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Adaptive Corporate Governance and the Cost of Capital: Market Structure of India's Renewable Independent Power Producer (IPP) Sector and Other Dynamics

Introduction

The Indian government targets 500 GW of renewable energy capacity by 2030. This requires a 40-50 GW increase in renewable capacity per year and hundreds of billions of dollars of capital, private and public, for deployment, which makes it one of the largest infrastructure buildouts in the world. The Indian utility IPP market is a reverse auction market with no product differentiation, which by design is a race to the bottom for revenue tariffs. This mechanism is designed to create an ecosystem of private utility-scale players in the market that are technologically efficient, deeply innovative, and in the long run operate on minimal to zero economic profit. However, this has paradoxically led to a two-tiered valuation structure for publicly listed firms: a small number of firms command large multiples based on high growth expectations, and the rest command cash-flow anchored and conservative multiples. We use EV/EBITDA multiples primarily for valuation here, since 70-80% of a firm’s funding base is via debt, making it highly capital structure dependent. The central analytical goal of this essay is to understand and grapple with this gap.

This sector has an underlying time-bound competitive market structure that drives its dynamics. The potential for value creation and destruction for an investor is conditioned on the length of time an investor seeks to remain deployed in this sector. This shapes the essay’s perspective on how the market structure evolves as a result. In the short run (0-3 years), technological moats are a dominating force, allowing leaner and more nimble market players, with strong execution skills, to make disproportionate profits. In the medium term (3-6 years), government demand led distortions create enough space in the market for firms of various sizes to survive through opportunistic tender bidding and other moats, such as grid connectivity and wind power generation execution skills. In the long run (7-10 years), cost of capital is a dominating factor. In this time frame, the execution skill moat decreases and the cost of capital as a factor develops a lever arm large enough to dominate the other competitive forces across large scale capacity producers in this sector. A fluid cohort of small and nimble firms that chase opportunistic and technology enabled tenders is likely to persist. Power producers that can raise capital at sovereign or near sovereign credit ratings will have a tendency to dominate the majority of the high revenue, large capacity tenders.

A single factor connects and explains these competitive dynamics across all three time horizons. This factor is systematically under indexed by foreign investors and over indexed by domestic ones. It is corporate governance. Corporate governance has traditionally been treated as a binary variable that is largely static in nature. However, in this sector it is much more conditional and dependent on the operating scale and context of that individual firm, which is in contrast to what traditional ESG frameworks suggest. Indian infrastructure operates in an environment that has significant interface with regulatory bodies, land acquisition complexity, DISCOM payment dynamics, and a high degree of regulatory burden. This produces outcomes that cannot map onto traditional Western quality perspectives. This essay proposes an adaptive corporate governance framework that is specific to markets where firms' order books are made up of almost entirely of governmental tender procurement agencies. Here the relationship between governance and value creation is counterintuitive, acting in a non-linear way that has significant implications for how this market should be analysed and firms within it should be valued.

The structure of this essay unfolds in two sections. The first section covers industry structure, underlying operational dynamics, and features that make it analytically distinct. The second section develops the market structure thesis regarding the evolution of this industry across the short, medium, and long run time horizons, and why adaptive corporate governance is a key insight that connects this together. This analysis is the central goal of this essay. It carries with it structural, investable implications that are illustrated through a convergence trade based upon the compression of the valuation multiples between the two tiers of listed firms, and through two ideas for private capital deployment.

Section 1

1.1: C&I versus utility IPPs:

We begin by defining the scope of this analysis. Within IPPs a large distinction can be made based upon the final consumers of the electricity generated: utility producers which service the needs of the government versus commercial and industrial (C&I) producers which supply energy to individual firms.

C&I IPPs typically involve firms that generate and sell renewable electricity (typically solar) to individual firms at a lower tariff rate than they would pay to state DISCOMs. C&I IPPs make revenue based upon their spread between cost of generation and the price the individual firm pays. These projects are typically smaller in size, shorter in tenure (5-15 years), and more customized to fit the needs of individual firms. Electricity is usually generated in areas that are near in geography or generated elsewhere and provided through open access (the act of generating electricity in a different location and using the public shared grid for transmission). This results in regulatory exposure for firms that utilize open access as several states have made this process more difficult and costly, reducing spreads to protect DISCOM revenue. The main participants in this niche are CleanMax, Amplus, Radiance, and Cleantech Solar.

Utility-scale IPPs typically build much larger capacity projects with a longer tenure (usually 25 years), with the goal of supplying energy to a state DISCOM or to the central government through agencies like SECI under power purchase agreements (PPAs) at a fixed tariff. This results in a business enterprise where the counterparty has sovereign or near-sovereign credit ratings (unlike those in C&I where cash flows are contingent on the business being operational and solvent for the length of the contract period), resulting in highly predictable and contractually fixed cash flows. The key risks in this industry are execution risk (building and operating the needed technology in a cost-efficient manner), grid connectivity (securing grid access in desired locations), and state DISCOM creditworthiness (timely payments). Revenue is directly determined by the spread between the cost of production and the fixed, pre-determined tariff. The main participants in this niche are Adani Green, ReNew Power, Greenko, NTPC Green, and ACME Solar.

This essay focuses on utility-scale IPPs where the product is homogenous, the counterparty risk is minimal, and, therefore, execution and capital costs become the dominant factors determining the profitability of a firm.

1.2 Tendering Mechanisms:

We now talk about the general tendering mechanisms in this industry. The bidding process happens through the TBCB (Tariff-Based Competitive Bidding) guidelines set by the Ministry of Power. There are different agencies based upon whether the government tender is ISTS (Inter-State Transmission System) or STU (State Transmission Utility). This determines whether the offtaker is a state specific DISCOM or central nodal agency such as SECI, NTPC, NHPC, SJVN, etc. These determine if the project is localized to a specific state during the tender process or if the firm has freedom of where they can build the project and provide it to individual DISCOMs via the shared interstate grid. Each tender provides specifications on technology type (pure solar, hybrid, FDRE), tenure, location flexibility, and VGF (Viability Gap Funding) eligibility.

The bidding process follows two stages. A NIT (Notice Inviting Tender) is created followed by a RfS (Request for Selection). At first there is a minimal technical and financial qualification stage that determines the universe of acceptable bidders, followed by a second reverse auction e-bidding stage. This results in the lowest tariff bidder (L1) winning the auction and getting awarded a Letter of Award (LOA), which precedes the formal PPA. In centrally procured ISTS tenders, SECI acts as an intermediary between the final state DISCOM that ultimately receives the energy and the IPP. SECI then signs back to back legally binding power purchase agreements (PPAs) with the IPP and power sale agreements (PSAs) with the state DISCOM resulting in an insulating effect for both parties. In non-centrally procured tenders this process takes place directly between a state DISCOM and IPP. This process usually takes at most 12 months to take place with any LOAs that have not been converted to PPAs within 12 months being referred to as stranded LOAs, which usually occurs because of PSA delays due to overbuilt capacity, grid connectivity issues causing PPAs to fail to be executed, DISCOM regulatory approval challenges, land acquisition related failures, or changing commercial terms during negotiation such as excess tariff compression. Once a PPA is signed, contractual requirements usually dictate that capacity is constructed and becomes operational within 24 months. There is leakage at every stage of this process and delays are getting increasingly prominent due to grid congestion in specific high irradiation states, such as Rajasthan, Andhra Pradesh, and Karnataka. This e-reverse auction mechanism results in price being the only variable for firms to compete on once they are eligible. ISTS tenders attract a larger degree of price competition and have a lower potential spread, however, the STU framework creates scope for state specific specialists to exist and compete.

1.3 Historical evolution and tariff dynamics:

In this section, we address the historical evolution of the renewables based utility IPP industry. The Indian renewables based utility IPP sector has distinctly evolved in several distinct phases historically, each with its own quirks and large theme that sets the underlying competitive dynamics. The story of this sector is one of technological disruption as an initiating factor, and then cost of capital being a mean reverting factor that slowly overwhelms other competitive forces.

<u>Phase One: Solar Commoditization, Low hanging fruits, and Tariff Floors (2010-2017):</u>

This phase was one dominated by exploration and economic viability discovery of this sector. Driven by VGF and initially launched under Jawaharlal Nehru National Solar Mission (JNNSM) in 2010, this was India's first foray into the renewables based IPP sector and proved it technologically and commercially. In the early years (2010-2013), tariffs were incredibly high by today's standards reaching INR 17/kWh in 2010-2011. This reflected the high financing costs and high technology costs associated with each module in terms of solar cells, basic inverters, etc. Projects in this era were highly concentrated in Rajasthan, Gujarat, and Andhra Pradesh due to their high irradiation levels and high solar yields, which drove the capacity utilization factor (CUF) higher. Then due to China entering the solar cells and module sector with vast manufacturing capacities, there was rapid tariff compression due to falling operational costs, resulting in tariffs of ~INR 6/kWh by 2016-2017. Due to renewables based electricity being entirely homogenous in nature this entire reduction in cost was almost entirely passed onto the consumer due to its monopsony like nature. This resulted in the existence of a significant first mover advantage as firms that had historically successfully delivered projects on time were able to raise debt capital at lower interest rates reducing their WACC. This factor is especially heightened as, due to predictable cash flows, the capital structure of firms in this industry is highly funded via debt structures (typically 70-80% debt versus 30-20% equity financing). This results in firms that can raise more debt at a lower interest rate having magnified ROEs. This tariff compression shock became undeniable in 2017 when ACME Solar placed a record low bid of INR 2.44/kWh and SBG Cleantech placed a record low bid of INR 2.45/kWh in Bhadla Phase-III Solar Park, Rajasthan for 200 MW and 300 MW of capacity respectively, acting as a turning point, which demonstrated that solar generated electricity was economically competitive to coal-fired sources. This also signalled a need for alternative means for competition as solar had reached a viability price floor for IPPs.

Phase Two: Wind and Solar Hybrids, Mid-Tier Traps and Regulatory Relief (2017 - 2022):

Phase two was dominated by a central theme of product differentiation as a result of execution excellence. Tariffs of pure solar had become commoditized and stabilized at INR 2.2/kWh – INR 2.7/kWh, with some bids falling below INR 2/kWh. In this regime small cost of debt differences of 20-30 basis points changed the commercial viability of a project. Then there was the introduction of innovative hybrid (wind + solar) projects in a single PPA that commanded a significant premium. Incorporating wind sources led to utility projects having a higher CUF as wind energy could be produced relatively smoothly 24 hours a day including evenings. The energy being produced via hybrids demanded a higher tariff rate as they were more valuable to state DISCOMs, as they had a smoother production profile with fewer intermittency issues. Hybrid tariffs would stabilize at INR 2.5/kWh – INR 3/kWh. This was dominated by a few innovative firms that chose to invest in wind energy as a production mechanism. Wind energy production had a large technological moat as it required different site selection criteria, different EPC supply chains, and different O&M requirements. This resulted in a great deal of operational complexity being introduced. However, eventually as more firms started to incorporate this technology, hybrid energy sources started to become commoditized, compressing spreads.

A significant problem in this era was high receivable days (days sales outstanding), usually 80-100+. This was historically a structural feature of this sector that led to significant working capital requirements. When tariffs were high, the financing cost of this capital and of delayed payments was manageable but painful, however, once tariff compression occurred and spreads fell significantly this became existential in nature. This problem had four structural drivers: state DISCOM financial weakness, lack of enforcement mechanisms, legal delays due to contested PPAs from states like Andhra Pradesh and Telangana, and absence of transparency mechanisms. Relief for these issues came in waves as the central government decided to make a change to this process. Firstly, centrally procured tenders became increasingly prominent with central nodal agencies, like SECI, acting as financial intermediaries, significantly reducing counterparty risks in these transactions. The PRAAPTI portal was adopted in 2018 which was the Ministry of Power's first systematic way for IPPs to report DISCOMs that had delayed payments, allowing the central government to monitor this data systematically and created long lasting reputational issues for DISCOMs that defaulted. The Ministry of Power notified the Electricity (Late Payment Surcharge and Related Matters) Rules of 2022. This resulted in escalating surcharges for delayed payments, EMI based structured repayments for accumulated payments, and stricter power supply regulations for defaulting states, leading to an increased threat of enforcement. This resulted in DISCOM legacy dues falling from INR 1.39 lakh crore in June 2022 to just INR 3,300 crore as of April 2026. This regulatory relief disproportionately helped firms that had a higher proportion of central offtakers, resulting in firms today bidding largely through central tenders and receivable days falling across the industry to below 30 on average.

This also resulted in a mid-tier firm squeeze. Large firms are able to raise capital with low interest rates and have significant ability to raise debt. Small firms are nimble and can focus on technological and execution excellence, with low overhead costs and opportunism. Several mid-tier firms, such as Suzlon Energy and Azure Power, have exited and/or restructured to become development and EPC based players and have divested from decreasingly viable legacy projects (rooftop based solar portfolio and pure solar commodities) in this regime due to execution difficulties and valuation challenges. This highlights how the primary driving forces for profitability are derived from capital structure or execution excellence, with mid-tier firms facing compression on both ends as the technological moat diffuses and ease of capital raising is related to scale.

By 2023, the grid had begun to reach a new form of structural equilibrium, as energy production became increasingly commoditized and tariffs compressed significantly. However, a factor intrinsic to the timing mismatch of electricity supply and demand became increasingly prominent. A structural problem in the grid began to appear.

1.4: FDRE, BESS, the New Competitive Terrain, and Supply Chains:

The electricity grid at its core can be thought of as economics in action, where the forces of demand and supply of energy attempt to find equilibrium in real time. Due to several physical factors such as grid frequency, which has relatively low tolerances of shifting built into it, and sociological factors such as human demand peaking in certain time periods we have electricity demand and supply gaps that are increasingly pronounced during certain times of the day. The electricity grid is a marketplace and solar energy has almost zero variable cost during the daytime, resulting in solar energy often being sold for the cheapest tariff rate in the real time market (RTM) during peak irradiation hours. This results in cheap electricity being available in daytime, and expensive energy tariffs at evenings and night time where there is a lack of low variable cost energy sources. This distortion in demand and supply results in a duck curve of electricity prices appearing every day, due to demand and supply imbalances. Paradoxically, the increase in pure solar electricity producers will only magnify this problem and steepen the price differences across different peaks. This is exacerbated to such an extent in recent years that solar energy often has to be curtailed in the daytime due to excess energy supply and a relative lack of ancillary grid services in India (frequency smoothening, etc.). As a result, solar energy producers without BESS capability are getting crowded out of the market, and today renewable based utility IPPs demand an increased amount of BESS capability with a recent Central Electricity Authority (CEA) advisory recommending a minimum of 2-hour BESS capacity for all new solar tenders equal to at least 10% of installed solar capacity. This has resulted in today almost all new government tenders having underlying technologies of FDRE (Firm and Dispatchable Renewable Energy) and/or Hybrid forms. This reflects a new competitive terrain where not only is it necessary for energy to be cheap, but also for it to be available reliably, smoothly, and across the entire day.

FDRE is this marketplace's response to the underlying economic and physical needs of the grid at large, representing renewable green energy that behaves like firm power. The market hierarchy for FDRE tenders can be split into several forms: assured peak, round the clock (RTC), load following, and peak specific. Each has its own intrinsic characteristics, tariffs and operational expertise needed associated with it. In assured peak tenders, developers guarantee power during specific peak windows (usually 90% availability across 4 specific hours/day), currently commanding tariffs of ~4.5 INR/kWh. RTC tenders require ~75-85% availability for 24 hours a day, commanding tariffs of ~4.7 INR/kWh and combining wind, solar, and BESS to achieve this. In load following tenders, developers must match DISCOM demand on an hour by hour basis across the length of the entire PPA. This process requires a high degree of technological, data, and operational sophistication. This is the most complex operationally and commands tariffs of ~5.3 INR/kWh, with the first load following PPA being signed by Vena Energy in July 2025, requiring significant adoption of wind sources. Peak specific tenders require charging batteries during the day and only dispatching them in a specific evening defined discharge window only, commanding the highest tariffs of ~6.7 INR/kWh. This represents a ladder of increasing tariff revenue as operational complexity increases for various FDRE tenders, showing how product mix has a hierarchal nature for technologically superior firms to make greater revenues.

BESS as a technology is still in its nascent stages with the most recent tenders for FDRE utility tenders that incorporate BESS coming up in the last three years. PPA tenders that utilize BESS in FDRE projects represent new operational challenges associated with them due to degradation built into battery systems that lose efficiency as they discharge over time and cycle throughout the day. Lithium-Iron-Phosphate (LFP) cells, the current commercial standard, degrade ~2.5% per year. This makes augmentation of BESS a certain future liability, not just a contingent one. Different operators may use differing duration assumptions. Due to fixed cash flows and potential penalties from undersupply, this can be deeply problematic for aggressive inexperienced bidders. Therefore, these bidders, who are chasing higher revenue tariffs, are likely to face issues decades into the PPA. As a result, there is significant first mover advantage for firms that have built their operational capability through innovation for BESS in Phase Two of this sector's history.

BESS technology has made more projects increasingly viable, while at the same time, making older production forms unviable. BESS can be largely divided into three forms based on how long they're designed to store energy: 2-hour, 4-hour, and 6-hour storage. 2-hour BESS forms usually charge and discharge in two cycles a day; 4-hour and 6-hour BESS storage systems cycle once per day. Recent rapid tariff compression has also affected the BESS markets, with projects using 2-hour BESS becoming economically unviable due to speculative bidding and procurement stalls. Solar sources generate energy only in the day so these longer BESS systems are essential for FDRE; however, solar and BESS alone are not enough for all forms, and tenders require wind due to its higher CUF and greater potential margins when balancing storage needs, especially for RTC and load following tenders, representing a technological moat for firms with superior execution capability in wind power production.

Apart from FDRE technology using BESS directly, some developers use BESS and act as merchants. In this case developers either use cheap energy from the grid at peak times, or co-located BESS systems with their own production chains to trade electricity in the RTM, making profits through arbitrage and other ancillary services. This has been highly profitable for firms to date; however, due to the rise of recent mega BESS projects from firms such as Adani Green in Khavda, which has built 3,530 MWh in 10 months and is targeting 50 GWh by 2030, and a dramatic increase in BESS capacity in India, merchant BESS led electricity arbitrage that does not provide any additional value is likely to have reduced economic profits in the coming years. As spreads compress, firms that excel in deploying complementary variable sources such as wind power alongside sophisticated dispatch and ancillary services capabilities will be the only ones who can sustain merchant BESS profitably, while pure arbitrage players will be squeezed out.

Mass capital flows into the battery sector in China have led to rapidly declining costs, making 4-hour and 6-hour BESS systems commercially viable while reducing viability of legacy 2-hour BESS systems. Indian firms mainly act as integrators and/or assemblers of BESS systems, with the imported components (cell manufacturing, module assembly, DC block) representing roughly 55-60% of the landed cost of the final BESS system in India. This represents a significant supply chain risk as almost all BESS and solar components are imported from China, representing a long term risk as India begins to adopt FDRE systems for its utility based renewable IPPs as the effect of procurement stalls becomes a long term threat to the energy strategy of India.

The third phase of the market represents one where innovators of the past, who have become experienced in executing wind power systems and have been early adopters of BESS, are structurally advantaged. However, large scale producers are using overwhelming capital to reduce this advantage. Grid connectivity is becoming an existential threat to the entire sector at large, irrespective of a firm’s size. The technological moat that lasted much longer in the past is beginning to compress in a faster timeline. Yet, the technological moat and variety in product mix with different levels of profitability raise questions with regards to valuation due to differing spreads, especially when predicting long-term growth dynamics and the cross-correlation of innovation, capital, and governance.

Section 2:

2.1: The Three Layer Competitive Framework

In this section we assert that three competitive forces are primarily driving this market. They are technological moats, government led demand pull distortions, and capital. The competitive structure resolves in complex ways, depending on the time horizon we look at, as differing moats diffuse and let other forces dominate.

2.1.1 The Short Run (0-3 years): Technological Moats, Rapid Diffusion, and Inevitability

In the short run (0-3 years), technological moats hold and let nimbler players win disproportionately and expand rapidly. We can observe that each technological window (bifacial, trackers, hybrid, and now BESS) historically allowed these execution-driven, technology-first nimbler players to get higher economic profits for two to three tender cycles before larger players were able to reliably underbid them. Today, the technological moat and differentiator that exists is in wind energy execution abilities (as seen in 1.3 (Phase Two) and 1.4), with it being a key prerequisite for higher tariff FDRE tenders. A key insight is that due to increasing amount of attention and capital headed towards this sector, with regulatory burdens now easing, the durability of this technological moat has shortened, with faster adoption of new technology across this industry. The Adani Khavda mega BESS development is a key example of this. They built 3,530 MWh in just 10 months, and are targeting 50 GWh of capacity by 2030. BESS requires a high degree of operational excellence which scales only with experience via accumulated days of operation. Dispatch algorithms, degradation calibration, and thermal protocols are all essential experiential abilities that can only be earned. By the time a mid-tier player accumulates 500 MWh of experience Adani has orders of magnitude more experience, with multiple technology iterations. This showcases a willingness of larger firms to innovate in a faster timeline, compressing the technological moat diffusion timeline.

We also see that technological innovation is a core attribute of this industry, and its presence and resulting phase changes are inevitable while electricity price arbitrage exists across the entire day. When solar generation was cheap every incremental solar only producer cannibalized the midday prices (negative feedback loop), while raising the value of storage (positive feedback loop for BESS). This has resulted in the FDRE/BESS transition being a structurally irreversible ratchet, and not just a temporary phase. Similar feedback loops exist whenever price arbitrage exists and technological progress attempts to smoothen price tariffs across the day. This dynamic is reflexive in the Soros sense. Solar energy's own success systematically creates the conditions that reduce the economic viability of more solar production. This forces the competitive terrain toward FDRE tenders being adopted, and in the transitional whitespace, merchant BESS has acted as a bridge. This creates significant first mover advantages for players who have already built storage and wind capability. This transition is not due to exogenous policy pressure, but instead due to an endogenous market dynamic, which is primarily driven by the sector's own growth.

2.1.2 The Medium Term (3-6 years): Policy Distortions and Shrinking Timelines

The government has demanded a renewable energy based utility target of 500 GW of contracted capacity of tenders by 2030. This is a significant undertaking (as described in the introduction). No one firm has the capacity or capital to achieve this without extreme leverage, creating an implicit incentive for the market to have multiple competing firms. In an unmanaged, completely free market with no VGF, the cost of capital flywheel would have already resulted in significant industrial consolidation. As described in section 1.2, the ISTS versus STU based tendering mechanism creates further government distortions promoting a much richer competitive environment, while creating space for mid-sized firms to exist as state specialists. Must run status flags for government tenders, reliable cash flows (through regulatory relief described in Phase Two, section 1.3) de-risks revenue for all players regardless of scale. Furthermore, specialised auxiliary services create space for technologically mobile firms to operate; however, this whitespace reduces over time. Development finance institutions (DFIs), such as IFC, BII, Norfund, and various GOI MSME schemes, deliberately provide below market capital for small-scale operators. However, a lot of this capital is earmarked for new frontier projects and may not be a correct comparison for commercial firms. This regulatory and policy driven gap in the market is likely to reduce in significance in the long run as the market matures and policy goals are attained, while providing an opportunity for small firms to use this as a launching pad and transition into larger, more defensible entities.

2.1.3 The Long Run (7-10 years): Cost of Capital Flywheel and Oligopolistic Steady States

We assert that when technological moats diffuse and government led distortions in the market lose their efficacy then cost of capital is the sole lingering, long-term, and defensible moat that remains. In other words, as the time horizon of investment increases, operational excellence and technological moats becomes increasingly fungible through accumulated experience, and cost of capital becomes a decisive force. The sovereign 10 year yield rate is 6.85% (as of mid-June 2026), AAA PSU (public sector undertaking) paper has yields of ~7.2-7.6%, strong AA- private players in this industry have ~8.4-8.6% weighted average cost of debt (WACD), and mid-tier renewable based IPPs have 9-10% WACD, as of writing this paper (mid to late June 2026). These spreads are substantial, and over a 25 year lifetime contract of a PPA, they make up a substantial component of valuing contractual NPVs for each project. The gap in WACC of these firms is a primary driver for the valuation multiple gap. A lower WACC creates the possibility for a lower bid floor for firms acting as a driver to both increase profitability, through greater spreads, and for greater revenues, due to the reverse auction structure. This is a reflexive loop resulting in lollapalooza like effects as lower bid floors directly lead to more tenders won, which increases operational capabilities, improves credit ratings, and further reduces WACC. By raising funds in foreign denominated bonds that have a lower cost of debt associated with them, some firms due to their massive scale are able to take advantage of currency related interest rate arbitrage to reduce WACC, which is particularly prominent in this sector due to ~55% of green debt in India being USD denominated. However, this mechanism is asymmetric in nature. This creates significant tail risk due to FX changes, and even though this gives a WACC advantage to larger firms, this embeds a depreciation risk that is not fully hedged. Credit crunches that occur due to sudden credit narrative breaks represent discrete events that can raise interest rates and trigger partial asset sales due to an inability to service debt. This is a prominent risk for firms that are heavily leveraged with low duration variable interest rate bonds, and acts as a potential mitigant to this idea.

We can also see cost of capital, which is directly related to scale and market capitalization, faces discontinuous barriers by BESS adoption and from a shift to FDRE tenders. BESS costs represent a dramatic increase in the cost of projects, resulting in a squeeze for smaller firms and eliminating firms that could have competed in a pure solar power production capacity. We can observe that supply chain risk also becomes especially prominent in this time scale, and it asymmetrically presents itself to smaller players by amplifying their cost of capital disadvantage. Large players are able to hedge against this by large volume deals (for example ACME Solar's 3.1 GWh BESS order from Zhejiang Narada and Trina Storage), multi-year contracts, supplier diversification, and vertical integration (for example Adani Group's Mundra solar manufacturing facility). Smaller players are forced to purchase through one-off contracts or on the spot market, facing much more volatility and exogenous effects that determine the economic viability of projects ex post facto. This suggests that, in the long run, the steady state of the market is an oligopoly of two to four firms, matching with predictions of natural oligopolies in markets with high fixed cost barriers to entry.

2.2 Adaptive Corporate Governance

A major factor that compresses valuations in this sector is poor corporate governance. Several prominent publicly listed firms face depressed valuations as a result. In this section we argue that corporate governance should not be treated as a binary attribute of firms, as seen in most ESG frameworks. It is important to note that corporate governance issues are prominent in this sector due to several factors such as related-party EPC contracts, promoter concentration, holding-company opacity, inconsistent accounting in terms of revenue recognition and expensing self-built EPC projects, and continuous interactions with government agencies for large land purchases and bidding of tenders. These create numerous opportunities for corporate governance issues to be flagged; however, we assert that these are adaptations to the Indian infrastructure sector's operating environment that are common across most sectors where the government is a major source of revenue. We argue that corporate governance has a dual nature here, and its value accretive and destructive effects are based largely upon a firm's scale. Furthermore, institutional capital that screens firms by these same frameworks is likely to be underweight the long run winners.

The operating environment of this sector results in these governance structures being a natural outcome. The utility scale tenders being announced in India require navigating complex auction mechanisms. This, alongside the informal relationships that have been taking a reduced but non-negligible role in the tendering processes, results in these structures being a byproduct of the present system. Land acquisition of large swaths of land, which often have unclear titles in rural areas, requires navigating local political institutions that act as substitutes for highly functioning and regulated real estate markets. Additionally, grid connectivity has become a key factor behind delays in markets today and states with high irradiation, such as Rajasthan and Andhra Pradesh, are likely to have even more stressors on this factor, resulting in grid connectivity timelines becoming a function of relationships with state electricity boards and not contractual rights. This is magnified due to large heterogeneity amongst states of rules and regulations. These frictions act as institutional voids that opaque corporate governance attempts to solve via market forces. Problematic governance structures are outcomes of these large socio-political mechanisms. Standalone IPPs with arm's-length external financing and a clean governance structure face systematic disadvantages against promoter-controlled conglomerates.

The idea of the dual nature of corporate governance is not novel, but instead is derived from existing theoretical frameworks and empirical evidence. Khanna and Palepu in “Is Group Affiliation Profitable in Emerging Markets? An Analysis of Diversified Indian Business Groups”, which was published in 2000, highlighted how diversification in Indian business conglomerates had a U shaped relationship with performance: Indian business groups destroyed firm value up to a threshold level of diversification and created value beyond it. The mechanism is created when in emerging markets with clear institutional voids large diversified groups developed internal mechanisms, such as capital, product, and labor markets, that acted as substitutes for external institutions, which were weak, unreliable, or flawed. This U-shaped relationship acts as the theoretical foundation for the scale conditioned adaptive corporate governance mechanism we propose. This internal capital allocation mechanism that overpowers the negative aspects of poor corporate mechanisms in conglomerates is analysed in Jeremy C. Stein’s 1997 paper titled “Internal Capital Markets and the Competition for Corporate Resources”. In this paper, Stein explains and formalizes the process of "winner picking" in diversified firms as a mechanism for the efficient allocation of resources. He demonstrates that a firm's headquarters can allocate resources to more efficient and profitable projects, while moving them away from weaker ones and acting within the firm's overall credit constraints. This reallocation process can create value for the shareholders of the firm. Within the renewable IPP sector context, conglomerates can cross subsidize tenders, selectively fund the most attractive projects in a given auction cycle, and redeploy capital across projects that smaller firms reliant on external financing with fewer active projects at any given point of time cannot. This structurally disadvantages firms with strong governance mechanisms, who restrict cross allocations and intermingling of accounts, and firms of smaller scale.

While the above attributes paint a theoretical picture of only positives this mechanism is contested and highly dependent on the individual firm's culture and execution capabilities. David S. Scharfstein and Jeremy C. Stein, in their 2000 paper "The Dark Side of Internal Capital Markets: Divisional Rent-Seeking and Inefficient Investment", show how empire building and rent seeking behaviour within divisions in a firm can lead to inefficiency and misconduct. Strong groups within a firm can extract value from a weak CEO and produce socialism-like cross subsidization effects, where cash flows are directed from stronger projects to weaker ones to ensure their continued existence. This is a form of the principal-agent problem occurring, where individual managerial goals are antithetical to the firm's larger goals. However, this exact form does not match the Indian IPP context as there is no weak principal, but instead a strong promoter controlling capital from a top down perspective. Concentrated strong promoter control produces value creation through winner picking; however, the primary corporate governance issue that occurs here is that of tunnelling of funds from minority shareholders to the promoter. The agency cost changes form from socialist-like internal corporate markets to tunnelling.

Bertrand, Mehta, and Mullainathan in "Ferreting out Tunneling: An Application to Indian Business Groups", a paper which they published in 2002, documented that the repercussions of this corporate governance failure are significant in the Indian context. They provided significant evidence of corporate malfeasance that occurred primarily through the manipulation of nonoperating profit items, one time exceptional write-offs, and unspecified items, rather than through operating profit suppression. In the

American and Western context the larger issue is that of internal rent seeking behaviour causing internal capital distortions, which is unlike the behaviour of corporate malfeasance in promoter controlled Indian firms.

We provide a mechanism for scale conditioned effects due to corporate governance failures. At small scales, the firm bears a significant tunnelling risk and there is insufficient scale for institutional substitution and winner picking benefits to dominate. At large scales, in an environment where there are substantial governmental voids a rational promoter has decreased incentive to tunnel as the firm's operational value is greater than the extractable surplus for the promoter. Similarly, the internal capital market effects via winner picking and internal market substitution have enough scale to provide significant benefits. This creates a reflexive loop via an inflection point argument that once a firm achieves a certain scale for a promoter to value it more as a going concern, the benefits become value creative and compound.

The primary mechanism for value extraction for promoters, as identified earlier, was primarily through one-off exceptional items and nonoperating profit items, and this requires accounting opacity and weak external disclosures. At sufficient scale firms expand and raise outside capital and attract external institutional investors. This marks a durable phase change as outside investors through increased vigilance and scrutiny impose disclosure requirements, demand consolidated accounts, and reduce related party transactions. This closes, or at least highly restricts, the mechanism for tunnelling, acting as a reflexive loop. Scale attracts institutional capital that demands disclosure. This further compresses the mechanism for corporate malfeasance and lowers cost of capital. The lowered cost of capital funds further growth which reinforces scale advantages, demonstrating that governance and scale have significant cross correlations. This process further supports the adaptive corporate governance hypothesis we proposed.

This sector also has prominent PSU firms that operate in it, such as NTPC Green. In this case the state ownership structure of the firm is not a better version of a private conglomerate's governance but instead is a different form of corporate governance entirely. In this case, the sovereign balance sheet substitutes for political relationships and concentrated ownership. The sovereign ownership structure essentially acts as a substitute for the informal political benefits, land acquisition capabilities, and the navigation of the complex and state-dependent regulatory landscape for grid connectivity that private conglomerates achieve through opacity and related-party structures. Through sovereign backing, it is able to significantly reduce the frictions caused by voids in external institutions. NTPC Green and Adani Green solve for external institutional voids through different mechanisms. This does not contradict the adaptive corporate governance hypothesis but instead provides an alternate mechanism for the same voids being dealt with via PSUs.

2.3 Two Tier Valuation Gap, Convergence Trade, and Private Capital Deployments

As of writing this essay the following firms have trailing EV/EBITDA ratios as specified, NTPC Green: ~41x, Adani Green: ~31x, ACME Solar: ~16x, ReNew: 9x (NASDAQ listed), and multiple private players trade alongside similar valuation multiple lines in the unlisted market. This showcases a two tier valuation gap for how the market values the risk adjusted returns and growth of larger versus smaller firms. This gap represents the market's recognition of the fundamental forces we mentioned above: the short run technological moat, the medium run government led demand distortions, the long run cost of capital flywheel, the adaptive corporate governance hypothesis, and the corresponding cascading effects as these have strong cross correlations. The gap shows that the market is directionally correct, and the premium tier represents the likely firms that will be part of this sector's long term oligopoly-like market structure. This gap also represents a dynamic and reflexive equilibrium for the market. Once firms trade at higher multiples, they can raise equity capital cheaply, fund a larger number of diverse projects, invest more in innovation, and sustain higher growth, ultimately justifying the higher multiples. A lower multiple for firms on the discount tier raises their cost of equity capital, constrains growth, and compresses profitability, ultimately justifying their low multiple. This is a primary factor for why the gap is sustained and is not eliminated via arbitrage.

We make use of the pari-mutuel mental model and assert that these "obvious" reasons for the valuation gap have led to excess capital flows into richly priced firms, while leading to decreased flows to the discount tier of firms. The implied odds of substantial above-market returns from investing in the premium tier of these utility based renewable IPPs have become unfavourable due to their multiples getting heavily stretched, which is clear from the required long term growth rate these multiples imply. At the same time, the implied odds for the discount tier of firms are getting increasingly favourable. We argue that the market is treating the large players as the obvious winners and pricing their odds accordingly, leaving the mid-tier firms underbet relative to their actual probability of capturing the white space that is likely to be persistent in this sector for the foreseeable future, especially firms that have shown a great deal of skill in execution and sustained first mover technological adoption. We believe this rerating is likely to occur when tender pipeline converts from execution-risk-discounted LOA capacity into contracted PPA cash flows, making the cash flows contractually obligated and predictable. As this conversion takes place, the risk discount for the discount tier of firms is likely to compress and the reflexive loop sustaining this gap is likely to reduce in efficacy. The FY28-30 cycle of tenders is likely to be a catalyst for the same as the cash flows become contractual, giving opportunities for firms with lower credit ratings in the discount tier to refinance their debt capital and take advantage of the virtuous cycle present for the large scale firms in this industry. Therefore, we argue that a multiple convergence trade by taking a long position on the discount tier and a short position on the premium tier provides opportunity for uncorrelated alpha.

There are significant caveats that can lead to this trade's outcomes being delayed or not attractive enough. There is significant tail risk as the short of the premium tier requires betting against firms that have significant market influence, captive demand, strong political ties, and a reflexive recovery history. The convergence timeline is also uncertain; however, once significant contractual cash flows exist in a firm and profitability stabilizes, it may be delayed but inevitable. The pari-mutuel analogy is also not a perfect match here as it is possible that both tiers re-rate upwards. This seems highly unlikely given the historical ranges of multiples and the overstretched growth expectations the premium tier currently carries with it.

We also provide two compelling approaches for private capital to enter this industry that provide a strong opportunity for excess returns that is especially magnified with access to leverage, which has its roots in the same analysis that produced the convergence trade above. Private equity firms can exploit the same convergence thesis made earlier in the value chain with a larger entry discount. Pre-IPO and late stage private deals are particularly attractive in this sector as several discount-tier targets are accessible in private markets before they are publicly listed. However, this increased return is due to an illiquidity premium and a longer holding period. Platform based roll-ups are also particularly attractive in this sector. Mid-tier firms, due to their structural squeeze, are disadvantaged. There is significant opportunity for value creation due to an inflection point argument, as mentioned earlier. By consolidating subscale assets, which may be stranded or distressed, into a scaled platform, private equity firms can harness the cost of capital re-rating, as the scaled platform has lower credit risk than any individual firm, and the corporate governance re-rating, as the tunnelling discount is compressed, to achieve strong risk adjusted returns.

Conclusion:

A paradox that drives the renewable-based utility IPP market is how a reverse auction mechanism has resulted in a sustained valuation gap. Through a granular examination of this industry and the primary forces that drive it, we proposed a time-bound competitive market structure where the dominant forces shift over time. We attempted to answer this paradox through larger insights on ESG frameworks in developing markets and how some outward failures are economic responses to external institutional voids. Investing implications are derived not from a directional challenge to current market prices, but instead from an argument based upon a pari-mutuel mental model arguing that the odds are mispriced. We provide inflection point based arguments that rely on reflexive loops and leverage these to provide possibilities for excess risk adjusted returns in the public markets and two strong starting points for private capital deployment in this industry. A deeper theoretical question lingers that this essay has attempted to answer: firms' governance structures have been traditionally judged on absolute terms, but firms that have the most adaptive governance for the operating environment and the regime the sector is moving toward are likely to win. This has significant implications for ESG frameworks and mispricings in other politically sensitive sectors in India.

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