Tamil Nadu Generation and Distribution Corporation Limited

From	To
Rajeev Ranjan, I.A.S Principal Secretary & Chairman Cum Managing Director, 144, Anna salai, Chennai -600 002.	Shri.A.K.Rajput, Director/ Distribution Planning & Development Division, Central Electricity Authority Government of India, New Delhi – 110066.

Lr.No SE/PLG/EE/GP/AEE4/F.Best practices/D 327/2012 dated:30.8.2012

Sub: Uploading of best practices on e-platform of CEA-Reply furnished -Reg.

Ref: 1. Letter No.CEA/Best Practices/DPD/2012/1872-2015 dt.31.05.2012

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Adverting to the letter cited under reference (1) the following reply is furnished,

The Best practices that are being carried out in TANGEDCO are as follows.

1. Reduction in Losses:

<u>Reduction of System Losses:</u>

The Transmission & Distribution loss depends upon various factors such as size of the network, energy demand, connected Load etc. The Transmission Losses in the power system is an inherent character, and as such this power loss cannot be totally eliminated.

However, Tamil Nadu Generation and Distribution Corporation Limited Electricity Board is continuously carrying out the following improvement works to reduce the line loss.

- Erecting new substations
- Capacitor Banks
- Link lines
- Bifurcation and re-routing of feeders
- Erection of Distribution transformers and
- Strengthening of conductors across all voltage levels.

Best practices being followed to reduce line loss

- High voltage Distribution System (HVDS).
- Network reconfiguration.
- Network re conductoring.
- Optimal location of DTRs.

Advantages of HVDS

i) The LT line length is more in distribution network, than the HT line length. As the line length, current flowing through the line, and the losses is more in LT network, the same can be reduced by the implementing HVDS.

ii) The High voltage distribution system, with small capacity distribution Transformers (16 KVA to 25 KVA) is to be introduced to maintain better voltages and reliability. Tail end voltage is increased in the HVD comparing to LVD.

iii) The Loss in distribution feeders can be reduced by converting 11KV & 22KV feeders in to dedicated feeders (for agricultural) with High voltage Distribution system (HVDS).

iv) In HVDS the voltage is high, thereby theft of energy by way of hooking will be reduced.

Segregation of feeders with agricultural loads and supplying them with HVDS is proposed in all the Distribution regions. At present a pilot study on HVDS is being done with selective distribution feeders.

Reconfiguration, Recoductoring of network and Optimal location of DTs

The reconfiguration of the distribution network is done by

- Identifying over loaded feeders, and distribution transformers. The feeders are bifurcated, to form new feeders thereby to reduce the losses. The loads on the DTs are reduced by proposing additional DTs.
- By balancing the load in the three phases, by way of re-distributing the single phase loads, over loading of independent phases are reduced.
- To improve the tail end voltage, the first 2 to 3 spans of conductors are strengthened by replacing the smaller size conductors by higher size conductors.

- Periodically the tightness of the bus bars, fuses, and lines are checked to avoid high resistance formation.
- At the proposal stage itself the Distribution Transformers are proposed at the load centers. Due to this the length of the LT line is reduced, and thus LT Line loss.

In the Restructured APDRP (R-APDRP) scheme, 110 numbers of Towns/ Cities have been identified all over the state where in AT & C Losses are planned to be reduced in 2 parts .

Part-A aims at establishing base line data for accurate measurement of losses at various levels and improving customer services.

Part – B, emphasizes on system strengthening through capacity augumentation and renovation and modernization of the system.

For effective energy accounting and auditing, initially, under the R-APDRP scheme, in 110 towns/ cities, 43,276 Nos. Distribution Transformers (approx.) are proposed to be metered afresh by meters with Automatic Meter Reading (AMR) facility which will enable accounting the energy at a particular point of time in all the meters. After this, in the non- RAPDRP parts also the Distribution Transformers (DTs) will be provided with meters having Automatic reading facility (AMR).

To reduce the Commercial Losses,

- The collection efficiency is being maintained at about 99%.
- The Commercial loss due to theft/ pilferage of energy is very minimum in TANGEDCO and it is also effectively controlled by the enforcement wing of TANGEDCO.

Further to the above,

- Special courts have been formed.
- Incentives are given to employees for information on theft.
- Incentives are also given to public who give credible information on theft.

2. Ensuring Long term financial viability and Sustainability:

a) In order to lessen the dependability of external power purchase, TANGEDCO has been executing the following own projects:

(i) Mettur Stage – 3 (1X600 MW)

(ii) North Chennai Stage – II (2X600 MW)

(iii) BKB – III and other small HEPs – 56.5 MW

(iv) Joint Venture Projects With NTPC – 3 X 500 MW

With NLC - 2 X 500 MW

b) Further, the augmentation of cheaper source of power purchase from NLC II Expansion, Simhadiri, Koodandulam, etc, TANGEDCO could be able to restrict costly power and save on power purchase cost.

c) Revision of Tariff at regular Interval so as to give effects of elimination of gap between ARR and ACS.

d) Infusion of Equity share capital by Government of Tamil Nadu, continuously @ Rs.2000 crores per annum.

e) Augmenting internal generation of power through encouraging new projects either by Central sector, State sector or Private sector, in the ensuing periods.

f) Focusing on the Non-conventional Energy Sources (NCES) to improve generation to the feasible highest level.

g) The improvement of T&D network, feasible reduction in T&D loss through R-APDDRP schemes will enable TANGEDCO to be technically strong enough to handle the increasing demand.

Persistent follow up and monitoring of above measures would lead TANGEDCO's sustainability and ensure financial viability.

3. Improved consumer satisfaction:

Low Tension Current Consumption Billing:

The waiting time of the consumers at the counters is considerably reduced by introducing better methods such as payment throughout the month based on the 30 days assessment and collection methodology. The consumer is allowed to pay through any mode of collection (viz., TANGEDCO counters, Internet, Post Office, Bank Counters, ATP Machines, Mobiles) as soon as his assessment data gets uploaded. By using internet, the consumers can pay from their home at their convenience. The consumers of rural areas utilize the services of Post Office or Bank whichever is nearer.

The consumers who have registered through internet are intimated about their bill through e-mail as soon as the assessment data gets uploaded.

High Tension Current Consumption Billing: RTGS/NEFT transfer has been enabled for HT billing payments

Consumer Complaints Monitoring System: The consumers can utilize the website for lodging online complaints and the same are forwarded to the concerned officials for necessary grievance redress.

4. Technological Innovation and adoption:

In LT Billing Application:

The assessment and collection of electricity bills were initially carried out manually. To adopt the technology innovation, TNEB has computerized the process of assessment and collection since 2004. The assessment is done using Hand Held Devices by the assessors of TNEB. Presently, the meter reading data has to be keyed in the device and need to be uploaded to the data center server. Alternative methods of assessment using mobile based solutions are under study.

The collection module has also been completely computerized. On furnishing the service number in the nearest TNEB Collection Counters, the consumers can pay their Bills and get instant receipt.

Further to this, other alternate modes of collection were introduced since 2008, viz Internet payment, Any Time Payment machines, counters of India Post, counters of City Union Bank and payment through mobile. The above modules are in beneficial use throughout the State.

Hardware and Network for implementing LT Billing computerization:

The computerization of LT Billing under Project BEST Phase I and II was commissioned during 2006 & 2008 respectively. In computerized LT Billing around 2500 collection centres are connected to the Data centre in Regions through leased lines, RF network & V-SAT connectivity. Though the Project BEST scheme consists of hybrid network comprising Leased lines, RF and V-SAT connectivity, the RF plays a main part. Most of the collection centres are connected to nodal points through RF network. For the RF network the recurring expenditure to be incurred such as bandwidth charges are nil. Only the equipments connected are to be maintained / replaced in case of failure.

Collection centres in remote areas were connected through V-SAT connectivity where establishment of RF connectivity or leased lines are not feasible. The maintenance of V-SAT connectivity is little bit expensive and data transfer speed is low. The alternate network connectivity using MPLS VPN (Multi Protocol Label Switching) have been tried for remote sections and has proved successful. This concept is adopted for collection centre as replacement of V-SAT connectivity and is working successfully. The recurring expenditure to be incurred is comparatively less.

Also open source LINUX machines are used for assessment and collection and further thin client PCs are being used for collection.

TANGEDCO's Network:

To enhance the online initiatives, the internet leased line is upgraded to 45 Mbps bandwidth in July 2012 with a redundant line of same bandwidth to be provided in three months time.

State of the art firewall solution through checkpoint has been implemented with an active-active mode, for protecting the traffic in and out of the TANGEDCO network.

A network monitoring system has been placed in for effective monitoring of the traffic and hence making the service of TANGEDCO in an effective way.

5. Securing the interest of consumers:

TNEB has taken lots of initiatives to maintain the interest of the consumers. This is carried out by providing lots of consumer oriented information in TANGEDCO's portal www.tangedco.gov.in as mentioned below:

1) Account Summary – Full service connection and payment details
2) Tariff Calculator
3) All Forms required by consumers.
4) Tariff Schedule and rates.

The consumers are enlightened with the latest tariff under which they are being billed through internet. The bill is also being served through e-mail for those LT consumers who have registered under online collection.

Display in the Receipt:

The details of availability of Security Deposit are being displayed in the receipt so that the consumers are aware of the amount of his deposit with TANGEDCO.

Providing interest on deposit:

- The amount of interest for the security deposit is also being displayed in the receipt.
- Interest at 6% p.a. is credited to the consumer's account on the amount of security deposit held by him.

Facility to pay in advance:

- There is no limit as to how much the consumer may pay to TANGEDCO in advance towards cc charges.
- This facilitates the consumers to make advance payment when he is out of station and avoid disconnection.

Intertest on Advance CC charges:

- The consumer is being credited with interest at 6% p.a. on the advance cc remitted.
- The interest accrues from the date of payment and it will get adjusted on the succeeding bill amount payable by the consumers.

Refund of Security Deposit:

- During the yearly review in the case of HT services and once in two years review in case of LT services, whenever the review of ASD is found to be in excess of the requirements then the same will automatically be adjusted into cc bills and balance refunded to the consumer even without the request of the consumer.

6. Skill development measures of employees:

The following programmes are conducted for the Employees:

Engineers:

- **Workshop on Protection of 110 KVSS equipments**: The participants are taken to 110 KV SS where various protection schemes and their purposes are explained. Trainees are also made to trace control circuits in substations.

- **Workshop on Trouble Free Operation Of Distribution System and Effective Earthing**: The participants are taught the importance of earthing, checking earth pit resistance at site and how to maintain effective earth resistance for trouble free distribution system.

- **Workshop on Safety Management in Power Sector:** In addition to electrical safety the participants are trained in fire safety by the staff of the District Fire Safety wing and in first aid by professionals from St. John's Ambulance Association and a provisional certificate will be issued by them to the participants for having undergone First aid training.

- **Workshop on Testing of SS Equipments**: It is an onsite programme where the participants are trained at Substations how to test various SS equipments & relays practically.

- **Workshop on Breaker Maintenance**: The participants are trained at the manufacturer's site and hands on training are given to them on breaker functioning & maintenance concepts.

- **Workshop on Instrument Transformers**: The workshop is conducted at the manufacturer's site and the participants are able to see the constructional design aspects and their importance in Instrument Transformers.

- **Workshop on Batteries**: Participants are exposed to various parts of the battery, maintenance of batteries, importance of arresting D.C leakage system, remedies & trouble shooting of batteries system.

- **Workshop on Hot Line Maintenance**: A demo on hotline washing is given at site to the participants and the importance of maintenance of insulators is highlighted.

- **Workshop on Load Management and Open Access System** : This programme exposes the participants to practically manage the grid at Load Despatch Centres and concepts of Open Access System.

- **Workshop on Lightning Arrestors**: Participants are introduced to lightning theories and functioning & maintenance of Lightning Arrestors are explained at manufacturer's site.

- **Workshop on Power Transformer & OLTC**: Conducted at the manufacturer's site where participants are exposed to Construction, operational aspects and trouble shooting of Power Transformer and OLTC.

- **Contact programme with manufacturers on Power plant equipments** exposes the participants to the recent trends and developments in material wise, technology wise & prospective retrofitting of spares for performance enhancement with demonstration of spares and equipments.

- **Training programme on Dynamic balancing and Vibration analysis** exposes the participants to the techniques and methods of Dynamic balancing and alignment of machines, vibration and signature analysis with a practical demonstration of balancing techniques and balance tolerances to correction planes.

- **Workshop on Operational emergencies & Problems encountered, remedial measures adopted in Power Stations** is conducted at periodical intervals to create a platform to study the recent incidents on tripping, causes, remedies to be adopted for prevention of similar occurrences in other Power Stations.

- **National Level Workshops on Problems encountered in Power Plants, Analysis, Inference & remedial Measures Adopted** are conducted for Engineers of various Utilities to discuss about the Recent trends & Developments in Power plants and problems arising in the Main Equipments and Auxiliaries of Power plants and remedial measures to be adopted with case studies.

- **Heat Shrinkable Cable Jointing Low Voltage (LT) & 11KV/33 KV (HT) Hands on Practical Training Courses:** Engineers and staff are made to understand the field of UG Power Cable & Jointing Techniques with practical demonstration and execution of Power Cable Heat Shrinkable Joint & End Termination in a systematic & professional manner to get trained as Skilled Jointers.

Staff:

- A separate model room is available in every Training Centre in which all the trainees are given with a demonstration of models which will give a visual effect.

- In the training programme on **"Attending minor repairs to DT**", Overview of the DTs, its various parts, importance of Maintenance are first described to the participants and then the trainees are taken to the Special Maintenance Lab where DTs are repaired normally and given Hands on

training on attending to small repairs in DTs. This helps the field staff in developing their skill and confidence in attending to small repairs in DTs.

- **Adoption of Distribution Transformer at field:** During this training programme, a DT is adopted and the trainees are taught at site on the aspect of importance of Neutral and maintenance of the DT and replacement of worn out rods, gaskets etc., as per site requirement, is also carried out by the trainees while doing complete maintenance of the DT . Earth resistance of DT is practically measured and then improved by watering, soil treatment by adding Bentonite powder if earth pit resistance is found high.

- **Standard Erection Practices:** Educating the trainees and involving them to do at site on how to dig the pole pits and erect poles, supporting poles, Cross arm and insulator etc., and stringing of the conductor, earthing of cutpoint poles for LT and HT Poles are being done practically. The training methodology adopted is to begin with theory classes on the first which is followed by practicals on the second day. One new structure is completely erected by the trainees with standard clearances & safety measures.

- **Training Programme on Tieing up of services and Line Maintenance:** Trainees are practically taught at field how to set straight the leaned poles, replacement of worn out stays, such as replacement of defective Guy shackle, stay rod etc, resagging of LT Lines, Providing of " U " jumper at all service poles. Effecting Service connection works are practically taught at site.

- A Distribution section with high DT failure rate is adopted and with the practical training given to the staff of that section on various problems related to DT failure, the failure rate in a year is greatly reduced.

- To enhance the skills on Standard erection practices of Distribution Transformer Structure and associated lines, special training programmes are conducted which includes on-site training.

- Training programmes to Assessment staff are also conducted to enhance their skills in plugging the leakage of revenue. Ways and means of reducing commercial losses by proper assessment, collection, reporting of defective meters, and applicability of appropriate tariff are also dealt with. Using of HHDs and updating their working knowledge with regard to the software packages on project BEST (Billing of Energy Services in TANGEDCO) is also being taken care of.

For Adm. /Accounts Staff

- Onsite training programmes are conducted on the following topics:
    - Workshop on Increasing Revenue & Effective Cost Control
    - Workshop on Enhancing Administrative Skilssls
    - Workshop on Court Cases (Administration/Theft of Energy, Unauthorised Use)
    - Effective Handling of Disciplinary Proceedings cases
- "Activity task role" is a skill enhancing tool for the Administration / Accounts wing in which a task is given to a group with an expectation whether all the activities involved are listed with a step by step flow diagram.

7. Imparting consumer education:

For Students:

- Energy Conservation & Electrical safety awareness programmes (Half-a-day) are conducted at all Towns/places for the Students of Schools/ Polytechnics/Colleges where importance of energy conservation is stressed upon & energy conservation tips are given through Powerpoint Presentations, Exhibiting of Models and displaying the Charts. A pocket size Card was given to all the students and they were asked to enter the Energy Consumption of their House for that current month and again note down the consumption after the next cycle and compare the reduction in consumption after following the conservation measures and prizes were awarded for the Student who has shown higher reduction applying better Energy Conservation measures. They are also exposed to the importance of electrical safety.
- Participation in the Science Expo 2012 for school children conducted by Govt. of Tamilnadu - by putting up a stall, displaying models and explaining using power point presentation.
- Programmes were also conducted to faculties and students of Engineering colleges on practical aspects of power system

For Public (Consumers):

- Arranged several awareness program on Energy Conservation for the General public for educating the need for energy conservation and displaying models/charts on how to conserve Energy.
- Organised an Exhibition at Visveswaraya Tower Park, Annanagar, Chennai in Association with Lions Club and Indian Society of Lighting Engineers to create awareness about Energy Conservation to the General Public and many consumers visited the Exhibition and got benefited and appreciated this effort.
- Participation in the Exhibitions conducted by Govt. such as State level Exhibition on World Consumer's Right Day, inaugural function of "BACHAT LAMP YOJANA, etc. for educating the need for energy conservation and displaying models/charts on how to conserve Energy.
- During Energy Conservation week(DECEMBER) arranging of Exhibitions, meetings, procession etc. at all towns/places

Programmes to HT consumers & industrial consumers are conducted to make them aware of billing aspects like energy audit, significance of energy conservation measures, importance of installing of correct rating of capacitors.

8. Load & demand management measures:

As the whole nation is facing severe power deficit, the demand side management measures has become inevitable in the present power management. In the above line Tamil Nadu has following some demand side management measures which are furnished below.

Supply side management:

a) Because of rapid growth in the electricity demand and shortage in the generating capacity due to varies factors, the supply side cushion is not available and hence the only possibility in supply side management is the utilization of the existing sources in an optimum way and Tamil Nadu is following the same.

b) The demand estimation is carried out season wise based on the historical data and according to the deficit estimated the power

purchase from the external sources are planned in long term/medium term/short term/week ahead/day ahead basis by TANGEDCO.

c) Power purchase is also being arranged through Case 1 bidding by TANGEDCO.

d) Even after arranging the maximum possible power, the balance deficit is planned to be met through Restriction and Control (R&C) Measures.

e) In real time operation, the high cost sources are regulated economically on merit order.

f) As a long term supply side management measures, efforts are being taken in early commissioning of the on-going projects.

Demand Side Management:-

- The HT consumers are permitted to purchase power through both Inter-state and Intra-State open access.
- Generators within State are allowed to sell power to HT consumers through intra state open access.
- Kadamparai pumped storage is being used effectively to flatten the system load curve.
- The HT consumers are provided with TOD tariff meter.

- **Energy Conservation by TANGEDCO:-**
  - Awareness is created among the consumers about the need of Energy Conservation through advertisements, special programmes in televisions/radios etc.
  - Making Energy audit as mandatory for the designated consumers.
  - Supply of Energy efficient motors to the Agriculturists.
- **SMART GRID arrangement to be made by TANGEDCO**

  Introduction of SMART GRID is under pipe line and the Smart grids will help consumers to monitor and optimize the use of energy. With the help of "smart meters" the consumers could know how much electricity is

being used and how much it costs, and accordingly the consumer could adjust the usage to match how much they are willing to spend.

9. Energy efficiency and demand side management:

- TNEB had made Energy audit mandatory for the HT Industrial and HT Commercial establishments in the industrial sector, even before the enactment of the Energy Conservation Act 2001, as per the Government of Tamil Nadu G.O.Ms.No.72 Energy (C2) dt.10.05.1996.
- The HT consumers were taking up Energy audit studies / implementation by engaging the approved Auditors of TNEB.
- The Energy audit Programme was carried out in a phased manner based on the sanctioned demand of the HT consumer.
- The mandatory energy audit programme could not be enforced after the enactment of the Electricity Act 2003 and after the appointment of the Tamil Nadu Electrical Inspectorate (TNEI) as the State Designated Agency (SDA) to implement the provisions of the EC Act 2001 in the State of Tamil Nadu.
- TANGEDCO have nevertheless taken every effort to promote DSM in the domestic & agricultural sector.
- The GoTN vide G.O. Ms.No.126 dt.10.11.2008 has issued the guidelines for achieving energy conservation and has banned the usage of ICBs and to use CFLs in place of ICBs in all the Govt. Departments, Public Sector Undertakings, Boards, Societies etc vide G.O.Ms.No.75 dt.20.08.2010.
- TANGEDCO as a part of promoting the DSM measure in Agricultural sector have arranged for replacing 242 Nos. of Energy Efficient Pumpsets to the willing farmers in exchange for the old inefficient pumpsets and so far about 141 EEPs were replaced.
- TANGEDCO have made Energy Efficient agricultural pump-sets (EEPS) as a mandatory requirement for the providing new Agricultural service connections to avoid energy loss.

- TANGEDCO is celebrating energy conservation day every year in December for a week between 14th December & 20th December throughout Tamil Nadu.
- During this period, the messages on Energy Conservation are arranged to be printed on the Aavin milk sachets and energy conservation slogans are sent as SMS to all the BSNL Mobile users.
- Wide awareness among public regarding energy conservation has been made through Newspapers, Telephone Messages, Projecting slides in cinema theatres, broadcasting in local cable TV networks, conducting workshops, road shows, rallies, human chain, seminars, talk sessions etc by involving the eminent personalities of various organization.
- To promote DSM activities further in the TANGEDCO/ State, the GoTN has announced the following new proposals for implementation in the future.
- To provide CFL bulbs at no cost to the consumer, as replacement to Incandescent Bulbs (ICBs) to about 14.62 Lakh Hut services in the State who are being provided with free electricity.
- TANGEDCO in the first phase has also proposed to distribute 1 Crore CFL lamps to the metered domestic consumers in the State as replacement to the ICBs at the subsidized rate of Rs.15/- per CFL.
- TANGEDCO is also planning for a demonstration project in agricultural sector to create awareness among the farmers on the use of Energy Efficient Pumpsets (EEPS) to conserve energy.
- TANGEDCO through the consultant M/s.TERI under the aegis of M/s.Shakthi Sustainable Energy Foundation (M/s.SSE) is carrying out a study on preparation of "DSM action plan for the state of Tamil Nadu based on load research".
- TANGEDCO is taking all possible steps to achieve the target Specific Energy Consumption (SEC) as notified by Bureau of Energy Efficiency

(BEE) in all Thermal and Gas Power Generation Stations under Perform, Achieve and Trade (PAT) scheme.

- TANGEDCO has also proposed to install 60 KW Roof Top demonstration solar power plant at TANGEDCO Head Quarters.

10. Technological innovation and adoption thereof:

- ULDC revamping works programmed with coverage of all new substations and Energy Management System.
- SCADA/DMS project is being implemented in 7 cities through R-APDRP, with the latest technology solutions.
- Automation of Distribution System through Provision of RMU and Sectionalisers in SCADA/DMS project.
- Fibre Optic network is planned to be established throughout the grid.
- Digital Microwave Communication has been dispensed with.

Skill development measures of employees:

- Technical classes and interaction for knowledge improvement conducted periodically.
- Sharing of Disturbance Analyse for improvement of knowledge.
- Technical articles in magazines communicated to down level officers for creating awareness.

Yours faithfully,

Sd/-(30.08.2012)
(T.Jeyaseelan)
Director/Distribution
for CMD/TANGEDCO