LEVITAN & ASSOCIATES, INC.

To: Jennifer Manierre, Luke Forster, Brian Newton
From: S.G. Parker, J.T. Slovin, R.L. Levitan
Re: Recommended WACCs and Discount Rates for the 2024 Tax Model
Date: September 22, 2023

Privileged & Confidential
Attorney / Client Work Product

Introduction

LAI is supporting NYSERDA and the NYS Department of Tax & Finance (T&F) in updating the assumptions to be used in the 2024 Solar and Wind Tax Model for solar and wind projects over one megawatt (MW). The scope of our update includes forecasted electricity prices, operating and maintenance expenses, residential and commercial retail electric rates, and the weighted average cost of capital (WACC). We are also converting the Tax Model from nominal cash flows and discounts rates (which include inflation) to real values (which exclude inflation). This memo specifically addresses WACC and its underlying assumptions. The pre-tax WACC is used as the Tax Model's discount rate to determine appraisal values for renewable energy projects. To avoid confusion, we identify WACC values and underlying financial assumptions as pre-tax or after-tax values. The financial analyses in this memo use nominal values. At the end of this memo, we convert the recommended nominal WACC values to real WACC values.[1]

Consistent with guidance received from T&F, LAI utilized renewable energy industry and financial data as of the July 1, 2023 cutoff date. Any data, reports, or developments affecting WACC calculations after this cutoff date were deemed irrelevant for purposes of this update. In updating the WACC assumptions documented in this memo, LAI exercised professional judgment where appropriate.

April 2022 Tax Model WACC Values

The WACC values used in the April 2022 Tax Model, shown in Table 1 below, are from the T&F website page, Appraisal methodology for solar and wind energy projects.[2]

[1] Utilizing real (also referred to as constant) dollar cash flows and discounts rates in the Tax Model may not result in identical appraisal values relative to a nominal dollar convention despite the theoretical basis for equivalent outcomes.

[2] "Appraisal methodology for solar and wind energy projects," New York State Department of Taxation and Finance; April 29, 2022 (https://www.tax.ny.gov/research/property/renewable-appraisal.htm)

Table 1. April 2022 Tax Model Pre-Tax WACC Values (nominal)

Large-scale solar (5 MW and larger)	Weighting	Cost	Weighted Cost
Weighted cost of debt (pre-tax)	51.9%	4.00%	2.08%
Weighted cost of equity (pre-tax)	48.1%	10.58%	5.09%
Base discount rate per WACC (pre-tax)			7.16%

VDER Solar (1-5 MW)	Weighting	Cost	Weighted Cost
Weighted cost of debt (pre-tax)	30.0%	4.50%	1.35%
Weighted cost of equity (pre-tax)	70.0%	9.50%	6.65%
Base discount rate per WACC (pre-tax)			8.00%

Wind (1 MW and larger)	Weighting	Cost	Weighted Cost
Weighted cost of debt (pre-tax)	31.6%	4.00%	1.26%
Weighted cost of equity (pre-tax)	68.4%	12.28%	8.40%
Base discount rate per WACC (pre-tax)			9.66%

The T&F website provided the following explanation for these WACC values and underlying financial assumptions:

> The discount rates below are based on the economic principle of weighted average cost of capital (WACC). The cost of capital is a forward-looking measure comprised of the time value of money and investor risk. It takes into account the expected rate of return that market participants require to attract funds to a particular investment. The cost of capital is synonymous with the discount rate that is typically used in renewable energy discounted cash flow analysis. The discount rates are separated into three distinct categories based on investment risk associated with system type and size.
>
> The Tax Department consulted with the following entities as it developed the appraisal model:
> - NYSERDA
> - NYSAA
> - Alliance for Clean Energy
> - New York State Economic Development Council
> - renewable energy developers
>
> Following a 60-day comment period, the Tax Department reviewed all of the comments received and adjusted the model appropriately.

NREL ATB and Tax Model Project Definitions

In order to check the reasonableness of the April 2022 Tax Model's WACC values and to recommend updated WACC values for the 2024 Tax Model, LAI utilized financial data from the National Renewable

Energy Laboratory (NREL) Annual Technology Baseline (ATB).[3] According to the NREL website, the ATB "provides a consistent set of technology cost and performance data for energy analysis … each year NREL provides a robust set of modeling input assumptions for energy technologies (the Annual Technology Baseline) and a diverse set of potential electricity generation futures or modeling scenarios." LAI believes the ATB data to be reliable and appropriate for use in the Tax Model.

NREL's ATB includes a comprehensive set of financial parameters for renewable energy projects that are the result of extensive confidential surveys and discussions with renewable energy developers and financiers. NREL provides ATB financial data for multiple modeling scenarios. LAI utilized the ATB data for the scenarios with (i) the Moderate level of technology innovation (widespread adoption of today's cutting-edge technology, expected level of innovation, and current levels of public and private R&D) and (ii) the Market + Policies case (current tax credits and interest rates). We consider these to be the most appropriate scenarios for the Tax Model.

The April 2022 Tax Model includes WACC values for each of three NYSERDA project types: Tier 1 solar (> 5 MW), VDER solar (1-5 MW), and Tier 1 land-based wind (>1 MW). The 2024 Tax Model will also include community net energy metering solar projects as an additional project type, which are identical to VDER solar projects in all aspects except for receiving significantly higher revenues in the form of utility bill credits. There are several hundred community net energy metering projects, but these revenues are no longer offered to new projects.

NREL's renewable project categories do not match exactly with those used in the Tax Model, but the category descriptions in Table 2 below indicate our understanding of the correspondence between the project categories in the April 2022 Tax Model and NREL ATB.[4]

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[3] "Annual Technology Baseline," National Renewable Energy Laboratory," https://atb.nrel.gov/

[4] NREL Renewable Project Definitions:

> Utility-Scale PV: "We focus on larger systems for the 2020 and 2021 values to better align with recent trends in utility-scale installations. (EIA, 2021) reported 155 PV installations (greater than 5 MWAC in capacity) totaling 9.5 GWAC were placed in service in 2020 in the United States."
>
> Commercial PV: "For the 2022 ATB, commercial PV systems are modeled for a 200-kWDC, flat-roof-mounted system with a 1.15 DC-to-AC ratio, or inverter loading ratio (ILR) (Ramasamy et al., 2021)."
>
> Land-Based Wind: "The representative technology for land-based wind in the Base Year consists of a 2.8-MW nameplate rating, a rotor diameter of 124.9 m, and a hub height of 90.2 m (Wiser and Bolinger, 2021)"

Table 2. Comparison of April 2022 Tax Model and NREL Renewable Project Categories

2022 Tax Model Renewable Project Category	NREL Renewable Project Category
Large-scale Solar (5 MW and larger)	Utility-Scale PV (greater than 5 MW)
VDER Solar (1-5 MW)	Commercial-Scale PV (200 kW DC systems)
Land-based Wind (1 MW and larger)	Land-Based Wind (2.8 MW units)

NYSERDA has provided guidance that it is more accurate to map VDER and community net energy metering projects to the Utility-Scale PV NREL project category instead of the Commercial-Scale PV NREL project category. This is because VDER and community net energy metering projects are rack-mount (as is NREL's utility-scale PV project category) and much larger than the 200 kW DC flat-roof-mount Commercial-Scale PV NREL project category.[5] Therefore, we have revised the mapping of NYSERDA project types, as shown in Table 3 below, to propose that the 2024 Tax Model include two WACC values: one for all solar project types and one for land-based wind projects.[6]

Table 3. Comparison of Proposed 2024 Tax Model and NREL Renewable Project Categories

2024 Tax Model Renewable Project Category	NREL Renewable Project Category
Solar (1 MW and larger)	Utility-Scale PV (greater than 5 MW)
Land-based Wind (1 MW and larger)	Land-Based Wind (2.8 MW units)

2021 and 2023 NREL ATB WACC Values

NREL's 2021 ATB data is relevant because it was contemporaneous with the April 2022 Tax Model. The most recent NREL data is contained in the 2023 ATB that was published prior to the July 1, 2023 cutoff date and is thus applicable to the 2024 Tax Model. Both sets of NREL ATB WACC values for the relevant project categories are summarized in Table 4 below.[7,8]

[5] Using NREL's DC-to-AC ratio of 1.15, 200 kW DC is equivalent to 174 kW AC.

[6] The single solar project category now includes all three solar project types used in the Tax Model: community net energy metering solar (1-5 MW), VDER solar (1-5 MW), and Tier 1 solar (>5 MW).

[7] 2021 Corrected Annual Technology Baseline Workbook from 8-12-2021.xlsm from "2021 Annual Technology Baseline (ATB) Cost and Performance Data for Electricity Generation Technologies," National Renewable Energy Laboratory; July 9, 2021 (https://data.openei.org/submissions/4129)

[8] 2023_v1_Workbook_06_28_23.xlsx from "2023 Annual Technology Baseline (ATB) Cost and Performance Data for Electricity Generation Technologies," National Renewable Energy Laboratory; June 28, 2023 (https://data.openei.org/submissions/5865)

Table 4. 2021 and 2023 NREL ATB WACC Assumptions for Renewable Energy Projects (nominal)

Project Category	2021 NREL ATB			2023 NREL ATB		
Utility-Scale PV	**Weight**	**Cost**	**Weighted Cost (pre-tax)**	**Weight**	**Cost**	**Weighted Cost (pre-tax)**
Debt (pre-tax)	51.8%	4.0%	2.1%	51.1%	7.0%	3.6%
Equity (after-tax)	48.2%	7.8%	5.1%	48.9%	8.8%	5.8%
WACC (pre-tax)			7.1%			9.4%

Land-Based Wind	**Weight**	**Cost**	**Weighted Cost (pre-tax)**	**Weight**	**Cost**	**Weighted Cost (pre-tax)**
Debt (pre-tax)	31.6%	4.0%	1.3%	47.7%	7.0%	3.3%
Equity (after-tax)	68.4%	9.0%	8.3%	52.3%	10.0%	7.0%
WACC (pre-tax)			9.5%			10.4%

Inflation Rate	2.5%		2.5%

NREL's debt costs are provided on a pre-tax basis; equity costs and WACCs are provided on an after-tax basis. To enable a consistent comparison with the April 2022 and 2024 Tax Models, LAI calculated NREL's WACCs on a pre-tax basis as shown in Table 4.[9] The NREL ATB assumes a combined effective federal and state tax rate of 25.7%.[10] NREL documented its original derivation of financial parameters, i.e., WACC components and weights, in a 2020 report and has updated these values annually in subsequent iterations of the ATB.[11] The assumptions underlying NREL's latest WACC values are laid out in a section of the 2023 ATB website, Methods for Developing Financial Assumptions.[12]

[9] Pre-tax WACC = (After-tax Cost of Equity / (1 – Combined Effective Corporate Tax Rate) * Equity Weight) + (Pre-tax Cost of Debt * Debt Weight)

After-tax WACC = (After-tax Cost of Equity * Equity Weight) + (Pre-tax Cost of Debt * (1 – Combined Effective Corporate Tax Rate) * Debt Weight)

[10] 25.7% is commonly used to represent the combined effective state and federal income tax rate in the United States, including an average of state corporate income taxes. This value is not specific to NYS.

[11] "Current and Future Costs of Renewable Energy Project Finance Across Technologies," National Renewable Energy Laboratory; July 2020 (https://www.nrel.gov/docs/fy20osti/76881.pdf)

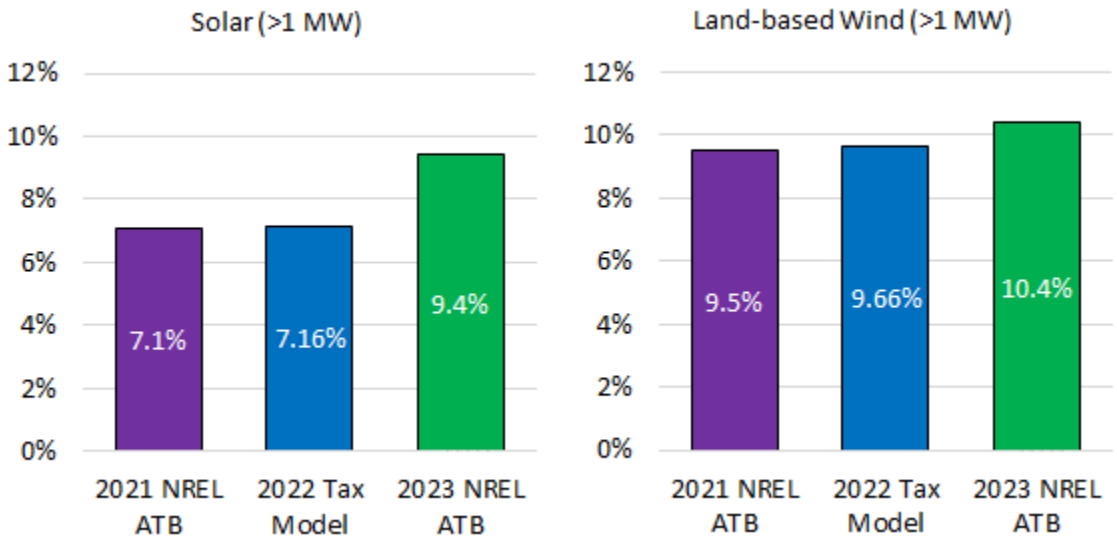
[12] "Financial Cases & Methods," National Renewable Energy Laboratory; 2023 (https://atb.nrel.gov/electricity/2023/financial_cases_&_methods)

The key differences between NREL's 2021 and 2023 ATB values are (i) the pre-tax cost of debt rose by 3.0% and (ii) the after-tax cost of equity rose by 1.0%. The debt and equity weights changed very little for solar, but changed significantly for land-based wind. The underlying 2.5% inflation rate did not change.

Comparison of WACCs

Figure 1 below displays the WACC values in the April 2022 Tax Model and the contemporaneous 2021 NREL ATB, as well as the increase in WACC values from the 2021 ATB to the 2023 ATB. The minor differences between the April 2022 Tax Model and 2021 NREL ATB WACCs are explained by the fact that the former uses a 26.73% NYS-specific combined effective tax rate, while the latter uses a generic 25.7% rate. If calculated using a consistent combined effective tax rate, the April 2022 Tax Model and 2021 NREL ATB WACCs would be identical. To better understand the changes in the NREL WACC values, we checked the underlying long-term inflation assumptions and then evaluated the individual WACC components of debt cost, equity cost, and capital structure weights.

Figure 1. Comparison of Pre-tax WACCs by Technology and Source (nominal)



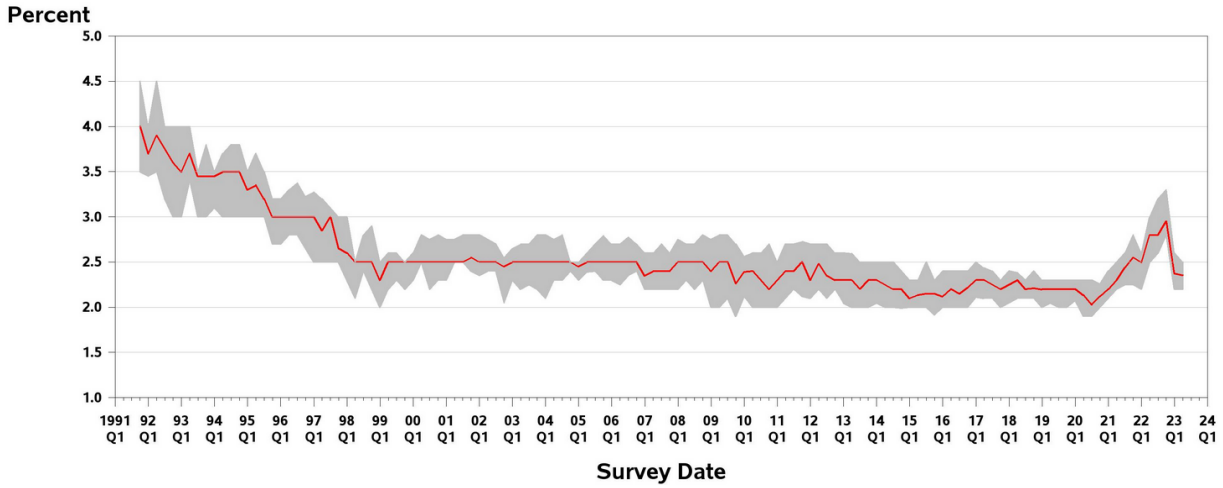
Inflation Rate

The April 2022 Tax Model assumes an inflation rate of 2.00% for OpEx and other model functions. Some model inputs (such as the nominal energy price forecast) are based on their own inflation assumptions. Long-term inflation is a key driver of nominal debt and equity costs and thus WACC discount rates. LAI checked the inflation rates underlying the financial data to see if they require updating in the Tax Model. Since the April 2022 Tax Model was published, short-term inflation skyrocketed, but has moderated in the past few months as the Federal Reserve steadily raised the overnight bank borrowing rate beginning on

March 18, 2022.[13] While annual inflation as of June 2023 was higher than the Fed's target of 2%, such short-term inflation rates are not applicable to setting debt and equity costs during a project's operating period. Instead, the relevant inflation rate for those WACC components in the 2024 Tax Model is the long-term inflation forecast as of June 30, 2023.[14] Uncertainty in short-term inflation rates are therefore irrelevant for purposes of setting WACC in the present context.

The U.S. Federal Reserve Bank of Philadelphia publishes a quarterly Survey of Professional Forecasters that LAI believes to be among the most reliable forecasts of inflation and other macroeconomic indicators.[15] As of Q2 2023, the long-term (10-year) consensus forecast for Headline Consumer Price Index (CPI) was 2.36% and for Headline Personal Consumer Expenditures (PCE) was 2.20%.[16] As illustrated in Figure 2 below, the outlook for long-term inflation peaked in Q4 2022 and declined considerably in Q1 and Q2 2023.

Figure 2. Federal Reserve of Philadelphia: Long-Term CPI Consensus Long-Term Inflation Forecasts



[13] According to the US Bureau of Labor Statistics, "Over the year ended June 2023, consumer prices increased 3.0 percent, after increasing 4.0 percent over the year ended in May 2023. The June 2023 increase was the smallest 12-month increase since March 2021. A year earlier, in June 2022, the 12-month increase in overall prices was 9.1 percent, and had been 7.0 percent or higher in the preceding 6 months."

[14] NYSERDA's incorporation of a short-term inflation adjustment mechanism for Tier 1 RES awards and offshore wind is an entirely different matter than the long-term inflation values used for WACC.

[15] "Second Quarter 2023 Survey of Professional Forecasters," U.S. Federal Reserve Bank of Philadelphia; May 12, 2023 (https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/spf-q2-2023)

[16] The CPI is published by the US Bureau of Labor Statistics as the weighted average of prices for a basket of goods and services based on household surveys. The PCE is used by the Federal Reserve to measure inflation and includes durable and non-durable goods as well as services based on GDP and supplier data. Headline inflation includes all goods and services while core inflation excludes food and fuel, which tend to be volatile.

To guide the decision of whether to adjust the WACC values for inflation, we note three factors. First, these are headline inflation forecasts that include volatile food and energy prices. Core inflation excludes those elements, is more stable, and is often lower. While a long-term forecast of core inflation may therefore be more appropriate for use in the Tax Model, it is not available from the Federal Reserve and we are not aware of any other reliable sources that provide a long-term domestic core inflation forecast. Second, the high near-term inflation outlook in Q2 2023 is tempered by the long-term outlook of relatively low inflation expectations for the remaining years.[17] Third, inflation may matter less for WACC values than for CapEx. According to the Norton Rose March 2022 Project Finance Newsletter, when asked if high inflation was affecting the tax equity market (a significant source of equity financing for renewable energy projects), one experienced financier stated, "Inflation may have more of an effect on project costs than on financing costs."[18]

Simply put, short-term inflation has been high, but the long-term outlook is for inflation to moderate fairly quickly in response to the US Federal Reserve's overnight bank borrowing rate increases. Therefore, we believe NREL's 2.5% inflation assumption in the 2023 ATB is in line with the Q2 2023 long-term consensus inflation forecasts of 2.36% for Headline CPI and 2.20% for Headline PCE, and is reasonable. Because of this, no inflation adjustment to the NREL WACC values is warranted. For consistency with NREL's ATB and the consensus long-term inflation forecast, LAI suggests changing the model's inflation rate assumption from 2.00% to 2.50%.

Cost of Debt Comparison

LAI compared the April 2022 Tax Model's pre-tax debt costs against those from NREL's 2021 and 2023 ATBs, as shown in Table 5 below.[19] The debt costs are identical in the April 2022 Tax Model and the 2021 NREL ATB, while NREL debt costs have increased considerably from the 2021 to the 2023 ATB.

[17] According to the Q2 2023 Survey of Professional Forecasters published by the U.S. Federal Reserve Bank of Philadelphia, the Headline CPI consensus forecast was 3.4% for 2023, 2.5% for 2024, and 2.3% for 2025. The Q2 2023 Headline CPE consensus forecast was 3.4% for 2023, 2.3% for 2024, and 2.1% for 2025.

[18] "Cost of capital: 2022 outlook," Keith Martin of Norton Rose Fulbright; February 28, 2022 (https://www.projectfinance.law/publications/2022/february/cost-of-capital-2022-outlook/)

[19] The quantity of debt as a percentage of overall project capitalization, i.e., capital structure weight, is another matter and is addressed later in this memo. Equity costs are more affected by overall project risk and revenue volatility than are debt costs.

Table 5. Comparison of Debt Rates by Technology and Source (nominal)

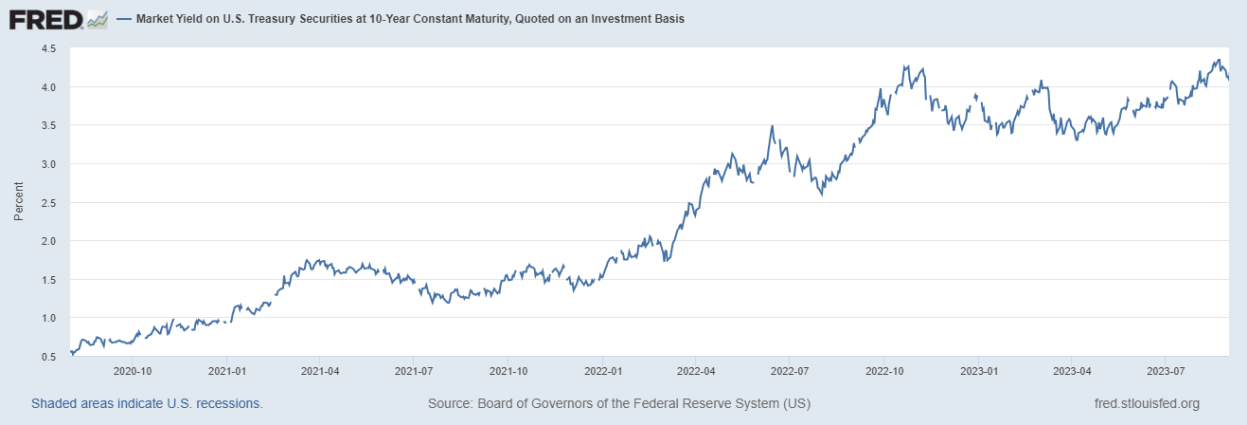
Project Category	2021 NREL ATB	2022 Tax Model	2023 NREL ATB
Solar (pre-tax, 1 MW and larger)	4.0%	4.00%	7.0%
Land-based Wind (pre-tax, 1 MW and larger)	4.0%	4.00%	7.0%

NREL provided the following description of its 2023 ATB methodology for estimating debt costs:

> For interest rates, we assume a 300 basis point spread relative to the 10-year treasury yield (U.S. Department of the Treasury, 2023), which at the time of data entry was at 3.9% and resulted in interest rates of 7% for most technologies … These rates are a 300 basis point increase from our previous interest rates, which matches the increase in the 10-year treasury yield since the 2022 ATB.[20]

U.S. treasury rates underpin virtually all domestic corporate debt rates. Historical yields on 10-year U.S. treasury bonds are shown in Figure 3 below. Yields have increased significantly in the past three years, rising from 0.5% in the beginning of August 2020 to 3.8% as of June 30, 2023.[21]

Figure 3. Market Yield on U.S. Treasury Securities at 10-Year Constant Maturity, Quoted on an Investment Basis (Aug 2020 – Aug 2023)



The solar and wind projects that are subject to Tax Model appraisal generally do not enter into project-specific debt arrangements. Except for some of the very largest projects, developers typically arrange debt financing at the parent company level. In this structure, the cost of renewable project debt reflects the

[20] "Financial Cases & Methods," National Renewable Energy Laboratory; 2023 (https://atb.nrel.gov/electricity/2023/financial_cases_&_methods)

[21] "Market Yield on U.S. Treasury Securities at 10-Year Constant Maturity, Quoted on an Investment Basis," Federal Reserve Economic Data; Retrieved September 13, 2023 (https://fred.stlouisfed.org/series/DGS10/)

benefits of reduced portfolio risk and of other business operations. Without project-specific debt data, LAI relied on industry debt rates for renewable energy borrowers that have comparable credit risks.

In order to view how debt costs have changed since 2021, we present two graphs of long-term (20-year and longer) debt yields from the Federal Reserve Economic Data (FRED), an online database maintained by the Federal Reserve Bank of St. Louis Research Department. Based on our review of the credit ratings of a limited number of companies whose business portfolios are entirely or predominantly renewable projects, LAI believes that typical NYS renewable energy project developers would have low investment grade credit ratings, i.e., Baa/BBB, or high speculative grade ratings, i.e., Ba/BB.[22] Our choice of these ratings reflects our research of company credit ratings and the relative stability of energy revenues provided by the Index REC mechanism used by projects with NYSERDA contracts.

Figure 4 below, using Moody's Analytics data from FRED, illustrates how Baa (equivalent to S&P BBB) debt rates have increased starting in January 2021 due to inflation fears and Federal Reserve interest rate policy.[23] Figure 5, also below, using ICE Bank of America data from FRED, shows a similar pattern for high speculative grade BB (equivalent to Moody's Ba) debt.[24]

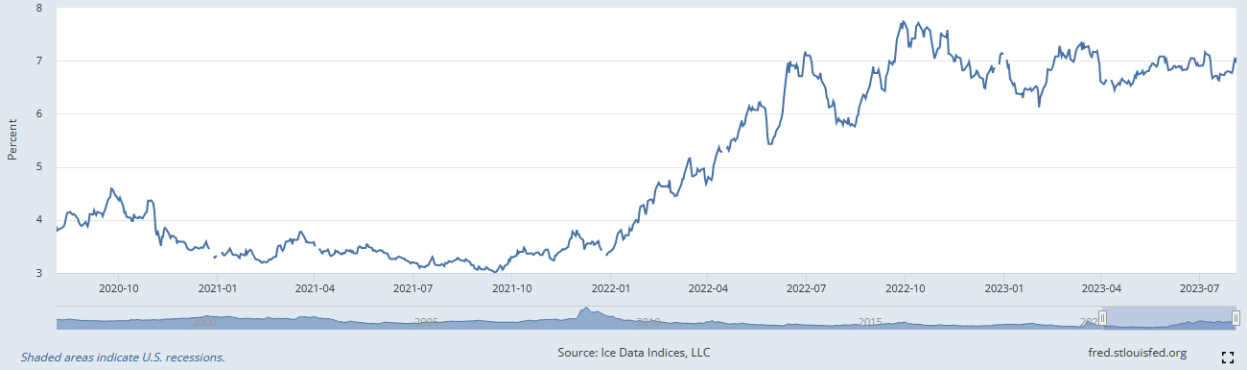
Figure 4. Moody's Seasoned Low Investment Grade (Baa) Corporate Bond Yield (Aug 2020 – Aug 2023)

[22] LAI found four firms that are entirely or predominantly renewable energy companies. Two of these firms (Constellation Renewables and Topaz Solar Farm) have Ba (high speculative) credit ratings and the other two firms (Continental Wind and Solar Star Funding) have Baa (low investment-grade) credit ratings from Moody's Investor Services. We excluded companies with significant non-renewable businesses, e.g., NextEra Energy, and companies with material governmental ownership, e.g., Ørsted. We also found some entirely or predominantly renewable energy companies that did not have credit ratings, e.g., Invenergy.

[23] "Moody's Seasoned Baa Corporate Bond Yield," Federal Reserve Economic Data; Retrieved August 3, 2023 (https://fred.stlouisfed.org/series/DBAA)

[24] "ICE BofA BB US High Yield Index Effective Yield," Federal Reserve Economic Data; Retrieved August 3, 2023 (https://fred.stlouisfed.org/series/BAMLH0A1HYBBEY#)

Figure 5. ICE Bank of America High Speculative Grade (BB) Effective Yield (Aug 2020 – Aug 2023)



We note that Baa/BBB and Ba/BB rates were low when the April 2022 Tax Model was developed, generally 3.5% as of June 2021. This is reasonably consistent with the debt costs in the April 2022 Tax Model and in NREL's 2021 ATB. Since then, however, long-term debt costs have increased significantly. Moody's Baa corporate yields in H1 2023 were mostly in the 5.3%-5.9% range and were 5.7% as of June 30, 2023, as shown in Figure 4. ICE Bank of America's lower-rated BB corporate yields in H1 2023 were mostly in the 6.2%-7.4% range and were 6.9% as of June 30, 2023, as shown in Figure 5.

A fresh calculation of NREL's debt cost methodology of applying a 300 basis point adder to the June 30, 2023 10-year treasury yield of 3.8%, results in a 6.8% debt cost for renewable energy projects. This value is within the range of empirical debt costs of 5.7% (BBB/Baa) to 6.9% (Ba/BB) as illustrated in the graphs above and is very close to NREL's 2023 ATB estimate of 7.0%, which relied on earlier data. Therefore, we recommend a 6.8% pre-tax debt cost for the 2024 Tax Model for solar and land-based wind project categories.

Costs of Equity Comparison

Estimating the ROE required or achieved by renewable energy project developers is difficult given the virtual absence of relevant data in the public domain. Required or achieved ROEs are commercially sensitive, so project developers do not willingly disclose ROE benchmarks. The NREL Project Finance report relies on detailed confidential discussions with fifteen unidentified project developers and financial institutions in 2020, as described in this excerpt from page 17:

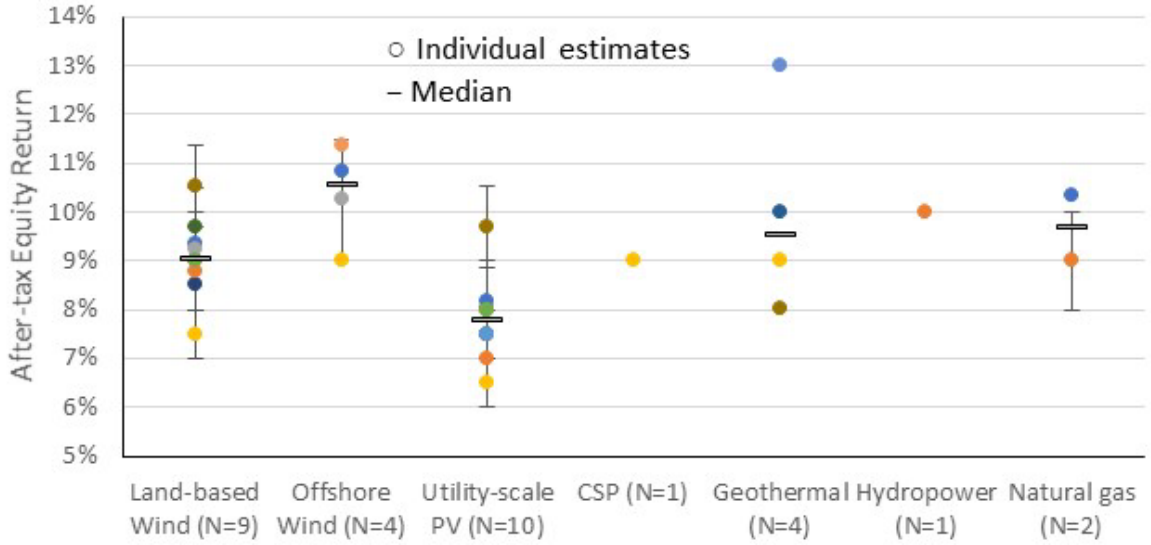
> While financing for IPP-owned electric generation assets comes from various sources and can involve multiple owners including tax equity, we focus our analysis on the after-tax equity return requirements of assets solely owned by IPPs. These large companies typically have access to significant capital through ongoing operations and public capital markets; however, because debt is almost always less costly than equity, Figure 8 summarizes 31 separate data points gathered from 15 sources for the levered after-tax cost of equity by technology type. In some instances, unlevered equity returns were provided, which we convert to levered via a derivation of the weighted average cost of capital (WACC) formula. Equity investments in electric generating assets only cover the portion of the project not funded through debt—thus, representing "levered" returns.

> For example, we calculate a 7.5% unlevered rate of return to be equivalent to a 10.5% levered rate of return.

Figure 8 in the NREL Project Finance report, "Empirical data and medians of the after-tax levered cost of equity, by technology", reproduced as Figure 6 below, illustrates the considerable range of ROE values for different renewable energy technologies. NREL's median values for the Tax Model's project categories were 7.75% for solar (utility-scale PV) and 9.0% for land-based wind.

Figure 6. NREL Project Finance Report (2020) Empirical Equity Costs

Empirical data and medians of the after-tax levered cost of equity, by technology



The Financial Cases and Methods section of NREL's 2023 ATB website explains why it raised the cost of equity from the 2021 ATB for renewable energy projects:[25]

> Based on recent increases in the cost of capital (Norton Rose Fulbright, 2023), the 2023 ATB increases the nominal cost of equity by 1% for all technologies relative to prior years. Documentation for differences in the cost of equity can be found in (Feldman et al., 2020) or in prior editions of the ATB.

The published Tax Model equity costs on T&F's web page Appraisal Methodology for Solar and Wind Energy Projects – Discount Rates, as shown in Table 1, are pre-tax values. A WACC spreadsheet provided

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[25] NREL reference: "Financial Cases & Methods," National Renewable Energy Laboratory; 2023 (https://atb.nrel.gov/electricity/2023/financial_cases_&_methods)

The Norton Rose Fullbright reference: "Cost of Capital: 2023 Outlook," Norton Rose Fulbright; January 13, 2023 (https://www.nortonrosefulbright.com/en-us/knowledge/webinars/2c5504d5/cost-of-capital-2023-outlook). This webinar featured a panel including senior banking executives from Bank of America, Investec Group, JP Morgan, and Mitsubishi UFJ Financial Group.

by T&F gave pre-tax and after-tax equity values for solar and land-based wind projects. This spreadsheet indicates T&F calculated its pre-tax equity costs based on after-tax equity costs in NREL's 2020 Project Finance report and an effective combined federal and NYS income tax rate of 26.73%.[26]

In order to compare the April 2022 Tax Model and NREL ATB after-tax equity costs on a consistent basis, LAI calculated after-tax equity costs from the April 2022 Tax Model using the published pre-tax values and the NYS combined effective tax rate of 26.73%. The resulting April 2022 Tax Model after-tax equity costs of 7.75% for solar projects and 9.00% for land-based wind projects, shown in Table 6 below, are identical to the 2021 NREL ATB values after rounding. Based on these considerations, and in light of not having additional equity cost data, LAI recommends that T&F utilize NREL's 2023 ATB equity costs in the 2024 Tax Model.

Table 6. Comparison of Returns on Equity by Technology and Source

Category	2022 Tax Model (pre-tax)	2022 Tax Model (after-tax)*	NREL 2021 ATB (after-tax)	NREL 2023 ATB (after-tax)
Solar (1 MW and larger)	10.58%	7.75%	7.8%	8.8%
Land-based Wind (1 MW and larger)	12.28%	9.00%	9.0%	10.0%

** LAI calculation using the 26.73% combined effective NYS tax rate assumption that was used in the April 2022 Tax Model to enable a consistent comparison with NREL's after-tax equity cost values*

LAI has considered various methods to independently update the cost of equity. While debt costs can be updated based on published yields for long-term corporate debt securities, no such database or benchmark exists for equity cost. The Capital Asset Pricing Model (CAPM) is a tool often used to estimate a company's cost of equity based on stock market data, capital structure and debt cost but is not possible in this case.[27] First, there are very few publicly listed pure renewable energy companies that can comprise a cohort group to estimate a company's beta, i.e., volatility relative to the market as a whole. We found only five such companies (listed in footnote 22), of which two (Topaz Solar Farm and Solar Star Funding) appear to be solely debt-funded entities without stock prices. This is an insufficient sample size for a robust calculation. Second, most of the projects in these companies' portfolios likely have variable revenues streams whereas almost all the NYS projects receive Index RECs that stabilize their revenue streams. As a result, the NYS renewable projects have much lower risk and are not comparable to this cohort group of renewable energy companies. Third, in our opinion it is not appropriate to calculate the cost of capital for a company with a portfolio of diverse projects and then apply it to a single project. Fourth, the CAPM itself has been criticized because it relies on questionable, idealized financial

[26] The effective combined rate of 26.73% reflects a federal income tax rate of 21.0% and a NYS income tax rate of 7.25%. LAI used this NYS-specific rate in calculating the final WACC values presented at the end of this memo.

[27] "Capital Asset Pricing Model (CAPM) and Assumptions Explained," Will Kenton of Investopedia; May 24, 2023 (https://www.investopedia.com/terms/c/capm.asp)

assumptions.[28] Therefore, we suggest relying on the cost of equity estimates in the 2023 NREL ATB for use in the 2024 Tax Model.

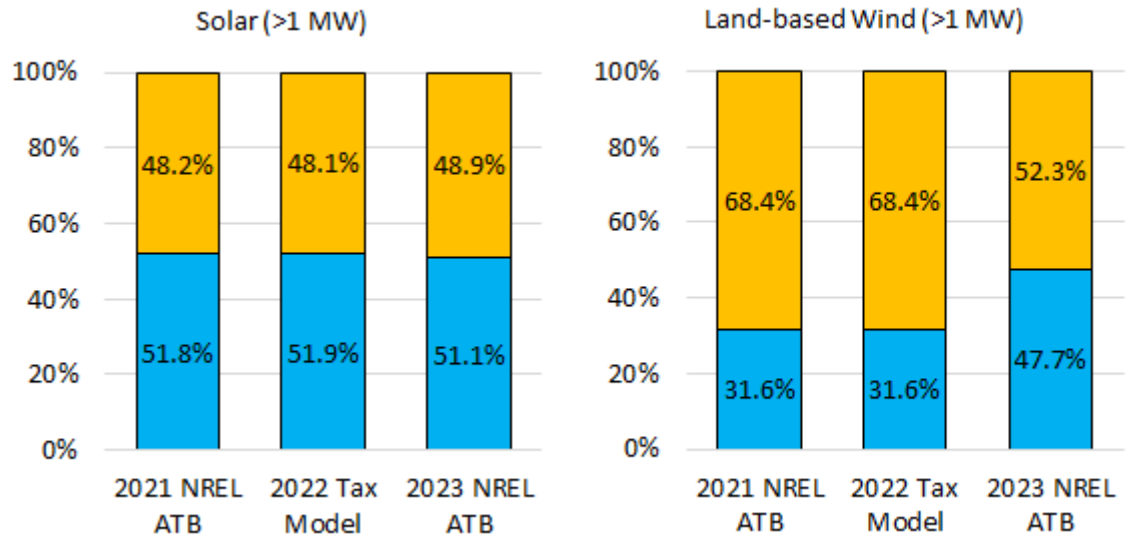
Capital Weights

The final WACC component we evaluated was the capital structure weights for debt and equity. The April 2022 Tax Model and NREL weights are compared in Table 7 and Figure 7 below. The utility-scale PV capital structure did not change materially from the 2021 to 2023 NREL ATB, while the land-based wind debt fraction increased from 31.6% to 47.7%. The April 2022 Tax Model's capital structures for solar and land-based wind are consistent with those in the 2021 NREL ATB.

Table 7. Comparison of Capital Weights (Debt / Equity) by Technology and Source

Project Category	2021 NREL ATB	2022 Tax Model	2023 NREL ATB
Solar (pre-tax, 1 MW and larger)	51.8% / 48.2%	51.9% / 48.1%	51.1% / 48.9%
Land-based Wind (pre-tax, 1 MW and larger)	31.6% / 68.4%	31.6% / 68.4%	47.7% / 52.3%

Figure 7. Comparison of Capital Weights (Debt / Equity) by Technology and Source



NREL determined its capital structures based on the amount of debt a project can support from its net income as calculated using the debt service coverage ratio (DSCR) required by the lender. As explained on page 16 of NREL's Project Finance report, the DSCR "represents and dictates the size of the 'cushion'

[28] "The Critique Of CAPM," Dillon Nimako of The Carlyle Group; January 31, 2018 (https://seekingalpha.com/instablog/48728222-dillonnimako/5105922-critique-of-capm)

required by the lender to ensure the loan will be repaid—even under 'worst-case' operating conditions." NREL obtained DSCR data from financiers and renewable project developers.[29]

Both solar and wind technologies benefit from the revenue stability provided under the Index REC contract structure in NYS, but NREL found that wind projects can support less debt in their capital structures because "revenue uncertainty mostly boils down to resource uncertainty." LAI is not aware of any fundamental changes in lenders' approach since 2020. Without additional information supporting the capital structures used in the April 2022 Tax Model, LAI recommends that the capital structures in NREL's 2023 ATB be used in the 2024 Tax Model.

Conclusion

In summary, LAI recommends that the 2024 Tax Model's WACC values adopt NREL's 2023 ATB costs of equity values converted from after-tax to pre-tax using the NYS-specific combined effective tax rate of 26.73%, NREL's 2023 ATB capital structure values, and LAI's updated 6.8% pre-tax cost of debt value. LAI also suggests changing the model's inflation rate assumption from 2.00% to 2.50%. Table 8 below utilizes these financial values to calculate nominal and real WACCs for the 2024 Tax Model.

Table 8. LAI Recommended WACC Values for the 2024 Tax Model

Solar (1 MW and larger)	Weight	Cost	Weighted Cost (pre-tax)
Debt (pre-tax)	51.1%	6.8%	3.47%
Equity (after-tax)	48.9%	8.8%	5.87%
Nominal WACC (pre-tax)			9.35%
Real WACC (pre-tax)			6.68%

Land-based Wind (1 MW and larger)	Weight	Cost	Weighted Cost (pre-tax)
Debt (pre-tax)	47.7%	6.8%	3.24%
Equity (after-tax)	52.3%	10.0%	7.14%
Nominal WACC (pre-tax)			10.38%
Real WACC (pre-tax)			7.69%

[29] NREL's Project Finance report provides considerable detail on the DSCR methodology. NREL's DSCR values for different technologies (1.30 for utility PV and commercial PV; 1.40 for wind) are provided in the Financial Assumptions by Technology section on the ATB Financial Cases and Methods website:

"Financial Cases & Methods," National Renewable Energy Laboratory; 2023 (https://atb.nrel.gov/electricity/2023/financial_cases_&_methods)