

KPI IMPROVEMENT PLAN FOR AURANGABAD DIVISION-1

BACKGROUND:

The Distribution Reform, Upgrades and Management (DRUM) Project is an ambitious joint undertaking sponsored by India's Ministry of Power (MOP) and the U.S. Agency for International Development (USAID) focused on "the last mile" of the electricity network. The three dimensions to the DRUM goal are to:

1. Create Centres of Excellence in distribution
2. Test new concepts (technology, business process, etc.)
3. Identify possible "breakthroughs" that will help to accelerate the pace of reform

Under this program, DRUM team led by PA Government Services, is working to create a replicable, sustainable, upgradeable and model for creating a center of excellence.

The DRUM team envisages that availability, reliability and cost of power supply coupled with good customer relations are the key ingredients of customer satisfaction. Based on a shared vision and objectives of advancing power sector development and reform in India, DRUM team believes that the measurement and continuous monitoring of key performance indicator is a vital cog in the wheel to meet the aforementioned objectives.

A set of KPIs broadly on 'Supply availability and reliability', 'Cost of supply' and 'Consumer service' was set and target defined. It was unprecedented in the power sector and the Board of respective Discoms committed financial resources and full dedication.

The implementation of various technical projects is in its advance stage of implementation. There is indeed improvement in few of the KPIs but the demands of the hour is to focus and strive to achieve the target value for each identified and agreed KPI. The success of the DRUM project is intervened very much with the success of achieving the KPIs target value to show case that a good cause with dedication and honesty can bring tremendous benefits to the company, its employees, customers and the society at large.

STEP FORWARD PLAN: It has been observed that there are improvements reflected in the few of the KPIs but they are still far behind the target. There were certain common problems envisaged which include:

- **Measurement:** There should be uniformity, consistency and clear criteria. Few people in the same organisation may calculate the same parameter differently by including or excluding certain events. Consistency in measurement among different people and companies is a primary requirement.
- **Responsibility for improvement:** The entire electricity distribution system is interlinked and thus integrated. Similarly the efforts to improve a particular KPI should not be limited to one person but may be improved through a co-ordinated effort cutting across departmental boundaries and functioning in a cross functional team.

- Severe weather and “acts of God” / “force majeure”: The KPIs depends on many factors both controllable and uncontrollable on part of Discom. For example, many interruptions are due to weather effects, especially lightning, strong wind and heavy snow. Weather effects can vary from one year to another and from one area to another. Certain exceptional conditions — often called “acts of God” or “force majeure” — are so rare that it is often argued that it is not economic to design networks to withstand them; as a result many consider that interruptions due to force majeure should not be subject to standards. It is true for all other KPIs. Hence while calculating the KPIs, it is imperative to consider only controllable factors.
- Transparency and comparability: This calls for common definitions of KPIs and their calculation, a requirement for companies to report them on a timely basis and the need for independent audits.

The targets set for most of the KPIs were mostly on annualised basis. The subsequent sections will provide the general guidelines and methodology for consistency, transparency, factors to be considered and/or omit etc. to have a common understanding and platform. All the KKPIs shall have to be measured on monthly basis except consumer satisfaction survey related KKPI.

1. SUPPLY AVAILABILITY AND RELIABILITY

1.1. SIADI, SAIFI, CAIDI

Definitions

Indicator	Definitions
System Average Interruption Frequency Index “SAIFI”	$\text{SAIFI} = \frac{\text{Total number of customer interruptions}}{\text{Total number of customers served}}$ <p>This index is designed to give information about the average frequency of sustained interruptions per customer over a predefined area.</p>
System Average Interruption Duration Index “SAIDI”	$\text{SAIDI} = \frac{\sum \text{Customer interruption durations}}{\text{Total number of customers served}}$ <p>This index is designed to give information about the average time the customers are interrupted and it commonly referred to as customer minutes of interruption or customer hours.</p>
Customer Average Interruption Duration Index “CAIDI”	$\text{CAIDI} = \frac{\sum \text{Customer interruption durations}}{\text{Total number of customer interruptions}} = \frac{\text{SAIDI}}{\text{SAIFI}}$ <p>This index is designed to give information about the average time required to restore service to the average customer per sustained interruption.</p>

Measurement Methodology and Target

Perspective	Target DRUM	UOM	Measures
SAIDI- System Average Interruption Duration Index	2	Hours	$\frac{\Sigma(\text{Duration of outage}) \times (\text{No of Customers affected})}{(\text{Total No. of Customers})}$
CAIDI – Customer Average Interruption Duration Index	90	Minutes per occasion	$\frac{\Sigma(\text{Customer Interruption Durations})}{(\text{Total No. of Customer Interruptions})}$ = SAIDI/SAIFI
SAIFI- System Average Interruption Duration Index	1.3	No.	$\frac{\Sigma(\text{No of interruptions}) \times (\text{No of Customers affected})}{(\text{Total No. of Customers})}$

1.1.1. Parameters to be considered

- Outage type: The following outages to be excluded while calculating the SAIDI, SAIFI and CAIDI.

Schedule outages (Load shedding and planned), momentary outage of a duration less than 3 minutes, outage due to Grid failure (Including transmission and generation outages), outages due to force majeure conditions, Supply disconnection because of consumer attributable causes such as non payment, safety, consumer equipment/wiring fault etc.

- Ref: MERC Standard of performance of distribution licensee period for giving supply and determination of compensation regulations 2005

1.1.2. Level: 11 kV Feeder to begin with. Later on it will be implemented at Distribution Transformer level upon completion of DT metering and consumer indexing.

1.1.3. Calculation:

The calculation would be done on monthly basis and then annualised. A sample calculation and example is exhibited in the Appendix-1 (In excel file).

1.1.4. Requirements

- Consumer Indexing
- Mapping of consumer data with 11 KV feeders on dynamic basis

1.1.5. Measurement:

- 11 kV feeder identification and no. of consumers connected.
- 11 kV feeder outage capturing mechanism

1.1.6. Improvement Strategy:

- **Technical:** Maintenance (Including Tree pruning), Refurbishment, FPI, Auto Reclosure, Feeder bifurcation, Underground network, New Substations, ABC, HVDS etc.
- **Facilities:** Mobile breakdown vehicle, Communication / Mobile phone, Cable Fault Locator, Computer
- **Manpower:** Training, Adequate numbers
- **Administrative:** Feedback, Audit
- **MIS and monitoring** of faults against target level (AEE-Daily, EE-Weekly, SE-Fortnightly, CE-Monthly etc.)

IMMEDIATE ACTIONABLE ITEMS:

- Development and adherence to maintenance schedule.
- Development of MIS system. A sample MIS is provided in Annexure-1.

1.2. DT Failure

Measurement Methodology and Target

Perspective	Target DRUM	UOM	Measures
Distribution Txr failure	Nil	%	(No of DTR failure during a year) Average No of DTRs during the year

1.2.1. Parameters to be considered

- **Guarantee Period:** Transformers failed in GP and repaired and brought back under GP should be included.
- **Force Majeure Conditions:** Transformers failed because of Force Majeure conditions e.g. storm, fluid etc. to be excluded.
- **Transformers Failed:** Absolute no of transformers failed YTD

1.2.2. Level:

All the 11/0.4 kV Distribution transformers connected in the system.

1.2.3. Calculation:

The calculation would be done on monthly basis and then annualised. A sample calculation is attached herewith as Appendix-2 (In excel file).

1.2.4. Requirements:

- Distribution transformers asset mapping
- Updation of asset as per the network changes taking place in dynamic manner.

1.2.5. Measurement:

- All transformers in working condition of capacity 11/0.4 KV.
- Any transformer which is unable to provide service, excluding the reasons due to load.

1.2.6. Improvement Strategy:

- **Technical:** Load balancing, Overloading, Maintenance (Trf and LT mains), Refurbishment, Protection (Buchholz relay, HT and LT side), ABC, Lightning Arrestor, Earthing health etc.
- **Facilities:** Proper tools and tackles
- **Manpower:** Training, Regular Maintenance.
- **MIS and monitoring**

IMMEDIATE ACTIONABLE ITEMS:

- Load balancing through peak load reading and/or meter data analysis.
- Overloading report.
- Development and adherence to maintenance schedule including earthing rectification, attending to transformer oil leakage and/or oil quality checking etc.
- Development of MIS system. A sample MIS is provided in Annexure-2.

1.3. Line Failure

Measurement Methodology and Target

Perspective	Target DRUM	UOM	Measures
OH failure rate	2	<i>Faults per 100 ckt-km of 11 kV OH line</i>	No of Faults during a year X 100 (Total 11 kV OH circuit kilometer)
Cable (UG) failure rate	2	<i>Faults per 100 ckt-km of 11 kV UG line</i>	No of Faults during a year X 100 (Total 11 kV UG circuit kilometer)

1.3.1. Parameters to be considered

The following to be excluded while calculating this KPI :
Momentary tripping (Less than 3 minutes); planned outages (including load shedding); Transmission, 33/11 kV Substation and Consumer attributable factors; Line failed because of Distribution transformer failure. Force Majeure conditions

1.3.2. Level : 11 kV Overhead and underground lines (separately).

1.3.3. Calculation:

The calculation would be done on monthly basis and then annualised. A sample calculation is exhibited in the Appendix-3.

1.3.4. Requirements:

- Updation of asset as per the network changes taking place in dynamic manner.
- Single circuit mains shall also to be considered for computation purpose.

1.3.5. Measurement:

- 11 kV feeder identification and segregation the mains length in Overhead and Underground network.
- 11 kV feeder outage capturing mechanism.
- Filtering of data as per the above defined logic considering all the specified exclusions and inclusions.

1.3.6. Improvement Strategy:

- **Technical:** Maintenance, Refurbishment, Protection, Lightning Arrestor, Bird fault protection, tree pruning etc.
- **Manpower:** Training, Adequate numbers to adhere to Maintenance schedule
- **MIS and monitoring**

IMMEDIATE ACTIONABLE ITEMS:

- Development and adherence to maintenance schedule.
- Development of MIS system. Reliability indices MIS to be used. (Annexure-1)
- Annualization as per the formula provided (Appendix-3).

2. CONSUMER SERVICE

2.1. Consumer Satisfaction Survey

Measurement Methodology and Target

Perspective	Target DRUM	UOM	Measures
Customer satisfaction index	100	% of customers, somewhat or very satisfied	No of customers expressed satisfaction Sample size of customers interviewed

2.1.1. Parameters to be considered

- As per the defined attributes, needs to be changed as per the ever growing consumer expectations and consumer services provided backed by the latest technology. General attributes are related to cost, supply availability, reliability and quality, behaviour of employer's staff, honesty, facilities provided and promptness of services.

2.1.2. Level: Consumers getting supply at all the voltage levels and all consumer category should be considered.

2.1.3. Calculation:

The survey and calculation for determination of CSI should be done by the third party based on statistical acceptable techniques on annual basis.

2.1.4. Requirements

- Consumers of all categories, all geographical locations, all voltage levels to be covered.
- The sample size selected should be such to give a confidence level of at least 95%.

2.1.5. Measurement:

- As per the established industrial practice.

2.1.6. Improvement Strategy:

- Needs to be done every year by third party.
- Feedback forms to be kept at consumer's convenient locations.
- Monthly analysis of data received through feedback form

IMMEDIATE ACTIONABLE ITEMS:

- Development of feedback form.
- Availability of feedback forms at consumer's convenient locations.
- Availability of drop/suggestion box.

2.2. Instances of Voltage Complaint

Measurement Methodology and Target

Perspective	Target	UOM	Measures
Number of voltage complaints	Nil	No	No of complaints received in a month

2.2.1. Parameters to be considered

- Complaints received from the consumer for the high/low voltage level below the tolerance limit specified in IE rules.

2.2.2. Level : All consumers

2.2.3. Calculation:

The calculation would be done on monthly basis.

2.2.4. Requirements:

- Logging of voltage complaints and their assortment through IT system.
- Consumer education to log the complaints at 24X7 call centre.
- Separate field in call centre software to register voltage related complaints.

2.2.5. Measurement:

- Only instances to be captured.
- Reporting through computerised system, already available and operational.
- Filtering of data as per the above defined logic considering all the specified exclusions and inclusions.

2.2.6. Improvement Strategy:

- Load balancing
- Overloading of transformer and network
- Capacitor banks to have proper power factor
- Good HT:LT ratio
- Voltage regulator
- Voltage booster
- Measurement of tail end consumer's voltage periodically and taking remedial action, if required.
- Harmonic analysis and harmonic suppressor usage
- Pf compensation at DT level.

IMMEDIATE ACTIONABLE ITEMS:

- Reporting of all the complaints to call centre by section office.
- Report generation from call centre software.

2.3. New Service Connection

Measurement Methodology and Target

Perspective	Target	UOM	Measures
% of new services provided within 3 days	100	%	(No of connections provided within 3 days)X 100 (Total No. of connections provided)

2.3.1. Parameters to be considered

- Applicable where distribution mains extension is not required.
- Three days to be counted from the date of payment and completion of all compliances by consumer (including Test report submission), whichever is later.

2.3.2. Level : Domestic category consumers seeking connection from low tension network.

2.3.3. Calculation:

The calculation would be done on monthly basis. The format to capture the data is enclosed as Annexure-3.

2.3.4. Requirements:

- Upkeep of register at section office.
- Weekly compilation and reporting to Sub Division and then in turn to Division office.

2.3.5. Measurement:

- The time to be considered from the latest compliance date by consumer including making payment, submission of test report by Licensed electrical contractor, Submission of meter, if applicable with Discom etc.

2.3.6. Improvement Strategy:

- **MIS and monitoring**
- Availability of material

IMMEDIATE ACTIONABLE ITEMS:

- An MIS for payment-test report-connection date.
- Should be tracked through IT system with proper escalation mechanism.

2.4. Response to resolve supply complaints

Measurement Methodology and Target

Perspective	Target	UOM	Measures
% of supply complaints resolved within 2 hrs	100	%	(No of complaints resolved within 2 hours)X 100 / (Total No. of complaints received)

2.4.1. Parameters to be considered

- Applicable to complaints such as fuse call, connection problem etc.
- To be excluded: Transformer failure, feeder breakdown, cable fault etc.

2.4.2. Level: All consumers connected with the network and falling in Urban / Town boundary limits.

2.4.3. Calculation:

The calculation would be done on monthly basis.

2.4.4. Requirements:

- All the complaints to be logged at call centre.

2.4.5. Measurement:

- The report should be generated through the system based on complaint register time and its restoration time.

2.4.6. Improvement Strategy:

- **MIS and monitoring**

IMMEDIATE ACTIONABLE ITEMS:

- An MIS for fuse call system to be developed.
- All the complaints to be logged at call centre.
- Should be tracked through IT system with proper escalation mechanism.
- Report to be generated from call centre software.

2.5. Billing Complaints

Measurement Methodology and Target

Perspective	Target	UOM	Measures
% billing complaints resolved within regulatory time limits	100	%	(No of complaints resolved within regulatory time limits)X 100 /(Total No. of complaints)

2.5.1. Parameters to be considered

- Billing related complaints received from consumer.

2.5.2. Level : All consumers

2.5.3. Calculation:

The calculation would be done on monthly basis.

2.5.4. Requirements:

- Logging of billing complaints in a register at Sub division office.
- Compilation at Division level.
- Consumer education to log the complaints at 24X7 call centre.
- Separate field in call centre software to register billing related complaints.

2.5.5. Measurement:

- Depending upon the type as mentioned above, the complaints to be captured and measured in terms of prescribed time limit.

2.5.6. Improvement Strategy:

- Complaint logging mechanism
- Accountability of a single person
- MIS and monitoring

IMMEDIATE ACTIONABLE ITEMS:

- Complaints received at Section office to be logged at customer call centre by utility.
- First compilation at sub division office and then at division office.
- Should be tracked through IT system with proper escalation mechanism and MIS to be churned out from call centre software. A sample format is provided herewith as Annexure-4.
- The format is provided below.
- SDO should be made responsible for ensuring complaints are resolved within regulatory time frame

3. COST

3.1. O&M Expenses

Measurement Methodology and Target

Perspective	Target DRUM	UOM	Measures
O& M expenses per unit of energy input	10	Paise per unit	Total O & M expenses Total energy imported

3.1.1. Parameters to be considered

- Inclusion:
 - Maintenance & repair cost (Mtc. of HT and LT lines, replacement of faulty / old meters, transformer repair / replacement cost, asset repair, augmentation if not covered under scheme and outsourcing cost)
 - Salary on pro rata basis.
 - Admin Cost on pro rata basis (office, stationery, etc.)
 - Actual commercial and insurance cost, compensation as per situation
 - Head office Admin Cost on pro rata basis.
- Energy Import

Note: Generally, many things like staff, stationery, office etc are common for capital and maintenance works. Therefore, it is suggested to calculate it on pro-rata basis of expenditure incurred in maintenance and capital works.

3.1.2. Level : Unit (Sub Division, Division etc.)

3.1.3. Calculation:

The calculation would be done on monthly basis and then annualised.

3.1.4. Requirements:

- As per the format provided to capture the cost.

3.1.5. Measurement:

- As provided in the attached format.

3.1.6. Improvement Strategy:

- Preventive maintenance
- Judicious use of manpower and material
- Regular Data updation

IMMEDIATE ACTIONABLE ITEMS:

- The data to be captured and calculation to be done as per the format provided herewith as Appendix-4.

3.2. ROCE:

Measurement Methodology and Target

Perspective	Target DRUM	UOM	Measures
ROCE – Return on capital employed	10	%	(Profit before Interest & Tax) (Long term loan + Equity)

3.2.1. Parameters to be considered

- As specified in the attached format. Majority of the line items are covered in O&M cost section.

3.2.2. Level : Division

3.2.3. Calculation:

The calculation would be done on monthly basis and then annualised.

3.2.4. Requirements:

- As per the format provided to capture the cost.

3.2.5. Measurement:

- As provided in the attached format.

3.2.6. Improvement Strategy:

- It is a culmination of all other related KPI performance. The efforts should be to improve the performance of each KPI.

IMMEDIATE ACTIONABLE ITEMS:

- Data to be captured and calculated as per the format provided as Appendix-5.

3.3. AT&C LOSSES

Perspective	Target DRUM	UOM	Measures
Aggregate Technical & Commercial Losses	8	%	<u>Energy Realized</u> Energy Import

3.3.1. Parameters to be considered

- Area level energy import
- Energy billed (metered and unmetered separately)
- Amount billed
- Amount realised
- Cut off date of implementation

3.3.2. Level:

- Distribution transformer
- 11 kV feeder
- Sub Division
- Division

3.3.3. Calculation:

The calculation would be done on monthly basis and then annualised. A sample calculation is exhibited in the Appendix-6 (In Excel file).

3.3.4. Requirement:

- Consumer indexing
- Proper metering at DT, Boundary location, 11 kV feeder level.
- IT support to perform the energy audit.

3.3.5. Measurement:

- Needs to be annualised which is not done.
- 11 kV level Energy Accounting including boundary metering
- DT level Energy Accounting and proper Consumer Indexing

3.3.6. Improvement Strategy:

- **Technical:**
 - New S/Stn., Feeder, DTCs etc.
 - Line reconfiguration and bifurcation etc.
 - Load balancing
 - Overloading of network
 - Underloading of transformers
 - Boundary metering

- If boundary meter not available then mechanism as per site specific conditions to be evolved.
- Capacitor bank
- HVDS
- Underground mains
- Quality of maintenance
- Regular meter accuracy testing as per schedule
- **Commercial**
 - Segregation of current and arrear amount for billed and collected portion
 - Provisional billing and assessed energy
 - No. of consumers not paying for last 2 billing cycle
 - Consumers energised but not billed
 - Consumers disconnected but not entered in the system
 - Consumers permanently disconnected but assets not removed and consumer still in the system
 - Electronic meters vs. electromechanical meters
 - Meter testing as per the norms specified by Regulatory Commission and under Rule 57 of IE Rule 1956.
 - Replacement of faulty and burnt meters in time bound manner
 - Faster resolution of billing complaints
 - Correct bill generation
 - Timely bill delivery
 - Easy payment mechanism
 - Disconnection of non paying consumers
 - Billed energy analysis and conducting raids
 - Regular updation of IT system
- **Administrative and Legal**
 - Accountability say of Feeder manager / DT manager
 - MIS and monitoring against target level (AEE-Daily, EE-Weekly, SE-Fortnightly, CE-Monthly etc.)
 - ABC Analysis, Audit
 - Quick disposal of disputed cases
 - Lodging of FIR / Court case

IMMEDIATE ACTIONABLE ITEMS:

- The data to be provided as per the format above having annualised value.
- Cycle to be reduced from monthly to fortnightly for entry of energised connection in billing system.
- Energy audit to be done monthly for each 11 KV feeder.
- HVDS to be implemented on top priority.
- The immediate attention is required in Chawani and Shahganj Sub Division. The same approach may be adopted for Power House Sub Divion.
- The areas are as follows in Chawani Sub Division:
 - The cause of zero consumption for industrial and commercial connections to be ascertained and proper vigil required.

- Similarly there are many consumers getting bills on Average basis, the reading agency should bring the actual reading with a target of 95% to begin with. Presently it is 67%.
- Overall collection efficiency has reduced from 99.58% to 84.13% from Apr-Nov'07 to Apr-Nov'08. The collection efficiency in residential is 72.8%, in commercial it is 84.4%, in Hoarding & Advt it is 9.3% and for temporary connection it is 65.7%.
- In PWW category, the metered sales in the above mentioned period decreased by 5.8% but amount billed decreased by 18.42%. It should not be the case. Investigation and necessary corrections are required.
- The positive point is that in residential category the metered sale has increased by 37.81% and the demand increased by 52.23%. However, in HT industrial category, the metered sales in the above mentioned period decreased by 26.47% but amount billed decreased by 37.35%. It should not be the case. Investigation and necessary corrections are required.
- The areas are as follows in Shahganj Sub Division:
 - The cause of zero consumption for industrial (45) and commercial (183) connections to be ascertained and proper vigil required.
 - Similarly there are many consumers getting bills on Average basis, the reading agency should bring the actual reading with a target of 95% to begin with. Presently it is 71%.
 - Overall collection efficiency has reduced from 91.24% to 82.82% from Apr-Nov'07 to Apr-Nov'08. The collection efficiency in residential is 77.1%, in commercial it is 82.5% and for temporary connection it is 76.35%.
 - In PWW category, the metered sales in the above mentioned period decreased by 0.82% but amount billed decreased by 18.11%. It should not be the case. Investigation and necessary corrections are required.
 - Similarly in LT industrial category, the metered sales in the above mentioned period decreased by 3.72% but amount billed decreased by 8.27%. It should not be the case. Investigation and necessary corrections are required.
 - However the positive point is that in residential category the corresponding figures are 24.5% and 31.75%. The improvement is there in commercial category also.

3.4. END TO END MONEY FLOW

100 – AT&C Loss

OTHER GENERAL OBSERVATIONS

- There should be a review and monitoring mechanism between IT department and field offices so that field staff can take the help of powerful IT tool. For that purpose IT executive may visit the Sub Division and resolve / facilitate the field staff every fortnight.

APPENDIX

Appendix-1 : Methodology along with sample calculation for SAIDI, SAIFI and CAIDI KPIs determination.

Month	Feeder Description	Average No of Customers (C _i)	Breakdown (B _i)				Total Outage		R _{fi} C _i	R _{di} C _i	B _{fi} C _i	B _{di} C _i	SAIFI (Distribution) Nos.	SAIDI (Distribution) in Min	CAIDI (Distribution) Min per Occasion	Passed from beginning of year	SAIFI (Distribution) Nos.	SAIDI (Distribution) in Min	CAIDI (Distribution) Min per Occasion
			Instances (B _{fi})	Hr	Min	Duration (Mins) (B _{di})	Instances (R _{fi}) =(G _{fi} + S _{fi} + B _{fi})	Duration (Mins)(R _{di}) =(G _{di} + S _{di} + B _{di})											
Mar-08	DF-1	7055	5	1	0	60	5	60	35275	423300	35275	423300	5	60	12	1	60	720	12
Mar-08	DF-2	3285	5	1	0	60	5	60	16425	197921	16425	197921	5	60	12	1	60	723	12
Mar-08	DF-3	1823	14	12	0	720	14	720	25522	1312925	25522	1312925	14	720	51	1	168	8642	51
Mar-08		12163	24	14	0	840	24	840	77222	1934146	77222	1934146	6	159	25	1	76	1908	25
Apr-08	DF-1	7055	3	2	12	132	3	132	21165	931260	21165	931260	3	132	44	2	18	792	44
Apr-08	DF-2	3285	6	1	0	60	6	60	19710	197593	19710	197593	6	60	10	2	36	361	10
Apr-08	DF-3	1823	8	12	0	720	8	720	14584	1313016	14584	1313016	8	720	90	2	48	4322	90
Apr-08		12163	17	15	12	912	17	912	55459	2441869	55459	2441869	5	201	44	2	27	1205	44

Appendix-2: Methodology along with sample calculation for DT failure KPI determination.**Maharashtra State Distribution Company Limited****Month- December. 08**

11/0.4 kV Transformer Failure Rate, Aurangabad Division

Subdivision :- **Power House**

Total no of 11/0.4 kV transformers in service as on 1st April of the financial year	:	A	156.00
Total no of 11/0.4 kV transformers in service at the end of the month	:	B	167.00
Total no of 11/0.4 kV transformers commissioned since 1st April of the financial year	:	C = (B-A)	11.00
Total no of 11/0.4 kV transformers failed since 1st April of the financial year	:	D	5.00
No of months expired since the month of April of the financial year	:	E	9.00
Estimated no of 11/0.4 kV transformers at the end of the financial year	:	F = (A + C/E X 12)	170.67
Estimated average no of 11/0.4 kV transformers during the financial year	:	G = (A + F)/2	163
Estimated instances of failure of 11/0.4 kV transformers during the financial year	:	H = 12 X D/E	6.67
Annualized 11/0.4 kV transformer failure rate (%) :			I=(H / G) X 100
			4.08%

Subdivision :- **Waluj**

Total no of 11/0.4 kV transformers in service as on 1st April of the financial year	:	A	376.00
Total no of 11/0.4 kV transformers in service at the end of the month	:	B	500.00
Total no of 11/0.4 kV transformers commissioned since 1st April of the financial year	:	C = (B-A)	124.00
Total no of 11/0.4 kV transformers failed since 1st April of the financial year	:	D	9.00
No of months expired since the month of April of the financial year	:	E	9.00
Estimated no of 11/0.4 kV transformers at the end of the financial year	:	F = (A + C/E X 12)	541.33
Estimated average no of 11/0.4 kV transformers during the financial year	:	G = (A + F)/2	459
Estimated instances of failure of 11/0.4 kV transformers during the financial year	:	H = 12 X D/E	12.00
Annualized 11/0.4 kV transformer failure rate (%) :			I=(H / G) X 100
			2.62%

Subdivision :- **Chawani**

Total no of 11/0.4 kV transformers in service as on 1st April of the financial year	:	A	229.00
Total no of 11/0.4 kV transformers in service at the end of the month	:	B	290.00
Total no of 11/0.4 kV transformers commissioned since 1st April of the financial year	:	C = (B-A)	61.00
Total no of 11/0.4 kV transformers failed since 1st April of the financial year	:	D	18.00
No of months expired since the month of April of the financial year	:	E	9.00
Estimated no of 11/0.4 kV transformers at the end of the financial year	:	F = (A + C/E X 12)	310.33
Estimated average no of 11/0.4 kV transformers during the financial year	:	G = (A + F)/2	270
Estimated instances of failure of 11/0.4 kV transformers during the financial year	:	H = 12 X D/E	24.00
Annualized 11/0.4 kV transformer failure rate (%) :			I=(H / G) X 100
			8.90%

Subdivision :- **Shahaganj**

Total no of 11/0.4 kV transformers in service as on 1st April of the financial year	:	A	149.00
Total no of 11/0.4 kV transformers in service at the end of the month	:	B	176.00
Total no of 11/0.4 kV transformers commissioned since 1st April of the financial year	:	C = (B-A)	27.00
Total no of 11/0.4 kV transformers failed since 1st April of the financial year	:	D	6.00
No of months expired since the month of April of the financial year	:	E	9.00
Estimated no of 11/0.4 kV transformers at the end of the financial year	:	F = (A + C/E X 12)	185.00
Estimated average no of 11/0.4 kV transformers during the financial year	:	G = (A + F)/2	167
Estimated instances of failure of 11/0.4 kV transformers during the financial year	:	H = 12 X D/E	8.00
Annualized 11/0.4 kV transformer failure rate (%) :			I=(H / G) X 100
			4.79%

Aurangabad Division-I

Total no of 11/0.4 kV transformers in service as on 1st April of the financial year	:	A	910.00
Total no of 11/0.4 kV transformers in service at the end of the month	:	B	1133.00
Total no of 11/0.4 kV transformers commissioned since 1st April of the financial year	:	C = (B-A)	223.00
Total no of 11/0.4 kV transformers failed since 1st April of the financial year	:	D	38.00
No of months expired since the month of April of the financial year	:	E	9.00
Estimated no of 11/0.4 kV transformers at the end of the financial year	:	F = (A + C/E X 12)	1207.33
Estimated average no of 11/0.4 kV transformers during the financial year	:	G = (A + F)/2	1058.67
Estimated instances of failure of 11/0.4 kV transformers during the financial year	:	H = 12 X D/E	50.67
Annualized 11/0.4 kV transformer failure rate (%) :			I=(H / G) X 100
			4.79%

Appendix-3: Methodology along with sample calculation for Line failure KPI determination.

HT line failure Rate

Month Year	11 KV Line Length-Ckt Kms	Total number faults during the month	Month after 1st Jan of current year	Cumulative Faults	Annualized Fault	Average Annualized	Failure Rate per 100 Ct. Kms
FY 2008-09							
Jan-08	1110.6	216	1	216	2592	1111	233
Feb-08	1113.5	216	2	432	2592	1112	233
Mar-08	1113.5	203	3	635	2540	1112	228
Apr-08	1126.9	206	4	841	2523	1119	226
May-08	1210.7	196	5	1037	2489	1161	214
Jun-08	1237.0	210	6	1247	2494	1174	212

Appendix-4: Format for O&M cost KPI determination.

Sl. No.	Parameter	Amount	Remark
1	Maintenance & repair cost (Rs. Million)		
2	Salary on pro rata basis (Rs. Million)		
3	Actual commercial and insurance cost, compensation as per situation (Rs. Million)		
4	Admin Cost other than row 3 on pro rata basis (Rs. Million)		
5	Head office Admin Cost on pro rata basis (Rs. Million)		
6	Total Cost (A) (Rs. Million)		

7 Energy import (B)

MU

Appendix-5: Format and calculation methodology for ROCE KPI determination.

Sl. No.	Description		UoM	Value	Remarks
	Power Purchase rate - Net of transmission cost (pool price per unit)	(A)	Rs.		
	Energy import / input	(B)	MU		
	O&M expenses	(C)	Rs. Million		
	Other expenses (Monthly interest on loan amount, monthly return on per annum equity@15% i.e. 1.25%, Equity is the amount equivalent to subtraction of capital on which interest paid – capital base)	(D)	Rs. Million		
	Total Expenses	(E=A*B+C+D)	Rs. Million		
	Capital Base	(F)	Rs. Million		
	Revenue realised	(G)	Rs. Million		
	Other Income	(H)	Rs. Million		
	Total Income (To be considered on annual basis)	(I=G+H)	Rs. Million		
	Net Profit	(J=I-E)	Rs. Million		
	ROCE	(J/F*100)	%		

Appendix-6: Methodology along with sample calculation for AT&C KPI determination.

Aggregate Technical & Commercial Loss (Including H.T.)

Month-Year	Energy Import	Energy Billed to consumers	Amount Billed	Amount Realized	Collection Efficiency	Energy Realized	AT& C Losses	Monthly AT& C Losses	Annualized AT& C Losses
	Units	Units	Rs. (Lakh)	Rs. (Lakh)	%	Units	Units	%	%
	A	B	C	D	E=D/C	F=B X E	G=A-F	H=G/A	
	Feb-08	60805000	53196000	2305	2426	105.3%	55991173	4813827	7.92%
Mar-08	65267000	49951000	2208	2445	110.7%	55302917	9964083	15.27%	11.72%
Apr-08	64763500	54057000	2439	2283	93.61%	50600216	14163284	21.87%	15.17%
May-08	69195000	53819000	2340	2122	90.71%	48818364	20376636	29.45%	18.97%

Aggregate Technical & Commercial Loss (L.T.)

Month-Year	Energy Import	Energy Billed to consumers	Amount Billed	Amount Realized	Collection Efficiency	Energy Realized	AT& C Losses	Monthly AT& C Losses	Annualized AT& C Losses
	Units	Units	Rs. (Lakh)	Rs. (Lakh)	%	Units	Units	%	%
	A	B	C	D	E=D/C	F=B X E	G=A-F	H=G/A	
	Jan-08	25577000	14560000	619	668	108.0%	15721422	9855578	38.53%
Feb-08	30029000	13618000	592	719	121.4%	16536011	13492989	44.93%	41.99%
Mar-08	28962000	13646000	597	676	113.3%	15467358	13494642	46.59%	43.57%
Apr-08	25954500	15248000	682	528	77.4%	11795493	14159007	54.55%	46.15%
May-08	32197000	16821000	727	594	81.7%	13740014	18456986	57.33%	48.67%

ANNEXURE

Annexure-4: MIS format for Billing complaints

Sl. No.	Description of complaint	Total No of complaints Received	No of complaints resolved within regulatory time frame	No of complaints resolved beyond regulatory time frame	% of complaints resolved beyond regulatory time	Remark
1	Payment not reflected in next bill					
2	Wrong Reading					
3	Meter replacement					
4	Provisional billing					
5	Others					
6	Total					

Note:-Complaints which are not resolved will be carried forward and will be accounted in next month

Supporting Data for our observations and recommendations

Shahganj Sub Division

MONTH	ZERO CONS.	%	AVERAGE CONS.	%	FAULTY CONS.	%	AVERAGE + FAULTY CONS.	%	TOTAL CONS.
NOV-2008									
RESIDENTIAL	879	3.20	7,817	28.41	244	0.89	8,061	29.30	27,511
COMMERCIAL	183	4.15	1,351	30.64	54	1.22	1,405	31.87	4,409
INDUSTRIAL	45	11.39	7	1.77	1	0.25	8	2.03	395
TOTAL :	1,107	3.43	9,175	28.39	299	0.93	9,474	29.32	32,315

BILLING EFFICIENCY, DISTRIBUTION LOSS, COLLECTION EFFICIENCY , ATC EFFICIENCY SUMMARY

DESCRIPTION	APR-2007 TO NOV-2007	APR-2008 TO NOV-2008	% CHANGE
Metered / Credit MUs.	25.89	30.83	19.07
Unmetered MUs.	0.54	0.48	-11.11
Total MUs	26.43	31.31	18.46
Billed Amount (LAKHS)	1019.59	1215.19	19.18
Received Amount (LAKHS)	930.29	1006.44	8.19
Collection Efficiency (%)	91.24	82.82	-9.23

CATEGORYWISE INPUT ENERGY , BILLED ENERGY , COLLECTION EFFICIENCY REPORTS

CATEGORY	APR-2007 TO NOV-2007				APR-2008 TO NOV-2008				% CHANGE		
	Metered / Credit Sale MUs.	Amount Billed LAKHS	Amount Received LAKHS	Coll. Effi. %	Metered / Credit Sale MUs.	Amount Billed LAKHS	Amount Received LAKHS	Coll. Effi. %	Metered / Credit Sale %	Amount Billed %	Amount Received %
Residential	15.61	519.46	435.80	83.89	19.43	684.37	528.13	77.17	24.50	31.75	21.19
Commercial	4.61	270.72	246.61	91.10	6.19	380.93	328.41	86.21	34.20	40.71	33.17
HT-Industrial	1.54	84.05	84.19	100.16	0.00	0.00	0.00	**** **	-100.00	-100.00	-100.00
LT-Industrial	1.65	64.69	62.58	96.74	1.59	59.34	54.55	91.93	-3.72	-8.27	-12.83
PWW	0.64	25.36	24.29	95.74	0.64	20.77	21.77	104.81	-0.82	-18.11	-10.36

STATISTICS OF ZERO, FAULTY, AVERAGE CONSUMERS FOR R/C/I.

MONTH	ZERO CONS.	%	AVERAGE CONS.	%	FAULTY CONS.	%	AVERAGE + FAULTY CONS.	%	TOTAL CONS.
MAR-2006									
RESIDENTIAL	482	2.14	2,998	13.32	2,062	9.16	5,060	22.49	22,501
COMMERCIAL	168	4.64	637	17.59	138	3.81	775	21.40	3,621
INDUSTRIAL	19	5.41	49	13.96	1	0.28	50	14.25	351
TOTAL :	669	2.53	3,684	13.92	2,201	8.31	5,885	22.23	26,473
MAR-2007									
RESIDENTIAL	773	3.22	2,237	9.31	1,946	8.10	4,183	17.41	24,028

COMMERCIAL	169	4.47	505	13.35	264	6.98	769	20.33	3,783
INDUSTRIAL	30	8.60	32	9.17	6	1.72	38	10.89	349
TOTAL :	972	3.45	2,774	9.85	2,216	7.87	4,990	17.72	28,160
MAR-2008									
RESIDENTIAL	1,314	5.11	6,483	25.20	936	3.64	7,419	28.84	25,724
COMMERCIAL	249	6.20	1,117	27.82	124	3.09	1,241	30.91	4,015
INDUSTRIAL	33	8.87	9	2.42	0	0.00	9	2.42	372
TOTAL :	1,596	5.30	7,609	25.27	1,060	3.52	8,669	28.79	30,111
NOV-2008									
RESIDENTIAL	879	3.20	7,817	28.41	244	0.89	8,061	29.30	27,511
COMMERCIAL	183	4.15	1,351	30.64	54	1.22	1,405	31.87	4,409
INDUSTRIAL	45	11.39	7	1.77	1	0.25	8	2.03	395
TOTAL :	1,107	3.43	9,175	28.39	299	0.93	9,474	29.32	32,315

L.T. NUMBER OF RCI CONSUMERS HAVING CONSUMPTION BETWEEN 1-30 UNITS AS ON NOV-08

NAME	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		TOTAL	
	NOV-07	NOV-08	NOV-07	NOV-08	NOV-07	NOV-08	NOV-07	NOV-08
SHAHGANJ S/DN.	3,791	3,957	795	903	11	10	4,597	4,870
REPORT TOTAL	3,791	3,957	795	903	11	10	4,597	4,870

METERED SALE, DEMAND (AG ZERO BILLS) AND COLLECTION REPORT

CATEGORY	YEAR 2006 - 2007				YEAR 2007 - 2008				APR-2008 TO NOV-2008			
	Metered Sale	Demand	Collection %	%	Metered Sale	Demand	Collection %	%	Metered Sale	Demand	Collection %	%
LT-DOMESTIC	18,017,555	7,68,13,794	7,14,04,965	92.96	23,033,494	7,77,75,912	7,46,06,536	95.92	19,404,551	6,84,32,473	5,28,12,474	77.17
LT-COMMERCIAL	6,018,724	3,59,89,928	3,54,18,707	98.41	6,540,993	3,87,02,953	3,94,60,261	101.96	4,697,407	2,90,11,334	2,39,45,389	82.54
LT-INDUSTRIAL	1,818,597	87,44,289	1,01,15,743	115.68	2,414,498	93,02,893	98,60,649	106.00	1,590,193	59,34,026	54,54,976	91.93
TEMP. CONNECTIONS		032534,275	****.**		22,592	3,03,050	3,16,113	104.31	39,433	5,55,382	4,24,040	76.35

Chawani S/Div

MONTH	ZERO CONS.	%	AVERAGE CONS.	%	FAULTY CONS.	%	AVERAGE + FAULTY CONS.	%	TOTAL CONS.
MAR-2008									
RESIDENTIAL	713	2.85	7,714	30.86	832	3.33	8,546	34.18	25,000
COMMERCIAL	71	3.71	679	35.44	83	4.33	762	39.77	1,916
INDUSTRIAL	37	8.43	8	1.82	0	0.00	8	1.82	439
TOTAL :	821	3.00	8,401	30.71	915	3.34	9,316	34.06	27,355
NOV-2008									
RESIDENTIAL	668	2.47	8,641	31.91	192	0.71	8,833	32.62	27,078
COMMERCIAL	60	2.57	1,046	44.76	38	1.63	1,084	46.38	2,337
INDUSTRIAL	47	11.03	5	1.17	0	0.00	5	1.17	426
TOTAL :	775	2.60	9,692	32.48	230	0.77	9,922	33.25	29,841

BILLING EFFICIENCY, DISTRIBUTION LOSS, COLLECTION EFFICIENCY , ATC EFFICIENCY SUMMARY

DESCRIPTION	APR-2007 TO NOV- 2007	APR-2008 TO NOV- 2008	% CHANGE
Metered / Credit MUs.	35.55	46.81	31.66
Unmetered MUs.	2.16	1.18	-45.37
Total MUs	37.71	47.99	27.25
Billed Amount (LAKHS)	1465.20	1929.53	31.69
Received Amount (LAKHS)	1458.98	1623.39	11.27
Collection Efficiency (%)	99.58	84.13	-15.51

CATEGORY	APR-2007 TO NOV-2007				APR-2008 TO NOV-2008				% CHANGE		
	Metered/ Credit Sale MUs.	Amount Billed LAKHS	Amount Received LAKHS	Coll. Effi. %	Metered/ Credit Sale MUs.	Amount Billed LAKHS	Amount Received LAKHS	Coll. Effi. %	Metered/ Credit Sale %	Amount Billed %	Amount Received %

PWW	3.61	165.82	172.05	103.76	3.40	135.27	139.60	103.20	-5.80	-18.42	-18.86
HT-Industrial	3.56	188.10	188.23	100.07	2.62	117.84	120.01	101.84	-26.47	-37.35	-36.24

Positive

Residential	19.77	669.97	653.32	97.52	27.25	1019.92	773.42	75.83	37.81	52.23	18.38
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L.T. NUMBER OF RCI CONSUMERS HAVING CONSUMPTION BETWEEN 1-30 UNITS AS ON NOV-08

NAME	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		TOTAL	
	NOV-07	NOV-08	NOV-07	NOV-08	NOV-07	NOV-08	NOV-07	NOV-08
CHAWANI S/DN.	4,115	5,782	405	515	19	10	4,539	6,307
REPORT TOTAL	4,115	5,782	405	515	19	10	4,539	6,307

METERED SALE, DEMAND (AG ZERO BILLS) AND COLLECTION REPORT

CATEGORY	YEAR 2006 - 2007				YEAR 2007 - 2008				APR-2008 TO NOV-2008			
	Metered Sale	Demand	Collection	%	Metered Sale	Demand	Collection	%	Metered Sale	Demand	Collection	%

LT-DOMESTIC	20,022,018	8,66,65,040	8,14,29,297	93.96	25,452,144	9,01,78,789	8,70,91,303	96.58	23,880,603	9,02,71,549	6,57,23,320	72.81
LT-COMMERCIAL	4,772,410	2,90,11,452	2,86,06,023	98.60	5,406,469	3,32,95,063	3,23,31,498	97.11	4,658,894	2,89,16,724	2,44,09,736	84.41
LT-INDUSTRIAL	3,008,778	1,50,89,237	1,45,77,423	96.61	3,327,983	1,36,80,838	1,37,05,885	100.18	2,134,584	91,28,495	91,84,837	100.62
HORDING AND ADVT.	2,887	44,092	0	0.00	11,101	2,17,271	53,750	24.74	5,597	1,14,305	10,630	9.30
TEMP. CONNECTIONS	24,202	3,20,037	10,34,684	323.30	229,507	31,10,007	25,12,642	80.79	327,642	44,00,241	28,93,935	65.77