

# **Discussion Paper On Depreciation Norms**

BY



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### ABBREVIATIONS

CA	Companies Act, 1956
CERC	Central Electricity Regulatory Commission
CPUC	California Public Utility Commission
CUs	Central Utilities
DCF	Discounted Cash Flow
ESA	Electricity Supply Act
FPL	Florida Power limited
FPUC	Florida Public Utility Commission
HC	Historical Cost
IPPs	Independent Power Producers
IT	Income Tax
MACRS	Modified Accelerated Cost Recovery System
MMC	Monopolies and Mergers Commission
NHPC	National Hydro-Electric Power Corporation
NTPC	National Thermal Power Corporation Limited
ODRC	Optimised Depreciated Replacement Cost
OFFER	Office of the Electricity Regulator
PGCIL	Power Grid Corporation of India Limited
RAB	Regulatory Asset Base
SCE	Southern California Edison
SLM	Straight Line Method
WDV	Written Down Value

## 1. EXECUTIVE SUMMARY

### 1.1 Background

Depreciation is a deductible expense for the purpose of tariff determination and hence it is an important of the tariff. The three elements of depreciation are

1. The depreciation method
2. The depreciation rate
3. The asset base

In determining these factors, we have kept in mind the following prerequisites

1. The proposed norms should be as objectively determined as possible
2. Consumers should not be subjected to a price shock, or alternatively, the price smoothness should be maintained
3. The depreciation norms should not affect the commercial viability of the utility

### 1.2 Recommendations

We recommend that the Straight Line Method be followed based on its wide acceptance, price smoothness and the positive effects on utility interests.

The depreciation rates currently prescribed have no relationship with the fair life of the asset. We propose that the rates be derived from the fair life assuming a residual value of 10%. This will result in a reduction of the depreciation rates. The median rate will decline from 7.84% to 3.6% after the adoption of this method. The fair life used to determine the rates is as prescribed in the 1994 notification. We have considered the possibility that the life may be lower than the notified life by comparing the asset lives with international norms. It is observed that the internationally prescribed asset lives are higher compared to the Indian norms. While this may be due to differences in operating conditions, we also propose that the asset lives be determined afresh after a scientific study.

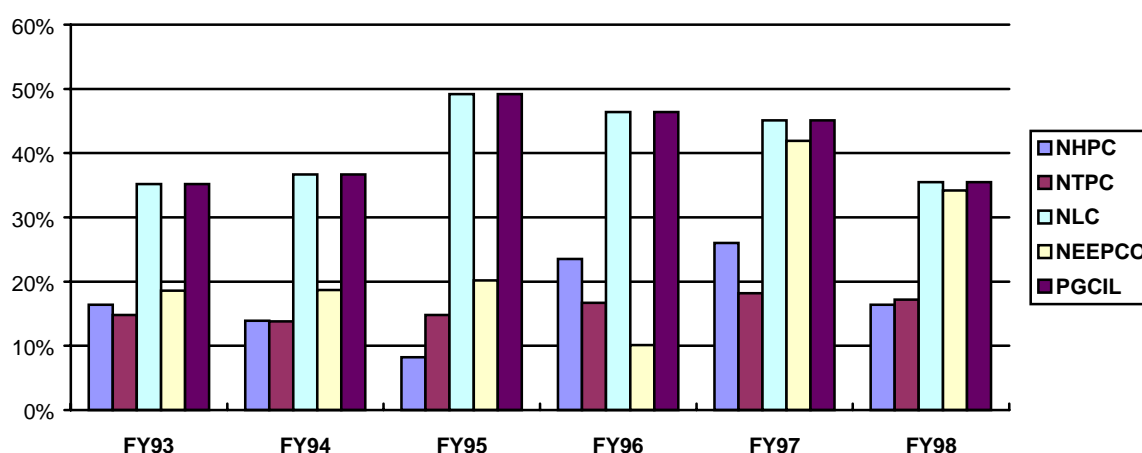
The depreciation rates are currently applied on the historical cost base. The historical cost base lends itself to many advantages. However, using a historical asset base results in significant price shocks to consumers at the time of replacement of the asset. The price shocks cannot be reduced without adversely affecting a utilities commercial viability. We therefore recommend that depreciation base be gradually shifted to an Optimised Depreciated Replacement Cost base. The period over which this shift needs to be done can be determined by the utilities and the CERC.

## 2. BACKGROUND

### 2.1 Introduction

Depreciation is an allowable expense (under sub-section 1 of Section 68 of the Electricity Supply Act, 1948) for the purpose of tariff computation.

**Depreciation as a % of Total Expenditure**



As seen in the chart above depreciation accounts for a significant proportion of the costs and hence of the tariffs charged by the utilities. The Central Electricity Regulatory Commission [CERC] has been mandated with regulatory oversight of the central generation and transmission entities and it has appointed ICRA to advise it on the depreciation policy to be adopted for tariff purposes as a part of its regulatory duties.

## 3. DEPRECIATION

Depreciation can be defined in both accounting and regulatory terms.

### 3.1 Accounting Definition of Depreciation

Depreciation, in accounting terms, is used to denote the shrinkage in value of an asset due to physical deterioration or wear and tear, obsolescence; passage of time, inadequacy and action of elements. Depreciation is computed so as to charge a fair proportion of the depreciable amount in each accounting period during the expected useful life of the asset.

### 3.2 Regulatory Definitions of Depreciation

There are two regulatory views of depreciation: the first that it represents a **return of capital** subscribed; and second that it represents a **replacement of capital** or a charge for the replacement of the assets consumed. The return view is consistent with the use of the Regulatory Asset Base [RAB] as the basis for assessing the investment in the firm, attributable to shareholders since shareholders expect an adequate return of and on the capital which they have subscribed to.

The replacement view denotes a measurement of the investment by the firm in real assets. The second view suggests that depreciation should be calculated on the basis of the current cost of assets. According to this view, the asset consumption can best be assessed through an annual depreciation charge on the basis of an estimate of the economic life and the current cost of the asset. However, this may not reflect the real value in current cost terms of the consumption of the service delivery capacity.

Irrespective of the view three ingredients necessary for computing depreciation are:

1. The Depreciation Method
2. The Depreciation Rate
3. The base on which the rate is to be applied using the method.

## 4. THE DEPRECIATION METHOD

### 4.1 Introduction

There are many methods for depreciating an asset, however the most commonly used one are the:

1. Straight Line Method
2. The Double Declining Value Method
3. Sum of Digits Method
4. The Renewals Annuity Method

#### 4.1.1 STRAIGHT LINE METHOD [SLM]

Its is the simplest and most widely used method. Depreciable cost (cost of the asset minus the scrap value) is divided by the estimated years of useful life to determine the depreciation each year. It provides a reasonable approximation between the return of capital and the reduction in an assets service potential. Regulatory compliance costs also reduce if the regulatory asset lives are similar to the accounting lives. The straight line method is extensively applied in electricity industry in most regulatory jurisdictions.

#### 4.1.2 200% DECLINING BALANCE METHOD

In this method, twice the straight line rate per year is applied to the declining balance each year. The principal advantage of this method is that it does not charge off any more depreciation over the entire period compared to the SLM but most of the depreciation is bunched in the earlier years of the estimated useful life. This method is used to encourage investment in assets. This is closer to the replacement view of depreciation.

The major advantages of the accelerated depreciation techniques being : (1) Higher depreciation is charged in the earlier years when the machine is most efficient compared to later years. The higher cost matches with the larger revenues resulting from the increased production. (2) The obsolescence problem is given due care because major part of the depreciation is charged in earlier years.

#### 4.1.3 SUM OF THE DIGITS METHOD

This is also an accelerated method of depreciation like the declining balance method. The number of years of useful life is added up and the depreciation each year is in a decreasing progression on a constant base. The method can be changed to increasing progression on the same base. The profile of the decreasing progression resembles the declining balance method with charge being front ended. The increasing progression results in charges being back ended.

#### 4.1.4 THE RENEWALS ANNUITY METHOD

This method is based on the premise that infrastructure assets have an infinite life span and that it would be erroneous to depreciate them over a finite lifespan. This method generates an annuity cash flow that reflects the future cash flow required to maintain the operating capacity of the asset. This method is well suited for assets that have a long life such as civil structures (dams, spillways in a hydro project) or when individual asset data is unavailable for the calculation of discrete asset life and depreciation charges.

The data requirements for this method are large and presume certain asset management practices that can be subject to audit. In addition the method is not a recognised method for accounting purposes.

## 4.2 The Indian Scenario

Depreciation for Indian electric utilities is governed by three acts:

1. The Electricity (Supply) Act, 1948
2. The Income Tax Act
3. The Companies Act, 1956

### 4.2.1 THE ELECTRICITY (SUPPLY) ACT, 1948 [ESA]

Three sections of the ESA make a reference to depreciation.

#### **Section 43-A(2): Terms, conditions and tariff for sale of electricity by Generating Company:**

The tariff for the sale of electricity by a Generating Company<sup>1</sup> to the Board shall be determined in accordance with the norms regarding operation and the Plant Load Factor as may be laid down by the Authority and in accordance with the *rates of depreciation* and reasonable return and such other factors as may be determined, from time to time, by the Central Government, by notification in the Official Gazette.

#### **Section 68(1): Charging of Depreciation by Board<sup>2</sup>:**

The Board shall provide each year *for depreciation* such sum calculated in accordance with such principles as the Central Government may, after consultation with the Authority, by notification in the Official Gazette lay down from time to time.

#### **Section 75-A(3): Annual Reports and accounts of a Generating Company:**

For the purpose of preparing the statement of accounts, the *depreciation to be provided* every year, shall be calculated at such rate as may be specified by the Central Government, by notification in the Official Gazette in accordance with the provisions of Section 43A.

One of these sections makes a reference to State Electricity Boards while the other two are more pertinent to Central Utilities. However, all the sections refer the issue of setting depreciation norms to the Central Government.

Gol has segregated the assets of a typical electric utility into 36 types for the purpose of setting the depreciation norms. (*A detailed list of these assets is enclosed in Annexe-I*).

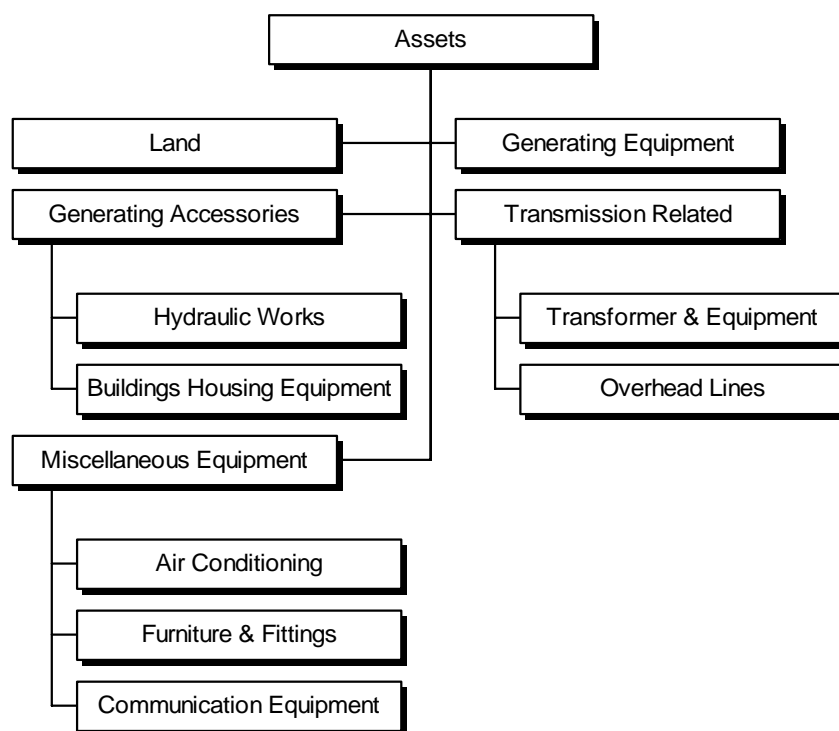
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<sup>1</sup> Generating Company means a company registered under the Companies Act, 1956 and which has among its objects the establishment operation and maintenance of generating stations.

<sup>2</sup> Board means a State Electricity Board established under Section 5 of the ESA.



The 36 asset types can be classified into 5 groups based on life of the asset<sup>3</sup> and 7 groups based on the depreciation rates. In addition, there are two asset classes on which depreciation is either not specified in the statute or is not allowed. For instance no depreciation is allowed on freehold land while leasehold land is depreciated based on the tenure of the lease. The asset categories and the breakup is depicted in the chart below.



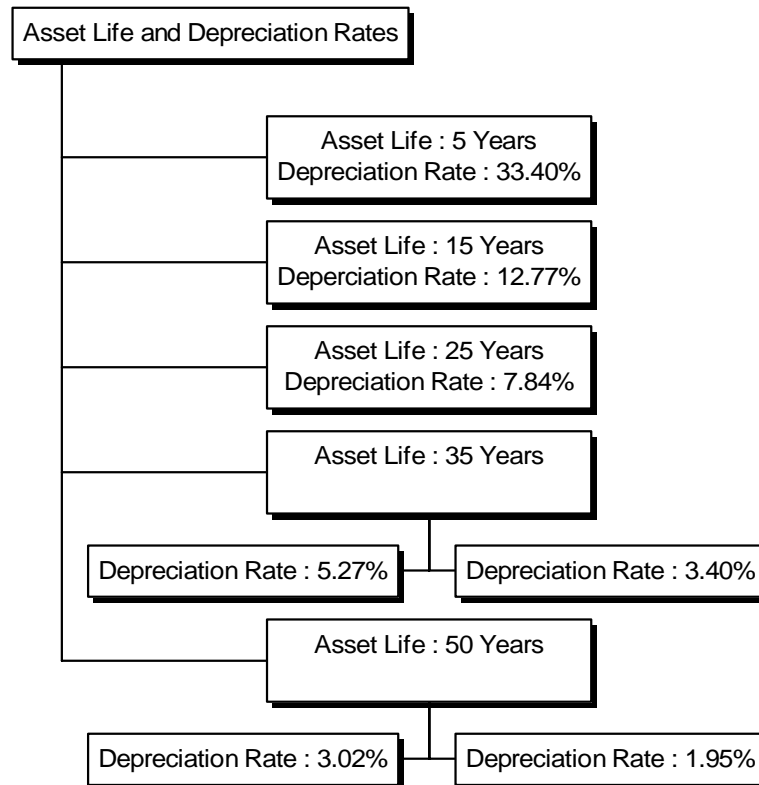
There have been two notifications on depreciation for electric utilities in the 1990s:

1. S.O.93(E) dated 23<sup>rd</sup> January, 1992
2. S.O.266(E) dated 29<sup>th</sup> March, 1994

The asset categorization was not changed in these notifications and the number of assets continues to remain at 36 till date. The notifications have however rationalized the fair life of these assets and the depreciation rates.

Prior to the notification in 1992, assets could be classified into 12 groups based on the fair life and 19 based on the depreciation rates. The 1992 notification reduced the number of groups to 7 on both aspects of fair life and depreciation rates. This was done by reducing the fair life and increasing the depreciation rates. Prior to 1992, the notified fair life ranged from 100 years for dams and roads to 5 years for temporary structures, while depreciation rates ranged from 0.9% to 18%. In 1992, the maximum fair life was reduced to 50 years, the minimum depreciation rate was increased to 1.95% and the maximum to 21.55%. Further, in 1994, the fair life of assets remained unchanged while the depreciation rates increased. All the assets can be classified into the categories listed overleaf based on their depreciation rate and their useful life.

<sup>3</sup> The depreciation rate under the straight line method is a function of the asset life and the residual value.



#### 4.2.2 THE COMPANIES ACT, 1956 [CA]

The CA fixes depreciation norms on the nature of assets, the industry or end –use of the asset and its usage rate. The Companies Act segregates assets into four classes based on their nature

1. Buildings
2. Plant and Machinery
3. Furniture and Fittings
4. Ships

Within this broad classification assets are further categorised on the basis of end-use. Plant and machinery is sub-divided into

1. Continuous Process plant and machinery
2. Non-continuous plant and machinery
3. Category for which special rates are applicable

Continuous process plants have two prescribed rates; one for written down value method and one for firms that wish to adopt the straight line method. Industries which are not continuous process plants are free to choose from a mix of single shift, two shift or three shift rates and then apply the specified rates for each shift and choose either the SLM or the WDV approach.

Under the CA, the relevant rates for electric utilities are

	WDV	SLM
Buildings (other than factory buildings)	5.00%	1.63%
Factory Buildings	10.00%	3.34%
Temporary Erections	100.00%	100.00%
Process Plant and machinery	15.33%	5.28%
Vehicles	40.00%	16.21%
Furniture and fittings	18.10%	6.33%

#### 4.2.3 THE INCOME TAX ACT [I.T.ACT]

The I.T Act requires a company to choose between the Written Down Value and the Straight Line Method of depreciation. Until FY97, electric utilities were expected to follow the rates prescribed in the Companies Act for computing their tax liability. However from FY99 the depreciation rates for electric utilities has been synchronised with those notified by GoI under the Electricity Supply Act 1948 (*Refer Annexe-II*). The revised rates in the I.T Act differ from those notified in the ESA only in two areas:

1. The rate for transformers having a rating of over 100 KVA under the ESA is 7.84% while it is 7.81% under the I.T Act
2. The rate for residual items (i.e. those that are not explicitly mentioned in the Schedule) is undefined in the ESA. The I.T Act however specifies a rate of 7.69%.

#### 4.2.4 ACCELERATED DEPRECIATION FOR HYDRO PLANTS

Hydro plants are allowed to benefit from an accelerated depreciation charge to cover for principal payments on loans having a tenor of 12 years or less. These plants are eligible to claim an “Advance against Depreciation” at an annual amount not exceeding one-twelfth of the loan amount and limited to the actual loan liability for the year as per a approved financial package.

However, the total of depreciation including “Advance against Depreciation” is not to exceed 90% of the approved capital cost of the project during the life of the project.

#### 4.3 International Practise

The straight line method is the commonly followed method internationally for accounting and regulatory purposes. Some hydro-electric utilities follow the renewals annuity method but these are not the norm.

#### 4.4 Our Recommendation

We recommend that the straight line method be adopted for the following reasons:

1. SLM is the current method of depreciation in India and its adoption would ensure price smoothness
2. It is an internationally accepted and practised norm and hence regulatory risks are minimal
3. Compliance costs are lower since no change is required to the current depreciation practise on this count.

## 5. THE DEPRECIATION RATE

Assessment of depreciation rate and the amount of depreciation to be charged in an accounting period are based on the following factors:

- (i) The Value of the Asset (The issue of asset value is discussed in the following chapter)
- (ii) Expected useful economic life of the depreciable asset
- (iii) Estimated residual value of the depreciable asset

The depreciation rate under the straight line method the depreciation rate is

$$\text{Depreciation Rate} = \frac{\text{Asset Value} - \text{Residual Value}}{\text{Economic Life}}$$

The depreciation for any asset should be spread out over the economic life of the asset i.e. the period over which economic benefits are expected to flow from the asset. The economic life is the shortest of the legal, physical, technical or commercial lives<sup>4</sup>.

1. Legal Life: The life of a leased asset would be limited to the period of the lease.
2. Physical Life: The asset may physically wear out and be reduced to scrap
3. Technical Life: A technically superior asset may supersede the old asset resulting in power costs, which would translate into a competitive advantage for the new user.
4. Commercial Life: The present value of the operating and maintenance expenditures may exceed the cost of replacement.

Assets that do not have a material value are fully depreciated in the accounting period in which they are acquired. In the Indian context the two important determinants of life would be the commercial life and the technical life. Only a small number of power sector assets are leased and the number of assets are currently in use beyond the estimated physical life is negligible.

### 5.1 The Indian Scenario

Until 1992, the depreciation rates prescribed were based on the accounting definition indicated above except for five items<sup>5</sup>. The depreciation rates were based on the residual value of 10% of the historical purchase cost of the asset. However, in the subsequent revisions (1992 and 1994) the link between the useful life<sup>6</sup>, asset value and depreciation rates is less evident<sup>7</sup>.

The latter revisions have seen the median rate shifting from 3% to 5.06% and in 1994 to 7.84%. No published material exists to indicate the rationale for these changes. But circumstantial evidence indicates that these changes were made to help Independent Power Producers [IPPs] protect their Return on Equity [RoE].

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<sup>4</sup> Henderson S. and Peirson G, "Issues in Financial Accounting", Longman

<sup>5</sup> The five items for which the depreciation rate did not fit the accounting method were steam and electric plant and machinery, concrete pipelines and associated hydraulic works, buildings containing thermoelectric generating plant, switchgear and lighting arrestors

<sup>6</sup> The notifications refer to fair life which has been interpreted to mean useful life

<sup>7</sup> It has been pointed out that the rates are based on a reinvestment rate of 12% and an inflation rate of 8% to assist in the replacement of the asset.

IPPs had been invited to invest in the power sector with a promise of a 16% RoE. IPPs were allowed a gearing of 4 times their equity to finance the project with caveats on the amounts of funds that needed to be sourced from local markets. Sponsors soon discovered that the local markets did not provide funds with tenors longer than 12 years and if the prescribed gearing was to be attempted it would result in a fall in their earnings. Depreciation was then used to bridge this gap and an average rate of 7.84% was prescribed. At this rate the cash flow from depreciation was sufficient to cover the principal payment on debt with a tenor of 9 years and more without affecting the RoE subject to the condition that the debt to equity ratio was lower than 2.33. This method of fixing the depreciation rate to help meet principal payments is akin to the Return of Capital approach.

## 5.2 International Practise

The depreciation rate in most countries is derived on the basis of the accounting definition of depreciation. International experience also suggests that the utilities follow the same depreciation charge for regulatory accounting (tariff determination) and statutory accounting purposes. The useful life comparison for various asset items with a few International Utilities has been illustrated in *Annexe-III*. Similarly the average rates of depreciation comparison for these utilities has also been shown in Table below.

**Average depreciation rate comparison for various utilities**

	Land/ Building	Generation assets	Transmission and distribution assets	Others	Total (average)
As per Indian Electricity Act, 1948	1.95 – 5.06% (Civil Works)	3.4 – 8.24%	3.4 – 8.24%	8.24 – 21.55%	3.5 –7.84%
National Grid, United Kingdom	2.0%	3.4% (Plant & Machinery)		7.9%	3.7%
Manitoba Hydro, Canada	1.1 – 2.1% (Civil Works)	2.2 – 4.2% (Turbines & Generators) 1.7 – 3.1% (Accessory Station Eqpt.)		0.5 – 2.3%	-
Scottish HydroElectric United Kingdom	2.2%	3.0%	3.1%	7.5%	3.5%
Snowy Mountains Hydro, Australia	1.9% (civil assets) 5.5% (Others)	8.4% (Electronic Equipments) 3.8% (Electrical/Mechanical Eqpt.)		6.2%	2.5%
Hydro – Electric Corporation, Australia	-	2.0%	4.0 – 5.0%	16.0 – 18.0 %	3.1%
National Power, United Kingdom	3.8%	4.5%		4.5%	4.4%
Scottish Power, United Kingdom	3.7%	2.4%		5.9%	2.8%
PowerGen, United Kingdom	-	2.7%	1.1%	7.8%	2.6%
United Networks, New Zealand	-				3.2%
Gener S.A., Chile	-				3.2%

As is apparent from the two tables, the depreciation rates indicated against individual asset heads, for Indian utilities are comparable to the corresponding figures for international

utilities. However, the average depreciation rate on an overall basis exceeds the average 3 – 4% rate for international utilities. This difference arises from the fact that plant and machinery are depreciated at lower rates internationally (linked to their useful life) while the prescribed rate is higher in India resulting in a higher average depreciation rate.

A comparison of the international norms on asset life indicates that the life of the asset in India is lower than those overseas. The difference ranges from 5 years in the case of gas fuelled plants to 35 years for hydro-electric plants. The difference may arise because of harsher operating conditions in the sub-continent.

### 5.3 International Practise on Accelerated Depreciation

Accelerated depreciation is based on the premise that the loss of economic usefulness of an asset is the greatest during the early years. The method provides for larger amounts for depreciation in the early years of the asset life while the amount progressively declines in later years. Some of the accelerated depreciation methods include: (a) declining balance method, written down value method and (b) sum-of-the years' digits method.

Nearly 97 percent of the utilities around the world apply a straight-line recovery method for ratemaking purposes, and only a small percentage of them also use the accelerated depreciation methodology. Adoption of this procedure tends to raise rates (expenses) over the shortened depreciation schedule, with a corresponding decline later on. This methodology has been used to promote ecologically friendly technologies such as wind, solar, geothermal projects. In US, the qualified solar energy property follows the Modified Accelerated Cost Recovery System [MACRS] 5-year depreciation schedule using a 200 percent declining balance method. Without this legal provision for solar equipment, depreciation for such equipment would be done over the standard 20-year period. Similarly in Netherlands the wind energy projects are allowed accelerated depreciation. Accelerated depreciation techniques in US are recommended for specific non-marketable assets, such as those under the category of regulatory assets<sup>8</sup>. Some of the other related methods include :

**Transfer Depreciation Reserves:** Under this method, depreciation reserves from transmission and distribution categories are transferred to generation assets. Net plant valuation of generating assets is thereby reduced, with a corresponding increase in the net valuation of the above assets.

**Accelerated Depreciation Offset with Decelerated Depreciation:** This is the same as "accelerated depreciation" but with a countervailing proviso that decelerates depreciation charges in asset areas that are risk free (such as transmission and distribution assets). This procedure constrains (or offsets) increases in rates.

**Economic Levelization:** When a plant or an asset is added to the rate base, a utility recovers depreciation together with income on its full value. The sum of these two is always higher in the initial years and declines continually over time (other things being equal) as the asset valuation is reduced by the amount depreciated each year. This regulatory approach tends to make the process "front-end loaded." Economic levelization keeps the depreciation

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<sup>8</sup> Regulatory assets include previously incurred costs that have been deferred for recovery in future rates with the concurrence of regulatory authorities. Such a classification is permissible under the provisions of Financial Accounting Standard (FAS) No. 71. Thus, regulatory assets include any costs that could or would have been otherwise expensed under standard accounting conventions. Examples of its components include regulatory tax assets recoverable through future rates, deferred finance charges, deferred environmental charges, unamortized property losses, unamortized demand-side management expenditures, certain post-retirement benefit costs, cancelled or abandoned plants for which recovery of unamortized costs has been allowed, and others

expense of a resource constant (in real dollars) over time. Thus, economic levelization has the opposite effect of accelerated depreciation and may be viewed as a strategy during the transition to promote sales.

Some regulators have also allowed nuclear power plants to be charge based on the accelerated depreciation methodology such as in California and Florida. The California Public Utility Commission [CPUC] granted a request from Southern California Edison [SCE] to accelerate the recovery of SCE's investment in the San Onofre nuclear power plant. Similarly the Florida Public Utility Commission [FPUC] also allowed the Florida Power limited [FPL] to charge based on the accelerated depreciation methodology.

## 5.4 Our Recommendation

We disagree with the concept that depreciation is a replacement of capital where depreciation is seen as a charge for the replacement of assets consumed with funds generated from depreciation used to meet the replacement costs. However, the replacement of any asset will be determined by the economics of investing in assets at that point in time. If a replacement decision does not make commercial sense it should not be implemented irrespective of the availability of funds. And if the decision makes economic sense, it can be funded from the capital markets without having to depend on the funds generated from depreciation.

A rational investor can be expected to recover his investment faster and would hence prefer a higher rate of depreciation. This would help reduce the risk arising from the stranding of any asset. However, consumers would be adversely affected with current consumers paying a higher proportion of the costs. There is also the risk that if investors are allowed to recover their investment upfront they will have lesser incentive to maintain and operate the asset efficiently. We are therefore in partial agreement with the return of capital concept but we believe that it is important to base depreciation on the total useful life of the asset. We base our conclusions on three considerations:

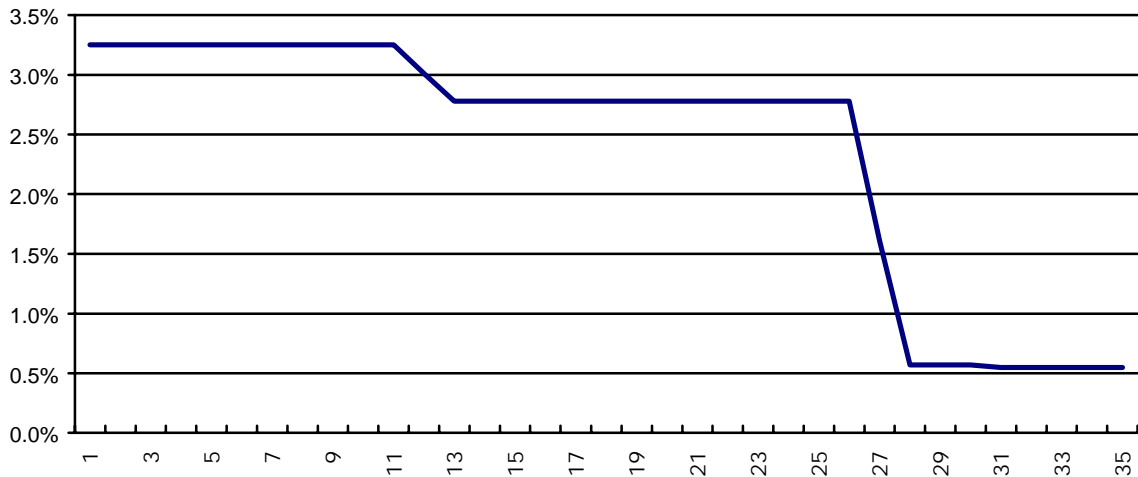
1. Price Smoothness: If assets are replaced before their useful economic life the depreciation charge would increase due to
  - double depreciation where both old and new assets performing the same function being depreciated
  - no depreciation where the asset has been fully depreciated but the continues to be used
  - unnecessary capital expenditure resulting in higher capital charges or no depreciation
2. Historical Records: An analysis of the accounting records of local and international utilities indicates that depreciation is not dovetailed to debt servicing.
3. Proper signalling of economic costs in terms of consumption of the service potential of the asset by the appropriate users. This is important from an inter-generational cross-subsidy perspective where one generation of customers essentially pay tariffs which includes an element of subsidy

### 5.4.1 PRICE SMOOTHNESS

The chart depicts the depreciation profile for a typical hydro generating utility assuming prevailing depreciation rates are applicable. If we for instance assume that all the assets

used to compute the depreciation last for 50 years<sup>9</sup> then the tariff profile (assuming other cost elements remain unchanged) would not be smooth. Depreciating the asset over its

**Depreciation Profile**



useful life (instead of a shorter time span) will ensure the criteria of price smoothness is met.

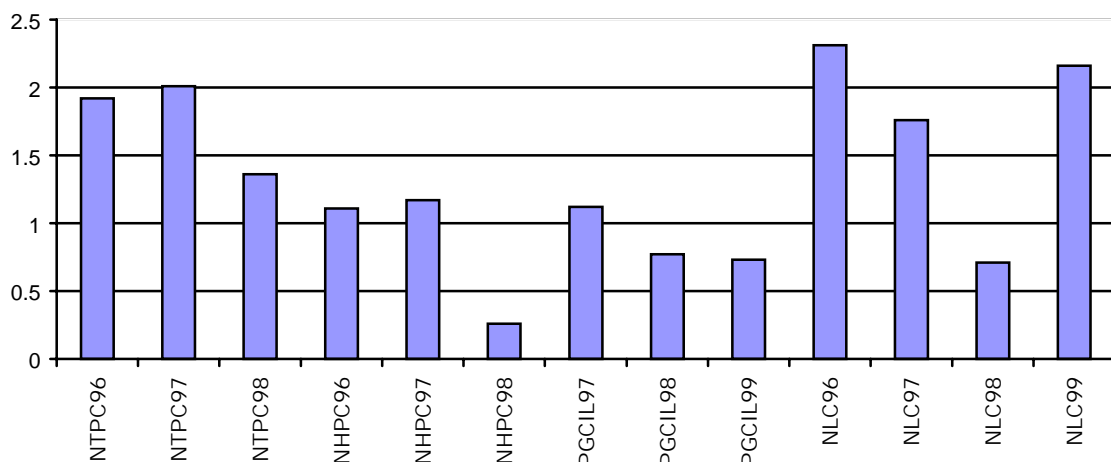
Improper assessment of life will either result in

1. the asset being replaced while it is still capable of functioning resulting in higher capital charges
2. continuing to keep the asset in use resulting in higher maintenance and repair expenses.

**5.4.2 HISTORICAL TRENDS**

A review of the depreciation charged and the principal payments indicates that there is no

**Ratio of Depreciation to Principal Payment-Indian Utilities**

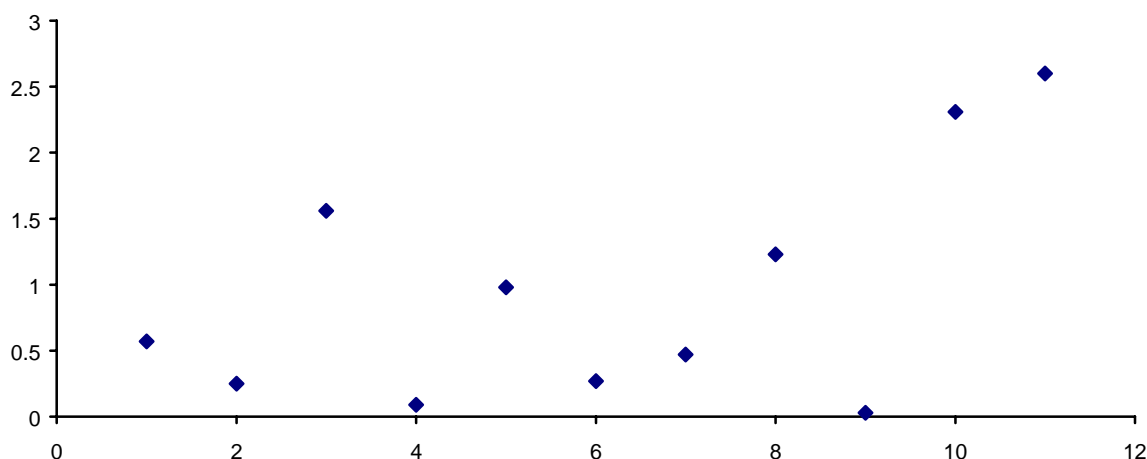


<sup>9</sup> If an asset had a shorter life it would have to be replaced which would push up the curve at the point of replacement.



link between the two. There are period when the amount charged as depreciation is twice the principal payments made and other instances when the principal payment is only a third of the depreciation charged.

**Ratio of Depreciation to Principal Payment - International Utilities**



A review of the international utility accounts also indicates the absence of a link between depreciation and principal payment.

### 5.4.3 PRICE SIGNALLING

It is argued that if effective price signalling is a consideration depreciation rates should not be reduced because

- There is currently a shortfall in energy supply which needs to be addressed through higher investment in the sector
- Consumers will be willing to bear the cost of providing this additional energy through higher tariffs, including higher depreciation rates
- The consumers energy requirements are immediate while the issue of inter-generational subsidy is an issue for the future when there may be surplus energy.

We agree that supply of energy is inadequate to meet the demand and that the market would probably clear at a higher price. However, investment flows would be driven by *magnitude* of the return *on* capital rather than the *source* of return *of* capital. The issue of inter-generational equity is important costs need to be linked to economic benefits from derived from consuming the asset. Computing the depreciation rate on the basis of economic life will ensure that economic costs in terms of consumption are linked to the benefits.

The depreciation profile can be however be rendered irrelevant, i.e. constant net present value of total revenues, if the return on capital is based on the net asset base rather than on a fixed base (equity subscribed) as at present.

## 5.5 Setting the Depreciation Rates

If depreciation rates are to be determined the useful life of the asset needs to be estimated. For reasons mentioned earlier the useful life would be the shorter of the technical commercial life. The estimation of commercial life would require substantial amount of historical data that may not be readily available. Our observations indicate that the fair life figures prescribed in the Gol notification have an engineering basis. A comparison of the asset lives with international norms indicates that the prescribed life in India for most assets is close to the international levels. The only significant difference arises in the case of hydro assets. The Indian norms prescribe a life of 35 years for hydro plant and machinery while asset lives in Canada, UK and Australia range from 50 to 70 years. The lower asset lives in India may be due to harsher operating conditions. Considering the similarity of asset lives across regulatory jurisdictions we recommend that the rates be set using the prescribed fair assuming a residual value of 10%.

## 5.6 Impact of Measuring Rates based on the Useful Life

If the depreciation rates are evenly spaced out over the life of the asset it will result in a reduction in depreciation rates compared to those that are currently applicable. The declines range from 0.15% in the case of hydro-electric plant and machinery to 15.4% for electrical equipment (*See Annexe-IV for item-wise rates*). However, the current median rate of 7.84% will reduce to 3.6% a reduction of about 50% on the current base. At this rate the cash flows from depreciation will be sufficient to cover principal payments on debt which has a tenor of atleast 9 years. A reduction of the depreciation rate will have the impact of reducing cash flows to support debt servicing. The impact will vary depending on the capital structure used for financing the project, the useful life of the asset and the tenor of the loan.

In general, the loan tenors are shorter than the asset lives prescribed and hence a reduction in cash flows from depreciation will mean that the debt servicing has to be done from the return on equity component until the debts are paid off. The results of a simulation to determine the present value<sup>10</sup> of cash flows to equity shareholders under various debt<sup>11</sup> equity structures for an average asset life of 25 years<sup>12</sup> (translating into a depreciation rate of nearly 4%) is depicted below.

The prescribed system of setting depreciation rates will be beneficial at lower debt equity ratios with a cross-over at debt to equity ratio of 1.25. This is because cash flows from depreciation will be higher than the principal payments due to the small proportion of debt financing. The situation reverses at higher debt equity ratios when the debt in the initial years has to be serviced from return on equity.

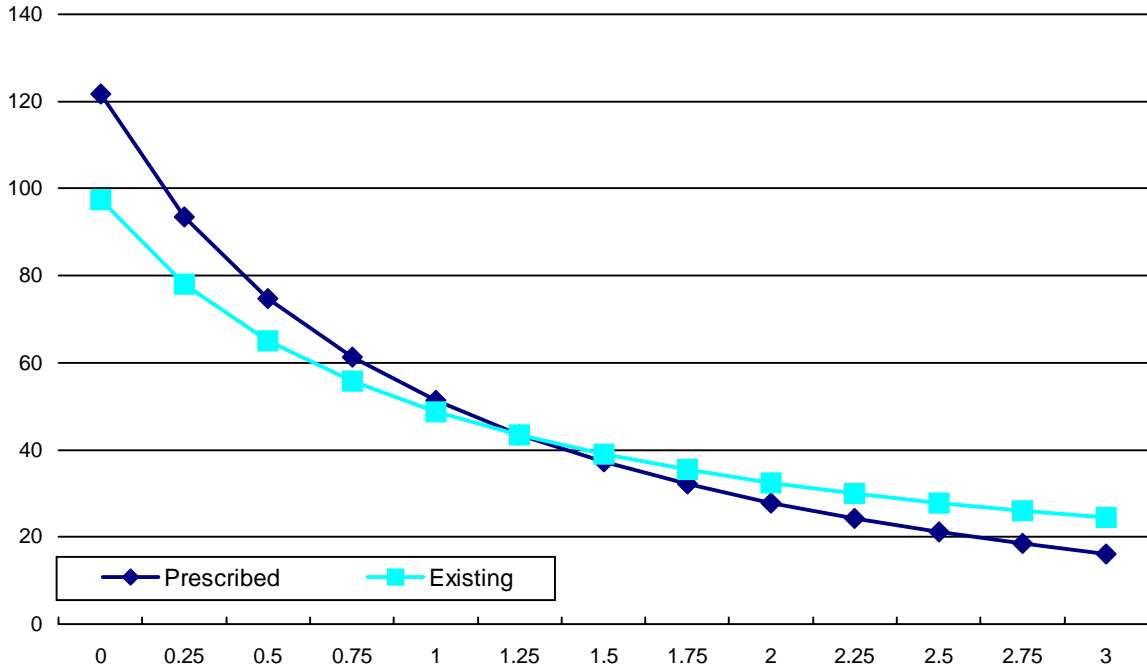
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<sup>10</sup> Discounted at 16%.

<sup>11</sup> The debt is assumed to have a tenor of 12 years and with equal amounts being paid every year.

<sup>12</sup> The median asset life in the statute books is 25 years. This asset life corresponds to generating plant and machinery will comprise the bulk of the project cost and hence is reflective of the project.

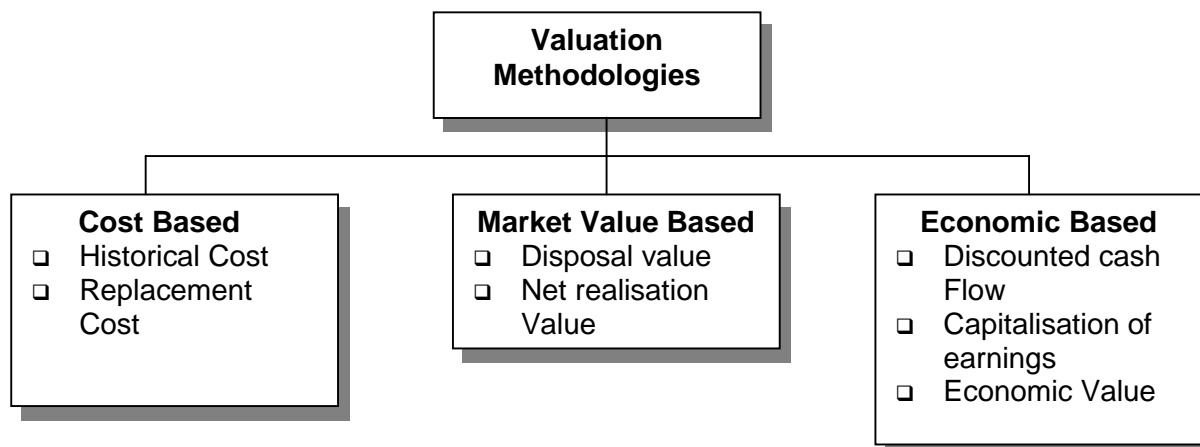
**Present Value of Cash Flows to Equity Shareholders**



The reduction in effective return on equity due to the reduction in cash flows from depreciation would range from 0.5% (at a leverage of 1.5) to 1% (at a leverage of 3).

## 6. THE ASSET BASE

The valuation of the initial capital base is a central issue in the determination of a reasonable future price path for regulated utilities. There are three main methods in vogue for valuing the asset base as depicted in the chart below.



The market based and economic based approaches use a number of subjective factors to determine the revenues and also suffer from a problem of circularity.

### 6.1 Cost Based Approaches

An approach based on cost has the advantage because they are based on more objective valuations used for financial reporting purposes. They also more accurately reflect the economic cost of service consumption.

#### 6.1.1 HISTORICAL COST

The historical cost of a depreciable asset represents its money outlay or its equivalent in connection with its acquisition, installation and commissioning as well as for additions to or improvements to the asset.

While the HC is less error prone and auditable there are a number of significant weaknesses in the HC valuation methodology.

##### 6.1.1.1 Price Shocks

If the opening asset base is valued at HC, a price shock will arise from significant new replacement capital expenditure even if the prices are indexed. This is because replacement cost values for new assets are usually in excess of the recorded HC values in the RAB of the asset which it will replace.

##### 6.1.1.2 Economic Signalling

The valuation of the opening asset base or new investment at a lower value will price the cost of service below economically efficient levels and will thus create distortions in the electricity markets

#### 6.1.1.3 Asset life estimation

HC asset lives are not based on rigorous engineering methodology being applied to assets. This affects the starting point for HC since it is likely to be lower written down value than under other methods which employ engineering based asset valuations. Accumulated depreciation at that starting point is also likely to be higher under HC therefore the utility will not be able to recover the difference between other methods depreciation and HC depreciation in a regulated revenue path. This will effectively result in the depreciation differential becoming a sunk cost for the utility. This depreciation gap will in lower revenues under HC forcing the utility to run the risk of insufficient returns going forward particularly when the capital expenditure increases significantly with the ageing of assets. If the utility is not achieving commercial returns in times of very high capital expenditure, prices will need to increase to compensate causing price spikes.

#### 6.1.1.4 Consistency with financial based asset valuation

The capital markets will value the business through the share price once the utilities are privatised. To be consistent the regulatory value should also present a current Rupee value.

There is therefore a risk that the HC asset base will not lead to long term recovery of a commercial rate of return for the utility reflecting insufficient returns being made on a low valued asset base. This may discourage utilities to invest in capital expenditure at the end of the economic life of the asset and thus encourage inefficient use of the service potential of the assets.

### 6.2 ODRC Method

The optimised depreciated replacement cost [ODRC] method involves

- (a) assessment of the gross current replacement cost of modern equivalent assets
- (b) making an adjustment for over design, over capacity and redundant assets and then,
- (c) depreciating this optimum gross current replacement cost to reflect the anticipated effective working life of the asset from new, the age of the asset and the estimated residual value at the end of the asset's working life.

The effective working life of an asset is the estimated life of the asset, assuming continued use in its present function, as a part of a continuing business. The ODRC method comprises the following steps:

1. Preparing a detailed asset register. Asset registers should contain data on quantity, location physical condition, age and maintenance of the assets.
2. Calculation of the replacement cost. This refers to the cost of replacing the assets with modern equivalent assets.
3. Assessment of depreciation. The new assets at replacement costs identified earlier need to be depreciated in case the life of the existing asset is lower than the life of the new asset.
4. System Optimisation: This is done to measure the most cost effective way of delivering service, in terms of capacity and quality to meet the requirements. This involves three levels;
  - Capacity Optimisation both in size and number
  - Optimisation of spares
  - Optimisation of unit costs

Under an ODRC valuation methodology depreciation would be greater than the capital expenditure likely to be incurred during the proposed regulatory period when the assets that exist in the system are old. For instance generating machinery set up in the 70s would be

due for replacement in the present decade and a switch to the ODRC valuation basis would result in higher depreciation charges due to higher current replacement costs.

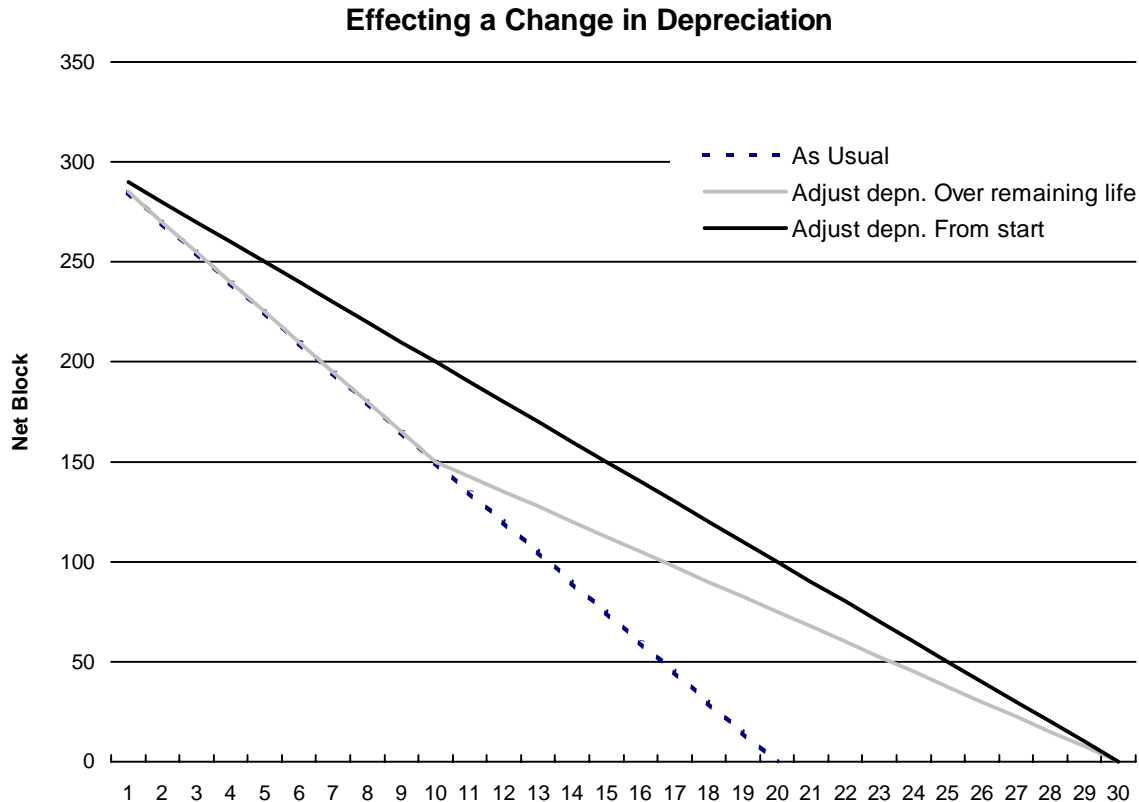
The implementation of the ODRC would impart a significant shock to the system but this would be more gradual than under the HC system. The shocks can be further minimised if the period between adoption of the ODRC method and replacement of assets is spaced out. This would therefore require an immediate implementation of the ODRC valuation method.

### 6.3 Effecting Changes in the Economic Asset Life

The review of the asset base in each price review period will include an assessment of the reasonableness of the existing assumption concerning the remaining useful economic life of the asset. The change in the asset life can be effected through

- A change in the net block to reflect a reappraisal of the portion of the asset life that has expired. The Straight Line is applied on the basis of the revised net block and the remaining life or
- The net block is left unchanged and the asset continues to be depreciated but over a revised number of asset life.

These alternatives are depicted in the chart below which depicts the example of an asset with an original assessed life of 20 years now reassessed as 30 years.



As illustrated a one-off revision to the net block results in a double return of capital to the extent that depreciation has already been earned for those years that have expired under the previous useful life assessment. Reassessment is however a common practise in competitive markets where a competitors assessment of longer asset life would filter through to the product pricing. Lower product prices by one market participant would force others to mark the depreciation rates downwards. It is therefore not unreasonable to expect utilities to incorporate the reassessed lives in their pricing.

Revision of the net block concurrent with asset life revision presents certain inter-generational equity issues. If asset lives are lengthened the remaining depreciation charge that is to be recovered from future users has been set as to allow recovery of an equitable portion of the asset's value based on the most recent estimate. But if tariffs for the earlier generation have been set to recover a higher level of depreciation than that being applied to later generations it could be argued that earlier generations have provided a subsidy to later users of the asset. The converse applies in case of a reduction in asset lives.

Therefore an appropriate approach would be one which

- ❑ Generates flatter a cash flow pattern that is more probable to lead to stable prices in the future
- ❑ Allows the regulated utility to manage its business according to when capital expenditure is required
- ❑ Minimises the problem of inter-generational inequity

#### 6.4 The Indian Scenario

Assets are valued on the basis of historical cost and the depreciation is charged on this base at the rates prescribed in the ESA. Depreciation is provided on fixed assets from the year following that in which the assets become available for use as per the ESA.

Where the cost of depreciable assets has undergone a change during the year due to increase or decrease in long term liabilities on account of exchange fluctuation, price adjustment, change in duties or similar factors, unamortised balance of such asset is depreciated prospectively over the residual life.

#### 6.5 International Practise

While the depreciation approaches being used by most utilities is the straight-line method, the rate base computation for its application varies widely. The valuation of the rate base is a central issue in the determination of a reasonable future price path for the utilities. In fact in United Kingdom (UK) and Australia the regulators have been debating whether the regulatory asset base represents shareholders financial investments in the firm or the physical assets of the firm. In UK, depreciation is based either on the current cost of the assets, or the regulated asset base itself. However in case of Scottish transmission and distribution companies the asset are treated as having regulatory values broadly equal to the current cost net book values. The calculation methodology adopted for all electricity transmission or distribution business other than Northern Ireland has been to compute :

- ❑ Depreciation on pre-privatisation assets on the basis that these assets are a single asset which at privatisation had a remaining life equal to the deemed average remaining life of assets existing at that time.

- Depreciation on post privatisation assets was calculated by dividing each successive years investment by a deemed average life for the company's assets (normally 40 years) albeit with a straight line depreciation profile for National Grid Company and a tilted depreciation profile for the others (3% per annum for the first 20 years and 2% for the remaining years). All new efficiently incurred capital expenditure was added to the regulatory asset base.

Northern Ireland Electricity plc has adopted a different methodology, based on the Monopolies and Mergers Commission's [MMC] objection to the method proposed by OFREG (utility regulatory body for Northern Ireland). The MMC took the view that writing off pre-privatisation assets over the average remaining life of those assets was unfair as between present and future electricity consumers. Instead, it recommended that depreciation profile match the companies book depreciation. Current cost depreciation for most of the companies is calculated after indexation of the gross book value to replacement cost or its 'modern equivalent asset' analogue, whereas regulatory depreciation requires Retail Price Index [RPI] indexation.

In the United States, depreciation is calculated on the rate base using historical cost net book value. The ODRC method is used to value the network business in Australia and New Zealand.

## 6.6 Our Recommendation

To minimise the price shocks arising as a result of the lumpiness in capital expenditure and resultant fluctuations in depreciation, the asset valuation method adopted should to the greatest extent reflect current economic replacement cost. This approach will also enhance price signalling which is best done by using the ODRC valuation.

We however recommend that the historical cost be used as the basis for the short term (the exact time frame to be arrived based on discussion between CERC and the utilities) and thereafter shift to the ODRC method. We do not recommend an immediate shift to the ODRC method due to

1. Problems in producing a detailed asset register
2. The absence of norms for standard lives of assets
3. The absence of construction cost estimates
4. Lack of data on future load growth

The transition period should help utilities reorganise their management information systems to provide data for the implementation of the new valuation method.

The ODRC method would be better because

1. Little attention has been paid to replacing assets in India and many of these will be due for replacement in the coming decade. An adoption of the ODRC method will ensure that the price shocks are gradually administered to the customers.
2. This will ensure greater acceptability to users (State Electricity Boards and their Successors) since over capacity issues will be addressed and cost reductions possible from new technologies will be incorporated in the valuation
3. Since the valuation will reflect the cost of replacement utilities will be able to assess the timing and financing requirements with a greater degree of certainty.



**ANNEXE – I - RATES AS PRECIBED IN THE ELECTRICITY (SUPPLY) ACT, 1948**

	Pre 1992		1992		1994	
	Fair Life	Rate	Fair Life	Rate	Fair Life	Rate
<b>Land under full ownership</b>	0	0	0	0.00%	0	0.00%
Land under lease						
for investment in the land						
for cost of clearing the site						
<b>Assets purchased new</b>						
<b>Plant and machinery in generating stations including plant foundations</b>						
Hydro-electric	35	2.57%	35	3.40%	35	3.40%
Steam electric NHRS& waste heat recovery boilers	25	3.06%	25	5.06%	25	7.84%
Diesel electric and gas plant	15	6.10%	15	8.24%	15	8.24%
Cooling towers and circulating water systems	30	3.00%	25	5.06%	25	7.84%
<b>Hydraulic works forming part of the hydro-electric system including electric system including:</b>						
Dams, spillways, weirs, canals, reinforced concrete flumes and syphons	100	0.90%	50	1.95%	50	1.95%
Reinforced concrete pipelines and surge tanks, steel pipelines sluice gates steel surge tanks hydraulic control valves and other hydraulic works	50	0.25%	35	3.40%	35	3.40%
<b>Building &amp; civil engineering works of a permanent character not mentioned above</b>						
Offices and showrooms	50	1.80%	50	1.95%	50	3.02%
Containing thermo-electric generating plant	25	3.00%	25	5.06%	25	7.84%
Containing hydro-electric generating plant	35	12.57%	35	3.40%	35	3.40%
Temporary erections such as wooden structures	5	18.00%	5	21.55%	5	33.40%
Roads other than Kutcha roads	100	0.90%	50	1.95%	50	3.02%
Others	50	1.80%	50	1.95%	50	3.02%
<b>Transformers, kiosk, sub-station equipment &amp; other fixed apparatus (including plant foundation)</b>						
Transformers including foundations having rating of 100 KVA and over	35	2.57%	25	5.06%	25	7.84%
Others	25	3.60%	25	5.06%	25	7.84%
Switchgear including cable connections	20	6.50%	25	5.06%	25	7.84%
<b>Lightning arrestors</b>						
Station Type	20	6.50%	25	5.06%	25	7.84%
Pole type	15	6.00%	15	8.24%	15	12.77%
Synchronous condensor	35	2.57%	35	3.40%	35	5.27%
Batteries	10	9.00%	5	21.55%	5	33.40%
Underground cable including joint boxes and disconnected boxes	40	2.25%	35	3.40%	35	5.27%

Discussion Paper on Depreciation Norms

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	Pre 1992		1992		1994	
	Fair Life	Rate	Fair Life	Rate	Fair Life	Rate
Cable duct systems	60	1.50%	50	1.95%	50	3.02%
<b>Overhead lines including cable support systems</b>						
Lines on fabricated steel operating at terminal voltages higher than 66 KV	35	2.57%	35	3.40%	35	5.27%
Lines on steel supports operating at terminal voltages higher than 13.2 KV but not exceeding 66 KV	30	3.00%	25	5.06%	25	7.84%
Lines on steel or reinforced concrete support	25	3.60%	25	5.06%	25	7.84%
Lines on treated wood support	20	4.50%	25	5.06%	25	7.84%
Meters	15	6.00%	15	8.24%	15	12.77%
Self Propelled Vehicles	7	12.86%	5	21.55%	5	33.40%
<b>Air-conditioning plants</b>						
Static	15	6.00%	15	8.24%	15	12.77%
Portable	7	12.86%	5	21.55%	5	33.40%
Office Furniture and finishing	20	4.55%	15	8.24%	15	12.77%
Office equipment	10	9.00%	15	8.24%	15	12.77%
Internal wiring including fittings and apparatus	15	6.00%	15	8.24%	15	12.77%
Steel light fittings	15	6.00%	15	8.24%	15	12.77%
<b>Apparatus let on hire</b>						
Other than motors	7	12.86%	5	21.55%	5	33.40%
Motors	20	4.50%	15	8.24%	15	12.77%
Communication equipment						
Radio and high frequency carrier system	15	6.00%	15	8.24%	15	12.77%
Telephone lines and telephones	20	4.50%	15	8.24%	15	12.77%

**ANNEXE – II -DEPRECIATION RATES AS PRESCRIBED IN THE INCOME TAX ACT  
APPLICABLE FROM FY98**

<b>Description</b>	<b>Rate</b>
Hydro-electric	3.40%
Steam electric NHRS& waste heat recovery boilers	7.84%
Diesel electric and gas plant	8.24%
Cooling towers and circulating water systems	7.84%
Hydraulic works forming part of the hydro-electric system including electric system including:	
Dams, spillways, weirs, canals, reinforced concrete flumes and syphons	1.95%
Reinforced concrete pipelines and surge tanks, steel pipelines sluice gates steel surge tanks hydraulic control valves and other hydraulic works	3.40%
Building & civil engineering works of a permanent character not mentioned above	3.02%
Offices and showrooms	
Containing thermo-electric generating plant	7.84%
Containing hydro-electric generating plant	3.40%
Temporary erections such as wooden structures	33.40%
Roads other than Kutcha roads	3.02%
Others	3.02%
Transformers, kiosk, sub-station equipment & other fixed apparatus (including plant foundation)	7.81%
Transformers including foundations having rating of 100 KVA and over	7.84%
Others	7.84%
Switchgear including cable connections	
Lightning arrestors	
Station Type	7.84%
Pole type	12.77%
Synchronous condensor	5.27%
Batteries	33.40%
Underground cable including joint boxes and disconnected boxes	5.27%
Cable duct systems	3.02%
Overhead lines including cable support systems	
Lines on fabricated steel operating at terminal voltages higher than 66 KV	5.27%
Lines on steel supports operating at terminal voltages higher than 13.2 KV but not exceeding 66 KV	7.84%
Lines on steel or reinforced concrete support	7.84%
Lines on treated wood support	7.84%
Meters	12.77%
Self Propelled Vehicles	33.40%
Air-conditioning plants	

<b>Description</b>	<b>Rate</b>
Static	12.77%
Portable	33.40%
Office Furnitures and finishing	12.77%
Office equipment	12.77%
Internal wiring including fittings and apparatus	12.77%
Steel light fittings	12.77%
Apparatus let on hire	
Other than motors	33.40%
Motors	12.77%
Communication equipment	
Radio and high frequency carrier system	12.77%
Telephone lines and telephones	12.77%
Any other asset not covered above	7.69%

**Annexe-III- International Comparison of Useful Life for Depreciation of Assets**

Asset description	As per Indian electricity Supply Act, 1948	National Grid, United Kingdom	United Networks Ltd, New Zealand	Manitoba Hydro, Canada	Scottish hydro-electric plc, United Kingdom	Snowy Mountains Hydro-Electric Authority, Australia	Hydro-Electric Corporation, Australia	National Power, United Kingdom
Civil Works	35 - 50	–	–	100	–	30 - 100	–	–
Freehold and leasehold properties	Infinity - under lease (period of lease)	upto 40	50 - 100 (Freehold building)	100	–	10 - 30	–	not depreciated
Other buildings	25 - 50	–	–	75	–	–	–	40 (Non-operational buildings)
Generating assets	15 - 35	–	–	50 (Turbines and Generators)	20-60	20 - 70 (Electrical and Mechanical Equipment)	50 (Generation)	20 (CCGT) 20-40 (Other stations) 7 (power station under operating lease)
Power Station		–	–	35 - 40 (accessory station equipment)				
Towers	25 - 35	40 or 60	16 - 70 (Reticulation system)	45 - 80	40-80	5 - 15 (Mobile Plant)	23 (Transmission) 20 (Distribution)	4
Substation plant, overhead lines and cables	25 - 50	40 or 50		30				
Protection and control equipment	15 - 25	15 or 25		20	15-25 (Other transmission and distribution buildings, plant and equipments)			
Cross-channel link		25	–					
Telecommunication equipment	15	3 - 25	3 - 10 (Plant, vehicles and equipments)	20	5 - 15 (Electronic Equipment)	6	4 - 5 (Fixtures, fittings, tools and equipments)	
Motor vehicles and office equipments	5 - 15	3 or 5	7 - 17	3 - 10	3 - 15 (Intangibles)	6 (Others)	3 - 5	

**Annex-IV - Depreciation Rates Based on Fair Life of the Asset**

<b>Asset</b>	<b>New Rate</b>
Hydro-electric	2.57%
Steam electric NHRS& waste heat recovery boilers	3.60%
Diesel electric and gas plant	6.00%
Cooling towers and circulating water systems	3.60%
<b>Hydraulic works forming part of the hydro-electric system including electric system including:</b>	
Dams, spillways, weirs, canals, reinforced concrete flumes and syphons	1.80%
Reinforced concrete pipelines and surge tanks, steel pipelines sluice gates steel surge tanks hydraulic control valves and other hydraulic works	2.57%
<b>Building &amp; civil engineering works of a permanent character not mentioned above</b>	
Offices and showrooms	1.80%
Containing thermo-electric generating plant	3.60%
Containing hydro-electric generating plant	2.57%
Temporary erections such as wooden structures	18.00%
Roads other than Kutcha roads	1.80%
Others	1.80%
<b>Transformers, kiosk, sub-station equipment &amp; other fixed apparatus (including plant foundation)</b>	
Transformers including foundations having rating of 100 KVA and over	3.60%
Others	3.60%
Switchgear including cable connections	3.60%
<b>Lightning arrestors</b>	
Station Type	3.60%
Pole type	6.00%
Synchronous condensor	2.57%
Batteries	18.00%
Underground cable including joint boxes and disconnected boxes	2.57%
Cable duct systems	1.80%
<b>Overhead lines including cable support systems</b>	
Lines on fabricated steel operating at terminal voltages higher than 66 KV	2.57%
Lines on steel supports operating at terminal voltages higher than 13.2 KV but not exceeding 66 KV	3.60%
Lines on steel or reinforced concrete support	3.60%

<b>Asset</b>	<b>New Rate</b>
Lines on treated wood support	3.60%
Meters	6.00%
Self Propelled Vehicles	18.00%
<b>Air-conditioning plants</b>	
Static	6.00%
Portable	18.00%
Office Furnitures and finishing	6.00%
Office equipment	6.00%
Internal wiring including fittings and apparatus	6.00%
Steel light fittings	6.00%
<b>Apparatus let on hire</b>	
Other than motors	18.00%
Motors	6.00%
<b>Communication equipment</b>	
Radio and high frequency carrier system	6.00%
Telephone lines and telephones	6.00%

**ANNEXE-V – PERCENTAGE OF TOTAL DEPRECIATION BY ASSET CLASS**

		NTPC - Gas based Stations	NTPC - Coal based Stations
<b>Land (including development)</b>			
1	Freehold	-	-
2	Leasehold	-	0.003%
3	Unclassified	-	-
4	Roads, Bridges, culverts & helipads	0.12%	0.42%
<b>Buildings</b>		-	-
5	Main plant	3.67%	3.20%
6	Others	0.52%	2.72%
7	Temporary Erection	0.02%	0.08%
<b>Plant and Machinery</b>			
8	Water supply, drainage & sewerage	-	-
9	Equipment, pipeline	0.10%	0.23%
10	Civil works, others	0.07%	0.30%
11	MGR tracts and signaling system	-	1.91%
12	Railway siding	-	0.15%
13	Earth dam reservoir	0.10%	-
14	Plant & Machinery	94.48%	88.08%
15	Constn equipment	0.01%	0.82%
16	Electrical installation	0.46%	0.40%
17	Vehicles	0.0003%	0.0719%
18	Aircrafts/Aero-engines/speed boats	-	-
19	Furniture & fixtures	0.15%	0.51%
20	Other office equipment	0.09%	0.30%
21	EDP, Wp machines & SATCOM equipment	0.08%	0.48%
22	Communication equipment	0.11%	0.24%
23	Hospital equipment	0.01%	0.09%
24	Lab & Workshop equipment	-	-
25	Capital expenditure on assets not owned by company	-	-
		-	-
		100%	100%



	<b>PGCIL</b>
<b>Land (including development)</b>	
Freehold	
Leasehold	0.04%
Unclassified	
Roads, Bridges, culverts & helipads	0.17%
<b>Buildings</b>	
Main plant	0.68%
Others	0.80%
Temporary Erection	0.05%
Water supply, drainage & sewerage	0.14%
<b>Plant &amp; Machinery</b>	
Plant & Machinery	96.56%
Construction and Workshop equipment	0.16%
Electrical installation	0.22%
Vehicles	0.06%
Aircrafts/Aero Engines Boats	
Furniture Fixtures & Other Equipment	0.53%
EDP & WP machines	0.32%
Laboratory and Workshop Equipment	0.26%
Hospital & School Equipment	0.002%
Assets not owned by the company	0.06%
<b>Grand Total</b>	<b>100%</b>

	<b>Hydro Station Uri</b>
Land Leasehold	
Buildings	0.59%
Roads	0.06%
Construction Plant	0.01%
<b>Substation Plant</b>	0.22%
Vehicles	0.08%
Furniture & Fixtures	0.005%
Office Equipment	0.06%
Miscellaneous Assets	0.03%
Building containing Generating Plant	5.47%
Generating Plant & Machinery	11.55%
Auxiliary & Ancillary Equipment	4.75%
Miscellaneous Power Plant	2.87%
Switch Yard	13.92%
Barrage	6.32%
Channel	10.68%
Tunnel	26.53%
Penstock	4.70%
Tail race Tunnel	12.08%
Transmission Line	0.08%
<b>Grand Total</b>	<b>100%</b>

**Annexe-VI- Comments of the participants and their responses – Study on the depreciation norms for Central utilities**

This section lists the observations of various panelists invited to the review the draft consultation paper on 6<sup>th</sup> April 2000. The issues raised and ICRA's responses are as follows:

**Comment 1** : The draft report has indicated non-existence of any relationship between the depreciation rates and the useful life as provided in the MoP notification 1994. However, the relationship can be proved arithmetically by assuming the funds retained by depreciation are reinvested at the rate of 12% and the replacement cost of assets are inflated at the rate of 8%.

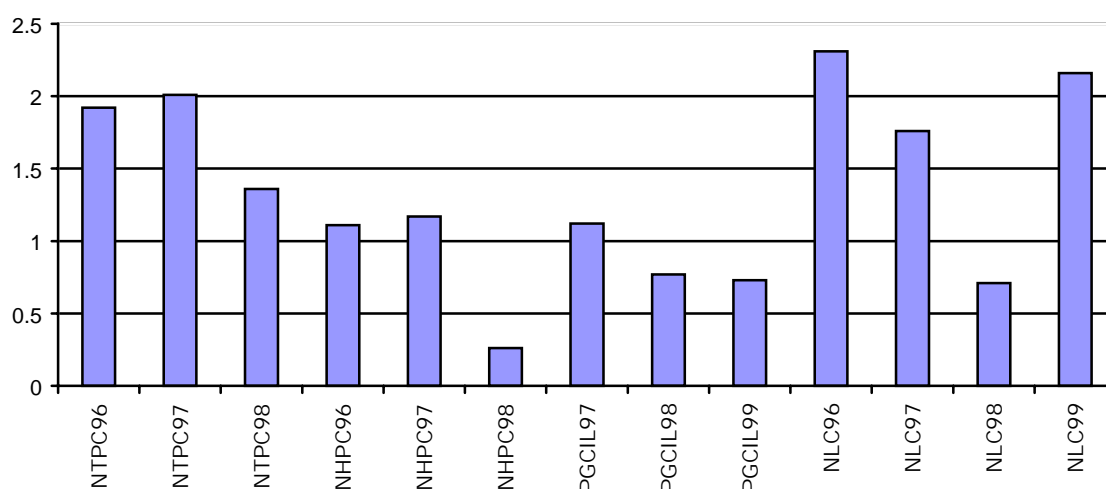
**Response** : As a part of the study, meetings were held with several experts within the Central utilities and ex-CEA officials involved in fixing the depreciation norms. While depreciation norms before the 1992 and 1994 amendments suggested a clear link between the rates and the useful life for most of the items, the same was lost under the new notification. Most experts opined that the policy to encourage IPPs was the basic premises for increasing the rates of depreciation while the useful life continued to remain same (between 1992 and 1994). Hence, the conclusion that no clear link exists between the useful life and the depreciation rate.

The arithmetic relationship suggested is based on the assumptions on the inflation as well as the reinvestment rate. These two factors vary depending on the economic and market conditions, while the depreciation rates continue to remain same and are not indexed to those variations. For instance the current reinvestment rate is less than 12% while the inflation rate is only 3% while the depreciation rate continues to remain at 7.84%. The link between the depreciation rate can be justified with any values for the two independent variables. This lack of consistency does not justify the hypothesis of a one to one relationship between depreciation rates and useful life.

**Comment 2** : The depreciation rate has been structured to match the Debt servicing obligation of the utilities. Hence spreading over the useful life will reduce the internal resources available to these utilities to repay the loans.

**Response :** The consultants have analysed the relationship between debt servicing and the principal repayment for NTPC, NHPC, Power Grid and NLC for a period of three years. As indicated in the table below the amount charged as depreciation charge varies from as high as is twice of the principal payments to as low as one third of the payments. Hence, no clear link can be established between the two charges for central utilities.

**Ratio of Depreciation to Principal Payment-Indian Utilities**



**Comment 3 :** ODRC method is a subjective process because there will be as many valuations as there are agencies who value assets. Moreover the process is complicated and time consuming.

**Response :** As has been indicated in the report by the consultants the ODRC method is a time-consuming exercise with a detailed valuation of all the assets of the utilities. In Australia, where a similar exercise was undertaken, the valuation process spanned over a period of one and a half years. Considering the lack of infrastructure availability with some of the central utilities, the Consultants have suggested that the transition period be mutually decided between the Central Utilities and CERC.

It would be impossible to make every process entirely objective. Appointing an independent valuation firm with engineering and audit professionals is expected to make the process as objective as possible.

**Comment 4 :** The suggested ODRC methodology is extremely complicated. There is no need to change from the existing system. The existing depreciation methodology should continue.

**Response :** The consultants have formulated their recommendations keeping in mind the following issues:

4. The proposed norms should be as objectively determined as possible
5. Consumers should not be subjected to a price shock, or alternatively, the price smoothness should be maintained
6. The depreciation norms should not affect the commercial viability of the utility

Under the present historical cost system, consumers will be subject to a price shock at the time of replacement of the asset. The price shock could arise from factors that are outside the control of the utility such as inflation or a deliberate/inadvertent over-sizing of the plant. The ODRC method allows depreciation to be charged based on the current cost of the asset while penalising the utility for any deliberate/inadvertent engineering over-design.

**Comment 5 :** Customers would be burdened under the proposed concept. The higher replacement cost will increase the asset base and therefore depreciation, which will reflect in higher tariffs payable by consumers.

**Response :** The concept proposed by the consultants is based on the economic logic of operating the business. The ODRC method lays stress on optimisation of the replacement value. This approach would penalise the utility for sub-optimal use of resources i.e. if higher capacities have been built while insufficient demand persists, the consumers are only required to pay for capacities which have been prudently incurred. Moreover, the assumption made by many participants on the rise in replacement cost may be true for some items but some others might have fallen. However, technological advancement since the time of purchase and increased market competition may have driven down the prices. Together the two aspects listed above lay stress on only the justified costs being passed over to the consumers. In assets where the price has increased the replacement cost will have to be passed on to consumers irrespective of the method followed. The ODRC method will incorporate this recognition earlier and allow for CERC to determine a glide path for the transition period. The approach would also promote efficiency in the operation of the utilities while addressing the issue of their financial viability. Thus, the

concept being proposed attempts to meet the objective of economic efficiency, which simulates a competitive market scenario.

**Comment 6** : One concept should be applied to IPPs and the central utilities.

**Response** : CERC is mandated to regulate the functioning of central generating stations supplying power to more than one state. Similarly, IPPs supplying power to more than one region also falls under the CERC purview. Hence while the norms to be applied for rate making purposes, issued by CERC would apply to the entities discussed above, other generating stations falling under the regulatory jurisdiction of the state regulatory commissions may not follow the same norms. The restructuring models being adopted by most states envisage the generating function independent of the regulatory control. The long term PPAs already signed with these entities already defines the tariff components chargeable from the state electricity boards. The state regulators however have the option in future to prescribe the norms adopted by CERC, propose their own norms or continue with the current practice.