The Many Values of Renewable Energy
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The Many Values of Renewable Energy

Learning Objectives

This course is intended to provide attendees:

(i) a better understanding of the similarities and differences between the various valuations performed related to Renewable Energy Assets; and

(ii) a basic understanding of the approaches used to value Renewable Energy Assets and some of the key inputs and value drivers.
Renewable Energy Valuation

Topics Covered

- Comparison of Valuation Standards
  - Uses of Value and Definitional Differences
  - Units of Account

- Renewable Energy Valuation Approaches
  - Cost Approach
  - Market Approach
  - Income Approach

- Key Considerations – Income Approach
  - Power Prices
  - Tax Attributes
  - Contracts and Intangible Assets
  - Discount Rate

- Ad Valorem Tax Considerations
Section 1

Valuation Definitions
The Many Uses of Renewable Energy Value

- **Fair Value ("FV")** – Financial Reporting (US GAAP or IFRS)
  - Assets are recorded at FV as of the acquisition date

- **Fair Market Value ("FMV")** – IRS (Federal Tax Purposes)
  - In a taxable transaction, assets are recorded at FMV
  - At Commercial Operation Date ("COD"), the FMV of eligible advanced energy property determines the Investment Tax Credit ("ITC") amount

- **Transfer Tax Value ("TTV")** – Various states
  - Used to determine the magnitude of tax due to states related to the transfer of real property (the definition of which varies by state)

- **Property Tax Assessed Value ("PTAV")** – Various states
  - Used to determine the annual property tax liability due for annual ownership of the assets (regimes vary significantly by state)
Fair Value Definition

**FV** is defined in Accounting Standards Codification 820 as “the price that would be received to sell an asset in an orderly transaction to market participants (“MPs”) at the measurement date”

- **FV** of acquired renewable energy Asset FV typically does not exceed purchase price
  - ✓ Strong demand among MPs for in-service, contracted renewable assets
- **FV** of PP&E and intangibles may be presented separately
  - ✓ Contract FV may be based on comparison to market power price for renewable power or “substitute” market contract price
Fair Market Value Definition

**FMV** is defined as “the price at which property would change hands between a willing buyer and a willing seller, neither being under any compulsion to buy or to sell, and both having reasonable knowledge of relevant facts.” *(Rev. Ruling 59-60, 1959-1 C.B. 237)*

- **FMV** linked to the actual price paid in the transaction
  - Allocated to assets based on Asset Classes I through VII
  - No FMV recognized in excess of purchase price
- **FMV** of eligible advanced energy property based on appraisal
  - Income Approach commonly used to estimate FMV
  - Cost Approach relevant to FMV but does not quantify developer premium
Transfer Tax – Example Definition of Value

For **TTV**, an example standard of value is “the amount a willing buyer would pay a willing seller for the *real property* without deducting mortgages or other liens at the property may be taken subject to as part of the sale or transfer.”

- **TTV** should be linked to the actual price paid in the transaction
  - TTV is used to compute either Real Estate Transfer Tax ("RETT") or Controlling Interest Transfer Tax ("CITT")

- **Real Property** definition varies by state
  - Real Property may include towers and ground mount equipment
  - Certain states exclude renewable equipment from Real Property
Property Tax Assessed Value

**PTAV** can be defined as “the dollar value assigned to a property to measure applicable taxes and takes comparable sales into consideration in order to ensure equitable treatment of comparable property.”

- For renewable energy assets without abatements / exemptions, **PTAV** is difficult to establish for several reasons
  - Lack of relevant comparable sales
  - Difficulty in carving out intangible assets / value of non-taxable property

- **PTAV** is generally established annually with the specific process and requirements varying by state
# Comparison of Key Value Elements

<table>
<thead>
<tr>
<th>Element</th>
<th>FV</th>
<th>FMV</th>
<th>TTV</th>
<th>PTAV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Premise</td>
<td>Exit (Sales) Price</td>
<td>Transaction Price</td>
<td>Transaction Price</td>
<td>Comparable Value</td>
</tr>
<tr>
<td>Critical Party</td>
<td>MP Buyer</td>
<td>Willing Parties</td>
<td>Willing Parties</td>
<td>Hypothetical</td>
</tr>
<tr>
<td>Buyer Synergies</td>
<td>MP Synergies Only</td>
<td>Include</td>
<td>Include</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Unit of Account</td>
<td>PP&amp;E, Intangibles</td>
<td>Combined FMV</td>
<td>Taxable Components</td>
<td>Taxable Components</td>
</tr>
<tr>
<td>Developer Premium</td>
<td>Included</td>
<td>Included (Assessed)</td>
<td>Excluded</td>
<td>Excluded</td>
</tr>
</tbody>
</table>

- While the objectives and definitions are similar, there are relevant differences between the various Valuation Standards.

**Conclusion:** *FV and FMV may provide useful information to estimating TTV and PTAV, but appropriate adjustments should be carefully considered.*
Market Considerations
Renewable Energy Construction Costs

Cost reductions (per kW) levelling off after a decade of declines

Conclusion: Current replacement cost new may be lower than depreciated replacement cost for a seasoned facility before functional obsolescence

Source: Energy Information Administration
Sustained Supply of Natural Gas
*Renewable Energy’s Best Friend and Worst Enemy*

- Natural gas delivers the majority of the dispatchable power needed to offset renewable energy intermittency
- However, sustained gas supply (and the resulting power price impact) limits the value of post-contract renewable energy MWhs

*Source: SNL Energy*
Market Challenges Vary by Region

- **PJM** – Marcellus production, seasonal negative gas basis
  - ✓ Off peak and “shoulder” season pricing can be very unattractive

- **Mid-Con / ERCOT** – Wind-on-Wind Competition
  - ✓ High wind production typically correlated with low demand hours
  - ✓ Realized pricing can be 15% or more below zonal / nodal price forecast

- **CAISO** – Peak daily pricing now shortly after sunset
  - ✓ Residential / behind the meter solar has changed the demand profile

- **WECC (Northwest)** – Wind and hydro drive low-cost supply
  - ✓ Data center contracts can absorb low-cost supply on a locational basis

**Solution:** *Renewable energy projects are seeking fixed price contracts, even if the base price is low and/or escalation is negligible or 0%*
Evolutions of Market Participants

2006
- Independent developers “sold down” to financial investors at COD
- Increasing competition for critical utility scale PPAs

2010
- IPPs / Integrated Utilities build largest projects
- ARRA cash grant provides financing “bridge” through crisis

2014
- Rise and Fall of the YieldCos that positioned themselves as “GrowthCos”
- Markets identify contracted renewables as debt alternative

2018
- Insurance Companies and Pension Funds (“Funds”) drive up valuations
- Consumer & Industrial (“C&I”) PPAs proliferate at lower $/MWh prices
Section 3

Valuation over the Life Cycle
Renewable Energy Project Life Cycle

Development

Construction *(NTP to COD)*

Post COD *(Tax Attributes)*

Tail Cash Flows / Residual
Project Development

Key Valuation Milestones

- **Land Rights** – This is a threshold requirement for definition of a project (narrowing regional development to a specific site)

- **Permitting** – Difficulty (and therefore value) varies by state
  - Additional environmental permitting can become a bottleneck

- **Interconnection** – Necessary for Utility / large C&I contracts

- **Power Purchase Agreement ("PPA")** – Critical element of development phase, defines the profitability of the project
  - PPA terms transition valuation from *Cost Approach* to *Income Approach*
  - Critical element to securing construction capital

- **Engineering, Procurement & Construction Contract ("EPC")**
  - Firm cost estimate over which developer premium is earned
Very little value is created in the early stage of project development.

Value creation has increased in late stage development due to increased access to capital and recognition that the bulk of the developer “premium” is earned by NTP.

 Developers are willing to sell at NTP because they obtain the majority of the premium without incurring the costs (and spending the time) needed to secure construction funding.

These ratios are rough estimates which broadly represent current market dynamics.
Market Participants are Buying Sooner

*Notice to Proceed ("NTP") is the new COD*

Why are Funds willing to buy Projects at NTP?

- **Negligible Remaining Development Risk** – With PPA and EPC in place, the construction risk is deemed manageable
  
  ✓ Credible EPC contractors consistently deliver within contract terms

- **Funds are Providing Construction Capital** – Removes an intermediate financing step
  
  ✓ Minor boost to realized Fund yield (~ 25-50 basis points)
  ✓ Avoids change of control “Price” contemporaneous with COD (for ITC)

- **No Earnings / Cash Flow Dilution Concerns**
  
  ✓ YieldCos purchased at COD to avoid year one cash flow “dip”
Renewable Energy Project Life Cycle

Development

Construction (NTP to COD)

Post COD (Tax Attributes)

Tail Cash Flows / Residual
Valuation Methodology

Key Drivers of Operating Projects

- **Asset Characteristics**
  - Capacity
  - Resource Capacity Factor
  - Degradation
  - Estimate Useful Life
  - Location

- **Contracted Revenue**
  - Contracted Capacity
  - Price Structure (Indexed, etc.)
  - Tariff Structure
  - Renewal Options / Assumptions

- **Merchant Revenue**
  - Locational-based Pricing
  - Forward Power (& Gas) Curves
  - Capacity Payments / Regime
  - Correlation Considerations

- **Variable Operating Expenses**
  - Royalty Fees
  - Asset Management Fees
  - Other VOM Costs (Maintenance)

- **Fixed Operating Expenses**
  - Labor & Benefits
  - Plant G&A Costs
  - Land Lease Costs
  - Utilities
  - Insurance

- **Taxes**
  - Non-Income (Property, etc.) Tax
  - Capital Cost Allowable Rules
  - Operating Losses / Carryforward
  - Tax Credits / Incentives
New Wind Project – COD Value *(sample)*

**What Drives Value?**

- **Tax Benefits Dominate** – For a high capacity factor, as much as 75% of value comes from PTCs and MACRS
  - ✓ Accurate wind forecast is critical (PTCs ~50% of Value)
  - ✓ PPA price may be less than 50% of revenue per MWH

- **Value Front-End Loaded** – 90% of value and 2/3 of cash flow (undiscounted) are in first 10 years
  - ✓ Merchant price / tail has negligible impact on value (~5%)

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**Characteristics**

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</tr>
<tr>
<td>Capacity Factor</td>
<td>45%</td>
</tr>
<tr>
<td>PPA Price</td>
<td>$20/MWh, 2% esc.</td>
</tr>
<tr>
<td>PPA Term</td>
<td>20 Years</td>
</tr>
<tr>
<td>Merchant Price</td>
<td>$30/MWh (2039)</td>
</tr>
<tr>
<td>Value</td>
<td>$1,600 / kW</td>
</tr>
</tbody>
</table>
Weighed Average Cost of Capital ("WACC")

**Contracted Wind**

- A Capital Structure of 50% debt and 50% equity reflects the leverage supported by the fixed contract price as well as the tax related cash flows.
- Return on Debt of 4.2% is based on the credit quality of the PPA off-taker and the fixed per MWh contract pricing.
- Return on Equity is estimated based on the Capital Asset Pricing Model ("CAPM") where return on common equity is estimated as the risk-free rate plus a market risk premium multiplied by an industry average "beta".
  - A normalized risk-free rate of 3.5%\(^1\) and a composite market risk premium of 5.0%\(^1\) are appropriate (8.5% market return).
  - YieldCos provide the best indication of levered Betas.
  - A small stock premium of 3.5%\(^1\) (or alpha) was also incorporated to reflect incremental risk of specific projects.
- Overall, a **Contracted Wind WACC** is estimated to be 6.5%.

\[WACC = R_d(W_d) + R_e(W_e)\]
\[R_d = i \times (1 - t)\]
\[R_e = R_f + b (R_p) + Ssp\]

### Key Components of WACC

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<tr>
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<th>Value</th>
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<tr>
<td>Debt Weighting (W_d)</td>
<td>50.0%</td>
</tr>
<tr>
<td>Equity Weighting (W_e)</td>
<td>50.0%</td>
</tr>
<tr>
<td>After-Tax Cost of Debt (R_d)</td>
<td>3.25%</td>
</tr>
<tr>
<td>Tax Rate (t)</td>
<td>21%</td>
</tr>
<tr>
<td>Risk Free Rate (R_f)</td>
<td>3.5%</td>
</tr>
<tr>
<td>Unlevered Beta</td>
<td>0.30</td>
</tr>
<tr>
<td>Relevered Beta (b)</td>
<td>0.54</td>
</tr>
<tr>
<td>Market Risk Premium (R_p)</td>
<td>5.0%</td>
</tr>
<tr>
<td>Size Premium (Ssp)</td>
<td>3.5%</td>
</tr>
<tr>
<td>Cost of Equity (R_e)</td>
<td>9.75%</td>
</tr>
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\(^1\) For more information, please see: [https://costofcapital.duffandphelps.com/landing](https://costofcapital.duffandphelps.com/landing)

July 31, 2018
New Solar Project – COD Value *(sample)*

*FMV is Front Loaded due to Investment Tax Tax Credit (“ITC”)*

- **Income Approach FMV includes**:  
  **ITC step-up** – Willing buyers pay for the ITC benefit in pre-COD solar projects  
  ✓ Over 1/3 of FMV (and 75% of tax attribute value) realized in **Year 1**  
  ✓ Tax reform adversely impacted MACRS depreciation value

- **Developer Premiums Vary** – size and complexity of project matter  
  ✓ PPA price and solar resource are key determinants of FMV  
  ✓ Re-contracting at discounted pricing is more common for solar

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<td>Size</td>
<td>20 MW</td>
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<td>Capacity Factor</td>
<td>25%</td>
</tr>
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<td>PPA Price</td>
<td>$60/MWh, 1% esc.</td>
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<tr>
<td>PPA Term</td>
<td>20 Years</td>
</tr>
<tr>
<td>Renewal Price</td>
<td>$60/MWh (2039)</td>
</tr>
<tr>
<td>Value</td>
<td>$2,500 / kW</td>
</tr>
</tbody>
</table>

### NEW SOLAR VALUE BREAKDOWN

- **MACRS**: 28%
- **ITC**: 16%
- **Contract CF**: 20%
- **Renewal CF**: 7%
WACC

**Contracted Solar**

- With less volume variability, Contracted Solar support even greater leverage, as much as 60% debt and 40% equity.
- Return on Debt of 4.2% is based on the credit quality of the PPA off-taker and the fixed per MWh contract pricing.
- Return on Equity is estimated based on the CAPM where return on common equity is estimated as the risk-free rate plus a market risk premium multiplied by an industry average “beta”
  - A normalized risk-free rate of 3.5%\(^1\) and a composite market risk premium of 5.0%\(^1\) are appropriate (8.5% market return)
  - YieldCos provide the best indication of levered Betas
  - A small stock premium of 3.5%\(^1\) (or alpha) was also incorporated to reflect incremental risk of specific projects
- Overall, a **Contracted Solar WACC** is estimated to be 6.0%

\[ WACC = R_d(W_d) + R_e(W_e) \]
\[ R_d = i \times (1 - t) \]
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<td>Equity Weighting ((W_e))</td>
<td>40.0%</td>
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<td>0.30</td>
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<tr>
<td>Relevered Beta ((b))</td>
<td>0.66</td>
</tr>
<tr>
<td>Market Risk Premium ((R_p))</td>
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<td>Size Premium ((Ssp))</td>
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<tr>
<td>Cost of Equity ((R_e))</td>
<td>10.25%</td>
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Renewable Energy Project Life Cycle

Development

Construction *(NTP to COD)*

Post COD *(Tax Attributes)*

Tail Cash Flows / Residual
Post-PTC Wind Project *(sample)*

Similar Project but PTC Expired

- **Contract Escalation Rate**
  - Critical – Beyond the PTC period, the escalation rate (as much as the base price) dictates FMV
  - PPA Escalators are increasingly below inflation of 2% to 2.5%

- **Post PPA prospects** – can be 15% to 25% of FMV, price outlook starts to compete with discount rate to determine winning bidder
  - Limited observable information on competitive landscape and post-PPA pricing

*Value declined over 60% after 1/3 of life!*

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<td>$25/MWh, 2% esc.</td>
</tr>
<tr>
<td>PPA Term</td>
<td>10 Years Remaining</td>
</tr>
<tr>
<td>Merchant Price</td>
<td>$25/MWh (2029)</td>
</tr>
<tr>
<td>Value</td>
<td>$525 / kW</td>
</tr>
</tbody>
</table>

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**Seasoned Wind Value Breakdown**

- Contract CF: 60%
- Merchant CF: 22%
- MACRIS: 10%
Seasoned Solar Facilities \textit{(sample)}

High Contract Pricing Sustains Greater Value

- **Favorable PPAs Persist** – Power pricing linked to initial (historical) construction costs
  - Vintage PPAs provided greater returns on significantly higher $/MW capital investments

- **Renewal PPAs** – Re-contracting at discounted prices represents a better option than merchant
  - Discounted PPA still allows for some financial leverage
  - SRECs generate value in certain markets (for now)

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</tr>
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<tr>
<td>PPA Term</td>
<td>10 Years Remaining</td>
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<tr>
<td>Renewal Price</td>
<td>$60/MWh (2033)</td>
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<tr>
<td>Value</td>
<td>$2,400 / kW</td>
</tr>
</tbody>
</table>

![Seasoned Solar Value Breakdown](image-url)
WACC

Merchant Solar (Renewal Contract)

- Although pricing uncertainty exists, Solar “renewal” contracts support some leverage, estimated at 25% debt and 75% equity.
- Return on Debt of 4.2% is based on the assumed credit quality of the PPA off-taker, likely still investment grade.
- Return on Equity is estimated based on the CAPM where return on common equity is estimated as the risk-free rate plus a market risk premium multiplied by an industry average “beta.”
  - A normalized risk-free rate of 3.5% and a composite market risk premium of 5.0% are appropriate (8.5% market return)
  - YieldCos continue to be the basis for levered Betas
  - A small stock premium of 3.5% remains appropriate to reflect project specific risks and renewal uncertainty in particular
- Overall, a **Renewal WACC** for Solar is estimated to be 8.0%

\[
\text{WACC} = R_d(W_d) + R_e(W_e)
\]

\[
R_d = i \times (1 - t) \\
R_e = R_f + b \times (R_p) + Ssp
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<tr>
<td>Equity Weighting ((W_e))</td>
<td>75%</td>
</tr>
<tr>
<td>After-Tax Cost of Debt ((R_d))</td>
<td>3.25%</td>
</tr>
<tr>
<td>Tax Rate ((t))</td>
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<td>Risk Free Rate ((R_f))</td>
<td>3.5%</td>
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<td>Unlevered Beta</td>
<td>0.30</td>
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<td>Relevered Beta ((b))</td>
<td>0.38</td>
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<td>Market Risk Premium ((R_p))</td>
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Renewable Energy Project Life Cycle

Development

Construction (NTP to COD)

Post COD (Tax Attributes)

Tail Cash Flows / Residual
Seasoned Merchant Wind *(sample)*

Seasoned Wind Farms Struggle to Survive

- **Pre-2010 Farms** – Depending on turbine and location, Value may be approaching $0 for many sites
  - Average pricing below $20/MWh in many markets for wind hours
  - Older turbines have lower capacity factors and reliability

- **Silver Lining** – Very low value turbines / location may be able to requalify for 10 year of PTCs with modest investment in upgrades
  - FMV (before repowering) must be less than 25% of upgrade costs (20% is more prudent)

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<tr>
<td>PPA Remaining</td>
<td>None</td>
</tr>
<tr>
<td>Remaining Life</td>
<td>15 Years</td>
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<tr>
<td>Merchant Price</td>
<td>$20/MWh</td>
</tr>
<tr>
<td>Value</td>
<td>$75 / kW</td>
</tr>
</tbody>
</table>
WACC

Merchant Wind

- Merchant wind (without hedges) struggles to secure debt financing, and 100% equity is a reasonable assumption for assessing the residual (merchant FV)
- Return on Equity is estimated based on the CAPM where return on common equity is estimated as the risk-free rate plus a market risk premium multiplied by an industry average “beta”
  - A normalized risk-free rate of 3.5% \(^1\) and a composite market risk premium of 5.0% \(^1\) are appropriate (8.5% market return)
  - IPPs may provide a better indication of levered Betas
  - A small stock premium of 3.5% \(^1\) was also incorporated to reflect incremental risk, and may underestimate the necessary risk adjustment related to merchant exposure
  - SSP may increase to 5.4% premium at end of plant life
- Overall, a Merchant Wind WACC is estimated to be 8.5%

\[
\text{WACC} = \frac{\text{R}_d(W_d)}{\text{R}_e(W_e)}
\]

\[
\begin{align*}
\text{R}_d &= i \times (1 - t) \\
\text{R}_e &= R_f + b \times (R_p) + S_{sp}
\end{align*}
\]

Key Components of WACC

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<tr>
<td>Tax Rate ((t))</td>
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<tr>
<td>Market Risk Premium ((R_p))</td>
<td>5.0%</td>
</tr>
<tr>
<td>Size Premium ((S_{sp}))</td>
<td>3.5%</td>
</tr>
<tr>
<td>Cost of Equity ((R_e))</td>
<td>8.5%</td>
</tr>
</tbody>
</table>

\(^1\) For more information, please see: https://costofcapital.duffandphelps.com/landing
Section 4

Ad Valorem Tax Considerations
Renewable Energy Valuation

What Did We Learn

- Valuation Approaches
  - FV and FMV are relevant but appropriate adjustments must be considered

- Cost Approach
  - Construction costs declined steadily but are starting to level out
  - Value of seasoned facilities has little correlation to the initial construction cost
  - Straight-line depreciation likely understates the rate of value decline

- Income Approach
  - Tax attributes represent a significant portion of the value of a pre-COD project
  - PPA pricing is critical to the value of post-COD renewable energy facilities
  - Funds have driven down the rates of return and driven up values for contracted renewable energy facilities, with an emphasis on NTP to COD opportunities
Future Renewable Energy Considerations

What May Impact Future Valuations

Favorable

- Increasing C&I Demand
  ✅ Provide PPA price support
- Continued RPS / REC Programs
  ✅ Renewable compensation that benefits existing assets
- Solid Fuel Plant Retirements
  ✅ Short-run marginal cost-based pricing does not fund recurring maintenance capital needs
- Natural Gas Price Shock

Unfavorable

- Renewable Competition
  ✅ Decreasing realized prices
- PTC / ITC Expiration
  ✅ PPA pricing unsustainable upon expiration of tax benefits
- Ancillary / Capacity Pricing
  ✅ Intermittent resources could be “charged” for back-up power
- Increase in Interest Rates
Thank You