	24.25					
WAB	Wabtec	17.73	0.53	0.49	7.3	0.508	6.290	6.798	0.00627	0.00092
WMT	Walmart	390.62	1.53	1.51	8.35	1.573	6.990	8.563	0.17404	0.02032
WBA	Walgreens Boots Alliance	40.35	4.05	4.01	3.73	4.085	3.910	7.995	0.01678	0.00210
WM	Waste Management	63.66	1.64	1.45	12.25	1.539	9.590	11.129	0.03686	0.00331
WAT	Waters	19.6	N/A	0	10					
WEC	WEC Energy Group	30.12	2.97	2.75	6.1	2.834	5.490	8.324	0.01304	0.00157

WFC	Wells Fargo	194.34	1.93	1.16	118.9					
WELL	Welltower	41.53	2.53	2.53	13	2.694	10.090	12.784	0.02762	0.00216
WST	West Pharmaceutical Services	29.95	0.18	0.17	9.6	0.178	7.823	8.001	0.01247	0.00156
WDC	Western Digital	15.23	N/A	0	20					
WRK	WestRock	12.14	2.12	1.96	21.99					
WY	Weyerhaeuser	28.47	1.87	1.76	5	1.804	4.757	6.561	0.00972	0.00148
WHR	Whirlpool	10.69	3.86	2.99	6.2	3.083	5.557	8.639	0.00481	0.00056
WMB	Williams	39.82	5.11	4.92	5.1	5.045	4.823	9.869	0.02045	0.00207
WTW	Willis Towers Watson	27.31	1.36	1.3	6.36	1.341	5.663	7.005	0.00995	0.00142
WYNN	Wynn Resorts	9.11	N/A	0	-133.4					
XEL	Xcel Energy	37.71	2.76	2.57	6.9	2.659	6.023	8.682	0.01703	0.00196
XYL	Xylem	15.57	1.38	1.29	18.76	1.411	13.930	15.341	0.01243	0.00081
YUM	Yum! Brands	33.51	1.91	1.71	12.52	1.817	9.770	11.587	0.02020	0.00174
ZBRA	Zebra	22.29	N/A	0	10					
ZBH	Zimmer Biomet	25.26	0.77	0.76	9.82	0.797	7.970	8.767	0.01152	0.00131
ZION	Zions Bancorp	10.28	2.14	2.07	-32.4					
ZTS	Zoetis	90.25	0.69	0.53	12	0.562	9.423	9.985	0.04689	0.00470

**Market
Return**

Total Market Capitalization	2.07	8.24	10.32	10.65	
30675					Total
Total Market Cap - Adjusted					1.00000
19220					

Average 30-year T-bond yield October 2021 – March 2022.

2.10

Market Risk Premium

8.55

Notes:

Market Capitalization was obtained as of March 28, 2022

So were forward dividend yield, trailing dividend yield and projected next 5-year earnings growth.

From Finance.yahoo.com

Total Market Capitalization - Adjusted: exclude market capitalization of companies with negative or higher than 20% earnings growth rate

		CAPM				
		Market Return based on IBES Expected Earnings Forecast				
Company		[1]	[2]	[3]	[4]	[5]
		Beta	Risk Free Rate	Market Risk Premium	Adjusted RP	ROE
1	Atmos Energy Corp	0.675	2.10%	8.55%	5.77%	7.87%
2	New Jersey Resources	0.825	2.10%	8.55%	7.05%	9.16%
3	NiSource	0.7	2.10%	8.55%	5.99%	8.09%
4	N.W. Natural	0.675	2.10%	8.55%	5.77%	7.87%
5	One Gas Inc	0.7	2.10%	8.55%	5.99%	8.09%
6	South Jersey Industries	0.9	2.10%	8.55%	7.70%	9.80%
7	Spire Inc	0.725	2.10%	8.55%	6.20%	8.30%
	Min	0.68	2.10%	8.55%	5.77%	7.87%
	Max	0.90	2.10%	8.55%	7.70%	9.80%
	Median	0.70	2.10%	8.55%	5.99%	8.09%
	Average	0.74	2.10%	8.55%	6.35%	8.45%
	Midpoint	0.79	2.10%	8.55%	6.73%	8.83%

[1] Beta is the average beta value of Feb 2020 and Feb 2022.

[2] 6-month Average 30- year U.S. Treasury bond yields are from October 2021 to March 2022.

[3] MRP - See Exhibit___(ZZ-7)

[4] [1]x[3]

[5] [2]+[4]

Exhibit ZZ-9

The Risk Premium Model

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Filing Date	Decision Date	Authorized ROE	Rate Case Duration (months)	Interest Rate	Risk Premium
12/3/1980	7/2/1981	14.00	7	12.83	1.17
4/28/1995	11/27/1995	13.60	7	6.63	6.97
5/25/1990	12/21/1990	13.60	7	8.65	4.95
1/4/1985	3/28/1985	14.80	2	11.58	3.22
11/30/1982	6/30/1983	14.80	7	10.66	4.14
10/15/2013	7/25/2014	9.30	9	3.61	5.69
3/8/2007	11/20/2007	9.90	8	4.90	5.00
2/1/2005	12/9/2005	9.70	10	4.54	5.16
12/15/2017	10/5/2018	9.61	9	3.05	6.56
4/1/2015	1/28/2016	9.40	10	2.93	6.47
9/9/2013	7/7/2014	9.30	10	3.64	5.66
9/25/2006	7/13/2007	9.50	9	4.86	4.64
12/29/2004	11/2/2005	9.70	10	4.55	5.15
11/8/2002	9/17/2003	9.90	10	5.07	4.83
1/30/1996	11/27/1996	11.30	10	6.78	4.52
11/24/1980	7/21/1981	15.78	7	12.86	2.92
11/10/2015	9/2/2016	9.50	9	2.61	6.89
1/16/2007	10/25/2007	9.65	9	4.91	4.74
11/24/2004	9/19/2005	9.45	9	4.58	4.87
4/9/1993	2/9/1994	10.70	10	6.41	4.29
3/21/1985	12/6/1985	12.00	8	10.68	1.32
8/27/1982	9/30/1983	16.15	13	11.04	5.11
11/18/1980	10/29/1981	16.50	11	13.31	3.19
11/2/1979	5/29/1980	16.00	6	11.04	4.96
5/1/2019	12/9/2020	9.10	19	1.89	7.21
5/2/2016	4/11/2017	9.50	11	2.69	6.81
11/12/2010	12/13/2011	9.50	13	4.01	5.49
8/31/2007	12/24/2008	10.00	16	4.39	5.61
12/9/2004	2/15/2006	9.50	14	4.58	4.92
5/5/2000	10/24/2001	11.00	17	5.66	5.34
11/7/1990	2/27/1992	11.75	15	8.11	3.64
7/2/1990	8/12/1993	10.75	37	7.83	2.92
4/20/1989	8/31/1990	12.50	16	8.38	4.12
4/20/1989	8/31/1990	12.50	16	8.38	4.12
9/23/1983	6/13/1984	15.50	8	12.23	3.27
3/2/1982	9/30/1982	16.50	7	13.21	3.29
6/12/1981	11/30/1981	16.75	5	13.98	2.77
6/2/1980	4/30/1981	15.00	11	11.75	3.25
4/8/2011	4/24/2012	9.75	12	3.52	6.23

Exhibit ZZ-9

The Risk Premium Model

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11/7/2008	4/1/2010	9.50	17	4.09	5.41
7/13/2006	11/27/2007	10.00	16	4.86	5.14
8/6/2002	7/1/2003	11.00	10	5.03	5.97
5/3/1993	6/16/1994	10.50	13	6.60	3.90
4/20/2012	12/20/2012	10.40	8	2.82	7.58
11/8/2002	6/2/2004	11.22	19	5.13	6.09
4/22/2019	12/19/2019	10.20	8	2.40	7.80
9/29/2017	10/26/2017	10.20	0	2.87	7.33
4/20/2012	12/20/2012	10.30	8	2.82	7.48
7/1/1980	12/30/1980	14.50	6	11.45	3.05
4/22/2019	12/19/2019	10.05	8	2.40	7.65
9/29/2017	10/30/2017	10.05	1	2.88	7.17
4/20/2012	12/20/2012	10.10	8	2.82	7.28
8/30/2019	3/25/2021	10.00	19	1.77	8.23
8/30/2019	3/25/2021	10.00	19	1.77	8.23
8/30/2019	3/25/2021	10.00	19	1.77	8.23
2/13/2002	3/16/2004	10.90	25	5.25	5.65
2/13/2002	3/16/2004	10.90	25	5.25	5.65
7/2/1982	11/17/1982	16.00	4	12.18	3.82
6/1/2021	12/13/2021	9.20	6	1.98	7.22
2/1/2019	5/19/2020	9.20	15	2.28	6.92
6/24/2010	12/1/2010	10.00	5	3.93	6.07
3/4/2008	8/27/2008	10.25	5	4.54	5.71
2/5/2020	10/12/2020	9.20	8	1.45	7.75
12/17/2010	9/1/2011	10.10	8	4.32	5.78
12/1/2006	7/3/2007	10.25	7	4.87	5.38
5/27/2005	2/3/2006	10.50	8	4.51	5.99
5/31/2002	6/26/2003	11.00	13	5.14	5.86
7/17/2000	3/15/2001	11.25	8	5.65	5.60
11/2/1998	6/8/1999	11.25	7	5.42	5.83
6/5/1996	1/31/1997	11.25	8	6.83	4.42
1/20/1993	11/26/1993	11.00	10	6.59	4.41
5/18/1981	12/1/1981	15.70	6	13.86	1.84
5/7/1980	12/12/1980	15.45	7	11.04	4.41
3/26/1980	5/27/1980	14.60	2	11.07	3.53
7/8/2013	1/22/2014	9.18	6	3.76	5.42
1/16/2009	6/30/2009	9.31	5	3.89	5.42
9/29/2006	3/14/2007	10.10	5	4.77	5.33
11/9/1999	5/25/2000	10.80	6	6.21	4.59
4/10/1995	10/13/1995	10.76	6	6.78	3.98
6/17/1993	12/16/1993	11.20	6	6.26	4.94

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3/13/1989	8/23/1989	12.90	5	8.56	4.34
1/8/1987	6/30/1987	12.60	5	8.04	4.56
4/16/1984	9/12/1984	15.90	4	13.06	2.84
1/24/1983	6/30/1983	15.90	5	10.70	5.20
12/18/1981	5/25/1982	16.25	5	13.71	2.54
1/17/1980	6/25/1980	14.25	5	11.19	3.06
7/1/1988	12/21/1988	12.90	5	9.08	3.82
8/8/1987	2/4/1988	12.60	6	9.17	3.43
11/25/1985	6/11/1986	14.00	6	8.45	5.55
7/15/1983	12/8/1983	15.90	4	11.68	4.22
7/30/1982	12/14/1982	16.40	4	11.58	4.82
7/2/1981	11/25/1981	16.10	4	14.14	1.96
7/2/1981	11/25/1981	16.10	4	14.14	1.96
5/5/1980	10/9/1980	14.50	5	10.60	3.90
5/5/1980	10/9/1980	14.50	5	10.60	3.90
1/20/2009	7/17/2009	9.26	5	3.95	5.31
4/29/2005	12/28/2005	10.00	8	4.50	5.50
7/15/1999	1/28/2000	10.71	6	6.23	4.48
4/23/1993	12/1/1993	11.45	7	6.42	5.03
10/13/1989	3/28/1990	13.00	5	8.19	4.81
3/6/1987	10/20/1987	12.60	7	8.75	3.85
7/24/1984	1/2/1985	16.00	5	12.05	3.95
6/21/1982	11/2/1982	16.25	4	12.54	3.71
5/28/1981	8/25/1981	15.45	2	13.48	1.97
6/6/1980	11/6/1980	14.35	5	10.86	3.49
12/29/2006	6/29/2007	10.10	6	4.89	5.21
7/2/2004	12/8/2004	9.90	5	5.06	4.84
7/24/2001	1/30/2002	11.00	6	5.35	5.65
3/30/1992	8/26/1992	12.43	4	7.75	4.68
6/22/1990	11/19/1990	13.00	5	8.77	4.23
1/13/2020	2/24/2021	9.25	13	1.58	7.67
2/26/2016	3/1/2017	9.25	12	2.64	6.61
2/29/2012	5/10/2013	9.25	14	2.95	6.30
2/7/2003	11/10/2003	10.60	9	5.09	5.51
6/19/2001	10/30/2002	10.60	16	5.46	5.14
12/18/1992	10/8/1993	11.50	9	6.75	4.75
9/22/1989	5/31/1990	12.40	8	8.33	4.07
1/22/1988	10/27/1988	12.95	9	8.95	4.00
10/23/1985	9/5/1986	13.30	10	8.32	4.98
4/14/1982	2/25/1983	15.70	10	12.04	3.66
4/24/1981	2/9/1982	14.95	9	13.87	1.08

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8/3/1984	2/22/1985	14.86	6	11.84	3.02
5/8/1981	12/15/1981	15.81	7	13.82	1.99
6/8/2020	11/19/2020	9.90	5	1.45	8.45
6/3/2019	12/19/2019	10.25	6	2.31	7.94
12/1/2016	2/21/2017	10.55	2	3.06	7.49
5/3/2010	11/3/2010	10.75	6	3.98	6.77
5/25/2004	6/10/2005	10.90	12	4.90	6.00
8/24/2001	4/29/2002	11.00	8	5.45	5.55
11/26/1997	6/30/1998	11.00	7	5.89	5.11
3/31/1993	9/29/1993	11.00	6	6.59	4.41
3/31/1992	9/30/1992	11.60	6	7.67	3.93
5/31/1991	11/26/1991	12.00	5	8.15	3.85
3/30/1990	9/18/1990	12.75	5	8.69	4.06
3/31/1989	7/31/1989	13.00	4	8.56	4.44
5/27/1987	11/29/1988	12.75	18	9.00	3.75
3/27/1986	9/23/1986	12.75	6	7.44	5.31
3/29/1985	9/23/1985	15.30	5	10.79	4.51
4/2/1984	9/25/1984	16.25	5	12.95	3.30
3/31/1983	9/30/1983	16.25	6	11.14	5.11
3/31/1982	9/30/1982	16.70	6	13.16	3.54
7/2/1981	12/22/1981	16.00	5	14.01	1.99
7/20/1979	1/18/1980	14.00	6	9.70	4.31
10/1/2009	3/31/2010	10.70	6	4.48	6.22
3/20/2008	9/19/2008	10.70	6	4.51	6.19
5/20/2005	12/20/2005	10.13	7	4.49	5.64
7/28/1981	9/3/1982	15.50	13	13.76	1.74
5/24/1992	11/25/1992	12.00	6	7.56	4.44
3/1/2019	12/18/2019	9.60	9	2.50	7.10
11/9/1992	9/1/1993	11.25	9	6.95	4.30
8/24/1990	4/30/1991	12.45	8	8.45	4.00
6/30/1989	4/30/1990	12.45	10	8.22	4.23
10/1/1981	7/2/1982	15.10	9	13.78	1.32
9/15/1980	4/30/1981	13.60	7	12.37	1.23
5/11/1984	8/21/1984	14.64	3	13.22	1.42
8/30/1982	2/10/1983	15.00	5	11.02	3.98
12/30/1980	3/3/1982	15.00	14	13.54	1.46
8/1/1980	7/31/1981	14.20	12	12.47	1.73
5/1/1980	11/6/1981	15.17	18	12.43	2.74
8/1/1978	7/31/1981	13.50	36	10.90	2.60
6/22/1978	8/1/1980	12.50	25	9.91	2.59
3/29/1978	4/29/1980	12.50	25	9.86	2.64

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6/1/2015	12/18/2015	9.50	6	2.98	6.52
1/23/2009	7/17/2009	10.50	5	3.97	6.53
4/3/2008	9/30/2008	10.20	6	4.51	5.69
2/6/2004	9/9/2004	10.40	7	5.23	5.17
3/17/1982	9/17/1982	15.25	6	13.28	1.97
3/20/1981	10/20/1981	15.25	7	13.72	1.53
3/17/1980	8/11/1980	14.85	4	10.68	4.17
8/12/2016	4/28/2017	9.50	8	2.82	6.68
4/30/1982	11/4/1982	15.75	6	12.76	2.99
9/3/1981	2/9/1982	15.75	5	14.11	1.64
5/14/1980	10/31/1980	14.50	5	10.75	3.75
2/21/2020	1/13/2021	9.67	10	1.47	8.20
1/31/2018	11/1/2018	9.87	9	3.11	6.76
1/23/2015	12/9/2015	9.60	10	2.85	6.75
1/25/2013	12/18/2013	9.08	10	3.46	5.62
2/18/2011	1/10/2012	9.06	10	3.79	5.27
6/5/2009	4/29/2010	9.40	10	4.46	4.94
6/5/2009	4/29/2010	9.19	10	4.46	4.73
6/5/2009	4/29/2010	9.40	10	4.46	4.94
11/2/2007	9/24/2008	10.68	10	4.49	6.19
11/2/2007	9/24/2008	10.68	10	4.49	6.19
11/2/2007	9/24/2008	10.68	10	4.49	6.19
6/25/2004	5/17/2005	10.00	10	4.89	5.11
11/27/2002	10/22/2003	10.46	10	5.09	5.37
11/27/2002	10/22/2003	10.71	10	5.09	5.62
11/22/2002	10/17/2003	10.54	10	5.08	5.46
6/29/1998	3/1/1999	10.65	8	5.29	5.36
6/29/1998	3/1/1999	10.65	8	5.29	5.36
1/14/1994	12/12/1994	11.82	11	7.39	4.43
5/14/1993	4/6/1994	11.24	10	6.43	4.81
4/24/1991	3/18/1992	12.50	10	8.03	4.47
2/22/1990	1/16/1991	13.25	10	8.64	4.61
1/16/1990	11/28/1990	12.75	10	8.67	4.08
2/19/1982	1/12/1983	15.50	10	12.46	3.04
1/4/1982	11/23/1982	15.50	10	13.02	2.48
5/6/1981	7/1/1982	16.00	14	13.78	2.22
5/1/1980	3/25/1981	15.30	10	11.47	3.83
2/15/1980	1/7/1981	14.30	10	11.33	2.97
6/2/2009	3/24/2010	10.13	9	4.43	5.70
10/19/2001	9/11/2002	11.20	10	5.49	5.71
9/1/1999	7/17/2000	11.06	10	6.15	4.91

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9/1/1992	7/21/1993	11.78	10	7.13	4.65
11/23/1982	10/13/1983	15.52	10	10.96	4.56
10/2/1981	8/25/1982	16.00	10	13.67	2.33
7/11/1980	6/3/1981	14.67	10	12.17	2.50
10/15/2020	9/8/2021	9.67	10	2.00	7.67
2/26/2014	1/21/2015	9.05	10	3.23	5.82
7/31/2012	6/18/2013	9.28	10	2.98	6.30
2/15/2011	1/10/2012	9.45	10	3.80	5.65
2/13/2009	1/21/2010	10.33	11	4.21	6.12
3/9/2007	2/5/2008	9.99	11	4.79	5.20
12/16/1994	11/8/1995	11.30	10	7.04	4.26
12/14/1990	11/8/1991	12.75	10	8.20	4.55
11/2/1983	9/12/1984	15.60	10	12.51	3.09
3/18/1982	12/28/1982	15.25	9	12.46	2.79
1/21/1980	12/17/1980	14.40	11	11.30	3.11
1/14/2021	11/18/2021	9.75	10	2.09	7.66
11/9/2018	10/2/2019	9.73	10	2.76	6.97
3/10/2017	1/31/2018	9.80	10	2.86	6.94
4/29/2008	3/25/2009	10.17	11	4.02	6.15
11/4/2004	9/30/2005	10.51	11	4.60	5.91
5/8/1995	4/3/1996	11.13	11	6.47	4.66
1/27/1987	1/20/1988	12.75	11	8.69	4.06
8/6/1981	7/1/1982	15.55	10	13.89	1.66
2/9/1979	1/3/1980	12.55	10	9.34	3.21
2/26/2014	1/21/2015	9.05	10	3.23	5.82
7/31/2012	6/18/2013	9.28	10	2.98	6.30
2/15/2011	1/10/2012	9.45	10	3.80	5.65
2/13/2009	1/21/2010	10.23	11	4.21	6.02
3/9/2007	2/5/2008	10.19	11	4.79	5.40
12/16/1994	11/8/1995	11.10	10	7.04	4.06
11/15/1991	10/6/1992	12.25	10	7.72	4.53
12/15/1989	11/9/1990	13.25	10	8.62	4.63
10/17/1983	8/30/1984	15.60	10	12.47	3.13
2/3/1982	12/28/1982	15.25	10	12.65	2.60
1/21/1980	12/17/1980	14.20	11	11.30	2.90
5/18/2007	2/13/2008	10.20	9	4.77	5.43
3/19/2004	11/30/2004	10.60	8	5.18	5.42
1/8/1992	10/28/1992	12.25	9	7.70	4.55
5/1/1990	10/31/1990	12.95	6	8.74	4.21
2/6/1987	9/18/1987	13.00	7	8.46	4.54
7/8/1983	1/18/1984	15.53	6	11.70	3.83

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3/25/1982	10/27/1982	17.00	7	12.94	4.06
6/11/1980	12/8/1980	16.40	6	11.14	5.26
11/12/1987	10/26/1988	13.50	11	8.97	4.53
11/16/1981	8/11/1982	17.11	8	13.63	3.48
9/1/2006	8/1/2007	10.15	11	4.87	5.28
3/12/2004	6/30/2004	10.50	3	5.32	5.18
12/15/1995	7/3/1996	11.25	6	6.58	4.67
6/28/2019	2/24/2020	9.10	8	2.24	6.86
1/9/2014	9/4/2014	9.10	7	3.47	5.63
5/15/1992	1/12/1993	12.00	8	7.55	4.45
10/28/1999	6/22/2000	11.25	7	6.17	5.08
8/17/1995	4/15/1996	10.50	8	6.37	4.13
11/25/1987	9/26/1988	12.40	10	8.97	3.43
2/25/1987	10/20/1987	12.98	7	8.70	4.28
10/18/1985	6/13/1986	13.55	7	8.71	4.84
12/16/1983	8/9/1984	15.33	7	12.65	2.68
4/7/1982	12/3/1982	15.33	8	12.55	2.78
5/29/1981	1/25/1982	16.25	8	13.88	2.37
3/10/1981	11/4/1981	15.33	7	13.72	1.61
11/16/1979	7/23/1980	14.19	8	10.84	3.35
6/20/1979	3/5/1980	14.00	8	9.97	4.03
9/28/2018	5/7/2019	9.65	7	3.11	6.54
9/28/2017	5/3/2018	9.70	7	2.95	6.75
2/13/1990	9/13/1990	12.50	7	8.65	3.85
5/9/1986	10/31/1986	13.75	5	7.50	6.25
6/10/1983	12/1/1983	14.50	5	11.55	2.95
5/28/2021	12/28/2021	9.35	7	1.97	7.38
2/1/2007	8/29/2007	10.50	6	4.94	5.56
1/30/1989	10/6/1989	13.00	8	8.57	4.43
1/21/1988	10/21/1988	12.80	9	8.95	3.85
4/30/1984	10/18/1984	15.00	5	12.90	2.10
1/14/1983	7/5/1983	15.00	5	10.70	4.30
5/28/2021	1/3/2022	9.25	7	1.97	7.28
4/23/2010	10/21/2010	10.40	6	4.00	6.40
4/20/2007	10/19/2007	10.50	6	4.96	5.54
6/1/2021	12/28/2021	9.38	7	1.97	7.41
8/31/2018	3/27/2019	9.70	6	3.15	6.55
7/1/2009	12/29/2009	10.38	6	4.32	6.06
3/29/2001	1/31/2002	11.00	10	5.48	5.52
9/16/1992	7/23/1993	11.50	10	7.12	4.38
4/2/1990	10/2/1990	13.00	6	8.72	4.28

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5/4/1984	10/24/1984	15.50	5	12.86	2.64
11/25/2020	6/30/2021	9.43	7	2.09	7.34
9/28/2018	4/30/2019	9.73	7	3.11	6.62
11/23/2016	6/22/2017	9.70	7	3.00	6.70
6/29/2012	12/20/2012	10.25	5	2.80	7.45
2/22/2000	9/27/2000	11.25	7	5.92	5.33
6/29/1990	12/21/1990	12.50	5	8.69	3.81
11/20/1987	7/1/1988	12.75	7	8.89	3.86
11/23/1983	5/16/1984	15.00	5	12.21	2.79
9/10/1982	3/2/1983	15.25	5	10.90	4.35
7/1/1981	1/4/1982	15.50	6	13.99	1.51
3/31/1980	9/24/1980	15.00	5	10.67	4.33
6/14/1995	4/17/1996	10.77	10	6.45	4.32
1/14/1988	11/15/1988	12.00	10	8.95	3.05
3/27/1986	2/24/1987	12.00	11	7.47	4.53
3/1/1985	9/25/1985	14.50	6	10.93	3.57
5/11/1984	10/2/1984	14.80	4	12.97	1.83
9/28/1982	6/27/1983	14.50	9	10.71	3.79
11/4/1981	5/20/1982	15.82	6	13.63	2.19
5/14/1980	10/28/1980	12.00	5	10.71	1.29
11/14/2003	7/22/2004	10.25	8	5.23	5.02
3/28/1991	12/10/1991	11.75	8	8.16	3.59
8/19/1987	7/8/1988	12.00	10	9.04	2.96
3/30/1987	11/24/1987	12.50	7	8.90	3.60
6/11/1985	5/28/1986	14.00	11	9.44	4.56
5/6/1983	9/26/1983	14.50	4	11.30	3.20
5/15/1981	10/26/1981	13.50	5	13.91	(0.41)
7/2/2004	7/6/2005	10.50	12	4.81	5.69
12/10/1982	12/12/1983	14.50	12	11.10	3.40
11/9/1979	11/17/1980	15.50	12	11.00	4.50
9/21/2018	11/7/2019	9.35	13	2.78	6.57
7/31/2008	4/2/2009	10.75	8	3.77	6.98
4/18/1980	4/9/1981	15.00	11	11.52	3.48
11/15/2017	9/28/2018	9.50	10	3.02	6.48
4/16/2010	11/2/2010	9.75	6	4.03	5.72
4/16/2003	10/31/2003	10.20	6	5.09	5.11
4/16/1993	10/29/1993	11.25	6	6.47	4.78
6/24/1988	9/30/1988	13.25	3	9.16	4.09
3/16/1982	9/30/1982	15.50	6	13.19	2.31
11/15/2017	9/28/2018	9.50	10	3.02	6.48
4/16/2010	11/2/2010	9.75	6	4.03	5.72

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5/17/1982	11/30/1982	16.10	6	12.46	3.64
4/16/2013	2/28/2014	9.55	10	3.60	5.95
4/13/2012	11/1/2012	9.45	6	2.82	6.63
4/16/2009	10/30/2009	9.95	6	4.28	5.67
4/27/2005	11/30/2005	10.00	7	4.48	5.52
4/16/1992	10/30/1992	11.40	6	7.63	3.77
5/17/1983	8/31/1983	15.25	3	11.30	3.95
5/17/1982	11/30/1982	15.50	6	12.46	3.04
7/17/1981	1/31/1982	14.00	6	14.08	(0.08)
6/16/2015	4/29/2016	9.80	10	2.87	6.93
1/14/2011	8/1/2011	9.20	6	4.42	4.78
9/16/2010	3/31/2011	9.45	6	4.31	5.14
7/17/2008	2/2/2009	10.05	6	3.88	6.17
12/17/2014	10/30/2015	9.80	10	2.81	6.99
6/16/1987	12/31/1987	13.25	6	9.09	4.16
5/17/1982	11/30/1982	15.50	6	12.46	3.04
7/17/1979	1/31/1980	12.61	6	9.76	2.85
5/17/2018	1/18/2019	9.70	8	3.14	6.56
5/24/2019	12/17/2019	9.75	6	2.32	7.43
6/8/2018	1/4/2019	9.80	7	3.15	6.65
11/6/2015	6/3/2016	9.65	7	2.76	6.89
5/17/2013	12/13/2013	9.60	7	3.65	5.95
7/27/2012	2/22/2013	9.60	7	2.91	6.69
5/7/2010	12/6/2010	9.56	7	4.00	5.56
4/29/2005	12/21/2005	11.00	7	4.50	6.50
11/7/1999	6/19/2000	11.05	7	6.18	4.87
4/21/1995	11/20/1995	11.40	7	6.67	4.73
9/25/1992	4/23/1993	11.75	7	7.25	4.50
11/10/1986	5/5/1987	12.85	5	7.63	5.22
12/6/1982	7/1/1983	14.80	6	10.66	4.14
7/10/1981	2/8/1982	15.50	7	14.07	1.43
11/13/1979	6/10/1980	13.78	7	11.01	2.77
5/1/2006	9/26/2006	10.75	4	5.08	5.67
5/14/2021	12/3/2021	9.65	6	2.01	7.64
5/15/2020	11/7/2020	9.60	5	1.44	8.16
5/22/2019	12/18/2019	9.60	7	2.33	7.27
4/14/2017	9/19/2017	9.70	5	2.85	6.85
2/28/2013	9/23/2013	9.60	6	3.38	6.22
8/28/2020	4/9/2021	9.70	7	1.81	7.89
4/22/2019	10/15/2019	9.70	5	2.45	7.25
5/15/2018	12/11/2018	9.70	7	3.15	6.55

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4/26/2013	11/22/2013	9.50	7	3.57	5.93
4/15/2011	11/14/2011	9.60	7	3.80	5.80
4/20/2007	11/15/2007	10.00	6	4.92	5.08
3/13/2003	10/31/2003	10.75	7	5.10	5.65
6/1/1994	10/18/1994	11.50	4	7.58	3.92
3/31/1993	7/29/1993	11.50	4	6.80	4.70
3/31/1989	8/22/1989	12.80	4	8.48	4.32
2/23/1988	9/20/1988	12.90	7	9.02	3.88
3/31/1983	8/29/1983	16.00	5	11.03	4.97
4/29/1982	11/24/1982	16.02	6	12.56	3.46
7/31/1981	3/1/1982	15.96	7	14.11	1.85
7/11/1980	12/31/1980	14.56	5	11.54	3.02
10/17/1979	1/14/1980	13.20	2	10.21	2.99
6/28/2019	3/26/2020	9.48	9	2.15	7.33
5/31/2017	2/28/2018	9.50	9	2.85	6.65
12/16/2019	9/10/2020	9.90	8	1.59	8.31
11/30/2018	9/26/2019	9.90	10	2.73	7.17
10/31/2017	8/28/2018	10.00	10	3.00	7.00
8/13/2010	5/26/2011	10.50	9	4.26	6.24
12/29/1994	3/11/1996	11.60	14	6.78	4.82
11/13/1987	12/7/1989	13.25	25	8.75	4.50
2/12/2021	12/9/2021	9.90	10	2.10	7.80
11/25/2019	8/20/2020	9.90	8	1.65	8.25
11/22/2017	9/13/2018	10.00	9	3.02	6.98
9/1/1992	10/28/1993	11.50	14	6.90	4.60
9/11/1989	4/12/1990	13.25	7	8.21	5.04
8/14/1987	12/22/1988	13.50	16	9.05	4.45
2/10/1984	6/26/1985	14.82	16	12.07	2.75
3/22/2021	9/9/2021	9.85	5	2.13	7.72
6/22/2015	12/11/2015	9.90	5	2.97	6.93
6/7/2013	11/14/2013	10.25	5	3.67	6.58
7/1/2009	12/16/2009	10.75	5	4.31	6.44
5/16/2008	1/13/2009	10.45	8	4.12	6.33
10/31/1995	3/27/1997	10.75	17	6.66	4.09
6/29/1984	3/11/1986	14.00	20	11.01	2.99
7/25/1983	2/14/1984	14.25	6	11.74	2.51
5/31/2019	12/6/2019	9.87	6	2.31	7.56
5/26/2006	1/9/2007	11.00	7	4.91	6.09
12/1/2004	3/29/2005	11.00	3	4.76	6.24
11/21/2002	5/2/2003	11.40	5	5.10	6.30
12/10/1996	10/29/1997	10.75	10	6.71	4.04

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4/14/1989	6/29/1990	13.25	14	8.35	4.90
4/29/1988	10/25/1988	13.25	5	9.12	4.13
9/29/2017	6/6/2018	9.80	8	2.97	6.83
2/6/2014	12/3/2014	10.00	10	3.34	6.66
4/11/2017	2/21/2018	9.80	10	2.86	6.94
4/2/2009	2/10/2010	10.00	10	4.32	5.68
5/2/2006	3/22/2007	10.50	10	4.91	5.59
11/4/2003	9/21/2004	10.50	10	5.21	5.29
10/3/1997	8/26/1998	10.93	10	5.90	5.03
3/1/1996	1/22/1997	11.30	10	6.81	4.49
3/8/1991	1/22/1992	12.84	10	8.09	4.75
11/14/1980	10/2/1981	14.80	10	13.19	1.61
12/11/2020	10/27/2021	9.37	10	2.06	7.31
4/11/2017	2/21/2018	9.80	10	2.86	6.94
1/26/1999	12/14/1999	10.50	10	5.89	4.61
1/2/2014	10/29/2014	10.80	10	3.42	7.38
8/1/1985	11/8/1985	12.94	3	10.52	2.42
8/31/1982	11/30/1982	12.98	3	11.30	1.68
9/25/2017	5/29/2018	9.40	8	2.96	6.44
7/13/1981	4/18/1982	14.70	9	13.98	0.72
6/25/1980	4/29/1981	13.50	10	11.90	1.60
9/30/2016	7/20/2017	9.55	9	2.92	6.63
7/29/1996	10/31/1997	11.25	15	6.73	4.52
4/7/1980	12/22/1980	13.45	8	11.10	2.35
3/31/2003	10/30/2003	11.00	7	5.09	5.91
5/8/1991	12/6/1991	12.70	7	8.15	4.55
3/27/1986	11/10/1986	14.00	7	7.49	6.51
4/27/1983	12/12/1983	15.50	7	11.38	4.12
4/1/2019	10/31/2019	9.70	7	2.48	7.22
5/31/2013	12/17/2013	10.00	6	3.69	6.31
3/31/2008	10/24/2008	10.60	6	4.47	6.13
3/28/2002	10/28/2002	11.30	7	5.47	5.83
3/31/2000	10/5/2000	11.30	6	5.89	5.41
12/21/1990	7/22/1991	12.90	7	8.28	4.62
5/14/1985	12/11/1985	14.90	7	10.45	4.45
4/30/1982	11/30/1982	15.65	7	12.51	3.14
6/26/1981	2/2/1982	16.24	7	14.01	2.23
3/31/2016	10/28/2016	9.70	7	2.43	7.27
3/31/2008	10/24/2008	10.60	6	4.47	6.13
4/2/1998	10/30/1998	11.40	7	5.57	5.83
3/9/1994	10/7/1994	11.87	7	7.43	4.44

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4/1/1991	11/1/1991	12.90	7	8.20	4.70
4/5/1989	11/5/1989	13.20	7	8.33	4.87
4/11/1986	11/19/1986	13.75	7	7.49	6.26
4/19/1985	11/20/1985	14.90	7	10.61	4.29
1/19/1983	8/18/1983	15.30	7	10.91	4.39
10/20/1981	5/14/1982	15.80	6	13.72	2.08
6/10/1980	1/12/1981	14.95	7	11.30	3.65
8/24/1981	4/12/1982	15.10	7	14.02	1.08
12/15/2006	6/13/2007	10.75	6	4.85	5.90
4/18/2019	11/13/2019	9.60	6	2.43	7.17
8/31/2016	6/30/2017	9.60	10	2.86	6.74
3/10/2009	12/17/2009	10.30	9	4.21	6.09
4/16/2002	11/20/2002	10.00	7	5.41	4.59
12/13/1990	9/30/1991	12.40	9	8.23	4.17
12/16/1988	1/18/1990	12.50	13	8.45	4.05
12/12/1986	12/8/1987	12.50	12	8.49	4.01
12/15/1981	5/21/1982	15.50	5	13.71	1.79
3/30/2021	11/17/2021	9.60	7	2.08	7.52
3/28/2019	11/13/2019	9.60	7	2.48	7.12
11/20/2007	10/3/2008	10.30	10	4.48	5.82
4/5/1993	1/5/1994	11.50	9	6.43	5.07
8/22/1991	6/24/1992	12.20	10	7.87	4.33
8/7/1990	2/15/1991	12.70	6	8.59	4.11
3/30/1989	3/21/1990	12.80	11	8.30	4.50
6/29/1987	12/31/1987	12.85	6	9.14	3.71
10/11/1985	7/30/1986	13.30	9	8.52	4.78
1/21/1983	6/9/1983	14.85	4	10.67	4.18
5/19/1981	12/17/1981	14.75	7	13.82	0.93
1/12/2018	10/29/2018	9.60	9	3.10	6.50
5/29/2009	6/18/2010	10.30	12	4.43	5.87
9/30/2005	11/9/2006	10.00	13	4.85	5.15
5/21/2001	1/9/2002	10.00	7	5.44	4.56
11/14/1991	12/30/1992	12.00	13	7.68	4.32
7/1/1983	3/23/1984	15.50	8	11.78	3.72
2/13/1981	2/11/1982	16.00	12	13.68	2.32
4/2/1979	5/8/1980	13.75	13	10.07	3.68
3/13/2020	9/23/2020	9.60	6	1.38	8.22
1/27/2017	10/20/2017	9.60	8	2.91	6.69
11/29/2013	9/30/2014	9.75	10	3.51	6.24
1/15/2010	9/16/2010	10.30	8	4.29	6.01
8/29/2003	7/8/2004	10.00	10	5.24	4.76

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1/16/1996	1/27/1997	11.25	12	6.74	4.51
1/7/1994	12/14/1994	11.50	11	7.37	4.13
7/19/1991	8/10/1992	12.10	12	7.87	4.23
4/16/1987	3/23/1988	13.00	11	8.90	4.10
3/30/1984	2/15/1985	15.00	10	12.37	2.63
1/28/1983	5/19/1983	14.85	3	10.62	4.23
8/27/1981	10/8/1982	15.00	13	13.58	1.42
12/23/2019	12/16/2020	9.38	11	1.57	7.81
3/25/2011	1/31/2012	10.00	10	3.65	6.35
5/30/2006	6/29/2007	9.53	13	4.91	4.62
1/10/2003	1/13/2004	10.25	12	5.11	5.14
8/28/1995	2/13/1997	11.00	17	6.63	4.37
8/28/1987	8/8/1988	12.74	11	9.05	3.69
2/27/1984	11/7/1984	15.00	8	12.71	2.29
12/26/1982	10/26/1983	14.75	10	11.03	3.72
11/25/1981	8/30/1982	16.25	9	13.57	2.68
3/31/1980	7/27/1981	15.50	16	11.93	3.57
6/6/2016	12/22/2016	9.50	6	2.51	6.99
6/3/2013	12/16/2013	9.73	6	3.69	6.04
6/1/2010	12/20/2010	10.10	6	4.00	6.10
10/3/2005	4/26/2006	10.60	6	4.69	5.91
12/15/1992	6/7/1993	11.50	5	7.03	4.47
7/26/1991	1/31/1992	12.00	6	7.89	4.11
12/15/1987	6/24/1988	11.50	6	8.86	2.64
1/12/1983	5/9/1983	15.50	3	10.64	4.86
3/2/1981	8/28/1981	15.00	5	13.35	1.65
4/30/1980	11/4/1980	15.00	6	10.74	4.26
9/1/2021	3/22/2022	9.40	6	2.05	7.35
9/1/2021	3/22/2022	9.40	6	2.05	7.35
2/28/2020	9/25/2020	9.25	7	1.38	7.87
2/28/2020	9/25/2020	9.25	7	1.38	7.87
5/29/2018	12/24/2018	9.25	6	3.15	6.10
5/29/2018	12/24/2018	9.25	6	3.15	6.10
4/4/2012	10/31/2012	10.00	7	2.84	7.16
4/4/2012	10/31/2012	9.30	7	2.84	6.46
4/3/2009	10/28/2009	10.15	6	4.25	5.90
4/3/2009	10/28/2009	10.15	6	4.25	5.90
3/8/2004	8/26/2004	10.50	5	5.28	5.22
3/8/2004	8/26/2004	10.50	5	5.28	5.22
3/1/1993	10/25/1993	11.55	7	6.55	5.00
10/13/1983	4/9/1984	15.20	5	11.95	3.25

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7/30/1982	11/30/1982	16.00	4	11.70	4.30
7/30/1982	1/24/1983	16.00	5	11.34	4.66
10/14/1981	4/12/1982	16.70	6	13.84	2.86
5/6/1980	10/27/1980	15.20	5	10.68	4.52
4/30/1980	10/27/1980	15.20	6	10.68	4.52
11/22/1989	10/17/1990	11.90	10	8.56	3.34
11/14/1988	9/21/1989	12.10	10	8.69	3.41
11/24/1982	10/19/1983	15.20	10	10.97	4.23
11/25/1981	10/19/1982	15.90	10	13.30	2.60
11/23/1981	10/10/1984	15.50	35	12.20	3.30
11/25/1980	10/20/1981	16.50	10	13.28	3.22
10/11/1979	9/4/1980	14.00	10	10.77	3.23
7/31/2008	6/22/2009	10.00	10	3.87	6.13
11/11/1995	10/3/1996	10.00	10	6.65	3.35
11/12/1992	12/16/1993	10.60	13	6.71	3.89
8/10/1990	7/1/1991	11.70	10	8.46	3.24
5/23/1984	4/16/1985	15.70	10	12.16	3.54
2/16/1983	1/10/1984	15.90	10	11.25	4.65
11/23/1981	10/15/1982	15.90	10	13.32	2.58
8/21/1980	7/14/1981	16.90	10	12.49	4.41
11/20/1990	10/3/1991	11.30	10	8.24	3.06
11/9/1984	11/25/1985	13.30	12	11.00	2.30
7/7/1981	6/7/1982	16.00	11	13.86	2.14
4/11/1979	3/7/1980	13.50	11	9.81	3.69
2/27/2020	5/19/2021	8.80	14	1.68	7.12
12/31/1991	11/25/1992	11.00	11	7.69	3.31
1/25/1991	11/26/1991	11.60	10	8.17	3.43
2/27/1989	1/26/1990	12.10	11	8.35	3.75
5/27/1983	12/9/1983	15.30	6	11.52	3.78
2/26/1982	1/24/1983	15.50	11	12.37	3.13
4/28/2016	4/20/2017	8.70	11	2.69	6.01
1/29/2007	12/21/2007	9.10	10	4.84	4.26
10/21/1994	9/15/1995	10.40	10	7.31	3.09
8/27/1990	7/19/1991	12.30	10	8.44	3.86
8/29/1989	7/19/1990	11.70	10	8.33	3.37
8/26/1988	7/19/1989	11.80	10	8.88	2.92
8/27/1987	7/18/1988	12.00	10	9.04	2.96
5/10/1985	4/2/1986	12.90	10	9.91	2.99
1/28/1983	12/20/1983	15.40	10	11.20	4.20
1/29/1982	12/21/1982	15.70	10	12.71	2.99
1/30/1981	12/22/1981	15.70	10	13.55	2.15

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5/23/1980	12/26/1980	14.00	7	11.17	2.83
6/16/1979	3/14/1980	14.00	9	10.05	3.95
2/4/1994	4/19/1995	11.00	14	7.51	3.49
2/19/1993	2/2/1994	10.40	11	6.47	3.93
1/31/1992	2/2/1993	11.40	12	7.65	3.75
4/20/1984	3/14/1985	15.50	10	12.31	3.19
4/29/1983	3/20/1984	16.00	10	11.56	4.44
4/30/1982	3/23/1983	15.40	10	11.86	3.54
4/16/1981	3/8/1982	17.10	10	13.85	3.25
4/18/1980	3/12/1981	15.65	10	11.41	4.24
4/6/1979	2/29/1980	14.00	10	9.74	4.26
8/28/1991	7/22/1992	11.20	10	7.85	3.35
2/27/1990	1/25/1991	11.70	11	8.63	3.07
8/29/1988	7/25/1989	12.80	11	8.86	3.94
4/11/1988	3/8/1989	13.00	11	9.06	3.94
5/18/1984	4/9/1985	15.50	10	12.20	3.30
5/27/1983	4/18/1984	16.20	10	11.75	4.45
2/18/1982	1/11/1983	15.90	10	12.48	3.42
8/28/1979	7/22/1980	14.10	10	10.55	3.55
3/18/1985	2/11/1986	12.50	11	10.44	2.06
7/7/1982	5/31/1983	14.00	10	11.23	2.77
1/5/1981	12/1/1981	16.00	11	13.45	2.55
5/1/1979	3/27/1980	12.69	11	10.01	2.68
2/15/2002	3/7/2003	9.96	12	5.38	4.58
8/2/1991	6/29/1992	11.00	11	7.89	3.11
8/3/1990	6/25/1991	11.70	10	8.46	3.24
8/15/1989	7/6/1990	12.10	10	8.32	3.78
8/21/1987	7/20/1988	13.40	11	9.04	4.36
8/22/1986	6/15/1987	13.20	9	7.78	5.42
8/17/1984	7/9/1985	15.00	10	11.52	3.48
8/19/1983	7/10/1984	16.00	10	12.27	3.73
8/27/1982	7/19/1983	15.10	10	10.89	4.21
8/21/1981	7/13/1982	16.80	10	13.88	2.92
8/28/1980	7/10/1981	16.00	10	12.52	3.48
8/24/1979	7/18/1980	13.80	10	10.54	3.26
3/3/2008	12/3/2008	10.39	9	4.39	6.00
3/6/1991	11/27/1991	12.70	8	8.18	4.52
7/5/1988	10/17/1989	12.41	15	8.77	3.64
12/16/1982	11/9/1983	16.51	10	11.05	5.46
12/9/1982	11/9/1983	16.51	11	11.04	5.47
1/12/1982	9/15/1982	16.04	8	13.49	2.55

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12/31/1981	9/9/1982	16.04	8	13.54	2.50
10/29/1980	8/12/1981	13.72	9	12.91	0.81
10/17/1980	8/12/1981	13.72	9	12.86	0.86
7/9/2012	11/13/2013	9.84	16	3.18	6.66
7/18/2007	5/28/2008	10.50	10	4.60	5.90
7/31/2001	6/11/2002	11.77	10	5.50	6.27
1/8/1996	12/12/1996	11.96	11	6.72	5.24
4/2/1990	1/3/1991	13.02	9	8.66	4.36
3/6/1984	11/20/1984	15.92	8	12.68	3.24
4/16/1981	1/27/1982	16.84	9	13.83	3.01
4/2/1991	2/20/1992	13.00	10	8.05	4.95
10/21/1983	8/7/1984	16.69	9	12.49	4.20
2/6/1981	9/30/1981	15.94	7	13.48	2.46
8/7/1979	5/7/1980	14.27	9	10.56	3.71
1/4/1983	8/19/1983	15.79	7	10.88	4.91
11/13/1981	8/4/1982	15.58	8	13.63	1.95
10/31/1980	8/12/1981	14.41	9	12.91	1.50
10/2/1979	7/9/1980	14.51	9	10.74	3.77
5/28/2004	4/13/2005	10.60	10	4.98	5.62
7/26/2001	12/4/2002	10.75	16	5.42	5.33
1/30/1985	1/17/1986	14.50	11	10.66	3.84
7/9/1982	9/16/1983	15.51	14	11.26	4.25
6/20/1980	2/20/1981	14.50	8	11.58	2.92
5/28/2021	11/30/2021	9.40	6	2.00	7.40
7/8/2015	1/6/2016	9.50	6	2.96	6.54
6/26/2009	12/14/2009	10.50	5	4.30	6.20
1/28/2005	10/4/2005	9.90	8	4.51	5.39
5/23/1985	12/20/1985	14.88	7	10.38	4.50
12/17/1982	10/27/1983	14.88	10	11.02	3.86
6/15/1981	3/31/1982	16.25	9	13.92	2.33
6/30/1980	2/11/1981	14.50	7	11.61	2.89
6/15/1979	2/8/1980	14.50	7	9.71	4.79
3/16/2020	12/10/2020	9.40	8	1.44	7.96
3/15/2019	10/8/2019	9.40	6	2.54	6.86
11/30/2016	9/13/2017	9.40	9	2.95	6.45
5/1/2015	2/29/2016	9.40	10	2.93	6.47
9/2/2014	4/9/2015	9.50	7	2.82	6.68
6/25/2009	10/26/2009	10.10	4	4.29	5.81
4/9/2003	9/25/2003	10.25	5	5.05	5.20
3/31/2020	1/6/2021	9.40	9	1.46	7.94
12/30/2019	10/16/2020	9.40	9	1.54	7.86

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12/29/2017	10/26/2018	9.40	10	3.08	6.32
12/30/2011	10/26/2012	9.50	10	2.94	6.56
10/16/1998	11/12/1999	10.25	13	5.68	4.57
1/6/1989	10/18/1989	13.25	9	8.57	4.68
3/11/1983	3/23/1983	16.10	0	10.68	5.42
8/31/1982	10/1/1982	16.50	1	12.07	4.43
3/1/1982	4/1/1982	16.50	1	13.54	2.96
2/27/1981	4/1/1981	15.30	1	12.70	2.60
3/1/1980	4/1/1980	14.75	1	12.34	2.41
4/24/2020	2/19/2021	9.86	10	1.54	8.32
12/28/1989	9/20/1990	12.50	8	8.61	3.89
11/28/1983	8/27/1984	14.52	9	12.58	1.94
7/29/1981	1/14/1982	11.95	5	14.09	(2.14)
3/31/1980	8/28/1980	13.61	5	10.57	3.04
2/21/1990	11/21/1990	12.50	9	8.70	3.80
1/4/1985	9/26/1985	14.50	8	11.03	3.47
10/12/1982	7/8/1983	15.50	8	10.69	4.81
5/30/1980	10/24/1980	14.00	4	10.73	3.27
3/8/1994	12/1/1994	11.00	8	7.54	3.46
4/3/1990	12/20/1990	12.50	8	8.68	3.82
4/3/1989	12/21/1989	12.80	8	8.26	4.54
8/28/1987	5/27/1988	13.18	9	9.04	4.14
2/25/1986	11/25/1986	13.15	9	7.56	5.59
12/10/1982	4/29/1983	15.05	4	10.64	4.41
6/26/1981	3/26/1982	16.00	9	13.97	2.03
10/29/1979	8/28/1980	14.00	10	10.81	3.19
9/30/2020	6/17/2021	10.24	8	1.98	8.26
4/16/1987	1/15/1988	13.15	9	9.00	4.15
7/29/1983	4/27/1984	15.85	9	11.93	3.92
9/28/1981	6/25/1982	16.50	9	13.79	2.71
3/30/1979	1/4/1980	13.75	9	9.40	4.35
4/28/1988	1/26/1989	12.60	9	9.07	3.53
1/28/1986	10/30/1986	13.00	9	7.71	5.29
4/15/1983	1/13/1984	15.50	9	11.40	4.10
4/16/1982	11/5/1982	14.73	6	12.78	1.95
4/30/1981	9/23/1981	14.34	4	13.73	0.61
4/29/1980	8/21/1980	13.03	3	10.30	2.73
4/27/2006	2/8/2007	10.40	9	4.94	5.46
4/29/1983	1/26/1984	15.90	9	11.46	4.44
3/31/1982	12/17/1982	16.25	8	12.47	3.78
4/30/1981	10/23/1981	15.50	5	13.90	1.60

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4/27/2012	12/20/2012	9.50	7	2.81	6.69
4/1/2008	11/24/2008	10.50	7	4.43	6.07
2/16/1995	11/17/1995	10.90	9	6.85	4.05
1/15/1993	10/14/1993	11.20	9	6.67	4.53
5/17/1990	2/15/1991	12.80	9	8.56	4.24
8/4/1988	5/4/1989	13.00	9	9.05	3.95
1/23/1987	7/27/1987	13.50	6	8.17	5.33
2/27/1984	11/30/1984	15.50	9	12.62	2.88
9/28/1981	6/23/1982	15.50	8	13.79	1.71
4/26/2005	10/31/2005	10.25	6	4.45	5.80
6/1/1989	11/28/1989	12.75	6	8.09	4.66
6/5/1987	11/12/1987	12.75	5	9.07	3.68
6/13/1983	9/28/1983	14.25	3	11.50	2.75
6/15/2018	9/26/2018	10.20	3	3.05	7.15
6/15/2017	9/27/2017	10.20	3	2.81	7.39
6/15/2016	10/13/2016	10.20	4	2.31	7.89
5/3/2002	11/1/2002	12.60	6	5.40	7.20
5/8/1995	11/7/1995	12.50	6	6.64	5.86
11/25/2014	5/11/2015	9.80	5	2.64	7.16
6/22/2012	11/8/2012	10.10	4	2.78	7.32
10/15/2008	3/9/2009	10.30	4	3.49	6.81
5/4/2007	10/8/2007	10.48	5	4.99	5.49
5/11/1989	11/9/1989	12.60	6	8.18	4.42
8/21/1986	2/13/1987	12.60	5	7.50	5.10
12/15/1984	6/10/1985	15.75	5	11.39	4.36
11/16/2009	5/24/2010	10.05	6	4.55	5.50
6/30/2006	12/5/2006	10.20	5	4.90	5.30
1/26/2004	10/20/2004	10.20	8	5.19	5.01
5/1/1997	10/7/1998	11.06	17	6.06	5.00
8/3/1993	1/25/1994	12.00	5	6.16	5.84
8/16/1985	2/12/1986	15.20	6	10.00	5.20
6/28/1982	12/13/1982	16.00	5	12.00	4.00
9/2/2011	1/23/2012	10.20	4	3.06	7.14
6/1/1996	12/17/1996	11.50	6	6.85	4.65
3/28/1991	9/27/1991	12.50	6	8.25	4.25
6/9/1989	11/3/1989	12.93	4	8.10	4.83
5/15/1987	11/13/1987	12.75	6	9.04	3.71
4/26/1985	10/25/1985	15.25	6	10.64	4.61
9/17/1982	3/16/1983	16.00	6	10.82	5.18
9/27/2019	4/21/2020	9.80	6	1.99	7.81
10/11/2018	5/21/2019	9.80	7	3.08	6.72

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5/31/2012	12/4/2012	10.50	6	2.77	7.73
4/24/2009	1/26/2010	10.40	9	4.35	6.05
10/26/2007	6/24/2008	10.00	8	4.50	5.50
5/31/2006	3/29/2007	10.00	10	4.88	5.12
5/23/2003	5/25/2004	10.00	12	5.16	4.84
11/14/2019	6/16/2020	9.65	7	1.78	7.87
11/16/2016	5/23/2017	9.60	6	3.03	6.57
7/2/2012	12/4/2012	10.00	5	2.79	7.21
12/3/2010	4/18/2011	10.05	4	4.53	5.52
7/31/2009	2/23/2010	10.50	6	4.39	6.11
3/6/2008	10/20/2008	10.06	7	4.47	5.59
12/20/2019	8/4/2020	9.50	7	1.61	7.89
3/31/2016	9/27/2016	9.50	6	2.43	7.07
6/3/2010	12/14/2010	10.33	6	3.99	6.34
7/1/2013	2/21/2014	9.85	7	3.75	6.10
12/3/2009	4/8/2010	10.35	4	4.61	5.74
12/19/2007	6/27/2008	10.00	6	4.50	5.50
5/3/2002	12/30/2002	11.20	8	5.35	5.85
4/2/1993	1/10/1994	11.00	9	6.43	4.57
3/30/1990	11/21/1990	12.10	7	8.73	3.37
8/8/1984	2/7/1985	14.85	6	11.85	3.00
1/9/1981	6/22/1981	16.00	5	12.93	3.07
1/4/1980	5/19/1980	15.50	4	11.46	4.04
5/3/2010	12/17/2010	10.10	7	4.04	6.06
5/4/1993	6/23/1994	10.60	13	6.62	3.98
4/30/1990	11/29/1990	12.75	7	8.72	4.03
7/1/2005	7/24/2006	10.00	12	4.74	5.26
7/22/1982	12/20/1982	15.00	5	11.65	3.35
6/6/1990	4/3/1991	13.00	10	8.51	4.49
3/17/1988	10/28/1988	13.00	7	9.07	3.93
10/30/2020	9/27/2021	9.40	11	2.01	7.39
4/30/2019	3/25/2020	9.40	11	2.26	7.14
5/26/2017	4/26/2018	9.50	11	2.89	6.61
2/9/2015	1/6/2016	9.50	11	2.89	6.61
3/23/2010	11/19/2010	10.20	8	4.12	6.08
1/23/2009	12/22/2009	10.20	11	4.13	6.07
3/4/2008	12/29/2008	10.20	10	4.26	5.94
4/26/2007	12/19/2007	10.20	7	4.86	5.34
3/29/2005	12/21/2005	10.40	8	4.52	5.88
10/22/1999	9/29/2000	11.16	11	6.07	5.09
6/27/1997	12/24/1997	10.75	6	6.36	4.39

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9/1/1988	10/20/1989	12.90	13	8.70	4.20
3/17/1982	12/29/1982	16.25	9	12.46	3.79
3/6/1981	11/25/1981	15.25	8	13.67	1.58
3/3/1980	1/26/1981	15.25	10	11.33	3.92
6/19/2020	5/18/2021	9.40	11	1.77	7.63
3/29/2019	2/3/2020	9.40	10	2.42	6.98
8/31/2017	7/20/2018	9.40	10	2.96	6.44
12/11/1995	7/22/1996	11.25	7	6.61	4.64
6/24/1986	1/23/1987	13.55	7	7.45	6.10
11/8/1982	6/20/1983	16.50	7	10.63	5.87
5/6/1982	8/6/1982	16.50	3	13.57	2.93
8/7/1981	4/9/1982	16.50	8	14.02	2.48
11/12/1980	4/29/1981	14.25	5	12.60	1.65
12/31/2018	10/21/2019	9.40	9	2.65	6.75
3/28/2008	12/26/2008	10.10	9	4.26	5.84
6/20/2019	7/8/2020	9.40	12	1.95	7.45
1/13/2017	12/5/2017	9.50	10	2.90	6.60
2/1/2013	6/25/2013	9.80	4	3.14	6.66
6/13/2011	5/7/2012	9.80	10	3.34	6.46
5/8/2009	4/2/2010	10.10	10	4.43	5.67
12/3/2007	10/8/2008	10.15	10	4.47	5.68
2/15/2006	1/5/2007	10.40	10	4.92	5.48
4/5/2004	2/18/2005	10.30	10	5.09	5.21
11/26/2001	8/28/2002	11.00	9	5.58	5.42
7/27/1992	9/27/1993	10.50	14	7.01	3.49
8/15/1984	12/28/1984	16.25	4	11.94	4.31
4/13/1983	10/1/1983	16.25	5	11.18	5.07
5/16/1982	12/29/1982	16.25	7	12.21	4.04
3/21/1980	11/19/1980	13.50	8	11.00	2.50
8/28/2020	11/24/2020	9.80	2	1.53	8.27
4/8/2016	11/9/2016	9.80	7	2.44	7.36
4/17/2014	11/26/2014	10.20	7	3.26	6.94
3/23/2012	11/9/2012	10.30	7	2.87	7.43
4/22/2010	1/12/2011	10.30	8	4.10	6.20
4/29/2009	12/22/2009	10.40	7	4.33	6.07
5/7/2007	12/14/2007	10.80	7	4.87	5.93
4/19/2005	12/12/2005	11.00	7	4.49	6.51
5/5/2004	12/22/2004	11.50	7	5.16	6.34
5/30/2003	1/13/2004	12.00	7	5.17	6.83
5/1/2002	2/28/2003	12.30	10	5.30	7.00
4/17/2000	11/28/2000	12.90	7	5.87	7.03

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The Risk Premium Model

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4/15/1998	12/10/1998	12.20	7	5.49	6.71
9/3/1996	7/17/1997	12.00	10	6.80	5.20
4/14/1994	12/8/1994	11.70	7	7.63	4.07
10/26/1992	6/3/1993	12.00	7	7.15	4.85
9/29/1989	6/15/1990	13.20	8	8.33	4.87
9/30/1988	6/8/1989	13.50	8	8.97	4.53
10/9/1987	6/14/1988	13.50	8	8.95	4.55
10/10/1986	5/28/1987	13.50	7	7.76	5.74
10/25/1985	5/29/1986	13.90	7	8.72	5.18
6/15/1984	7/26/1985	14.50	13	11.72	2.78
5/27/1983	2/28/1984	14.50	9	11.62	2.88
6/18/1982	6/2/1983	14.50	11	11.37	3.13
9/11/1981	7/22/1982	14.50	10	13.82	0.68
5/31/1979	2/14/1980	13.00	8	9.70	3.30
5/4/2017	12/7/2017	9.80	7	2.84	6.96
5/29/2015	12/3/2015	10.00	6	2.98	7.02
5/31/2013	12/5/2013	10.20	6	3.67	6.53
6/1/2011	12/22/2011	10.40	6	3.52	6.88
6/1/2007	1/8/2008	10.75	7	4.83	5.92
11/14/1997	9/15/1998	11.90	10	5.81	6.09
3/15/1996	11/26/1996	11.30	8	6.87	4.43
6/1/1995	12/14/1995	11.30	6	6.52	4.78
6/1/1992	1/12/1993	12.00	7	7.53	4.47
5/31/1991	12/19/1991	12.60	6	8.11	4.49
8/21/1989	12/27/1989	12.50	4	8.01	4.49
6/1/1987	12/22/1987	12.00	6	9.07	2.93
7/30/1982	7/19/1983	15.00	11	11.05	3.95
3/28/2019	10/31/2019	10.00	7	2.49	7.51
5/30/2014	11/14/2014	10.20	5	3.24	6.96
3/23/2012	11/28/2012	10.40	8	2.86	7.54
3/13/2009	12/18/2009	10.40	9	4.22	6.18
5/7/2007	1/17/2008	10.75	8	4.82	5.93
6/1/2005	1/25/2006	11.20	7	4.50	6.70
3/28/2019	10/31/2019	10.20	7	2.49	7.71
3/23/2012	11/28/2012	10.50	8	2.86	7.64
3/13/2009	12/18/2009	10.50	9	4.22	6.28
5/7/2007	1/17/2008	10.75	8	4.82	5.93
6/1/2005	1/25/2006	11.20	7	4.50	6.70
3/31/1993	11/12/1993	11.80	7	6.48	5.32
3/31/1992	10/29/1992	12.75	7	7.65	5.10
3/28/1991	10/15/1991	13.40	6	8.22	5.18

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4/28/1989	10/31/1989	13.60	6	8.25	5.35
6/30/1986	12/30/1986	13.90	6	7.46	6.44
6/28/1985	12/20/1985	15.00	5	10.35	4.65
6/28/1984	12/20/1984	15.00	5	12.26	2.74
6/28/1983	12/29/1983	15.00	6	11.66	3.34
6/28/1982	1/18/1983	15.00	6	11.73	3.27
8/4/1981	4/6/1982	15.00	8	14.03	0.97
5/15/1980	12/18/1980	14.00	7	11.12	2.88
1/16/1996	2/13/1997	11.80	13	6.74	5.06
3/27/1995	9/11/1995	11.30	5	6.89	4.41
12/30/1992	8/31/1993	11.90	8	6.84	5.06
12/30/1991	10/13/1992	12.75	9	7.70	5.05
12/27/1990	8/29/1991	13.30	8	8.27	5.03
12/23/1987	9/27/1988	13.65	9	8.96	4.70
11/7/1983	8/28/1984	14.75	9	12.53	2.22
9/30/1982	9/8/1983	14.75	11	10.90	3.85
2/5/1982	10/28/1982	14.75	8	13.08	1.67
2/16/1981	9/29/1981	14.50	7	13.49	1.01
5/1/2020	12/23/2020	10.00	7	1.47	8.53
5/24/2018	9/14/2018	10.00	3	3.04	6.96
4/9/2014	6/6/2014	10.40	1	3.43	6.97
5/3/2012	6/15/2012	10.40	1	2.83	7.57
5/8/2009	12/18/2009	10.40	7	4.33	6.07
3/17/2006	1/19/2007	10.80	10	4.94	5.86
9/17/2004	7/19/2005	11.50	10	4.69	6.81
3/6/2003	12/19/2003	12.00	9	5.11	6.89
5/7/2002	4/3/2003	12.00	11	5.26	6.74
4/1/1996	4/29/1997	11.70	13	6.85	4.85
2/4/1994	12/8/1994	11.50	10	7.46	4.04
1/4/1993	9/30/1993	11.60	8	6.74	4.86
12/30/1991	12/22/1992	12.40	11	7.67	4.73
12/29/1989	6/27/1990	12.90	6	8.54	4.36
12/30/1988	11/9/1989	13.00	10	8.53	4.47
2/29/1988	10/13/1988	13.10	7	9.03	4.07
1/5/1987	3/31/1987	13.00	2	7.49	5.51
12/30/1985	8/14/1986	13.50	7	7.96	5.54
12/28/1984	8/29/1985	14.50	8	11.09	3.41
12/30/1983	10/9/1984	14.75	9	12.62	2.13
1/10/1983	8/31/1983	14.75	7	10.93	3.82
3/28/2019	10/31/2019	10.00	7	2.49	7.51
4/17/2015	11/19/2015	10.00	7	2.96	7.04

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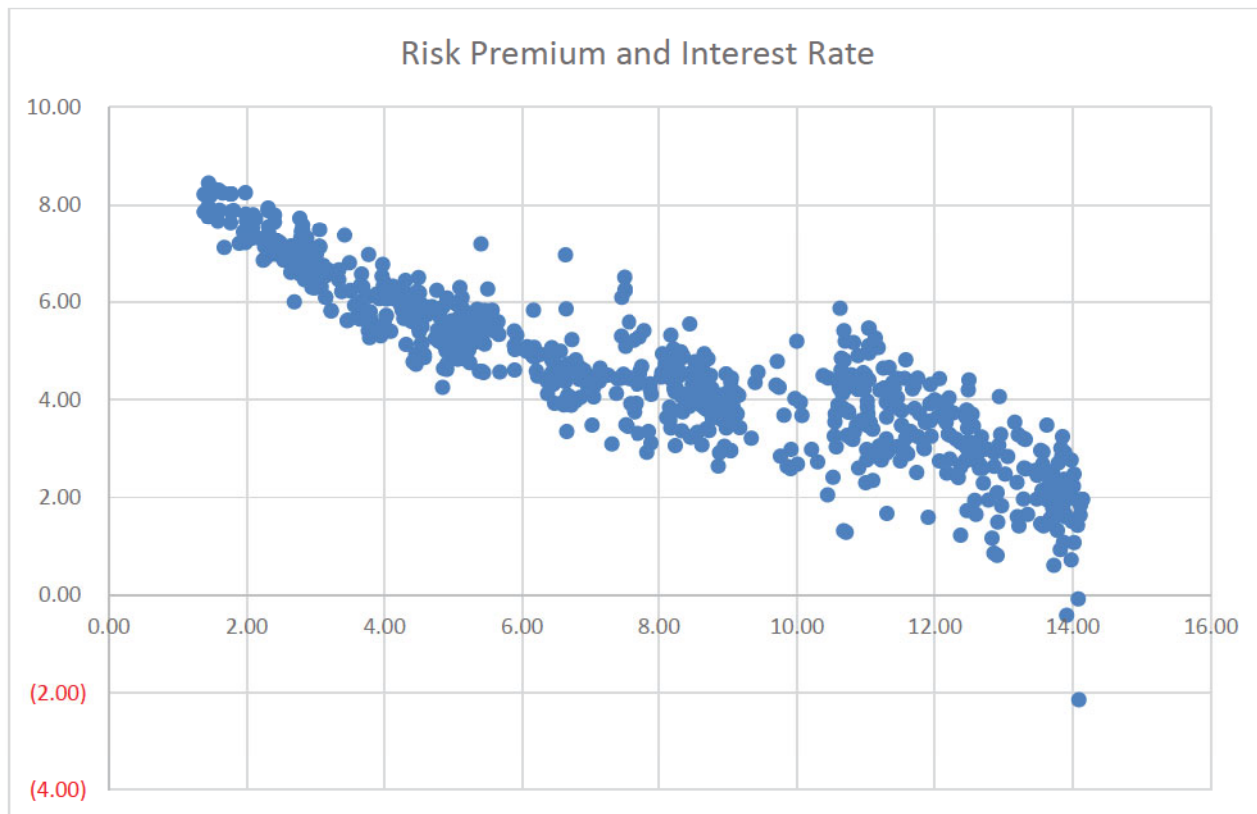
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4/1/2014	11/6/2014	10.20	7	3.30	6.90
3/29/2013	11/6/2013	10.20	7	3.47	6.73
3/30/2012	10/24/2012	10.30	6	2.85	7.45
4/1/2010	1/13/2011	10.30	9	4.15	6.15
3/31/2006	1/11/2007	10.90	9	4.95	5.95
4/1/2005	12/22/2005	11.00	8	4.51	6.49
4/1/2004	12/21/2004	11.50	8	5.18	6.32
4/1/2003	12/19/2003	12.00	8	5.12	6.88
3/28/2002	3/20/2003	12.00	11	5.33	6.67
3/31/2000	11/30/2000	12.10	8	5.86	6.24
4/1/1998	12/17/1998	12.10	8	5.49	6.61
4/1/1996	2/20/1997	11.80	10	6.83	4.97
4/15/1994	12/19/1994	11.50	8	7.65	3.86
3/31/1993	12/21/1993	11.30	8	6.45	4.85
3/31/1992	12/22/1992	12.30	8	7.63	4.67
4/1/1991	12/19/1991	12.80	8	8.14	4.66
3/30/1990	12/18/1990	13.10	8	8.68	4.42
3/31/1989	12/21/1989	12.90	8	8.27	4.63
4/15/1988	1/27/1989	13.00	9	9.07	3.93
6/19/1987	1/29/1988	13.20	7	9.07	4.13
4/28/1986	7/10/1987	12.90	14	7.73	5.17
4/13/1984	1/31/1985	14.75	9	12.42	2.33
7/2/1982	3/24/1983	15.00	8	11.44	3.56
7/15/1981	4/27/1982	15.00	9	13.95	1.05
7/15/1980	5/21/1981	14.00	10	12.15	1.85
9/30/2020	7/27/2021	9.54	10	1.98	7.56
10/16/2008	11/20/2009	9.45	13	3.94	5.51
1/4/1993	10/29/1993	10.20	9	6.66	3.54
11/5/1984	8/30/1985	14.38	9	11.17	3.21
4/6/1982	1/31/1983	15.00	10	12.18	2.82
1/16/1981	11/12/1981	15.00	10	13.54	1.46
1/2/1980	10/28/1980	13.00	10	11.05	1.95
3/6/2019	12/26/2019	9.75	9	2.49	7.26
1/5/2015	10/13/2015	9.75	9	2.81	6.94
11/4/2011	10/31/2012	9.90	12	2.95	6.95
1/4/1993	10/29/1993	10.10	9	6.66	3.44
1/17/1992	11/9/1992	10.60	9	7.71	2.89
10/23/1986	8/25/1987	11.40	10	8.04	3.36
7/30/1982	6/7/1983	14.50	10	11.04	3.46
7/27/1981	6/2/1982	14.50	10	13.89	0.61
6/3/2019	12/11/2019	9.40	6	2.31	7.09

Exhibit ZZ-9
The Risk Premium Model
Page 24 of 25

2/26/2010	12/23/2010	9.92	10	4.18	5.74
2/28/2006	9/20/2006	11.00	6	5.03	5.97
11/17/2017	7/16/2018	9.60	8	3.00	6.60
12/2/2013	7/31/2014	9.90	8	3.57	6.33
12/1/2011	6/18/2012	9.60	6	3.05	6.55
3/1/2007	11/29/2007	10.90	9	4.87	6.03
4/18/2005	10/4/2005	10.75	5	4.42	6.33
5/23/2019	1/15/2020	9.35	7	2.33	7.02
11/1/2019	8/21/2020	9.35	9	1.70	7.65



Average Interest Rate for last 9 months:	2.04
Risk Premium	7.04
Expected Return	9.08

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.905695
R Square	0.820283
Adjusted R Squ	0.820093
Standard Error	0.72158
Observations	950

ANOVA

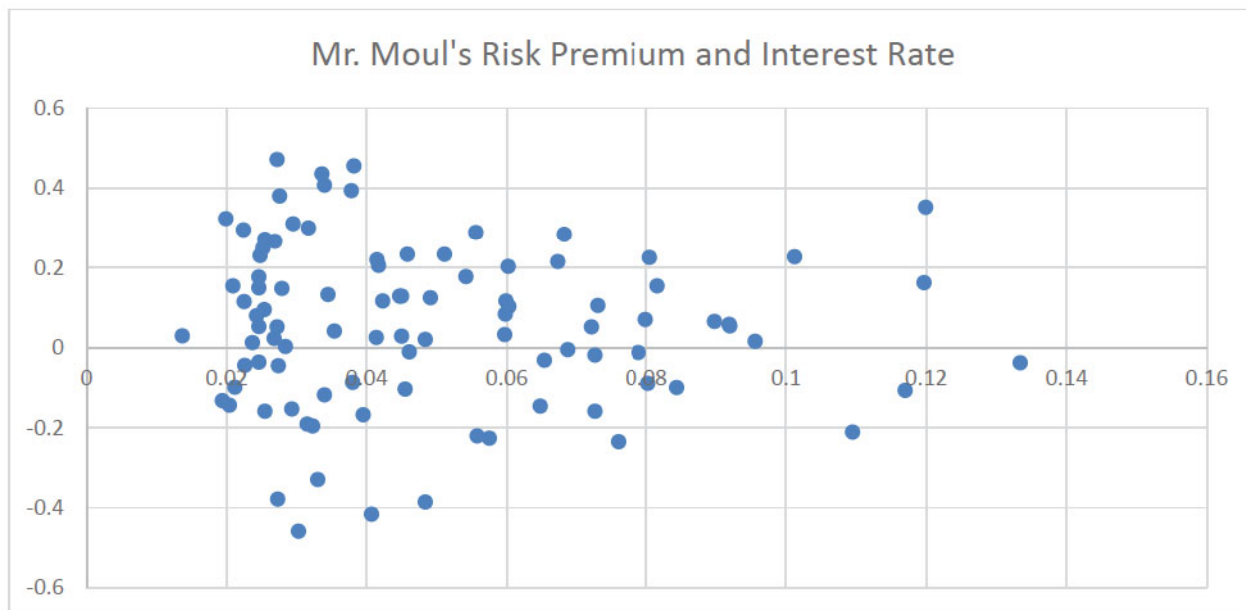
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	2252.944	2252.944	4326.95	0
Residual	948	493.602	0.520677		
Total	949	2746.546			

	<i>Coefficients</i>	<i>Standard Err</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	7.886741	0.052279	150.8579	0	7.784144	7.989337	7.784144	7.989337
Interest Rate	-0.41569	0.006319	-65.7796	0	-0.42809	-0.40328	-0.42809	-0.40328

Exhibit OCC-ZZ-10

Moul Risk Premium and Interest Rate

Page 1 of 1



SUMMARY OUTPUT						
Regression Statistics						
Multiple R	0.05247226					
R Square	0.002753338					
Adjusted R Square	-0.007969744					
Standard Error	0.200820242					
Observations	95					
ANOVA						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	1	0.010355114	0.010355114	0.256767413	0.613549046	
Residual	93	3.750575564	0.04032877			
Total	94	3.760930677				
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.075763779	0.042979829	1.76277526	0.081223505	-0.009585643	0.161113202
Long-Term Govt. Bonds Yields	-0.38624131	0.762234794	-0.506722224	0.613549046	-1.899888548	1.127405927

The Hamada Beta Adjustment and the Cost of Capital for the Regulated Utilities

By

Scott Linn and Zhen Zhu²⁵

I. Introduction

Despite many issues with the Capital Asset Pricing Model (CAPM), it is still one of main methods that is used to estimate the expected rate of return on equity for regulated utilities in rate proceedings in the United States. A primary underpinning of the model is that investors require compensation for bearing undiversifiable systematic risk. A product of the theory is that the degree of systematic risk (beta risk) an investor bears for investing in any equity security is measured by how closely the stock's price changes (returns) covary with the overall market, proxied by the returns on a market index. The expected cost of equity is the sum of two parts: a risk-free rate and a risk premium which is the product of the beta of the company's stock and a market risk premium. A key ingredient of course is the stock's beta, which depends upon the nature of the business as well as how the business is financed. Our focus in this note is on the latter relation between beta and how a company is financed (specifically the debt/equity ratio), and how this relation if not considered correctly can lead to incorrect estimates of a company's required return on equity, and consequently to incorrect rate adjustments.

Technical Box A: CAPM

$$R = R_f + \beta(R_m - R_f),$$

Where R is the required or expected return on equity for the utility, R_f is the risk-free rate, β is the company beta, and R_m is the market return. $(R_m - R_f)$ is the market risk premium.

In the practice of a rate proceeding, various methods have been utilized to model each of the three components of the CAPM: the risk-free return, the market risk premium, and the beta. Some rate-setting commissions have specific requirements regarding how to model each component. For example, the Federal Energy Regulatory Commission (FERC) requires the risk-free interest rate to be a long-term Treasury Bond yield, the company stock beta is the beta value provided by Value Line, and the market risk premium is measured by the difference between the market return based on a one-step DCF model applied to the dividend paying S&P 500 companies and the risk-free rate. The rules however are not uniform across state commissions, so that an estimate in one jurisdiction could potentially deviate from an estimate in another for the

²⁵ Linn is John and Donnie Brock Chair and Professor of Finance and Research Director of the Price Energy Institute at the Price College of Business, University of Oklahoma. Zhu is Dr. Michael Metzger Chair and Professor of Economics at University of Central Oklahoma and Managing Consultant with C.H. Guernsey and Company in Oklahoma City.

same company. At the same time there has been increasing advocacy for methods designed to adjust beta. The point of this note is to consider one such adjustment and to highlight how that adjustment can lead to a biased estimate of a company's beta and hence the required return on equity.

Theory tells us that beta as generally measured, is under certain conditions, positively related to the company's debt to equity ratio, where the ratio is measured using the total market values of a company's debt and equity. It is important to recognize that the beta computed by most popular commercial services, such as Value Line and Bloomberg, is based upon market returns. What does this mean? Specifically, the returns on a stock are based upon the assessment by capital market participants of changes in the stock's value which are then reflected in changes in its market price. Changes in value reflect market participants' interpretation of fundamental information about the company, including how it is financed. The market value debt to equity ratio reflects the extent to which the shareholders share the total value of the company with the debtholders, and hence the shareholders' exposure to debt financing. Recognize that the total value of a company equals, in usual parlance, the total market value of the debt and equity, which would only by accident equal the book value of debt plus the book value of equity. In other words, market participants know this information and condition changes in prices on knowledge of a company's market value debt to equity ratio.

Hence, the implied cost of capital, whether the equity required return or the weighted average cost of capital, is a number based upon the market values of debt and equity not book values.²⁶

This leads us to an important issue confronting rate setting commissions. One common practice on the side of the ROE requesting utilities is to use what is commonly referred to as the Hamada equation to make an adjustment to the beta value obtained from an investment service. The argument for this so-called leverage adjustment is that the capital structure used in calculating the weighted average cost of capital is based on book value but the return on equity is based on the market value, and in addition, the rate base is based on book value.

Setting aside how the weighted average cost of capital is computed, whether using book value or market value weights, we explore the implications of adjusting beta using the book value versus market value debt to equity ratio. As the market value of most utility's equity nowadays is typically higher than the book value of the equity, the book value debt ratio will typically be larger than if the market value debt/equity ratio is employed. As the beta computed using market returns reflects the market debt/equity ratio, if instead it is adjusted to conform to a book value debt/equity ratio, the resulting beta will be larger than the observed beta provided by say Value Line. Such an adjustment would lead to higher beta values and thus a higher calculated expected rate of return on equity given the estimate of the risk-free rate and the market risk premium.

II. What is the Hamada equation?

Professor Hamada, once the dean of the famed Booth College of Business at the University of Chicago, was the first to derive the relation between a company's stock's beta and the company's market value debt/equity ratio. Specifically he shows that beta increases as the market debt/equity ratio increases. Hamada defines two different betas for a company's stock. One beta is what we usually obtain from the investment services such as Value Line, and this beta is called the levered beta as it is derived from the market data reflecting the company's existing capital

²⁶ The general practice in the rate making process, however, is to use book value capital structure in weighting the cost of capital, for some reasons, see, for example, Roger A. Morin, *New Regulatory Finance, Public Utilities Reports, Inc.*, 2006, page 452. This has been another important and interesting issue in the practice. However, it goes beyond the scope of this note.

structure, that is, its market value debt/equity ratio. In contrast, suppose the same company used no debt financing, then the corresponding beta would be what we would observe for an unlevered (no debt financing) company, and is typically referred to as the unlevered beta. The levered beta exceeds the unlevered beta which the company uses debt financing. Note that all terms are measured in market values.

The equation shown nearby shows how a company's beta changes as the company's market

Technical Box B – The Hamada Equation:

$$\beta_L = \beta_U [1 + (1-t) D/E],$$

where β_L is the levered beta, which measures the firm's systematic risk with the impact of debt and β_U is the unlevered beta, which measures the firm's systematic risk without the impact of debt, t is the marginal tax rate, D/E is the company's debt-to-equity ratio which measures the company's financial leverage.

value debt/equity ratio changes. The higher the market value debt/equity ratio (leverage), the higher the financial risk and thus the higher is beta. For example, if a company's unlevered beta is 1.0, the market value debt/equity ratio is 0.5, and the marginal tax rate is 21%, then the levered beta would be 1.395, an increase of 39.5%.

The beauty of the Hamada Equation is that it can be used to infer what a company's beta would equal for any assumed debt/equity ratio, including what an analyst might argue is the debt/equity ratio that goes with an 'optimal' capital structure for the company.²⁷ The process of finding a new levered beta involves what is often referred to as first unlevering and then relevering. The starting levered beta is observed by consulting an investment service such as Value Line. The unlevered beta is not directly observable but can be backed out of the Hamada formula if other information such as the tax rate and an estimate of the market value debt ratio are available. This process is called unlevering. The unlevered beta can then be relevered to obtain the new levered beta estimate that is conditional on an assumed debt/equity ratio which could be the one that goes with the optimal capital structure. This process of course makes the explicit assumption that the current debt/equity ratio is not what is desired and that shortly in the future the company will rearrange its financing to reflect a better mix and a new debt/equity ratio.

Take the example of finding the beta for a company's stock assuming the current debt/equity ratio is not the best but the analyst believes she knows what the best debt/equity ratio equals. Suppose the current observable beta or levered beta is 0.8 for a utility that has a debt ratio of 1.25. With a tax rate of 0.21, the unlevering process would generate an unlevered beta of 0.40. Conceptually, if the company used no debt financing the beta would be 0.40.

²⁷ We do not take up the issue of what an 'optimal' capital structure might be for any particular utility. Some argue this can be inferred by looking at industry averages, but that presumes the industry participants are themselves choosing optimally. Needless to say, the concept of what is an optimal capital structure is by no means a resolved issue.

Suppose the optimal capital structure is 50% debt and 50% equity, so the debt-to-equity ratio would equal 1.0, then the relevered beta would equal 0.716. Specifically with the optimal capital structure, the company's beta would equal 0.716, a value less than the current levered beta value of 0.8.

Two important assumptions underlying the Hamada equation are first that the beta of the company's debt is zero, and second that the CAPM model is valid.

III. How is the Hamada equation used to adjust the beta in rate proceedings?

Sometimes, the Hamada equation is used in rate proceedings to adjust the unlevered beta using the book value debt/equity ratio. If the book value of equity is less than the total market value of equity, which is typical nowadays, this will lead to a beta that is inflated more than it should be, and consequently a required return on equity computed using the CAPM that is larger than it should be. The argument goes that such a "book value leverage adjustment" is necessary because the required rate of return on equity will be used to compute a weighted average cost of capital using weights based upon the book values of debt and equity. According to advocates of this suggested adjustment, beta based on a market value capital structure mis-represents the financial risk of the company, and therefore, the conventionally available betas cannot be used directly in the CAPM, unless the cost of equity developed using these betas is applied to the computation of a weighted average cost of capital in which the weights are based upon market values. The market value capital structure of a utility and the company's book value capital structure typically are not the same. The argument that, there is a need to make the so-called leverage adjustment to adjust the beta to reflect the utility's risk based on book value capital structure, is simply incorrect as true risk is not based upon historic book values. The reason is that the book value of the assets of the company is not a true reflection of the assets' market value and it is the market value of the assets which indicates the true support for the company's debt.

The following example illustrates how the Hamada equation used incorrectly leads to a cost of capital that is too large.

Assume a utility with a market value debt/equity ratio²⁸ of 0.8 has a Value Line reported beta of 0.75. Suppose the company's marginal tax rate equals 21%, then the company's unlevered beta can be computed as shown earlier, and will equal 0.46.

Utility total equity market values are usually significantly higher than the book values, leading to a significantly higher book value debt/equity ratio than would be the case for the market value debt/equity ratio. This comparison is typically the reason why some analysts claim that the financial risk represented by the book value is higher than the financial risk represented by the market value.²⁹ But this is inherently a flawed argument as we have just commented.

Assume for our example company that the book value debt/equity ratio is 1.0. The unlevered beta value of 0.46 is then relevered by the book value capital structure to arrive at an adjusted estimate of beta that would for our illustration, equal 0.82, a 9% increase in the beta to be used in the cost of capital calculation

²⁸ The market value of equity can be based on the market capitalization. Utility debt instruments are frequently not traded and so do not have observable market prices. However, under current reporting requirements, fair value estimates of a utility's debt can be obtained from the utility's 10K report.

²⁹ Again, the notion of two different financial risks is dubious as a company cannot have two different measures of financial risks that are not the same.

The book value relevered beta value when used in the CAPM model will therefore lead to a required return on equity that is larger than it should be.

IV. Is the Hamada adjustment reasonable?

In summary we repeat the limitations of the book value debt/equity adjustment process as well as a more general limitation of the Hamada model.

First, unlike the process of unlevering and relevering the market value beta to obtain a levered market value beta that reflects the optimal market value capital structure, relevering the market value unlevered beta using the book value debt/equity ratio, yields a beta estimate that **cannot be interpreted**, and therefore cannot legitimately be used in the estimation of the cost of capital in the CAPM model.

Second, the Hamada adjustment process assumes, even if we are using the correct market value deb/equity ratio, that the beta of the company's debt is zero. This assumption is simply not strictly met, although academic studies that present estimates of bond betas generally find that they are small but nevertheless positive.³⁰ Thus the **formula is invalid** for any leveraging or unlevering operations in general if the company's debt beta is not zero or the risk is systematic³¹.

V. Conclusions

We have demonstrated in this short note what the Hamada leverage adjustment is and how it should be applied. We also pointed out that one of the applications of this formula is in the context of capital cost estimation in the rate case proceedings for public utilities. That application involves an adjustment based upon the book values of debt and equity of the utility. We illustrate how such an adjustment leads to an incorrect estimate of the beta used in the Capital Asset Pricing Model formula, which in turns leads to an estimated required return on equity that is too large. While this adjustment is used to justify the higher requested return on equity by utilities, this is an incorrect use of the Hamada equation adjustment. We have pointed out the invalidity of the adjustment process using book values for debt and equity as the theory underlying the Hamada equation requires a debt/equity ratio based upon market values. In other words, if the adjustment is to be correct there is no room for the use of book values.

Many analysts in the past rate proceedings have pointed out various issues with the application of the Hamada leverage adjustment; however, to our knowledge, there is no clear demonstration of how this Hamada leverage adjustment application is invalid in its process. It is our hope that practitioners engaged in the estimation of utility cost of capital recognize the issues we raise and the biases that can arise from the incorrect application of the Hamada adjustment. Our second objective with this note is to inform the many jurisdictional authorities faced with the task of deciding on rate adjustments of the potential biases we have highlighted. Perhaps, these decision makers have recognized the potential problems we outline as no such Hamada adjustment has yet been allowed in any utility rate proceedings to our knowledge. However, this is not to say that cost of capital witnesses have not been advocating the type of book value debt/equity adjustment we have illustrated which makes the information we provide both timely and of potentially important. In our opinion, due to its lack of theoretical support and the upward bias it

³⁰ See a study of bond returns by Backaert and De Santis, "Risk and return in international corporate bond markets", *Journal of International Financial Markets, Institutions & Money*, Vol. 72, 2021.

³¹ By systematic we mean that the returns on the bond vary with the returns on a market index the way the returns on a stock vary with an index. Conine demonstrated that the Hamada formula is not compatible with the assumption of issuing risky debt. See Conine, T. (1980) *Corporate Debt and Corporate Taxes: An Extension*. *The Journal of Finance*, 35(4), 1033-1037.

The Hamada Beta Adjustment and the Cost of Capital for the Regulated Utilities

introduces, the idea of making the so-call book value leverage adjustment to beta should be put to rest.

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Case No(s). 21-0637-GA-AIR, 21-0638-GA-ALT, 21-0639-GA-UNC, 21-0640-GA-AAM

Summary: Testimony Direct Testimony of Zhen Zhu, Ph.D. On Behalf of Office of
The Ohio Consumers' Counsel and Northeast Ohio Public Energy Council
electronically filed by Mrs. Tracy J. Greene on behalf of O'Brien, Angela D

OCC EXHIBIT NO._____

**BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO**

In the Matter of the Application of)	
Columbia Gas of Ohio, Inc. for Authority)	
to Amend its Filed Tariffs to Increase the	)	Case No. 21-637-GA-AIR
Rates and Charges for Gas Services and)	
Related Matters.)	
In the Matter of the Application of)	
Columbia Gas of Ohio, Inc. for Approval	)	Case No. 21-638-GA-ALT
of an Alternative Form of Regulation.)	
In the Matter of the Application of)	
Columbia Gas of Ohio, Inc. for Approval)	
of a Demand Side Management Program	)	Case No. 21-639-GA-UNC
for its Residential and Commercial)	
Customers.)	
In the Matter of the Application of)	
Columbia Gas of Ohio, Inc. for Approval	)	Case No. 21-640-GA-AAM
to Change Accounting Methods.)	

**DIRECT TESTIMONY
OF
ROGER D. COLTON**

**On Behalf of
Office of the Ohio Consumers' Counsel**
*65 East State Street, Suite 700
Columbus, Ohio 43215*

May 13, 2022

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ATTACHMENTS:

Schedule RDC-1
Schedule RDC-2
Schedule RDC-3
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Schedule RDC-7

Schedule RDC-8

Appendix A: Colton Curriculum Vitae Summary

*Direct Testimony of Roger D. Colton
On Behalf of Office of the Ohio Consumers' Counsel
PUCO Case No. 21-637-GA-AIR et al.*

1 **I. INTRODUCTION**

2

3 ***Q1. PLEASE STATE YOUR NAME AND ADDRESS FOR THE RECORD.***

4 ***A1.*** My name is Roger Colton. My address is 34 Warwick Road, Belmont, MA
5 02478.

6

7 ***Q2. BY WHOM ARE YOU EMPLOYED AND IN WHAT POSITION?***

8 ***A2.*** I am a principal in the firm of Fisher Sheehan & Colton, Public Finance and
9 General Economics of Belmont, Massachusetts. In that capacity, I provide
10 technical assistance to a variety of federal and state agencies, consumer
11 organizations and public utilities on utility rates and customer service issues
12 involving water/sewer, natural gas and electric utilities.

13

14 ***Q3. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?***

15 ***A3.*** I am testifying on behalf of the Office of the Ohio Consumers' Counsel.

16

17 ***Q4. PLEASE DESCRIBE YOUR PROFESSIONAL BACKGROUND.***

18 ***A4.*** I work primarily on low-income utility issues. This involves regulatory work on
19 utility rates and customer service issues, as well as research into low-income
20 usage, payment patterns, and affordability programs. At present, I am working on
21 various projects in the states of New Hampshire, Maryland, Pennsylvania, Ohio,
22 Michigan, Tennessee, Kansas, Wisconsin and Washington. My typical clients
23 include state agencies (e.g., Pennsylvania Office of Consumer Advocate,

*Direct Testimony of Roger D. Colton
On Behalf of Office of the Ohio Consumers' Counsel
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Maryland Office of People's Counsel, Illinois Office of Attorney General), federal agencies (e.g., the U.S. Department of Health and Human Services), community-based organizations (e.g., National Housing Trust, Natural Resources Defense Council, Advocacy Centre Tenants Ontario), and private utilities (e.g., Toledo Water, Entergy Services, Xcel Energy d/b/a Public Service of Colorado). In addition to state-specific and utility-specific work, I engage in national work throughout the United States. For example, in 2011, I worked with the U.S. Department of Health and Human Services (the federal LIHEAP office) to create and advance the utilization of the Home Energy Insecurity Scale as an outcomes measurement tool for the federal Low-Income Home Energy Assistance Program ("LIHEAP"). In 2007, I was part of a team that performed a multi-sponsor public/private national study of low-income energy assistance programs. In 2020, I completed a study of water affordability in twelve U.S. cities for the London-based newspaper, The Guardian. In 2021, I prepared a Water Affordability Plan for the City of Toledo (OH). A brief description of my professional background is provided in Appendix A.

Q5. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND.

A5. After receiving my undergraduate degree in 1975 (Iowa State University), I obtained further training in both law and economics. I received my law degree in 1981 (University of Florida). I received my Master's Degree (regulatory economics) from the MacGregor School at Antioch University (Yellow Springs, OH) in 1993.

*Direct Testimony of Roger D. Colton
On Behalf of Office of the Ohio Consumers' Counsel
PUCO Case No. 21-637-GA-AIR et al.*

1 ***Q6. HAVE YOU EVER PUBLISHED ON PUBLIC UTILITY REGULATORY***
2 ***ISSUES?***

3 ***A6.*** Yes. I have published three books and more than 80 articles in scholarly and trade
4 journals, primarily on low-income utility and housing issues. I have published an
5 equal number of technical reports for various clients on energy, water,
6 telecommunications and other associated low-income utility issues. My most
7 recent publication is a chapter in the book “Energy Justice: US and International
8 Perspectives,” published by Edward Elgar Publishing in London. My chapter was
9 titled “The equities of efficiency: distributing usage reduction dollars.” It offers an
10 objective definition of “equity” based on established legal and economic
11 doctrines.

12
13 ***Q7. HAVE YOU EVER TESTIFIED BEFORE THIS OR OTHER UTILITY***
14 ***COMMISSIONS?***

15 ***A7.*** Yes. I have testified before the Public Utilities Commission of Ohio (“PUCO” or
16 “Commission”) on several occasions regarding utility issues affecting low-income
17 customers and customer service.¹ I have also testified in more than 300
18 proceedings in 43 states and various Canadian provinces on a wide range of utility
19 issues. A list of the states and provinces in which I have testified is listed in
20 Appendix A.

¹ See, e.g., Case No. 08-072-GA-AIR (Columbia); Case No. 07-829-GA-AIR (Dominion East Ohio Gas); Case No. 07-1080-GA-AIR (Vectren Energy Delivery).

*Direct Testimony of Roger D. Colton
On Behalf of Office of the Ohio Consumers' Counsel
PUCO Case No. 21-637-GA-AIR et al.*

1 **Q8. PLEASE EXPLAIN THE PURPOSE OF YOUR DIRECT TESTIMONY.**

2 **A8.** The purpose of my Direct Testimony is to support OCC/NOPEC Objections No.
3 36, 37, and 38. Specifically, I conclude the Staff Report erred by not proposing
4 further reduction to the monthly fixed charges, by not proposing more consumer
5 protections to make gas services more affordable including for at-risk Ohioans,
6 and by failing to examine the economic impacts of the coronavirus pandemic and
7 to make appropriate recommendations. The PUCO, as the public institution vested
8 with public trust and utility regulation and in the interest of energy justice, can
9 and should do more to protect at-risk consumers served by Columbia.

10

11 My testimony is organized as follows.

12 ➤ First, I examine the disproportionate adverse impacts on low-income
13 customers arising from the Columbia Gas of Ohio (“Columbia,” or
14 “Utility”) proposal to increase its Small General Service (SGS) fixed
15 distribution charge by 32.7%, from \$34.91 to \$46.31 initially.² I examine
16 how the higher customer charge affects low-use customers, and I establish
17 that low-income customers are, disproportionately and on average, low-
18 use customers.

19

20 ➤ Second, I examine some of the harms that will result from the
21 disproportionate bill increases imposed on low-income customers. I
22 consider how the proposed increase in the customer charge will increase
23 low-income payment difficulties; how Columbia’s existing programs will
24 not protect low-income customers from the harms of an increased
25 customer charge; and how the increased customer charge will impede the
26 ability of low-income customers to control their bills through usage
27 reduction efforts.

² The \$34.91 includes the monthly fixed customer charge of \$16.75, plus \$11.98 in the IRP Rider, plus \$5.91 in the CEP Rider, plus \$0.27 in the IDR Rider.

*Direct Testimony of Roger D. Colton
On Behalf of Office of the Ohio Consumers' Counsel
PUCO Case No. 21-637-GA-AIR et al.*

- 1 ➤ Third, I examine how the harms I identify above, which will arise in
2 “normal times,” will be exacerbated even more in the continuing
3 economic crisis arising from the COVID-19 public health emergency.
4
5 ➤ Fourth, I examine how the Columbia proposal to increase its SGS
6 customer charge will contribute to spiraling housing burdens in the
7 Columbia service territory. I explain how those increasing housing
8 burdens harm the low-income consumers of Columbia.
9
10 ➤ Finally, I will propose several important remedial actions the PUCO and
11 Columbia should take. These remedial actions, among other items, include
12 a \$10 million bill-payment assistance program paid by Columbia’s
13 shareholders, an implementation moratorium on the disconnection of
14 service for nonpayment of bills for the 2022-2023 winter heating season,
15 and waiving late payment charge for any customer who has been a
16 recipient of a cash or crisis grant within the immediately preceding three
17 years

*Direct Testimony of Roger D. Colton
On Behalf of Office of the Ohio Consumers' Counsel
PUCO Case No. 21-637-GA-AIR et al.*

II. SUMMARY OF RECOMMENDATIONS.

PART 1. THE COMPANY'S PROPOSED SMALL GENERAL SERVICE (SGS) CUSTOMER CHARGE.

Q9. PLEASE DESCRIBE THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY.

A9. In this part of my testimony, I respond to Columbia's proposal to increase the Small General Service (SGS) customer charge by 32.7% initially. According to the Staff Report (page 38), Columbia is proposing to increase its fixed monthly charge for SGS customers from \$34.91 per month to \$46.31 per month. (Staff Report, at 38, 43). As the charges for the Infrastructure Replacement Program (IRP) and Capital Expenditure Program (CEP) are projected to increase significantly after the first year of this rate case, the fixed monthly charges to SGS customers will increase even more. By 2027, the total fixed monthly charge (Customer Charge + Riders) is projected to be \$80 for SGS customers.³ (Application Exhibit A, at 11, 20, and 24). While this monthly fixed charge would impose a hardship on many residential consumers, my discussion below examines

³ Specifically, by 2027, the monthly fixed IRP charge for residential consumers (Small General Service class) will be \$10.87, and the monthly fixed CEP charge will be \$15.89. The monthly fixed Delivery Charge for the SGS class (residential consumers) would be \$73.07 per month (\$46.31 + \$10.87 + \$15.89). On top of this, Columbia is proposing a Federal Mandate Rider that by 2027 could reach an additional \$7.00 per month.

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1 the particularly disproportionate adverse impacts that this Columbia proposal
2 would have on low-income consumers.⁴

3

4 **OCC/NOPEC Objection No. 36**

5

6 ***Q10. IS THERE A PARTICULAR ADVERSE IMPACT ON LOW USE***
7 ***CONSUMERS FROM THE COMPANY'S PROPOSED INCREASE IN ITS***
8 ***FIXED MONTHLY CHARGE?***

9 ***A10.*** Yes. There can be no dispute but that the proposed Columbia increase in its fixed
10 monthly customer charge will have a greater impact on low-use consumers.
11 According to Schedule E-5 of the Staff Report (page 236), as consumption
12 increases, the percentage increase in an SGS bill decreases. At a usage of 0
13 MCF/month, the percentage of bill increase is 33.4%. In contrast, at a usage of 1.0
14 MCF, the percentage of bill increase (including fuel cost) is 28.9%, while at 5.0
15 MCF, the percentage bill increase is 18.8%. (Staff Report, Schedule E-5). I cite
16 these numbers not to show typical bills, but to illustrate the fact that as usage
17 decreases, the percentage bill increase proposed by Columbia increases.

⁴ The Staff Report (page 39) notes that "The Company proposes to establish a monthly delivery charge for the LGS Rate Classes based upon the sum of the current monthly fixed charges under the IRP and CEP Riders and the customer-related costs for the rate class adjusted by the approximate percentage increase in revenues for the rate class." Staff then states that (page 40): "Staff does not agree with these approaches. First, the IRP and CEP rider rates are a product of numerous factors negotiated in alternative rate regulation cases. Rider rates should be evaluated when considering the appropriateness of any proposed rate, however, they are not the basis for the rate design. The basis for the rate design should be the COSS. Second, the Applicant's COSS already includes the costs of assets currently recovered in the IRP and CEP riders." The applicability of this reasoning to the SGS class is beyond the scope of my testimony. My failure to address whether that same reasoning applies to the SGS class is not an indication that I disagree with the reasoning, but rather simply a recognition of the fact that it is beyond the scope of my testimony.

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1 ***Q11. IS THERE A RELATIONSHIP BETWEEN NATURAL GAS CONSUMPTION***
2 ***AND INCOME?***

3 ***A11.*** Yes. Every federal agency that has examined natural gas usage and income has
4 found that as income increases, natural gas consumption increases as well. The
5 fact that any one of these federal agencies reaches this conclusion is perhaps not
6 the most significant observation to draw from this data. The more significant
7 conclusion to draw is the fact that every single one of the federal agencies charged
8 with studying such relationships has found a relationship to exist between income
9 and natural gas consumption. Low-income consumers use less gas, period.

10

11 Consider, first, the U.S. Department of Energy's Energy Information
12 Administration (DOE/EIA) data generated through its Residential Energy
13 Consumption Survey (RECS). The most recent (2015) DOE/EIA data reports that
14 there is an association between energy use, natural gas use, and income. For both
15 the United States as a whole, and for the Midwest Census Region (of which Ohio
16 is a part), while energy usage and natural gas usage is less efficient at lower
17 income levels, total usage increases as incomes increase. In the Midwest Region,
18 for example, while households with income less than \$20,000 use 592 CCF of
19 natural gas per year (on average), households with income at \$80,000 to \$99,999
20 use 754 CCF, and households with income at \$140,000 or more use 1,102 CCF.

21

22 This lower total consumption for low-income consumers occurs despite the fact
23 that natural gas usage by low-income consumers may be less efficient than gas

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1 consumption by higher income consumers. The lower efficiency occurs because
2 low-income households tend to live in less energy efficient homes. They tend to
3 use less efficient energy consuming systems (e.g., space heating systems, hot
4 water systems).⁵ However, low-income households live in homes that are
5 sufficiently smaller, often multi-family rental apartments rather than single-family
6 detached homes, that the total consumption is lower.

Table 1. U.S. and Midwest (including Ohio) Total Energy Consumption and Natural Gas Consumption by Income (U.S. Department of Energy/Energy Information Administration)						
Annual Income	U.S. Site Energy Consumption		U.S. Energy Expenditures		Midwest Average Site Natural Gas Consumption (of HHs Using Nat Gas)	
	Per Household (million Btu)	Per Square Foot (thousand Btu)	Per Household (dollars)	Per Square Foot (dollars)	Per Household (million Btu)	Per Household (CCF)
Less than \$20,000	67.2	46.6	\$1,320	\$0.91	43.2	592
\$20,000 - \$39,999	84.7	44.5	\$1,571	\$0.82	54.2	714
\$40,000 - \$59,999	88.7	40.6	\$1,675	\$0.77	56.4	745
\$60,000 - \$79,999	99.3	40.8	\$1,872	\$0.77	59.1	754
\$80,000 - \$99,999	105.4	41.1	\$1,996	\$0.78	62.7	787
\$100,000 - \$119,999	113.9	34.9	\$2,205	\$0.68	66.0	885
\$120,000 - \$139,999	124.8	39.6	\$2,294	\$0.73	73.4	954
\$140,000 or more	143.8	38.8	\$2,418	\$0.65	71.1	1,102

7
8 It is not merely DOE/EIA data which reports that natural gas consumption
9 increases as income increases. The U.S. Bureau of Labor Statistics releases its

⁵ The extent to which, if at all, ratepayers should provide subsidies for energy efficiency improvements is not at issue in this proceeding. I do not address that question.

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1 Consumer Expenditures Survey (CEX) on an annual basis. The CEX tracks
2 natural gas expenditures by income level. In the Midwest (of which Ohio is a
3 part), natural gas expenditures are somewhat less than three times higher with an
4 income of \$200,000 or more compared to expenditures at an income of less than
5 \$15,000; they are two times higher at an income of \$100,000 to \$149,999 than
6 they are at an income of less than \$15,000. The same relationship exists for
7 natural gas expenditures nationwide as exists for natural gas expenditures in the
8 Midwest.

Table 2. Mean Expenditures on Natural Gas by Income before Taxes (U.S. and Midwest) (U.S. Department of Labor Statistics) (shading simply to improve readability)									
	Less than \$15,000	\$15,000 to \$29,999	\$30,000 to \$39,999	\$40,000 to \$49,999	\$50,000 to \$69,999	\$70,000 to \$99,999	\$100,000 to \$149,999	\$150,000 to \$199,999	\$200,000 or more
U.S. (2020)	\$251	\$313	\$339	\$347	\$389	\$430	\$496	\$569	\$732
Midwest (2019 – 2020)	\$336	\$523	\$575	\$547	\$579	\$653	\$666	\$762	\$940

9
10 Finally, the U.S. Department of Health and Human Services (HHS), which is the
11 federal agency administering the Low-Income Home Energy Assistance Program
12 (LIHEAP), publishes a periodic “Home Energy Notebook.” The LIHEAP
13 agency’s Home Energy Notebook includes data both on home energy
14 expenditures by heating fuel and on home energy consumption by heating fuel.
15 The most recent HHS Home Energy Notebook compared natural gas expenditures
16 and consumption for “all households,” “non-low-income households” and “low-
17 income households” (in addition to splitting LIHEAP recipients out separately).
18 Like the Department of Energy and the Department of Labor Statistics, the federal

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1 LIHEAP office finds that low-income households use noticeably less natural gas
2 for space heating than do non-low-income households. According to the LIHEAP
3 report, low-income households annually use 3 MMBtus less natural gas for space
4 heating, and spend more than \$270 less for natural gas space heating than do non-
5 low-income households.

Table 3. Annual Average Natural Gas Heating Expenditures and Annual Average Natural Gas Heating Usage (Per Household) (Midwest Region) (LIHEAP Home Energy Book)		
	Usage (MMBtus)	Expenditures
All households	57.4	\$1,917
Non-low-income households	58.7	\$2,009
Low-income households	54.9	\$1,738

6
7 ***Q12. IS THERE ALSO LOCAL OR STATE DATA THAT SUPPORTS THESE***
8 ***FINDINGS BY THE FEDERAL AGENCIES YOU CITE?***

9 ***A12.*** Yes. The U.S. Census Bureau reports data on natural gas bills each year through
10 the micro-data it provides on Public Use Microdata Areas (PUMAs).⁶ I compiled
11 the data on natural gas bills (for homes heating with natural gas and who pay for
12 their own natural gas) for each PUMA comprising the Columbia service territory.
13 The PUMAs I used to define the Columbia service territory are listed in Schedule
14 RDC-1. I compiled gas bills for each PUMA by differing income ranges. The
15 lowest income range I used was \$1 - \$20,000. I then increased the income in

⁶ The Census Bureau describes PUMAs as follows: “Public Use Microdata Areas (PUMAs) are non-overlapping, statistical geographic areas that partition each state or equivalent entity into geographic areas containing no fewer than 100,000 people each.” <https://www.census.gov/programs-surveys/geography/guidance/geo-areas/pumas.html>.

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1 \$20,000 increments to a maximum of \$200,000. I finally indexed, for each
2 PUMA, the natural gas bill at each income level to the natural gas bill at an
3 income of \$1 to \$20,000.

4
5 If the gas bill at a particular income range was higher than the gas bill at an
6 income of \$1 to \$20,000, the index was more than 100%. If the gas bill at a
7 particular income range was lower than the gas bill at an income of \$1 to \$20,000,
8 the index was less than 100%. I graphed the resulting indices for the four lowest
9 income ranges and the four highest income ranges.⁷ The graphed indices are
10 presented in Schedule RDC-2 (pages 1 through 4). As can be seen, the gas heating
11 expenditures at higher income levels are uniformly higher than the gas heating
12 expenditures at the lowest income level. For the four lowest income tiers above
13 \$20,000:

- 14 ➤ Income at \$20,001 - \$40,000: In 28 of the 46 PUMAs, the gas heating bill
- 15 index at the higher income level was more than 100%;
- 16 ➤ Income at \$40,001 - \$60,000: In 31 of the 46 PUMAs, the gas heating bill
- 17 index at the higher income level was more than 100%;
- 18 ➤ Income at \$60,001 - \$80,000: In 30 of the 46 PUMAs, the gas heating bill
- 19 index at the higher income level was more than 100%; and

⁷ The four lowest income ranges above \$20,000 are: \$20,001 - \$40,000; \$40,001 - \$60,000; \$60,001 - \$80,000; and \$80,001 - \$100,000. The four highest income ranges were \$120,001 - \$140,000; \$140,001 - \$160,000; \$160,001 - \$180,000; and \$180,001 - \$200,000.

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➤ Income at \$80,001 - \$100,000: In 37 of the 46 PUMAs, the gas heating bill index at the higher income level was more than 100%.

Similarly, at the four highest income levels above \$20,000, I examine the PUMA data reveals that in the Columbia service territory:

➤ Income at \$120,001 - \$140,000: In 34 of the 46 PUMAs, the gas heating bill index at the higher income level was more than 100%;

➤ Income at \$140,001 - \$160,000: In 32 of the 46 PUMAs, the gas heating bill index at the higher income level was more than 100%;

➤ Income at \$160,001 - \$180,000: In 39 of the 46 PUMAs, the gas heating bill index at the higher income level was more than 100%; and

➤ Income \$180,001 - \$200,000: In 33 of the 46 PUMAs, the gas heating bill index at the higher income level was more than 100%.

As can be seen, the local Columbia data supports the findings of every Federal agency that has examined the relationship between income and natural gas consumption. Gas consumption at higher income levels is higher than gas consumption at lower income levels.

Q13. WHAT FACTORS DRIVE THIS RESULT?

A13. The factors that drive this result in the Columbia service territory are the same factors that the DOE/EIA Residential Energy Consumption Survey has found to drive the result. While gas consumption may be less efficient at lower incomes

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than the gas consumption at higher incomes on a per square foot of housing basis, low-income households tend to live in much smaller housing units. As a result, even while the gas usage may be less efficient on a per square foot basis, low-income households live in homes that have sufficiently fewer square feet of housing space that the total gas consumption is nonetheless lower for lower income households.

Q14. IS THERE LOCAL DATA IN THE COLUMBIA SERVICE TERRITORY THAT SUPPORTS THIS RELATIONSHIP BETWEEN CONSUMERS' INCOME AND HOUSING UNIT SIZE?

A14. Yes. As in my discussion above, the data I consider is data for the PUMAs which comprise the Columbia service territory. I again limit the data I examine not merely to those occupied housing units using natural gas for space heating, but also to households who pay for their own natural gas.

➤ The first factor I examine is the type of building a housing unit represents. Schedule RDC-3 presents the distribution of housing units by structure of the building and income. I compare the percentage of households at different income ranges in each housing type to the percentage of households in those income ranges for the population as a whole. The data strikingly shows that low-income households are heavily over-represented in those households occupying mobile homes. While 13.3% of the total population has income less than \$10,000, 29.5% of the total population living in mobile homes does. While 20.4% of the total population has

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1 income between \$20,000 and \$40,000, 35.7% of the total population living
2 in mobile homes does. The data also shows that low-income households
3 are over-represented in the population living in apartments, while higher-
4 income households are under-represented in apartments.

5 ➤ The second factor I examine is the tenure (i.e., owner/renter status) by
6 income. The data is presented in Schedule RDC-4. The data clearly shows
7 that in the Columbia service territory, lower income households are under-
8 represented in owner-occupied housing units with a mortgage or loan and
9 over-represented in rental housing. While 13.0% of all units for which
10 tenure is established have income less than \$20,000, only 5.3% of the
11 owner-occupied units with a mortgage or loan have income that low.
12 While 20.3% of the total population has income between \$20,000 and
13 \$40,000, only 12.9% of the owner-occupied units with a mortgage (or
14 loan) have income in that range. In contrast, renter occupied housing is
15 over-represented within these income ranges (24.8% with income less than
16 \$20,000; 28.6% with income between \$20,000 and \$40,000). In contrast,
17 throughout the higher income ranges, owner-occupied units with a
18 mortgage (or loan) are over-represented and renter units are under-
19 represented. For example, while 10.6% of the total population has income
20 between \$80,000 and \$100,000, and 3.7% of the total population has
21 income between \$140,000 and \$160,000, only 6.6% and 1.0% of the
22 renters have incomes in those two ranges respectively.

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➤ I examined the size of housing units as well. In the absence of square footage data for housing units, there are two ways to consider the size of housing: (1) by the number of rooms (Schedule RDC-5); and (2) by the number of bedrooms (Schedule RDC-6). The data from the Columbia service territory clearly shows that lower income households are over-represented in those living in units with fewer rooms (13.7% of those with income less than \$20,000 in total population versus 39.6% of those living in one-room homes and 30.8% living in two-room homes) and under-represented in units with more rooms (7.4% in eight-room homes; 4.8% in nine-room homes). In contrast, higher income households are under-represented in smaller homes (e.g., 10.5% of total population have income at \$80,000 to \$100,000 vs. 0.7% of population living in one-room homes, and 5.2% of population living in two-room homes having income at that level). At the same time, high income households are over-represented in larger homes (e.g., 7.4% of total population have income of \$100,000 to \$120,000 while 11.1% to 11.6% of households living in homes with eight or more rooms have that income; 5.0% of total population have income of \$120,000 to \$140,000 vs. 8.0% to 10.6% of households living in homes with eight or more rooms have income in that range).

➤ Finally, when housing size is measured by the number of bedrooms (rather than the number of rooms), the same relationship is found. Schedule RDC-6 shows that lower-income households are over-represented amongst housing units with fewer bedrooms and under-represented in housing units

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1 with more bedrooms. Higher-income households are precisely the
2 opposite. Higher-income households are under-represented in housing
3 units with fewer bedrooms and over-represented in housing units with a
4 larger number of bedrooms. For example, while 13.3% of the total
5 population has income less than \$20,000, 31.6% of the population living
6 with one-bedroom have income that low (versus 5.4% of the population
7 living with five-bedrooms have income in that range). In contrast, while
8 3.7% of the total population live with income between \$140,000 and
9 \$160,000, 7.9% of the population living with five-bedrooms have income
10 in that range.

11
12 All of the data that I have examined supports the same conclusion. Income and
13 natural gas usage are related. As household income increases, natural gas usage
14 tends to increase as well. This is not to say that all low-income households have
15 low usage, or that all high-income households have high usage. But
16 disproportionately, and on average, lower income households tend also to be
17 lower use customers.

18
19 ***Q15. PLEASE EXPLAIN WHY PIPP CONSUMPTION MIGHT BE MUCH***
20 ***HIGHER THAN TYPICAL LOW-INCOME CONSUMPTION.***

21 ***A15.*** The Columbia Gas “PIPP Report” for 2021 indicates that average annual
22 consumption for PIPP consumers in the twelve months ending December 2021
23 was 88.34 MCF while the average consumption of non-PIPP residential

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1 consumers was 75.22 MCF. (Columbia Gas PIPP Report, lines 61 – 63, “Usage”).

2 While I do not dispute this data, neither does this data stand in contravention of
3 my discussion above. First, as I establish below, PIPP serves a very small fraction
4 (13.6%) of the total low-income customer base of Columbia. This small sample of
5 PIPP customers is not representative of the low-income population of Columbia.

6 This can be attributed to the underlying design of the program. A low-income
7 customer will only participate in PIPP if the customer’s natural gas bill exceeds
8 the PIPP’s definition of an unaffordable home energy bill. Customers with smaller
9 bills, and thus lower burdens, do not participate in PIPP. The fact that PIPP usage
10 is higher, therefore, cannot be attributed to the fact that low-income customers
11 have higher consumption. It can be attributed to the fact that, by its very design,
12 PIPP enrolls higher use customers.

13

14 ***Q16. WHY IS THE CONSIDERATION OF RENTER UNITS IMPORTANT***
15 ***ABOVE?***

16 ***A16.*** The consideration of renter units above is important because of the sharp
17 association between the size of housing units in Ohio and the tenure (i.e.,
18 owner/renter status) of the housing occupants. According to the 2019 American
19 Housing Survey (AHS), published by the U.S. Department of Housing and Urban
20 Development (HUD), smaller housing units are overwhelmingly renter-occupied
21 units. HUD reports that 32% of all Ohio housing units are renter-occupied. In
22 contrast, more than 90% of units that have fewer than 750 square feet of space are
23 renter-occupied, while 63% of housing units with 750 to 999 square feet of space

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1 are renter occupied. Not until housing units have more than 1,000 square feet in
2 space do they become predominantly owner-occupied. By the time housing units
3 have between 1,500 and 2,000 square feet of space, 86% of those units are owner-
4 occupied. When Ohio housing units have 2,000 or more square feet of space,
5 substantially more than 90% of the units are owner-occupied (compared to 68%
6 of all units that are owner-occupied).

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Table 4. Number of Occupied Housing Units by Square Footage and Tenure (Ohio) (2019) (2019 American Housing Survey) (U.S. Department of Housing and Urban Development)			
Size of Housing Unit (square footage)	Tenure	Number of Housing Units (in 000s)	Percentage of Housing Units
Total	Total	4,794.0	
	Owner	3,272.8	68%
	Renter	1,521.2	32%
Less than 500	Total	85.1	
	Owner	NA	NA
	Renter	77.4	91%
500 to 749	Total	225.6	
	Owner	NA	NA
	Renter	204.2	91%
750 to 999	Total	464.5	
	Owner	174.2	38%
	Renter	290.4	63%
1,000 to 1,499	Total	1,113.5	
	Owner	784.0	70%
	Renter	329.5	30%
1,500 to 1,999	Total	895.5	
	Owner	766.9	86%
	Renter	128.5	14%
2,000 to 2,499	Total	565.8	
	Owner	533.4	94%
	Renter	32.4	6%
2,500 to 2,999	Total	288.7	
	Owner	276.7	96%
	Renter	NA	NA
3,000 to 3,999	Total	297.9	
	Owner	286.9	96%
	Renter	NA	NA
4,000 or more	Total	140.6	
	Owner	136.4	97%
	Renter	NA	NA

***NA indicates an insufficient number reporting for the AHS to report results.

1

2

3

4

5

When we know, as we do from the Census data I discussed above, that renter-occupied units are disproportionately occupied by low-income households, we can deduce that these low-income occupied rental units are also units with fewer square feet of space, with correspondingly lower natural gas consumption.

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1 **Q17. WHAT DO YOU CONCLUDE?**

2 **A17.** Based on the data and discussion presented above, I conclude that the proposed
3 increased SGS customer charge will, disproportionately and on average, have a
4 detrimental impact on low-income consumers. It will take consumers who already
5 are in more payment trouble than the typical Columbia consumer and will
6 increase both the dollars in arrears, the accounts in arrears, and the loss of service
7 due to nonpayment disconnections based on those arrears. It will further reduce
8 the ability of those low-income payment-troubled consumers to reduce their bills
9 and thus take active steps to make their bills more affordable, and thus more
10 payable. As a result, there will be adverse consequences not merely to the low-
11 income consumers themselves, but also to other Columbia consumers who will
12 pay the tab for this inability-to-pay.

13

14 I will discuss this conclusion in more detail below, but let me illustrate here. I find
15 that Columbia is more likely to disconnect consumers for nonpayment in low-
16 income neighborhoods. Moreover, the accounts in these low-income
17 neighborhoods that are disconnected for nonpayment have a higher arrearage than
18 accounts that are disconnected for nonpayment in neighborhoods with fewer low-
19 income households. I began this inquiry by examining 2021 data. Out of the 510
20 Columbia zip codes for which data was available, I then identified three groups of
21 zip codes: (1) the 100 zip codes with the greatest percentage of Columbia
22 nonpayment disconnections; (2) the 50 zip codes with the greatest percentage of
23 Columbia nonpayment disconnections; and (3) the 25 zip codes with the greatest

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1 percentage of Columbia nonpayment disconnections. In calculating the
2 “percentage of disconnections,” the numerator was the number of nonpayment
3 disconnections in the zip code and denominator was the total number of Columbia
4 nonpayment disconnections. The sum of the percentages for all zip codes, in other
5 words, was 100%.

6
7 For each of the three groups, I examined the following metrics: (1) the percentage
8 of the total population in each group of zip codes; (2) the percentage of the total
9 number of households in each group of zip codes;⁸ (3) the percentage of
10 population with annual income below 150% of Federal Poverty Level; (4) the
11 percentage of households with annual income at or below \$15,000; (5) the
12 percentage of nonpayment disconnections; and (6) the percentage of arrearages at
13 the time of a nonpayment disconnection. Table 5 presents the results of these
14 inquiries.

15
16 The data shows that not only do low-income neighborhoods have a higher
17 percentage of nonpayment disconnections, but also that those accounts that have
18 had service disconnected for nonpayment in a low-income neighborhood have
19 higher arrears than other accounts subject to a nonpayment disconnection. For
20 example:

⁸ Census data reports Federal Poverty Level by population (persons) (American Community Survey, Table C17002), but reports household income by households (American Community Survey, Table B19001).

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- 1 ➤ The 100 zip codes with the greatest percentage of population with income
2 less than 150% of Poverty Level have virtually identical percentages of
3 the total population and total number of households (57.3% and 58.2%
4 respectively), but they have a noticeably higher percentage of the total
5 population below 150% of Poverty (69.5%) and of the total percentage of
6 households with income below \$15,000 (69.8%). In turn, these low-
7 income neighborhoods have even a higher percentage of the total
8 percentage of the total number of disconnections. The percentage of
9 dollars at the time of a disconnection that comes from these 100 zip codes
10 is higher still (83.0%). The 100 zip codes with roughly 70% of the total
11 low-income population have roughly 80% of the total number of
12 nonpayment disconnections and an even higher percentage of the dollars
13 that are owed on disconnected accounts.
- 14
- 15 ➤ The 50 zip codes with the greatest percentage of population with income
16 less than 150% of Poverty Level have roughly 35% of the total population,
17 but nearly half of the total low-income population. These zip codes with
18 half of the low-income population, however, generate nearly three-fifths
19 of the total number of nonpayment disconnections, and an even higher
20 percentage of the dollars of arrears on disconnected accounts (62.6%).
- 21
- 22 ➤ The 25 zip codes with the greatest percentage of population with income
23 less than 150% of Poverty Level have roughly 20% of the total population,
24 but have 30% of the total low-income population. These zip codes with
25 the disproportionate percentage of low-income customers have an even
26 more disproportionate percentage both of the nonpayment disconnections
27 (32.5%) and of the dollars of arrears on disconnected accounts (36.1%).

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Table 5. Nonpayment Disconnections (DNPs) and Low-Income Columbia Zip Codes Compared to Total Population and Total Households (HHs), Total Population Below 150% of Federal Poverty Level (FPL), and Total Number of HHs with Income Below \$15,000 (2021)						
	Total Pop	Tot HHs	Below Population with Income <150 FPL	Tot HHs with Income <\$15K	No. of DNPs	Total Arrears at Time of DNP
Sum of 100 zip codes with the greatest percent of pop <150% FPL	57.3%	58.2%	69.5%	69.8%	78.1%	83.0%
Sum of 50 zip codes with the greatest percent of pop <150% FPL	35.2%	35.5%	48.2%	47.3%	57.3%	62.6%
Sum of 25 zip codes with the greatest percent of pop < 150% FPL	18.8%	18.8%	30.8%	29.6%	32.5%	36.1%

2

3 The same results can be seen when one begins with a distribution of the
4 percentage of nonpayment disconnections by zip code.

- 5 ➤ The 100 zip codes with the highest percentage of total disconnections are
6 disproportionately low-income. These zip codes have 64% of the total
7 low-income population but 82.5% of the total number of disconnections,
8 and 87.2% of the total dollars of unpaid arrears at the time of a
9 nonpayment disconnection.
- 10 ➤ The 50 zip codes with the highest percentage of total disconnections have
11 44% of the total low-income population, but 63% of the total number of
12 disconnections, and 71% of the total dollars of unpaid arrears at the time
13 of a nonpayment disconnection.
- 14 ➤ The 25 zip codes with the highest percentage of disconnections have
15 roughly one-fourth of the total low-income population (27% <150% FPL;
16 26% <\$15,000), but have more than 42% of the total number of
17 disconnections and nearly half of the total unpaid arrears at the time of a
18 nonpayment disconnection.
19
20

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Table 6. Nonpayment Disconnections (DNPs) and Low-Income Columbia Zip Codes Compared to Total Population and Total Households (HHs), Total Population Below 150% of Federal Poverty Level (FPL), and Total Number of HHs with Income Below \$15,000 (2021)				
	Pct Below Population with Income <150 FPL	Pct HHs with Income <\$15K	Pct of DNPs	Pct Total Arrears at Time of DNP
Sum of top 100 pct of total disconnections	64.2%	64.2%	82.5%	87.2%
Sum of top 50 pct of total disconnections	44.2%	43.6%	63.1%	71.0%
Sum of top 25 pct of total disconnections	27.0%	26.0%	42.1%	49.6%

2

3 What Columbia proposes to do, however, is to impose the highest increase in bills
4 on these low-income customers who are in the greatest arrears and have the
5 greatest likelihood of involuntarily losing service due to a nonpayment
6 disconnection. Not only does Columbia propose to increase the bills the most to
7 these customers, but also to increase the proportion of the bills comprised of fixed
8 charges so as to make a higher percentage of the bills irreducible.

9

10 **PART 2. THE HARM OF AN INCREASED CUSTOMER CHARGE TO**
11 **LOW-INCOME CONSUMERS.**
12

13 ***Q18. PLEASE DESCRIBE THE PURPOSE OF THIS SECTION OF YOUR***
14 ***TESTIMONY.***

15 ***A18.*** In this section of my testimony, I explain how and why imposing a
16 disproportionately high, and irreducible, increase in the monthly gas bills of low-
17 income consumers will not only harm low-income consumers, but will also result

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1 in an overall increase in costs to Columbia that must be included in future rates.
2 My discussion below will demonstrate that even in normal times, increasing
3 unavoidable bills to low-income consumers will harm those consumers in many
4 different ways.

5

6 **A. The Bill Payment Difficulties of Low-Income Consumers.**

7

8 ***Q19. DO LOW-INCOME CONSUMERS HAVE GREATER BILL PAYMENT***
9 ***DIFFICULTIES THAN NON-LOW-INCOME CONSUMERS?***

10 ***A19.*** Payment difficulties are closely related to income according to national data from
11 the 2020 Residential Energy Consumption Survey (RECS)⁹ recently released by
12 the Department of Energy's Energy Information Administration (DOE/EIA). In
13 its 2022 release of national RECS data (state and regional data from the 2020
14 RECS is not yet available),¹⁰ DOE/EIA reported that the receipt of disconnection
15 notices (or delivery stop notices) sharply declines as incomes increase. Figure 1
16 immediately below presents the data. While more than one-in-four (26.6%)
17 households with annual income less than \$5,000 reported receiving a shutoff
18 notice in 2020, that percentage declined to one-in-eight (11.5%) by the time
19 income increased to between \$40,000 and \$60,000. Only 3.7% of households with
20 income between \$100,000 and \$150,000 received a shutoff notice.

⁹ U.S. Department of Energy, Energy Information Administration, 2020 Residential Energy Consumption Survey, available at <https://www.eia.gov/consumption/residential/data/2020/> (last accessed April 30, 2022).

¹⁰ Available at <https://www.eia.gov/consumption/residential/data/2020/> (last accessed April 22, 2022).

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1 Receiving a shutoff notice, however, is not the only evidence of payment
2 difficulty facing low-income consumers. The paid-but-unaffordable bill is also a
3 real phenomenon. According to the 2020 RECS data released by DOE/EIA, more
4 than 40% of households with income less than \$10,000 reported reducing or
5 forgoing food or medicine in order to have sufficient money to pay their home
6 energy costs in 2020.¹¹ More than 30% of households with income between
7 \$10,000 and \$40,000 reported forgoing food or medicine in order to have
8 sufficient money to pay home energy bills. By the time income reached \$60,000,
9 the percentage of households reporting making those trade-offs decreased to
10 roughly 10% or less.

11
12 ***Q20. DO YOU HAVE ADDITIONAL REASON TO BELIEVE THIS DOE/EIA***
13 ***DATA PRESENTS AN ACCURATE PICTURE OF LOW-INCOME***
14 ***CONSUMERS' PAYMENT DIFFICULTIES?***

15 ***A20.*** Yes. This DOE data is consistent with data from the National Energy Assistance
16 Directors Association ("NEADA"). NEADA periodically conducts a
17 Congressionally-funded survey of low-income households who receive benefits
18 through the federal fuel assistance program (called LIHEAP). The most recent
19 NEADA survey was published in December 2018.¹² NEADA provides three

¹¹ Available at <https://www.eia.gov/consumption/residential/data/2020/> (last accessed April 22, 2022).

¹² NEADA (December 2018). 2018 National Energy Assistance Survey, Final Report, available at <http://www.appriseinc.org/resource-library/selected-reports/energy-survey-research-and-policy-analysis/> (last accessed March 6, 2022).

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1 results that are important from the perspective of how inability-to-pay tracks
2 income levels.

3 ➤ First, according to NEADA, not only do a significant number of low-
4 income households skip paying or pay less than their full home energy bill
5 due to not having enough money for their energy bill, but the percentage
6 reporting taking such actions increases as incomes decline. Table 7
7 presents data which shows that one-in-nine LIHEAP recipients (11%)
8 either skipped paying their home energy bills every month, or paid less
9 than their full bill, because they did not have enough money to pay their
10 bill. Nearly three times as many LIHEAP recipients with income less than
11 50% of Poverty (17%), and 1.5 times as many recipients with income
12 between 51 and 100% of Poverty (9%), did so than did LIHEAP recipients
13 with income greater than 150% of Poverty (6%). Fewer than half of
14 LIHEAP recipients (49%) said that they “never” skipped paying a bill, or
15 paid less than their full bill. While three-in-five (57%) recipients with
16 income greater than 150% of Poverty reported never missing a payment,
17 or paying less than their full payment, only two-in-five (40%) recipients
18 with income below 50% of Poverty reported never skipping a payment.

Table 7. Skipped Paying or Paid Less than Entire Home Energy Bill
Due to Not having Enough Money for the Energy Bill During the Past Year
2018 NEA Survey Final Report (at 24 – 25)

	Total	Poverty Level			
		0 - 50%	51 – 100%	101 – 150%	>150%
Almost every month	11%	17%	9%	11%	6%
Some Months	21%	34%	17%	20%	15%
1 or 2 Months	17%	8%	24%	12%	20%
Never / No	49%	40%	47%	56%	57%
Don't Know/Refused	2%	2%	3%	1%	2%

19
20 ➤ Second, one impact of skipping payments, or making less than full
21 payments, is that LIHEAP recipients also report having received shutoff
22 notices. The data is set forth in Table 8 immediately below. Fewer than
23 half reported having “never” received a shutoff notice, while nearly one-
24 third report having received a shutoff notice either “almost every month”
25 (11%) or “some months” (21%). Again, there is a noticeable difference

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between households at the lowest income levels and households at the highest income level. While more than one-quarter (27%) of LIHEAP recipients with income less than 50% of Poverty report having received a disconnect notice either “almost every month” (10%) or “some months” (17%), only 4% of households with income greater less than 150% of Poverty reported receiving disconnect notices that frequently (0% almost every month; 4% some months). More than four-fifths (84%) of LIHEAP recipients with income greater than 150% of Poverty report never having received a shutoff notice, while only one-half (50%) of LIHEAP recipients with income less than 50% of Poverty did so.

Table 8. Received Notice or Threat to Disconnect or Discontinue Electricity or Home Heating Fuel Due to Not Having Enough Money for the Energy Bill During the Past Year
2018 NEA Survey Final Report (at 26 – 27)

	Total	Poverty Level			
		0 - 50%	51 – 100%	101 – 150%	>150%
Almost every month	4%	10%	3%	4%	0%
Some Months	13%	17%	15%	9%	4%
1 or 2 Months	17%	20%	18%	15%	12%
Never / No	64%	50%	62%	70%	84%
Don't Know/Refused	2%	4%	2%	2%	0%

- Finally, the NEADA survey of LIHEAP recipients reports that nearly one-in-six (15%) recipients experienced either an electricity shutoff or a natural gas shutoff due to nonpayment during the past year. When utility fuels are examined individually, the NEADA data shows that 13% of all LIHEAP recipients had their electricity disconnected for nonpayment, and 7% of LIHEAP recipients had their natural gas service disconnected for nonpayment. The data is presented in Table 9 below. The lowest income recipients had service disconnected far more frequently than did higher income recipients: five times more frequently for electricity (24% vs. 5%), and nearly six times more frequently for natural gas (12% vs. 2%).

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1

Table 9. Utility Service Was Shut Off Due to Nonpayment During the Past Year 2018 NEA Survey Final Report (at 27 – 28)					
	Total	Poverty Level			
		0 - 50%	51 – 100%	101 – 150%	>150%
Electricity	13%	24%	12%	9%	5%
Gas	7%	12%	6%	8%	2%
Electricity or Gas	15%	26%	14%	13%	7%

2

3

4 ***Q21. WHAT DO YOU CONCLUDE?***

5 ***A21.*** Based on this data and discussion, two conclusions have been convincingly
6 established. First, substantial numbers of low-income households either skip
7 payments or pay less than their full utility bill in any given month because they
8 lack the household resources to make such payments.

9 In addition, as a result of these actions, utilities respond by engaging in collection
10 activity that frequently leads to the threatened or actual disconnection of service.
11 The failure to pay, and the utility collection activity which results from that failure
12 to pay, is clearly related to low-income status. While problems are more prevalent
13 in the lowest income tier of poverty (0 – 50%), there is a bright line of distinction
14 between those households with income at or below 150% of poverty and those
15 households with income exceeding 150% of poverty.

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**Q22. HOW DO THE INCREASED FIXED CHARGES MAKE THESE PAYMENT
DIFFICULTIES EVEN MORE CHALLENGING FOR LOW-INCOME
CONSUMERS?**

A22. By making a higher proportion of a monthly bill irreducible as a fixed charge, it is more difficult for a low-income consumer to respond to their inability to pay. The National Energy Assistance survey I previously discussed, performed by the National Energy Assistance Directors Association (the national association of state agencies that administer the federal LIHEAP fuel assistance program), examined what low-income households do when they cannot afford to pay their bills. The most recent NEADA survey (2018) reported:

- 36% of low-income households “closed off part of home because they could not afford to heat or cool it due to not having enough money for the energy bill during the year” either: (1) almost every month (10%); (2) some months (16%); or (3) 1 or 2 months (10%). Households with income less than 50% of Poverty (i.e., the lowest income) undertook this action the most frequently (almost every month: 10%; some months: 24%; 1 or 2 months: 12%).
- More than 1-in-4 low-income households (26%) “kept home at temperature you felt was unsafe or unhealthy due to not having enough money for the energy bill during the past year (almost every month: 4%; some months: 13%; 1 or 2 months: 9%). Nearly 1-in-4 seniors took this action (almost every month: 4%; some months: 11%; 1 or 2 months: 8%), as did households with at least one child under age 18 (almost every month: 4%; some months: 12%; 1 or 2 months: 8%).
- Nearly one-third of low-income households (29%) used the kitchen stove or oven to provide heat due to not having enough money for the energy bill during the past year (almost every month: 1%; some months: 11%; 1 or 2 months: 18%). The disabled (almost every month: 1%; some months: 12%; 1 or 2 months: 19%), and households with at least one child under age 18 (almost every month: 2%; some months: 11%; 1 or 2 months: 20%)

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1 took this action more frequently, but not much more so, than seniors
2 (almost every month: <1%; some months: 9%; 1 or 2 months: 14%).
3

4 The lesson here is that Columbia's proposal to substantially increase its fixed
5 monthly customer charge makes these low-income responses to inability-to-pay
6 less efficacious. Having a low-income household close-off part of their home will
7 not reduce the bill as much if Columbia's proposal is approved to increase the
8 proportion of the bill that is a fixed monthly charge and thus unavoidable. Having
9 a low-income household reduce the temperature in the home, even to unsafe or
10 unhealthy levels, will not reduce the bill to more affordable levels if Columbia's
11 proposal to increase the proportion of the bill that is a fixed monthly charge and
12 thus unavoidable.

13
14 Having a low-income household use its stove or oven as a supplemental heating
15 source in order to reduce the heating usage in the home as a whole will not reduce
16 the bill to more affordable levels should Columbia's proposal to increase the
17 proportion of the bill that is irreducible as a fixed monthly charge is approved.
18 Low-income households, particularly vulnerable low-income households (e.g.,
19 elderly, disabled, families with children), will take dramatic actions to try to
20 reduce their bills to more affordable levels. Columbia's propose increase in its
21 fixed monthly charge, however, means that those efforts will be less and less
22 effective.

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1 **Q23. HOW DO THE CONSUMER PAYMENT DIFFICULTIES YOU IDENTIFY**
2 **ABOVE RELATE TO A UTILITY'S COST OF SERVICE?**

3 **A23.** As low-income payment difficulties increase, a utility's overall cost-of-service
4 increases as well. Payment difficulties contribute not only to Columbia's credit
5 and collection expenses, but to Columbia's bad debt expense as well. Bad debt
6 will increase when low-income accounts are disconnected and never reconnected.
7 In addition, to the extent that low-income arrears are associated with accounts that
8 are final-billed, whether or not disconnected, the corresponding uncollectibles
9 will be higher as consumers move and leave unpaid bills behind. Columbia
10 collects its uncollectible debt through its UEX Rider. These costs are thus paid by
11 all consumers.

12
13 These contributions to revenue requirement, however, are not the most significant
14 increase in costs. Even more substantially, low-income payment difficulties
15 contribute to Columbia's working capital expense. Moreover, since working
16 capital is a capital expense, there will be an equity return earned, with the
17 associated income tax impact. The rate impact of increased working capital needs
18 will thus be correspondingly higher all other things equal.

19
20 **Q24. HOW DO LOW-INCOME CONSUEMRS' PAYMENT DIFFICULTIES**
21 **CONTRIBUTE TO WORKING CAPITAL EXPENSES?**

22 **A24.** Low-income payment difficulties contribute to Columbia's working capital
23 requirements in two different ways. First, to the extent that low-income arrearages

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1 are higher than non-low-income arrearages (in dollar amounts), the working
2 capital expense will be higher. Second, to the extent that low-income arrearages
3 are older than non-low-income arrearages (in days of aging), the working capital
4 expense will be higher all else equal. All other things equal, a \$300 arrearage will
5 impose a higher working capital expense than a \$150 arrearage. All other things
6 equal, a 90-day arrearage will impose a higher working capital expense than a 30-
7 day arrearage.

8
9 In sum, when Columbia contributes to the increasing payment difficulties of the
10 Company's low-income consumer base through substantial increases to its
11 irreducible fixed monthly charge, Columbia is also contributing to an increase in
12 its own cost of service that will drive rates even higher than they would have been
13 in the future without the increased customer charge.

14

15 ***Q25. IS IT POSSIBLE TO QUANTIFY THE EXTENT OF THE INCREASED***
16 ***NONPAYMENT ARISING FROM THE COMBINED IMPACTS OF AN***
17 ***UNAFFORDABLE BILL AND THE INABILITY TO REDUCE THAT BILL***
18 ***TO MORE AFFORDABLE LEVELS?***

19 ***A25.*** Yes. While I do not have data for Ohio utilities, the lessons learned from
20 Pennsylvania, Ohio's next-door neighbor, are informative. In Pennsylvania, each
21 major natural gas and electric distribution company is required to operate a
22 Customer Assistance Program ("CAP"), Pennsylvania's equivalent to Ohio's
23 PIPP. The Pennsylvania PUC further requires each utility to retain an independent

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1 third-party to perform an impact evaluation on a periodic basis. The results of six
2 of those evaluations –the six in which an examination of payment coverage ratios
3 was undertaken—are presented in Table 10 below. I do not offer this Table to
4 demonstrate the benefits arising from adoption of an affordability program such
5 as CAP (or such as Ohio’s PIPP), but rather to show the nonpayment impacts that
6 charging an unaffordable bill has on the ability of low-income customers to pay
7 those unaffordable bills.

8
9 Table 10 shows the “payment coverage ratio” of low-income consumers before
10 and after those consumers enroll in the respective Pennsylvania CAP program. It
11 is the “pre” participation period that is of particular relevance to this proceeding.
12 A payment coverage ratio is a simple calculation. One places the amount of
13 dollars billed in the denominator and the amount of dollars collected in the
14 numerator. The resulting percentage of bill paid is known as the “payment
15 coverage ratio.”

16
17 As can be seen in the Table, when bills are at an unaffordable level, the payment
18 coverage ratio is substantially lower for low-income consumers. Of the five
19 utilities reporting pre-participation data, the percentage of consumers paying 90%
20 or more of their bill ranged from a low of 26% (Duquesne Light) and 30% (PGW)
21 to a high of 43% (PPL), 45% (UGI Gas), and 48% (Peoples Natural Gas). In no
22 instance, did more than half of the low-income customers pay more than 90% of
23 their bill when bills were unaffordable. In contrast, the percentage of low-income

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1 customers paying less than 80% of their bill ranged from a low of 39% (PPL) and
2 40% (UGI Gas, Peoples Natural Gas) to a high of 54% (Duquesne Light) and
3 59% (PGW).

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	UGI Gas ¹³		Duquesne Light (Electric Heating) ¹⁴		First Energy ¹⁵		PGW ¹⁶		Peoples Natural Gas ¹⁷		PPL ¹⁸ (Electric Heating)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
=>100%	31%	55%	15%	30%		36%	19%	31%	33%	71%	25%	59%
90% - 99%	14%	21%	11%	33%		23%	11%	25%	15%	9%	18%	21%
80% - 89%	15%	10%	19%	18%	N/A	19%	11%	14%	12%	6%	19%	9%
<80%	40%	13%	54%	19%		22%	59%	29%	40%	14%	39%	12%
Total	100%	100%	99%	100%		100%	100%	100%	100%	100%	100%	100%

¹³ UGI Utilities, Inc. – Gas Division and UGI Penn Natural Gas, Inc. Universal Service Program, Final Evaluation Report, at 78 (2012).

¹⁴ Duquesne Light Universal Service Programs, Final Evaluation Report, at 71 (2015).

¹⁵ First Energy Universal Service Programs, Final Evaluation Report, at 92 (2017). Individual FirstEnergy utilities also reported (Met-Ed, Penelec, Penn Power).

¹⁶ Philadelphia Gas Works Universal Service Programs Impact Evaluation, Final Report, at 59 (2019).

¹⁷ Peoples Natural Gas 2017 Universal Service Program Evaluation, Final Report, at 78 (2017).

¹⁸ PPL Electric Utilities Universal Service Programs, Final Evaluation Report, at 101 (2020).

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1 In contrast, when bills were made more affordable—in these cases through a rate
2 discount akin to Ohio's PIPP—the payment coverage ratios dramatically
3 improved. The percentage of low-income consumers paying 90% or more of their
4 bill improved from 45% to 76% for UGI Gas; from 26% to 66% for Duquesne
5 Light; from 30% to 56% for PGW; from 48% to 80% for Peoples Natural Gas;
6 and from 43% to 80% for PPL.

7
8 When taking into consideration the performance of each comparison group, even
9 UGI's performance demonstrates the role played by the CAP in improving bill
10 payment. While the improvement within the participant group (pre-participation
11 vs. in-participation) was 5%, UGI (electric)'s net change relative to its
12 comparison group was 18% (meaning that while performance improved within
13 the participant population, payment performance declined by 13% in the
14 comparison group). The net improvement in bill payment coverage ratios relative
15 to the comparison groups ranged from roughly 20% to more than 35% amongst
16 the various evaluations.

17
18 The greater payment difficulties when bills were at unaffordable levels imposed
19 greater costs on the utility.

20
21 ***Q26. IS THERE RELATED DATA SHOWING THIS IMPACT?***

22 ***A26.*** Yes. Insights into the reason for the improved payment patterns can be derived
23 from the data presented in Table 11 below, derived from the same independent

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1 third-party evaluations of the low-income programs. This Table reports data on
2 the ease or difficulty of bill payment reported by program participants before
3 enrolling in the discount program and while being enrolled in the discount
4 program. (Not all utility evaluations undertook this data collection and analysis.)
5

6 The applicability of this data to Columbia is evident at both ends of the spectrum
7 of bill payment difficulty (ease). The Table shows that as bills become more
8 affordable for each utility there was a substantial decline in the percentage of
9 program participants who reported finding it “very difficult” to make their bill
10 payments. In addition, for each utility, there was a substantial increase in the
11 percentage of program participants who reported finding it “not at all difficult”
12 (“very easy”) or “not too difficult” (“somewhat easy”) to make bill payments
13 when bills could be reduced to an affordable level.

14 ➤ For PPL, while 63% reported finding it very difficult to make bill
15 payments before program participation, only 3% reported it being very
16 difficult after enrolling in CAP. In contrast, while 5% reported it being not
17 at all difficult (very easy) to make bill payments before program
18 participation, 34% reported it being not at all difficult after enrollment.
19 Similarly, the change in the percentage reporting it being “somewhat
20 easy” (“not too difficult”) increased from 10% prior to program
21 participation to 47% after program enrollment.
22

23 ➤ For Peoples Gas, while 58% reported finding it very difficult to make bill
24 payments before program participation, only 5% reported it being very
25 difficult after CAP enrollment. While 4% reported it being “very easy”
26 (“not at all difficult”) to make bill payments before program participation,
27 and 5% reported it being “somewhat easy” (“not too difficult”) before
28 program participation, 34% said it was “very easy,” and 47% said it was
29 “somewhat easy” to make bill payments after enrollment.
30

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Table 11. Difficulty of Low-Income Customers in Making Bill Payments (Pennsylvania Gas and Electric Distribution Utilities)										
	PPL (2020)		Peoples Gas (2017)		First Energy (2017) (combined, ME, PP, PN)		UGI (electric) (2012)		Duquesne (non-heating & heating) (2015)	
	Before CAP	In CAP	Before CAP	In CAP	Before CAP	In CAP	Before CAP	In CAP	Before CAP	In CAP
Very difficult	63%	3%	58%	5%	56%	13%	67%	7%	49%	2%
Somewhat difficult	19%	16%	30%	25%	35%	23%	22%	35%	38%	8%
Somewhat easy/Not too difficult	10%	47%	5%	35%	4%	36%	6%	33%	9%	53%
Very Easy/Not at all difficult	5%	34%	4%	33%	3%	26%	0%	26%	1%	36%
Don't know	2%	0%	1%	1%	1%	1%	5%	0%	2%	1%
Refused	0%	0%	2%	1%	1%	1%	0%	0%	0%	0%
Total	99%	100%	100%	100%	100%	100%	100%	101%	99%	100%

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➤ For the FirstEnergy utilities, while 56% reported it being very difficult to make bill payments before program participation, 13% reported it being very difficult to make bill payments after enrollment. In contrast, while 3% said it was “very easy” (“not at all difficult”), and 4% said it was “somewhat easy” (“not too difficult”) to make bill payments before program participation, those numbers increased to 26% and 36% respectively after program enrollment.

Similar results were found for both UGI (electric) and Duquesne Light. The percentage of low-income consumers finding it “very difficult” to pay their bills before program participation dropped from 67% to 7% for UGI (electric), and from 49% to 2% for Duquesne Light. The percentage of low-income consumers who reported finding it “very easy” (not at all difficult) to pay their bills increased from 0% to 26% for UGI (electric) and from 1% to 36% for Duquesne Light. The percentage who reported it being “somewhat easy” (not too difficult) increased from 6% to 33% for UGI (electric) and from 9% to 53% for Duquesne Light.

Q27. HOW DOES THIS DATA RELATE TO THE COLUMBIA PROPOSED INCREASE IN ITS FIXED MONTHLY SGS CUSTOMER CHARGE?

A27. By dramatically increasing the portion of the Columbia bill that is unavoidable as a fixed monthly charge, Columbia is impeding, if not outright preventing, the ability of its low-income consumers to reduce their bills to more affordable levels, and thus to increase their bill payment coverage ratio as occurred in Pennsylvania. The Columbia proposal to significantly increase its fixed monthly charge effectively traps low-income consumers with unaffordable bills they cannot

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1 control by reducing usage to a level below that level where bills are “very
2 difficult” or “somewhat difficult” to pay.

3
4 As I discuss in the detail above, one impact of trapping low-income consumers
5 with irreducible, unaffordable, bills is to increase bill nonpayment with all of the
6 costs appurtenant to that nonpayment. Those costs of nonpayment will be borne
7 by all ratepayers in future rate cases. The dramatic increase in the SGS fixed
8 monthly charge, in other words, harms not only the low-income consumers who
9 cannot pay, but harms all other consumers, as well, as they pick up the bill for that
10 nonpayment.

11
12 **B. Potential Columbia Payment Assistance Responses Do Not**
13 **Sufficiently Protect Low-Income Consumers.**

14
15 ***Q28. DOESN'T COLUMBIA OFFER PROGRAMS AND PROCESSES THAT ARE***
16 ***DESIGNED TO ASSIST LOW-INCOME CONSUMERS?***

17 ***A28.*** Yes. I will examine three such programs in particular below: (1) promoting the
18 federal fuel assistance program (LIHEAP); (2) the Percentage of Income Payment
19 Program (“PIPP”); and (3) promoting deferred payment arrangements (DPAs)
20 through which to retire arrearages. I will examine each in turn. I find that these
21 Columbia programs will not sufficiently protect low-income consumers from the
22 harms of an increased fixed monthly customer charge.

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1 ***Q29. PLEASE EXPLAIN WHY FEDERAL LIHEAP BENEFITS WILL NOT***
2 ***PROTECT COLUMBIA LOW-INCOME CONSUMERS FROM THE HARMS***
3 ***OF THE PROPOSED FIXED MONTHLY CUSTOMER CHARGE.***

4 ***A29.*** Given the existing fixed monthly charge of \$34.91, and the proposed fixed
5 monthly customer charge of \$46.31, Columbia is increasing the unavoidable fixed
6 monthly payment by \$11.40 per month. Multiplied by the estimated 304,483 low-
7 income Columbia consumers on its system, the Company proposes to increase the
8 irreducible fixed monthly bill by \$41,653,274 per year ($304,483 \times \$11.40 \times 12 =$
9 $\$41,653,274$). This is the amount of the increase in the fixed customer charge
10 standing alone, not the amount of the total fixed charge.

11
12 In contrast, Columbia's low-income customers received a total LIHEAP Benefits
13 of \$10,026,414 in 2018; \$10,074,557 in 2019; \$18,335,142 in 2020;¹⁹
14 \$13,363,802 in 2021; and \$12,137,127 in 2022 (YTD). (See Discovery Response
15 to OCC-14-2(a)). The revenue being taken out of the Columbia's low-income
16 community, exclusively from the increase in the fixed monthly charge, not taking
17 into account the total rate increase, is from three to four times greater than the
18 total amount of LIHEAP flowing into Columbia's low-income customers in a
19 typical year.

¹⁹ LIHEAP benefits were substantially greater in 2020 due to supplemental Congressional appropriations in response to COVID-19.

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1 Moreover, Columbia reports that the number of Columbia customers receiving
2 LIHEAP basic cash grants was 83,044 (2018); 65,520 (2019); 79,632 (2020);
3 56,153 (2021); and 36,624 (2022 YTD). (OCC-14-1(a)). When compared to the
4 estimated number of low-income customers on its system (304,483), it is evident
5 that only one-fifth to one-quarter of Columbia's estimated number of low-income
6 customers even received LIHEAP benefits. LIHEAP will not protect Columbia's
7 low-income consumers from the proposed increase in the fixed monthly charge.

8
9 Finally, even if the increase in irreducible charges prompts more low-income
10 Columbia households to apply for LIHEAP, Columbia's low-income population
11 as a whole will not benefit. The annual allocation of federal LIHEAP dollars to
12 individual states is established by a Congressionally-prescribed formula. Neither
13 having more households participate in LIHEAP nor having LIHEAP participants
14 experience an increase in their home heating costs, affects that allocation. Even if
15 more households enroll in LIHEAP, the allocation of LIHEAP funds to Ohio will
16 remain constant. A higher enrollment would simply mean that each recipient
17 receives less.

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***Q30. PLEASE EXPLAIN WHY COLUMBIA'S PERCENTAGE OF INCOME
PAYMENT PLAN (PIPP) DOES NOT PROTECT ITS LOW-INCOME
CONSUMERS FROM THE SUBSTANTIAL INCREASE IN FIXED
MONTHLY CUSTOMER CHARGE.***

A30. While Columbia's Percentage of Income Payment Program (PIPP) may limit program participant bills to a level that does not exceed the program's maximum natural gas burden, a small fraction of Columbia's consumers participate in the PIPP. According to the Gas PIPP Report filed by Columbia for 2021, while Columbia had an average monthly number of 1,359,299 residential consumers in 2021, it had an average monthly number of 41,496 PIPP participants. As can be seen, only 3% of Columbia's consumers participate in PIPP ($41,496 / 1,359,299 = 0.031$).

In contrast, 22.4% of the population within the Ohio counties served by Columbia have income at or below 150% of the Federal Poverty Level in 2019. Applied to Columbia's total consumer base, an estimated 304,483 consumers would be income-eligible for PIPP. Columbia, in other words, serves only 14% (fewer than one-in-seven) income-qualified consumers through PIPP ($41,496 \text{ PIPP participants} / 304,483 \text{ estimated low-income consumers} = 0.136$). The remaining 86% of income-eligible consumers do not participate in Columbia's PIPP program.

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1 Moreover, even those who do participate in PIPP are not assured of obtaining
2 PIPP benefits. Ultimately, consumers have to pay their bill in full and on time to
3 get PIPP benefits. In addition, consumers have to pay all of their bills in order to
4 remain on the program from year-to-year. While PIPP works well for some, the
5 lowest income (who need the program the most) are those least likely to make all
6 of their payments. And, as I describe in detail above, Columbia's proposed
7 increase in its fixed monthly charge will make it even more difficult for these low
8 income consumers to make their monthly payments to access PIPP benefits.

9

10 ***Q31. EXPLAIN WHY COLUMBIA'S OFFER OF DEFERRED PAYMENT***
11 ***ARRANGEMENTS FOR CONSUMERS DOES NOT PROTECT LOW-***
12 ***INCOME CONSUMERS FROM THE INCREASED FIXED MONTHLY***
13 ***CUSTOMER CHARGE?***

14 ***A31.*** Columbia cannot rely on its deferred payment arrangements to protect low-
15 income consumers from the harms of the proposed increase in the fixed monthly
16 customer charge. I examined data reported by Columbia regarding deferred
17 payment arrangements in 2021. The data is presented in Table 12. The Table
18 shows that in the best months (November, December) only one-in-four consumers
19 on deferred payment plans were either meeting the terms of the plan or
20 successfully completing the plan. Moreover, the Table shows that, in 2021,
21 Columbia disconnected more than 13,700 (13,733) customers who were on
22 deferred payment plans.

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Table 12. Columbia Deferred Payment Plans (2021)				
	Extended Payment Plans (not Budget Billing)	Number of customers completing or meeting terms of a payment plan (not Budget Billing)	Percent of customer completing or meeting terms of a payment plan (not Budget Billing)	Payment Plans Disconnected (not Budget Billing)
JAN	44,901	2,855	6%	686
FEB	45,641	2,172	5%	323
MAR	45,034	3,651	8%	1,112
APR	40,057	6,462	16%	1,288
MAY	32,692	5,684	17%	1,622
JUNE	28,494	3,824	13%	1,802
JULY	26,860	1,971	7%	1,599
AUG	26,864	3,609	13%	1,692
SEPT	30,771	5,089	17%	1,268
OCT	29,882	3,347	11%	952
NOV	24,554	6,737	27%	756
DEC	20,364	5,545	27%	633

Q32. WHAT DO YOU CONCLUDE?

A32. I find based on the above data and discussion that the low-income consumers of Columbia will be seriously harmed by the Company's proposed increase in its fixed monthly customer charge. The amount of the increase, standing alone, more than offsets the total amount of federal fuel assistance delivered to Columbia consumers through the federal LIHEAP program in a typical year. While the PIPP provides some protection to a limited number of consumers, the Columbia PIPP serves a small fraction of income-eligible customers. Moreover, Columbia's offer of deferred payment arrangements, through which customers may retire arrears, is a largely ineffective process.

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**C. The Impact of Increasing the Fixed Monthly Customer Charge
on the Ability of Low-Income Consumers to Control Bills
through Usage Reduction.**

**Q33. PLEASE EXPLAIN THE PURPOSE OF THIS SECTION OF YOUR
TESTIMONY.**

A33. In this section of my testimony, I explain why the proposed increase in the fixed monthly customer charge will impede the ability of low-income consumers to reduce consumption as a means by which to control bills and improve affordability.²⁰ Increasing Columbia's unavoidable fixed monthly charge impedes low-income ability to pursue energy efficiency and/or weatherization as a mechanism to reduce bills.

Low-income consumers face significant barriers to energy efficiency and/or weatherization even in the absence of high fixed monthly charges. These barriers will be exacerbated by Columbia's proposal to increase its fixed monthly customer charge by 32.7%. The 2006 evaluation of the Ohio Weatherization Assistance Program found that single-family homes saved 326 ccf as a result of

²⁰ As I discuss in detail above, "reducing consumption" is not merely associated with energy efficiency improvements. Available research documents that low-income households also seek to reduce bills, by reducing consumption, through actions such as closing parts of their home; reducing heating temperatures, even if to unsafe or unhealthy levels; or substituting the use of ovens or stoves to heat limited areas of their homes rather than using their heating systems to heat the entire home.

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1 weatherization treatment, an average savings of 25.3% (a reduction from 1,300
2 ccf to 964 ccf).²¹ I apply these usage amounts to two different rates: (1) a fixed
3 monthly distribution charge (including the Riders) of \$34.91 along with other
4 existing charges; and (2) the proposed fixed monthly customer charge included in
5 Staff Schedule E-5 (\$46.58) (along with other proposed charges). Using the rates
6 included in Staff's Schedule E-5, I find that at a usage of 130 MCF (the 1290
7 therms found for HWAP program participants rounded), the annual bill at the
8 existing fixed distribution charge (\$34.91) would be \$548, while the annual bill at
9 the proposed SGS customer charge (with \$0 in Riders) would be \$694. If
10 consumption were decreased by 326 CCF²² (the average 1-family weatherization
11 savings), the annual bill at the existing rates (including a \$34.91 fixed distribution
12 charge) would be \$520, while the annual bill at the proposed rates would be \$666.

13
14 The difference in the ability of low-income consumers to control their bills can
15 thus be seen. If the fixed monthly charge is increased from the existing \$34.91 to
16 the proposed \$46.58, the annual bill increases by nearly \$150 (27% for usage of
17 130 MCF; 28% for usage of 96.4 MCF). The bill reduction from achieving a
18 consumption reduction equal to the average Weatherization savings of 25.3%,
19 however, is \$27.91/year at the existing Columbia rates and \$27.69/year at the

²¹ Quantec (July 2006). Ohio Home Weatherization Assistance Program Impact Evaluation, prepared for Ohio Office of Energy Efficiency, at 16. Available at <https://library.cee1.org/content/ohio-home-weatherization-assistance-program-impact-evaluation> (last accessed April 30, 2022). Program nonparticipants experienced a usage decrease of 58 therms. The net decrease for HWAP participants was thus 268 therms, or 20.8%. *Id.*

²² Therms and CCF are found to be functionally identical.

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1 proposed Columbia rates. Even though bills increase by nearly 30% under
2 Columbia's proposed rates, the bill reduction achieved through achieving the
3 average weatherization savings actually decreases on both a dollar and a
4 percentage basis. A 25.8% reduction in usage given the \$34.91 fixed distribution
5 charge yields a 5.4% in the annual bill; a 25.8% reduction in usage given the
6 proposed fixed monthly charge of \$46.58 yields a bill reduction of only 4.2%.

7

Table 13. Bills at Current and Proposed Columbia Rates Given HWAP Usage and Reduced Usage at Average HWAP Savings (Rates Taken from Staff Report, Exhibit E-5)					
	Current Rate	Proposed Rate	Current Bill	Proposed Bill	Dollar Increase
Monthly fixed charge	\$34.91	\$46.58			
Annual fixed	\$418.92	\$555.72			
Variable	\$0.6320	\$0.6257			
96.4	Post-HWAP (Wx) use ²³		\$519.90	\$662.88	\$142.98
130	Pre-HWAP (Wx) use		\$547.81	\$690.57	\$142.76
	Wx bill reduction (\$)			\$27.91	\$27.69
	Wx bill reduction (%)			5.4%	4.2%
33.6	Usage reduction from HWAP services (130 pre-HWAP use minus 96.4 post-HWAP use)				
25.8%	Percent usage reduction from HWAP services (33.6 usage reduction / 130 pre-HWAP use)				
	Excise tax	\$0.1593			
	Gross receipts tax	4.987%			

8

²³ See, quantec, supra, and accompanying text.

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1 ***Q34. WHAT CAN BE EXPECTED IN THE FUTURE?***

2 ***A34.*** As the CEP and IRP Riders begin to build again after this rate case, and to
3 increase the fixed monthly distribution charge, it will become ever more difficult
4 for low-income consumers to reduce their bills by reducing consumption.
5 Substituting a fixed distribution charge of \$50 into the calculation, a 25.8%
6 decrease in usage yields a bill reduction of only 3.9%; at a fixed monthly
7 distribution charge of \$60, a 25.8% decrease in usage yields a bill reduction of
8 only 3.3%; at a fixed monthly distribution charge of \$80, a 25.8% reduction in
9 usage yields a bill reduction of only 2.5%.

10

11 ***Q35. ARE THERE ADDITIONAL WAYS COLUMBIA'S PROPOSED INCREASE***
12 ***IN ITS SGS CUSTOMER CHARGE IMPEDES LOW-INCOME USAGE***
13 ***REDUCTION INVESTMENTS?***

14 ***A35.*** Yes. I have established in other places in my testimony the extent to which low-
15 income customers lack discretionary income to invest in usage reduction
16 measures. This lack of capital, unto itself, means that low-income households do
17 not have "extra" money to invest in usage reduction measures. Because of that
18 lack of discretionary income to invest, low-income customers have been found to
19 have very high hurdle rates for energy efficiency investments (to the extent that
20 they have money to invest at all). A hurdle rate defines how quickly a household
21 wants its investment returned.

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1 A hurdle rate of 100% means that a household wants to earn its money back in
2 one year. Low-income households have energy efficiency hurdle rates of at or
3 approaching 100% (i.e., to make an energy efficiency investment, even if they
4 have the financial wherewithal to do so, they need to experience savings sufficient
5 to return their investment in one year).

6
7 Making more of an annual bill irreducible, however, means there is even fewer
8 bill reductions to return to low-income customers as savings. Accordingly, the
9 high hurdle rates are ever more difficult to achieve, making it ever more difficult
10 for low-income households to justify making those investments, again, even if
11 they have the financial capacity to do so.

12
13 In addition to impeding the ability of low-income households to achieve their high
14 hurdle rates, making an increasing proportion of an annual bill unavoidable
15 through high fixed charges impedes low-income investments in usage reduction
16 due to the frequent mobility of low-income households. A low-income household
17 will not invest in usage reduction measures that have a payback of three years if
18 the household does not anticipate being in their home for three years.

19
20 The frequent mobility of low-income households, combined with the higher
21 proportion of bills that cannot be avoided through an investment in usage
22 reduction measures, means that it is increasingly difficult for low-income
23 households to generate sufficient usage reduction through energy efficiency or

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1 weatherization to gain a payback during the term of their tenure. Making more of
2 a bill unavoidable makes it that much more difficult to get a payback within the
3 constraints of frequent mobility.

4
5 **Q36. DO YOU KNOW THAT LOW-INCOME HOUSEHOLDS ARE**
6 **FREQUENTLY MOBILE?**

7 **A36.** Yes. While the Census Bureau does not report mobility by income, it does report
8 mobility by tenure (homeowner vs. renter). I have established elsewhere the
9 strong association between renter status and low-income status. In counties served
10 by Columbia in 2019, renters are four times more likely to move than are
11 homeowners. While 93% of all homeowners lived in the same house in 2019 that
12 they lived in one year prior, only 72% of renters did. While 7% of homeowners
13 moved in counties served by Columbia within a one-year period, 28% of renters
14 moved within that one year period.

15
16 **Q37. HOW DOES THE INABILITY TO CONTROL MONTHLY GAS BILLS**
17 **HARM COLUMBIA'S LOW-INCOME CONSUMERS IN PARTICULAR?**

18 **A37.** In contrast to households with higher incomes in Ohio, households with lower
19 incomes do not have a reasonable expectation that their incomes will increase
20 from year-to-year. I have examined the average income for the First Quintile (Q1)
21 of Income for the time period 2013 through 2019 for each of the Ohio counties

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1 served by Columbia for which one-year Census data is available.²⁴ Of those 24
2 counties, nearly 40% had Q1 incomes that declined from one year to the next at
3 least four times of the six instances in which a change in income could occur.²⁵ In
4 contrast, in only one county (Franklin County) did Q1 incomes increase each
5 year, while in only four counties (Columbiana, Fairfield, Hancock, Medina) did
6 incomes increase in every year but one. In nine counties served by Columbia, Q1
7 incomes were as likely to decrease from one year to the next as they were to
8 increase from 2013 through 2019.

9
10 The problem with Q1 incomes that are as likely to decrease as they are to increase
11 is amplified by the low incomes experienced by this part of the population with
12 which to begin. For example, in only three of the nine counties with decreasing
13 Q1 incomes (Clermont, Licking, Wayne), did the average Q1 income exceed
14 \$15,000 in 2019. In half of these nine counties (Lorain, Mahoning, Marion, Ross),
15 the average annual Q1 income was less than \$13,000. The average Q1 income
16 never reached \$20,000 in any of these nine counties in any of these years.

17
18 As Columbia increases the portion of its bills that is unavoidable as a fixed
19 charge, as will occur if Columbia's proposal to increase its SGS customer charge

²⁴ Not all counties have sufficiently large populations for 1-year American Community Survey (ACS) data to be published. For these counties, 5-year data is published. In the Columbia service territory, 24 counties have 1-year ACS data published. Given that I am tracking year-by-year changes in income, use of the ACS 1-year data is most appropriate.

²⁵ I examined a seven year period (2013 - 2019, meaning that income changes could occur six times (2013-2014; 2014-2015; 2015-2016; 2016-2017; 2017-2018; and 2018 -2019).

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by 32.7% is approved, the ability of these consumers to respond to their changes in income by reducing their natural gas bills through reduced consumption, is taken away from them. As a result, the resulting payment difficulties, including not only bill nonpayment but the paid-but-unaffordable bill I discuss above, increases.

Q38. IS IT POSSIBLE TO QUANTIFY THE DOLLAR MAGNITUDE OF THE INABILITY-TO-PAY THAT YOU HAVE IDENTIFIED?

A38. Yes. The Ohio Association of Community Action Agencies (OACAA) works with the Center for Women's Welfare in the School of Social Work at the University of Washington to periodically document a "self-sufficiency standard" for Ohio.²⁶ The Self-Sufficiency Standard provides the dollar amount needed to live a basic quality of life given the household size and composition, and taking into account cost-of-living by county within the state. For each Ohio county, for example, the Self-Sufficiency Standard recognizes that two three-person households would have different income needs to be self-sufficient, if the first family has an adult and two school-age children, and the second family has an adult, an infant, and a toddler. The Self-Sufficiency Standard provides county-specific self-sufficiency incomes for 719 different households (varying by household size and composition).

²⁶ Available at <https://selfsufficiencystandard.org/ohio/> (last accessed April 23, 2022).

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1 I have continued to examine the nine counties I identify above as having Q1
2 incomes that are as likely to decrease as to increase from one year to the next. I
3 examine a three-person household as being a typical household size in Ohio. I
4 have selected three different compositions of families. For each family
5 composition, I compare the Self-Sufficiency income to 150% of the Federal
6 Poverty Level (both in 2019 dollars).

Table 14. Ohio Self-Sufficiency Income (2019) Compared to 150% Poverty Level (2019) Three-Person Household with Selected Compositions for Selected Ohio Counties				
	Adult / Infant / Preschool	Adult / Preschool / School-age	2 Adults / School- age	150% FPL
Belmont County	\$57,081.83	\$51,697.02	\$43,308.71	\$31,995
Clermont County	\$60,744.23	\$55,507.24	\$48,019.66	\$31,995
Licking County	\$53,743.12	\$50,053.60	\$45,832.30	\$31,995
Lorain County	\$60,738.27	\$55,342.45	\$47,642.90	\$31,995
Mahoning County	\$59,267.72	\$53,916.01	\$46,266.12	\$31,995
Marion County	\$48,125.40	\$45,216.24	\$39,620.46	\$31,995
Ross County	\$50,535.93	\$47,651.43	\$43,015.77	\$31,995
Tuscarawas County	\$48,247.58	\$45,450.42	\$40,389.54	\$31,995
Wayne County	\$50,835.12	\$47,226.95	\$42,009.08	\$31,995

7
8 As can be seen, for none of these family types, and in none of these nine counties,
9 does 150% of the Federal Poverty Level, the maximum income eligibility level
10 for Ohio's PIPP, come even close to the Self-Sufficiency income in these
11 Columbia counties. The three-person families with two adults come closest, but
12 the 3-person income at 150% of Poverty still falls \$8,000 or more short of a Self-
13 Sufficiency income in the two counties where the Self-Sufficiency income for this
14 family composition and 150% of Poverty are the closest to being the same

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1 (Marion = \$7,625 difference; Tuscarawas = \$8,395 difference). For the three-
2 person household with one adult, an infant, and a pre-school child, income at
3 150% of Poverty can fall short of the Self-Sufficiency income by \$29,000 a year
4 or more (Clermont, Lorain, Mahoning).

5
6 Households with these types of shortfalls should not be subjected to a 32.7%
7 increase in the unavoidable fixed monthly charge for natural gas service as
8 Columbia proposes in this proceeding. Increasing the fixed monthly customer
9 charge to this extent has the effect not only of decreasing the ability of low-
10 income households to pay their bills in normal times, but has that adverse effect
11 magnified in these times of the ongoing economic crisis associated with the
12 COVID-19 health pandemic.

13

14 **PART 3. THE CONTINUING ECONOMIC IMPACTS OF COVID-19**
15 **SHOULD NOT BE IGNORED.**

16

17 **OCC/NOPEC Objection No. 38.**

18

19 ***Q39. PLEASE EXPLAIN THE PURPOSE OF THIS SECTION OF YOUR***
20 ***TESTIMONY.***

21 ***A39.*** In my discussion above, I demonstrated that the proposed increase in the
22 Columbia SGS fixed monthly customer charge would have serious adverse
23 impacts on low-income residential consumers in normal times. In this section of

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my testimony, I examine the continuing economic impacts of the coronavirus pandemic (COVID-19). I find that COVID-19 continues to have a substantial adverse impact on the ability of low-income consumers to pay their day-to-day bills, including utility bills. These adverse impacts of COVID-19 should be considered before imposing a 32.7% increase in the irreducible Columbia fixed monthly charge.

Q40. WHAT DATA DO YOU USE IN YOUR EXAMINATION OF THE ONGOING ECONOMIC IMPACTS OF COVID-19?

A40. In my discussion below, I examine the Census Bureau's COVID-19 "PULSE Survey" published periodically since the middle of 2020. The PULSE Survey has published results on a biweekly basis, with the most current results published in "Week 44" (March 30, 2022 through April 11, 2022). Rather than examining each week of data, I have chosen six weeks of published results to track the impact of COVID at different point in time, from the inception of the pandemic through the present. The six weeks of data I examined include:

- Week 13 (August 19, 2020 through August 31-2020);
- Week 21 (December 9, 2020 through December 21, 2020);
- Week 28 (April 14, 2021 through April 26, 2021);
- Week 39 (September 29, 2021 through October 11, 2021);
- Week 42 (January 6, 2022 through February 7, 2022; and
- Week 44 (March 30, 2022 through April 11, 2022).

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I choose these six weeks to provide a review of the impacts of COVID from the depths of the health crisis (in that first summer of 2020) to present. Data at the present time, and at other points in time, is most meaningful when compared to the Summer of 2020 when everyone agrees the health crisis and the economic crisis was at its most profound.

More specifically, I examine the data on household spending difficulties published in those Surveys. The PULSE Survey did not include questions on such spending patterns before Week 13, the first week I examined. I examine the data published for the State of Ohio. The COVID-19 PULSE Surveys generate data on a state-specific basis, but not for intra-state geographic regions. The data I examined is presented in Schedule RDC-7 (pages 1 – 3).

Q41. WHAT DID YOU FIND?

A41. While there is some fluctuation from week-to-week in the percentage of PULSE Survey respondents who report having a “somewhat difficult” or “very difficult” time in “paying for usual household expenses,” a number of consistent patterns nonetheless emerge. First, the lowest income respondents reported the most difficult time in paying for their usual household expenses. In the first week of data I consider (Week 13), more than half (52.1%) of households with income less than \$25,000 reported being able to pay for their usual household expenses as being either “somewhat difficult” (13.4%) or “very difficult” (38.7%). By Week 21, that percentage had increased to nearly three-in-five (somewhat difficult =

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1 34.1%; very difficult = 22.6%). In both Weeks, as incomes increased, the
2 percentage of respondents reporting these difficulties decreased. There appeared
3 to be a clear breakpoint at \$50,000, at which point more than three-quarters of
4 respondents reported their ability to pay for usual household expenses was either
5 “not at all difficult” or “a little difficult.”

6
7 For our purposes here, however, I will not trace the difference between income
8 levels over time. I will instead focus on the three lowest income levels (below
9 \$25,000; \$25,000 - \$34,999; \$35,000 - \$49,999).

10
11 By Week 39 (September 9, 2021 through October 11, 2021), PULSE respondents
12 in the lowest income range (below \$25,000) had experienced somewhat, but not
13 substantially improved circumstances. In that Survey, 47% reported that their
14 ability to pay usual household expenses was either “somewhat difficult” or “very
15 difficult.” Even at an annual income of \$35,000 to \$49,999 in Week 39, a
16 substantial number of PULSE respondents were having difficulty in paying their
17 usual household expenses, with nearly four-in-ten reporting that their ability was
18 either “somewhat difficult” (16.7%) or “very difficult” (21.2%) (37.9%
19 combined). While this was not a substantial change since the first week of Survey
20 results on this question (Week 13: somewhat difficult = 34.1%; very difficult =
21 22.6%), the nearly 40% reporting difficulties at even this more moderate income
22 level is substantial.

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1 The difficulties at the lowest income level continue through the present. In the
2 most recent PULSE Survey results in Week 44, more than half of respondents
3 with annual household income less than \$25,000 report that their ability to pay
4 usual household expenses is either “somewhat difficult” (32.2%) or “very
5 difficult” (20.3%) (combined 52.5%).

6
7 What improvement in the ability to pay usual household expenses has occurred in
8 the next two higher income ranges. In the most recent Survey results (March 30,
9 2022 to April 11, 2022), respondents with household income of \$15,000 - \$34,999
10 reported that they had a “somewhat difficult” time paying usual household
11 expenses in 30.0% of the instances, and a “very difficult” time in 14.0% of the
12 instances. Respondents with an annual income of \$35,000 to \$49,999 reported
13 having a “somewhat difficult” time in 22.2% of the instances, and a “very
14 difficult” time in 15.3% of the instances. The data for these three lower income
15 levels is graphed in Schedule RDC-8 (pages 1 – 3).

16
17 ***Q42. PLEASE EXPLAIN CHANGES IN THE AMOUNT OF FEDERAL FUEL***
18 ***ASSISTANCE THAT WAS MADE AVAILABLE DURING THE HEIGHT OF***
19 ***THE COVID-19 HEALTH EMERGENCY.***

20 ***A42.*** Ohio received hundreds of millions of dollars in additional federal assistance that
21 could be distributed to help pay home energy bills the nonpayment of which was
22 threatened by COVID-19. For example, the Emergency Rental Assistance
23 Program (ERAP), which provided financial assistance to help pay utility bills, had

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1 two phases, “ERAP 1” and “ERAP 2.” Under ERAP 1, Ohio received
2 \$775,405,764 in funding, while under ERAP 2, Ohio received an additional
3 \$613,542,291.²⁷ Through March 31, 2022, Ohio had expended more than \$350
4 million of the federal ERAP-1 aid it had received, and more than \$24 million of
5 the ERA-2 assistance.²⁸

6
7 Both ERAP programs, however, were temporary, emergency assistance programs
8 tied to COVID-19. They will not continue to provide additional aid to Ohio
9 residents.

10
11 Moreover, in addition to the ERAP emergency relief, the federal government
12 provided additional LIHEAP assistance through the Bipartisan Infrastructure
13 Law. In Fiscal Year 2022, with the addition of infrastructure funding, Congress
14 provided \$8.3 billion in LIHEAP assistance, the largest investment in a given year
15 since the program was first established in 1981.²⁹

16
17 The point is that while the economic crisis associated with COVID-19 will
18 continue for low-income customers of Columbia, this temporary increase in
19 federal aid will not. When this temporary increase in federal assistance is

²⁷ <https://home.treasury.gov/policy-issues/coronavirus/assistance-for-state-local-and-tribal-governments/emergency-rental-assistance-program/allocations-and-payments>.

²⁸ <https://home.treasury.gov/policy-issues/coronavirus/assistance-for-state-local-and-tribal-governments/emergency-rental-assistance-program>.

²⁹ <https://www.whitehouse.gov/briefing-room/statements-releases/2022/04/21/fact-sheet-white-house-announces-additional-385-million-to-lower-home-energy-bills-for-american-families/>.

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exhausted, expected in 2022, there is no indication that it will be renewed for future federal fiscal years and again made available to help the low-income consumers of Columbia pay increased bills that cannot be reduced by decreases in usage given Columbia's substantial increases to the irreducible, unavoidable, portion of the bill included as a fixed monthly charge.

Q43. WHAT DO YOU CONCLUDE?

A43. I conclude based on the above data and discussion that low- and even low- to moderate-income consumers in Ohio continue to have economic difficulties engendered by the COVID-19 pandemic. Whether or not the state is gaining control over the public health crisis, the economic crisis caused by the pandemic continues for these lower income households. More than half of all households with income less than \$25,000 continue to have either a "somewhat difficult" or a "very difficult" time in paying their usual household expenses as of April 2022. More than 40% of households with income between \$25,000 and \$34,999, and nearly 40% of households with income between \$35,000 and \$49,999, continue to have either a "somewhat difficult" or a "very difficult" time in paying their usual household expenses. Federal assistance that has been made available during the COVID pandemic will not continue into the future to help customers pay these bills. Despite these continuing payment difficulties, Columbia is proposing to increase natural gas bills the most to these lowest income households through its proposed 32.7% increase to the unavoidable fixed monthly charge. I conclude that now is not the time for such a dramatic change in rates to be approved.

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**PART 4. SUBSTANTIAL INCREASES IN GAS DELIVERY COSTS
COMPETE WITH OTHER LOW-INCOME HOUSEHOLD
EXPENSES.**

***Q44. PLEASE EXPLAIN THE PURPOSE OF THIS SECTION OF YOUR
TESTIMONY.***

A44. One impact of increasing Columbia's fixed monthly customer charge for SGS (including residential consumers) is that it contributes to the unaffordability of housing as well as to the unaffordability of home heating. Natural gas utility costs are considered part of total "housing" (or "shelter") costs for purposes of the Census Bureau's calculation of housing cost burdens (i.e., housing costs as a percentage of income). Households with housing burdens that exceed 30% of income are considered to be over-extended. Home energy bills that become increasingly higher, particularly those that become higher with unavoidable fixed charges, thus increasingly force housing burdens higher as well. The higher Columbia gas delivery costs impede the ability of lower-income households to afford quality housing.

The data on housing affordability for the three lowest ranges of income in the counties served by Columbia is presented in Table 15. As the Table shows, even without the increase in the fixed monthly charge, nearly 75% of owners, and more than 80% of renters have housing burdens exceeding 30% of income, when incomes are less than \$10,000. When incomes are between \$10,000 and \$19,999, nearly 75% of homeowners and more than 80% of renters have housing burdens

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1 exceeding 30% of income. Only when incomes increase to more than \$20,000, do
2 housing burdens fall below 30% for more than half of the homeowner population.
3 However, more than 60% of renters continue to have excess housing burdens.
4 Remember, that as was established above, the vast majority of low-income
5 households are renters rather than homeowners.

Table 15. Percent of Households by Excess Housing Cost Burdens by Selected Incomes				
Income	Owner		Renter	
	Housing Burden > 30%	Housing Burden >35%	Housing Burden > 30%	Housing Burden >35%
Less than \$10,000	73.5%	71.2%	80.3%	73.5%
\$10,000 - \$19,999	65.8%	56.4%	65.8%	56.4%
\$20,000 - \$34,999	40.0%	30.7%	61.8%	44.7%

6
7 High housing burdens substantially contribute to harms to low-income Columbia
8 consumers, in multiple ways. First, high home heating bills which contribute to
9 higher high housing burdens tend to create a self-reinforcing loop. High housing
10 burdens tend to force low-income households into older and lower quality
11 housing. The resulting home heating bills experienced by these low-income
12 households will thus be even higher than they would have been if energy bills
13 would have been more affordable with which to begin.

14
15 Second, higher home heating bills contribute to low-income households
16 increasing their mobility in search of more affordable housing costs. As I
17 discussed in more detail above, the frequent mobility of low-income households
18 impedes their ability to invest in usage reduction measures that would help them

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control their home heating bills so that those heating bills could be more affordable.

Third, the very process of moving imposes its own level of costs on low-income households. Part of those costs are out-of-pocket moving expenses. An additional part of those costs, however, involves the lost income associated with the time devoted to the housing search or the time devoted to the move.

Q45. IS THERE DATA TO SUPPORT YOUR CONCLUSION THAT HIGH HOUSING COSTS CONTRIBUTE TO FREQUENT HOUSEHOLD MOBILITY?

A45. Yes. In the American Housing Survey (AHS), the U.S. Department of Housing and Urban Development (HUD) periodically includes questions about the reasons why residents move. The national Survey extends to residents of selected states (of which Ohio is one). The results of the most recent Ohio data are presented in the Table below.

Table 16. Number (000s) and Percent of Ohio Residents who Moved by Reason for Move (2015)
(American Housing Survey)

	Percent of Poverty					
	Total	Less < 50%	50 to 99%	100 to 149%	150 to 199%	200% +
Total moved in last two years	1,237.8	115.2	157.8	174.9	129.8	660.0
Moved to reduce housing costs	202.0	24.4	26.2	41.4	32.2	77.9
Percent of those who moved	16.3%	21.2%	16.6%	23.7%	24.8%	11.8%

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1 The AHS data for Ohio shows that lower income households are
2 disproportionately represented in the population of Ohio residents who change
3 residences in search of more affordable housing.³⁰ The data shows that 16.3% of
4 all Ohio residents who moved in 2015 did so in an effort to reduce their housing
5 costs. The movers who cited a search for “reduced housing costs” as the reason
6 for their move are over-represented for all income levels except those with
7 income that exceeds 200% of Poverty Level. For example, while 16.3% of all
8 movers do so in search of reduced housing costs, 21.2% of the movers with
9 income less than 50% of Poverty do so; 23.7% of the movers with income
10 between 100% and 150% of Poverty do so; and 24.8% of the movers with income
11 between 150% and 200% of Poverty do so.

12
13 In addition, in research I published in the Journal on Children and Poverty,³¹ I
14 examined the relationship between “frequent mobility” and unaffordable home
15 energy costs. I reported that “. . . unaffordable home energy bills represent a
16 substantial cause of the frequent mobility amongst Missouri's low-income school
17 age children.” More than 40% of the five year frequent mover households listed
18 unaffordable heating bills as a "very important" factor contributing to their most
19 recent move; another 11% listed these bills as "somewhat important." I concluded

³⁰ As with the Census questions, “housing” costs include rent plus all utilities (excluding telephone). Internet service is not considered a “utility” for purposes of these questions.

³¹ Colton (1996). "The Road Oft Taken: Unaffordable Home Energy Bills, Forced Mobility And Childhood Education in Missouri." 2 *Journal on Children and Poverty* 23, available at <https://www.tandfonline.com/doi/abs/10.1080/10796129608414757?needAccess=true&journalCode=cjcp20> (last accessed April 24, 2022).

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1 that "of the frequent mover population, unaffordable energy bills played a role in
2 the move in more than half of the cases."

3
4 My study further reported that "[a] substantial portion of the population moving
5 because of unaffordable energy bills did *not* have problems with other shelter
6 costs." Of the households listing unaffordable energy as a "very important" factor
7 in their decision to move, 45.8% listed "unaffordable rent" as *not* being a "very
8 important" factor in their decision. In a substantial proportion of the frequent
9 mover population I identified, home energy bills, but not unaffordable rents, were
10 the primary cause of the decision to move.

11
12 **PART 5: RECOMMENDED IMMEDIATE REMEDIES.**

13
14 **OCC/NOPEC Objection No. 37.**

15
16 ***Q46. GIVEN THE DIFFICULTIES FACING LOW-INCOME CONSUMERS YOU***
17 ***IDENTIFY ABOVE, WHAT DO YOU RECOMMEND THE PUCO SHOULD***
18 ***ORDER AS PART OF THIS RATE PROCEEDING?***

19 ***A46.*** The PUCO and Columbia should take particular care not to exacerbate the
20 difficulties that the current pending rate case will impose on customers, including
21 at-risk Ohioans, as I have identified throughout my testimony above. In particular,
22 I recommend that the PUCO ensure that Columbia provides adequate protections
23 to help low-income customers, fixed income seniors and disabled; and the

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1 working poor so they are able to afford their bills for current service. There
2 should also be an adequate opportunity for consumers to retire unpaid account
3 balances that might arise. In addition, Columbia should not unreasonably
4 contribute to the imposition of higher charges on low-income consumers through
5 the collection of late-payment fees and other charges (e.g., reconnect fees, cash
6 security deposits).

7
8 ***Q47. WHAT SHOULD THE PUCO ORDER COLUMBIA TO DO TO OFFSET***
9 ***THE ADVERSE IMPACTS ON LOW-INCOME CONSUMERS FOR***
10 ***CURRENT SERVICE?***

11 ***A47.*** Columbia should be ordered by the PUCO to take substantial steps to make
12 natural gas services more affordable for all consumers and to protect at-risk, low-
13 income, working poor, and fixed-income senior Ohioans from potential loss of
14 natural gas services. With respect to bills for current service, those protections
15 should include, but not be limited to, increased bill-payment assistance by
16 Columbia shareholders to help low-income, at-risk, working poor consumers, and
17 seniors on fixed incomes avoid being disconnected for non-payment.

18
19 As I discuss in detail throughout my testimony, existing programs available to
20 Columbia consumers will not do enough to protect low-income consumers from
21 the harms of increased fixed monthly customer charges including rider charges.
22 Accordingly, the PUCO should order Columbia to offer a \$10 million bill-
23 payment assistance program, at shareholder expense. The \$10 million should be

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1 fully used for the intended program purpose. The funds should be distributed by
2 Columbia within three years of the PUCO's initial Order in this case or such
3 longer period as is necessary to disburse all funds. Program eligibility would be
4 for low-income, fixed-income disabled and seniors, and working-poor Ohioans.
5 Specific program terms would be developed between Columbia, OCC and
6 NOPEC. Through reporting and other means, Columbia should be required to
7 make the program completely transparent to OCC, NOPEC and the PUCO.

8
9 ***Q48. WHAT INCOME ELIGIBILITY DO YOU PROPOSE FOR THE BILL-***
10 ***PAYMENT ASSISTANCE TO OHIOANS IN NEED?***

11 ***A48.*** I recommend that this financial assistance be established for low-income, fixed-
12 income disabled and senior consumers, and the working poor in Columbia's
13 service area. As I explain in my testimony above, payment difficulties exist for
14 many Ohioans harmed by the economic crisis associated with the health
15 pandemic. Such financial difficulties are not exclusively limited to consumers
16 who are generally thought of as "low-income" (e.g., LIHEAP-eligible, PIPP-
17 eligible).

18
19 In particular, the Census PULSE Surveys document that payment difficulties exist
20 for the working poor as well. Nearly 2-of-5 Ohio households with income
21 between \$35,000 and \$50,000 continue to report that it is "somewhat difficult" or
22 "very difficult" to pay their usual household expenses, while nearly 1-of-3
23 households with income between \$50,000 and \$75,000 report it "somewhat

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1 difficult” or “very difficult” to pay their usual household expenses. While low-
2 income households are certainly at-risk, along with fixed-income disabled and
3 senior Ohio residents, these survey data clearly indicate that many Ohioans are
4 emerging from the pandemic with financial challenges. To exacerbate these
5 payment difficulties, energy prices are soaring, inflation is on the rise, and a
6 recession is possible. The rates proposed by Columbia in this proceeding make
7 the situation even worse.

8
9 Accordingly, the \$10 million contribution for consumer bill-payment assistance
10 that I recommend is a reasonable PUCO and Columbia response to help offset the
11 risks to these particularly vulnerable populations in Columbia’s service area. My
12 recommended financial assistance should be adopted by the PUCO for
13 Columbia’s consumers in need.

14
15 ***Q49. WHAT SHOULD THE PUCO ORDER COLUMBIA TO DO TO ENABLE***
16 ***CUSTOMERS TO RETIRE UNPAID BALANCES?***

17 ***A49.*** The PUCO currently has rules that mandate certain types of “extended payment
18 plans.” The three mandatory plans, aside from PIPP Plus, are the one-sixth plan,
19 the one-ninth plan, and the winter heating season plan. While the offer of these
20 three plans is mandatory, these plans do not limit the additional options that
21 Columbia may provide for deferred payment plans. The PUCO’s rules
22 specifically provide that “upon contact by a customer whose account is delinquent
23 or who desires to avoid a delinquency, the utility company shall inform the

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customer that it will make reasonable extensions or other extended payment plans appropriate for both the customer and the utility company.” (Rule 4901:1-18-05(A)).

As costs for gas and Columbia’s gas service spiral higher for this essential service, along with Columbia’s rates becoming increasingly irreducible, enabling consumers to retire (or avoid) account arrearages is of critical importance. The PUCO should, therefore, require Columbia to cap the installment payment for any deferred payment plan at 50% of the average monthly bill and to notify the customer that such a payment plan is available. A customer who accepts such a payment plan will be deemed have agreed to a “reasonable extension or other extended payment plan appropriate for both the customer and the utility company” pursuant to the terms of the regulation.

Q50. WHAT SHOULD THE PUCO REQUIRE COLUMBIA TO DO TO ENSURE THAT COLUMBIA DOES NOT UNREASONABLY ADD LATE PAYMENT CHARGES TO A LOW-INCOME CONSUMER’S BILL?

A50. Given how Columbia’s proposed rate design is substantially increasing the irreducible portion of a residential customer’s bill, Columbia should make substantial efforts to ensure that it does not unnecessarily increase low-income bills even further for those customers who find they cannot pay.

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1 One way to protect consumers is to avoid unreasonably increasing the bill of a
2 consumer facing an inability-to-pay through the imposition of late payment
3 charges. PUCO regulations mandate that late payment charges be avoided for any
4 customer who is current on a payment plan or who is on PIPP Plus. (Rule 4901:1-
5 18-05(H).) Those rules, however, do not bar the utility from waiving late payment
6 charges for other customers facing an inability-to-pay. I recommend that as
7 Columbia increases the irreducible portion of its monthly bill, the PUCO should
8 require it to respond to the resulting increasing payment difficulties by waiving
9 late payment charges for any customer who has been a recipient of a LIHEAP
10 cash or crisis grant within the immediately preceding three years.

11
12 In addition, Columbia should be required to encourage and facilitate consumers to
13 seek public assistance when they find themselves unable to pay a monthly bill.
14 When a consumer contacts Columbia and expresses an inability-to-pay an
15 outstanding balance (current or past-due), Columbia should be required to impose
16 a 60-day freeze on any collections process, including the forgoing of late payment
17 charges, to allow that consumer to pursue public or private energy assistance
18 (including enrollment in PIPP) to address that unpaid bill. It makes little sense to
19 respond to a consumer's effort to pursue financial assistance by increasing the
20 unpaid balance, or by continuing collection efforts, during the pendency of that
21 pursuit.

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1 **Q51. DO YOU HAVE ANY FINAL RECOMMENDATION?**

2 **A51.** Yes. As I testify above, quite aside from the public health crisis associated with
3 the pandemic, the economic crisis engendered by the public health pandemic
4 continues to affect Ohioans. The data presented in Schedule RDC-7 that I
5 previously discussed demonstrates that:

- 6 (1) more than half of Ohio residents with income less than \$25,000
7 have either a “somewhat difficult” (32.2%) or “very difficult”
8 (20.3%) time in paying their usual household expenses in the past
9 seven days;
- 10 (2) nearly half of Ohio residents with income between \$25,000 and
11 \$35,000 have either a “somewhat difficult” (30.0%) or “very
12 difficult” (14.0%) time; and
- 13 (3) nearly 40% of Ohio residents with income of \$35,000 to \$50,000
14 have reported continuing to have a “somewhat difficult” (22.2%)
15 or “very difficult” (15.3%) paying their usual household expenses.

16

17 Indeed, nearly one-third of Ohio residents with income between \$50,000 and
18 \$75,000 report continuing to have a “somewhat difficult” (11.8%) or “very
19 difficult” (18.7%) paying their usual household expenses. As Columbia seeks to
20 make more and more of its monthly bills irreducible, the PUCO should ensure
21 that increasing an irreducible bill from Columbia (in these times of such ongoing
22 payment difficulties) will not exacerbate the financial difficulties facing Ohioans
23 through the loss of utility service.

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1 Accordingly, I recommend that Columbia be directed to implement an income-
2 based moratorium on the disconnection of service for nonpayment of bills for the
3 2022-2023 winter heating season. The PUCO should then revisit if there is a need
4 for a moratorium for the 2023-2024 winter heating season and beyond.

5

6 ***Q52. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?***

7 ***A52.*** Yes. However, I reserve the right to supplement this testimony should additional
8 information be made available.

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing *Direct Testimony of Roger D. Colton on behalf of Office of the Ohio Consumers' Counsel* has been served upon those persons listed below via electronic service this 13th day of May 2022.

/s/ Angela D. O'Brien
Angela D. O'Brien
Assistant Consumers' Counsel

The PUCO's e-filing system will electronically serve notice of the filing of this document on the following parties:

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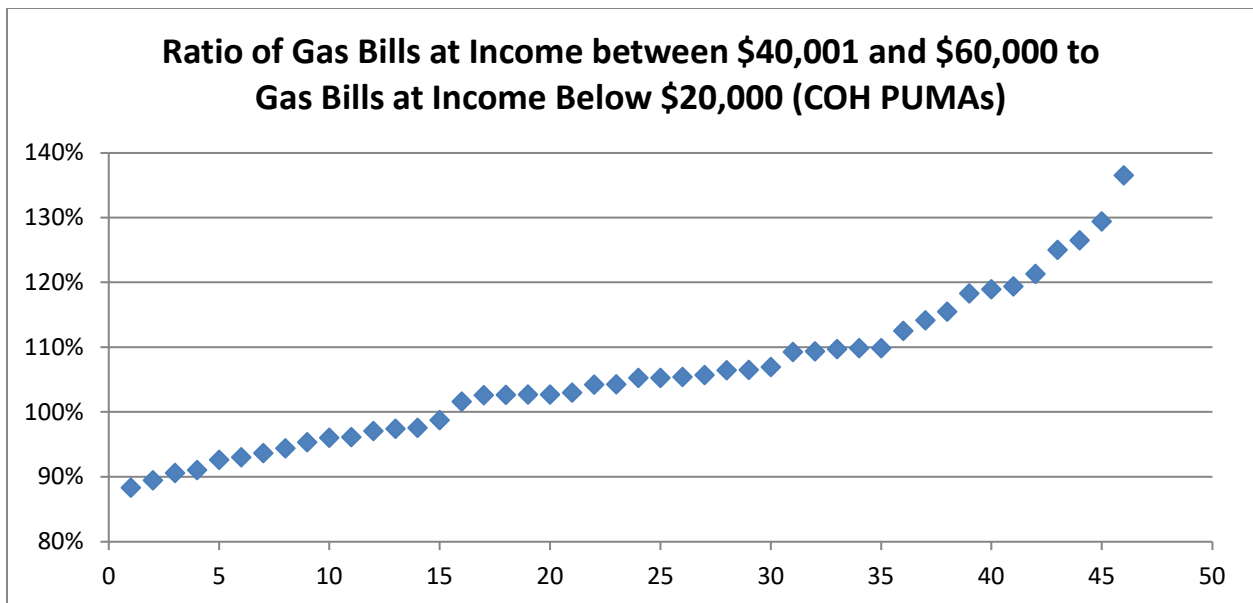
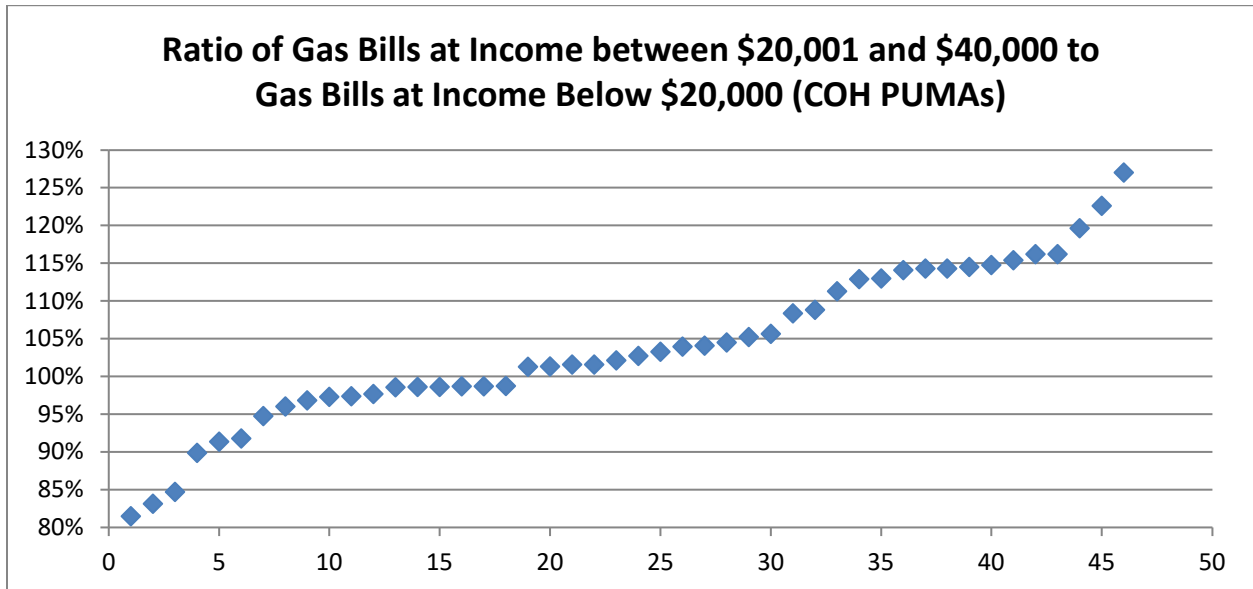
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Schedule RDC-1

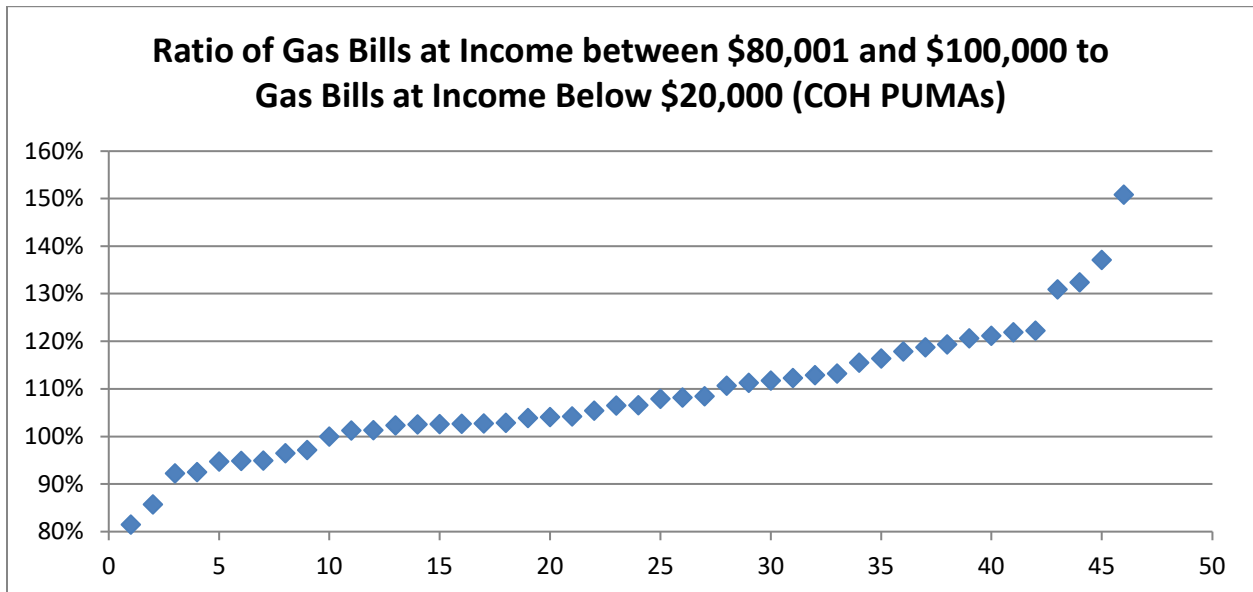
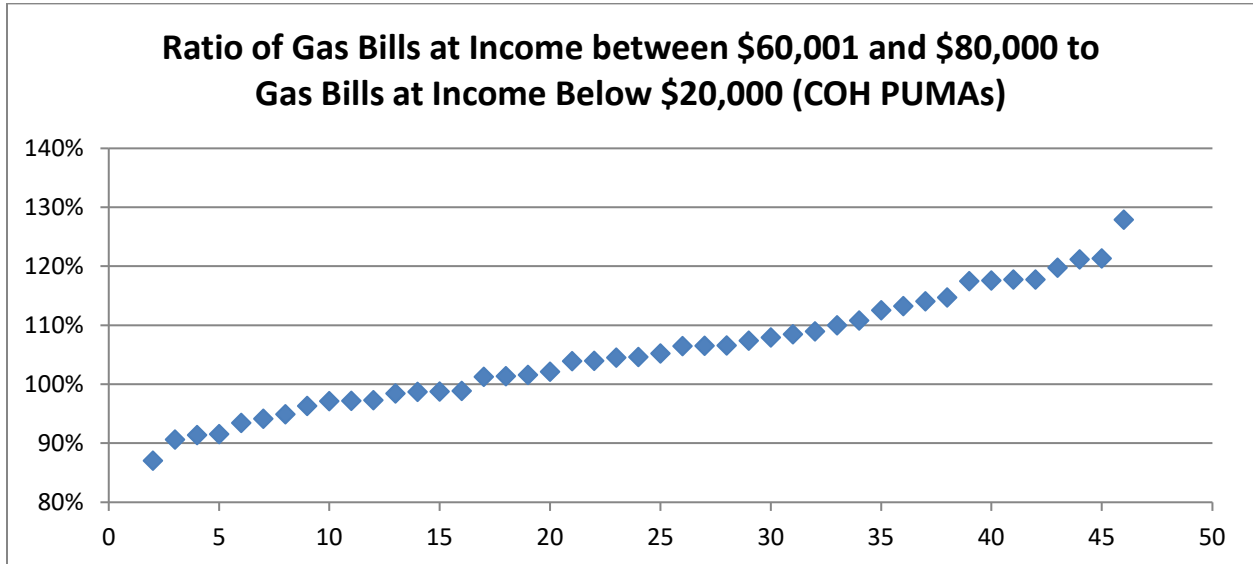
Selected Geographies

Lucas (West) & Wood (North Central) Counties--Perrysburg, Sylvania & Maumee Cities PUMA; Ohio
Toledo City (West) PUMA, Ohio
Toledo City (East) PUMA, Ohio
Ottawa, Wood (Northeast) & Lucas (East) Counties--Oregon City PUMA; Ohio
Erie & Sandusky Counties PUMA, Ohio
Lorain County (North)--Elyria & Lorain Cities PUMA, Ohio
Lorain County (South)--Avon, Avon Lake & North Ridgeville Cities PUMA; Ohio
Trumbull (Outside Warren City) & Mahoning (Outside Youngstown City) Counties PUMA, Ohio
Mahoning County (Northeast)--Youngstown City, Boardman & Austintown PUMA; Ohio
Trumbull County (South Central)--Warren & Niles Cities PUMA, Ohio
Medina County PUMA, Ohio
Wayne County PUMA, Ohio
Huron & Ashland Counties PUMA, Ohio
Richland County PUMA, Ohio
Seneca, Crawford & Wyandot Counties PUMA; Ohio
Logan, Champaign & Hardin Counties PUMA; Ohio
Marion, Knox & Morrow Counties PUMA; Ohio
Holmes, Guernsey & Coshocton Counties PUMA; Ohio
Tuscarawas & Harrison Counties PUMA, Ohio
Stark County (West)--Massillon City PUMA, Ohio
Stark County (Central)--Canton & North Canton Cities PUMA, Ohio
Stark County (East) & Carroll County--Alliance City PUMA, Ohio
Columbiana County PUMA, Ohio
Belmont & Jefferson Counties PUMA, Ohio
Washington, Morgan, Noble & Monroe Counties PUMA; Ohio
Muskingum & Perry Counties PUMA, Ohio
Licking County PUMA, Ohio
Fairfield County PUMA, Ohio
Delaware County PUMA, Ohio
Columbus (Far Northeast), Gahanna & New Albany Cities PUMA; Ohio
Columbus (North), Westerville & Worthington Cities PUMA; Ohio
Columbus (Far Northwest), Dublin & Hilliard (North) Cities PUMA; Ohio
Columbus (Northwest), Upper Arlington & Grandview Heights Cities PUMA; Ohio
Columbus City (Central) PUMA, Ohio
Columbus City (Northeast) PUMA, Ohio
Columbus (East), Whitehall & Bexley Cities PUMA; Ohio
Columbus (Southeast) & Reynoldsburg Cities PUMA, Ohio
Franklin County (South)--Columbus (South), Grove Cities & Groveport Village PUMA; Ohio
Columbus City (West) PUMA, Ohio
Columbus (Far West) & Hilliard (South) Cities PUMA, Ohio
Pickaway, Union & Madison Counties PUMA; Ohio
Clark County PUMA, Ohio
Ross & Fayette Counties PUMA, Ohio
Jackson, Hocking, Pike & Vinton Counties PUMA; Ohio
Athens, Gallia & Meigs Counties PUMA; Ohio
Scioto & Lawrence Counties PUMA, Ohio

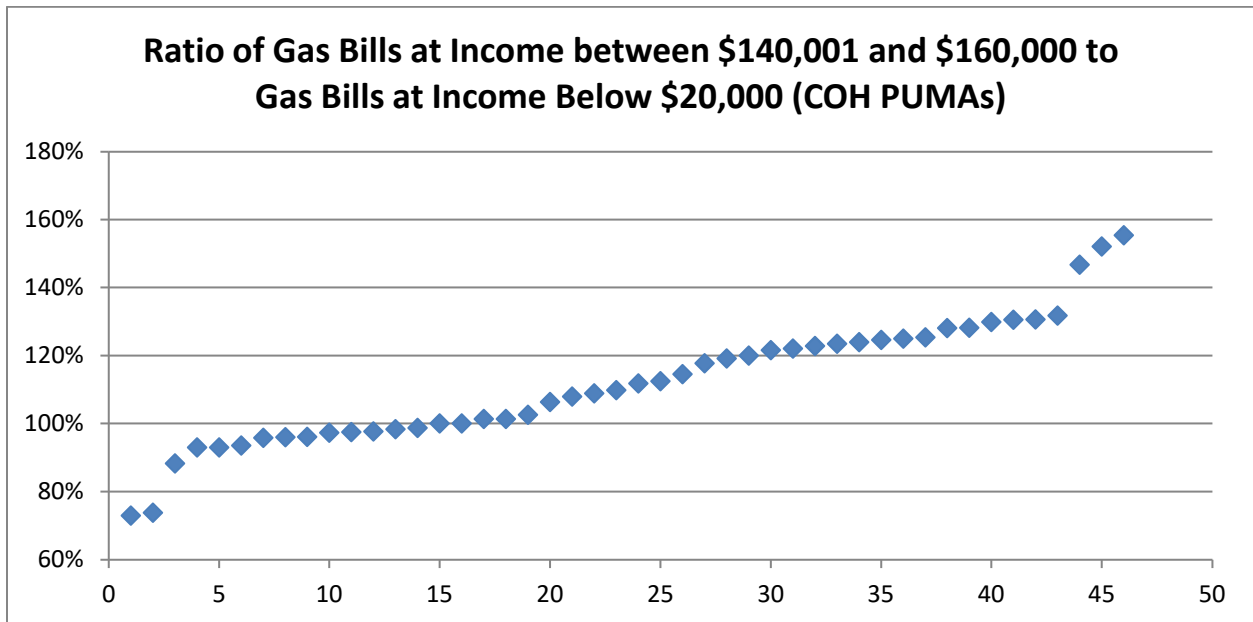
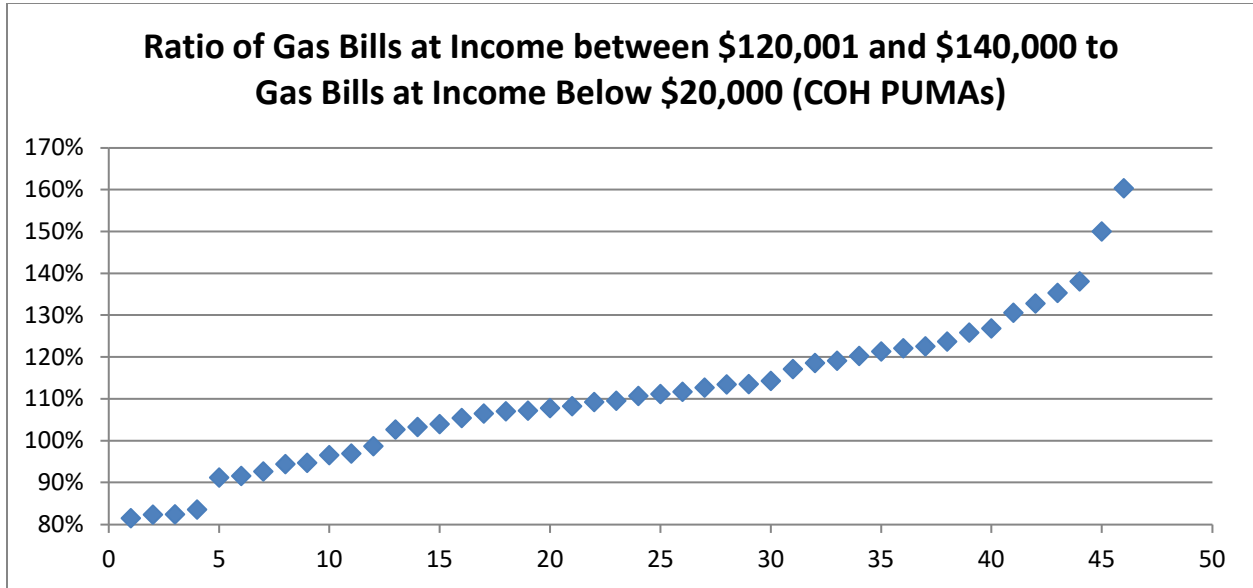
Schedule RDC-2
Page 1 of 4



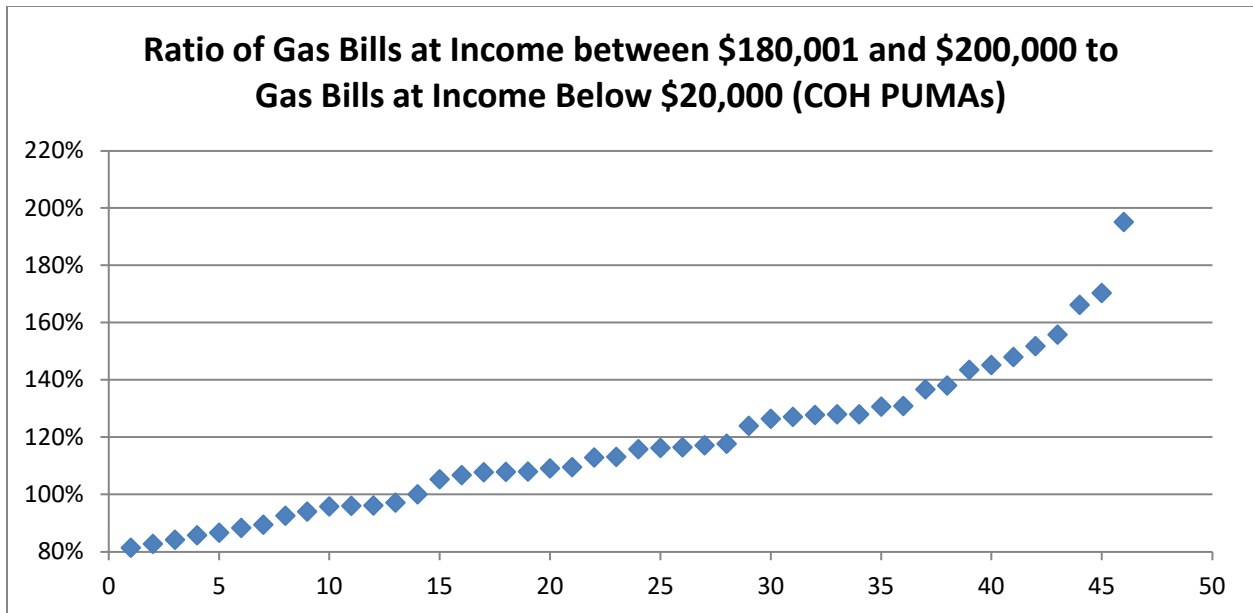
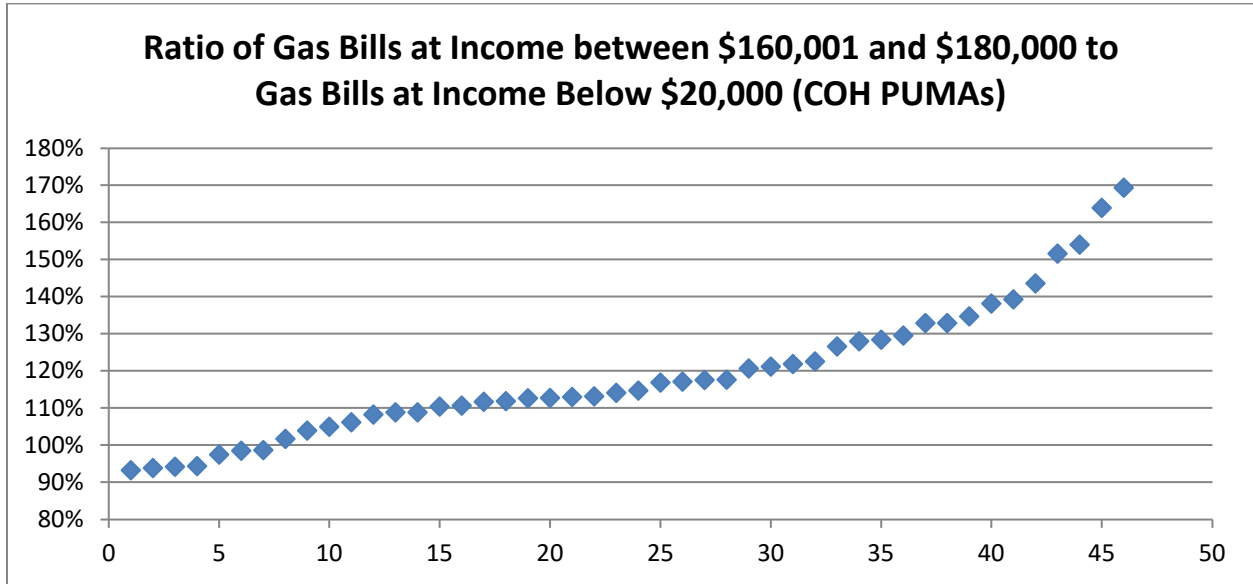
Schedule RDC-2
(page 2 of 4)



Schedule RDC-2
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Schedule RDC-2
Page 4 of 4



Schedule RDC-3

Columbia Ohio: Percent of Occupied Housing Units by Building Structure Type and Household Income (Has gas heating--pays for gas heating) (2020)														
	Total	\$1 to \$20,000	\$20,001 to \$40,000	\$40,001 to \$60,000	\$60,001 to \$80,000	\$80,001 to \$100,000	\$100,001 to \$120,000	\$120,001 to \$140,000	\$140,001 to \$160,000	\$160,001 to \$180,000	\$180,001 to \$200,000	\$200,001 to \$220,000	\$220,001 to \$240,000	\$240,001 to \$250,000
Total	100.0%	13.3%	20.4%	18.5%	14.4%	10.5%	7.5%	5.2%	3.7%	2.4%	1.8%	1.1%	0.8%	0.3%
Mobile Home	100.0%	29.5%	35.7%	17.1%	10.8%	3.8%	2.0%	0.6%	0.3%	0.2%	0.1%	0.1%	0.0%	0.0%
1-fam detached	100.0%	11.0%	18.4%	18.2%	14.9%	11.4%	8.5%	5.9%	4.3%	2.8%	2.0%	1.3%	0.9%	0.4%
1-fam attached	100.0%	14.2%	22.9%	21.0%	15.0%	10.3%	4.9%	4.3%	2.6%	1.6%	1.7%	0.8%	0.4%	0.2%
2 Apts	100.0%	27.5%	31.6%	18.4%	10.3%	6.7%	3.1%	1.1%	0.7%	0.2%	0.1%	0.3%	0.0%	0.0%
3-4 Apts	100.0%	26.4%	28.7%	20.1%	11.5%	6.5%	3.2%	1.6%	1.3%	0.5%	0.1%	0.1%	0.1%	0.1%
5-9 Apts	100.0%	22.8%	27.8%	20.0%	14.7%	6.3%	3.8%	2.4%	0.5%	0.9%	0.3%	0.3%	0.1%	0.1%
10-19 Apts	100.0%	20.3%	31.8%	20.1%	11.9%	7.4%	3.5%	2.0%	0.6%	1.2%	1.0%	0.0%	0.2%	0.0%
20-49 Apts	100.0%	25.1%	36.3%	23.3%	7.6%	2.0%	1.5%	0.4%	1.3%	1.2%	0.9%	0.1%	0.3%	0.0%
50+ Apts	100.0%	23.3%	28.2%	20.1%	12.6%	5.6%	5.7%	1.7%	1.2%	0.7%	0.7%	0.2%	0.0%	0.0%

Schedule RDC-4

Columbia Ohio: Percent of Occupied Housing Units by Tenure and Household Income (Has gas heating--pays for gas heating) (2020)														
Selected Geographies	Total	\$1 to \$20,000	\$20,001 to \$40,000	\$40,001 to \$60,000	\$60,001 to \$80,000	\$80,001 to \$100,000	\$100,001 to \$120,000	\$120,001 to \$140,000	\$140,001 to \$160,000	\$160,001 to \$180,000	\$180,001 to \$200,000	\$200,001 to \$220,000	\$220,001 to \$240,000	\$240,001 to \$250,000
Total	100.0%	13.0%	20.3%	18.5%	14.5%	10.6%	7.6%	5.2%	3.7%	2.4%	1.8%	1.2%	0.8%	0.3%
Owned with mortgage or loan***	100.0%	5.3%	12.9%	16.8%	16.4%	13.9%	10.7%	8.0%	5.9%	3.8%	2.9%	1.8%	1.3%	0.5%
Owned Free And Clear	100.0%	15.5%	25.5%	19.8%	13.3%	8.7%	6.0%	3.6%	2.6%	1.8%	1.3%	0.9%	0.7%	0.3%
Rented	100.0%	24.8%	28.6%	20.3%	12.2%	6.6%	3.5%	1.9%	1.0%	0.5%	0.4%	0.2%	0.1%	0.0%
***Includes home equity loans														

Schedule RDC-5

Columbia Ohio: Percent of Occupied Housing Units by Number of Rooms and Household Income (Has gas heating--pays for gas heating) (2020)														
# of Rooms (1 – 10)	Total	\$1 to \$20,000	\$20,001 to \$40,000	\$40,001 to \$60,000	\$60,001 to \$80,000	\$80,001 to \$100,000	\$100,001 to \$120,000	\$120,001 to \$140,000	\$140,001 to \$160,000	\$160,001 to \$180,000	\$180,001 to \$200,000	\$200,001 to \$220,000	\$220,001 to \$240,000	\$240,001 to \$250,000
Total	100.0%	13.7%	21.0%	18.9%	14.5%	10.5%	7.4%	5.0%	3.5%	2.2%	1.5%	1.0%	0.7%	0.3%
1	100.0%	39.6%	36.2%	9.9%	8.6%	0.7%	1.1%	0.5%	0.3%	1.3%	0.0%	1.7%	0.0%	0.0%
2	100.0%	30.8%	27.6%	23.9%	6.0%	5.2%	2.0%	2.1%	1.5%	0.2%	0.2%	0.1%	0.0%	0.4%
3	100.0%	26.8%	33.5%	18.1%	9.9%	5.5%	2.7%	1.6%	0.6%	0.6%	0.3%	0.1%	0.0%	0.0%
4	100.0%	25.1%	29.2%	20.9%	11.3%	6.2%	3.1%	1.8%	0.9%	0.5%	0.4%	0.3%	0.1%	0.0%
5	100.0%	17.5%	26.1%	21.3%	14.7%	8.5%	5.1%	2.6%	1.9%	0.8%	0.7%	0.3%	0.2%	0.2%
6	100.0%	13.0%	22.5%	20.4%	15.6%	11.3%	6.7%	4.6%	2.5%	1.4%	1.0%	0.5%	0.3%	0.1%
7	100.0%	9.3%	17.0%	18.8%	16.1%	12.7%	9.6%	5.9%	4.6%	2.6%	1.5%	1.0%	0.7%	0.2%
8	100.0%	7.4%	13.1%	16.2%	15.1%	12.8%	11.1%	8.0%	5.9%	3.8%	2.6%	2.2%	1.2%	0.6%
9	100.0%	4.8%	11.5%	13.0%	14.3%	13.1%	11.6%	9.0%	6.6%	5.9%	4.4%	2.8%	2.2%	0.9%
10	100.0%	5.3%	8.9%	11.2%	12.1%	12.2%	11.3%	10.6%	9.1%	6.2%	5.2%	3.7%	3.1%	1.1%

Schedule RDC-6

Columbia Ohio: Percent of Occupied Housing Units by Number of Bedrooms and Household Income (Has gas heating--pays for gas heating) (2020)														
# Bedrooms	Total	\$1 to \$20,000	\$20,001 to \$40,000	\$40,001 to \$60,000	\$60,001 to \$80,000	\$80,001 to \$100,000	\$100,001 to \$120,000	\$120,001 to \$140,000	\$140,001 to \$160,000	\$160,001 to \$180,000	\$180,001 to \$200,000	\$200,001 to \$220,000	\$220,001 to \$240,000	\$240,001 to \$250,000
Total	100.0%	13.3%	20.5%	18.6%	14.4%	10.5%	7.5%	5.2%	3.7%	2.4%	1.7%	1.1%	0.8%	0.3%
0	100.0%	38.1%	36.5%	10.2%	8.4%	1.1%	1.6%	0.5%	0.2%	1.9%	0.0%	1.5%	0.0%	0.0%
1	100.0%	31.6%	34.1%	18.5%	7.2%	4.5%	1.8%	1.1%	0.6%	0.1%	0.4%	0.1%	0.0%	0.1%
2	100.0%	21.5%	28.0%	21.3%	13.3%	7.0%	3.9%	2.2%	1.2%	0.8%	0.5%	0.3%	0.2%	0.0%
3	100.0%	10.9%	19.9%	19.6%	16.1%	12.2%	8.1%	5.2%	3.3%	2.0%	1.3%	0.7%	0.5%	0.2%
4	100.0%	6.2%	11.1%	13.1%	13.3%	12.1%	11.5%	9.4%	7.9%	5.4%	4.3%	2.9%	2.1%	0.8%
5	100.0%	5.4%	10.4%	14.8%	12.6%	10.8%	10.1%	8.2%	7.9%	5.9%	5.2%	4.5%	2.8%	1.4%

Schedule RDC-7
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Difficulty paying for usual household expenses in the last 7 days (Ohio)					
Week 44 (3-30-22 – 4-11-22)	Total	Not at all difficult	A little difficult	Somewhat difficult	Very difficult
Household income					
Less than \$25,000	100.0%	27.7%	19.8%	32.2%	20.3%
\$25,000 - \$34,999	100.0%	28.1%	27.5%	30.0%	14.0%
\$35,000 - \$49,999	100.0%	33.7%	28.8%	22.2%	15.3%
\$50,000 - \$74,999	100.0%	45.2%	24.3%	11.8%	18.7%
\$75,000 - \$99,999	100.0%	53.2%	26.6%	18.3%	1.9%
\$100,000 - \$149,999	100.0%	61.5%	21.7%	13.4%	3.2%
\$150,000 - \$199,999	100.0%	69.0%	24.4%	4.0%	2.7%
\$200,000 and above	100.0%	90.2%	3.4%	6.4%	0.0%

Difficulty paying for usual household expenses in the last 7 days (Ohio)					
Week 42 (1-6-22 – 2-7-22)	Total	Not at all difficult	A little difficult	Somewhat difficult	Very difficult
Household income					
Less than \$25,000	100.0%	14.0%	29.6%	19.0%	37.4%
\$25,000 - \$34,999	100.0%	27.5%	28.9%	31.9%	11.6%
\$35,000 - \$49,999	100.0%	29.8%	21.9%	27.4%	20.9%
\$50,000 - \$74,999	100.0%	44.7%	24.9%	19.7%	10.7%
\$75,000 - \$99,999	100.0%	63.1%	23.2%	7.8%	5.8%
\$100,000 - \$149,999	100.0%	68.2%	22.5%	7.3%	1.9%
\$150,000 - \$199,999	100.0%	76.3%	16.3%	7.4%	0.0%
\$200,000 and above	100.0%	90.9%	9.1%	0.0%	0.0%

Schedule RDC-7
Page 2 of 3

Difficulty paying for usual household expenses during the coronavirus pandemic (Ohio)					
Week 39 (9-29-21 – 10-11-21)	Total	Not at all difficult	A little difficult	Somewhat difficult	Very difficult
Less than \$25,000	100.0%	19.7%	33.2%	20.0%	27.1%
\$25,000 - \$34,999	100.0%	35.5%	18.7%	25.9%	19.8%
\$35,000 - \$49,999	100.0%	39.0%	23.1%	16.7%	21.2%
\$50,000 - \$74,999	100.0%	52.3%	29.5%	9.1%	9.2%
\$75,000 - \$99,999	100.0%	62.7%	24.2%	11.2%	1.9%
\$100,000 - \$149,999	100.0%	70.3%	17.5%	11.7%	0.5%
\$150,000 - \$199,999	100.0%	84.9%	8.9%	6.1%	0.0%
\$200,000 and above	100.0%	90.0%	6.3%	0.0%	3.6%

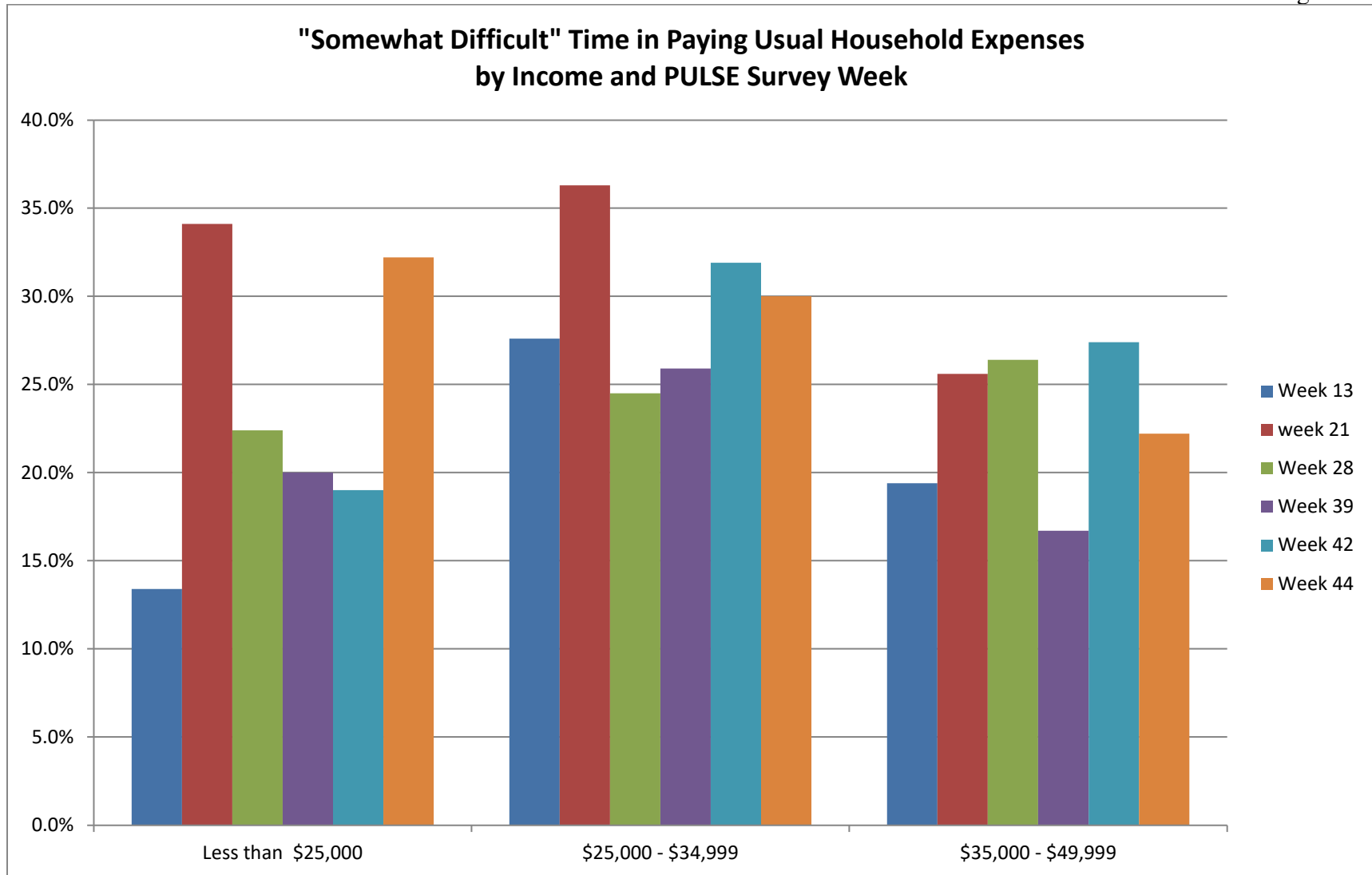
Difficulty paying for usual household expenses during the coronavirus pandemic (Ohio)					
Week 28 (4-14-21 – 4-26-21)	Total	Not at all difficult	A little difficult	Somewhat difficult	Very difficult
Less than \$25,000	100.0%	26.7%	31.3%	22.4%	19.6%
\$25,000 - \$34,999 (some HHs not reporting)	96.5%	30.5%	26.6%	24.5%	14.9%
\$35,000 - \$49,999	100.0%	37.8%	28.0%	26.4%	7.8%
\$50,000 - \$74,999	100.0%	60.6%	22.9%	12.2%	4.3%
\$75,000 - \$99,999	100.0%	64.1%	23.6%	7.2%	5.1%
\$100,000 - \$149,999	100.0%	81.7%	11.0%	3.4%	4.0%
\$150,000 - \$199,999	100.0%	86.6%	9.8%	3.6%	0.0%
\$200,000 and above	100.0%	85.4%	9.6%	5.0%	0.0%

Schedule RDC-7
(page 3 of 3)

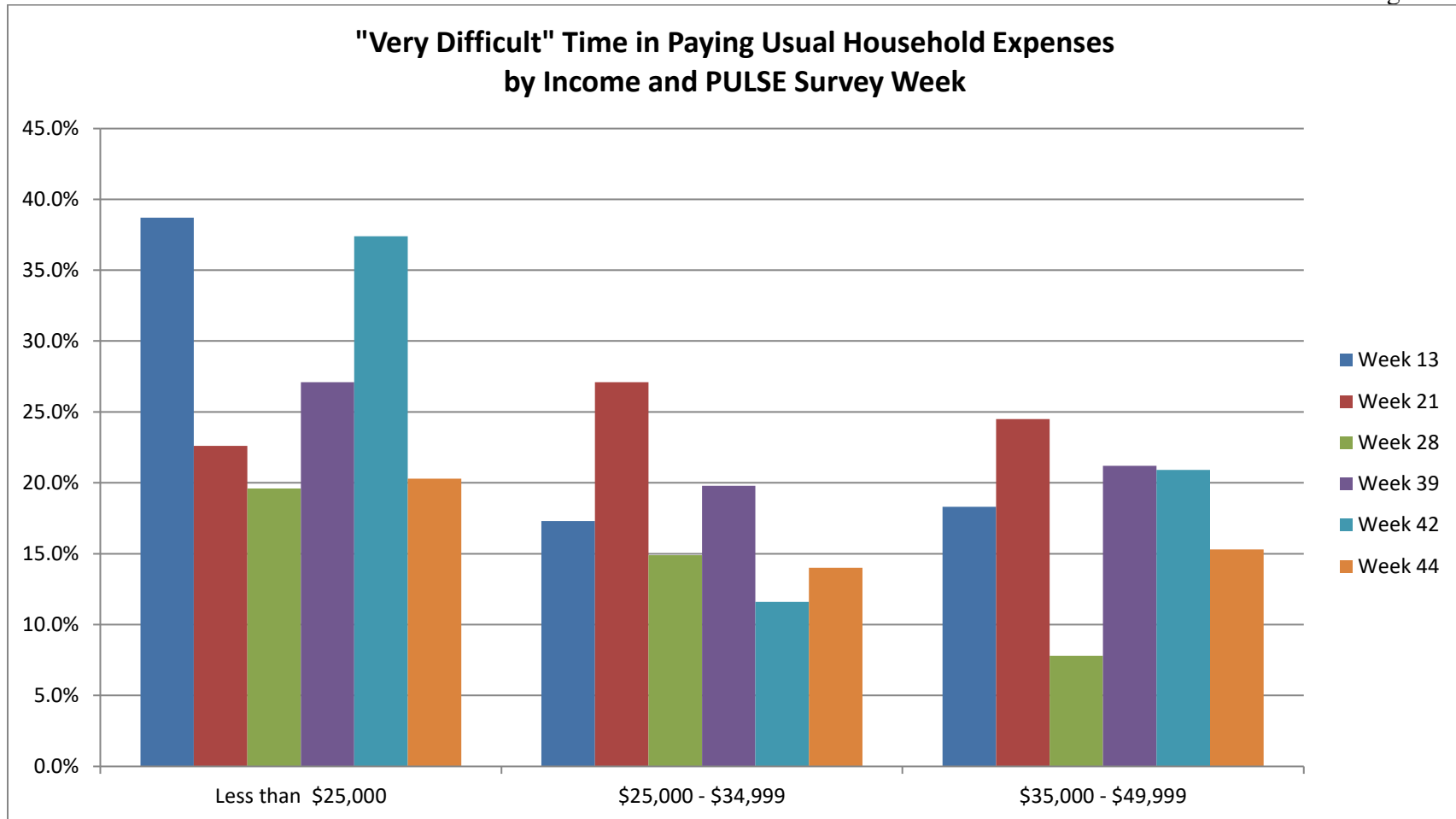
Difficulty paying for usual household expenses during the coronavirus pandemic (Ohio)					
Week 21 (12-9-20 – 12-21-20)	Total	Not at all difficult	A little difficult	Somewhat difficult	Very difficult
Less than \$25,000	100.0%	17.9%	25.3%	34.1%	22.6%
\$25,000 - \$34,999	100.0%	17.3%	19.3%	36.3%	27.1%
\$35,000 - \$49,999	100.0%	25.5%	24.4%	25.6%	24.5%
\$50,000 - \$74,999	100.0%	49.2%	26.2%	18.0%	6.6%
\$75,000 - \$99,999	100.0%	53.1%	30.3%	11.0%	5.6%
\$100,000 - \$149,999	99.4%	60.7%	24.9%	9.4%	4.3%
\$150,000 - \$199,999	100.0%	83.0%	14.0%	0.4%	2.5%
\$200,000 and above	100.0%	83.6%	7.1%	7.8%	1.5%

Difficulty paying for usual household expenses during the coronavirus pandemic (Ohio)					
Week 13 (8-19-20 – 8-31-20)	Total	Not at all difficult	A little difficult	Somewhat difficult	Very difficult
Household income					
Less than \$25,000	100.0%	22.9%	25.0%	13.4%	38.7%
\$25,000 - \$34,999	100.0%	24.7%	30.4%	27.6%	17.3%
\$35,000 - \$49,999	100.0%	28.3%	34.1%	19.4%	18.3%
\$50,000 - \$74,999	100.0%	52.9%	26.3%	11.1%	9.6%
\$75,000 - \$99,999	100.0%	63.6%	24.3%	7.8%	4.3%
\$100,000 - \$149,999	100.0%	63.7%	16.0%	8.1%	12.2%
\$150,000 - \$199,999	100.0%	64.1%	23.9%	9.7%	2.3%
\$200,000 and above (some HHs not reporting)	100.0%	89.8%	10.2%	0.0%	0.0%

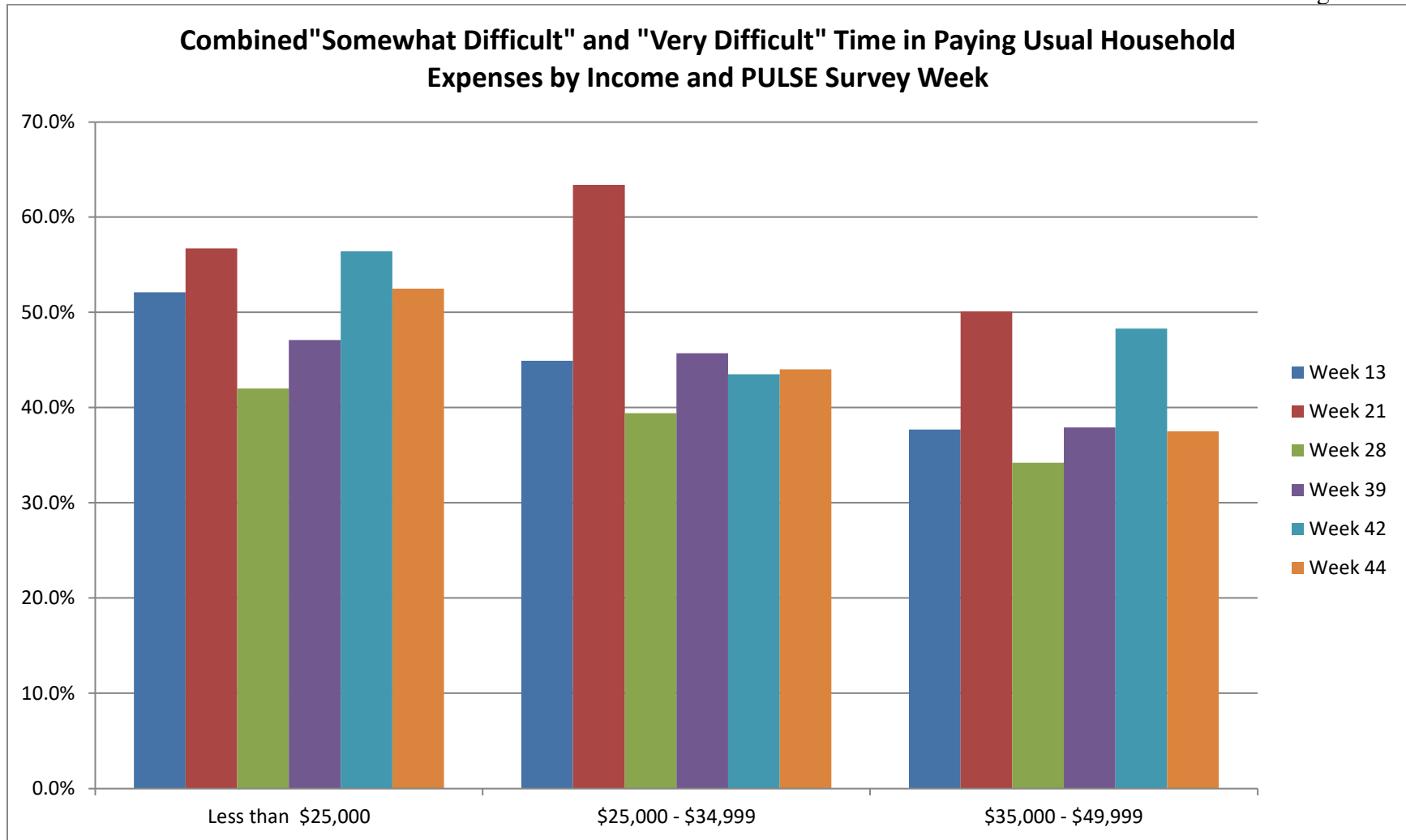
Schedule RDC-8
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Page 2 of 3



Schedule RDC-8
Page 3 of 3



Appendix A: Colton Curriculum Vitae Summary

Roger Colton
Fisher, Sheehan & Colton
Public Finance and General Economics
Belmont, MA

* * * * *

EDUCATION:

J.D. (Order of the Coif), University of Florida (1981)

M.A. (Regulatory Economics), McGregor School, Antioch University (1993)

B.A. Iowa State University (1975) (journalism, political science, speech)

PROFESSIONAL EXPERIENCE:

Fisher, Sheehan and Colton, Public Finance and General Economics: 1985 - present.

As a co-founder of this economics consulting partnership, Colton provides services in a variety of areas, including: regulatory economics, poverty law and economics, public benefits, fair housing, community development, energy efficiency, utility law and economics (energy, telecommunications, water/sewer), government budgeting, and planning and zoning.

Colton has testified in state and federal courts in the United States and Canada, as well as before regulatory and legislative bodies in more than three dozen states. He is particularly noted for creative program design and implementation within tight budget constraints.

PROFESSIONAL AFFILIATIONS:

Past Chair:	Belmont Zoning By-law Review Working Committee (climate change)
Member:	Board of Directors, Massachusetts Rivers Alliance
Columnist:	Belmont Citizen-Herald
Producer:	Belmont Media Center: BMC Podcast Network
Host:	Belmont Media Center: Belmont Journal
Member:	Belmont Town Meeting
Vice-chair:	Belmont Light General Manager Screening Committee
Past Chair:	Belmont Goes Solar
Coordinator:	BelmontBudget.org (Belmont's Community Budget Forum)
Coordinator:	Belmont Affordable Shelter Fund (BASF)
Past Chair:	Belmont Solar Initiative Oversight Committee
Past Member:	City of Detroit Blue Ribbon Panel on Water Affordability
Past Chair:	Belmont Energy Committee

Member: Massachusetts Municipal Energy Group (Mass Municipal Association)

Past Chair: Housing Work Group, Belmont (MA) Comprehensive Planning Process

Past Chair: Board of Directors, Belmont Housing Trust, Inc.

Past Chair: Waverley Square Fire Station Re-use Study Committee (Belmont MA)

Past Member: Belmont (MA) Energy and Facilities Work Group

Past Member: Belmont (MA) Uplands Advisory Committee

Past Member: Advisory Board: Fair Housing Center of Greater Boston.

Past Chair: Fair Housing Committee, Town of Belmont (MA)

Past Member: Aggregation Advisory Committee, New York State Energy Research and Development Authority.

Past Member: Board of Directors, Vermont Energy Investment Corporation.

Past Member: Board of Directors, National Fuel Funds Network

Past Member: Board of Directors, Affordable Comfort, Inc.

Past Member: National Advisory Committee, U.S. Department of Health and Human Services, Administration for Children and Families, Performance Goals for Low-Income Home Energy Assistance.

Past Member: Editorial Advisory Board, International Library, *Public Utility Law Anthology*.

Past Member: ASHRAE Guidelines Committee, GPC-8, *Energy Cost Allocation of Comfort HVAC Systems for Multiple Occupancy Buildings*

Past Member: National Advisory Committee, U.S. Department of Housing and Urban Development, Calculation of Utility Allowances for Public Housing.

Past Member: National Advisory Board: Energy Financing Alternatives for Subsidized Housing, New York State Energy Research and Development Authority.

PROFESSIONAL ASSOCIATIONS:

National Association of Housing and Redevelopment Officials (NAHRO)

National Society of Newspaper Columnists (NSNC)

Association for Enterprise Opportunity (AEO)

Iowa State Bar Association

Energy Bar Association

Association for Institutional Thought (AFIT)

Association for Evolutionary Economics (AEE)

Society for the Study of Social Problems (SSSO)

Association for Social Economics

BOOKS

Colton, *et al.*, *Access to Utility Service*, National Consumer Law Center: Boston (4th edition 2008).

Colton, *et al.*, *Tenants' Rights to Utility Service*, National Consumer Law Center: Boston (1994).

Colton, *The Regulation of Rural Electric Cooperatives*, National Consumer Law Center: Boston (1992).

BOOK CHAPTERS

Colton (2018). The equities of efficiency: distributing energy usage reduction dollars, Chapter in *Energy Justice: US and International Perspectives* (Edited by Raya Salter, Carmen Gonzalez and Elizabeth Ann Kronk Warner), Edward Elgar Publishing (London, England).

JOURNAL PUBLICATIONS

65 publications in industry and academic journals, primarily involving utility regulation and affordable housing. (list available upon request)

TECHNICAL REPORTS

200 technical reports for public-sector and private-sector clients (list available upon request)

JURISDICTIONS IN WHICH EXPERT WITNESS PROVIDED

1. Maine	17. Mississippi	33. Colorado
2. New Hampshire	18. Tennessee	34. New Mexico
3. Vermont	19. Kentucky	35. Arizona
4. Massachusetts	20. Ohio	36. Utah
5. Massachusetts	21. Indiana	37. Idaho
6. Rhode Island	22. Michigan	38. Nevada
7. Connecticut	23. Wisconsin	39. Washington
8. New Jersey	24. Illinois	40. Oregon
9. Maryland	25. Minnesota	41. California
10. Pennsylvania	26. Iowa	42. Hawaii
11. Washington D.C.	27. Missouri	43. Kansas
12. Virginia	28. Arkansas	Canadian Provinces
13. North Carolina	29. Texas (Federal Court)	1. Nova Scotia
14. South Carolina	30. South Dakota	2. Ontario
15. Florida (Federal Court)	31. North Dakota	3. Manitoba
16. Alabama	32. Montana	4. British Columbia

Columbia Exhibit No.

**BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO**

In the Matter of the Application of Co-)
lumbia Gas of Ohio, Inc. for Authority)
to Amend its Filed Tariffs to Increase the) Case No. 21-637-GA-AIR
Rates and Charges for Gas Services and)
Related Matters.)

In the Matter of the Application of Co-)
lumbia Gas of Ohio, Inc. for Approval of) Case No. 21-638-GA-ALT
an Alternative Form of Regulation.)

In the Matter of the Application of Co-)
lumbia Gas of Ohio, Inc. for Approval of)
a Demand Side Management Program) Case No. 21-639-GA-UNC
for its Residential and Commercial Cus-)
tomers.)

In the Matter of the Application of Co-)
lumbia Gas of Ohio, Inc. for Approval to) Case No. 21-640-GA-AAM
Change Accounting Methods.)

**PREPARED DIRECT TESTIMONY OF
SARAH POE
ON BEHALF OF COLUMBIA GAS OF OHIO, INC.**

- ☐ Management policies, practices, and organization
- ☐ Operating income
- ☐ Rate base
- ☐ Allocations
- ☐ Rate of return
- ☐ Rates and tariffs
- ☒ Other

Joseph M. Clark, Asst. Gen. Counsel
(0080711)

John R. Ryan, Sr. Counsel (0090607)

P.O. Box 117

290 W. Nationwide Blvd.

Columbus, Ohio 43216-0117

Telephone: (614) 813-8685

(614) 285-2220

E-mail: josephclark@nisource.com

johnryan@nisource.com

Eric B. Gallon (0071465)

Mark S. Stemm (0023146)

L. Bradfield Hughes (0070997)

Devan K. Flahive (0097457)

Porter, Wright, Morris & Arthur LLP

41 South High Street

Columbus, OH 43215

Telephone: (614) 227-2000

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Attorneys for

COLUMBIA GAS OF OHIO, INC.

July 14, 2021

**PREPARED DIRECT TESTIMONY
OF SARAH POE**

1 **Q. Please state your name and business address.**

2 A. Sarah Poe, 290 West Nationwide Boulevard, Columbus, Ohio 43215.

3

4 **Q. By whom are you employed?**

5 A. I am employed by Columbia Gas of Ohio, Inc. ("Columbia").

6

7 **Q. Will you please state briefly your educational background and experi-**
8 **ence?**

9 A. I graduated from the University of Dayton with a Bachelor of Science in
10 mathematics in 2007 and an MBA from Ohio University in 2015. I began my
11 career with Columbia in 2009 in the energy efficiency department, where I
12 was a Data and Performance Metrics Analyst. In August of 2012, I was pro-
13 moted to the position of Evaluation Team Leader. In April of 2017, I was
14 promoted to the position of Manager of Energy Efficiency Programs. In July
15 of 2020, I was promoted to my current position of Energy Efficiency Man-
16 ager.

17

18 **Q. What are your job responsibilities as Energy Efficiency Manager?**

19 A. I am responsible for the implementation of Columbia Gas of Ohio's energy
20 efficiency programs and services for Columbia customers, including low-
21 income customers. Other responsibilities include the preparation and/or
22 support of exhibits, proposed tariff changes and testimony filed by Colum-
23 bia in support of the Demand Side Management ("DSM") Program pro-
24 posed by Columbia in this case.

25

26 **Q. What is the purpose of your testimony in this proceeding?**

27 A. The purpose of my testimony is to support the continuation of Columbia's
28 DSM Program, which was previously approved by the Public Utilities
29 Commission of Ohio ("Commission") in Case Nos. 08-833-GA-UNC, 11-
30 5028-GA-UNC, and 16-1309-GA-UNC. The proposed DSM Program pro-
31 vides cost-effective, customer-oriented energy efficiency services for resi-
32 dential and commercial customers. Additionally, Columbia's income-qual-
33 ified energy efficiency program, WarmChoice®, will continue to provide
34 valuable health and safety measures to customers.

1 **Q. What are the primary customer benefits of the DSM Program?**

2 A. The primary benefits of the DSM Program continue to be:

3

- 4 • Cost-effective, customer-oriented energy efficiency services for Colum-
- 5 bia's residential and commercial customers
- 6 • Improved customer health, safety, comfort, and productivity
- 7 • Customer savings by lower utility bills

8

9 **Q. Please describe how Columbia's proposed DSM Program impacts cus-**
10 **tomers' health and safety.**

11 A. Columbia's WarmChoice® program provides income qualified customers
12 with a whole home energy inspection, which includes safety checks of nat-
13 ural gas appliances, including house lines, to ensure that they are safe upon
14 program completion. The WarmChoice® program mitigates many identi-
15 fied health and safety issues in order to safely weatherize a customer's
16 home, including, but not limited to, repair or replacement of defective heat-
17 ing and/or water heating equipment, corrections of unsafe wiring, fixing
18 interior gas leaks, and correcting venting code violations. From 2017 – 2020,
19 the WarmChoice® program identified and mitigated 413 gas leaks, 743 un-
20 safe wiring issues, 5,490 venting issues, and 2,390 cracked heat exchangers
21 in furnaces.

22

23 Additionally, as a part of Columbia's in-home energy audit program, en-
24 ergy auditors perform a safety check of the customer's natural gas furnace
25 and perform tests for natural gas leaks. From 2017 – 2020, the program iden-
26 tified 383 interior gas leaks, 5,050 mold and moisture issues, 1,708 combus-
27 tion safety issues, and 1,666 homes with asbestos.

28

29 **Q. Do the benefits of the DSM Program extend beyond the participating cus-**
30 **tomers?**

31 A. Yes. The DSM Program provides Columbia's customers and society with
32 multiple benefits beyond individual customer energy and utility bill sav-
33 ings. For instance, since the inception of the DSM Program, the savings
34 from Columbia's energy efficiency programs are equivalent to avoiding
35 over 6,700,000 tons of carbon dioxide over their lifetime, and additionally
36 the carbon dioxide reduction for Columbia's proposed DSM Program for

1 2023 – 2027 is estimated to be over 3,400,000 tons over its lifetime, the equiv-
2 alent of taking over 675,000 automobiles off the road for one year or plant-
3 ing more than 3.8 million acres of trees.¹

4
5 Columbia’s DSM Program creates numerous non-natural gas and non-en-
6 ergy benefits (“NEBs”), including:

- 7
- 8 • Lower water, sewer, and electric bills
- 9 • Avoided CO₂ emissions
- 10 • Direct economic benefits from jobs created by DSM programs
- 11 • Secondary economic (multiplier) benefits
- 12 • Lower customer arrearages and bad debt
- 13 • Increased tax revenue to state and local government
- 14 • Improvements in health and safety
- 15

16 **Q. Did Columbia engage with stakeholders about the DSM Program?**

17 **A.** Yes. Throughout the current DSM Program implementation period, Co-
18 lumbia met with its DSM Stakeholder Group annually in 2017 and 2018,
19 and biannually in 2019 and 2020. At these meetings, the DSM Stakeholder
20 Group discussed DSM Program performance. At its biannual meetings in
21 2019 and 2020, Columbia shared updates on marketing and outreach efforts
22 to make more customers aware of its WarmChoice® program. At its May
23 14, 2021 stakeholder group meeting, Columbia informed the stakeholder
24 group that it will be filing for an extension of its DSM Program on June 30,
25 2021.

26
27 **Q. How has Columbia’s current DSM Program performed from 2017 – 2020?**

28 **A.** Columbia’s current DSM Program continues to be successful. The following
29 table includes a summary of customers served and lifetime natural gas sav-
30 ings, by program, from 2017 – 2020.

¹ Lifetime savings are calculated based on the expected measure lives of the energy efficiency measures installed.

Program	Description	2017-2020 Custom- ers Served	2017-2020 Lifetime Mcf Sav- ings
Home Energy Audits and Rebates f/k/a Home Performance Solutions	In-home Energy Audit and Rebates	17,105	3,771,686
WarmChoice®	No-cost energy efficiency services to income-eligible customers	7,209	4,168,304
Appliance Rebates f/k/a High Efficiency Furnace Rebates	Rebates on high efficiency furnaces, boilers, and water heaters	25,905	6,165,647
EfficiencyCrafted SM Homes	Incentives to home builders for homes more energy efficient than energy code	11,464	7,600,139
Home Energy Efficiency Reports	Energy efficiency behavior modification reports to motivate customers to engage in energy efficiency actions	613,655	1,797,779
Product Rebates f/k/a Simple Energy Solutions	Online e-store and rebates on smart and programmable thermostats, energy efficient showerheads, and faucet aerators	76,589	6,670,096
e ³ smart	Energy efficiency education delivered as part of school curriculum, with a kit of energy efficiency measures for students to install in their homes	86,808	218,902
Home Energy Efficiency Checkup	On-line energy audit that refers customers to other DSM programs that can help them save more	27,235	-

Program	Description	2017-2020 Customers Served	2017-2020 Lifetime Mcf Savings
Innovative Energy Solutions	Prescriptive and custom rebates for energy audits and energy efficiency measures for nonprofits, houses of worship, schools, hospitals, government, and businesses	404	12,471,229
Small Commercial Construction f/k/a Energy Design Solutions	Rebates and training for small commercial building design professionals and trade allies to construct new commercial facilities more energy efficiently than energy code	99	727,330
U.S. EPA Portfolio Manager	Automated benchmarking for commercial customers' natural gas usage data and link to U.S. EPA's building energy benchmarking tool to determine efficiency level and next steps	163	-

Q. Have Columbia's DSM programs continued to receive recognition and awards?

A. Yes, Columbia's DSM programs and team members continue to be recognized for their leadership in the field of energy efficiency at the state, regional, and national levels. These awards and recognition are a testament to Columbia's focus on implementing best practices to market and deliver effective programs to customers. The current portfolio of DSM programs received 22 program awards from 2017 to 2021. Nationally, Columbia's largest programs, WarmChoice®, Home Energy Audits and Rebates, Appliance Rebates, Product Rebates, and EfficiencyCraftedSM Homes, have received awards from the United States Environmental Protection Agency ("U.S. EPA") and the WarmChoice® program has received an award from the American Council for an Energy Efficient Economy, leading proponents of energy efficiency as a resource for helping Americans manage energy

costs and reduce greenhouse gas emissions. Additionally, Columbia's energy efficiency marketing was recognized numerous times from 2017 to 2020 on both a local and national scale from the North American SABRE Awards, PRWeek, MarCom, the Telly Awards, and Public Relations Society of America ("PRSA"). Columbia's leadership, Commission Staff, and DSM Stakeholder Group members are to be credited for giving DSM Program staff the flexibility to develop and implement these peer-leading DSM programs in Ohio. A complete list of awards and recognition can be found in Section 3.1 of Columbia's DSM Application.

Q. Please describe the DSM programs that Columbia is proposing to continue and identify any enhancements going forward.

A. Below is a summary of the programs that Columbia proposes to continue offering from January 1, 2023, through December 31, 2027, with the enhancements noted.

WarmChoice®

The WarmChoice® program will continue to provide income qualified homeowners and renters with no-cost, whole-home energy efficiency services. Services include a whole-home diagnostic energy and safety inspection, and installation of necessary energy efficiency upgrades, which may include attic, wall, floor, duct, and pipe insulation, air leakage sealing, and replacement of defective natural gas fueled water and/or space heating appliances, when needed. Many safety issues that are identified during the energy inspection are corrected at no cost to the customer in order to safely weatherize the customer's home. Safety measures that are implemented through the WarmChoice® program include repair or replacement of defective heating and/or water heating equipment, mitigating interior gas leaks, and correcting venting code violations. Columbia proposes to increase the income guidelines for the WarmChoice® program to serve customers with incomes at or below 200% of the Federal Poverty Guidelines ("FPG"). This will allow additional customers who receive energy assistance through the Home Energy Assistance Program ("HEAP"), and have incomes up to 175% of the FPG, to receive no-cost weatherization through WarmChoice®. Additionally, increasing the income guidelines will allow for an opportunity for additional cost-sharing of jobs with the Federal Home Weatherization Assistance Program ("HWAP"), which currently provides energy efficiency services to customers with incomes at or below 200% of the FPG.

Product Rebates (formerly known as Simple Energy Solutions)

Columbia will continue its successful Product Rebates program to offer customers rebates for ENERGY STAR® certified smart thermostats, programmable thermostats, energy-efficient showerheads, and energy-efficient faucet aerators. Columbia proposes to continue to make rebates available instantly online via an e-store, and allow customers an option to purchase qualifying products and submit a post-purchase rebate form.

Home Energy Audits and Rebates (formerly known as Home Performance Solutions)

Columbia proposes to continue its Home Energy Audits and Rebates program to provide customers with low-cost energy audits and rebates for recommended energy efficiency upgrades. The program will continue to provide tiers to offer higher rebates to customers with lower incomes, but who may be above the proposed income guidelines for WarmChoice®. Columbia is proposing to shift the tiers from Area Median Income-based to Federal Poverty Guideline-based to better align with WarmChoice®. The in-home energy audit will identify recommended energy efficiency upgrades, and will perform a safety check of the customer's natural gas furnace. Recommended energy efficiency upgrades help customers save natural gas and increase comfort and safety. Additionally, Columbia will create a health and safety pilot for customers who qualify for the assisted tier of the Home Energy Audits and Rebates program to help correct some health and safety issues identified during the audit and to help remove barriers to the installation of the recommended energy efficiency measures.

Appliance Rebates (formerly known as High Efficiency Appliance Rebates)

The Appliance Rebates program will continue to provide customers with rebates when they install a high-efficiency natural gas heating or water heating system. Columbia proposes to expand the minimum Annual Fuel Utilization Efficiency ("AFUE") requirement for participation in the program to create a tiered rebate structure to continue to encourage customers to increase the efficiency of their heating system above current code standards. Additionally, Columbia proposes to pilot incorporating its rebates for ENERGY STAR® certified smart and programmable thermostats into the Appliance Rebates program to allow for contractors to instantly apply these rebates at the time of heating system replacement rather than having the customer apply for a rebate post-purchase.

Home Energy Efficiency Reports

Columbia proposes to continue its Home Energy Efficiency Reports program to provide paper and email reports to customers with their energy usage information, a comparison of their usage with similar homes, and energy savings tips to help them take actions to reduce their natural gas usage. Columbia hopes to create new treatment waves to retain customer participation levels due to attrition.

EfficiencyCraftedSM Homes

The EfficiencyCraftedSM Homes program will continue to provide incentives to builders to construct homes to a higher energy efficiency standard than Ohio's building energy code. Participating builders construct ENERGY STAR® certified homes or EfficiencyCraftedSM Homes that score 70 or lower on the Home Energy Rating System ("HERS") scale. Both standard market and affordable housing market homebuilders will be encouraged to participate in the program. The program will continue to recruit home energy raters and homebuilders to participate in the program and provide them with training and technical assistance.

e³ smart (Energy Efficiency Education for Students)

Columbia proposes to continue the e³ smart program to provide program education and materials to schoolteachers to offer a curriculum on energy efficiency to students. Students will receive a kit of energy efficiency materials, including an energy-efficient showerhead and kitchen and bathroom faucet aerators to install in their homes as a part of the course curriculum to help lower their home energy usage.

Innovative Energy Solutions

The Innovative Energy Solutions program will continue to provide funding for commercial and industrial buildings, including not-for-profits and religious institutions, to have energy audits conducted and make natural gas energy efficiency improvements.

Small Commercial Construction (formerly known as Energy Design Solutions)

Columbia proposes to continue this program to provide education and training to building industry professionals and owners on the benefits of constructing energy efficient new buildings. The program will continue to

provide rebates to newly constructed facilities, including schools, non-profits, and municipal buildings, to increase the energy efficiency of the facilities above current Ohio energy code.

EPA Portfolio Manager Automated Benchmarking

Columbia proposes to continue to provide commercial and industrial customers with a tool to help track natural gas consumption over time and compare energy consumption of their buildings with that of similar building types to identify energy savings opportunities.

Q. Is Columbia proposing any new programs?

Yes. Columbia is proposing a Sustainable Energy Pilot that will provide Columbia the opportunity to pilot new and emerging natural gas sustainability and energy efficiency technology, which may include natural gas fuel cells and natural gas heat pumps for heating and water heating.

Q. What are the proposed costs and cost effectiveness of Columbia's proposed DSM Portfolio?

A. Columbia is proposing a portfolio of energy efficiency programs for the period of January 1, 2023, through December 31, 2027, which has a proposed average budget of \$30.9 million annually.² The overall DSM Portfolio has been determined to be cost-effective, as shown in Appendix A to the Application. The proposed portfolio of energy efficiency programs generated a Utility Cost Test ("UCT") score of 2.37 excluding the low income program, WarmChoice®, and a UCT score of 1.52 including the WarmChoice® program.

With the exception of the proposed \$7.1 million that Columbia is including in base rates, Columbia is proposing to continue to have the flexibility to shift funding between and within programs without Commission approval in order to maximize program performance and customer benefits. Columbia also proposes to continue to have the ability to carry any unspent budget from one calendar year forward to future calendar years.

² The average annual budget of \$30.9 million does not include the proposed \$7.1 million in budget being proposed for WarmChoice base rates. The budget will increase annually by approximately 2% to account for inflation.

1 **Q. Are you sponsoring Appendix A to Columbia's DSM Application?**

2 A. Yes. I am sponsoring Appendix A to Columbia's DSM Application. Appen-
3 dix A shows the proposed annual DSM Program budgets from 2023 – 2027,
4 the annual natural gas savings projections from 2023 – 2027, and the DSM
5 Program cost effectiveness test results.
6

7 **Q. How does Columbia propose to incur WarmChoice® expenses from Base
8 Rates and the DSM Rider?**

9 A. Columbia proposes to continue to primarily incur expenses for its Warm-
10 Choice® program against the \$7.1 million in base rates first, and after the
11 \$7.1 million has been fully invested it will incur expenses in the DSM Rider.
12 This will include, but is not limited to, costs to implement and weatherize
13 customers' homes through the program and internal labor costs associated
14 with the WarmChoice® program.
15

16 **Q. How will labor associated with Columbia staff who support the DSM
17 programs be billed?**

18 A. Columbia staff who support the DSM programs will continue to bill their
19 time through the DSM Rider. This may include staff who support the
20 WarmChoice® program, and a portion of their time will be billed to the DSM
21 Rider once the base rate budget has been fully invested.
22

23 **Q. Please describe the shared savings performance incentive that Columbia
24 is proposing.**

25 A. Columbia proposes to continue the shared savings incentive mechanism
26 approved by the Commission in Case Nos. 16-1309-GA-UNC, *et al.* The
27 mechanism gathers and tracks data for energy efficiency measures installed
28 through each DSM program. Columbia uses this data, with limited excep-
29 tions, to calculate the projected natural gas savings using the formulas iden-
30 tified in the State of Ohio Energy Efficiency Technical Reference Manual
31 ("TRM"), or for measures not identified in the Ohio TRM, TRM resources
32 from nearby states will be utilized. The other exceptions are the Warm-
33 Choice® program, where historic billing analysis is used; the Home Energy
34 Efficiency Reports program, where contract savings with adjustments for
35 measured actual savings are used; and the Innovative Energy Solutions and
36 Small Commercial Construction programs, where the energy audit or
37 building modeling software projected natural gas savings are used. Using
38 the energy efficiency measure lifetime identified in the TRM, Columbia cal-
39 culates the projected lifetime natural gas savings and the value of the natu-
40 ral gas savings for all of its DSM programs.

1 The shared savings mechanism is based on Columbia earning a share of the
2 net benefits as calculated under the UCT. Shared savings are computed on
3 the difference between the net present value of Portfolio lifetime energy
4 savings minus the program costs calculated from the UCT. The recovery of
5 the shared savings performance incentive, grossed up for taxes, will be
6 based on the following tiered levels of Portfolio achievement:
7

Percent of Mcf Savings Targets Minimum	Percent of Mcf Savings Targets Maximum	Corresponding Shared Savings Percentage
100%	< 105%	5%
≥ 105%	< 110%	6%
≥ 110%	< 115%	7%
≥ 115%	< 120%	8%
≥ 120%	< 125%	9%
≥ 125%		10%

8
9 Columbia proposes to cap the shared savings incentive, over the entire term
10 of the DSM Program ending on December 31, 2027, at \$10 million plus a
11 gross up for taxes.
12

13 This shared savings approach provides Columbia incentives for effectively
14 and efficiently managing the programs and for meeting the ambitious pro-
15 gram goals.
16

17 **Q. Please describe the mechanism that Columbia is proposing to recover**
18 **costs related to the DSM Program.**

19 **A.** Columbia is proposing to continue the accounting treatment for the deferral
20 of DSM expenses and the recovery mechanism for DSM expenses as previ-
21 ously approved in Case Nos. 11-5028-GA-UNC, *et al.* and 16-1309-GA-
22 UNC, *et al.* Columbia will continue filing annually to adjust the Rider DSM
23 rate to allow for the review and recovery of DSM costs incurred and shared
24 savings realized during the prior calendar year. Columbia will continue de-
25 ferring the difference between actual DSM Program expenses (including
26 carrying costs) and Columbia's portion of shared savings.
27

28 Columbia will defer expenses in special sub-accounts of Account 182-Other
29 Regulatory Assets for recovery through Rider DSM. DSM expenses eligible
30 for deferral will include all expenses incurred through implementation of
31 the comprehensive, ratepayer-funded, cost-effective, energy efficiency

1 portfolio. Consistent with its current program and the Commission's Opin-
2 ion and Order in Case Nos. 08-72-GA-AIR, *et al.*, Rider DSM will further
3 include carrying costs to be computed at Columbia's current cost of long-
4 term debt and any incentives approved by the Commission. Columbia's
5 portion of shared savings during each calendar year will be calculated and
6 supported through an annual report based on actual data for the previous
7 calendar year. Columbia will submit this report to Commission Staff no
8 later than June 30 of the subsequent calendar year.
9

10 **Q. In conclusion, please summarize what Columbia requests.**

11 A. Columbia seeks authority from the Commission to: (1) continue its DSM
12 Program for an additional five years; (2) include additional programmatic
13 changes proposed by Columbia; (3) increase the annual DSM funding level
14 by approximately 2% each calendar year for the balance of the five-year pe-
15 riod for inflation; (4) continue its shared savings mechanism with increased
16 Mcf targets, and an overall shared savings incentive cap; (5) continue Rider
17 DSM for the five-year period, as previously approved in Case Nos. 11-5028-
18 GA-UNC and 16-1309-GA-UNC; and (6) continue the accounting treatment
19 of the DSM Program expenses as previously approved in the 2011 and 2016
20 Extensions.
21

22 **Q. Does this complete your Prepared Direct Testimony?**

23 A. Yes, it does. However, I reserve the right to supplement this testimony.

CERTIFICATE OF SERVICE

The Public Utilities Commission of Ohio's e-filing system will electronically serve notice of the filing of this document on the parties referenced on the service list of the docket card who have electronically subscribed to the case. In addition, the undersigned hereby certifies that a copy of the foregoing document is also being served via electronic mail on the 14th day of July, 2021, upon the persons listed below.

/s/ Joseph M. Clark

Joseph M. Clark

Attorney for

COLUMBIA GAS OF OHIO, INC.

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Revisiting Bonbright's principles of public utility rates in a DER world

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ABSTRACT

Professor James Bonbright's *Principles of Public Utility Rates*, first published in 1961, was built around a model of vertically integrated electricity monopolies and approached ratemaking largely as an exercise in balancing the interests of capital attraction with those of ratepayers, all within a 'public interest' framework. This article seeds a new conversation about changes to the venerable Bonbright principles and introduces new principles of public utility rates for an era of electric utility transformation.

1. Introduction

When James Bonbright's "Principles of Public Utility Rates"¹ was published in 1961, electric utilities and the environment in which they operated were vastly different. The central station utility model was dominant, and economies of plant scale appeared inexhaustible. In fact, the 1960s marked the zenith of the trend toward large power plants,² and since that decade, we have seen a wide range of fundamental changes in the electricity system. These changes include widespread competition in the generation sector, retail competition, the emergence of renewable energy generation, and, most significantly, a revolution in scale that has ushered in an era of distributed energy resources (DER).³ Bonbright's text did not account for these changes; now, nearly 60 years since the publication of the Bonbright's treatise, it is time for a rewrite.⁴

Rewriting such a profoundly influential treatise is beyond the scope of this article. Indeed, such a project would be worthy of an extended sabbatical and a genius grant's worth of funding. With all due respect for the enormity of that effort, and with keen appreciation of the

authors' limited resources, we can nevertheless briefly introduce some of the important revisions and additions to Bonbright's principles that today's utility sector conditions compel.

2. Drivers of change

In 2002, Rocky Mountain Institute published *Small Is Profitable*, presaging today's rapidly expanding markets for DER technologies and services.⁵ More importantly, *Small Is Profitable* also foresaw the potential sector impacts:

*These "distributed resources" could displace new bulk power generation, bulk power trade, and even much transmission as new technologies, market forces, institutional structures, analytic methods, and societal preferences propel a rapid shift to "distributed utilities," operating on a scale more comparable to that of individual customers and their end-use needs.*⁶

Small Is Profitable identified 12 key drivers of change, still powerful

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¹ Bonbright (1961), "Principles of Public Utility Rates," Columbia University Press (1st ed., 1961), available at <http://www.raponline.org/document/download/id/813>.

² In fact, the economics of large central station generation were waning already with Bonbright's book was published. See A. Lovins (2002) "Small Is Profitable," Rocky Mountain Institute (2002), available at <https://www.rmi.org/insights/knowledge-center/small-is-profitable/>.

³ This article uses the broadest definition of "distributed energy resources," to include generation, efficiency, energy management, storage, electric vehicles, and other technologies and services interconnected and operated as resources at the distribution edge of the electric system.

⁴ A second edition was published in 1988, three years after Bonbright's death, and was authored by Albert L. Danielsen and David R. Kamerschen. This article references only the original first edition.

⁵ *Small Is Profitable*, at § 1.2.1.

⁶ *Id.* The full list of drivers included: more efficient end use; small-scale fueled cogeneration; cheap kilowatt-scale fuel cells; new fuels; cheap, easy-to-use renewable sources; distributed electric storage; grid improvements; distributed information; distributed benefits; competition; shifts in electricity providers' mission, structure, and culture; and unbundled service attributes.

and defining today. These included energy efficiency and distributed generation, distributed storage and cogeneration, business model changes and competition, and data. New technologies and evolving consumer attitudes continue to drive transformation of the traditional utility business model into a new, more transactive, competitive, and customer-responsive marketplace. As customers increasingly seek to generate their own electricity through on-site generation, reduce their load through energy efficiency, and otherwise take more control over their energy usage and bills, utilities are facing challenges unimagined or at least not fully appreciated when Bonbright articulated principles for public utility ratemaking.

In response to low or negative sales growth, many utilities have increasingly pushed for rate designs that feature higher non-bypassable customer charges to increase the certainty of revenue recovery (and weaken the incentive for efficiency and self-generation), demand charges intended to generate the revenue to pay for infrastructure and grid modernization investments, access charges and reduced compensation rates for customer-generators to address alleged cost shifts and lost revenues,⁷ and standby fees that increase charges for self-generators who interact with the grid less frequently than customer-generators.

Other shifts are also contributing to the changing electric utility landscape, including changing priorities in the broad concept of the “public interest.” These shifts include the growth of third-party markets for products and services that in Bonbright’s day would have traditionally rested with the utility as a monopoly provider; the increased recognition of and commitment to address the opportunities and challenges associated with ensuring that low- and moderate-income customers have equitable access to sustainable energy; state renewables and climate change goals; and a now decades-old efforts to value and incorporate into prices and costs the economic externalities of the electricity sector associated with generation, transfer, and use.

In a few jurisdictions, regulators are working with utilities and market participants to develop rates and pricing strategies designed to better align with public policy objectives. Often these efforts are seen as progenitors to a transition to performance-based revenue models and a new platform-provider role for electric distribution utilities.

Public utility rates are hardly the only tool at the disposal of regulators and policymakers for securing the benefits of access to reliable, affordable, and clean electric service. Indeed, they are not even the best tool in all circumstances. But electric rates are a vital tool, and if poorly designed and implemented, they can be a significant and pernicious obstacle to meeting public policy objectives. The purpose of this article is to continue and advance a decades-old discussion and exploration of how to design and implement electric utility rates so as to protect and serve the public interest inherent in those rates.

3. New principles for the DER era

Bonbright’s Principles of Public Utility Rates are often summarized as three: (1) revenue requirement, (2) fair apportionment of costs among customers, and (3) optimal efficiency. These principles have generally been read as focusing on the utility’s revenue requirement, fair apportionment of costs among customer classes, and optimal efficiency in consumption of electricity as a commodity. In addition, Bonbright instructed that rates must be simple, understandable, acceptable, free from controversy in interpretation, stable, and non-discriminatory. Today, utilities are not the only investors with skin in the electric service game; customers classes are becoming more diverse, not less so; and the tools and metrics of economic efficiency require attention to far more factors than the price revealed by a century-old approach to cost-

of-service accounting. There is important work to do in ensuring that public utility rates serve and support the public interest.

Responsibility for addressing these issues rests with regulators. As one commentator succinctly summed up the *raison d’être* for regulation of utilities and their rates, “[r]eal competition disciplines performance so that sellers’ self-interest is aligned with customers’ needs. Monopolists don’t face competition, so the missing discipline is provided by regulation.”⁸ Where there are no plans to increase the operation of market forces in the electricity sector, the primary responsibility of regulators is to ensure that the utilities do not use rate design as a vehicle for abusing their monopoly power and extracting monopoly rents. Where the state policy favors the introduction of competitive market forces into the utility landscape, the regulator must also ensure that utilities do not use their relative market power to discriminate against competitors—today that especially means DER services and technologies. That is because DER services and products increasingly offer superior value in serving customers’ needs and advancing the public interest.

DERs have changed the electricity landscape, and should change the regulatory approach to setting rates. A walk through Bonbright’s principles in this new era illustrates the need for change. Customers, in their own right and through non-utility parties, are making their own investments in electric service provision—they have their own “revenue requirements.” Services are no longer only provided by the electric utility, so the scope of inquiry regarding economic efficiency must countenance a much broader review of costs and benefits, over both the short and long run.

Utilities still largely enjoy state action antitrust immunity, but the underlying comprehensive regulation of utilities by state regulators has, in many places, given way to competitive market structures, raising the very real fairness concern that rate design can be used as an anti-competitive tool against emergent competitors and customer-generators. So, regulatory review of rates should include scrutiny of anti-competitive effects. Similarly, just as PURPA⁹ forbids discrimination against small power producers, rate design should not be used to advance undue discrimination. This principle should relate not just to class rates, but also to rates impacting subsets of traditional customer classes—customer-generators, and owners, operators, and providers of other DER.

As policy continues to advance the use of market forces in the electricity services sector, revenue stability for traditional utility and emerging platform functions must be balanced with increased utility exposure to markets and performance standards. Customers are increasingly presented with the opportunity to take service under more dynamic and innovative rates, raising important concerns about the necessary prerequisites for exposing customers to such rates, including comprehensive assessment of the relative costs and benefits of utility service and non-utility options, and in terms of rate design, data access, opt-out provisions, tools to understand and manage use of services, safe harbors, grandfathering, and other features. Finally, the concept of discouraging wasteful use of electricity has heightened importance in a world facing huge environmental challenges, such as global climate change. Full assessment of costs and benefits and of the costs avoided through use of or reliance on DER for the provision of electric service is absolutely essential.

Revisiting Bonbright’s principles necessitates both revisiting the manner in which still-relevant principles must be updated for today’s realities, as well as the articulation of new principles. A start to the effort means addressing the most important issues that DERs and increasing sector competition bring to the industry. Candidate new

⁷ Rabago (2016), “The Net Metering Riddle,” ElectricityPolicy.com (Apr. 2016), available at: <http://peccpublication.pace.edu/publications/net-metering-riddle>.

⁸ Hempling (2018), *Regulatory Candor: Do We Own Up?*, (Jul. 18, 2018), available at: <http://www.scotthemplinglaw.com/essays/regulatory-candor-do-we-own-up>.

⁹ 18 C.F.R. § 292.304 (2018).

principles appear in the following discussion.

3.1. Regulators should fully comprehend and reflect resource value in rates

John Dos Passos once said that “[a]pathy is one of the characteristic responses of any living organism when it is subjected to stimuli too intense or too complicated to cope with. The cure for apathy is comprehension.”¹⁰ Regulation is complex, even more so in an era of DER and increasingly competitive markets. Rates are often based on historical costs, but have their most profound impact on future behaviors and costs. The growing menu of cost-effective DER-based services and increasing customer choice compels an analysis and explicit reflection of costs, avoided costs, and benefits in basic service and optional rates because of their impact on DER utilization. Regulators can easily recognize that there are significant and challenging gaps between costs, prices, and value in the electricity sector. The cure for reconciling these differences is not regulatory apathy but conscious engagement with objective, data-driven valuation processes.

3.2. Rate making must account for the relative market positions of various market actors, and for the information asymmetries among different customers, utilities, and market participants

The communication of price signals is often touted as the primary, and often only, justification for rate designs that increase fixed customer charges, impose charges on self-generators, or impose demand charges on small customers. Too often, sending price signals to customers about utility cost structure is the only criteria applied to such rate changes. The notion is that utilities have always been high-fixed-cost businesses, but are even more so today. And so, the argument applies a distorted version of the principle that “rate design should reflect cost causation.”

The twisted and increasingly common version of the original principle is that “increasing fixed costs should be reflected in increasing fixed charges,” with the implication that this will improve economic efficiency.¹¹ The formulation has the appeal of syntactical alliteration, but this hardly qualifies the proposition as a principle of economics. Indeed, the authors can find no principled economic basis or practical market evidence to support the proposition that fixed costs dictate fixed charges.¹² Moreover, the concept of communicating the utility’s cost structure as a price signal ignores the very real price signals that these approaches send to the utility, to the relative information position and choice options of diverse customer types, and to markets for DER. Immunizing a utility’s fixed cost investments from the consequences of

customer behavior is a recipe for gold-plating, and for the extraction of monopoly rents from customers without the tools and resources to cost-effectively respond to the new rate design.

3.3. Sound rate design must be grounded in a careful assessment of practical economic impacts on all market participants, especially customers

Well-designed and well-understood rates can be an effective tool in encouraging changes in customer behavior and investments over both the short and the long term. But customer charges and access charges for distributed generation, for example, can establish a monthly minimum bill that customers cannot save their way out of, no matter how efficient their use or how much they invest their private capital in generation for self-consumption. Increased customer charges can weaken the economic signal supporting two market segments that are recognized as priorities in many states—efficient use and local generation.

Rate design is often a zero-sum game once revenue requirements are determined and costs are functionalized, classified, and allocated. Fixing or imposing effectively non-bypassable charges therefore reduces volumetric charges and weakens the incentive and value of efficiency and self-generation. Imposing demand-based charges, whether directly through demand charges or indirectly through time-variant charges, on customers who have no practical, meaningful opportunity to respond to those charges turns the theory of “price signals” into the regulatory equivalent of telling customers that if they can’t afford electricity during peak periods, they can just “eat cake.”

This bundle of issues, related to the recent explosion of rate design innovations proposed across the country, merits another new rate-making principle: No new rate design should be imposed on customers in the absence of that customer enjoying a meaningful opportunity to respond to the rate through modification of behavior or affordable investment in technologies or services. (Caveat: Going without electric service—privation—is seldom a meaningful option). Call it the principle of economic symmetry in rates, perhaps, but it is vital in an era of rate design experimentation and the growth of DER markets and services. Customers must have the education, experience, resources, and options to respond to new rates. Else, the rate is just a tool for the extraction of monopoly rents.¹³

3.4. Rates must support capital attraction for all resources that provide energy services, regardless of whether the affected investor is the utility, the customer, or a third-party provider

Buying or leasing a rooftop solar system, replacing a roof or an HVAC system, weatherizing a home, or just changing a lightbulb all reflect investments by the customer, the landlord, or the DER service provider. Mobilizing capital investments by non-utility parties reduces the cost of service for utility customers, supports market innovation, and diversifies the capital risk associated with the provision of electric services of all kinds. Successful growth in DER markets can reduce the overall societal costs of obtaining reliable electric service. For these reasons, regulators must increasingly account for the impact that electric rates have on capital attraction and project financeability for non-utility DER service and technology providers, and for customers who make direct investments themselves.

¹⁰ Dos Passos (1950) “The Prospect Before Us.” Thanks to Scott Hempling for the reminder of this great quote.

¹¹ The assertion that it is more efficient to recover fixed costs through fixed charges has been used as a justification for minimum-system approaches to cost classification, recovering demand-related costs through customer charges or increases to customer charges, residential demand charges, and reductions in volumetric energy charges, usually justified only with incantation of some version of the phrase: “Fixed costs should be reflected in fixed charges.”

¹² The logical extension of this proposition would be cover charges at coffee shops, cable TV pricing for electric service, and monthly charges for hotels, airlines, railroads, and toll roads, regardless of use. One particularly dogmatic economist once asserted to author Rábago that the proposition that high fixed charges advance economic efficiency is supported by the approach known as Ramsey-Boiteux pricing, a second-best approach in which costs are allocated to customers in inverse proportion to the demand elasticity demonstrated by the customer class. Aside from the fact that regulators largely rejected the broad application of the method because of the fairness and policy impacts when it was originally used to argue for allocating the burdens of expensive power plant investments to residential customers, the concept of Ramsey-Boiteux pricing has no place in a world where regulation seeks to increase competitive choice in all market segments. The idea now belongs squarely on the dust heap of regulation.

¹³ A simple thought experiment makes the case: Imagine a customer of modest income, living in a rental apartment and holding down two jobs, one that ends at 5:00 pm, and a second that starts at 7:00 pm. If the system peaks at 5:00 pm, a coincident-peak demand charge or time-of-use rate will hit that customer just as they come home to do the dishes and the laundry, bathe the children, and cook the dinner. What are the practical, affordable options for reducing demand or on-peak use for such a customer?

3.5. Rates must be designed to account for the incentives they create for utilities, customers, and non-utility market participants

Just as “all regulation is incentive regulation,”¹⁴ all rate design is incentive rate design. Regulators must resist indifference to the reality of changing electricity service markets and their influence on the relative positions of utilities, customers, and third-party service providers. As explained above, high customer charges reduce the incentive to pursue energy efficiency or distributed generation and the attendant paybacks for customers, and weaken the financeability of products offered by non-utility service and technology providers. High fixed charges and straight fixed variable rates also reduce the incentive for utilities to find or support third-party alternatives to utility self-build investment options.

3.6. Just and reasonable rates require accurate accounting for utility costs

Ratemaking is the transformation of costs into charges. Unfortunately, cost-of-service studies often rely upon outdated and inaccurate rules of thumb in classifying costs. These classified costs are often directly translated into rate design. For example, under FERC’s Uniform System of Accounts, Account 370, entitled “Meters,” is used to “include the cost of installed meters or devices and appurtenances thereto, for use in measuring the electricity delivered to its users.”¹⁵ In Bonbright’s era, all that a meter could do was measure electricity use, and one was required for each customer. It is not surprising, then, that utility cost-of-service studies routinely classify all Account 370 costs as “customer costs,” and that these costs are routinely allocated to the fixed monthly customer charge. Putting meter costs in the customer charge is the end result of straight fixed variable rates, the basic customer method, and minimum system methods. But today’s meters are not Bonbright’s meters. New advanced meter functionality (AMF) meters not only measure consumption like yesterday’s spinning-disk analog meters, but they are also a key component of integrating distributed generation, logging demand response, and generating data to support dynamic rates and other services. These meters house data logs and telemetry functions, and are an element of increasingly complex networks of monitoring, signaling, and control systems embedded in the distribution system. With all this change in what used to be the simple task of measuring consumption, it seems plain error to treat all meter-related costs as a customer cost, much less recover these costs through customer charges.

The economically efficient integration of DER services and technologies on an increasingly widespread basis opens the door for many ratemaking innovations, especially for regulators seeking to maximize the benefits and reduce the costs associated with increased market penetration of DERs, whether the hardware and customer interface is owned by the utility, its customers, or non-utility market players.¹⁶ New cost categories are appropriate for energy efficiency-related cost, demand response functionality, and integration costs associated with distributed generation, distributed storage, and electric vehicles. Regulators should work with utilities and other market stakeholders in developing more granular functionalization regimes for electric service costs, in order to support the development of more precise cost accounting structures, and ultimately, more accurate and effective rates.

¹⁴ Lazar (2016), “Electricity Regulation in the U.S.,” Regulatory Assistance Project (Jun. 2016), available at: <https://www.raponline.org/knowledge-center/electricity-regulation-in-the-us-a-guide-2/>.

¹⁵ 18 C.F.R. Part 101 (2013).

¹⁶ See, e.g., Hawaii Revised Stat. § 269-6(d)(4), requiring the Hawaii PUC to consider a shared cost savings incentive, a renewable energy curtailment mitigation mechanism, a stranded cost recovery mechanism, and the establishment of differentiated authorized rates of return on common equity to encourage particular kinds of utility investments.

3.7. Rate design and cost allocation are separate functions, driven by distinct policy objectives

As previously discussed, the common practice of recovering customer costs through customer charges has alliterative appeal, but does not honor economic policy or necessarily best serve the public interest. Once costs are labeled, however they are labeled, the process of designing rates should not be dictated by mere accounting convention. Treating accounting labels as determinants of rate design serves to encourage the pernicious practice of contorting customer cost definitions in an effort to increase customer charges. The minimum system method stands as an example of the kind of poor policy that remains today, in spite of Bonbright’s specific rejection of the approach.¹⁷

4. Conclusion

Much of Bonbright’s classic treatise on the principles of public utility rates has stood the test of time, and still provides a basis for useful reflection on principles of regulation and rate development. Today, a massive sea change is sweeping through the electric utility industry, finally inviting the realization of a service model, performance-based rate making, and the emergence of exciting non-utility markets. And so, some new interpretations of Bonbright’s principles and even some new principles are in order. Bonbright’s book was published 63 years after Samuel Insull delivered his call for public regulation of electric utilities,¹⁸ and as history now shows, it was published at the point that might be called “peak central station” for the industry. Now that we are nearly 60 years into the new era of distributed energy resources, a new take on those valuable precepts is most timely.

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¹⁷ Bonbright, at pp. 347–49.

¹⁸ Insull (1898), “Public Control and Private Operation,” speech before the National Electric Light Assoc. (now Edison Electric Institute), Chicago (Jun. 7, 1898), available at: <https://www.masterresource.org/edison-electric-institute/the-insull-speech-of-1898/>.

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