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COST OF CAPITAL FOR PRIVATISED DISTRIBUTION COMPANIES

A Working Paper on a Calculation for India

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I. INTRODUCTION

One of the goals of the Orissa Reform Program is the privatisation of distribution electricity companies, in the hope that the sector can attract domestic and foreign private investors. As the privatisation process unfolds, concerns are being expressed regarding the regulatory treatment of equity capital of the privatised companies. This concern stems from the requirement in paragraph 22.1 of the Distribution and Retail Supply Licence that

> the Licensee should prepare a statement showing its revenue requirement for the ensuing financial year in accordance with the financial principles provided in Sections 57 and 57 A of the Electricity (Supply) Act, 1948 and in the sixth schedule thereto, with departures therefrom as authorised by the Commission.

The continued use of the Sixth Schedule for tariff purposes is perceived to pose problems. It is suggested that the Schedule does not deal specifically with the equity capital, and to the degree it does recognize equity capital, may not allow an appropriate return.[1]

The following memorandum will discuss: first, the calculations of return under the Sixth Schedule; second, the methodologies typically used in the US for calculating a weighted cost of capital under Rate Base/Rate of Return Regulation; third, the data limitations and required methodological modifications that would be required to implement a Rate Base/Rate of Return approach in the Indian context; and finally, a preliminary assessment based on the alternative methodologies of whether the returns allowed under the Sixth Schedule will be adequate to attract investors, domestic and foreign, to the sector.

II. SIXTH SCHEDULE OF THE ELECTRICITY (SUPPLY) ACT, 1948

Understanding the principles of the capital base of the Sixth Schedule is difficult for both regulators and investors. It is conceptually a different notion from the rate base found in

[1] An additional issue of particular concern to any company that borrows funds in international capital markets is its vulnerability to foreign exchange risk (FX risk). These companies they collect their revenues in Indian rupees but service their debt (and for foreign companies, their equity) in US dollars or other foreign currency. A well-defined policy in this regard would instill confidence among those investors. Moreover, it is not clear that recognition of FX risk can be easily incorporated into the calculations of the Sixth Schedule.

US style rate base/rate of return regulation, and does not strictly follow either of the Companies Act of 1956 version of a balance sheet or the balance sheets of International Accounting Standards.

In traditional US utility regulation, a rate base is composed of physical assets: (1) net plant in service; (2) property held for future use; (3) working capital; and (4) construction work in progress. In the US, rate base and capital structure are separate concepts, and, indeed, differences between the two can result in the return on rate base that does not match the costs of servicing the debt and equity of the capital structure.

In contrast, the capital base of the Sixth Schedule is defined as the difference between the application of funds, *i.e.*, the sum of certain assets, and some selected elements of the sources of funds. The capital base will include equity capital, reserves, as well as some loans. The Sixth Schedule then separately provides for interest payments on the loans not covered in the capital base, plus a 0.5% bonus as an expense.[2] The standard return on the capital base, combined with the treatment of most debt costs as an expense, services the capital structure cost but the capital base itself is neither a US-style rate base or a US-style capital structure.

A. Treatment of equity capital in the Sixth Schedule of the Indian 1948 Electricity (Supply) Act

In order to understand the inherent logic of the Sixth Schedule, it is helpful to first compare its structure to the financial entries of a balance sheet according to the Companies Act 1956 which provides a detailed format of the balance sheet to be prepared by companies in India. (See Table 1.) A company's balance sheet summarizes how the funds available to a company were utilized during the accounting period under consideration. The accounting identity is that total funds available are equal to the application of such funds (i.e. total debit amount is just equal to total credit). It is to be noted that moving elements like depreciation and current liabilities from a negative element in the application of funds to a positive element in the source of funds does not alter the balance.

[2] The Sixth Schedule is most nearly similar to the US Times Interest Earned Ratio (TIER Coverage) calculated by Commissions for such entities as cooperatives, whose capital structures are also 100% debt. The TIER Coverage divides net income by debt costs. Thus, a TIER Coverage of 1.0 exactly recovers the debt expenses, while higher ratios increase the revenue requirement to provide a cushion for debt service. Higher ratios are sometimes required by lending agencies and institutions, particularly for more risky investments.

In contrast to the balance sheet format, the Sixth Schedule of the 1948 Electricity (Supply) Act defines the capital base of a licensee as the difference between two streams of funds. The Sixth Schedule begins with the application of funds (Element A) rather than with the source of funds (Element B). Element A takes into account all four elements of the application of funds listed in a balance sheet, namely, fixed assets, investments, current assets (work in progress and working capital) and miscellaneous expenditure (cost of intangible assets). The gross value of the fixed assets is computed at original cost but the accumulated depreciation is subtracted later, which makes the items comparable.

Element B covers some, but not all, of the sources of funds: secured loans from approved institutions, unsecured loans (debentures), current liabilities and provisions for taxation, dividends and contingencies. However, only advances made by the Board and loans from approved institutions are included in Element B so that funds not borrowed from the Board but raised from other institutions not approved by State Government or from its own resources are not covered by Element B and become rather part of the residual capital base. Other items that do not appear in either in element A or in element B are the net from the profit and loss account, which is assumed to be zero, and share capital. Moreover, Since the Sixth Schedule uses as allowance for working capital rather than the actual values, currently liability can be different from the balance sheet, which could result in a residual current liability element. The difference between the assets in Element A and the liabilities in Element B is the capital base. It represents whatever is not accounted for in the liabilities: the equity capital, reserves and surplus, part of the current liabilities, and any loans not included in Element B. As demonstrated by the following cases, it is clear that the Sixth Schedule does recognize equity capital, that is, capital supplied by investors, although without clearly specifying so and in a somewhat circuitous fashion:

> A licensee without any equity capital – the capital base will consist of loans raised by the utility on its own (other than debentures raised and covered already in element B).
>
> A licensee having both equity and loan capital where part of the loans is obtained from the Board and from approved institutions - the capital base includes equity as well as loan capital reduced by the amount of loan obtained from the Board or approved institutions.

A licensee having both equity and loan capital but no loans from the Board or from approved institutions would also find the entire amount of its fund coming under the purview of the capital base.

A licensee having no loan capital will see its entire equity capital covered by the capital base.

An interesting inference can be made from the above cases. Subject to the limits of reasonable return, the Sixth Schedule attributes a standard rate to the capital base rather than the actual cost of capital. Therefore, if the actual cost of borrowed funds from sources other than the Board or approved institutions is less than the standard rate, the equity holders earn not only the standard rate on their own capital but also disparity between the standard and the actual interest rates on loans

B. "Clear Profit": Determination of net income in the Sixth Schedule

The control mechanism of the Sixth Schedule is based on the comparison of "clear profit" with the reasonable return. "Clear profit" is defined as the net of income and the sum of expenditure plus specific appropriations and generally follows the same accounting principles as the Profit and Loss (P&L) account prescribed by the Companies Act 1956.

On the income side there is almost no difference between the Sixth Schedule and the P&L, except in the Sixth Schedule's specificity for the electricity business. Its treatment of income is comprehensive and coverage is not limited to revenue from the sale of electricity, although this is undoubtedly the largest element in the income stream.

The expense of distribution and retail sales of energy includes not only the operating expenses (employees, materials, depreciation, and administration and general expenses) of the P&L, but the interest charges on loans advanced by the Board and approved institutions and security deposits as well. The Sixth Schedule also provides for "special appropriations," coverage of charges under abnormal or unforeseen circumstances, and of certain contributions that require concurrence of the State Government.[3] The test employed for the recognition of expenses, verification that they are properly incurred in relation to the electricity business, is

[3] The effect of "special appropriations" is to allow the calculation of clear profits to be reduced for certain approved purposes before being measured against the reasonable return. The effect is the same as compensating for losses in one year by earning and retaining a higher return in a subsequent year.

similar to the prudence test used in the US. In general, the Sixth Schedule requires certain statutory reserves and investments that may not be appropriate for other companies, but it does not deny any expense allowed under the Companies Act, although the treatment may be somewhat different or otherwise defined.

C. Treatment of rate of return in the Sixth Schedule

The Sixth Schedule requires that the licensee shall adjust its tariffs to assure that its clear profit in any year of account shall not exceed the amount of reasonable return. The Sixth Schedule's prescription for the standard rate of return on the capital base stipulates the calculation method and the relevant rate data and is therefore less discretionary, and more complicated than US rate of return calculations:

> 7% for the capital base that is equivalent to the capital base as on the 31st day of March 1965;
>
> the Reserve Bank rate at the beginning of the year plus 2% for investments made up to the date of the commencement of the Electricity Laws (Amendment) Act, 1991 and plus 5% for investments made thereafter.

Thus, the rate of return under Sixth Schedule depends on current interest rates and the vintage of the investment. At the present RBI rate, the maximum allowed rate of return on the capital base is 15.5%. Since the rate of return is linked to vintage of the asset, the average rate of return is time dependent. It is not clear whether licensees keep capital base data by vintage; if not, this method is difficult to apply.

The reasonable return is then the product of capital base and the standard rate, plus:

> the income derived from investments other than those included in the capital base;
>
> an amount equal to 0.5% on any loans advanced by the Board or borrowed from organizations or institutions approved by the State Government or on accumulations in the Development Reserve; and
>
> such other amount as may be allowed by the Central Government having regard to the prevailing tax structure in the country.

A private investor is likely to focus on the total cost of servicing funds required to be put to service: the sum of return on equity times the equity capital, plus the sum of various loan instruments times the respective interest rates. The treatment prescribed in the Sixth Schedule differs in two ways. First, the standard rate applied to the capital base is normative does not

make any reference to the actual cost of capital, investor expectations, and risks of the investment. This normative rate may give the investor an idea of the range of return he can expect, but the actual return on equity can be significantly different from the standard rate depending on the capital structure of the licensee and the performance of a licensee.[4] Second, the capital base does not cover loans from the Board or from approved institutions. This should not be a major concern for the private investor, as the debt service is covered as an expense. However, both these factors mean that the treatment is complex, unfamiliar and consequently less transparent to investors. The return itself is not by definition, however, necessarily insufficient to attract equity participation by private investors, both local and foreign.

D. Conclusion

The major observations of this section regarding the apparent idiosyncrasies of the Sixth Schedule are:

Equity capital is accommodated in the Sixth Schedule but the treatment is somewhat indirect.

The coverage of capital base of the Sixth Schedule varies depending on the capital structure of the utility; the capital base attempts to reconcile assets with the capital structure but it is not equivalent to the US rate base.

The Schedule specifies a rate of return that can vary with vintage of the asset as well as macroeconomic condition of the economy but the rate of return does not take into consideration actual costs of borrowing the capital and expectations of the investor.

The clear profit of the Sixth Schedule may or may not be equivalent to net income as depending on the capital structure of the utility, it may include a return on some loans as well as equity.

[4] Private distribution companies, whose tariffs are set in accordance with the Sixth Schedule, are known to earn returns on equity, and in consequence pay dividends, substantially in excess of 15.5%. For example, the Economic Times reported that the Surat Electricity Company (SEC) had declared a dividend for 1997-98 of 30%, compared to 22% in the previous year based on a net profit of Rs. 9.19 crore on turnover of Rs. 502.26 crore compared with Rs. 5.37 and Rs. 398.11 crore in the previous fiscal year. (8 September 1998, Companies, Finance & Markets Section)

III. RATE BASE/RATE OF RETURN REGULATION

A. Formula for Revenue Requirement

Rate Base/Rate of Return regulation regulates the utility through its earnings on its investment. The regulator first covers the utility's legitimate expenses of doing business, and then provides a return on the investments that the utility has made in the assets required for serving the public. The basic formula is

RR = r (RB) + E, where

RR is the annual revenue requirement, the total revenue to be collected from consumers

r is the rate of return

RB is the rate base; and

E represents the utility expenses

Rearranging the elements in the formula makes clear that the Commission regulates the utility by setting, and allowing the utility an opportunity to earn, its rate of return:

$$r = \frac{\text{Net Income}}{\text{Investment}}$$

where the Net Income is Revenue minus Expenses, and Investment is the utility's Rate Base. Commissions allow the utility an *opportunity* to earn their allowed rate of return, not a *guarantee* of that return. The rate of return actually earned will deviate from the allowed rate of return as the relationship among revenues, expenses and investment differs from that calculated or forecast when the tariff was approved. If the "r" that is actually earned is below that authorized, the utility is said to be "under-earning" and may request a tariff increase to raise its rate of return. Where "r" is above the authorized, the utility is said to be "over-earning" and the Commission may wish to call the utility in to adjust the tariff downwards.[5]

All of the numbers in the calculation are based on a single "test year" over which to compare assets, revenues and costs. Traditionally, the test year has been an historic year (the 12-month period for which audited data is available), but some commissions use the snapshot

[5] A tariff application could also be initiated if the allowed rate of return no longer reflects current market values.

of the year-end or a projected test year that includes part of the following year. The particular year chosen is at the discretion of the commission and which option is selected is not as important as the matching principle: the same year is used for all measures of revenues, expenses and investment.

US commissions apply two tests of whether costs should be included in the calculation. A prudence test asks whether the investment or expense was prudent (least cost) given what the decision-maker knew, *or should have known*, when the investment was made. The used and useful test asks whether the investment or expense was (and is) necessary for the provision of supply. A commission may disallow any expense or asset that fails *either* test.

The utility's Expenses are taken from its regulatory accounts. They include:

Operating expenses (wages, materials, cost of supply to the extent it is not separately included in a fuel and purchased power adjustment clause)

Billing/customer accounts/meter reading

Administrative/General (telephones, supplies, executive salaries)

Taxes (based on the state's tax system)

Promotional expenses (for conservation when there is shortage of supply and marketing for increased usage when the utility is capacity rich)

Depreciation (the one year allowance for the test year.)

The last term, depreciation, is a pro-rata return *of* the investors' or lenders' funds and can be used to pay down the debt as the asset for which the capital was provided depreciates or, if the investment was made from equity, increase retained earnings or buy back equity. In contrast, the rate of return is the return *on* the investors' and lenders' capital. If the capital structure exactly matches the Rate Base, depreciation and the return on Rate Base are sufficient but no more than sufficient to service the capital that was raised to provide the physical assets of the utility.

B. "r" - Weighted Cost of Capital

In setting tariffs, a commission *may* use a forecast of rate base and expenses, but will *certainly* attempt to estimate the cost of capital that will prevail in the next period. That is, even commissions that use historical test years for the rate base and expenses will be forward looking in calculating the return that investors will require while the new rates are in effect. The estimation of "r" is based on the utility's capital structure and is a rate in which the

(mostly) actual costs of the various debt components and the estimated costs of the equity components are weighted by their percentage share in the capital structure.

1. Debt

Debt includes both long-term and short-term debt, including bank loans, notes, and bonds. Since debt is a contractual obligation between the utility and its lenders, the elements are known and generally not controversial.[6] Short-term debt and notes can be costed at the test year average amount of debt and either the average cost or the most recent cost of short-term debt. The most straightforward calculation for long-term debt is to examine the amount outstanding and annual cost of each debt issue. The amount outstanding is the initial issue reduced by any repayment. The annual cost of the issue is the sum of the yearly interest payment and any annual costs associated with the issue, such as hedging instruments for FX risk, plus the issuance costs amortized over the life of the issue. The sum of the amounts outstanding divided into the sum of the costs provides a weighted cost of debt.

2. Equity

Where debt is, usually, a straightforward arithmetical calculation, the cost of equity, even in the US, is probably the single most contentious element in any tariff proceeding. The goal is to estimate a rate of return for the utility business comparable to returns earned on investments in enterprises of similar risk. It is the opportunity cost of investors in a situation where the country, the sector and the utility must compete for against all available alternative investments; *i.e.*, it is the difference in the investors' ability to earn dividends from the utility and from any other investment. The question for regulators is that, given their alternatives, what level of return do investors require in order to provide the capital for the utility's needs. The two methodologies most commonly used by state commissions to approximate an answer to this question are the discounted cash flow methodology and the risk premium methodology. The former is most common, with the latter mostly used as a "sanity check". Another methodology that could be employed but is not commonly used by state commissions in the US is the capital asset pricing model (CAPM). Implementation of the methodologies require

[6] The complexities of international financing may raise methodological issues that would be unusual (although not unheard of) in the US context. For example, the regulator would have to decide whether to attribute costs to a loan for which no debt service is currently due (a balloon payment), perhaps on the basis of a discounted cash flow calculation, or to deal only with actual annual obligations.

different types and amounts of data, but all require considerable judgment on the part of the analyst.

a. Discounted Cash Flow (DCF)

The DCF method assumes that from equity, investors require both a current return and growth in value, although either can be zero depending on the stock.[7] The return to equity therefore equals the expected yield (expected annual dividend divided by stock price) plus a measurement of growth. Looking forward, the yield investors who invest in the current market expect to receive in the coming year is the dividend of the last four quarters increased by the growth rate divided by a current measure of price. In addition, they expect to receive some capital appreciation, measured again by the growth rate:

$$\mathbf{r = \frac{D\,(1 + g)}{P} + g}$$

In the above formula, measurements of dividend and price are readily available in the US from such sources as Standard and Poor's, the Wall Street Journal and Value Line. The calculation of the growth rate is a matter of the analyst's judgement, but is usually based on some weighting of the historic growth of dividends and earnings over a five to ten year period.

The calculation is made for a sample of comparable companies, generally which are in the same sector and whose risk profile is similar to the company for which the calculation is being made. As sample is used rather than the utility itself to avoid circularity: earnings, and therefore dividends, depend on the utility's earned rate of return and the allowed rate of return in turn is calculated based on the expected dividends.

b. Risk Premium

An alternative methodology to calculate the cost of equity is to ask what premium investors may require above that which has been demanded for the cost of the utility's debt Equity is considered a riskier investment than debt because if the company experiences financial difficulties the service on loans has a higher priority than payment of dividends. The method is most often used as a check on the DCF methodology to assure that the results of the DCF calculation are at least no lower than the most recent interest rate demanded on a loan. In

[7] Conceptually, the growth rate is the steady state growth of dividends into infinity. A shareholder's short-term realization of the value of growth stems from the appreciation of the stock price reflecting the anticipated growth in dividends.

the US, the premium for equity over the interest rate demanded by a commercial institution tends to be around 2-3%, although it is not a stable premium and seems to be in part a function of inflation.[8] The calculation becomes more difficult if the utility does not have any recent commercial issues, in which case the premium can be built up from risk free government bonds, though the uncertainty increases with each separate calculation of the individual premiums (risk free to commercial lending, loans to equity

c. CAPM

CAPM is based on the relationship between the rate of return on, and the risk of investing in, power sector assets, compared to the rate of return and risk of investing in the market in general. The model uses a standardized formula for the calculation of the rate of return on equity:

$$r_e = r_f + Beta * (r_m - r_f)$$

where

r_e is the rate of return on an equity

r_f is the risk-free rate of return (*e.g.*, government bonds)

r_m is the market rate of return (i.e., the returns on equities in general, measured by adding a equity premium to the risk free rate)

Beta is the coefficient reflecting the volatility (risk) of the utility's stock relative to the market

CAPM requires substantial information on stock prices and volatility and requires that shares of a utility be traded in a well-functioning stock market where risk and return are appropriately valued. While not used frequently by regulators in the US, the validity of CAPM method is supported by the fact that it is widely used by an investment community in valuation of assets.

[8]Based on data from Ibbotson & Associates, premiums were actually negative in years with large macroeconomic disruptions, e.g., energy crises in 1973-4 and 1981.

3. Weighted Cost of Capital

Once a measure of the return to equity is estimated, the weighted equity component is added to the debt to obtain an overall cost of capital. For example assuming the capitalization is 60% debt and 40 % equity, and the weighted cost of debt is 8% and the estimate of the required return to equity is 13%, "r", the total overall cost of capital is:

.60 x 8% = 4.8%

.40 x 11% = 4.4%

Total overall = 9.2%

This 9.2% figure would then be applied to the Rate Base to obtain the revenues reflecting the return required by the debt and equity holders to compensate them for the use of the capital they provided the utility for acquiring assets. These revenues added to the Expenses makes up the total Revenue Requirement.

IV. REQUIRED DATA AND METHODOLOGICAL MODIFICATIONS

The two main limitations to reliable determination of the costs of capital in Indian power sector are lack of reliable historical data on financial performance of former or existing State Electricity Boards (SEB) and imperfect valuation of capital in rapidly developing capital market in India. This section describes how these two limitations affect the usefulness of the methodologies commonly employed in the US and possible modifications to the approaches in light of existing data.

A. Rate Base

Indian regulators must make a classic regulatory decision of what asset value they want to use in tariff making: historical, replacement, or market. In Orissa, this question has been resolved by adopting asset values determined at the time of the transfer of assets from the OSEB to Gridco. The Commission has made clear in its *Conceptual Issues of Electricity Tariff in Orissa* that on the principle of predictable and stable tariffs and tariff methods, it will not change from this valuation lightly. It stated that while the company may revalue assets to current market values in discussions of the "true" worth of the utility in order to enhance its credit lines, such a market value will not be used for regulatory purposes

B. Sample

Selection of companies comparable to the spin-off of a State Electricity Board (SEB) will require careful analysis. The experience of the SEBs is probably irrelevant. State governments have exercised various degrees of political interventionism into SEBs' operation so that the past, uniformly adverse, financial performance of the SEBs should not indicate the expected performance of a privatised entity. Further, while historical financial data on SEBs exist, the multi-year time lag in its availability makes such an analysis a difficult exercise.

The alternative approach is to use a group of comparable private power companies. There are about ten private power companies with track records of more than ten years of operation in India. Their shares of at least five of these companies are actively traded on either the Bombay Stock Exchange or the National Stock Exchange. Therefore, data on financial performance of these private power companies is relatively accessible in annual reports or financial trade press.

Nevertheless, care must be taken in the selection of an appropriate sample. Some private power companies in India operate in unique market segments or are too small to represent a "main-stream" power company. Regulators must conduct a thorough review of business characteristics of private companies to find comparable companies to a newly privatised SEB.

C. Return on equity methodologies

1. Discounted Cash Flow

The DCF method uses the sum of dividend yield and growth to arrive to the rate of return on equity. Values of dividend yields for four private power companies in India can be taken from company reports at Bombay Stock Exchange (BSE) and from BARRA: Ahmedabad Electricity, BSES, CESC, and Surat Electric Company. The dividend yield from BSE calculated as of March 31, 1997, the same date to which data on earnings are calculated, was 2.65%.

The difficulty is that there is no good measure to calculate an Indian growth rate, which in the US is generally based on some weighting of historical dividend and earnings trends. Historical performance of power companies in India has been rather volatile, and in any case, the relevance of historical earnings to estimate future ones is questionable because the

structural and regulatory reform that is taking place in the power sector changes the way in which the sector operates. For the three companies for which both yield data and historical dividend and earnings information exist, the earnings growth for the last five years is 39.91% and the dividend growth has been 35.90%. Intuitively, these growth rates seem unrealistically high.[9]

An alternative is to look at the earnings of the whole power sector in India represented by the State Electricity Boards. Since the SEB's are relatively well established in power distribution business, their performance indicators should in theory reflect earnings of a typical power distribution company in India. However, in practice, the profitability of SEBs is significantly determined by government control of prices and operations. Indeed, the reform effort is premised on the expectation that private companies will be able to significantly improve operations related to the billing/metering/collection process, efficient operations and system reliability. Nevertheless, two indicators that could serve this purpose are power sales and revenues. Based on data from the Union Ministry of Power, the growth in kilowatt-hour sales by the SEBs for the last five years was 6.88% while the growth of revenues was 17.06%.

Thus, the wide range in the growth rates produces totals for estimated dividend yield and growth of between 9.71% and 46.80%. There is no clear indication of which estimate best represents investors' expectations of return from the post-SEB privatized companies, although historical revenue growth of the SEBs may be the most likely given its relationship to earnings under the Sixth Schedule.

An alternative approach would be to use the projections for private power companies made by financial institutions. These projections would be available in investment promotion literature, or regulators could survey banks and investment companies regarding their expectations of earnings growth rates in the power sector. However, great caution must be taken that such projections do not become self-fulfilling prophecies or are not biased by self-interest of surveyed companies.

[9] Analysis of six companies for which data exist results in a 35.94% five year growth rate in earnings and a 43.01% growth rate in dividends, which would raise the issue that even if these high growth in earnings continues, the even greater corresponding increases in dividends would not be sustainable. The sensitivity of the results to the sample further undermines the use of these historical growth rates in the DCF methodology.

2. Risk Premium (RP)

The RP method is an appropriate method for cost of capital determination, particularly where information about stock prices is not available or reliable. It requires the selection of an appropriate debt instrument and then the calculation of the appropriate premium based on identification and quantification of all risks incremental to those in the base.

Selection of an appropriate debt instrument is straightforward, and the current yield on a ten-year plus Government of India Treasury bill is most comparable to the long term Government bond usually selected in the US. This rate is currently 12.20%. Deflated to the real rate by last year's inflation rate of 7.02% (to 4.84%) and re-inflated by the forecasted inflation rate of 8.16%, the forecasted risk free rate would be 13.40%.

However, estimation of the equity premium is more difficult because of the inefficiency of Indian capital markets. As in any developing economy, capital markets in India suffer from illiquid trading and high volatility of prices. Stock prices generated by Indian capital markets do not adequately value the risk of the investment and thus can not reflect the true cost of equity capital. As a result, the equity premium based on data from Indian capital markets cannot be used reliably.[10]

An alternative approach for estimating the equity premium involves taking an estimated equity premium in a global equity markets and adjusting it for the power sector. The global equity premium is usually approximated by the US equity premium calculated by Ibbotson & Associates, adjusted for the risk characteristics of the power sector by multiplying the overall equity premium by Beta of a "typical" power sector utility. For example, the recent equity premium calculated by Ibbotson & Associates is 7.8% and beta of a typical US power distribution company is 0.7125. The equity premium for power distribution would be 5.56%, which would then be added to a forecasted risk free Indian T-Bill rate of 13.40% for a total of 18.96%.

A variation of the risk premium methodology may be of particular interest in the current context. Rather than calculating the premium an investor would require over some instrument of debt, it would be possible through any appropriate methodology to calculate the required

[10] For example, the equity premium measured as a difference between the return on BSE-100 Index and the yield on a 364-day GOI T-Bill was –11.34% in 1995-98.

return to equity for the electricity sector in the US or UK, and then estimate the premium required for the country risk associated with an investment in India. Such a methodology would be of particular interest in an inquiry on the required return for a foreign investor who may be interested in the electricity or energy sector but not necessarily tied to a particular geographical area.

The US return on equity could be calculated by any appropriate methodology, or, on a less current basis, could be taken from the National Association of Regulatory Utility Commissioners' biennial Compilation, which tabulates the rate of return on common equity for electric companies most recently approved by each state. The average for 1996 approved returns is 11.05%. The country risk premium, calculated as a difference in yields on 10+year Government of India T-bill and 30-year US Treasury bonds, adds another 7.03% for a total of 18.08%.

3. CAPM

Application of CAPM in Indian power sector is limited, but will increase with continuing liberalization of the power sector and the capital market in India. Although the capital market is rapidly developing, it has operated under liberalized conditions for a relatively short time. It is technically possible to estimate costs of capital with the CAPM methodology in India, though the inefficiency of the Indian stock markets as they pass through a development stage diminishes the reliability of the estimate. In addition, estimation must be based on a data set that is limited to a few private power companies whose stocks have been actively traded in the stock exchanges in India. Regulators must ask whether these companies adequately represent the whole or even a specific segment of the power sector in India.

The CAPM method calculates the return on equity as the sum of the risk-free rate and Beta times the market premium on equity. Since the capital market in India is not yet mature two approaches are possible: one based on global equity markets and the other based on local equity markets. In both cases, the Beta must first be adjusted to reflect differentials in the debt/equity ratio ("unlevered" and then "relevered").

Global Equity Market Approach

The global equity market approach attempts to avoid the problems stemming from the fact that capital markets in developing countries are not mature enough to generate reliable

estimates of the cost of equity. Instead, it bases the estimation of the cost of capital on the global capital market by measuring the performance of an individual stock against the performance of global equity market and then adds a premium for country risk.

ROE = Risk-free Rate in global market + (Global Beta * Global Market Premium) + Country Risk Premium.

- The risk-free rate of 4.74%, which is the current yield on the 10-year US Treasury bond based on the assumption that the US Government is the least risky borrower in global capital markets.

- Unlevered Global Beta of 0.147 (relevered to 0.211) for a typical power distribution company in India, which measures volatility of stock price against the volatility of the Global Equity Index, an index calculated by Morgan Stanley International

- The market premium on equity over debt of 7.8%, based on the long-term historical market premium on equity in the United States. Since the US equity market represents a large portion of the global equity market, the long-term historical premium on US equity is an appropriate approximation of the market premium on global equity.

- The country risk premium of 7.03%, calculated as a difference in yields on 10+year Government of India T-bill and 30-year US Treasury bonds.

The return on equity estimated under the global equity market approach is 13.41%. Unfortunately, using Global Betas to avoid problems of local market conditions creates methodological problems of its own and this result must be rejected as it is not very reliable. Low values of Global Betas of Indian power companies indicate a certain degree of segmentation of Indian capital markets from global markets.[11] The implication of the segmentation of the Indian capital market is that the Global Betas are not a good indication of the returns and risk of Indian stocks relative to the global market. In addition, CAPM as a methodology is inherently most accurate where the values of Beta are close to 1.0 and generates biased estimates of ROE where the values of Beta are unusually low and high.

[11] Other indications of market segmentation are the low value of Global Beta of BSE-30 Index with respect to Global Equity Index and the overall negative market equity premium in India in the last four years. Negative return on equity in India took place at the same time when global equity markets boomed.

Local Equity Market Approach

The local equity market approach accepts the immaturity of the local capital market and simply uses the more general CAPM formula. Inputs to the formula were estimated as follows:

- The risk free rate of 12.2%, the current yield on a 10+year Government of India Treasury bill, calculated as the average of high and low values of the yield-to-maturity in the secondary market, as reported by RBI.

- Unlevered Local Beta of 0.686 (relevered to 0.985) for a typical power distribution company in India. The Local Beta measures volatility of stock price against the volatility of the BSE-30 Index, a market index established at the Bombay Stock Exchange. Local Betas values for individual power distribution companies in India were also obtained from Barra.

- The market premium on equity of 7.8%. Given the lack of local data the long-term historical market premium on equity in the United States can be used as a proxy for both the premium in the global market (see above) and in the Indian market. There is certain rationale for using the US equity premium in this particular case. Investors in the Indian power sector will be mostly foreigners who will compare the equity/risk free debt premium in the local market to the premium of the global markets. Based on that comparison, they will require 7.8% as an average equity premium over the local risk-free costs of borrowing.[12]

The estimated ROE under the local equity market approach is 19.89%, which is most likely to be biased upward because it combines Local Betas together with the global market equity premium. Local Betas of Indian power companies are relatively high, reflecting their relatively high returns against the local market compared to typical returns (and Betas) of power utilities elsewhere. The application of the global market equity premium effectively makes the unlikely assumption that Local Betas would remain the same even if the local stock market performs as well as the global market.

[12] See page 17 for the derivation of the US premium.

D. Conclusion

There are data problems with all of the traditional methodologies. The most promising methodology in the current Indian context would appear to be one of the variations of the risk premium methodologies. As is not uncommon with the DCF method, it is possible to obtain the data required to estimate the yields of a sample of comparable companies fairly easily, but there is no clear estimation of an expected growth rate. The CAPM methodology at the present time would appear to have little to add to the Risk Premium methodology.

V. ADEQUACY OF SIXTH SCHEDULE RETURNS

The Sixth Schedule would currently allow a return of 15.5% on the capital base, with a sharing arrangement for additional earnings among stockholders, reserves and consumers up to a cap of 18.6%. The maximum return to stockholders under the Sixth Schedule is therefore $16.53 = 15.5 + {}^{1}/_{3}(3.1)$.

A. Debt

To the degree that the capital structure includes a portion of debt in the capital, the service of that debt will likely be covered by the standard return of the RBI plus 5%. Given that monetary policy is a major determinant of availability of credit, the RBI rate generally tracks the current cost of borrowing. The present rate may not have any direct relation to past interest rates on embedded debt. Thus, it would be a safe assumption that no utility would borrow at rates higher than the standard rate that was in existence at the time of the borrowing. However, absent a further assumption on re-financing, it cannot be assumed that the utility's capital structure contains no past debt issues at rates above the current RBI + 5%. To the extent the supplementary allowance of 5% accommodates the average fluctuation in rates, the standard rate of return may be sufficient to cover the cost of debt.

B. Equity

Employing rough estimates under the available methodologies, it is possible to make a preliminary assessment of whether the level of return formally allowed by the Sixth Schedule is sufficient for potential equity investors.

Estimation under the Risk Premium method resulted in the cost of equity of 18.96%: a 5.56% premium added to a forecasted risk free rate of 13.40%. Alternatively, the return on

equity allowed in the US averages 11.05%, which added to the country risk of 7.03%, results in an estimation of 18.08%.

According to the latest financial data of four private domestic power companies, the dividend yield, defined as the ratio of dividend per share to current market price, varied between 1.5 to 4%, with the average value of 2.65%.[13] Using SEB revenue growth in the public power sector as a proxy, 17.06%, results in a required return of 20.16%. While this is in the approximate neighborhood of the Risk Premium results, there is no strong justification for choosing historical SEB revenue growth as the measure of growth.

The CAPM method resulted in the estimation of adequate return of 13.41% under the global market model and 19.88% under the local market model. The first value is adversely affected by low Betas of Indian power companies where CAPM does not generate reliable estimates of the cost of equity. The second value is relatively more reliable, as it is based on Betas measured against local equity market and global equity premium. The major reservation in this estimation is that equity premiums in India and the global capital market are assumed to be the same, without adjustment for the risk characteristics prevailing in the power sector. This weakness also characterizes the variation of the Risk Premium methodology based on allowed returns in the US adjusted for country risk.

C. Conclusion

While there are difficulties with finding appropriate data for all of the approaches, the first rough approximations for the required return on equity result in the following estimations:

Risk Premium:

Indian Interest Rate + Premium:	18.96%
US ROE + Country Risk Premium:	18.08%
DCF (Growth at SEB Revenue growth):	20.16%

CAPM

Global:	13.41%
Local:	19.88%

[13] Source: BARRA, July 31, 1998.

Thus, the preliminary results, regardless of methodology, appear to indicate that the cap imposed by the Sixth Schedule of 16.53% provides a return that would be insufficient to attract international private investment to the sector and possibly domestic investors as well. The data are less supportive of conclusions regarding the attraction of domestic capital given the segmentation of the Indian capital market from the global market.

D. Recommendation

It is not necessary to abandon the Sixth Schedule altogether in order to incorporate a rate of return that would be sufficient to attract private investors. Rather than adopting Rate Base/Rate of Return regulation, which would apply a weighted cost of capital to the assets in the Rate Base, it is possible to make minor changes to the calculation of and return on the capital base of the Sixth Schedule. It would only be necessary to remove all loans from the capital base (not only those that have been "approved") and allow recovery of the interest charges as an expense, subject to a prudence review. The capital base will then contain only equity, invested capital and retained earnings. The required return on the capital base can then be calculated according to a methodology that appropriately reflects market realities.

Table 1 – Comparison between the Sixth Schedule and the Balance Sheet

Capital base according to the Sixth Schedule	Balance Sheet as per the Companies Act
Stream A comprising of the following: (1) Original cost of fixed assets available for use and necessary for the purpose of the undertaking (2) Cost of intangible assets (3) The original cost of Works-in-progress (4) The amount of investment compulsorily made under para-IV (5) An amount on account of working capital equal to the sum of (a) Average cost of stores, materials and supplies (1/12th of the sum of the stores materials and suppliers including fuel in hand at the end of each month of the year) (b) Average cash and bank balance (1/12th of the sum of cash and bank balance whether credit or debit and call and short term deposits at the end of each month of the year)	**I. Source of funds:** (1) Shareholder's funds (a) Capital (b) Reserves and Surplus (2) Loan funds (a) Secured loans (b) Unsecured loans TOTAL:
Stream B consisting of the following: (1) The amounts written off or set aside on account of depreciation of fixed assets. (2) The amount of any loan advanced by Board. 2-a) The amount of any loans borrowed from organisations or institutions approved by the State Govt. 2-b) The amount of any debenture issued by the licensee. (3) The amounts deposited in cash with the licensee by consumers, by way of Security. (4) The amount standing to the credit of Tariffs and Dividends control reserve at the beginning of the year of account. (5) The amount standing to the credit of the Development reserve at the close of the year. (6) The amount carried forward (at the beginning of the year of accounting) in the accounts of the Licensee for distribution to the consumers. (7) TOTAL :	**II. Application of funds:** (1) Fixed assets (a) Gross block (b) Less depreciation (c) Net block (d) Capital work-in-progress (2) Investments (3) Current assets, loans and advances: (a) Inventories (b) Sundry debtors (c) Cash and bank balances (d) Other current assets (e) Loans and advances to subsidiaries and partnership firms Less: Current liabilities and provisions: (a) Liabilities (b) Provisions Net current assets (4) (a) Miscellaneous expenditure to the extent not written off (b) Profit and loss account TOTAL:
Capital Base = A-B	

Attachments

1. **Estimation of Rate of Return on Equity for Indian Power Distribution- Summary**
2. **Discounted Cash Flow**
3. **Capital Assets Pricing Model – Global**
4. **Capital Assets Pricing Model – Local**
5. **Risk Premium**
6. **NARUC Compilation – Rate of Return on Common Equity**
7. **Debt Equity Ratios**
8. **Estimation of Growth Rates**
9. **Betas of Sample US power distribution companies**
10. **Barra Beta Book – Global Equity Model**

RISK PREMIUM

Estimation of a Borrowing Rate in India

	Nominal	Real *	Nominal-F
RBI Rate	10.50%	3.25%	0.116796
10+ year GOI T-Bill	12.20%	4.84%	0.133992
Prime Lending Rate	13.50%	6.06%	0.147117
IDBI Rate	14.50%	6.99%	0.157223

CHECK: Are loans from IDBI available to all investors in infrastructure or only to public companies (SEBs)???
Are GOI T-Bills actively traded in the secondary market???

Estimation of a Market Equity Risk Premium

in the US	7.80%

Historical equity risk premium for 1926-97. Source: Ibbotson&Associates

in India	7.80%

Equity investors require comparable premiums over the costs of borrowing anywhere in the world

Estimation of Equity Premium for Power Distribution

Beta of US distribution utilities	0.7125
Equity premium for power distribution	
in the US	5.56%
in India	5.56%

Estimation of Required Return on Equity (after-tax) in India
(based on Yield of a 10+ year GOI T-Bill and Equity Premium for Power Distribution)

	Real	Nominal-F
Total Equity Market	12.64%	21.20%
Power Distribution Equity	**10.40%**	18.96%

* Assuming the inflation rate of 7.02%

Based on CPI for Industrial Workers in 1998-97. Source: RBI

** Based on forecasted inflation rate of 8.16% in 1999-98.
Source: RBI

SUPPORTING
DATA

Debt-Equity Ratios

	Debt/Common Equity Ratios		
	Mar97	Mar96	Mar-95
AHMEDABAD ELECTRICITY CO LTD	68.977		
BSES LTD	65.31098		89.62
CESC LTD		80.63	
SURRAT ELECTRIC	**70 Assumed**		
ANDHRA VALLEY POWER SUPPLY	54.618		
TATA HYDRO-ELECTRIC POWER	60.835		
TATA POWER CO LTD	57.617		

SUPPORTING CALCULATIONS

Estimation of Growth Rates of Earnings of Indian Power Companies

Private Power Distribution 42.86% line 99

SEBs 17.06% line 121

Private Power Distribution

AHMEDABAD ELECTRICITY CO LTD

GVKEY:	222322						
INDUSTRY:	4911						
CURRENCY:	In Currency	Native					Growth rates (annual)
	Mar97	Mar-96	Mar-95	Mar-94	Mar-93	Mar-92	
Income Bef Extra Items	0.384	0.316	0.139	0.094	0.062	0.066	40.23%
Retained Earnings	0.131	0.042	0.023	0.012	0.006	0.023	
Dividends-Preferred	0.002	0	0	0	0	0	
Dividends-Common/Ordinary	0.153	0.129	0.109	0.069	0.059	0.059	21.62%
Preferred Stock	0.015	0.015	0.015	0	0	0	
Common Stock	0.633	0.633	0.632	0.566	0.331	0.331	
Shareholders' Equity-Total	3.942	3.474	3.125	2.545	1.708	1.554	

ANDHRA VALLEY POWER SUPPLY

GVKEY:	200177						
INDUSTRY:	4911						
CURRENCY:	In Currency	Native					
	Mar97	Mar-96	Mar-95	Mar-94	Mar-93	Mar-92	
Income Bef Extra Items	0.694	1.32	0.67	0.522	0.387	0.161	32.10%
Retained Earnings	0.804	3.411	0.396	0.239	0.142	0.105	
Dividends-Preferred	0	0	0	0	0	0	
Dividends-Common/Ordinary	0.231	0.231	0.161	0.08	0.037	0.022	51.29%
Preferred Stock	0	0	0	0	0	0	
Common Stock	0.657	0.655	0.656	0.357	0.258	0.11	
Shareholders' Equity-Total	7.347	8.023	6.91	3.776	2.343	1.517	

BSES LTD

GVKEY:	223040						
INDUSTRY:	4911						
CURRENCY:	In Currency	Native					
	Mar96	Mar-95	Mar-94	Mar-93	Mar-92	Mar-91	
Income Bef Extra Items	1.735	1.266	0.617	0.629	0.445	0.331	32.57%
Retained Earnings	0.051	0.001	0.001	0.001	0.001	0.001	
Dividends-Preferred	0.023	0	0	0	0	0	
Dividends-Common/Ordinary	0.318	0.162	0.139	0.106	0.023	0.023	55.03%
Preferred Stock	0.39	0	0	0.01	0.01	0.01	
Common Stock	1.365	1.084	0.576	0.574	0.117	0.117	

Shareholders' Equity-Total	14.69	8.594	3.969	3.453	1.741	1.347	

CESC LTD

GVKEY:	201143						
INDUSTRY:	4991						
CURRENCY:	In Currency	Native					
	Mar96	Mar-95	Mar-94	Mar-93	Mar-92	Mar-91	
Income Bef Extra Items	0.896	0.685	0.425	0.244	0.148	0.094	46.93%
Retained Earnings	0.239	0.121	0.093	0.079	0.028	0.028	
Dividends-Preferred	0.008	0	0	0	0	0	
Dividends-Common/Ordinary	0.144	0.133	0.089	0.064	0.04	0.036	31.04%
Preferred Stock	0.158	0	0	0.032	0.032	0	
Common Stock	0.434	0.384	0.3	0.298	0.208	0.202	
Shareholders' Equity-Total	21.456	19.936	16.649	1.732	1.328	1.123	

TATA HYDRO-ELECTRIC POWER

GVKEY:	203891						
INDUSTRY:	4911						
CURRENCY:	In Currency	Native					
	Mar97	Mar-96	Mar-95	Mar-94	Mar-93	Mar-92	
Income Bef Extra Items	0.478	0.885	0.457	0.361	0.266	0.11	32.06%
Retained Earnings	0.537	0.356	0.255	0.174	0.115	0.072	
Dividends-Preferred	0	0	0	0	0	0	
Dividends-Common/Ordinary	0.17	0.154	0.111	0.059	0.028	0.016	50.18%
Preferred Stock	0	0	0	0	0	0	
Common Stock	0.437	0.436	0.433	0.263	0.191	0.08	
Shareholders' Equity-Total	4.4	4.066	4.093	2.602	1.615	1.023	

TATA POWER CO LTD

GVKEY:	203894						
INDUSTRY:	4911						
CURRENCY:	In Currency	Native					
	Mar97	Mar-96	Mar-95	Mar-94	Mar-93	Mar-92	
Income Bef Extra Items	1.141	2.23	1.195	0.96	0.673	0.265	31.75%
Retained Earnings	1.364	0.929	0.667	0.407	0.243	0.175	
Dividends-Preferred	0	0	0	0	0	0	
Dividends-Common/Ordinary	0.387	0.387	0.281	0.153	0.071	0.042	48.00%
Preferred Stock	0	0	0	0	0	0	
Common Stock	1.151	1.1	1.09	0.675	0.495	0.213	
Shareholders' Equity-Total	12.198	12.336	8.993	5.349	4.056	2.554	

Six Companies

AVERAGE EARNINGS	**35.94%**
AVERAGE DIVIDENDS	**42.86%**

Three Companies

AVERAGE EARNINGS 39.91%

AVERAGE DIVIDENDS 35.90%

SEBs

Rs. Crores

	92-3	93-4	94-5	95-6	96-7	98-7	
Unit Costs of PS	128.2	149.1	163.4	181.8	207.7	217.9	P/kWh
Power Sales	210,764.0	219,087.0	236,503.0	254,117.0	272,238.0	295,356.0	Mkwh
Total Costs	27,009.4	32,670.3	38,644.6	46,198.5	56,554.7	64,358.1	Rs. Crores
Commercial Loss	-2,724.9	2,705.6	-2,747.4	2,614.3	-7,148.5	-7,218.7	Rs. Crores
Total Revenues	24,284.5	29,964.7	35,897.2	43,584.2	49,406.2	57,139.4	Rs. Crores
Subsidy from St. Govts.	3,182.0	2,354.3	3,589.2	5,709.5	2,634.1	2,909.2	Rs. Crores
Net Revenues	21,102.5	27,610.4	32,308.0	37,874.7	46,772.1	54,230.2	Rs. Crores

Growth rates

						GROWTH
Power Sales	3.95%	7.95%	7.45%	7.13%	8.49%	**6.88%**
Total Revenues	23.39%	19.80%	21.41%	13.36%	15.65%	**17.06%**
Net Revenues	30.84%	17.01%	17.23%	23.49%	15.95%	20.90%

Note:

Values for 1997-8 are preliminary.

Growth Rates: Log-lin least squares

Source: Ministry of Power, Government of India

SUPPORTING DATA

Betas of a sample of US power distribution utilities

Company	Beta	Publication Date (all 1998)
Duke Energy Corp.	0.65	13-Mar
Consolidated Edison	0.75	13-Mar
Entergy	0.7	9-Jan
Texas Utilities	0.75	9-Jan
Kansas City Power and Light	0.8	9-Jan
PG&E	0.6	20-Feb
Edison International	0.75	20-Feb
Pacificorp	0.7	20-Feb
Mean	0.7125	

Source: Value Line

BARRA Beta Book
Global Equity Model - Morgan Stanley Capital International Version

Rupies

SEDOL/ CUSIP	Name	Global Predicted Beta	Local Predicted Beta	Historical Beta	Specific Risk	Total Risk	Systematic Risk	Yield	Primary Industry	Price	Market Capitalization (U.S.$)	Country	As-Of Date
601135	AHMEDABAD ELECTRICITY	0.220	0.998	1.045	57.347%	66.789%	6.001%	4.219 %	Utilities - Electrical & Gas	52.15	79,350,336.00	India	31-Jul-98
614984	BSES LTD.	0.241	1.176	1.227	27.956%	48.342%	15.932%	2.177 %	Utilities - Electrical & Gas	147.00	476,082,944.00	India	31-Jul-98
616109	CESC LTD.	0.255	1.113	1.156	49.570%	62.624%	8.728%	6.612 %	Utilities - Electrical & Gas	30.25	41,908,192.00	India	31-Jul-98
686121	SURAT ELECTRICITY CO.L	0.145	0.730	0.756	44.882%	51.754%	4.743%	6.047 %	Utilities - Electrical & Gas	86.00	9,333,984.00	India	31-Jul-98
	Mean	0.215	1.004	1.046									
690532	TATA HYDRO-ELEC POWER	0.149	0.707	0.742	51.527%	57.139%	3.704%	4.415 %	Utilities - Electrical & Gas	83.80	85,595,200.00	India	31-Jul-98
690531	TATA POWER CO. LTD.	0.239	1.164	1.216	25.267%	46.679%	17.093%	4.205 %	Utilities - Electrical & Gas	88.00	238,194,304.00	India	31-Jul-98
604179	ANDHRA VALLEY POWER SU	0.149	0.700	0.737	53.477%	58.826%	3.485%	4.704 %	Utilities - Electrical & Gas	78.65	122,154,560.00	India	31-Jul-98
	BSE-30	0.183	1.000	1.000									31-Jul-98
		0.219	1.000	1.000									31-Aug-98

NARUC Compilation - Rate of Return on Common Equity

Agency	Company Name	Date Approved	Rate Approved
Arizona CC	Tuscon El Pwr	1/13/1994	11.00
DC PSC	PEPCo	3/4/1994	11.00
Iowa UB	Iowa-Illinois	2/25/1994	11.25
Maine PUC	Bangor Hydro	3/16/1994	10.60
Michigna PSC	Detroit Edison	1/21/1994	11.00
Montana PSC	Montana Power	4/28/1994	11.00
Oklahoma CC	OK G&E	2/25/1994	12.00
Texas PUC	Texas Utilities	1/28/1994	11.35
Vermont PSC	Citizens Utiities	1/26/1994	9.89
Virginia SCC	Virginia Power	2/3/1994	11.40
Average			11.05

Source: Table 215 - Rate of Return on Common Equity - Electric Utility
Most recently approved rate and rate actually earned by the same company
NARUC Compilation of Utility Regulatory Policy 1993-1994
Selection of rates approved in 1994