A.7 The base year for the forecast should subsequently be changed to T-1 after testing the performance of forecasting model.

A.8 Spatial Granularity - The forecasts should be prepared at the DISCOM/State level at least. In addition, forecast at more granular levels i.e. Zonal level, Circle level, District level, Sub-Station Level, Feeder/Transformer level should also be carried out in case of availability of adequate granular level data. Such granular forecasts would be more useful in power infrastructure planning. It would also help in generating more revenues as the potential customers would be fascinated to set up their base in the areas where their power requirements are expected to be fulfilled and are already a part of the planning process.

A.9 Time Granularity - The forecast should be worked out year-wise at least. In addition, month-wise/day-wise/hour-wise/time-block wise forecasts should also be done if adequate granular level data is available.

Note – These guidelines are focussed more on working out year-wise forecast for a DISCOM/State. However, the concept delineated in these guidelines could be extended for more granular (in terms of "Time" as well as "Spatial") forecasting exercises also.

A.10 The forecast should be carried out for at least three scenarios – Optimistic scenario, Business As Usual (BAU) scenario & Pessimistic scenario.

Note – More scenarios could also be built up particularly considering different permutations and combinations of extreme (favourable or harsh) weather conditions. Some typical such scenarios could be – (i) hottest temperature scenario only (ii) coldest temperature scenario only (iii) highest rainfall scenario only (iv) lowest rainfall scenario only (v) hottest temperature and lowest rainfall scenario. The optimistic scenario should consider hottest temperature and lowest rainfall scenario whereas the pessimistic scenarios should factor in lowest temperature and highest rainfall conditions. Since forecasting under BAU scenario should be based on normal past trends, the weather parameters need not required to be considered additionally in this case.

A.11 The power demand forecast should be done under the unrestricted scenario which essentially is reflective of the case when all the unserved demand currently not served by the utilities due to various supply side barriers such as generation & network constraints (resulting in planned load shedding and unplanned outages) is also included.

A.12 The method adopted for forecasting should aim at analysing past consumption data of each consumption category separately and factoring in impacts of emerging aspects to arrive at appropriate future growth trends. Central Electricity Authority traditionally adopts Partial End Use Method (PEUM) for carrying out Electric Power Survey (EPS) exercises which is explained in **Part C** below.

A.13 In addition to past growth trends, the medium-term forecast should be based on the assessment of impact of specific government policies, developmental plans and other emerging aspects in the definite quantum of electrical energy.

*Note – One way to assess impact of emerging effects could be to take into account the expected additional load and multiply it with average specific energy consumption of the relevant consumer category. The guidelines for factoring in impact of emerging aspects on power demand forecast are available in **part D** below.*

A.14 **The long-term forecast should also be ideally based on the assessment of impact of specific government policies, developmental plans and other emerging aspects in the definite quantum of electrical energy in addition to past growth trends. However, if such assessments are not feasible beyond medium term horizon, then** the long term forecast should be based on further extrapolation of the growth trends estimated under medium-term period.

Box A.1: The main aim of the forecast should be to cover electricity demand projection for the utility system. In addition, forecast of the entire power consumption including demand meeting from distributed power sources such as CPPs, solar roof top should also be carried out so that a holistic picture of power sector could emerge.

A.14 The forecasting results obtained should be validated through at least one different method. Econometric Method should preferably be one of the methods adopted for forecasting.

Input Data

B. Input Data

B.1 The category-wise consumption data should serve as the basic input for power demand forecasting.

B.2 The consumption categories should be identified as per the tariff structure prevailing in the respective DISCOMs. The broad categories are Domestic, Commercial, Public Lighting, Public Water Works, Irrigation, LT Industries, HT Industries, Railways, Bulk Supply, Open Access & Others.

Box B.1: Electricity consumption of Open Access consumers should be attributed to the respective DISCOM due to the following reasons:

a) Open access consumers use the network of the DISCOM for supply of electricity in most cases.
b) The source of electricity may change but the location of load will remain the same.
c) Although DISCOMs need not have to consider the demand of open access consumers for power procurement, however, the same should have to be considered for augmentation of power network by the DISCOMs/States/UTs.
d) It will give a better picture for planning/augmenting the transmission/sub-transmission/distribution network for sourcing power to the open access consumer in the DISCOM/State.

B.3 The input data should be collected for the past 10 years at least. An indicative format for collecting year-wise input data is given in **Annexure-II**.

Note – More granular data could also be collected in similar formats.

B.4 The "Other" category should generally include energy consumption not fitting into any of the standard categories such as temporary connections consumptions, State Centre Category (as in Jammu & Kashmir) consumption etc.

B.5 As far as possible, the unserved demand should be added category-wise as per the consumer mix profile of the concerned geographical areas.

In case of unavailability of these details, such demand should be added to the “Others” category.

B.6 The weather parameters (such as rainfall, temperature) should also be collected for arriving at the forecast range.

Box B.2: There should be proper up-keeping of data so that the data for any forecasting exercise should be readily available and not suffer from any inconsistency.

Forecast Methodology
(Partial End Use Method)

C. Forecast Methodology (Partial End Use Method)

C.1 The annual growth rate in the past for each energy consumption category should be analysed. Two of the simplest and appropriate statistical methods for such purposes are "Least Square Method" and "Weighted Average Method" which are explained with illustrative examples in **Annexure III**. Other advanced statistical tools may also be used to analyse growth rates.

Note - In case of more granular forecasting exercise, the days of the years should be adjusted and aligned in accordance with days of a week first and then, annual consumption growth rate of each day/hour/time-block could be analysed separately. Similar process should be adopted for the holidays and special days.

Box C.1: Based on availability of data, a hybrid approach may also be adopted for analysing growth trend of each consumption category separately. In this approach, various socio-economic and weather related independent variables (such as GDP, rate of industrialization, ground water depletion rate, urbanization etc.) over which the electricity demand depends may be identified for a dependent variable (i.e. energy consumption under a particular category) and an appropriate equation may be set up using statistical tools.

C.2 The past growth trends for T&D losses (in energy terms) should also be analysed separately for estimating future growth trends. For this purpose, the three components of T&D losses (viz. Distribution losses, Intra-state transmission losses and Inter-State transmission losses) should be analysed separately.

Box C.2: The three components of T&D losses viz. Distribution losses, Intra-state transmission losses and Inter-State transmission losses should be analysed separately as each component normally follows separate and disjoint trajectories. The transmission loss trajectories are normally found to be flatter in comparison to a steeper distribution loss trajectory. Also, the quantum of Inter-State transmission losses depends more on net energy import of the DISCOM/State whereas intrastate transmission losses depends more on technical losses.