Christensen ASSOCIATES

Evaluation of FERC Oil Price Index

for
The Canadian Association of Petroleum Producers

By

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Dan McLeod, PhD
Corey Goodrich

December 24, 2025

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1. INTRODUCTION

1.1 Qualifications

1. Christensen Associates Energy Consulting, LLC ("CA Energy Consulting") provides energy industry stakeholders with expert support on economic issues ranging from rate design, cost-of-service, cost of capital, econometric analysis, and incentive regulation, helping answer a broad array of regulatory and business questions through research reports and in docketed proceedings. In recent years, the firm has undertaken substantial project work assisting utilities and regulators in both the United States and Canada with evaluating and designing price and revenue cap frameworks. The company has a long history of work in this field, having been involved in developing the theoretical foundations and practical design of indexed regulation plans dating back to the introduction of such frameworks in North America in the 1980s and has a near fifty-year legacy of conducting productivity research across network industries, including electricity, telecommunications, natural gas, railroads, and the US Postal Service.

2. This report is authored by two CA Energy Consulting experts with substantial experience on issues related to regulation via price indexing. Mr. Nicholas Crowley is a Vice President. He has testified on index regulation issues in Massachusetts, New Hampshire, and Alberta, and has authored research reports on this subject in British Columbia, Ontario, Indiana, and Maine. He has also conducted research related to price cap regulation, co-authoring an article on the impact of performance-based regulation on Canadian electricity distribution utilities and a separate article with Dr. Daniel McLeod on utility remuneration and cost inflation.[1] Prior to joining CA Energy Consulting,

[1] "Measuring the Price Impact of Price-Cap Regulation Among Canadian Electricity Distribution Utilities." Utilities Policy. Vol. 72, October 2021. Also, "Trends and Drivers of Distribution Utility Costs in the United States: A Descriptive Analysis from 2008 to 2022. Electricity Journal. 37 (2024) 107397.

Mr. Crowley was an economist in the Division of Pipeline Regulation at the Federal Energy Regulatory Commission ("FERC," or "the Commission"). Mr. Crowley assisted with the 2015 FERC Oil Pipeline Price Index update as a FERC economist, under RM15-20-000. He holds a Bachelor of Science degree in economics, as well as a Master of Science degree in economics from the University of Wisconsin-Madison. He is also a CFA charterholder and a Certified Rate of Return Analyst. Mr. Crowley's resume is attached as Appendix 1.

3. Dr. McLeod is a Senior Economist. He has calibrated index caps in Alberta, British Columbia, Ontario, Massachusetts, and New Hampshire. He has assessed the properties of regulatory regimes more generally in Canada and the United States. He holds a PhD in economics from the University of Wisconsin-Madison, where he graduated with a focus in industrial organization and applied econometrics. Dr. McLeod's resume is attached is Appendix 2.

4. Mr. Corey Goodrich is a staff economist with CA Energy Consulting. He holds a Bachelor of Arts in economics from the University of Wisconsin – Eau Claire, and a Master of Arts in economics from the University of South Florida. His resume is attached as Appendix 3.

1.2 Purpose of the report

5. CA Energy Consulting has been asked by the Canadian Association of Petroleum Producers ("CAPP") to provide an independent evaluation of FERC's Notice of Proposed Rulemaking ("NOPR") regarding the Five-Year Review of the Oil Pipeline Index under Docket No. RM26-6-000. The Commission has proposed to use the Producer Price Index for Finished Goods ("PPI-FG") minus 1.42 percent as the index to adjust oil pipeline rates beginning July 1, 2026 through June 2031. The proposed indexing approach follows the Kahn Methodology, established under Docket No. RM93-11-000.[2]

6. The authors of this report are experts in the principles of economics as they relate to regulation. Our report relays recommendations for the design of a pipeline remuneration framework that results in just and reasonable rates for shippers and provides sufficient revenue for oil pipelines to recover their cost to serve, including the cost of capital. Our objective is to provide the Commission with an independent perspective drawing on well-established economic theory and on experience from our regulatory work in other industries that operate under similar price indexing frameworks.

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[2] *Revisions to Oil Pipeline Regulations Pursuant to the Energy Policy Act of 1992*, Order No. 561, 58 Fed. Reg. 53,130 (Oct. 14, 1993), *codified at* 18 C.F.R. pt. 340 *et al.*, FERC Stats. & Regs. ¶ 30,985 (1993).

1.3 Duty of Independence

7. CA Energy Consulting has undertaken the work contained in this report understanding that we have a duty to provide evidence to the Commission that is fair, objective, and non-partisan. This report reflects the independent analysis and opinions of the authors.

1.4 Organization of the Report

8. Following this introductory section, we present a summary of our positions. Section 3 provides historical context for the current proceeding, drawing upon industry data. Section 4 presents our comments on the issues listed by the Commission in its NOPR. Section 5 offers considerations for the price index approach going forward. Section 6 offers conclusions based on the evidence.

2. SUMMARY OF POSITIONS

9. Revenues have exceeded costs across the oil pipeline industry, particularly in the past decade. Companies have exhibited increasing realized returns on equity while the stated cost of equity appears stable. This trend differs from other regulated industries (gas pipelines, gas distributors, and electric utilities). The oil pipeline industry also exhibits a wider dispersion of returns relative to other industries.

10. In calculating the adjustment factor to calibrate the price index, we recommend using the middle 50 percent of companies. If the middle 80 percent is used, only the geometric average of unit cost growth is appropriate—not the arithmetic mean, as currently proposed in the NOPR. We also show that the middle 80 percent contains companies with apparently anomalous data. Given issues with resolving the 2020 cost of equity methodology change, and given evidence indicating a minimal industry-wide effect, we accept the Commission's proposal to use the total cost data as stated in the 2019 Page 700. We also agree with the Commission's use of the originally filed 2019 Form 6 data.

11. We recommend that FERC considers periodically rebasing rates according to cost-to-serve, and/or the adoption of guardrails like earnings sharing mechanisms ("ESMs") to ensure just and reasonable rates. This would align the design of the oil price index framework with other industries that operate under similar regulatory constructs.

3. HISTORICAL CONTEXT: 30+ YEARS OF THE OIL PRICE INDEX

3.1 Procedural History and Overview of Methodology

12. Pursuant to the Energy Policy Act of 1992, Congress mandated that FERC develop a "simplified and generally applicable ratemaking methodology for oil pipelines," along with a "final rule to streamline procedures…relating to oil pipeline rates in order to avoid unnecessary regulatory costs and delays."[3] In response, FERC issued Order No. 561, instituting a regulatory framework that employs an index to adjust, on an annual basis, the tariff rates of oil pipelines under its jurisdiction. The first iteration of the indexing methodology permitted rate changes in accordance with the annual percentage change in the Producer Price Index for Finished Goods ("PPI-FG"), as published by the Bureau of Labor Statistics, minus one percentage point.

13. The initial calibration of the oil price index was not intended to remain unchanged indefinitely. Order No. 561 stated:

> "To ensure further that the operation of the index meets the Commission's responsibility under the ICA to ensure that rates are just and reasonable, the Commission will undertake an examination of the relationship between the annual change in the PPI-FG, minus one percent, index and the actual cost changes experienced by the oil pipeline industry every five years, beginning in the year 2000."[4]

As such, since issuing Order No. 561, the Commission has undertaken six proceedings (2000, 2005, 2010, 2015, 2020) in which the price index has been recalibrated using oil pipeline cost data found in the FERC Form 6.

14. FERC's methodology, also known as "the Kahn Methodology," relies on six years of reported data on oil pipeline inputs (in the form of total costs) and output (in the form of barrel-miles). Since 2015, the Commission has relied upon Page 700 from the FERC Form 6 to obtain these data.

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[3] Energy Policy Act of 1992, Pub. L. No. 102-486, 106 Stat. 2776 (1992).

[4] *Revisions to Oil Pipeline Regulations Pursuant to the Energy Policy Act of 1992*, Order No. 561, 58 Fed. Reg. 53,130 (Oct. 14, 1993), *codified at* 18 C.F.R. pt. 340 *et al.*, FERC Stats. & Regs. ¶ 30,985 (1993).

15. The Kahn Methodology follows several steps to compute a price index adjustment factor which, over the ensuing five-year period, is applied to a five-year annualized growth rate in PPI-FG. In each five-year update, FERC has the ability to modify the calculation of the adjustment factor. In its NOPR this year, FERC proposed the following approach to calculating the adjustment factor:

    i. Companies from the Trans-Alaska Pipeline System and companies with incomplete data are removed from the sample.
    ii. For each remaining pipeline and each year over the most recent six years of data (2019-2024), total cost to serve is divided by barrel miles.
    iii. The geometric average growth rate of cost per barrel-mile is computed for each company over the six-year period.
    iv. After trimming away companies with growth rates outside of the middle 80 percent of the distribution, three measures of central tendency are calculated to obtain an industry cost per barrel-mile growth rate,: (1) the simple arithmetic average (+3.93%); (2) the weighted arithmetic average (+3.19%); and (3) the median (+2.44%).
    v. The geometric average annual change in PPI-FG (+4.61%) over the six-year period is subtracted from the average of the three industry measures found in step iv (+3.19%) to obtain the adjustment factor (-1.42%).

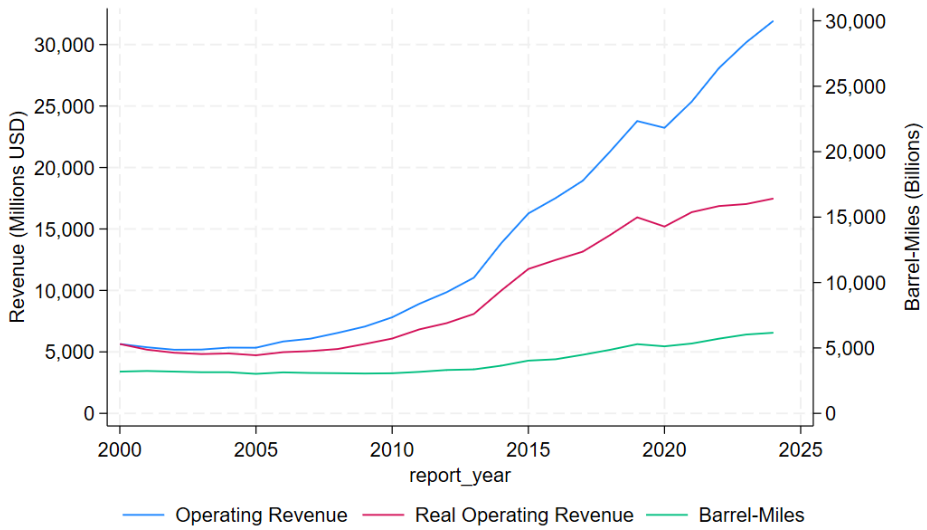
16. FERC allows oil pipeline rates to adjust by an annually updated measure of inflation (PPI-FG), plus the adjustment factor (i.e., the difference between the growth rate in cost per barrel-mile and PPI-FG over the most recent six-year period). If FERC maintains the adjustment factor suggested in the 2025 NOPR, oil pipelines will be granted the ability to raise rates each year by the most recent growth rate in PPI-FG minus 1.42 percent.

17. The assumption underlying the Kahn Methodology is that recent industry cost growth in excess of inflation will roughly persist prospectively—at least for the next five years. If the relationship does not persist between industry cost growth and inflation, as calculated under the Kahn Methodology described above, allowed changes in rates will not match the industry's cost growth. This could cause allowed revenue to diverge from costs over time.

3.2 Industry Statistics and Financial Outcomes[5]

18. In 2024, FERC had regulatory jurisdiction over 200 interstate pipelines carrying petroleum products. As shown in Figure 1, the FERC-regulated segment of this industry generated $31.9 billion in annual revenue in 2024, up from $5.6 billion in the year 2000, more than tripling in real terms.[6] Over this period, FERC-regulated oil pipeline output (measured in barrel-miles) approximately doubled.

Figure 1: Pipeline Revenue and Petroleum Products Barrel-Mile Growth (2000-2024)



19. Figure 2 illustrates that over the past 25 years, oil pipeline revenue has diverged from costs for companies in the middle 50 percent (a difference of approximately five billion dollars in 2024).[7] Accordingly, realized return on equity ("ROE") has increased, on average, growing from approximately 14 percent in the year 2001 to 25 percent in 2024 (Figure 3). The data indicate that realized ROE (depicted as blue dots) among pipelines has consistently exceeded the stated Cost of Stockholder's Equity found on line 6d of Page 700 (depicted as red triangles) since such data was made available in 2013.

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[5] We are happy to provide workpapers underlying all analysis contained in this report upon request. The analysis was conducted in R and Stata.

[6] According to the FERC Form 6, 2024.

[7] The middle 50 percent of companies were selected as follows. The sum of total cost and total revenue across all years was calculated, by company. A total revenue to total cost ratio for each company was calculated. The upper and lower 25 percentile companies by revenue-cost ratio were dropped. Note that this calculation includes, as part of total cost, the cost of equity reported on page 700.

Figure 2: Nominal Revenue and Costs for Oil Pipelines (2000-2024, Middle 50% of Companies)

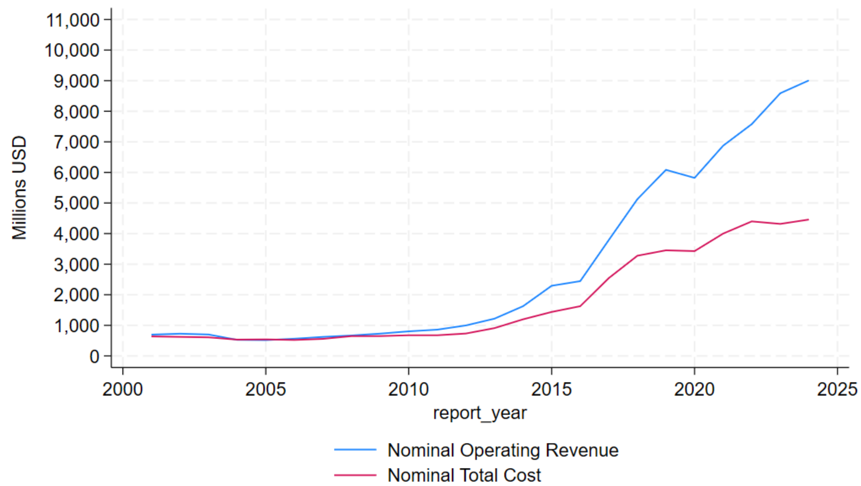
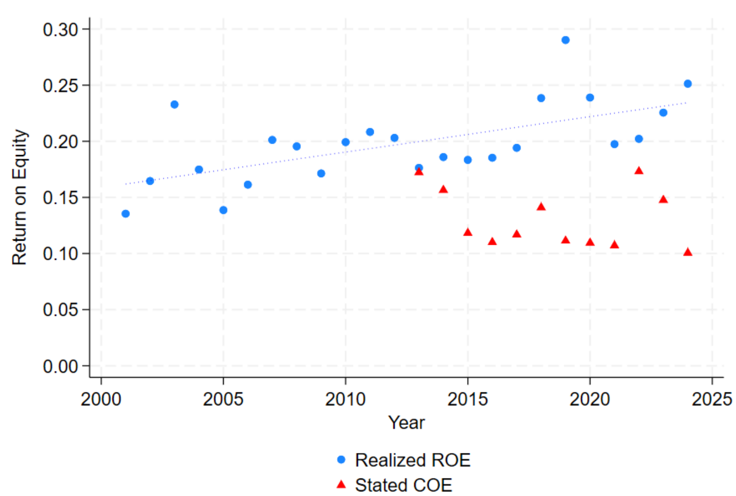


Figure 3: Realized ROE and Stated Cost of Shareholder's Equity[8] (2000-2024, Middle 50% of Companies)



[8] In the past, many oil pipelines operated under Master Limited Partnerships ("MLPs"). The ROE value of MLPs can be less meaningful for various reasons. This is why we present Figure 2, which compares costs and revenues directly. However, we still view the realized ROE ratio as useful for two reasons. First, we observe the middle 50 percent of companies, which would remove extreme outlier values that might have resulted from MLP distortions. Second, subsequent to the tax policy change, many oil pipelines converted from MLPs to C-Corporations. Therefore, since 2019, the ROE measure is generally meaningful (See: *Inquiry Regarding the Commission's Policy for Recovery of Income Tax Costs*, 162 FERC ¶ 61,227 (2018)).

20. The trend in ROE growth appears to be unique among regulated industries. Figure 4 compares ROE trends in three regulated energy industries. Panel one compares realized ROEs in the oil pipeline data with natural gas local distribution companies.[9] Panel two makes the same comparison with interstate natural gas pipelines.[10] Panel three makes the comparison with electric utilities.[11] The figure shows that the upward trend in oil pipeline realized ROE has moved in the opposite direction from the trend in other regulated industries.[12]

21. Companies in all three comparator industries depicted in Figure 4 must file periodic rate cases to adjust rates. During these rate cases, a company's allowed revenue is set equal to costs, meaning rates generally recover the company's cost to serve customers. As explained in Section 6, even companies that operate in jurisdictions in which rates adjust according to an index periodically "rebase" in order to reset rates according to the cost to serve.

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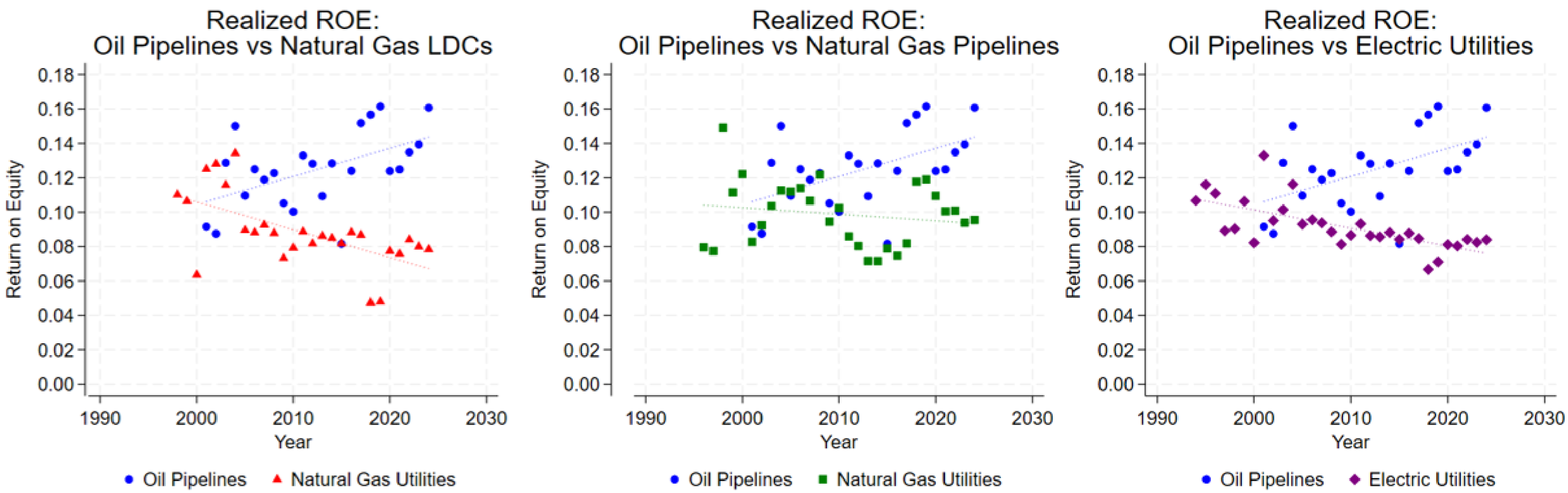
[9] Data from S&P Global *Capital IQ*.

[10] Data from the FERC Form 2.

[11] Data from the FERC Form 1.

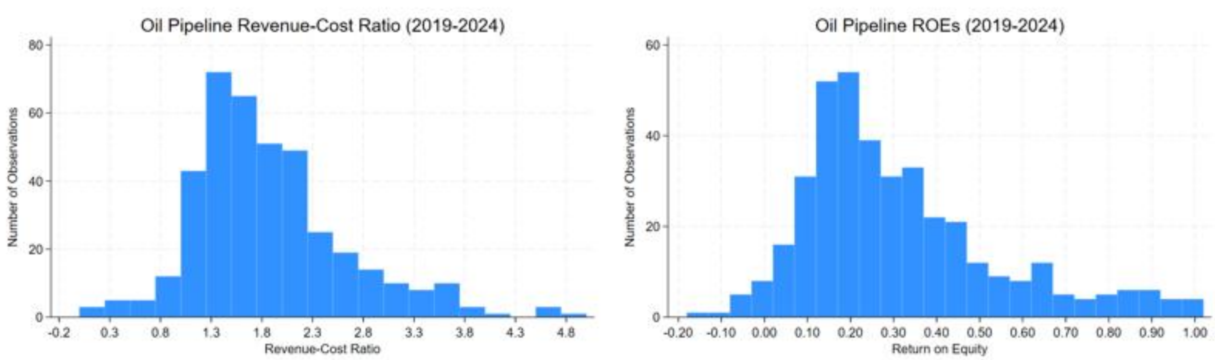
[12] We do not have total cost information including cost of capital for companies in other industries. In order to present a standardized comparison, we did not trim to the middle 50 percent of oil companies in Figure 4 (this is why the y-axis values of the blue dots differ between Figures 3 and 4).

Figure 4: Comparison of Oil Pipeline Realized ROE to Other Regulated Industries (2000-2024)



22. The middle 50 percent of oil pipeline companies have also exhibited a wide range of profitability, as measured by revenue-cost ratios and realized ROEs. The first panel of Figure 5 depicts annual revenue-cost ratios of oil pipeline companies, where each observation represents total revenues divided by total costs for one pipeline in a particular year during the period 2019 through 2024. The value of "total cost" used in this figure is drawn from Line 9 from Page 700 and thus includes the cost of capital, which means a revenue-cost ratio greater than one represents a company that has earned economic profit. The second panel in Figure 5 depicts the distribution of realized ROEs.[13] These histograms suggest that oil pipeline industry earnings vary substantially and exhibit positive skew across two separate measures of profitability.

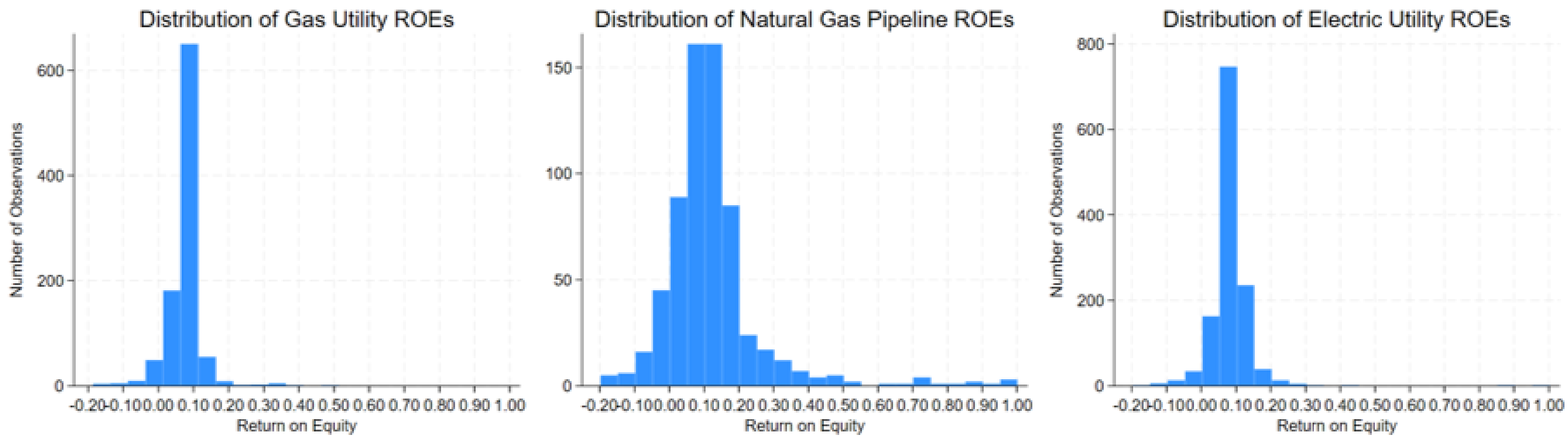
Figure 5: Histograms of Oil Pipeline Measures of Profit
(2019-2024, Middle 50% of Companies)



23. By comparison, ROE distributions differ between oil pipelines and companies in other regulated industries. Figure 6 contains three histograms illustrating the realized ROE values across three other regulated industries. Among both gas and electric utility industries, realized ROEs tend to cluster tightly around the median, with most utilities earning between 5 percent and 15 percent ROE in most years. The variance among natural gas pipelines is wider, but ROEs exceed 20 percent only in very few instances. Companies in these industries generally must file rate applications to adjust rates.

[13] As stated in Footnote 10, many pipelines converted from MLPs to C-Corps after 2018. Therefore, the 2019 through 2024 period provides a more meaningful representation of realized ROE distributions. To offer a robustness check, we present revenue-cost ratios alongside realized ROEs. The results are similar across both figures.

Figure 6: Distribution of Realized Return on Equity in Regulated Industries (2019-2024)



4. RECOMMENDATIONS FOR THE FIVE-YEAR PRICE INDEX UPDATE

4.1 Trimming the Data Set

24. The NOPR proposes a methodology for trimming the data that overestimates typical unit cost growth, leading to an upwardly biased index that allows for excessive rate growth. As explained in Section 3.1, FERC has estimated the central tendency of the distribution of unit cost growth across the period 2019 through 2024 using an average of the median, the simple arithmetic mean, and the weighted arithmetic mean over the middle 80 percent of cost growth observations (see paragraph 14, step iv). This approach is not appropriate because the distribution of the middle 80 percent of unit cost growth is lognormal (i.e. positively skewed), and thus the arithmetic mean will overstate the central tendency of the distribution.[14] The Commission acknowledged this point in 2015 when it noted "[t]o the extent that the middle 80 percent [of] data conforms to a lognormal distribution, outlying cost increases per barrel-mile will not be offset by similarly outlying cost decreases. Thus, using the middle 80 percent would skew the index upward based upon these outlying cost increases, which is contrary to the objective of the index to reflect normal industry-wide cost changes."[15] Furthermore, the Association of Oil Pipelines ("AOPL") has, in the past, acknowledged that the middle 80 percent of the unit cost growth has a lognormal distribution.[16]

25. We recommend adopting one of two approaches to mitigate the positive bias in the proposed index: (1) trim the data to the middle 50 percent so that the distribution of unit cost changes is less positively skewed; or (2) use the appropriate measure of central tendency when the distribution is lognormal, such as the geometric mean or the

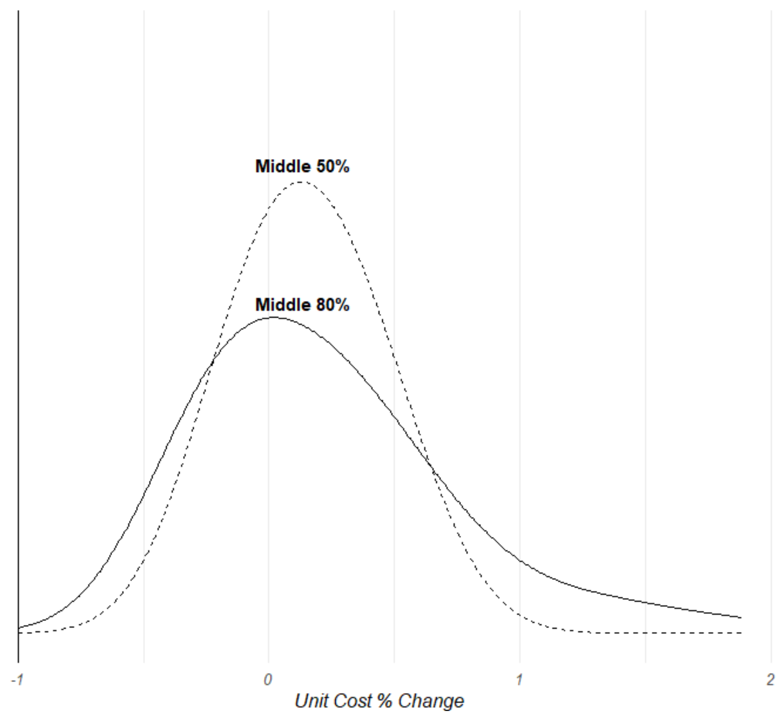
[14] Sachs, Lothar. 1984. *Applied Statistics: A Handbook of Techniques*. Translated by Zenon Reynarowych. 2nd ed. New York: Springer-Verlag, page 90.
[15] *Five-Year Review of the Oil Pipeline Index*, 153 FERC ¶ 61,312 (2015), page 32.
[16] Declaration of Ramsey D. Shehadeh, Ph.D. on Behalf of the Association of Oil Pipe Lines, August 17, 2020, page 24.

median.[17] In the following subsections, we will support both approaches and demonstrate empirically that they produce similar results.

4.1.1 Trimming to the Middle 50% Mitigates the Positive Skew

26. It is clear both visually and from formal statistical tests that the middle 50 percent of the distribution of unit cost changes is normally distributed while the middle 80 percent is lognormally distributed. Figure 7 plots the distribution of unit cost changes for the middle 50 percent and the middle 80 percent. The figure demonstrates that the middle 80 percent is positively skewed while the middle 50 percent is symmetric.

Figure 7: The Middle 50% and Middle 80% Distributions of Unit Cost Changes



27. We test this formally using the D'Agostino-Pearson test, which rejects normality in favor of a skewed distribution when the p-value is less than 0.05. The p-value for the middle 50 percent is 0.43, implying the data are consistent with a normal distribution. In

[17] Sachs, Lothar. 1984. *Applied Statistics: A Handbook of Techniques*. Translated by Zenon Reynarowych. 2nd ed. New York: Springer-Verlag, page 86 and page 90.

contrast, the p-value for the middle 80 percent is 0.000001, which convincingly demonstrates that the distribution is skewed.

28. The arithmetic mean is an appropriate measure of central tendency when data are normally distributed, but not when the data are lognormally distributed.[18] Therefore, FERC's use of an arithmetic mean to calculate an industry average growth rate in unit cost is an appropriate estimate of the central tendency only if the data are trimmed to the middle 50 percent. The arithmetic mean is not appropriate when the middle 80 percent of companies are used because, as we have shown, the data is positively skewed.

4.1.2 The Geometric Mean Is a Superior Measure of Expected Unit Cost Growth When the Data Are Positively Skewed

29. In its 2020 decision, the Commission stated that it is "appropriate to consider more data in measuring industry-wide cost changes rather than less."[19] If the preference is to use more data (i.e., the middle 80 percent rather than the middle 50 percent), this is still feasible. However, due to the lognormal shape of the distribution, as shown in Section 4.1.1, a geometric mean is the appropriate measure of industry cost growth.

30. When calculating the annual percentage change in unit cost *for each company* between 2019 and 2024, FERC correctly uses the geometric mean. However, FERC does not propose to use the geometric mean when calculating expected unit cost growth *across the industry*. It is well known that the central tendency of a lognormal distribution is the geometric mean, not the arithmetic mean, which will overestimate expected unit cost changes.[20] Thus, if the middle 80 percent is used to calculate expected unit cost growth, we recommend using the geometric mean as opposed to the average of the median, the simple arithmetic mean, and the weighted arithmetic mean.

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[18] See Table 1 on page 346 of Limpert, Eckhard, Werner A. Stahel, and Markus Abbt. "Log-normal distributions across the sciences: keys and clues: on the charms of statistics, and how mechanical models resembling gambling machines offer a link to a handy way to characterize log-normal distributions, which can provide deeper insight into variability and probability—normal or log-normal: that is the question." *BioScience* 51.5 (2001): 341-352.

[19] *Five-Year Review of the Oil Pipeline Index*, 173 FERC ¶ 61,245 (2020), page 19.

[20] When the distribution is lognormal, the geometric mean is equal to the median at the population level. Thus, the median is also an appropriate estimator. However, the geometric mean is more efficient (i.e. has lower variance). See page 345 of Limpert, Eckhard, Werner A. Stahel, and Markus Abbt, (2001).

4.1.3 Empirical Results

31. In this section, we present the empirical findings from our two recommended approaches and compare them to the adjustment factor of -1.42 percent contained in the NOPR. Our results are summarized in Table 1 below:

Table 1: Summary of Alternative Specifications

Trim Levels			
	2025		
	All	Middle 80%	Middle 50%
Median	2.44%	2.44%	2.44%
Simple Arithmetic Mean	12.13%	3.93%	2.75%
Weighted Arithmetic Mean	6.24%	3.19%	2.86%
Geometric Mean	2.30%	2.42%	2.35%
Composite	6.93%	3.19%	2.68%
PPI-FG	4.61%	4.61%	4.61%
Adjustment Factor (Composite - PPI-FG)	2.32%	-1.42%	-1.93%
Adjustment Factor (Geometric Mean - PPI-FG)	-2.31%	-2.19%	-2.26%

32. When the data are not trimmed, the arithmetic mean of unit cost growth is 12.13 percent, which ultimately leads to a positive 2.32 percent index that is far larger than the proposed -1.42 percent. Trimming to the middle 80 percent reduces this positive bias significantly, but the difference in measures of cost growth between the simple arithmetic mean (3.93 percent) and the geometric mean (2.42 percent) across the middle 80 percent of companies is still substantial because of the lognormal distribution.

33. It is only when the middle 50 percent of companies is considered that all of the measures of the central tendency tend to agree: the median, simple average, weighted average, and geometric mean are all within the range of 2.4 percent to 2.9 percent (found in the final column of Table 1). Indeed, when the middle 50 percent is considered, the adjustment factor calculated using only the geometric mean of unit cost changes is -2.26 percent, which is very close to the adjustment factor calculated with the composite measure of unit cost changes equal to -1.93 percent. The geometric average of the middle 80 percent yields an adjustment factor of -2.19 percent.

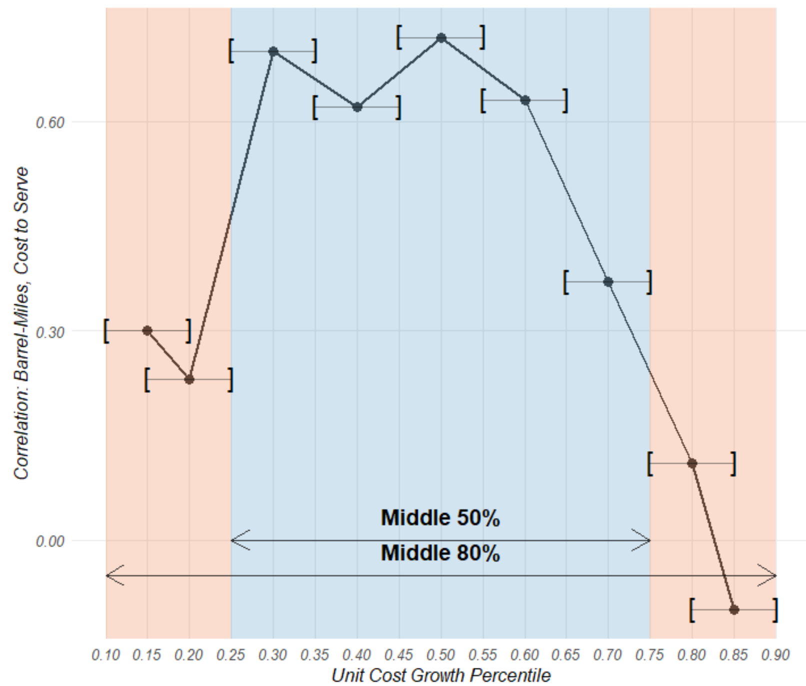
4.1.4 Data in the Incremental 30% May Not Reflect Typical Cost Changes

34. The Commission has stated that it finds it "appropriate to consider more data in measuring industry-wide cost changes rather than less."[21] We infer this to mean that while very large percentage changes in unit costs may not be "typical", the Commission believes such unit cost changes should nonetheless be included in the calculation of the index as they reflect the cost growth experienced by some oil pipelines. As we have shown, if the Commission aims to include more data, a geometric average of unit cost growth should be used.

35. Nevertheless, we believe the trimming of the incremental 30 percent of companies (from 80 percent to 50 percent) is further supported by their apparent anomalistic features, which we depict in Figure 8 below. The figure shows the correlation coefficient between total cost and barrel-miles for different unit cost growth percentiles from the years 2019 to 2024. Pipelines in the middle 50 percent exhibit reasonable cost and output trends. Specifically, for these pipelines, costs and output move together over time. This matches the general trend in the data: the correlation coefficient between cost and output for all pipelines is 0.85. This is expected: if output growth increases, cost growth would be expected to increase—at least on average. However, in the incremental 30 percent—those companies that would be included in the middle 80 percent but excluded from the middle 50 percent—the relationship between cost and output becomes weaker or negative. Between the 10th and 25th percentiles, correlations are 0.3 or lower. Between the 75th and 90th percentiles, pipelines exhibit very weak or negative correlations.

[21] *Five-Year Review of the Oil Pipeline Index*, 173 FERC ¶ 61,245 (2020), page 19.

Figure 8: Correlation Between Cost to Serve and Output by Unit Cost Growth Percentile



36. Thus, among some companies in the incremental 30 percent, output growth is *negatively* correlated with cost growth, which means total costs decline as output increases—a paradoxical result. These findings indicate that the data in the incremental 30 percent may be recorded with more measurement error or are associated with anomalies that are not representative of the industry.

37. In its 2020 decision, the Commission stated the following.

> [W]e emphasize that mere generalized concerns about outlying or unrepresentative data do not justify excluding the experiences of pipelines in the incremental 30% (i.e., those pipelines that are included in the middle 80% but not the middle 50%) from our review of industry cost changes. Unlike in prior index reviews, the record in this proceeding does not contain sufficient evidence that pipelines in the incremental 30% experienced anomalous cost changes that would skew the index. In the 2015 and 2010 Index Reviews, commenters presented detailed analyses demonstrating that the incremental 30% contained anomalous cost changes resulting from factors not broadly shared across the industry that would materially distort the index calculation. The record here does not contain a comparably detailed analysis of the incremental 30%."[22]

[22] *Five-Year Review of the Oil Pipeline Index*, 173 FERC ¶ 61,245 (2020), pages 20-21.

We argue that this analysis demonstrates that the incremental 30 percent exhibits trends between cost and output that are atypical or anomalous and should be excluded.

4.1.5 Summary of Recommendations Regarding Trimming

38. We have shown that unit cost growth in the middle 80 percent follows a lognormal distribution. We argue, like the Commission did in 2015,[23] that the arithmetic mean will lead one to overestimate typical unit cost growth. We have proposed trimming to the middle 50 percent – consistent with the methodology before 2020 – since the distribution of unit cost growth in the middle 50 percent is not skewed. Alternatively, if the middle 80 percent is used, the geometric mean is the appropriate measure of central tendency because the distribution of the data is lognormal. Both approaches produce similar results, as shown in Table 1 (-1.93 percent and -2.19 percent). Because either approach is reasonable, we recommend averaging the two results to obtain an adjustment factor of -2.06 percent.

39. We have responded to FERC's direction that the onus is on commenters to show that the incremental 30 percent contains anomalous data by noting that the incremental 30 percent contains cost and output trends that are economically unreasonable, summarized in Figure 8.

40. Importantly, we note that although our recommended adjustment factor of -2.06 percent most accurately reflects cost growth relative to PPI-FG during the study period, the index using this number is not expected to realign the divergence of revenues and costs demonstrated in Section 3.2. Level differences in revenues and costs will likely persist in the absence of explicit action.

4.2 Treatment of ROE in Data Set

41. The Kahn Methodology relies upon a total cost measure found on Page 700 of the FERC Form 6 that includes the cost of shareholder's equity. The cost of shareholders equity cannot be observed directly and must therefore be estimated. Until May 2020, the Commission relied solely upon the discounted cash flow ("DCF") model for estimating pipeline cost of equity ("COE"). Beginning in 2020, the Commission began estimating COE

[23] *Five-Year Review of the Oil Pipeline Index*, 153 FERC ¶ 61,312 (2015), page 32.

using an average of the DCF model and the capital asset pricing model ("CAPM").[24] This methodological change affects the calibration of the price index insofar as the CAPM and DCF model results differ, as differences in the methodology would affect each pipeline's total cost.

42. Because pipelines used only the DCF model during the first year of the data used in this proceeding (2019), the change in estimation methods could alter the calculated cost growth rate (and therefore the price index) even if no actual changes occurred with respect to the COE for each pipeline.

43. We acknowledge that the 2020 methodological change in calculating COE may result in a less accurate measure of total industry cost growth. In an effort to address this issue, we tested removing 2019 from the data, calculating cost growth from 2020-2024. This produced a much more negative adjustment factor and one that we do not believe is appropriate.[25] Alternatively, we considered calculating a company-specific average COE over the study period and recalculating each company's total cost in each year using this COE measure. However, this approach prevents each company's COE from adjusting to market conditions each year and could lead to inaccurate total costs. Furthermore, the Commission has observed that similar approaches lead to complexity inconsistent with the index's objective to provide a streamlined regulatory process.[26]

44. In reviewing the COE data, we found that the 2020 methodology change did not produce substantively different COE estimates compared to other years of data, on average across the industry. Given the issues associated with resolving the discrepancy described above and what appears to be a minimal effect of the methodological change on the COE results (on average), we accept the NOPR's proposal to use unadjusted data in this proceeding.

45. However, we note, as past experts have also noted,[27] use of the Page 700 COE and capital structure data also gives rise to other issues. In most regulated industries, rate

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[24] *Inquiry Regarding the Commission's Policy for Determining Return on Equity*, 171 FERC ¶ 61,173 (2020).

[25] The PPI-FG will not always precisely reflect oil pipeline input prices. However, the difference between the industry's "true" input price growth and PPI-FG, should be corrected over time as part of the new adjustment factor in each five-year update as PPI-FG is compared with industry cost growth. If a change is made to the number of years of cost data calibrating the adjustment factor, say by using five years rather than six years of data, the adjustment factor may not properly account for differences between PPI-FG and the industry's "true" input prices that occurred since the last update of the index.

[26] *Five-Year Review of the Oil Pipeline Index*, 173 FERC ¶ 61,245 (2020), page 39.

[27] See Affidavit of Elizabeth Crowe, on Behalf of the Liquid Shippers Group, Docket No. RM20-14-000, August 17, 2020.

cases provide a platform for stakeholders to evaluate a company's stated COE. However, oil pipelines do not file rate cases. Therefore, each pipeline company files annual cost information that has not been evaluated by any external expert. This means that the price index is constructed with data that have not been evaluated by third parties. Periodic rebasing of rates according to cost, as described in Section 5, would resolve this issue.

4.3 Resubmitted Form No. 6a

46. The NOPR presents a price index adjustment based on data from the FERC Form 6, as originally filed by each oil pipeline for the year 2019. The NOPR states that the revised Form 6 filings often provided limited explanations for changes in the data. The NOPR also states that, since not all pipelines filed revised documentation, the data used to calculate the price index adjustment could introduce bias. The Commission seeks comments on whether the calculation of the index level should incorporate the resubmitted Form 6 data.[28]

47. We agree with the use of the original data for the reasons provided by FERC in its NOPR.

[28] *Five-Year Review of the Oil Pipeline Index*, 193 FERC ¶ 61,145 (2025), page 11.

5. LOOKING AHEAD: CONSIDERATIONS FOR PRICE INDEX APPROACH

5.1 The Oil Pipeline Industry's Unique Regulatory Framework

48. Thirty-two years have passed since Order 561 established the price index approach to regulating interstate oil pipelines in the United States. In the first ten to fifteen years under the framework, revenues and costs remained roughly aligned, on average (see Figure 2). In the past decade, average revenues and costs have diverged, such that, on average, realized ROEs have substantially exceeded the stated COE found on the FERC Form 6, page 700 (see Figure 3). Measures of profitability have exhibited wide variation, with many companies experiencing ROE values above 50 percent over multiple years (see Figure 5). Oil pipelines under the existing price cap regulation framework have exhibited elevated ROE levels relative to other regulated industries, with average ROE trending upward for oil pipelines and down for natural gas pipelines, natural gas utilities, and electric utilities (see Figures 4 and 6).

49. We have not drawn conclusions regarding the cause of the observed upward drift in average earnings under the price index. One possible reason is that the adjustment factor calculated using the Kahn Methodology provides a backward-looking view of cost growth. If the industry continually exhibits productivity growth (i.e., %Δbarrel-miles > %Δtotal costs), the PPI-FG minus X formula will calculate rate adjustments that exceed prospective growth in industry average cost to serve. Another possible reason pertains to the inflation measure: actual industry input price growth may have consistently fallen below PPI-FG growth over the last 10-15 years.

50. Whatever the cause, we offer a few considerations, drawing upon lessons from price cap and revenue cap frameworks in other regulated industries. For many years, telecommunications companies operated under "I-X" price cap frameworks that adjusted rates according to inflation and a productivity offset calculated in a similar manner as the Kahn Methodology. Many regulated electricity and gas distribution utilities across various jurisdictions operate under such a framework.[29] The US Postal Service faces price cap

[29] For example, Alberta, Ontario, Massachusetts, Hawaii, Jamaica, and most European countries (see, "Regulatory Frameworks for European Energy Networks," Council of European Energy Regulators, February 3, 2025).

regulation for certain products.[30] Several lessons from price cap frameworks in other industries could inform and strengthen FERC's oil pipeline price index approach.

51. First, FERC's oil price index framework differs from index-based regulatory frameworks in other industries in that oil pipelines have had, for three decades, no requirement to reset rates according to cost. Most electricity and natural gas utilities operating under indexed regulation "rebase" through conventional rate cases. Periodic rebasing aligns with economic theory, as recognized by regulatory economist and professor John Kwoka:

> "[…] even the best-designed formula will inevitably diverge from underlying costs over time raising the question of whether, and how, the regulator should intervene. Failure to intervene may result in persistent, substantial profit windfalls or shortfalls that are unacceptable on both economic and political grounds."[31]

Professor Paul Joskow has also noted this point:

> "In practice, 'forever' price caps are not typically used in the regulation of distribution and transmission network price levels. Some form of cost-based regulation is used to set an initial value for p_o. The price cap mechanism then operates for a pre-established time period (for example, five years). At the end of this period a new starting price p_o and a new X factor are established after another cost-of-service and prudence or efficiency review of the firm's costs."[32] [Underline added.]

The oil pipeline framework is an outlier even among industries that did not integrate regular rebasing into their price cap framework. For example, price caps for telecommunications companies lasted only ten years, from 1990 to the year 2000.

52. Second, companies operating under indexed frameworks in the utility industry often operate with guardrails like earnings sharing mechanisms ("ESMs") or off-ramps. Under an ESM, each company shares with its customers a percentage of earnings in excess of a pre-determined level.[33] ESMs are considered a simple tool with low administrative costs that serve the purpose of protecting consumers without requiring a rate case. Under an off-ramp, rates could be reset according to costs if a certain earnings threshold were

[30] U.S. Postal Service Office of Inspector General (OIG), Risk Analysis Research Center. Revisiting the CPI-Only Price Cap Formula. Report No. RARC-WP-13-007. Washington, D.C.: U.S. Postal Service, April 12, 2013. https://www.uspsoig.gov/sites/default/files/reports/2023-01/rarc-wp-13-007_0.pdf.

[31] See Order No. 5763, *Order Adopting Final Rules for the System of Regulating Rates and Classes for Market Dominant Products*, Docket No. RM2017-3 (Postal Regulatory Commission, November 30, 2018).

[32] Joskow, Paul L. "Incentive Regulation and Its Implementation." New England Economic Review (January/February 2007): 119–145.

[33] For example, in Massachusetts, National Grid operates under an ESM that shares 75 percent of earnings above 100 basis points over the allowed ROE of 9.35 percent (see Decision under Massachusetts D.P.U. 23-150, September 30, 2024).

triggered. Most index-based regulatory frameworks in North America contain both of these guardrails, even though the amount of time between rate cases is generally only five years. Such tools are substantially more important if rebasing never occurs, as in the oil industry.

5.2 Recommended Updates for Consideration

53. The current Percentage Comparison Test does not resolve the issues we have presented. Under the Percentage Comparison Test, cost growth and rate growth may diverge by as much as 10percentage points in a given year before the Commission will contemplate a shipper protest.[34] Over time, these divergences could compound and result in rates that dramatically differ from costs.[35] Embedded differences in revenues and costs could persist for some companies even if an index does not allow for any rate growth over many years.

54. Therefore, we recommend considering at least one of the following: ESMs, off-ramps, or regular rate rebasing according to costs. ESMs would, with limited regulatory burden, protect shippers from paying rates that deviate from cost-to-serve above a certain threshold. The drawback of the ESM approach is that it does not provide intervening parties the ability to interrogate the evidence underlying the pipeline's reported costs. Periodic rate rebasing or off-ramps would resolve this problem by triggering a cost-of-service rate case where pipeline cost data could be evaluated, but would involve increased regulatory burden. To accommodate the number of oil pipelines under FERC's jurisdiction, rebasing schedules would need to be staggered.

55. Given the Commission's emphasis on minimizing regulatory burden through a streamlined process, the most realistic approach may be introducing a symmetric ESM that shares 50 percent of earnings above an established "deadband" over each company's stated COE. For example, suppose an oil pipeline had a stated COE of 10 percent and a symmetric ESM with a 300-basis point deadband. Suppose the pipeline earns a 15 percent ROE in the current year. Next year, the pipeline would refund to shippers 50 percent of dollar value of earnings between 13 and 15 percent ROE. Likewise, if the pipeline realized less a

[34] *Standard Applied to Complaints Against Oil Pipeline Index Rate Changes*, 181 FERC ¶ 61,057 (2022).

[35] As a simple example, suppose a pipeline sets rates such that revenue equals cost in Year 1. Suppose also that output growth does not change, so that rate growth equals revenue growth. Under the Percentage Comparison Test, cost growth could increase 1 percent annually and revenue growth could increase 11 percent annually, leading to revenues twice as high as costs in just eight years.

seven percent ROE in a given year, shippers would pay 50 percent of the shortfall through a rate increase the following year. This would protect both the pipeline and shippers from earnings fluctuations and deviations from the COE. In short, it would assure that rates remain just and reasonable across the industry without the regulatory burden of regular rate cases.

56. FERC's existing price index approach to regulating oil pipelines was designed within an economic climate with stable inflation and stable economic conditions.[36] Over the past five years, the United States has experienced elevated inflation rates. For example, the PPI-FG data on sheet "BLS" of FERC's Excel file indicates that the inflation measure grew approximately 9 percent between 2020 and 2021 and 14 percent between 2021 and 2022. To the extent this stability was foundational in the design of the index adjustment mechanism, we recommend considering design changes either in the form of rebasing or through the addition of an ESM or reopener to address the divergence of revenues and costs that have occurred in the past decade.

[36] "Under the economic climate that exists today, with little change in the index from year to year, it appears to the Commission that allowing changes in the index to occur annually will balance the interests of the industry with its customers in assuring some measure of rate stability." (FERC Order 561, 30,953.)

6. CONCLUSIONS

57. The Commission concluded in Order 561 that, "the Act of 1992 does not deregulate oil pipeline rates and that the Commission must continue to ensure that oil pipeline rates are just and reasonable."[37] As recognized in Section 3, the Five-Year Oil Price Index proceeding serves the purpose of examining the relationship between industry revenue and cost changes. In past proceedings, this has meant updating the PPI-FG adjustment factor with slight changes in the details of the Kahn Methodology (e.g., using the middle 50 percent vs. middle 80). Our evidence has commented on adjustments to the index and, in addition, analyzed pipeline revenues and costs directly.

58. Regarding FERC's request for comments on the three topic areas involving the calibration of the PPI-FG adjustment factor, we recommend the following:

    a. **Trimming the Data Set -** We recommend the use of the middle 50 percent of companies in the calculation of the PPI-FG adjustment factor. We have shown that the arithmetic mean, as FERC has proposed, is an acceptable measure of central tendency for the middle 50 percent of companies because the data is normally distributed. The arithmetic mean is not an acceptable measure of central tendency for the middle 80 percent of companies because this expanded set of cost growth data is lognormally distributed. Therefore, if the middle 80 percent is used, only the geometric average of unit cost growth is appropriate.

    b. **Treatment of ROE in the Data Set -** We understand that, in 2020, the Commission updated its methodology for estimating oil pipeline COE, leading to a methodological discrepancy between the first year of data in the analysis (2019) and subsequent data. We considered excluding 2019 from the calculation of the adjustment factor, among other potential solutions to this discrepancy, but we ultimately accept FERC's proposal to use the data as reported for all six years.

    c. **Resubmitted Form No. 6a –** We support FERC's usage of 2019 data as originally filed.

59. Applying our recommended methodological approach, we obtain an adjustment factor of -2.06 percent, to be applied to PPI-FG inflation over the period 2026-2030. We suggest a reasonable range would be -1.93 percent (the composite measure of central tendency

[37] FERC Order 561, 30,945.

of the middle 50 percent of companies) and -2.19 percent (the geometric average of the middle 80 percent of companies).

60. In our evidence, we have demonstrated that rates have not risen commensurately with changes in the cost of serving shippers. We have provided recommended changes to the calculation of the adjustment factor that will lead to allowed changes in rates that more accurately reflect changes in the cost-to-serve going forward (and on average). However, our recommended adjustment factor will not correct for embedded discrepancies in revenues and costs that have accumulated over time for certain companies. To handle this issue, more fundamental changes to the regulatory framework may be necessary.

61. We explained in Section 5 that the oil pipeline price index framework differs structurally from other regulated industries where rates adjust according to index values. Oil companies have not rebased rates according to cost since the 1990s, which is an abnormally long period of time in regulated industries. Most price and revenue cap frameworks in the utility industry require rebasing after five years, as cost and revenue growth can diverge over time even under well-designed indexes. This divergence can occur among individual companies even if revenues and costs remained aligned across the industry on average. We suggest consideration of rebasing oil pipeline rates on a staggered basis. A second-best alternative would be the introduction of ESMs that share earnings above a certain ROE threshold, or off-ramps, which would trigger a cost-based rate case above a certain ROE threshold.