

Concept Paper

**DETERMINATION OF RATE OF RETURN FOR POWER
SECTOR**

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Introduction

The objective of this paper is to evaluate the prevalent practice followed by NEPRA for determining/evaluating RoE and IRR for various technologies, and to offer recommendations for more informed decision making in this regard. This paper is an attempt to use conventional project finance technique to compute the expected cost of equity to commensurate the investors interested to invest in Pakistan's power sector. This is an initial draft expected to be revised many times after an exhaustive in house reviews before it is open for external review. In this report at first, a distinction has been made between Rate of Return or interchangeably referred in this report as Return on Equity vis-à-vis Internal Rate of Return. Afterwards, a Capital Asset Pricing Model (CAPM) has been used for calculating expected return on equity. CAPM can be applied in many ways. Efforts have been made that the assumptions used are sound, reasonable and reflective of the power sector's unique offerings. Finally, some issues related to technology specific return, RoE under Cost Plus regime versus Upfront regime, RoE review period have been highlighted that needs to be further reviewed.

1. RoE or IRR?

At the outset, it is important to clarify the difference between RoE and IRR. **RoE** is an accounting term which is derived through a simple equation that is;

Return on Equity = Net income / Average shareholder equity

Net Income = Revenue - (cost of sales + taxes + admin expenses + Depreciation)

Average Shareholders Equity = Average of Shareholders equity at the beginning of an accounting year and the end of that period.

Return on Equity measures the potential of a company/business to generate profitability with the money invested by shareholders.

Internal Rate of Return on the other hand is used primarily in project finance to evaluate the decision on various investment options. It inherently is the discount rate that equals future cash flow estimates to the initial investment:

Initial Cash Outflow (ICO) = Cash flow CF-1/ (1+IRR) + CF2/ (1+IRR) +..... +CFn/ (1+IRR) +ICO

In addition to above, it is also important to distinguish between "project IRR" and "equity IRR". To compute project IRR, annual cost/expense (O&M, Fuel, Insurance, Debt servicing etc.) is deducted from the annual revenue (cost of electricity) and the left over or the remaining cash flows are compared with initial investments. The discount rate that equates the ICO with CFs is the project IRR. Equity IRR on the other hand, is essentially a number which the Authority has already fixed for different technologies (Please see the table on next page). This means in the above equation, the discount rate or IRR is already given, and only the CF is required to be calculated.

While computing IRR, it is assumed that the investor return is due on the date the equity is injected into the project. This is a very important concept to understand. Because of this, investors who are building plants having more than a year of construction, are allowed return when the plant is under construction. In some cases, return becomes due even 5 to 6 years before

the plant sells the first unit. The return during construction is then accumulated and paid back to the investors - principal along with the return on the outstanding amount- over the entire project life. The treatment of Return on Equity during construction (RoEDC) is basically equal to Interest during construction (IDC). If IDC is the lenders return during construction, RoEDC is the investors compensation for the equity injected into the project. At NEPRA, the original equity is added back at the end year of the project life to quantify the project residual value. Once the long-term PPA is ended and the debt obligation is gone, the plant still has a value, so the residual value needs to be included in the IRR calculation. Equity investment in Pakistan is just like investing in bonds wherein, like bonds, you receive an annual coupon payment and once the bonds mature, you get the principal bond value back again.

The issue of IRR also needs to be looked into from the perspective of a regulator. For instance, why the Authority allows equity IRR and not the project IRR? The reason is that under the cost plus regime, all prudent expected cost is established by the Authority for a particular project. When, let's say an EPC cost is fixed, ideally, the investor can neither earn profit, nor incur loss on it because the EPC ought to reflect the market cost. In most thermal cases, a petitioner is required to submit firmed non-reopenable EPC contract. This leaves little room for price negotiation. Even, if the investor manages to reduce the EPC cost, post approval, the Authority adjusts the EPC cost at a later stage and thus deny the investor the benefit of any cost saving. In brief, the investors' only interest in the project is the return that is allowed on the equity injected.

2. IRR for Generation Projects- Existing Scenario

The existing generation tariff regimes of NEPRA, both upfront and cost-plus, allow for a fixed Internal Rate of Return (IRR). The IRR presently ranges in-between 15% and 20%. The table below incorporates list of technologies and the corresponding returns allowed by the Authority:

RoE/IRR	Small Hydro	Large Hydro	Coal	Solar	Wind	(RFO/Gas)	Bagasse	RLNG (interim)
Upfront	20%	-	17% to 20%	17%	17%	15%	-	16%
Cost-plus	17%	17%	-	-	17%	-	17%	

The working out of such IRR now needs to be effectively depicted against specific risk and return matrix and its adjustment for a particular technology. The IRR thus allowed should clearly spell out and be reflective of a return which has built-in approach to account for various parameters, such as; (a) prevailing power sector incentive packages, (b) associated country risks, (c) variants of that particular technology, (d) level of incentive to be created for investors and e) whether the investor is opting for upfront or cost plus regime.

Determining the required rate of return for power generation projects is thus dependent on above referred parameters. Regardless of the approach, an IRR to be effective, it has to correspond to the risks associated with generating electricity and at the same time engaging enough to attract the capital needed for a specific technology or purpose (generation or transmission). For example, technologies that have not been explored to the fullest potential and/or needed to quickly add power generation to the system may be offered a higher return to attract more rapid investment.

Equally important should be the idea that the IRR offered by Regulator must be more tailored towards improving the energy mix that is more reflective of a Country's available natural resources and macro-economic conditions. An IRR offered that is segregated, will be able to clearly reflect the incentive for investors for a particular technology or resource for improving energy mix that is best optimized for the Country.

3. A Risk Adjusted IRR:

Previously, guidelines for Determination of Tariff for Independent Power Producers, 2005, allowed for an IRR that was equal to the long-term interest rate based on the auction of 10-year PIB plus a premium of X% to be determined by NEPRA. Later, according to the latest Power Generation Policy, 2015, the Government has now indexed ROE component of tariff to US dollar, ensuring a US Dollar based return to the equity holders of power generation projects in Pakistan.

There are various methods to determine RoE i.e. Arbitrage Pricing Model, Fama French 3 factor model, etc. and all these models have their pros and cons. There is one method however that stands out the most in term of its frequency of usage, despite having shortcoming that is, the

Capital Asset Pricing Model (CAPM). CAPM was first developed by William Sharpe and John Lintner for which William Sharpe was given the Nobel Prize in 1990¹ (Rehman).

How to determine risk and return profile of the company and/or market is an intense academic debate that has been taking place for decades. Due to the limited scope of this paper, we have not delved into that discussion. In this paper, we will be exploring return based on the CAPM single factor model. We will use a particular derivative of CAPM called the “Bludgeon Approach” for determining expected return on equity. Under this approach, it is assumed that the companies in the market are equally exposed to country risk premium² (Damodaran 2003). In view thereof, the cost of equity for a firm in a market with a country risk can be determined using the equation below:

Cost of Equity = Risk Free rate + Beta (Market Risk Premium) + Country Risk Premium

3.1 Risk Free rate, or R_f represents the prevailing risk-free rate. It can be spot rate, annual, 5years, 10 years or 30 year rate. The Power Policy allows for dollar based return. Therefore, it is advisable to take US based risk free rate and Market Risk Premium (MRP). For CAPM, we will use US 5-year Treasury bond rate that any investor can get if he/she invests US Dollars in Government securities. The interest rate differential between Pakistan risk-free rate and US risk-free rate itself incorporates any impact of depreciation or appreciation of PKR value against the US Dollar. Therefore, the US risk-free rate seems to an appropriate instead of earlier approaches of Pakistani risk-free rate or PIB, keeping in mind that currency risk will be covered in this process and will also be consistent with the spirit of Generation Policy, 2015. This information is authentically available from the official website of the US Department of Treasury. Currently 5-years US Treasury bonds offer a yield of 1.38%³. And the same is being used for estimating RoE.

3.2 Market Risk Premium ($R_m - R_f$): Market risk premium is the difference between expected return on the portfolio of stock (R_m) and the risk free rate (R_f). Generally, investment in stock is risky, hence, MRP is the premium the investor would require above the riskless/risk-free

¹ Impact of Capital Asset Pricing Model (CAPM) on Pakistan (The Case of KSE 100 Index) Hameed Ur Rehman, Research Journal of Finance and Accounting Vol.4, No.7, 2013

² Measuring Company Exposure to Country Risk: Theory and Practice Aswath Damodaran Stern School of Business

³ <http://www.bloomberg.com/markets/rates-bonds/government-bonds/us>

rate. For the purpose of determining expected rate of return using CAPM, Pakistan based market return, which is actually the average return at Pakistan Stock Exchange (PSX), can be assumed. However, the PSX is not mature market or big enough and don't offer long term historical return patterns to forecast future MRP. The S&P 500 which is the US equivalent of PSX, is approx. US\$ 18000 billion market against PSX's US\$73 billion and offer MRP since 1928.

Hence, the average return on S&P 500 index minus US Treasury Bonds is considered for MRP. To completely evaluate an investment decision in the power generation business, an investor will first assess the return offered by a diversified equity market index and then demand a premium over and above that for the added risk of investing in the Pakistan. As mentioned earlier, the S&P 500 average return along with Treasury Bonds or the Rf is available since 1928. The question is what time frame should be assumed for computing Equity Risk Premium. Following is the MRP/Equity Risk Premium at different time period.

Time period ⁴	ERP (S&P 500 return minus US Treasury interest)
1928 to 2013	4.62%
1964-2013	3.33%
2004-2013	3.07%

For CAPM, we can assume all the three to give a range of RoE for decision making purpose. **Albeit, in the instant case 4.62% is rounded off to 5% & assumed as the MRP.**

3.3 **Beta** or commonly represented by the sign “ β ” reflects the systematic risk/undiversifiable risk. In other words, beta represents volatility in the value of a stock in comparison to the market. This type of risk affects the overall market, not just a particular stock or industry. This risk is both unpredictable and impossible to completely avoid and is an integral part of the Capital Asset Pricing Model⁵. The number of generation companies listed on the Pakistan Stock Exchange does not offer a reasonable sample size to calculate Beta. The US market does offer a reasonable estimate to compute beta for different industries including coal, power, etc. It is important to note that Pakistan power sector offers comprehensive incentive packages and risk protections from

⁴ Equity Risk Premiums (ERP): Determinants, Estimation and Implications – The 2014 Edition *Updated: March 2014*
Aswath Damodaran, Stern School of Business Damodaran

⁵ Investopedia, 2016

inflation and exchange rate coupled with sovereign guarantees. Further, two part tariff along with long term PPA essentially makes the generation in private sector a low risk sector. There is no method to capture and quantify these incentives in the conventional financial method such as CAPM. Nevertheless, ROE is required to be determined and we will have to work out ways to determine RoE using techniques like CAPM. We believe we can do that by being as conservative in our assumption as possible. This way we can hope to simulate the risk and return profile of the generation business. In our opinion, IPPs based generation being driven by long-term supply contract with single buyer closely mirror natural monopolies like utilities. In view thereof, we believe Beta of US Utilities is more similar in risk and return profile with Pakistan IPP's generation business because of all the GoP/NEPRA incentive packages. Therefore, the US Utilities (general) Unlevered Beta will be used. There is a method known as Hamada Equation through which one can adjust a sector beta to a desired capital structure, i.e. debt to equity ratio of let's say 70:30. But we believe that is not required here. Generally, in conventional setup, leverage or debt increases the level of risk for which RoE is calculated on the higher side. But under the regulatory regime wherein debt is a pass through item and considering the fact that portion of debt has no bearing whatsoever on RoE. De leveraging the unlevered beta using method like Hamada's will unnecessarily increase the beta & the resultant RoE. For instance, 70:30 debt equity structure increases the unlevered beta of 0.38 to 1.26. **Therefore, for CAPM, we will be using unlevered beta of 0.36 of US Utilities (General)**⁶

3.4 Country Risk Premium (CRP) can be determined at least in three different ways. The **first** is the sovereign rating attached to a country by ratings agencies. The **second** is to subscribe to services like Economic Intelligence Unit (EIU) country Risk Score. Similar services are also offered by Political Risk Services (PRS) that you can get by paying a subscription fee. The services include a broader measure of country risk that explicitly factor in the Economic, political and legal risks in individual countries. The **third** is to go with a market based measure such as the volatility in the country's credit markets, i.e. Credit Default Swap (CDS) or bond default rating⁷.

⁶ http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/Betas.html

⁷ Equity Risk Premiums (ERP): Determinants, Estimation and Implications – The 2014 Edition *Updated: March 2014*
Aswath Damodaran, Stern School of Business

We prefer measuring CRP through market based measures such as CDS. The CDS, we believe is a better indicator of capturing CRP because it is an updated number, reflects investor perception about a market at a particular point in time, unlike credit rating which is too slow in responding to the country's economic, political etc. changes.

3.5 CDS Credit Default Swap rate highlights investor sentiments about the health of a country's economy. It particularly measures the Government's ability to meet its sovereign foreign debt obligations. International investors evaluating to invest in Pakistan, particularly examine the risk associated with default on the Country's foreign debt and accordingly demand and expect a compensation against that risk. If the country's ability to meet its future sovereign foreign debt obligations improves, the risk premium associated with this risk factor should actually contribute to decreasing the risk-adjusted IRR for power generation. This information is also available from reliable sources like Bloomberg. The Pakistan CDS as of January 2016 was 5.92%. This rate needs to be adjusted to US CDS rate of 0.39% to get a pure Pakistan default rate of **5.53%**. Some analyst argues that 5.53% is the default associated with Pakistan foreign debt obligation. Equity market on the other hand is more risky, so it has to be adjusted upward by a factor. This factor is generally computed by dividing standard deviation of equity return with standard deviation of CDS rate. This factor, which currently is quoted as 1.11⁸ is further multiplied by the CDS rate to get the overall adjusted CDS rate. In the instant case 5.53% times 1.11 will yield adjusted CDS of 6.14% as per the formula given below

$$\text{Adjusted Country risk Premium} = \text{Credit Default Spread} \times \left(\frac{\sigma_{equity}}{\sigma_{CDS}} \right)$$

However, in Pakistan context, this adjustment is not needed. If applied, will unnecessarily increase the risk premium. According to Aswath (2014) the empirical evidence suggests that both equity market and bond market move close to each other therefore, beta is close to one. Which means there is no need for such adjustments.

Based on the above discussion, while taking Rf of 1.38%, ERP of 5.53%, Beta of 0.36, Country Risk Premium of 5.53%, RoE works out to be 8.73% (\$ term). Off course there can be many derivatives of RoE if one or many underlying assumptions such as ERP, levered vs. Unlevered

⁸ http://pages.stern.nyu.edu/~adamodar/New_Home_Page/data.html

Beta etc. are changed. We have changed a few assumptions among many, and it gave an overall RoE range of 8.59% (min) to 13.57% (max) as indicated in the table below:

Sensitivity of RoE	US Dollar Based				Pak Rupee Based			
	ERP @4.62%		ERP @5%		ERP @4.62%		ERP @5%	
	CDS	Adjusted CDS	CDS	Adjusted CDS	CDS	Adjusted CDS	CDS	Adjusted CDS
Unlevered Beta	8.59%	9.18%	8.73%	9.32%	14.6%	15.2%	14.7%	15.3%
Levered Beta @ D/E of 50:50	10.28%	10.86%	10.56%	11.14%	16.4%	17.0%	16.7%	17.3%
Levered Beta @ D/E of 70:30	12.53%	13.11%	12.99%	13.57%	18.7%	19.3%	19.2%	19.8%

One may argue against the assumptions used above and may propose a RoE higher than the one indicated in the above table. We have arrived at the expected RoE number which we believe is based on the rational application of financial concept to a market which already provide a sound protection against typical risks like Inflation, currency instability, etc. One may disagree with our interpretation of the underlying assumptions, therefore, the computed numbers are open to critical analysis for internal as well as external discussion.

4. Other Issues

a. Technology Specific RoE

The Authority may decide from time to time keeping in mind the target energy mix of the country or the risk associated with the specific technology or source used for generation to give a premium or discount on the already approved RoE. This is the segment of IRR where Regulator can effectively play its role to encourage/discourage particular technology. The Authority can accordingly reduce IRR for a technology where the risk factors have periodically reduced and later entrants thus do not deserve the same level of IRR as was offered to those who were pioneers in that particular technology. For instance 20% IRR allowed to Thar coal based power plant should be reduced once a sizable capacity of plants start generation electricity using Thar Coal. The reason being that early investor in developing Thar coal based power plants have much higher risk because of **lack of precedence**.

b. RoE under Upfront Vs. Cost Plus Regime

Under cost plus regime, as said earlier, the investor doesn't have the option to keep the saving arising from achieving better efficiency or reducing the cost of major CAPEX item i.e. EPC, post NEPRA approval. The investor, primarily relies on the Authority approved return. This is not the case in upfront tariff, wherein the investor is entitled to keep among many things, the project cost/efficiency saving and thus can attain RoE higher than the approved one. This means that the potential of earning profit is more in upfront tariff than under cost plus regime and thus the return offer on upfront tariff regime should be lower than the Cost Plus. One may argue that the potential of incurring loss in Upfront regime is also higher so, with higher risk and return, investor opting for upfront tariff should be compensated more. But this may not be true. The reason being that before an investor approach NEPRA for unconditional acceptance of upfront tariff they already have done market survey about EPC price/technology O&M cost and are reasonably sure that they can achieve the approved cost/tech benchmarks. There will certainly be a level of risk associated with cost increase, but that too would most likely related to project development cost and not major items like EPC which constitute ~70% of the total project cost and for which EPC quote can be obtained before unconditional acceptance. In view of the above, the Authority may offer different RoE for the same technology for the investors opting for either Upfront or Cost Plus regime.

c. Transmission & Distribution Sector

Although the current regulatory regime provides space for multiple transmission companies, however, generally, there is one company that is responsible for transmission of bulk of the generation that is National Transmission and Despatch Company (NTDC). The market is now opening up, Fatima group has already obtained special purpose transmission license and international investors have shown interest in entering Pakistan high voltage DC transmission business as a builder and an operator. This is certainly an exciting time for the transmission sector as the transmission sector is where the major bottleneck lies when it comes to power evacuation from the upcoming power plants. The prospective investor needs to be provided incentive so that their interest remained focused in the transmission sector. A reasonable IRR

commensurate with the level of risk is the first step in this direction. The Federal Government is also keen to privatize the Distribution Companies (Discos). Whether the current returns offered Discos are sufficient to attract investment? It is understood that generation, transmission and distribution are three separate businesses with distinct risk profile. What are these risks? How can it be translated into a sector specific return? These questions and many more required discussion and input from stakeholders in arriving at reasonable rate of return for this sector which is lately seeing interest from private players.

d. **RoE Review Period**

RoE once fixed for a particular period can't be applied indefinitely to all projects. RoE and its underlying assumption as stated earlier changes from one period to another. In principal, RoE should be dynamic and the formula should offer flexibility to change one or more variable so that the sector exposure to risk is adequately and timely addressed. Two issues emerge from this discussion a) when should the overall formula including all the underlying assumptions be reviewed or revised? b) What variables within the RoE locking period could be revised/updated that could compute RoE to reflect particular technology/project company risk at that point in time. To address the first point, we believe 5 year review period is good enough to capture broad risk/return factor for the sector. That is why in our assessment, we relied on 5 years, R_f . To address the second issue, the CAPM equation can be updated every year only to the extent of the 5 year US Bond rate and the prevailing Country Risk Premium in addition to technology specific premium/discount.