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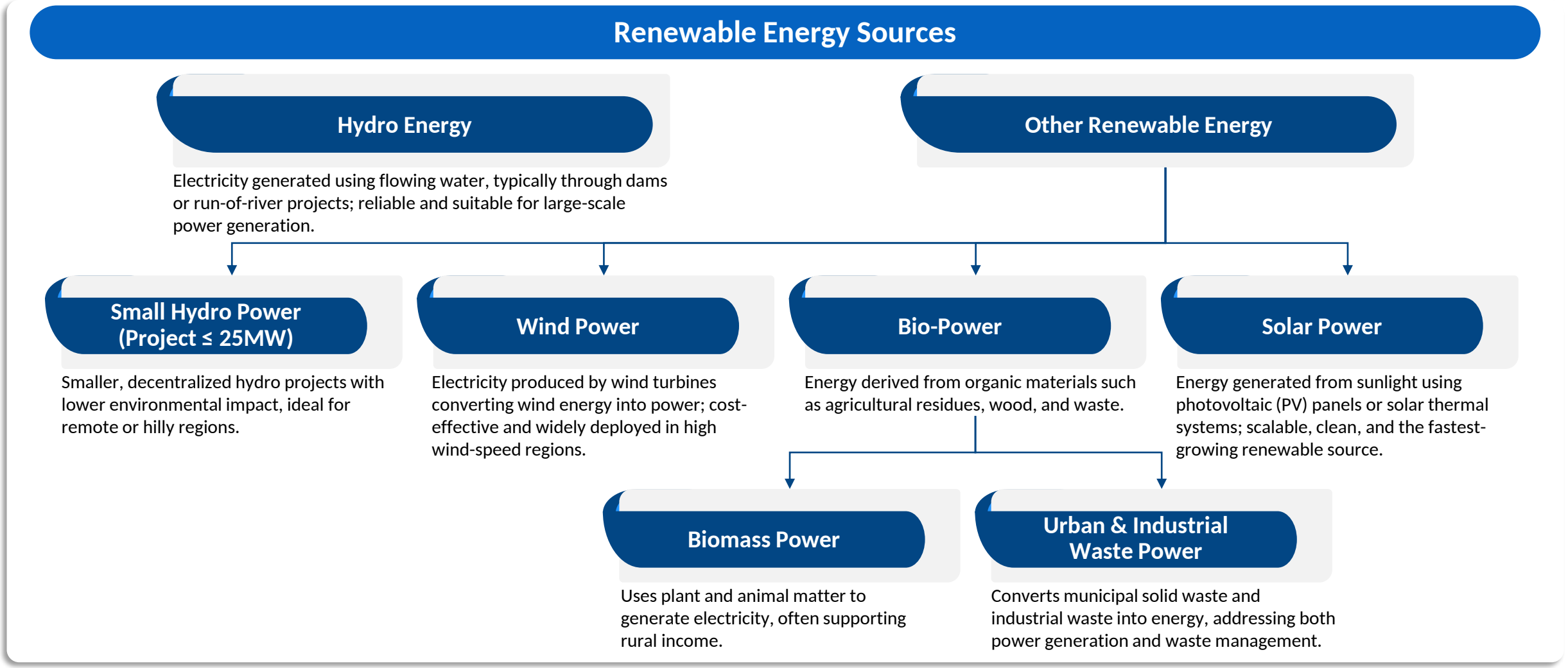
True Art of Valuation

Valuation of Renewable Energy Sector

March 2026

Renewable Energy Sources

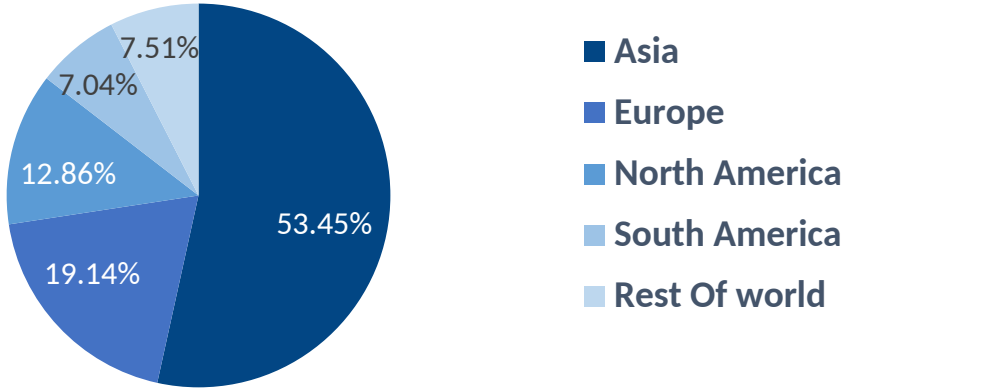


Source: IBEF Renewable energy report

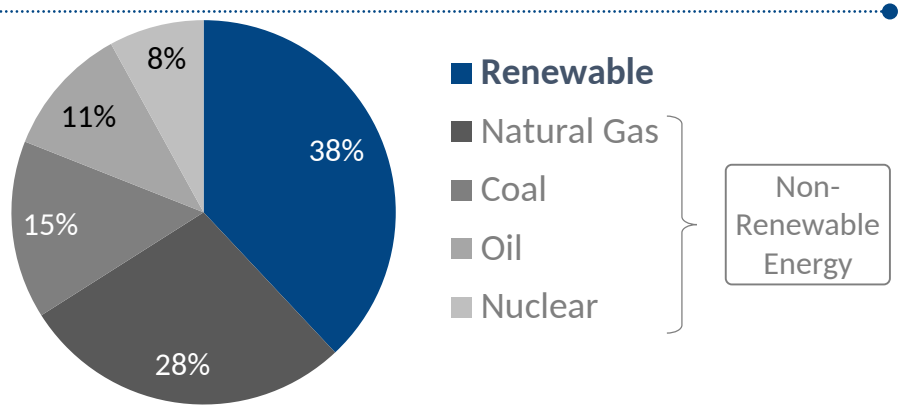
Renewable Energy Sector at a Glance (Global)

- Renewable Energy is a core **global infrastructure sector** with capital-intensive, utility-scale assets and **20-25-year operating lives**
- **Renewables account for >80% of net global power capacity additions** (IEA)
- **~700 GW of new renewable capacity added in 2024**, led primarily by **solar PV**
- **Renewables + nuclear supplied ~40% of global electricity generation**
- **Long-term offtake structures (PPAs) and regulated markets** provide high revenue visibility
- **Annuity-like, stable cash flows** post-commissioning
- Structural growth supported by:
  - **Rising global electricity demand (~4% growth in 2024)**
  - **Declining technology and installation costs**
  - **Strong policy support** linked to decarbonisation and energy security

Installed Capacity



Demand Rate

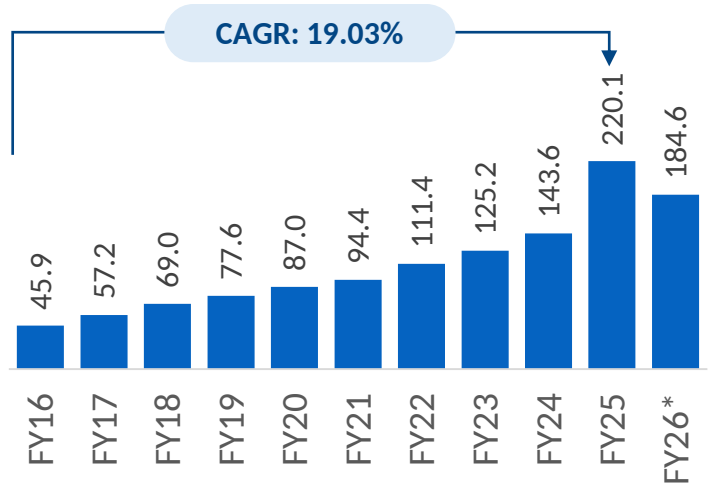


Source: Installed Capacity: Renewable energy statistics 2024-25 By MNRE; **Demand Rate:** Global Energy Review by IEA

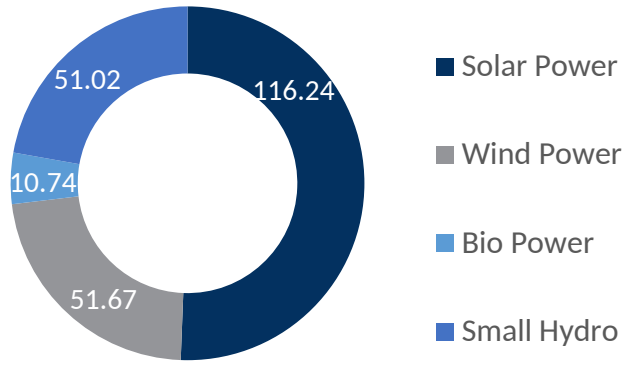
India Renewable Energy – Rapid Scale-Up with Strong Growth Visibility

- **Strong and sustained capacity expansion** driven by policy-led growth, falling technology costs, and structurally rising power demand
- **Installed renewable power generation capacity has grown rapidly over the past few years, recording a CAGR of 19.03% between FY16 and FY25 .**
- India ranks among the **top four global renewable energy markets**, alongside **China, the US, and Germany**
- **Robust long-term growth outlook** supported by clear policy direction
- **Government of India target of 500 GW non-fossil fuel capacity by 2030**
- Target provides **long-term policy visibility and investment certainty** for developers and capital providers

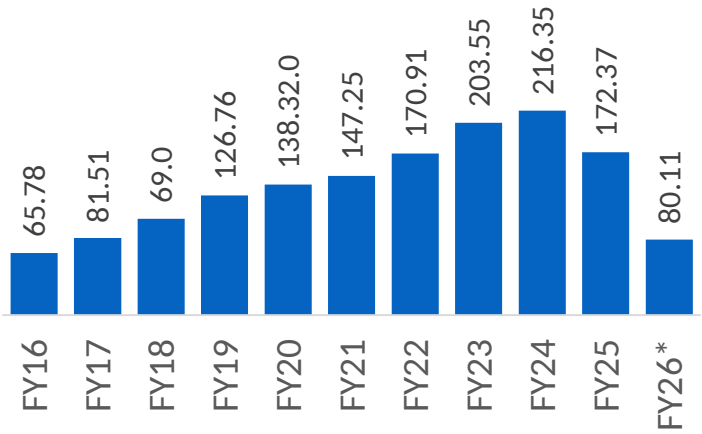
Installed Renewable Energy Capacity (GW)



Installed Renewable Capacity Breakup (GW) FY26 (cumulative achievement)



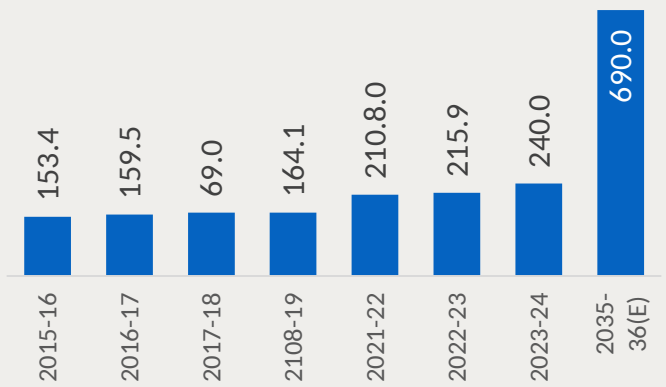
Electricity Generation from RES (billion units)



Source: IBEF Renewable energy report;
* FY26 is as of June 2025

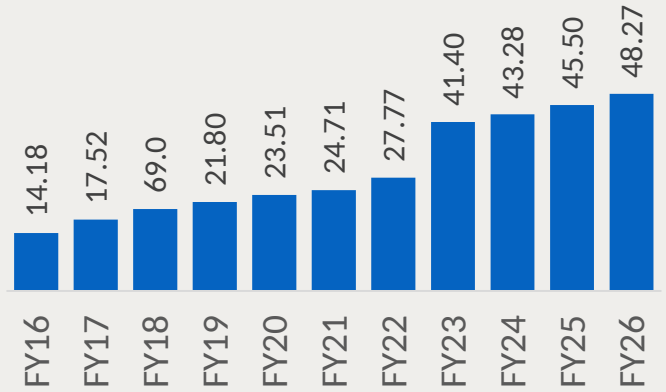
Future Power Demand & Capacity Expansion in India

Peak Power Demand in India (GW)



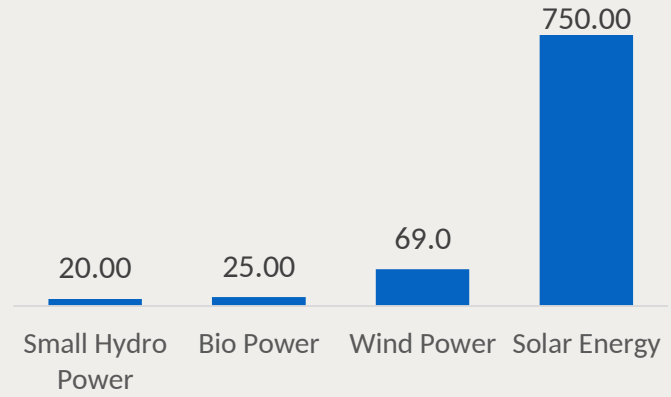
Peak power demand is on a steep upcycle: India's peak electricity demand has already crossed **250 GW** and is projected by the CEA to reach **~817 GW by 2030**, highlighting a widening demand–supply gap and the need for rapid capacity addition.

RES as Percentage of Total Installed Capacity (%)



Renewables are steadily gaining share in installed capacity: The share of renewable energy in total installed capacity has risen from **~14% in FY16 to ~48% in FY26 (as of June 2025)**, reflecting sustained policy support and accelerated deployment.

Renewable Energy Potential in India



Solar is the dominant driver of renewable potential: Out of India's estimated **~900 GW renewable energy potential**, **solar alone accounts for ~750 GW**, far exceeding wind (~102 GW) and other sources, making it central to achieving the **500 GW renewable target by 2030**.

Source: IBEF Renewable energy report

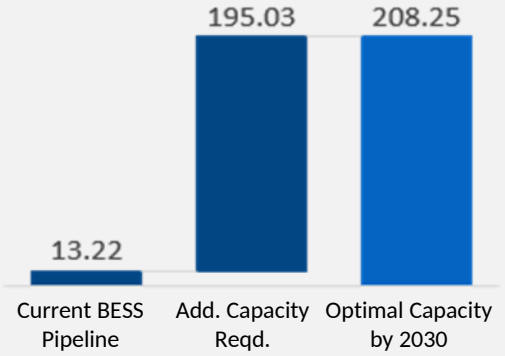
Energy Storage: The Backbone of India's Renewable Transition

Energy Storage - Key Enabler of India's Renewable Grid

- Rising renewable penetration makes energy storage critical for managing intermittency, grid stability, and reliable power supply
- **Total storage requirement** projected to rise from **~16.1 GW (FY2026–27)** to **~73.9 GW (FY2031–32)**

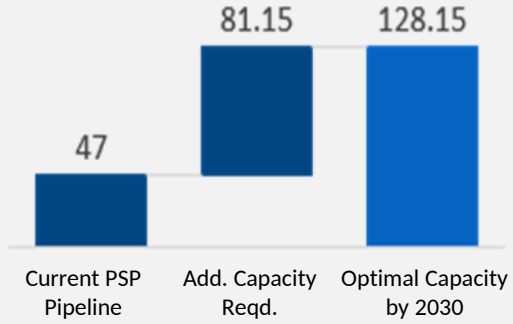
Battery Energy Storage Systems (BESS)

- Flexible, **location-agnostic** solution with rapid response to supply–demand fluctuations
- Suitable for **frequent charge-discharge cycles** with minimal degradation
- **Optimal capacity required: ~208 GWh by 2030**
- **Current pipeline: ~13 GWh** → significant growth headroom



Pumped Storage Projects (PSP)

- Enables **large-scale, long-duration** energy storage
- High storage capacity with **fast ramp-up/down** for grid balancing
- **Optimal capacity required: ~128 GWh by 2030**
- **Current pipeline: ~47 GWh**



Key Demand & Policy Drivers

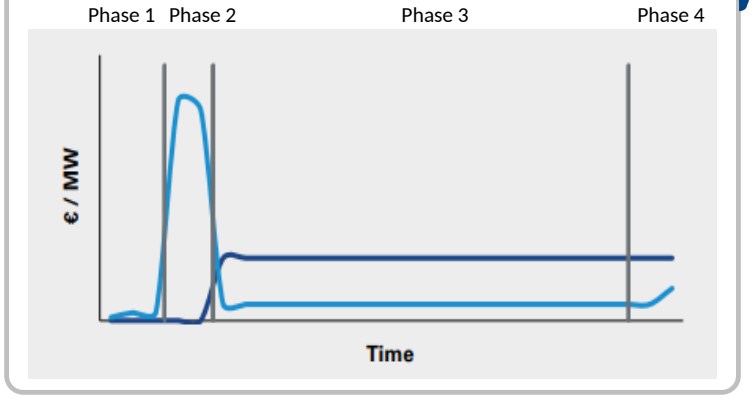
- **Energy Storage Obligations (ESO):** Mandates storage-backed power procurement, creating long-term demand visibility
- **Replacement of Diesel Generators (DG):** BESS emerging as a cleaner, cost-effective alternative for C&I backup power

Source: Ey Report-India: Enegy sector at Crossroad road

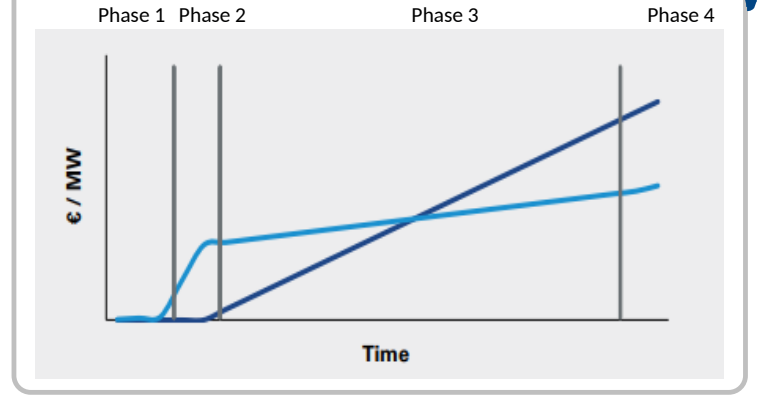
Renewable Power Projects: Cash Flow & Risk Dynamics

- Renewable power projects (solar & wind) are **long-life infrastructure assets** characterized by **contracted revenues, front-loaded capex, and low operating costs.**
- Projects typically operate under **long-term PPAs (up to 25 years)**, resulting in a **J-curve cash flow profile** — negative cash flows during construction followed by stable, annuity-like operating cash flows post-commissioning.
  - **Phase 1 – Pipeline:** Low business risk with limited cash outflows (feasibility, approvals, land, PPA negotiation).
  - **Phase 2 – Under Construction:** Highest risk due to heavy capital deployment and exposure to delays and cost overruns.
  - **Phase 3 – Operational (Post-COD):** Stable, predictable cash flows under FiTs/PPAs; risk comparable to regulated utilities.
  - **Phase 4 – Merchant Exposure:** Revenues linked to spot prices unless new PPAs are secured, increasing price volatility risk.

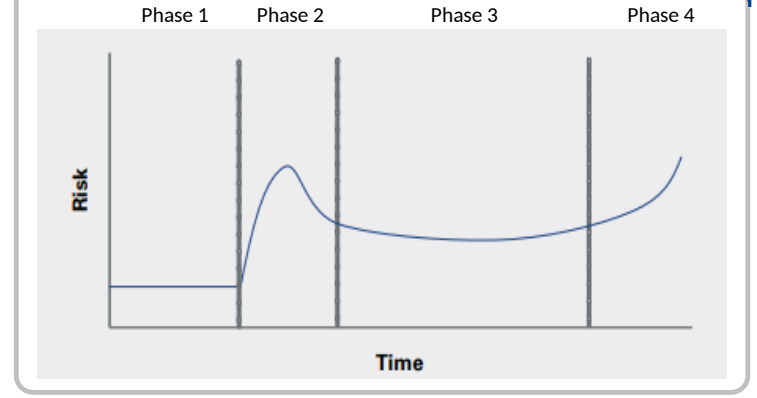
Cash Flow



Cumulative Cash Flow



Risk Profile



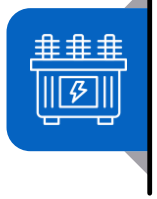
Phases Cash Inflow Cash Outflow

Source: Kpmg Report- renewable energy valuation in global energy transition

Revenue Model

Revenue = Contracted Tariff × Actual Energy Generated

Actual generation (and hence revenue) is driven by the following operating and resource factors



1. Capacity (MW Installed)

- Represents the maximum possible output of the plant under ideal conditions.
- Higher installed capacity directly scales revenue potential under fixed tariffs.
- Capacity addition is often phased, impacting ramp-up of revenues post-COD.

2. Plant Availability (%)

- Measures the percentage of time the plant is technically capable of generating power.
- High availability reflects strong O&M practices and equipment reliability.
- Availability shortfalls can trigger penalties or reduced billing under PPA terms.

3. Irradiation/ Resource Availability

- Refers to solar irradiation (for solar) or wind speeds (for wind projects).
- Natural variability directly impacts energy output despite constant capacity.
- Long-term P50 / P90 resource assessments are used to estimate sustainable revenues.

4. Performance Ratio (PR)

- Indicates the efficiency of the plant in converting available resource into usable electricity.
- Accounts for losses due to temperature, inverter efficiency, wiring, dust, and degradation.
- Higher PR signals superior design, technology selection, and O&M effectiveness.

5. CUF/PLF (Capacity/Plant Load Factor)

- Represents actual generation as a percentage of maximum possible generation.
- Captures combined impact of resource quality, availability, PR, and curtailment.
- CUF/PLF is a critical metric used by lenders and investors to assess revenue stability.

6. Downtime & Curtailment

- **Downtime:** Generation loss due to equipment failure, maintenance, or grid outages.
- **Curtailment:** Forced reduction in generation due to grid congestion or off-taker constraints.
- Increasing curtailment risk is driving adoption of **hybrid, storage, and RTC PPAs.**

Structural Enhancements to Revenue Stability

- **Long-tenor PPAs (20-25 years)** provide tariff visibility and cash flow certainty.
- **Hybrid & RTC structures** smooth generation profiles and improve offtaker value.
- **Policy-linked incentives** (where applicable) can provide upside, subject to regulatory stability

Cost Framework

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Renewable energy projects are capex-heavy and opex-light, with most lifetime costs incurred upfront before COD(Commercial Operation Date), followed by stable and predictable operating expenses.

1. Operations & Maintenance (O&M)

- Covers routine maintenance, breakdown repairs, spares, cleaning (especially critical for solar), and site operations.
- Typically contracted under long-term O&M agreements, providing cost visibility.
- Directly impacts plant availability, PR, and long-term revenue sustainability.

2. Insurance

- Includes coverage for property damage, business interruption, natural calamities, and liability risks.
- Premiums are relatively stable and often fixed or inflation-linked.
- Protects cash flows against low-probability, high-impact events.

3. Asset Management Fee

- Paid to the asset manager overseeing technical, commercial, and contractual performance.
- Includes compliance monitoring, PPA management, reporting to lenders/investors, and covenant tracking.
- Enhances governance, reduces operational risk, and supports refinancing or monetisation.

4. Monitoring Fee

- Covers real-time performance tracking systems (SCADA, data analytics, alarms).
- Enables early identification of underperformance, downtime, or grid issues.
- Supports optimization of generation and faster corrective actions.

5. Finance Cost

- Comprises interest on debt, commitment charges, hedging costs (if any), and refinancing expenses.
- A key determinant of project IRR, DSCR, and equity returns due to high upfront leverage.
- Sensitive to interest rates, debt tenor, and project risk perception.

6. Cost Structure Characteristics

- **High upfront capex →** front-loaded investment risk.
- **Low and predictable opex →** stable long-term cash flows.
- **Financing efficiency** often matters more than marginal opex savings.

Asset Life & Cash Flow Dynamics

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Renewable energy assets typically have a **20-25 year economic life**, closely aligned with **PPA tenures**, resulting in long-duration, predictable cash flows with limited reinvestment requirements.

Power Purchase Agreement (PPA)

- Long-term PPAs (typically **20-25 years**) provide revenue visibility and pricing certainty.
- Tariffs may be fixed, escalated, or partially indexed, influencing long-term cash flow profile.
- Offtaker credit quality and PPA enforceability are key determinants of cash flow stability.
- Post-PPA, assets may shift **to merchant sales, contract renewals, or captive/ RTC structures.**

Tenure (Asset & Contract Life)

- Asset life broadly matches PPA tenure, enabling full recovery of capex and debt amortization.
- Debt is typically structured with a shorter tenor than PPA, allowing post-deleveraging equity upside.
- After PPA expiry, assets often retain residual value due to:
  - Remaining useful life of equipment
  - Lower operating costs post debt repayment
  - Repowering or technology upgrades

Cash Flow Profile Over Asset Life

- **Pre-COD:** Negative cash flows due to capex and financing costs.
- **Post-COD:** Stable operating cash flows with high visibility.
- **Mid-life:** Limited capex for inverter replacement / major maintenance.
- **Late-life:** Optional repowering, life extension, or PPA renegotiation enhances terminal value.

Core Financial & Operational Metrics

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KPI

- **Capex/MW:** Measures the capital cost required to install 1 MW of capacity, indicating project cost efficiency.
- **Net Production (MWh/MW):** Represents annual energy generated per MW after losses, reflecting asset utilization and performance.
- **Revenue ($/MWh):** Average realized price per unit of electricity sold, capturing tariff quality and pricing power.

Debt Ratio

- **Leverage (% -Debt/Capex):** Indicates the proportion of project cost funded through debt, reflecting financial risk and capital structure.
- **DSCR:** Measures the project's ability to service debt from operating cash flows, with higher ratios indicating stronger debt coverage.
- **Debt/EBITDA:** Shows how many years of operating earnings are required to repay debt, indicating balance sheet leverage

Return Metrics

- **Project IRR:** Returns generated by the project based on total invested capital, independent of financing structure.
- **Equity IRR:** Returns earned by equity investors after accounting for leverage and debt servicing.
- **Payback Period:** Time required to recover the initial investment from project cash flows.
- **Discounted Payback Period:** Time required to recover the initial investment considering the time value of money.

Valuation Methods – Renewable Energy

1. Income Approach (Primary Method)

2. Market / Multiple Approach

3. Cost Approach (Limited Use)

1. Income Approach (Primary Method)

Discounted Cash Flow (DCF)

- Values renewable assets based on **long-term, contracted cash flows** under PPAs (typically **20-25 years**)
- Cash flows driven by:
  - Contracted tariffs
  - Expected generation (CUF/PLF assumptions)
  - O&M costs and financing structure
  - Asset life and residual value
- Best suited for **operational and contracted renewable projects**
- Captures the **annuity-like, infrastructure cash flow profile**
- **Cost of Capital**
  - Valuation commonly benchmarked using:
    - Project IRR (equity perspective)
    - WACC (enterprise valuation)

Discount rates reflect

- **Offtaker credit quality**
- **Regulatory risk**
- **Technology maturity** (solar < wind < storage)

India utility-scale renewables typically valued at **lower risk premiums vs other infra** due to contracted revenues.

- **Exit Value or Termination Value**: In a DCF, it represents the present value of all cash flows beyond the explicit forecast period, capturing the company's long-term value once it reaches a stable growth phase.

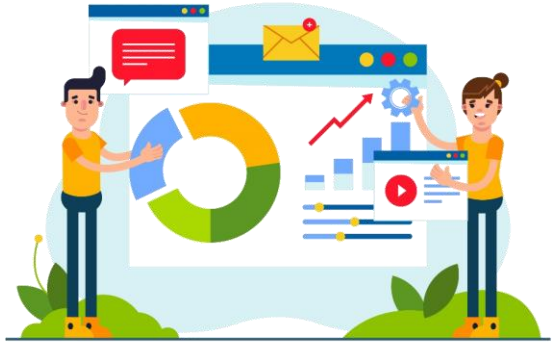
2. Market / Multiple Approach

EV per MW (Capacity-Based Valuation)

- Benchmarks enterprise value against installed capacity
- Commonly used in asset acquisitions and platform transactions
- Valuation influenced by:
  - Technology mix (solar, wind, hybrid)
  - Project maturity (operational vs under construction)
  - Tariff profile, offtaker quality, and leverage

EV/EBITDA

- Applied to **operational and stabilised renewable platforms**
- EBITDA reflects steady-state performance due to:
  - Low fuel costs
  - Limited operating variability post-commissioning



Transaction/M&A Comparables

- Uses valuation benchmarks from:
  - Renewable asset sales
  - Platform acquisitions
  - InvIT monetisation transactions
- Provides market-based reference for similar asset profiles

3. Cost Approach (Limited Use)

Replacement Cost Method

- Estimates value based on the current cost of developing similar renewable capacity
- Adjusted for:
  - Asset age
  - Technology efficiency
  - Remaining useful life
- Typically used as a **secondary reference or reasonableness check**

Conclusion

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Renewables Are Now Core Global Infrastructure

Renewables account for >80% of net global power capacity additions, with ~700 GW added in 2024 alone. Long-term PPAs and regulated markets provide annuity-like, stable cash flows post-commissioning.

India is on a Structural Growth Trajectory

India's installed renewable capacity has grown at a 19.03% CAGR (FY16–FY25), with renewables now at ~48% of total installed capacity. The government's **500 GW non-fossil fuel** target by 2030 provides long-term policy and investment certainty.

The Revenue & Cost Model is Built for Predictability

Revenue is driven by **Contracted tariffs X Actual generation** - underpinned by CUF/PLF, plant availability, and resource quality. The cost structure is capex-heavy but opex-light, with high cost visibility through long-term O&M, insurance, and financing agreements.

Energy Storage is the Critical Enabler

Total storage requirements are **projected to surge from ~16.1 GW (FY27) to ~73.9 GW (FY32).** BESS and PSP combined need **~336 GWh of optimal capacity** by 2030, against a current pipeline that leaves significant headroom -making storage a major investment frontier.

DCF is the Primary Valuation Tool, Supported by Market Multiples

Renewable assets are bestvalued using DCF, given their contracted 20-25 year cash flow profile. **EV/MW and EV/EBITDA multiples** from comparable transactions and InvIT monetisations serve as market-based cross-checks, while the replacement cost method provides a reasonableness floor.

Thank You…!

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