# "A Five-Year Analysis of Cost of Capital and WACC: A Study of Hitachi Energy India Limited"

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**ABSTRACT**

This study estimates the cost of equity (Ke), cost of debt (Kd) and WACC of Hitachi Energy India Limited, formerly ABB Power Products and Systems India Limited, over five reporting periods from FY 2021–22 to FY 2025–26, and benchmarks the results against ABB India Limited and Siemens Limited. Ke was estimated through CAPM with a Blume-adjusted beta, Kd through both the effective interest rate method and a rating-based method, and WACC using book and market weights. Ke ranged between 11.56% and 12.29%. Book-value WACC rose from 10.93% to 11.76%, while market-value WACC stayed between about 11.6% and 12.3%, as debt fell to below 2% of capital. The effective interest rate method produced implausible pre-tax rates of 20.6% to 37.0% for a AAA-rated firm, so the rating-based estimate of 5.4% to 5.8% after tax was adopted. At current market data, its WACC (12.02%) was close to ABB India's (11.79%) and below the RBSA capital goods benchmark of 13.9%, while the higher Siemens estimate (15.05%) reflects a demerger-distorted beta. The company's financing followed pecking order behaviour in normal periods but departed from it through a large equity issue in March 2025, which is consistent with market timing.

**Keywords:** *cost of capital, WACC, CAPM, capital structure, pecking order theory, market timing, power transmission equipment, Hitachi Energy India*

## 1. INTRODUCTION

The cost of capital links a firm's financing decisions to its investment decisions. It is the benchmark against which projects are accepted, businesses are valued and financing choices are judged. Modigliani and Miller (1958) showed that in a frictionless market a firm's value and overall cost of capital do not depend on its debt-equity mix, and Modigliani and Miller (1963) later showed that the tax deductibility of interest makes debt valuable. The trade-off theory holds that firms balance this tax benefit against distress costs (Berk & DeMarzo, 2020), while the pecking order theory argues that firms prefer internal funds, then debt, and use equity only as a last resort (Myers & Majluf, 1984). In practice, WACC is the hurdle rate in capital budgeting, and most large firms estimate it using CAPM (Graham & Harvey, 2001). In India, its inputs are more uncertain because interest rate cycles are sharper and bond markets are thinner.

The Indian power transmission equipment sector provides a useful setting for this analysis. India has committed to 500 GW of non-fossil electricity capacity by 2030, and the National Electricity Plan (Transmission) prepared by the Central Electricity Authority is designed to evacuate 500 GW of renewable capacity by 2030 and more than 600 GW by 2032 (Central Electricity Authority, 2024). Under this plan, the transmission network expands from 4.85 lakh circuit kilometres in 2024 to 6.48 lakh circuit kilometres by 2032, and inter-regional transfer capacity increases from 119 GW to 168 GW. Nine HVDC links with a combined capacity of 33.25 GW are to be added to the 33.5 GW already in operation, at a total planned investment of ₹9.15 lakh crore (Central Electricity Authority, 2024).

HVDC projects change the financial profile of equipment suppliers. Each involves a few very large, custom-engineered converter stations built over several years. Suppliers are paid against milestones such as design approval, supply, erection and commissioning, part of the contract value is retained until performance tests are completed, and suppliers must furnish advance payment and performance bank guarantees. A single HVDC order can therefore move receivables, contract assets and guarantee exposure sharply from one year to the next. The resulting working capital needs are lumpy and span several years, and they shape how firms balance internal accruals, customer advances, bank credit and equity.

Hitachi Energy India Limited is a leading supplier in this sector. It was incorporated in February 2019 as ABB Power Products and Systems India Limited to receive the power grids business demerged from ABB India, was listed on March 30, 2020, and was renamed Hitachi Energy India Limited in November 2021. It reported on a calendar-year basis until December 2020 and moved to a March year-end through a 15-month period ending March 2022. Its promoter, Hitachi Energy Ltd, is wholly owned by Hitachi Ltd, Japan, and held 75% of the company until March 2025 and 71.31% thereafter (Hitachi Energy India Limited, 2026). Its short listed history, multinational parentage and fast-growing order book make it a useful case of a low-leverage firm.

## 2. REVIEW OF LITERATURE

### 2.1 CAPM and the Cost of Equity

The CAPM of Sharpe (1964) states that the expected return on a security equals the risk-free rate plus a premium proportional to its systematic risk, measured by beta. In a survey of 392 US chief financial officers, Graham and Harvey (2001) found that about three-quarters used CAPM to estimate the cost of equity, with larger firms relying on it most heavily. Most firms also apply a single company-wide discount rate, which makes the company-level estimate particularly important.

The empirical record of the model is, however, weak. Fama and French (2004) reviewed four decades of tests and concluded that the relationship between beta and average return is much flatter than CAPM predicts, and that variables such as firm size and book-to-market equity explain returns that beta does not. The problem is sharper in emerging markets. Damodaran (2020) showed that historical equity risk premiums in emerging markets carry very large standard errors and recommended implied or country-risk-adjusted premiums. Beta estimates face a similar problem. Blume (1971) found that estimated betas regress towards 1.0 over time, which is why an adjusted beta is used in practice, and Dimson (1979) showed that betas of infrequently traded shares are biased downwards because their prices react to market movements with a delay.

### 2.2 Cost of Debt and the Tax Advantage of Borrowing

For Indian firms that borrow mainly from banks rather than through bonds, the cost of debt is usually measured as interest expense divided by average borrowings, and the tax deductibility of interest reduces the effective cost further (Pandey, 2015). The value of this tax shield can be large. Graham (2000) estimated that the tax benefit of debt is worth about 9.7% of firm value for the typical firm, and that the typical firm could roughly double this benefit by borrowing until the marginal tax benefit begins to decline. He found that the most conservative borrowers were large, liquid and profitable firms with low expected distress costs. Cash-rich multinational subsidiaries in India fit this description closely, and for such firms the ratio of finance cost to borrowings may be dominated by items that are not interest on debt.

### 2.3 Capital Structure Evidence

Tests of the pecking order theory give mixed results. Shyam-Sunder and Myers (1999) supported the theory using US firms that traded continuously over 1971–1989, finding that the financing deficit was closely matched by debt issues. Frank and Goyal (2003) tested the same model on a broad cross-section of publicly traded US firms for 1971–1998 and reached the opposite conclusion: net equity issues tracked the financing deficit more closely than net debt issues did. Baker and Wurgler (2002) offered an alternative explanation: firms issue equity when their market valuations are high, and the effect on leverage persists for many years.

Indian evidence broadly supports both the trade-off and pecking order views. Bhaduri (2002) found that leverage in the Indian corporate sector rises with firm size and asset tangibility, which is consistent with the trade-off view that firms with more collateral and lower distress risk can carry more debt. Chakraborty (2010) used a balanced panel of 1,169 non-financial firms listed on the BSE or NSE over 1995–2008, with 16,366 observations, and applied fully modified OLS and GMM estimation. The study found that both the pecking order and the static trade-off theories operate in Indian financing decisions, with little support for agency cost theory. Neither study, however, focuses on subsidiaries of multinational groups.

### 2.4 WACC and Investment Decisions

Theory prefers market value weights for investment decisions, because they reflect the current opportunity cost of investors' capital (Berk & DeMarzo, 2020), although book weights remain common in Indian practice and textbook treatments (Pandey, 2015). For a firm with negligible debt, the two methods converge and WACC approaches the cost

of equity. In that case, the quality of the beta and equity risk premium estimates determines the quality of the entire hurdle rate. Sector benchmarks help to judge whether a company estimate is reasonable; RBSA Advisors (2023) reported a weighted average cost of equity of 14.2% and WACC of 13.9% for Indian capital goods companies. These studies show how the cost of capital should be estimated but say little about how the estimates behave for firms that barely use debt.

## 3. NEED OF THE STUDY AND RESEARCH GAP

Prior studies focus on leveraged firms or broad samples, whereas transmission equipment makers are largely equity-financed, so their WACC depends almost entirely on the cost of equity. The period from 2021 to 2026 also covered a full interest rate cycle, and Hitachi Energy India raised ₹2,520.82 crore through a qualified institutional placement (QIP) that concluded on March 13, 2025, mainly to fund a ₹2,000 crore capex plan (CRISIL Ratings, 2025). The study addresses three gaps: no recent multi-year WACC study of this company using both weighting schemes, few comparisons among Indian subsidiaries of multinational groups, and the untested assumption that finance costs measure the cost of debt in near debt-free firms.

## 4. RESEARCH OBJECTIVES AND METHODOLOGY

### 4.1 Objectives

1. To estimate Ke of Hitachi Energy India for FY 2021–22 to FY 2025–26 using CAPM.
2. To estimate Kd using the effective interest rate method and a rating-based method, and to evaluate which is more reliable.
3. To compute WACC using book and market value weights and analyse its trend.
4. To benchmark the results against ABB India, Siemens Ltd. and the RBSA capital goods estimate.

### 4.2 Research Design and Study Period

The study follows a descriptive and analytical research design based entirely on secondary data. It covers five reporting periods: FY 2021–22 (15 months, January 2021 to March 2022) and the four twelve-month years FY 2022–23 to FY 2025–26. Because the first period is longer than a year, flow items such as finance costs are annualised by multiplying by 12/15, while balance sheet items are taken as reported at the period end. Standalone financial statements are used throughout.

### 4.3 Data Sources

Financial data are taken from the annual reports for FY 2021–22, FY 2023–24 and FY 2025–26, which cover all five years including comparative figures (Hitachi Energy India Limited, 2022, 2024, 2026). Peer data come from the latest annual reports of ABB India and Siemens Ltd. (ABB India Limited, 2026; Siemens Limited, 2026). The risk-free rate is the 10-year Government of India bond yield at each year-end (Reserve Bank of India, 2026; Trading Economics, 2026). Betas and year-end market capitalisation are taken from Yahoo Finance (2026) and TradingView (2026), and current market capitalisation from Screener.in (2026). The equity risk premium follows RBSA Advisors (2023), and the credit rating follows CRISIL Ratings (2025).

### 4.4 Computational Models

$$Ke = Rf + \beta(adj) \times ERP, \quad where\ \beta(adj) = 0.67 \times \beta(raw) + 0.33$$

$$Method\ A:\ Kd\ (pre\text{-}tax) = Finance\ Cost \div Average\ Borrowings$$

$$Method\ B:\ Kd\ (pre\text{-}tax) = Rf + AAA\ Spread\ (75\ bps); \quad Kd = Kd\ (pre\text{-}tax) \times (1 - T)$$

$$WACC = We \times Ke + Wd \times Kd, \quad We = E \div (E + D), \quad Wd = D \div (E + D)$$

Book weights use E equal to share capital plus reserves, and market weights use E equal to year-end market capitalisation. D is the book value of borrowings including lease liabilities, a reasonable proxy for market value because these borrowings are unlisted and short-term.

### 4.5 Choice of Inputs

The 10-year Government bond yield is used as the risk-free rate because its maturity matches long-term projects and it is the RBSA Advisors (2023) benchmark. A single 5-year monthly beta, adjusted by the Blume (1971) method, is used for all periods because shorter windows for this recently listed stock are noisy. The equity risk premium is held at 7%,

so changes in Ke reflect only the risk-free rate. The 75 basis point AAA spread has little effect, because debt is so small that even a large error changes WACC by less than 0.02 percentage points. Sensitivity to beta is examined in Section 5.2.

## 5. DATA ANALYSIS AND COMPUTATIONS

### 5.1 Financial and Capital Structure Inputs

Table 1 presents the inputs used in all subsequent computations.

**Table 1**

*Financial and Capital Structure Inputs, Hitachi Energy India Ltd. (₹ crore)*

| Particulars | FY 2021–22 (15m) | FY 2022–23 | FY 2023–24 | FY 2024–25 | FY 2025–26 |
|---|---|---|---|---|---|
| Book equity (E) | 1,132 | 1,215 | 1,359 | 4,214 | 5,176 |
| Borrowings incl. leases (D) | 190 | 334 | 214 | 88 | 86 |
| Finance cost (reported) | 53 | 54 | 57 | 54 | 28 |
| Profit before tax | 277 | 131 | 222 | 516 | 1,321 |
| Effective tax rate | 26% | 28% | 26% | 26% | 25% |
| **Book D/E ratio** | **0.168** | **0.275** | **0.157** | **0.021** | **0.017** |

Source: Hitachi Energy India Limited (2022, 2024, 2026). Book equity = share capital + reserves. D/E computed by the authors.

Table 1 shows that leverage peaked in FY 2022–23 at a D/E ratio of 0.275 and then fell to almost zero, while book equity more than tripled in FY 2024–25, mainly because of the QIP. At the end of FY 2024–25, reported total debt of ₹884.5 million equalled the company's lease obligations (Yahoo Finance, 2026), so the company had no bank borrowings on its balance sheet.

### 5.2 Cost of Equity

The 5-year monthly beta is 0.57 (Yahoo Finance, 2026), so $\beta(adj) = 0.67 \times 0.57 + 0.33 = 0.712$. For FY 2025–26, $Ke = 6.88\% + 0.712 \times 7.00\% = 11.86\%$. Table 2 applies this computation to all five periods.

**Table 2**

*Computation of Cost of Equity (Ke) using CAPM*

| Period (year-end) | Rf | β raw | β adj. | ERP | Rm = Rf + ERP | β × ERP | Ke |
|---|---|---|---|---|---|---|---|
| FY 2021–22 (Mar-22) | 6.84% | 0.57 | 0.712 | 7.00% | 13.84% | 4.98% | 11.82% |
| FY 2022–23 (Mar-23) | 7.31% | 0.57 | 0.712 | 7.00% | 14.31% | 4.98% | 12.29% |
| FY 2023–24 (Mar-24) | 7.05% | 0.57 | 0.712 | 7.00% | 14.05% | 4.98% | 12.03% |
| FY 2024–25 (Mar-25) | 6.58% | 0.57 | 0.712 | 7.00% | 13.58% | 4.98% | 11.56% |
| FY 2025–26 (Mar-26) | 6.88% | 0.57 | 0.712 | 7.00% | 13.88% | 4.98% | 11.86% |

Source: Reserve Bank of India (2026); Trading Economics (2026); RBSA Advisors (2023); Yahoo Finance (2026); computed by the authors.

Ke moves only with the risk-free rate, peaking during the RBI's tightening cycle in FY 2022–23 and falling to its lowest level as easing began in FY 2024–25. It is, however, highly sensitive to beta: for FY 2025–26, the raw 5-year beta of 0.57 gives 10.87%, and the 1-year beta of 0.84 (Bajaj Finserv, 2026) gives 12.76%, a spread of about 1.9 percentage points. This exceeds the entire movement in Ke caused by interest rates over the study period.

### 5.3 Cost of Debt

Under Method A for FY 2025–26, the pre-tax cost is 28 ÷ 87 = 32.2%. A AAA-rated firm (CRISIL Ratings, 2025) cannot be paying 32%, so reported finance costs must include items such as lease interest, guarantee commissions and unwinding of provisions. Method A therefore overstates the cost of debt. Under Method B, Kd = (6.88% + 0.75%) × (1 − 0.25) = 5.72%. Table 3 compares the two methods.

**Table 3**

*Computation of Cost of Debt (Kd) and Tax Shield (₹ crore / %)*

| Period | Finance cost (annual) | Avg. borrowings | Method A Kd pre-tax | Method B Kd pre-tax | Tax rate | Tax shield | Kd post-tax (B) |
|---|---|---|---|---|---|---|---|
| FY 2021–22 | 42.4 | 114.5 | 37.0% | 7.59% | 26% | 1.97% | 5.62% |
| FY 2022–23 | 54.0 | 262.0 | 20.6% | 8.06% | 28% | 2.26% | 5.80% |
| FY 2023–24 | 57.0 | 274.0 | 20.8% | 7.80% | 26% | 2.03% | 5.77% |
| FY 2024–25 | 54.0 | 151.0 | 35.8% | 7.33% | 26% | 1.91% | 5.42% |
| FY 2025–26 | 28.0 | 87.0 | 32.2% | 7.63% | 25% | 1.91% | 5.72% |

Source: Computed by the authors from Table 1. FY 2021–22 finance cost annualised as 53 × 12/15, with opening borrowings of ₹39 crore (December 2020). Method A is not used in WACC.

Method A is highest when borrowings were lowest (FY 2021–22 and FY 2024–25). This shows that its numerator contains costs unrelated to the amount borrowed. Method B stays within 5.42% to 5.80% after tax.

### 5.4 Weights and WACC

For FY 2025–26 on book weights, We = 5,176 ÷ 5,262 = 98.37%, so WACC = 0.9837 × 11.86% + 0.0163 × 5.72% = 11.76%. On market weights, with market capitalisation of ₹1.08 trillion at March 31, 2026 (Yahoo Finance, 2026), WACC = 11.86%. Table 4 reports the results for all periods.

**Table 4**

*Book Value vs. Market Value Weights and WACC*

| Period | Ke | Kd (post-tax) | We (book) | Wd (book) | WACC (book) | Market cap (₹ cr) | Wd (market) | WACC (market) |
|---|---|---|---|---|---|---|---|---|
| FY 2021–22 | 11.82% | 5.62% | 85.63% | 14.37% | 10.93% | > 10,000 | ≤ 1.87% | 11.71–11.82% |
| FY 2022–23 | 12.29% | 5.80% | 78.44% | 21.56% | 10.89% | > 10,000 | ≤ 3.23% | 12.08–12.29% |
| FY 2023–24 | 12.03% | 5.77% | 86.40% | 13.60% | 11.18% | > 10,000 | ≤ 2.10% | 11.90–12.03% |
| FY 2024–25 | 11.56% | 5.42% | 97.95% | 2.05% | 11.44% | 56,378 | 0.16% | 11.55% |
| FY 2025–26 | 11.86% | 5.72% | 98.37% | 1.63% | 11.76% | 1,08,000 | 0.08% | 11.86% |

Source: Computed by the authors; market capitalisation from Yahoo Finance (2026). For FY 2021–22 to FY 2023–24, market WACC is a range because Wd assumes a conservative market capitalisation of ₹10,000 crore; actual values were higher (CompaniesMarketCap, 2026).

Book-weight WACC rose from about 10.9% in FY 2021–23 to 11.76% in FY 2025–26 even though Ke was lower than in FY 2022–23, because cheaper after-tax debt dropped out of the capital mix. Under market weights, debt is negligible in every period and WACC is almost equal to Ke. Figure 1 plots the three series over the study period.

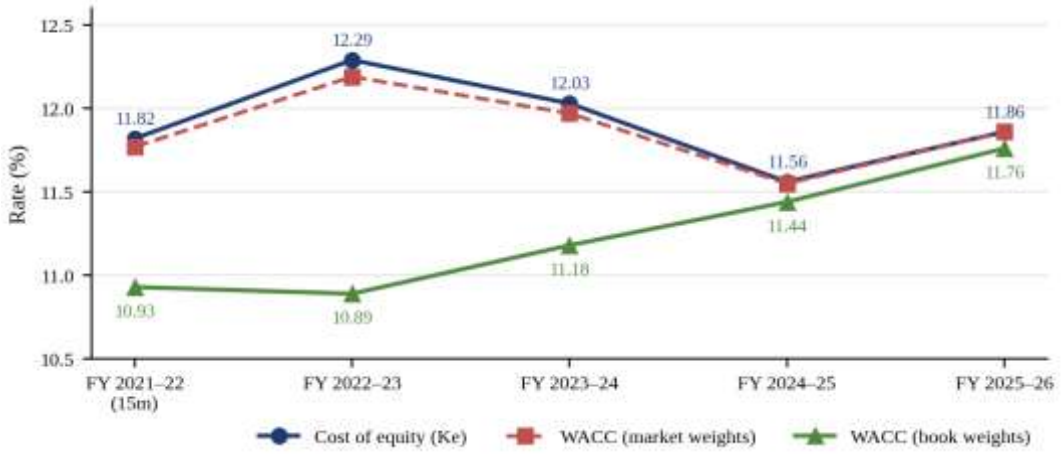



**Figure 1**

*Five-Year Trajectory of WACC and Cost of Equity, Hitachi Energy India Ltd. (%)*

Source: Authors' computation from Tables 2–4. Market-weight WACC for FY 2021–22 to FY 2023–24 is plotted at the midpoint of the bounded range reported in Table 4.

Figure 1 shows the two WACC lines converging, from a gap of about one percentage point in FY 2021–23 to 0.1 percentage points in FY 2025–26, because debt dropped out of the capital structure.

### 5.5 Peer Benchmarking

Table 5 compares the three firms using each company's latest audited data, market capitalisation as of September 23, 2026, and the current 10-year bond yield of 7.04% (Trading Economics, 2026).

**Table 5**

*Peer Benchmarking Matrix*

| Metric | Hitachi Energy India | ABB India | Siemens Ltd. (consol.) |
|---|---|---|---|
| Latest audited period | Apr 2025–Mar 2026 | Jan–Dec 2025 | Oct 2024–Mar 2026 (18m) |
| Book equity / Borrowings (₹ cr) | 5,176 / 86 | 7,836 / 85 | 13,840 / 307 |
| Book D/E | 0.017 | 0.011 | 0.022 |
| Market cap (₹ cr) | 1,39,042 | 1,50,445 | 1,38,138 |
| β raw / β adjusted | 0.57 (5Y) / 0.712 | 0.52 (5Y) / 0.678 | 1.22 (1Y) / 1.147 |
| **Ke** | **12.02%** | **11.79%** | **15.07%** |
| Method A Kd (pre-tax) | 32.2% | 29.2% | 16.6% |
| Kd post-tax (Method B) | 5.84% | 5.84% | 6.08% |
| **WACC (book / market)** | **11.92% / 12.02%** | **11.72% / 11.79%** | **14.88% / 15.05%** |
| RBSA capital goods Ke / WACC | 14.2% / 13.9% | 14.2% / 13.9% | 14.2% / 13.9% |

Source: Hitachi Energy India Limited (2026); ABB India Limited (2026); Siemens Limited (2026); Screener.in (2026); Yahoo Finance (2026); TradingView (2026); RBSA Advisors (2023); computed by the authors. Tax rates: 25%, 25% and 22%. Siemens finance cost annualised as 73 × 12/18.

All three firms have book D/E ratios below 0.03, so their costs of capital differ mainly because of beta. The Siemens estimate relies on a 1-year beta that covers the April 2025 demerger of its energy business (Siemens Limited, 2026). The share price fell when the energy business was separated, so a beta estimated from unadjusted prices over this window is distorted.

### 5.6 Summary of Results

Ke stayed within 11.56% to 12.29%, book-weight WACC rose as debt fell below 2% of capital, and Method A did not give credible Kd for any firm.

## 6. INTERPRETATION AND DISCUSSION

### 6.1 Movement of WACC

Two factors drove WACC over the period: the risk-free rate and management's decision to remove debt. From FY 2021–22 to FY 2022–23, market-weight WACC rose by about 0.4 percentage points as the RBI tightened policy, while book-weight WACC stayed flat because borrowing increased. That borrowing reflected operating stress: cash from operations was only ₹5 crore in FY 2022–23, against ₹252 crore in FY 2023–24 and ₹1,494 crore in FY 2024–25, and the operating margin fell to 6% (Hitachi Energy India Limited, 2024, 2026). From FY 2023–24 onwards, the company repaid most of its debt and completed the QIP, so book-weight WACC rose even as Ke fell.

### 6.2 Differences from Peers

Hitachi Energy India and ABB India have almost identical WACC, as both are AAA-rated subsidiaries of Swiss-origin groups with promoters holding 71–75% and more cash than debt. Both are about two percentage points below the RBSA benchmark. Part of this gap may reflect parent support and utility customers, but part is a measurement issue: Hitachi Energy India has only about 12.7 million freely traded shares out of 44.6 million (Yahoo Finance, 2026), and thinly traded stocks show betas biased towards zero (Dimson, 1979). The low Ke is therefore probably a lower bound.

### 6.3 Connection to Capital Structure Theory

Up to FY 2023–24, the pattern fits the pecking order (Myers & Majluf, 1984): debt rose when internal cash was scarce and was repaid when cash flow recovered. The trade-off theory is not supported, because a AAA-rated firm with a 25% tax rate chose almost no debt, giving up about ₹1.9 crore of annual tax saving for every ₹100 crore of debt at 7.6%, in line with Graham (2000). The March 2025 QIP is harder to reconcile with the pecking order. The company issued ₹2,520.82 crore of equity while it had unused debt capacity and cash and bank balances of about ₹4,860 crore (Hitachi Energy India Limited, 2026), at a price-to-book ratio of about 13.4 times. It fits market timing (Baker & Wurgler, 2002).

## 7. FINDINGS AND RECOMMENDATIONS

- Ke ranged from 11.56% to 12.29%; book-weight WACC rose from 10.93% to 11.76%, and market-weight WACC stayed near Ke.
- Rating-based Kd (5.4% to 5.8% after tax) is more reliable than the effective interest rate method (20.6% to 37.0% pre-tax).
- Hitachi Energy India and ABB India have WACC of about 12%, below the RBSA benchmark of 13.9%.

The finance team should consider three steps. First, a hurdle rate range of 12% to 14% should be used rather than the 11.9% point estimate, to guard against the downward bias in beta, with an added premium for HVDC and export projects. Second, QIP cash should be deployed in line with the ₹2,000 crore capex schedule, and surplus cash returned to shareholders if deployment is delayed. Third, modest long-term debt for long-life assets, at a D/E ratio of about 0.1 to 0.2, would slightly reduce WACC and create tax savings well within the capacity implied by the AAA rating.

## 8. CONCLUSION AND LIMITATIONS

The WACC of Hitachi Energy India was about 11% to 12% over FY 2021–22 to FY 2025–26 and converged on its cost of equity as debt fell to almost zero. Its financing fits the pecking order and market timing theories better than the trade-off theory. The study is limited by the use of a single 5-year beta for all periods, an assumed equity risk premium and credit spread, an annualised 15-month first period, bounded rather than exact market values for three years, and the demerger-affected Siemens beta. Future research could include Siemens Energy India and GE Vernova T&D India and test multi-factor models of the cost of equity.

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**AI USAGE DECLARATION**

In line with the FINM542 guidelines and the academic integrity policy of Lovely Professional University, the authors declare that Claude (Anthropic) was used to locate annual report data and secondary sources, to create an initial structure and draft text, to compute and cross-check Ke, Kd, weights and WACC, and to check APA 7th edition formatting. All figures were verified by the authors against the original annual reports, and all AI-assisted text was substantially rewritten in the authors' own words. The authors take full responsibility for the accuracy, interpretation and originality of the paper.