

STEP WISE GUIDELINES

FOR

PREPARATION

OF

DETAILED PROJECT REPORT

UNDER

ACCELERATED POWER DEVELOPMENT &
REFORMS PROGRAMME

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1 Introduction

The guidelines for “Upgradation and strengthening of Sub transmission and Distribution Network “ have been finalised by the Committee of Experts and are under circulation to various users. These guidelines are directed primarily towards achieving the objectives of APDRP and bring out the data to be collected for scientific assessment of the network parts “Accounting Units” which have the potential for revenue improvement.

The means for reduction of outages of feeders and Distribution Transformers, which pave the way for improving reliability of supply and customer satisfaction, are brought out. These are to be adopted circle wide.

The interventions required in these accounting units primarily towards reduction of commercial losses are discussed and the elements to be covered in the DPR arising out of such interventions are elaborated. These are to be adopted in accounting units that have potential for revenue increase.

The means for improvement of quality of power through improved voltages are discussed briefly.

The data, which is to be furnished with the DPR and the existing and anticipated performance benchmarks after implementation of the scheme, are described.

2 Step I Collection of Data

2.1 Commercial data for the Circle

a) *Tariff & Billing cycle category wise*

b) *Demand and supply position*

Reference period (Year)	Power Demand in MW		Energy Demand in MU	
	Unrestricted	Met	Unrestricted	Met

c) *Input energy & metering status*

No of input points		Type of meter		Energy inflow
Metered	Unmetered	Electronic	Electro- Mechanical	

d) *Consumer metering Status*

Category of Consumer	No of consumers		Connected Load	Energy Metered	Energy Billed
	Metered	Unmetered			

e) *Declared losses*

Period	Input energy		Metered energy	Assessed Energy	Declared losses	
					Technical	Commercial

f) *Revenue realisation*

Consumer Category	Previous Outstanding	Billed energy	Amount Billed	Amount collected	Current outstanding
Total for circle					

The commercial and technical data of the circle shall be broken down into different "Accounting units" for the purposes of better appreciation of the working of the circle. The Accounting unit is defined as a unit where all input points are metered & Consumers are traceable to input point this should preferably be a sub division be at least should be a Division. Additionally all towns having a population of 1 Lakh and above may also be treated as an "Accounting Unit"

2.2 Commercial data for each of the accounting units

Accounting Units:

(Divisions / Sub divisions) :

Town :

Demand & Supply position

Accounting unit	Power Demand in MW		Energy Demand in MU	
	Unrestricted	Met	Unrestricted	Met

Input Metering status

No of input points		Type of meter		Energy Flow
Metered	Unmetered	Electronic	Electro-Mechanical	

Consumer Metering Status for each accounting unit

For the Period of :

Category of Consumer	No of consumers		Connected Load	Energy Metered	Energy Billed
	Metered	Unmetered			

Energy Accounting

For the Period of :

Accounting unit	Input energy		Metered energy	Assessed Energy	Declared losses	
					Technical	Commercial

Revenue Realisation

For the Period of :

Consumer Category	Previous Outstanding	Billed energy	Amount Billed	Amount collected	Current outstanding

2.3 Technical Data of the Circle

The technical data of the circle shall include

- a) *Electrical single line diagram of the system*
- b) *Physical diagram showing geographic location of sub stations and lines and*
- c) *Single line diagram for each EHV & HV substation*
- d) *Details of EHV Sub Stations*

S. No.	Name of EHV S/Stn.	Voltage ratio	Transformer capacity			Maximum demand MVA
			No.	Capacity MVA	Total MVA	

- e) *Details of EHV interconnections*

Sl. no	From EHV S/Stn	To EHV S/Stn	Name of feeder	No. of circuits	length ckt km.	conductor Size-sq.inch	Average demand MW	Peak demand MW

- f) *Details of HV substations*

S. No.	Name of HV S/Stn.	Voltage ratio	Transformer capacity			Maximum demand	
			No.	Capacity MVA	Total MVA	MVA	MVAR

- g) *Details of connections from EHV to HV substations*

Sl. no	From EHV S/Stn	To HV S/Stn	Name of feeder	No. of circuits	length ckt km.	conductor Size-sq.inch	Average demand MW	Peak demand MW

h) Details of HV Interconnections

Sl. no	From HV S/Stn	To HV S/Stn	Name of feeder	No. of circuits	length ckt km.	conductor Size-sq.inch	Average demand MW	Peak demand MW

i) 11 kV feeders emanating from HV substations

Sl.No.	Name of HV S/St 66-33/11 KV	Name of transformer	Transformer Rating MVA	Name of feeder 11 KV	Distribution Transformer		
					Nos	KVA	Total KVA

k) 11 kV feeders emanating from EHV substations

Sl.No.	Name of EHV S/St	Name of transformer	Transformer Rating MVA	Name of feeder 11 KV	Distribution Transformer		
					Nos	KVA	Total KVA

2.4 Technical data for each of the accounting units

a) *Physical diagram showing location of HV Sub stations, routing of 11 kV feeders and location of Distribution transformers*

b) *Flow data on 11 kV feeder*

Name of feeder	Length of Main feeder	Conductor Size	Flow during reference period				Energy in MU
			Peak MW	MVA	Minimum MW	MVA	

c) *Flow Data of Distribution transformers*

Name of Distribution Transformer	Capacity	Details of LT capacitors KVAR	Flow during reference period				Energy in MU
			Peak MW	MVA	Minimum MW	MVA	

c) *Outage data of feeders*

Name of feeder	No of Outages during reference period		Total duration of outages	Number of DT failures
	< 5 Mins	> 5 Mins		

2.5 Analysis of data and formulation of schemes

The analysis shall be carried out using the following guidelines, consistent with the overall objectives of the Accelerated Power Development Program.

2.5.1 Circle wide schemes

The works to be carried out for the entire Circle for achieving the following objectives are described below:

2.5.1.1 Reduction of outages:

- Every 11 kV feeder shall be controlled by a circuit breaker so that cascade trippings of feeders are avoided.
- The physical condition of all equipment especially circuit breakers, reclosers, Instrument transformers, surge divertors and Distribution transformers shall be verified and wherever required these shall be taken up for R&M.
- Patrolling the feeders for rectifying any areas of reduced clearances & bad conductors, insulators
- Consider steps for reducing failure rate of Distribution transformers like health check, placement of all protective devices and LT capacitors.
- Outsourcing or creation of separate set up at Division level for preventive maintenance

2.5.1.2 Input energy metering

- All interconnection points to the circle as well as to each accounting unit shall be metered for better accounting and accountability.
- All 11 kV feeders shall be metered.
- The data from the meters should be transported either automatically or through portable Computer to a central data base in the circle and analysed.

2.5.1.3 Adoption of IT & MIS system

Computers shall be provided at all manned sub stations for feeder flow data and outage recording, consumer meter reading records, energy accounting at sub station level, etc.

Reports shall be generated from the system automatically. In case of unmanned sub stations the computers could be placed at the nearest manned office.

2.5.1.4 Improving revenue realisation

The administrative measures for commercial loss reduction and improving collection efficiency described in subsequent paras are to be adopted circle wide.

2.5.2 Accounting unit wise schemes

The funds under APDP are limited and are suggested to be used for setting up models, which can be replicated in other parts of the circle as well as in other circles. Hence the choice of the accounting unit where schemes are proposed shall be made on a scientific basis so that the results can be demonstrated faster.

2.5.2.1 Choice of Accounting unit

The accounting units shall be ranked on the basis of potential for showing improved revenue realisation. The following criterion for ranking in descending order is suggested:

Average realisation rate: $\text{Revenue realised} / \text{Energy input to the accounting unit}$

Having ranked the units on the basis of above criterion the higher ranked units shall be analysed for potential for revenue improvement in terms of

- Commercial loss reduction
- Improving collection efficiency.

2.5.2.2 Commercial loss reduction

This shall include administrative commercial as well as technical, interventions.

The **administrative interventions** would cover

- Making installation of capacitors mandatory by all consumers of 5 HP & above. Penal action to be taken for non-compliance.
- Designating Junior Engineer as Feeder Manager for accounting and accountability.
- Outsourcing meter reading, if required
- Outsourcing bill delivery
- Strengthening of vigilance squad for theft detection with review of action taken for penalty imposed & FIR lodged along with rigorous follow up of the registered cases for logical conclusions.

The **Commercial interventions** would cover

- No new connection to be released without proper meters.
- Consumer Mapping and Indexing to bring all consumers on record maintaining status profile of indexed consumers by periodic survey.
- Voluntary disclosure scheme of declaring connected load in each year in the month of April to be brought out for providing opportunity to consumers for declaring their increased load.
- Computerised Billing centers shall be provided at at least Circle level with WAN / Web connectivity upto at least Sub Division level.
- Creating a Data base of consumers with past consumption pattern
- Verification of Consumer energy meters and replacement wherever defective.
- Despite 100% calibrated metering, if the losses on feeder are not brought under 20% of input energy to the feeder, all Distribution Transformers on such feeders to be metered to identify the pockets for detecting commercial losses.
- Energy accounting upto DT level
- 100% Metering of all consumers
- Adoption of hand held computers for meter reading
- Meter reading for HT Consumers to be done on fortnightly basis. LT Industrial and commercial meters to be read on monthly basis and domestic meters to be read on bimonthly basis. Bills raised and delivered within 7 days of having read the meters.

With adoption of the above commercial and administrative measures there would be substantial improvements in revenue realisation. As a rough approximation the commercial losses should reduce by 30% about from the present level.

The **technical interventions** would cover adoption of technological solutions for theft control, like:

- HVDS could be adopted in new Greenfield areas.
- Conversion of existing LT overhead lines in urban areas into underground cables, HVDS or ABC system for loss reduction shall be considered after the commercial and administrative measures have failed to bring down losses below 30%.

Coupled with the commercial and administrative measures these should bring down the total losses to under 20%.

After the total losses (no assesement – this shall be based on metered energy only) are brought under 30% on the chosen feeder, further technical measures like installation of capacitors, reconductoring, bifurcation of feeders, creation of new sub stations can be considered for bringing the total losses to below 10%.

2.5.2.3 Improving collection efficiency

Measures for improving collection efficiency would cover

- Strengthening the customer grievance redressal system
- Taking prompt action for disconnection & reconnection
- Suitable incentive and disincentive scheme for motivating the employees in following areas to be provided:
 - Loss Reduction
 - Increase in metered energy
 - Prompt Disconnection for non-payment.& Early clearance of dues by consumer
 - Recovery of old arrears from the consumers.
 - Outage reduction.

2.5.2.4 Other scheme proposals

In addition to the common measures for outage reduction described for the circle there could be certain other schemes which the Circle may wish to propose for consideration under APDP. Such schemes, if any should be targeted towards improvement of quality of power supply in terms of voltage or augmentation of transformer or feeder capacity to prevent overloading.

The requirements should preferably be evolved on the basis of scientific data collection followed by computer analysis for the techno-economically optimal solution. If proposals are made as a short term measure without back up computer analysis the criterion for selection of element shall be prevalent loading conditions projected for a maximum period of 2 years. Augmentation proposals of feeders on which energy meters are not functional would not be entertained.

3 Step –II Preparation of DPR

The DPR shall contain the following details:

- System data in accordance with the guidelines for strengthening of sub transmission & distribution system issued by the Committee of experts and as described under collection of Data.
- Status of metering on feeders & consumers
- Details of commercial, administrative & technical interventions for improving revenue and reduction of losses
- Details of administrative and technical interventions for reducing outages
- Details of technical interventions for improving voltages.
- Details of proposed IT systems and MIS
- The existing levels of performance and the targeted levels expected to be reached after the interventions shall be brought out as below.

Sl No	Bench mark parameter	Present level	Level to be achieved	Date by which parameter would be achieved
a)	Input Vs metered energy,			
b)	Revenue realization Efficiency (Amount collected to amount Billed}			
c)	Billing cycle for different categories of consumers			
d)	Number of Feeder outages per 100 km of line in last year			
e)	Failure rate of DTs in last year			
f)	Failure rate system components such as Sub-station equipment and feeders etc.			
g)	Number of consumer complaints			
h)	Consumer complaint disposal time			
i)	Progress of meter installation			
j)	Consumer to employee ratio,			
k)	Million units metered to Employee ratio			
l)	HT/LT ratio,			
m)	Load factor on Distribution Transformers			
n)	Diversity factor			
o)	Power factor at input point			

- The DPR shall also bring out
 - Present manpower deployment accounting unit wise
 - Energy accounting statement accounting unit wise
 - Cost benefit analysis
 - Sensitivity analysis on parameters which having a bearing on the financial viability
 - The works packaging concept
 - Time schedule for execution of the works,
 - Fund flow requirements,
 - Arrangements for the 50% matching amount.

- The projects shall be executed within a short time span of maximum 18 months.

- The cost benefit ratio shall be such as to ensure a pay back within 3 - 4 years.