B. Additional Detail on Financing Parameters

This appendix provides additional detail on the data presented in Section III.A.2.

B.1 Additional Detail on COD

The table below provides detail on each debt issuance shown in Table 37.

Appendix B Table 1: Additional Detail on Bond Yields of Representative IPP Companies, Dec. 16, 2023 – Mar. 15, 2024[1]

IPP	LT Issuer Rating as of 3/15/2024	CUSIP	Face Value ($/000)	Maturity	Yield to Matrity 12/18/2023	Yield to Matrity 3/15/2024	Simple average 12/18/23 - 3/15/24
Vistra	BB	92840VAE2	800,000	10	5.84	5.76	5.67
NRG	BB	629377CS9	1,100,000	11	6.36	6.36	6.32
NRG	BB	629377CR1	1,030,000	10	6.31	6.33	6.30
NRG	BB	629377CL4	500,000	10	5.88	5.86	5.82
NRG	BB	629377CH3	733,000	10	6.21	6.34	6.23
NRG	BB	629377CC4	1,250,000	10	6.55	6.61	6.57
AES	BBB-	00130HCG8	1,000,000	10	5.32	5.78	5.46
AES	BBB-	00130HCC7	700,000	10	5.48	5.67	5.50
Constellation	BBB+	210385AC4	600,000	10	5.20	5.49	5.31

Notes: S&P Capital IQ; Bloomberg Data License. Average YTM is computed as the arithmetic average using daily Yields to Maturity ("YTMs") between Dec. 16, 2023 and Mar. 15, 2024 (not tabulated, to ease exposition).

B.2 Additional Detail on COE

We estimate the COE for our sample of publicly traded IPPs using the Capital Asset Pricing Model (CAPM), a commonly-used framework for estimating expected returns to equity. The CAPM assumes that the expected rate of return demanded by equity investors—and, therefore, the COE for the enterprise—is equal to a risk-free rate of return plus an additional return commensurate to the risk undertaken by equity investors in funding the specific enterprise.

Specifically, the CAPM is computed as:

$$E(R_i) = r_f + \beta_i[E(R_m) - r_f] \quad \text{[B1]}$$

Where:

- $E(R_i)$ is the expected return of a stock security *i*;
- r_f is the risk-free rate;
- β_i is the sensitivity of the stock security *i* to the market;
- $E(R_m)$ is the expected return of the market.

The term $E(R_m) - r_f$ is referred to as the equity risk premium (ERP), and it measures the additional expected compensation required by equity investors in excess of the risk-free rate. The CAPM reflects an equilibrium or market-clearing price, such that the COE to developers equals the expected return to investors (*i.e.*, $E(R_i)$).

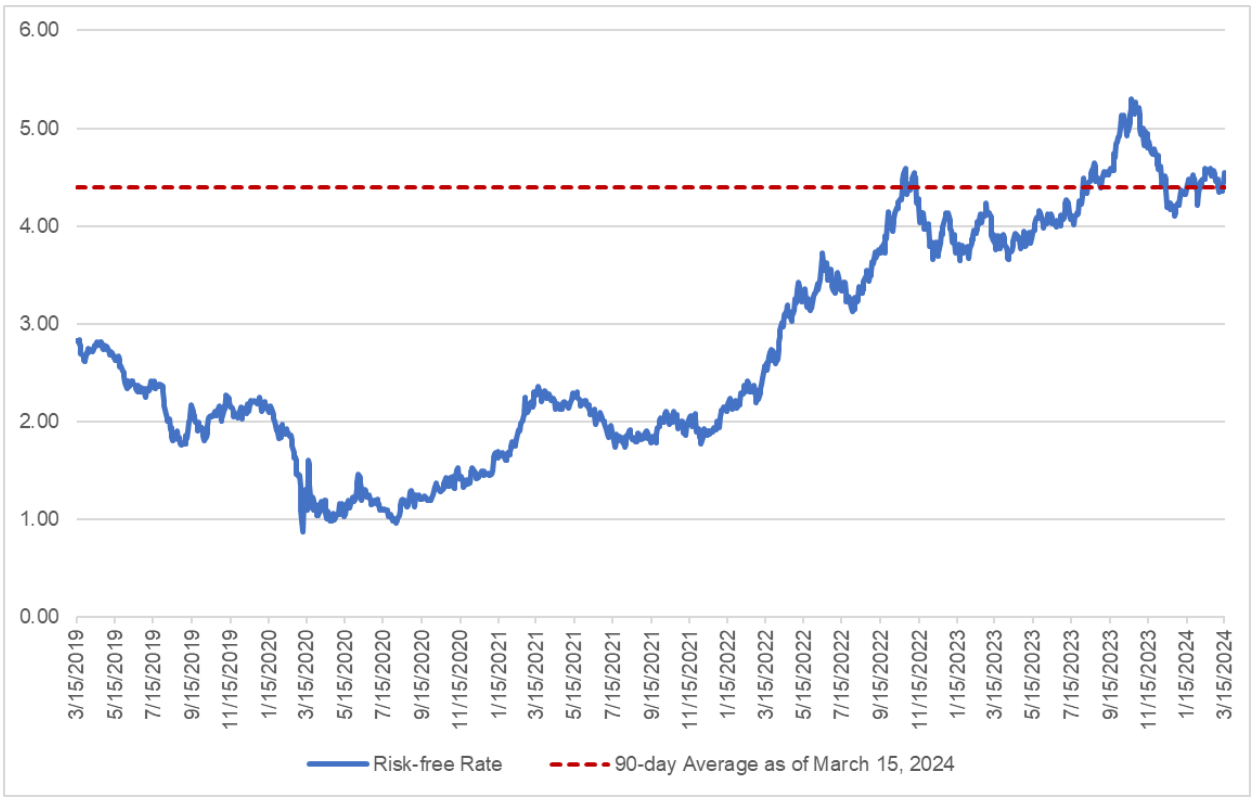
[1] First observed YTM rate date: December 18, 2023 (December 16, 2023 is a Saturday).

Below, we provide details on the estimation of each parameter in the above equation B1 required to estimate the COE.

a) Risk-free rate

The most commonly used proxy for risk-free rates are long-term governmental bonds, *i.e.*, treasury bonds with maturities equal to 10 years or longer. The economic life of a project for new power generation resources is typically around 20 years (prior to consideration of factors that may result in a shortened period). Consistent with this fact, AG used a 90-day average of the 20-year treasury rate (unique time series identifier: H15/H15/RIFLGFCY20_N.B) downloaded from the Federal Reserve Bank.[2] Over the 90 day period from December 16, 2023 – March 15, 2024, the rate for 20-year treasury bonds was 4.40%, which we select as the risk-free rate. The figure below reports both the 90-day average and the daily rate observed between March 2019 and March 2023. As the figure shows, the risk-free rate generally increased over the past five years.

Appendix B Figure 1: Risk-free rate – Historical 20 Year Treasury Constant Maturity Rate March 15, 2019 – March 15, 2020



Source: Federal Reserve Board.

b) Beta

Beta is the sensitivity of a company's stock return to the market's return. Beta is not directly observable and must therefore be estimated. We use the following common approach to estimate beta:

[2] Market yield on U.S. Treasury securities at 20-year constant maturity, quoted on investment basis, downloaded from https://www.federalreserve.gov/datadownload/Choose.aspx?rel=H15

1. *Step 1. Estimate levered betas*. We regress observed returns on the equity market's observed returns for industry companies (i.e., IPPs for purposes of this study). This regression yields an "equity" beta for each comparable company. This equity beta is referred to as the "levered" beta, as it is a function of both the operating risk of a company and its financial risk arising from the company's "leverage" – that is, ratio of debt to equity.

2. *Step 2. "Unlever" the betas*. To control for differences in each company's leverage, estimated levered betas are "unlevered" using data on each companies' capital structure. This operation yields "unlevered" or "asset" betas.[3] We estimate the average and upper bound of the unlevered betas from the sample of comparable companies. We evaluate the upper bound, as well as the average, value given that new project-level risk is generally higher than company-level risk for IPPs.

3. *Step 3. "Relever" the beta*. Lastly, we "relever" the resulting average and maximum unlevered beta using the target capital structure of the company being analyzed.[4] The "relevered" beta is the beta we use in the CAPM equation B1 above to estimate the COE.

c) Equity market return and ERP

The ERP is a measure of the additional remuneration that investors require for their invested capital, above the risk-free rate. We use two sources for ERP: (i) the Kroll cost of capital calculator, which provides estimates of ERP for discounted cash flow valuation purposes. Over the 90 day period from December 16, 2023 – March 15, 2024, Kroll recommends an ERP of 5.50%;[5] (ii) our internal computations using a Discounted Cash Flow (DCF) model, which yield a forward-looking ERP of 7.14%.[6]

***

We estimate the COE under five different scenarios. Each scenario reflects different assumptions used in deriving the parameters of the COE, including beta. In Scenario 1 and 3, we estimate beta using values reported by Bloomberg computed with monthly returns and a five-year time period. In Scenario 2 we use ValueLine betas, which are estimated using weekly returns and a five-year time period. In Scenario 4 and 5 we estimate beta using values reported by Bloomberg computed with monthly returns and a two-year time period. Scenario 1, 2, and 5 are estimated using data from Vistra, NRG, AES, while Scenario 3 is estimated only relying on Vistra and NRG, and Scenario 4 is estimated using the full Proxy Group (Vistra, NRG, AES, and Constellation). The table below reports the results for the computation of the COE, including the "delivering" and "relevering" of beta. The observed COE varies from 9.32% to 16.97%.

[3] To "unlever" the beta, we rely on the Hamada equation: $\beta_u = \beta_l / \left[1 + \frac{D}{E}\right]$, where β_u (β_l) is the unlevered (levered) beta and $\frac{D}{E}$ is the debt to equity ratio. See Hamada, Robert S., "The Effect of the Firm's Capital Structure on the Systematic Risk of Common Stocks," *Journal of Finance* (May 1972): 435–452.

[4] To "relever" the beta, we rely on the same Hamada equation, which rearranged yields a levered beta equal to: $\beta_l = \beta_u \times \left(1 + \frac{D}{E}\right)$.

[5] *See* https://www.kroll.com/en/insights/publications/cost-of-capital/recommended-us-equity-risk-premium-and-corresponding-risk-free-rates.

[6] Specifically, we compute the forward-looking ERP as the difference between expected market return and risk-free rate. To compute the expected market return, we apply a constant-growth DCF model for each dividend paying firm in the S&P 500 with expected three to five years growth rates between 0 and 20% as of March 15, 2024. For each stock, the expected return equals to the sum of (i) expected dividend (*i.e.,* the current year dividend times the expected earnings growth rate for each stock) divided by the stock price and (ii) the expected earnings growth rate for each stock. We compute the expected market return as the average returns for each security, weighted by their market capitalization (*i.e.,* the stock close price times the number of shares outstanding, retrieved through Refinitiv). We obtained the stock price (last closing) and (gross) dividend payments from Refinitiv and used expected earnings growth rates from the Institutional Brokers' Estimate System (IBES).

A maintained assumption of the scenarios above is that the representative IPPs are sufficiently far from insolvency and, thus, their debt is not risky. This assumption is commonly used when calculating the COE.[7] However, some companies in the Proxy Group are below investment grade. Given our sample of companies, we relax the assumption that the representative IPPs have negligible insolvency risk and, for each of the scenarios listed above, we estimate a beta using a modified estimation method to "unlever" and "relever" the betas in steps 2 and 3 described above. This modified estimation method accounts for the potential impact of default risk on the COE by including a "debt beta."[8] Using this alternative approach, we obtained a range for the COE from 9.21% to 15.80% across the five scenarios, fairly close to the range observed without including a "debt beta."

[7] *See* Koller, Tim, Mark Goedhart, and David Wessels, Valuation – Measuring and Managing the Value of Companies, Fifth Edition, *McKinsey & Company*, *Wiley*, 2010, Chapter 11.

[8] Specifically, assuming that the default risk of companies is non-negligible yields the following modified Hamada formula that we use to unlever beta: $\beta_u = \left[\beta_l + \frac{D}{E} \times \beta_d\right] / \left[1 + \frac{D}{E}\right]$, where β_u (β_l) is the unlevered (levered) beta, β_d is the beta associated to an IPP's debt, and $\frac{D}{E}$ is the debt to equity ratio. Similar to the equity beta, the debt beta is a measure of systematic risk that debt holders hold in the investment. We compute debt beta using the CAPM approach, but we replace COE with COD. To compute the company-specific beta debt, we use the same values for the risk-free and the ERPs used to compute the COE, the average bond yields of each company as described in the main body of this report, and solve the equation for beta.

Appendix B Table 2: Computation of COE under Different Scenario

IPP	Observed Levered Beta β_l	D/E	Unlevered Beta β_u	Risk-free Rate	Target D/E	"Relevered" Levered Beta β_l	ERP	COE using 5.50% ERP	COE using 7.14% ERP
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Scenario 1									
Vistra	1.04	0.81	0.57						
NRG	1.10	0.89	0.58						
AES	1.05	2.05	0.35						
Average β_u			0.50	4.40%	1.22	1.11	5.50 or 7.14%	**10.51%**	**12.33%**
Upper bound β_u			0.58	4.40%	1.22	1.29	5.50 or 7.14%	**11.49%**	**13.60%**
Scenario 2									
Vistra	1.10	0.81	0.61						
NRG	1.10	0.89	0.58						
AES	1.20	2.05	0.39						
Average β_u			0.53	4.40%	1.22	1.17	5.50 or 7.14%	**10.84%**	**12.76%**
Upper bound β_u			0.61	4.40%	1.22	1.35	5.50 or 7.14%	**11.81%**	**14.03%**
Scenario 3									
Vistra	1.04	0.81	0.57						
NRG	1.10	0.89	0.58						
Average β_u			0.58	4.40%	1.22	1.28	5.50 or 7.14%	**11.45%**	**13.55%**
Upper bound β_u			0.58	4.40%	1.22	1.29	5.50 or 7.14%	**11.49%**	**13.60%**
Scenario 4									
Vistra	0.60	0.81	0.33						
NRG	0.91	0.89	0.48						
AES	1.20	2.05	0.39						
Constellation	0.99	0.26	0.79						
Average β_u			0.50	4.40%	1.22	1.11	5.50 or 7.14%	**10.51%**	**12.33%**
Upper bound β_u			0.79	4.40%	1.22	1.76	5.50 or 7.14%	**14.08%**	**16.97%**
Scenario 5									
Vistra	0.60	0.81	0.33						
NRG	0.91	0.89	0.48						
AES	1.20	2.05	0.39						
Average β_u			0.40	4.40%	1.22	0.89	5.50 or 7.14%	**9.32%**	**10.78%**
Upper bound β_u			0.48	4.40%	1.22	1.07	5.50 or 7.14%	**10.29%**	**12.05%**

Notes:
[1] Levered beta obtaind using the specifications described in each Scenario (Scenario 1 and 3: values reported by Bloomberg computed with monthly returns and a five-year time period; Scenario 2: ValueLine betas estimated using weekly returns and a five-year time period; Scenario 4 and 5: values reported by Bloomberg computed with monthly returns and a two-year time period).
[2] Observed debt to equity structure as of Q4 2023. Equity is the market value of equity at year end.
[3] Unevered beta obtained as [1] / (1+[2]).
[4] 90-day average 20-year treasury rate from December 16, 2023 to March 15, 2024 for the market yield on U.S. Treasury securities at 20-year, constant maturity, taken from the Federal Reserve Board.
[5] Recommended debt-to-equity ratio.
[6] Relevered Beta obtained as [3]×(1+[5])
[7] ERP from either Kroll cost of capital calculator or DCF model computed by AG.
[8] and [9] Obtained as [4]+[6]×[7].

B.3 COE, COD, Debt-to-Equity, and ATWACC Estimates from Prior Net CONE Studies

The table below presents COE, COD, capital structure (D/(D+E)), and ATWACC estimates from prior CONE studies for ISO-NE, NYISO, and PJM.

Appendix B Table 3: COE, COD, Capital Structure, and ATWACC Estimates from Prior Net CONE Studies[9]

Period	RTO	COE	COD	D/(D+E)	ATWACC
Past Studies					
2014	ISO-NE	13.8%	7.0%	0.60	8.0%
2014	PJM	13.8%	7.0%	0.60	8.0%
2016 (2017-2021 DCR)	NYISO	13.4%	7.75%	0.55	8.6% (NY State) 8.36% (NYC)
2016	ISO-NE	13.4%	7.75%	0.60	8.1%
2018	PJM	12.8%	6.5%	0.65	7.5%
Most Recent Studies (by RTO)					
2020 (2021-2025 DCR)	NYISO	13.0%	6.7%	0.55	8.52% (NY State) 8.20% (NYC)
2022 (April)	PJM	13.6%	4.7%	0.55	8.0%
2022 (September)	PJM	14.1%	6.3%	0.55	8.85%
2023	ISO-NE	13.8%	6.85%	0.55	8.96%

[9] *See* AG 2023 ATWACC of New Entry for ISO-NE Forward Capacity Market Study; Brattle September 2022 PJM Study; Brattle April 2022 PJM Study; AG 2020 NYISO Study; Concentric 2020 ISO-NE Study; The Brattle Group and Sargent & Lundy, "PJM Cost of New Entry Combustion Turbines and Combined-Cycle Plants with June 1, 2022 Online Date," April 19, 2018; Concentric Energy Advisors, "ISO-NE CONE and ORTP Analysis," December 2, 2016; Analysis Group, Inc. and Lummus Consultants International, Inc., "Study to Establish New York Electricity Market ICAP Demand Curve Parameters," September 13, 2016; The Brattle Group and Sargent & Lundy, "Cost of New Entry Estimate for Combustion Turbine and Combined Cycle Plants in PJM With June 1, 2018 Online Date," May 15, 2014; Testimony of Dr. Samuel A. Newell and Mr. Christopher D. Ungate on Behalf of ISO New England Inc. Regarding the Net Cost of New Entry for the Forward Capacity Market Demand Curve, April 1, 2014.