Annexure - X

Report on the
Tasks -(d) to (f) of HLP Terms of Reference

1) Assess system improvement measures accomplished in distribution of power in particular urban areas as well as future needs/plans.

2) Examine geographical and spatial compulsions and determine their operational impact.

3) Review organization and managerial structure, man power employed and future requirement/ plan."

Submitted to

High Level Panel on Financial Position of Distribution Utilities

Contents

1. BACKGROUND

High Level Panel (HLP) on "Financial Position of Distribution Utilities" has been constituted to look into financial problems of State Electricity Boards (SEBs) and to identify potential corrective steps to be taken in this regards. In this report the scope is Terms of Reference (TOR) numbers (d to f) of the panel i.e.

- Assess system improvement measures accomplished in distribution of power in particular urban areas as well as future needs/plans
- Examine geographical and spatial compulsions and determine their operational impact
- Review organization and managerial structure, man power employed and future requirement/ plan".

A team, under Shri. R.K Narayan Ex. CMD PGCIL&UPPCL, was asked to examine above TOR. Shri R.K Narayan was supported by Shri. A Velayutham, Ex.Member MERC, Shri A.K.Pradhan Ex.Director PVVNL(U.P)& Shri M.K.Gupta Ex.Member (Tech) DVB .

1.1 Outline of the approach and data sources applied

The report has been prepared on the basis of visits made by the team to the utilities /states, presentations made by the utilities, interactions with them , information furnished by them in reference to our letter no 3/1/HLP /2010 dated 22/11/2010. A notice was also issued in news papers requesting public to come forward for suggestions. A copy of the advertisement is placed in Annexure I (However no response has been received)

The following states were visited for interaction with utility/states 1) Gujarat 2) West Bengal 3) Maharashtra 4) Andhra Pradesh 5)Karnataka 6)Tamil Nadu 7) Rajasthan 8) Punjab 9) Haryana 10) Uttarakhand 11) Uttar Pradesh 12) Meghalaya 13) Assam. The presentations and the documents submitted by the utilities are at Annexure II. Discussions were also held with concerned officials of CEA, PFC, BEE and REC. Interaction also held with RAPDRP consultants of IT ,IT Implementation agencies, Third Party Implementation Agency(NPC).

The report can be grouped into following broad areas:-

- Measures to be adopted to bring down AT&C losses, i.e. RAPDRP scheme, energy accounting and auditing, agriculture feeder separation, and metering & billing.
- RGGVY, 24X 7 hrs Power supply for non agriculture consumers and subsidy disbursal.
- Energy conservation
- Human Resources Management.
- Geographical and Spatial compulsion.
- Anti Theft Measures, Subsidy disbursal , Power purchase
- Open Access

1.2 The focus of this study is not on finding faults or criticizing the functioning of the Utility, but on identifying problematic areas that have hampered the operation of utility and suggest possible corrective actions for their improvement so as to ensure efficient functioning of the Utilities.

2. SUMMARY OF KEY FINDINGS AND RECOMMENDATIONS

2.1 Recommendations/suggestions on Task- Assess system improvement measures accomplished in distribution of power in particular urban areas as well as future needs/plans

2.1.1 RAPDRP Programme is right approach for introduction of IT based platform to manage all functions of distribution sector in the country, to start with, in urban areas. However, on examining the status, it is found that the progress in most of the states is slow, particularly in the areas of installation of Central Server, GIS consumer Survey, asset mapping and base level loss determination. It is also noted that Distribution Transformer metering is not progressing as per schedule (As annexed). It was also envisaged that the utility has completed metering of all their 11kV feeders. The following is therefore suggested:-

a. Most of the states have confirmed installation of energy meters on 11 KV feeders. However, Energy Accounting of these 11 KV feeders is not being done by the utilities on regular cyclic basis. Some of them are waiting for GPS based consumer mapping as well as for operationalising of RAPDRP programme Part (A). It is recommended that Energy accounting and auditing of 11Kv feeders be started on the basis of present consumer indexing, which in most states, indicates 33KV substation and 11KV feeder on which a consumer is connected. A 12 month rolling accounting and audit report be prepared and submitted to Utility Top Management every month. Action for loss reduction need not wait for completion of RAPDRP Part .

b. RAPDRP programme is limited to towns having population above 30,000 (10,000 for Special Category States) and covering an area of 40% of energy consumed in the country. Considering that 12%of energy is supplied thru private utilities, and further if we take an average 20% agriculture consumption countrywide, small towns/villages, which consume 28% of energy consumption are left over by the present RAPDRP scheme. It is to inform that rest of the system left over is not complicated as is the case with large town feeders. It is necessary for states to give equal importance to small towns &villages which are not covered in the present scheme of APDRP. With very little effort APDRP can be extended to other areas since the IT backbone is already being built under APDRP Project. Further, GOI is emphasizing development of small towns and villages to minimize the migration of population to towns. Therefore, energy consumption in these areas is bound to increase much faster than as envisaged so far.

   It is, therefore recommended that most elements of RAPDRP programme should be applied to all areas uniformly, except to agriculture, which is being discussed separately (Para 2.1.4).

2.1.2 RGGVY Scheme:- RGGVY, being implemented in most of the states, is progressing satisfactorily. However, there is need to regularly monitor the position of power supply in these villages post commissioning. It has been past experience that in case the power supply is not properly managed and maintained, it may result in consumers not paying for

electricity. Some time it was seen that even transformer and conductor were stolen and village was finally declared de-electrified. Proper Management of power supply is a must.

It is asserted that RGGY Scheme cannot be treated differently as a rural scheme. Assets created under this Scheme need be treated at par with towns identified under RAPDRP for supply of power as well as maintenance management..

b) It is also reported by many utilities that under RGGVY they are allowed to build up/ augment capacity of the distribution network taking into account 60 watt load from each BPL family. However, after commissioning of the system, BPL consumer find above load as very low and want to use TV and electric appliances which can go upto a minimum 1 kW. It is pertinent in view of the fact that some APL consumers living in the area also like to get electricity connection by which system can get over loaded and therefore denied connection. Such consumers try to illegally tap the system resulting in overloading. During the discussions with REC, it was conveyed that in such cases, state utility can increase the capacity of the system through their own funds. It is recommended that basic infrastructure such as transformer capacity needs to be built in the village keeping into account of future growth of next 5 years. Any additional expenditure on above can be given as loan by REC, 50% of which can be converted as grant in case the load level in the system is satisfactorily maintained in the level of 15-20% in the concerned village for next five years after commissioning or otherwise, the very purpose of giving grant / assistance by REC/GOI shall not serve the purpose it is expected to serve.

2.1.3 24X7 hrs Electric Supply:- In the order issued for RGGVY in 2005, it was envisaged that

"that states must make adequate arrangements for power supply and that there should not be any discrimination between power supply between rural and urban consumers". But the same was modified in 2008 order wherein it is mentioned that a minimum supply of 6-8 hrs of electricity in RGGVY shall be ensured. In this regards, it is strongly felt that it is necessary that villages are also supplied 24X7 hrs supply as their counterpart in towns for non agriculture consumers. Though, power supply to agriculture pump sets need be regulated in order to ensure efficient water and energy management. For this purpose it is essential to separate feeders for village power supply and power supply to Agriculture pump sets. Government of India may provide incentive/ interest subsidy / grant for meeting the cost of feeder separation schemes. Even feeders supplying power to pump sets be provided with Special Designed Transformer (SDT) as introduced by Gujarat, AP, Karnataka and Maharashtra so that non agriculture load even on such feeders is ensured 24X7 hrs for domestic light and fan use.

2.1.4 Agriculture Feeders

a. In case separation of feeder is not needed in states like West Bengal and Orissa and in North East States in view of less number of pump sets, 24X7 hrs supply to all consumers need to be ensured including metering of all agriculture consumers.

b. All 11KV agriculture feeders are expected to be provided with input meter with remote/automated reading so that energy supplied to agriculture consumers can be

computed. Power supply to these feeders need proper regulation for economising water consumption. It is also expected that all new agriculture pumps are provided with energy meters and these are being read regularly. Attempts need be made to arrange that at least 5% agriculture pumps are metered on each feeder so that billing can be done for all pumps on basis of reading of these meters. It is recommended that sample meters are provided in cluster of pump sets having a similar geological feature. It is very important that billing is done only on actual meter readings of these pumps provided with energy meters.

2.1.5 Metering & Billing

a. It has been seen that at present, in some states most of the energy billing is outsourced for bill preparations and distribution of bills and that energy consumption data is also allowed to be stored in Service Provider Server. This need be avoided as manipulation of consumer energy consumption data is possible and utility is left completely at mercy of service provider. It is recommended above practice needs be avoided and meter readings need be down loaded in server owned by Utility. It was noticed that monthly data of energy consumption of the utility and billing is computerised thru service provider covering most of the consumers, however a very few bills are still being prepared manually. These bills are relating to Agriculture pump sets and street lighting and traffic signaling etc. which in some utilities even by now are not provided with meters. Street lights and traffic signaling need be provided with separate meters immediately. It is also recommended that computation of the energy consumption and billing for these consumers be also computerized, for which a very simple software programme shall be needed. In short all energy accounting needs computerization to avoid manual manipulation.

b. Existing Electro mechanical meters need to be changed to Electronic meters expeditiously as old electro-mechanical meters have tendency to become slower with time because of friction in bearings as well they might have already been tempered with. State Utilities have informed that billing have increased even up to 20-30% by change of meters to electronic type with inbuilt anti-temper features. It was also reported that all new consumers are being supplied with electronic meters as per CEA approved specification. However, it is noticed that progress on replacement of old electro mechanical meters is slow. There are more than 20 millions such meters which need replacement. There need for time bound plan for changing such old meters There is need to continuously monitor feeder wise & DT losses and in case of increase in tempering is deducted, utility may even think for mass replacement. However, task of changing all old electro-mechanical meters is enormous as it has been found that even in one progressive state namely Maharashtra, the number of such old meters is about 2 million. Total in whole country can be of the order of 20 million. It can make a very large impact on present level of AT&C losses in case replacement of electromechanical meter with Electronic meters is expedited. It is estimated that country will need annually about 10 million new electronic meters keeping in view of providing meters for new consumers and as well as replacement of old meters. It was also reported by Utilities that there are

not many reputed meter manufacturers in the country. It is desired that CEA may look into manufacturing requirement in the country on long term basis.

c. It has been reported that most of the H.T & high value consumers have been provided with electronic meter with remote reading feature. It is desired that these consumers energy consumption is measured and monitored with immediate effect.

d. New meters need be provided so as to enable them to suit future requirement of smart grid which shall be introduced progressively in the country

e. Prepaid meters need be introduced progressively after implementation of R-APDRP as it reduces the work load of meter reading and revenue collection. Suitable rebate need be given to consumers opting for Prepaid Meters. However, it needs a proper marketing network to be established for availability of Prepaid Meter cards as well as for communication with the Utility Server, continuous remote sensing of consumption for close watch required to be kept in case a consumer is not getting his card recharged within a reasonable time. Prepaid meters can also be provided for agriculture pump sets as meter reading is very time consuming and therefore costly. Intelligence needs to be built up in meter for communication with CPU etc & easy availability of prepaid cards or their re-charging.

f. As per Electricity Supply Act 2003, all power consumers are to be metered & regularly read. It is difficult to arrange readings of agriculture pump sets in view of location etc. For this purpose, as discussed under metering in the report, State level negotiations need be held with Telecom companies and other such companies having base in the area such as banks, post offices, franchisees, etc. to get more reasonable rates for providing for remote operation and meter reading arrangements on agriculture pump sets. These companies can also be entrusted with services like billing, bill distribution & revenue collection.

g. Consumer meter board need be brought outside the premises of consumer as far as possible to minimize chances of tempering as well for ease of taking meter reading. Meter reading display can be provided in consumer premises.

h. TOD meters need be encouraged for high value consumers say, 10 kW or above connected load, in order to encourage a culture of load management by the consumers. With introduction of smart grid consumer shall be playing a very important role by participation in grid management

i. Meter reading need be taken by Automatic Hand held Meter Reading Instrument and the readings need be downloaded direct in the Utility server without any manual intervention to obviate any manipulation. CEA should finalise specifications for a common protocol for all types of meter reading instruments.

j. It is noted that earlier there was a failure on part of the utilities in taking meter readings especially in rural areas. As now it has been reported that meters are being provided to all new consumers including agriculture pump sets, it need be monitored whether meter readings is being taken regularly. Otherwise very purpose of providing meters will be

defeated. It is suggested that in case a Utility is not in position of taking meter reading by its own staff the same may be done outsourcing but arrangement need be put in place that regular audit of the same is done departmentally or thru an independent third party.

k. It is also desired that accuracy of meters is checked at manufacturing works during final testing, if required thru an independent agency and finally sealed. As far as possible testing/ calibration of meters in the departmental laboratories should be dispensed with, to obviate any malpractices. It is desired that these laboratories now be used as depository of meters received from manufacturers and issued to various consumers and also for tracing a meter history. All above work need be carried now electronically for which system is being worked out under R- APDRP. Meter labs may be used only for random accuracy checking of meters before installation as well as during operation. Allocation of meter to a consumer needs be done thru computerized system so that manual interference is minimized. It is also recommended that repair of meter be avoided in departmental labs. Meter damaged or found faulty need to be returned to manufacturer's work for repair and resealing.

2.2 Recommendation /suggestion on task:- Examine geographical and spatial compulsions and determine their operational impact

a. In villages and areas far away from Grid, electrification by Solar PV need be encouraged. Even use of biomass, bio-fuel and wind energy will be beneficial. Wind energy is a good source for supplying power to grid connected as well as to non-grid connected locations. As discussed in the report power generation using a DG set with bio-fuel or kerosene may be cheaper when considered with the subsidy given by GOI on providing kerosene in the villages for lighting.

b. Areas such as Sunderban in West Bengal, Kutch in Gujarat, Thar Desert in Rajasthan need be treated at par with Special category states like North East and Hilly states for electrification and be given 90% grant for electrification and building distribution back bone.

c. Solar power can be a good option for agriculture pumps as well as for telecom towers in rural India. Studies have revealed that in near future solar power shall have parity with grid energy as cost of electricity generation.

2.3 Recommendations /suggestions on task:- Review organization and managerial structure, man power employed and future requirement/ plan.

At present except for few states most of the distribution utilities are state government owned. This study and discussions are limited to Public sector distribution utilities only The following are the recommendations:-

a. There is need to have in house core team of IT experts in the organization who can work along with IT Consultants appointed under R APDRP Project. By this not only utility can get their Project implementation successfully completed but also fully take care of IT system during its maintenance phase and also can make its own plan for its future

expansion or improvement from time to time. It will be better if the multi functional team of Engineers, finance, HRD etc is kept along with the Core team who will gain experience in the IT and understand both hardware as well as software aspects of IT in addition to its interaction with their respective functions. Under R-APDRP Project there is a provision that IT Consultant as well as IT Implementation agency shall be holding hand with Utility for next five years after commissioning but there is need to build up for utility its own team from the very beginning.

b. Engineers and employees working in Operation and Maintenance, Revenue management and Finance and HRD areas need to be trained to work on computers to fulfill functional need. It is necessary that all new recruitment is done keeping in view above need. The present staff needs a properly developed orientation course to become familiar with the new system and get fully conversant on its operation. If required they should be given incentives to get conversant and operational on new system. All future selection, promotion as well as even increment in pay be made subject to employee passing necessary pro efficiency test on computer.

c. It is necessary that organization structure as well as Human resources required to handle the requirement of new system be modified keeping in view of R-APDRP Project as well as future vision of organization needs arising out of market competition.

d. The new structure needs to be lean with less tiers needed in making decision in view of multiple layers of information which sell be available on line with RAPDRP Project.

e. The corporate structure also needs to be reviewed for future requirement of International Financial Reporting Standard.

f. There is need of proper HRD department with persons having professional experience in dealing with Changed Management and new working culture and training needs. Similar is need for changes in Finance Department and requirement of professional having MBA, ICWA or C.A. Qualification.

g. During visits to various state utilities it has been observed that staff strength is very much on larger side and also average age of employee is above 50 years. It was also observed a large force of employees have no basic qualification and may not fit in new working environment. There is need that such states examine whether some of these employees can be made use of in some other state departments. Scheme like voluntary retirement need be examined as was done in Delhi after privatization. Scheme adopted in Maharashtra, where retiree employee's relation was allowed preference for new employment, need be examined.

h. In most of the states the service condition provides for pension related benefits. These states are facing difficulties in meeting these liabilities. In order to reduce the financial burden of utilities, it is suggested that distribution utilities need changes in service conditions of new employees on the lines of contributory pension scheme adopted in Central PSU's.

i. There is need to have transparent and all India based selection of Chief Executive of the Utility. Following selection committee is recommended for the selection :-

- Chief Secretary of the state –Chairman
- Chairman CEA/Member CEA
- Director of an IIT for technical posts/ Director IIM for financial and account post/ P&A posts
- One representative from Public Enterprises Selection Board, GOI

For the Board Members of the Utility, instead of the Chief Secretary, Principal Secretary Energy may chair the Selection Committee with CEO as one of the members. The other members shall remain the same.

j. Utility should have a full time CEO competent to take and implement all executive decisions. Further, the CEO of the utility, under no circumstances should be the Chief Secretary of the State

k. Term for posting be for a period of five years. Govt. officials who are interested / selected in joining the utility have to agree to serve full term of five year service, so that persons selected can be made responsible and answerable for the results. Termination or removal from the service of such executive(s) shall also need to be cleared by the above committee.

l. There is a need for at least 2 non executive independent directors from amongst the persons who have served in the power sector at Central level or in any other states.

m. There is need that utility is prepared to have at least 26% public share holding in 5 year period.

2.4 Other Recommendations

2.4.1 Anti Theft Measures

a. It is necessary that continuous measures are taken by the Utility to keep T&D loss level to a minimum level. Sometimes certain consumers adopt novel means for dishonest abstraction of electricity. It is necessary that functional working is coordinated not only at Board level but at zonal as well as circle level. For this purpose utility be made functionally strong at zone and circle level and finance, personal and administration personnel and police staff deputed for ensuring anti theft measures report to circle and zonal chief as well.

b. Group incentive scheme need be declared so that staff working at different level work in close coordination among themselves.

c. Police staff/home guards deputed should have full police power as they had in active police service so that they can take effective action in lodging theft FIR etc. State Government needs special notification to ensure above delegation of power. It is necessary that special police thanas are established at district level where FIR against

theft of electricity can be lodged exclusively and such thanas are under administrative control of Police officials posted in the Utility. It is also seen that special courts are not established in numbers of states, resulting cases lodged for theft of cases takes long time and proper message is not gone in public that any dishonest consumer of electricity shall not go unpunished. It is necessary that local staff is made responsible for any theft of electricity in their areas and that they keep proper check on the same regularly. Side by side Utility wise squad be organized and deputed after scrutiny of consumer data. However, a message should go to local staff that detection of large theft by centre team shall bring negative marking while deciding on their incentive as well as promotion etc. There is a need that legal staff is also posted at district level who can pursue cases against theft in courts without much involvement of technical staff. Such staff can be outsourced but need be paid based on increase in revenue collection by adopting antitheft drives.

2.4.2 Disbursal of Subsidy

a. It is recommended that Distribution utility do the billing based on actual meter reading and cost of supply as fixed by state regulator for all consumers including agriculture. The state government needs to make arrangement for disbursing subsidy to these consumers directly, instead of paying to utility (which is most cases paid partially or not paid at all). Subsidy should be based on land holding rather than per pump set.

b. Domestic consumers with consumption less than 300 units per month should be covered under the cross-subsidization.

2.4.3 Power Purchase

It is observed that many utilities have large components of short term power purchase. Since this is an expensive niche and power procurement constituting about 80-85% of the cost reflected in ARR, efforts should be made that the utilities plan for next 5 years or more, for procuring power by bidding process under case 1 or case 2 routes. It has also become obligatory for all utilities now to do so as per CERC notification as well as National Tariff Policy.

There is a also a need to organize a special planning cell in the utility so as to look after day to day scheduling of power requirement and to do short term purchase or sale of power on basis of day to day fluctuations of load in most economical manner.

2.4.4 Open Access

With the completion of R-APDRP Projects in states including a Utility level LD&C centre, it will be possible to facilitate open access upto 11 KV feeder and 100 Kw load. It is necessary that recommendation of FOR be implemented by states in order to promote open access as provided in Act so as to bring competition and efficiency in Electricity Market.

However, SERC should decide proper TOD tariff for open access consumers or decide additional surcharge by SERC suitably keeping in view the obligation of state utility to supply power so as to cover up the fixed cost of such power.

Intention should be to make available additional power to state system to meet power shortage at most economical cost.

3. DETAILED REPORT

As per Constitution of India, Electricity is a concurrent subject, wherein Government of India (GOI) has mandate for doing long term planning, taking long term policy decisions and enacting Acts concerning electricity supply in consultation with states, while states are responsible for supply, transmission and distribution within a state. The first Electricity Act regarding the electricity supply and business was enacted by GOI in 1910, popularly known as ''The Indian Electricity Act 1910''. It deals with the supply and use of electricity energy and rights and obligations of persons licensed to supply electricity. Later on after independence, The Electricity (Supply) Act 1948 was enacted by GOI dealing with the statuary power and functions of the Central Electricity Authority (CEA), State Electricity Boards (SEBs) and Generating Companies, providing for rationalization of the production and supply of electricity and for taking measures conducive to electrical development. Main responsibility of policy decisions and long term planning was with GOI which was to be taken in consultation with CEA while its implementation especially regarding distribution and supply of power to ultimate consumers was left entirely with SEBs, under control of state governments. Time to time amendments in these acts had been carried out to meet needs of the time.

The Electricity Act 2003 was enacted in 2003, in order to consolidate all amendments in Electricity laws as well as to bring in measures conducive to development of electricity industry promoting competition there in, protecting interest of consumers and supply of electricity to all areas, rationalization of electricity tariff, ensuring transparent policies. Constitution of Central and State Electricity Regulatory Commissions and establishment of Appellate Tribunal and for matters connected therewith and incidental thereto.

In late sixties India faced heavy shortage of food grains with increasing large population growth, bringing country on brink of famine condition and large dependence on food grain import. It was at this stage that GOI decided to increase agriculture production by bringing in more land area under agriculture production thru irrigation canals system as well as by allowing installation of large number of irrigation tube wells. This resulted in internal food sufficiency in the country, popularly known as First Green Revolution. However, this has also resulted in SEBs going in for rural electrification in big way by laying transmission as well as distribution lines to electrify Irrigation Tube wells. Not much care perhaps had been taken regarding increased technical losses as well as commercial issues such as tariff to be charged as well as other associated issues like metering, billing and revenue collection etc.

For gaining popularity among farmers, states started announcing cheap electricity to agriculture pump sets and some time announcing free electricity to these consumers. Slowly, SEBs started suffering financial losses. This resulted in under investment in strengthening transmission and distribution network in the country, thereby resulting in increase in technical as well as commercial losses and also in poor quality of power and frequent supply breakdown. Electricity blackout and brownout had become very common.

This had resulted in non- payment of dues to central generation and transmission companies by states/ SEBs. Not much new investment was possible in transmission and distribution

system until and unless health of distribution companies is improved. International Development Agencies like World Bank, ADB as well as private investors were reluctant in investing money in power sector, which is the backbone and most important of all the infrastructure needed for fast economic development in the country. Therefore, GOI in early 2000, based on recommendation of Ahluwalia Committee Report, came out with Reform Plan to bail out the states and SEBs financially and at the same time pleading SEBs for improving their performance. This has resulted in signing MOUs by states with MOP GOI for carrying out time bound Reforms in their working as well as allowing them to raise bonds for making payment of arrears to Central Utilities including Indian Railways.

Two major projects at present under implementation with GOI support are:

a. Restructured Accelerated Power Development Program (R-APDRP) with Power Finance Corporation as nodal agency.

b. Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY) with Rural Electric Corporation as nodal Agency

3.1 Evolution of R-APDRP

Power Distribution Sector has always been identified as a significant link in chain of power generation & supply as financial viability of entire power sector depends on financial viability of this sector as it is solely responsible for collecting energy charges from consumers. However, high commercial & technical losses in this sector have always placed enormous financial burden on state and central governments.

Aiming financial turnaround in the sector, MOP, GOI launched Accelerated Power Development Program (APDP) in 2000-2001 wherein additional central plan assistance was made available to states undertaking distribution reforms in a time bound manner by signing MOU with MOP. The funds were for 63 distribution circles identified as Centers of Excellence by adopting various interventions.

In March 2002, APDP was rechristened as APDRP with urban focus & introduction of reforms element. Incentive scheme was introduced for utilities achieving cash loss reduction. The AT&C losses during this program were reduced from 38.86% in 2001-02 to 29.24% in 2007-08. During 2009-10 the loss reduction has been below 1%. Therefore, the absolute level of losses were still at a higher level and needed further efforts for achieving lower loss levels. Also reliable & verifiable baseline data for revenue & energy were required for verifying exact AT&C losses in an area and further detection of commercial and technical loss pockets.

In order to achieve the above objective, the need for adoption of integrated IT system by utilities was recognized and hence, MOP, GOI launched restructured APDRP (R-APDRP) in July 2008 as a central sector scheme for XI Plan

FEATURES OF R-APDRP

Power Distribution Sector:

- Financial viability of entire power sector depends on financial viability of distribution sector as it is solely responsible for collecting energy charges from consumers

- Burgeoning commercial & technical losses in this sector have always placed enormous financial burden on state and central governments

IN THE BEGINNING as APDP in 2000-2001:

- Aiming financial turnaround in the sector, MOP, GOI launched Accelerated Power Development & Reforms Program (APDP) in 2000-2001 wherein additional central plan assistance was made available to states undertaking distribution reforms in a time bound manner by signing MOU with MOP
- Scheme was for 63 distribution circles identified as Centers of Excellence

MODIFIED AS APDRP FROM 2002:

- In March 2002, APDP was rechristened as APDRP with urban focus & introduction of reforms element. Incentive scheme was introduced to incentivize utilities achieving cash loss reduction.
- The program continued in tenth plan and was officially closed on 31-03-09
- Although AT&C losses reduced from 38.86% in 2001-02 to 29.24% in 2007-08, reduction to desired 15% targeted level was not achieved.
- The loss reduction too was not on sustainable basis.
- Reliable & verifiable baseline data for revenue & energy was not available.

R-APDRP SINCE 2008:

Since reliable & verifiable baseline data of revenue and energy was not possible without adoption of integrated IT system by utilities, MOP, GOI launched restructured APDRP (R-APDRP) in July 2008 as a central sector scheme for XI Plan.

The project provides for an IT Consultant to help Utility to modify the standard specifications to certain extent to suit Utility specific requirement as well as help it to implement the project. It provides for an Implementing Service Provider selected thru bidding process from eligible experienced IT Companies to implement the project both providing hardware as well as software. As scope may require more than one special expert company Implementation Agency shall be responsible to coordinate and integrate all activities and shall be single point Responsibility Centre to finally delivering the goods as per scope. The scope also provides for hand holding by Implementing Agency after commissioning of the project for 5 years, by which time it is expected that Distribution Agency shall be in position to self manage the total management.

Project also provides for appointment of third party Independent evaluation agency (TPIEA) by PFC to independently assess the work completed and results derived by Utility in system improvement enabling it to claim grant and other incentives from GOI. The Project also provides for suitable training of Utility employees which is very necessary for successful implementation as well as later on to utilize the systems built under the project.

The scheme comprises of two parts-Part-A, Part-B & Part-C:

R-APDRP (Part-A):

- Part-A of the scheme being dedicated to establishment of IT enabled system for achieving reliable & verifiable baseline data system.
- Installation of SCADA/DMS for towns with population greater than 4 lakhs & annual input energy greater than 350MU is also envisaged under Part-A.
- All towns with population greater than 30,000 as per 2001 census eligible (10,000 for Special Category States).
- 100% loan is provided under R-APDRP for Part-A projects & shall be converted to grant on completion of same.
- MOP GOI has earmarked Rs.10000 Cr for R-APDRP Part-A.

R-APDRP (Part-B):

- Part-B deals with regular Sub Transmission &Distribution system strengthening & up gradation projects
- The focus for Part-B shall be loss reduction on sustainable basis
- 25% loan (90% for special category states) is provided under Part-B projects and up to 50% of scheme cost (90% for special category states) is convertible to grant depending on extent of maintaining AT&C loss level at 15% level for five years.
- These five years shall start one year after year in which Baseline Data Acquisition System (Part-A) of project area has been completed & verified by independent evaluating agencies
- Up to 10% scheme cost for Part-B can be converted to grant each financial year for normal category states and up to 18% of scheme cost can be converted to grant each financial year for special category states on attaining 15% AT&C loss level for that financial year
- MOP GOI has earmarked Rs.40000 Cr as loan for R-APDRP Part-B

R-APDRP (Part-C):

- R-APDRP Part-C has provision of Capacity Building of Utility personnel and development of franchisees.
- Pilot projects adopting innovations are also envisaged under Part-C
- MOP GOI has earmarked Rs. 1,177 Cr under Part-C
- Of above, Rs.850 Cr as services rendered by Nodal Agency,

Third Party Independent Evaluating Agencies, Advisors and Project Management Consultants:

- Rs. 200 Cr earmarked for Capacity Building and Franchisee Development
- Rs.50 Cr earmarked for Pilots Projects
- Rs.77 Cr earmarked for miscellaneous activities like best practices workshops etc.

R-APDRP (Incentive Scheme)

Scheme envisages incentive scheme for utility employees in towns where AT&C losses have been bought below 15%.

- 2% of annual grant converted for Part-B for a particular town where AT&C losses have been brought below 15% shall be allocated by MOP for this purpose. Utility too shall match the funds and disburse to such employees.
- Model Incentive Scheme shall be formulated by MOP on basis of which each utility to submit such incentive scheme for approval from steering committee prior to disbursements under Part-B.

MOP GOI has earmarked Rs. 400 Cr for said scheme.

R-APDRP (Eligibility Criterion for states)

- Constitute SERC
- Achieve AT&C loss reductions at utility level every year starting one year after first project under Part-A is completed. The targets are 3% reduction per year for utilities having AT&C loss levels above 30% and 1.5% reduction per year for utilities having AT&C loss levels below 30%.
- Devise suitable incentive scheme for staff linking to achievements of AT&C loss reduction in project area.
- Submit previous year's AT&C loss figures of project areas as verified by independent evaluation agencies every year by 30th June every year.
- Commit time frame for introduction of measures for better accountability at all levels.

Third Party Independent Evaluating Agencies-IT (TPIEA-IT)

- To be appointed by Nodal Agency
- Shall verify completion of Part-A Projects by Utilities
- Successful Completion by Utilities shall enable conversion of entire loan for Part-A projects to Grant.

Third Party Independent Evaluating Agencies-Energy Audit (TPIEA-EA)

- To be appointed by Nodal Agency i.e. PFC
- To certify initial AT&C losses in project areas as per methodology
- Annual Verification of AT&C loss levels in project areas using baseline data acquisition system installed.
- Annual Verification of AT&C loss levels of Utility
- Submitting Quarterly Reports on AT&C loss levels in project areas to Nodal Agency

KEY MILESTONES ACHIEVED AS ON 31.3.2011 under RAPDRP is given as per annexure

The main technical feature of RAPDRP Project formulated for states by PFC have been worked after large deliberation with states by Ministry of Power and also on recommendation made by Task Force for restructuring of Accelerated Development and Reforms Program (R- APDRP) under Sri P Abraham 2006 and updation of IT Task Force 2002 r-ecommendation by its chairman, Sri Nandan Nilekeni in 2008.

Salient Technical Features of The System Review Specification (SRS) are as follows

Part A Required for setting up an IT backbone for collection of baseline data, Energy Accounting/Auditing and establishment of Customer Care Centers

1) Module - Meter data acquisition
2) Module - Energy Audit
3) Module - New Connection
4) Module - Disconnection and dismantling
5) Module - GIS based Consumer Indexing and asset mapping
6) Module - GIS based integrated network analysis module
7) Module - Centralized Customer Care services
8) Module - Management Information System (MIS)
9) Module - Web Self Service
10) Module Identity and access Management System
11) Module -System Security Requirement

PART B – Requirement based implementation of commercial Processes like metering, billing and collection for utilities, who have not implemented such IT enabled system so far consisting of:

1) Development of commercial based database of consumers
2) Module - Metering
3) Module - Billing
4) Module - Collection

PART C Other Optional Application Packages

1) Module - Asset Management
2) Module - Maintenance Management

Discussions

It can be seen that implementation of above Project shall result in complete Change in Management of Distribution Business of the Utility, making available all required information to Utility as well as consumer on line, facilitating better and quality service as well as utility performance. This action by GOI is most commendable initiative. However, it is felt by Panel that Utility need to own the project

and should not consider it as GOI or PFC initiative and need be totally involved in successful implementation of the project. The project also need be driven by Utility Management. IT Consultant and IT Implementing Agency need not be looked as mere contractor but as associates in driving Change Management in the Utility. The present progress on RAPDRP is enclosed at annexure.

It was informed by PFC that in most of the utilities that metering for all 11 Kv feeders has been accomplished. The ring fencing of targeted towns is also progressing satisfactorily in most of the states. However, metering on DTs is not keeping pace with desired target. It was also felt during discussions that most time consuming module in implementation of R-APDRP Project is of building GIS based consumer database and is lagging behind. The other area in which there is delay is DT metering . Metering to be done on LT side of DT is cumbersome and temper prone. Some states have suggested metering done on 11 kV side of DT the same need consideration. The above module shall be foundation for getting Feeder or DT base consumer data, essential for energy accounting and auditing. Energy accounting is most important indicator for pinpointing the location having theft or high loss of energy and to enable utility to take immediate measures. It is agreed that GIS base consumer data is essential but energy audit need not wait for completion of above module or completion of DT metering. It was informed that in most of the Utilities the present consumer indexing give reasonable feeder wise data about consumers and the same need be used for controlling theft and losses. Energy accounting and audit needs not wait for R-APDRP Project but need be continued or started at least on basis of 11 KV feeder metering and with existing consumer data. A 12 month rolling report be prepared and submitted to Utility Top Management every month.

It has been reported by PFC , that under APDRP program me 1401 towns/ cities towns with population greater than 30,000 as per 2001 census (10,000 for Special Category States) are being targeted . RAPDRP programme is limited to towns having population above 30,000 that means covering this area of about 40% of energy consumed, considering that 12%of energy is supplied thru private utilities, Further if we take an average 20%agriculture consumption countrywide, small towns/villages which consume 28% of energy consumption are left over by the present scheme. It is to inform that rest of the system is not complicated as is the case with town feeders. It is necessary for state to give equal importance to small towns &villages which are not covered in the present scheme of R-APDRP and with very little effort R-APDRP can be expanded to these areas since the system is already being built under R-APDRP. Further, GOI is emphasizing development of small towns and villages to minimize the migration of population to towns .Therefore energy consumption is bound to increase much faster than as envisaged so far. It is recommended that Utilities need not limit their scope to above towns only but should take up the same in rest of the area as well.

3.2 RURAL ELECTRIFICATION PROGRAMME: RAJIV GANDHI GRAMEEN VIDHUITKARAN YOJNA

GOI felt that the electricity infrastructure improvement not only limits to large utilities or towns covered under RAPDRP also to be executed to rural areas. For this purpose input meters are also being provided on11K.V feeders also . This is needed also for the reason that more than 7 crore new consumers are expected to be added under Rajiv Gandhi Grameen Vidyutikaran Yojna all over the country as discussed later on Rural Electrification Programme.

India used to be predominately an agriculture based society. Even today more than 60% of the population lives in villages and depends on agriculture. India in late sixties and early seventies took major efforts to take electricity to rural India but main aim was to install agriculture irrigation pump sets to increase irrigation areas and increase agriculture production. Today we can proudly say that despite of its very large population, the country is self sufficient in food production not only for feeding its masses but also exporting the same sometime. By year 2000, we had more than 12.5 millions pump sets working mostly in rural belt. However, not much emphasis was given to electric supply to households in rural areas with the result not more than 44% house hold in rural India enjoyed benefit of electricity.

As per first National Electricity Policy formulated in 2005 as required by Electricity Act 2003 Clause 3, the following are aims and objectives:

i) Access to Electricity –available for all households in next five years

ii) Availability of power- Demand to be fully met by 2012. Energy and peaking shortages to be overcome and adequate spinning reserve to be available

iii) Supply of reliable and quality power of specified standards in an efficient manner and at reasonable rate

iv) Per capita availability of electricity to be increased to over 1000 units by year 2012

v) Minimum consumption of one unit/household as a merit good by the year 2012

vi) Financial Turn around and commercial viability of Electricity sector

vii) Protection of consumer's interest

Also above policy laid out the plan for Rural Electrification and aimed for creating following:-

a. Rural Electrification Distribution Backbone (REDB) with at least one 33/11 KV or 66/11 KV substation in every block and more if required as per load, networked and connected appropriately to the state transmission system.

b. Emanating from REDB would be supply feeders and one distribution transformer at least in every village settlement.

c. Household electrification from distribution transformer to connect every household on demand.

d. Where above is not feasible (it is neither cost effective nor optimal solution to provide grid connectivity) decentralized distribution generation facilities together with local distribution network would be provided so that every household gets access to Electricity. This would be done either through conventional or non conventional methods of electricity generation whichever is more suitable and economical. Non conventional sources of energy could be utilized even when grid connectivity exists provided it is found cost effective.

e. Development of infrastructure would also cater for requirement of agriculture and other economic activities including pump sets. Small and medium industries, khadi and village industries, cold chain and social services like health and education.

The policy also talks about special emphasis on electrification of dalit basties, tribal areas and other weaker sections. It emphasizes also on recovery of cost of supply by distribution licensee but support to lifeline to household below poverty line who would be adequately subsidized. Subsidies should be properly targeted at the intended beneficiaries in most efficient manner.

Under RGGVY following infrastructure is to be developed:

- Rural Electricity Distribution Backbone (REDB) with 33/11 KV (or 66/11 KV) sub-station of adequate capacity in blocks where these do not exist.
- Village Electrification Infrastructure (VEI) with provision of distribution transformer of appropriate capacity in villages/habitations.
- Decentralized Distributed Generation (DDG) Systems based on conventional & non conventional energy sources where grid supply is not feasible or cost-effective

The scheme provides 90% grant from central government on capital expenditure for which a provision was kept for Rs 5000 Cr in X plan &Rs 28000 Cr in XI plan for capital expenditure by GOI. Rural Electrification Corporation was made the nodal agency for implementation. Provision was also made for proper training of employees as well franchisee to be employed by distribution licensee for management of electrified villages under the scheme. Ministry of Power also made services of central public sector undertakings, like NTPC, NHPC, DVC and POWERGRID, available for implementation of the projects approved by REC/MOP. CPSUs were supposed to hand over the completed projects to state distribution utilities after its completion. For better quality control independent agencies were appointed by REC for checking quality of plant and equipment of the projects such completed. The fixation of Meter Board within premises of BPL consumers as per norms of Kutir Jyoti Programme was kept in the scope of projects for which 100% subsidy has been provided.

It will be interesting to know that definition of electrification of a village has gone changed. Prior to Oct 97, while a village was considered as electrified earlier if electricity is being used within its revenue area for any purpose what so ever. With this, if a Tube well is energized in revenue area of a village, it was qualified as electrified. As per definition after 2004-05, a village would be declared as electrified if

i) Basic structure such as distribution transformer and distribution lines are provided in the inhabited locality as well as the Dalit Basti / hamlet where it exists

ii) Electricity is provided to public places such as schools, panchayat offices, health centers, dispensaries, community centers etc and

iii) The number of households electrified should be at least 10% of the total number of household in the village

In February 2008, the RGGVY was extended for the XI Plan with an estimated investment of Rs 28000 Cr to cover up all the villages numbering 1.15 lakhs and covering approximately 2.34 Cr BPL households. Subsidy up to 90% as provided earlier was continued.

As it stands till 15th March 2011, achievement so far on the scheme is as follows:-

Electrification achievements:

Villages	**Numbers**	**Total RHH**	**BPL**
Un Electrified	96815		
Electrified	191444		
Total	288259	17532533	16060656

Franchisee system in the states

States	Villages
16	110790

Funds released by REC

Cost of the projects sanctioned Rs 26349.03 Cr

Awarded/Revised cost of the projects approved Rs 32333.59 Cr

Funds released by REC to the states

Loan	subsidy	Total
Rs 2454.66 Crs	Rs 22883.39 Crs.	Rs. 25338 Cr

It was also provided that a minimum supply of 6-8 hrs of electricity in the RGGVY network shall be ensured with an assurance to meeting any deficit in this context by supplying electricity at subsidized tariff as required under Electricity Act 2003. This is reducing minimum power supply hours which was provided under orders issued earlier 2005, which mention of

“” states must make adequate arrangements for power supply and there should not be any discrimination in the hours of supply between rural and urban consumer””

Discussions on the issue

During discussions on the subject with the states, it was informed that they are not properly monitoring supply hours to rural consumers specifically to new rural consumers added up during RGGVY schemes as well as satisfaction level services provided by the Utilities. During discussions with Rural Electrification Corporation it was found that they are also not insisting with states for keeping such records. It is strongly felt that in case the electricity is not provided for sufficient hours specially during evening hours, there are chances that consumer become dissatisfied and may resort to non payment of electricity dues which in long run may result in consumers opting for disconnection or resorting to theft. In past it has been found that villages declared electrified are

found to be un-electrified and even infrastructure built earlier had been stolen. Such villages are being taken up for electrification again under RGGVY scheme in name of re-electrification of villages. It is observed that in some States, the BPL families are not able to pay their electricity bills leading to dis-connection. As such 50 Units per month per BPL family for a period of 2 years may be included in the cost of RGGVY scheme.

It is strongly felt that in order to supply sufficient hours of power supply to village area, 11 KV village feeders need be separated, one for village non agriculture consumers and other for supply to Irrigation pump sets. It is strongly felt that Irrigation pumps do not need power for more than 8hrs supply and time for supply can be regulated say in three batches supplying power for maximum 8 hrs supply each. This will help in saving in wastage of water which in my opinion is as much important as saving in Electricity as water table in majority of the states has gone down, with the result farmers are resorting to bore deeper tube wells resulting in higher horse power capacity pump sets. It is strongly felt that separation of feeders is must so as to properly manage the power supply to rural areas. Separation of Irrigation feeder can be remotely controlled at 33/11 KV substation along with proper metering system, which help us in determining realistic consumption of irrigation pump sets on a particular feeder and help us in carrying more reliable energy audit of distribution system & determining subsidy at State Government level. As regards meter reading of pump sets is concerned, the same can be done from time to time so as to see that at least meters are working. Discussions with some telecom companies including Tata Telecom were also held who had done pilot projects in Gujarat to enable a farmer to remotely switch on and off after getting indication of position of availability of power at the pump house by installation of a modem along with meter with a provision of starter also part of the metering panel. This ensures proper starting of the pump set as well as control on running of the pump or otherwise it has been seen that farmer normally leaves the pump set in on position as he is not aware as when power will be available and pump runs sometime even when water is not needed in the field thus wasting water as well as Electricity on getting power. This result in starting of all such pumps, thus drawing very large current and which sometime trips the entire feeder on overload. The telecom modem can also be used for remote meter reading. This was informed that fixing of modem shall cost extra of about Rs 2000 and recurring expenditure of Rs 20 per month. This does not include cost of three phase meter which even today Distribution Company is supposed to install. By fixing up above smart panel not only gives information on energy consumption but also of running hours of pump sets. It also helps us in minimizing running of pumps. It is desired that GOI should take up with State Government on issue of conserving water which perhaps today has become very important on account of scarcity of ground water. State governments can also make arrangement for electricity as well as water used thru smart metering system or directly thru UID schemes.

From above, it is clear that separation of feeders for agriculture purpose and for use in village for other uses is a must. There is no provision of any GOI incentive scheme for separation of feeders. The importance of separation of feeders has been recognized by all state Governments and utilities. Some states like Gujarat, Maharashtra, AP, Punjab etc are taking up above scheme on priority but during discussions they have desired that funding of above scheme by GOI at nominal interest be provided. It is felt that improvement in power supply to villages is a must in case we want

development and prosperity of the country rural area. This will improve life & there by satisfaction level of rural consumer. Even in villages small and medium industries, khadi and village industries, cold chain and social services like health and education can be developed there by checking the population flow from villages to cities.

During discussions Gujarat had conveyed that by separation of feeders and ensuring 24x7 hrs supply to villages they have found that satisfaction of rural consumers has increased and they are ready to pay for electricity charges regularly. It has also been reported that migration of population from villages to big cities has slowed. As such the Committee feels that the Government of India may provide incentive/ interest subsidy / grant for meeting the cost of feeder separation schemes.

Of course village development has to be seen bringing other infrastructure such as easy accessibility by road. Communication, hospitals, schools and water supply are also needed but need not say that regular power is basic and very important to start with. RGGVY scheme envisages more than 7 Cr consumers ultimately to be added up. We should not leave these consumers for second stage reform and should include improvement in power supply, metering, billing and realization of electricity charges as well, as proper customer services in rural area also along with towns being taken up under present R- APDRP scheme. Needless to say that Energy audit of rural consumers is much easier as compared to in towns and cities as chances of change of feeder supplying power is very remote in villages.

Gujarat has also provided for SDT (Special design transformers) even on agriculture feeders so that even house hold consumers living on their farms which are connected on these feeders can also get 24x7 hrs single phase power supply for light and fans while restricting three phase supply to agriculture pumps for maximum 8 hrs. During discussions Maharashtra, AP, Karnataka and Punjab has also informed about adopting similar system.

Of course in case of state like West Bengal, Orissa and North East States, where Agriculture consumption is very low there is a possibility not to go for separation of rural feeder, however it is recommended that no discrimination be made in power supply in rural non agriculture and urban consumers. It is also desired to examine means to restrict power supply to limited hours to Agriculture pump sets in these states be also resorted to by adopting IT application in order to conserve water as well electricity.

It is also reported by many utilities that under RGGVY they are allowed to build up/ augment capacity of the distribution network taking into account 60 watt load from each BPL family. However, after commissioning of the system, BPL consumer find above load as very low and want to use TV and electricity appliances which minimum goes upto atleast 1000 watts. Some APL consumers living in the area also. like to get electricity connection by which system can get over loaded and therefore denied connection. Such consumers try to illegally tap the system resulting in overloading. During the discussions with REC it was conveyed that in such case, state utility can increase the capacity of the system through their own funds.

It is recommended that basic infrastructure such as transformer capacity need to be built in the village keeping into account of the future growth of next 5 years. Any additional expenditure on above can be given as loan by REC, 50% of which can be converted as grant in case the load level in the system is satisfactorily maintained in the level of 15-20% in the concerned village for next five

years after commissioning or otherwise, the purpose of giving grant / assistance by REC/GOI shall not serve the purpose it is expected to serve.

3.3 METERING SYSTEM

Metering System is most important area in power distribution sector and includes not only meter but also its associated equipment such as PT and CTs. Its accuracy should meet a minimum accuracy level as provided in CEA regulation on Installation and Operation of Meters dated 17th March 2006. It is interesting to note that above regulations provides for installation of only electronic meters for all interface meters, consumer meters as well as Energy Accounting and Audit meters. Thus to great extent issue of installation of electromechanical meters vs. Electronic meters is over as use of electronic meters is recognized better in view of ease of provision, its interactive features and remote meter reading capability. State Power Distribution Utilities have by and large recognized the same and are providing electronic meters on all new registered consumers. It has also been informed by all utilities that they are providing meters on all new consumers as provided in Electricity Act 2003 including agriculture consumers.

However, the following points need to be taken carefully:

- Existing Electro mechanical meters need to be changed to new Electronic meters expeditiously as old electro-mechanical meters have tendency to become slower with time because of friction in bearings as well might have been tempered with. The state Utilities have informed that billing have increased even up to 20-30% by change of meters to electronic type with inbuilt anti temper features. It was reported that all new consumers are supplied with electronic meters. However, it is noticed that progress on replacement of old electro mechanical meters is very slow. There are more than 20 millions such meters which need replacement. There, is a need prepare a plan for changing such old meters There is need to continuously monitor feeder wise & DT losses and in case increase in tempering is detected, utility may even think for mass replacement of meters. However, task of changing all old electro-mechanical meters is enormous as it has been found that even in progressive state namely Maharashtra, the number of such old meters is about 2 million. Total in whole country can be about 20 million. It can make a very large impact on present level of AT&C losses in case replacement of electromechanical meter with Electronic meters is expedited. It is estimated that country will need annually about 10 million meters keeping in view of providing meters for new consumers and replacement of old meters. It was also reported by Utilities that there are not many reputed meter manufacturers in the country. It is desired that CEA may look into manufacturing requirement in the country on long term basis.
- It has been seen that at present, in some states most of the energy billing is outsourced for bill preparations and distribution and that energy consumption data is allowed to be stored in service provider Server. This need be avoided as manipulation of consumer energy data is possible and utility is left completely at mercy of service provider. It is recommended above practice need be completely

avoided and meter readings need be down loaded in server owned by Utility, till software which is being prepared under RAPDRP is completed. It was noticed that monthly data of energy consumption of utility is prepared mostly thru service provider covering most of the consumers; however a few bills are still being prepared manually. These bills are relating to Agriculture pump sets and street lighting and traffic signaling etc. which are even now not provided with meters. Street lights and traffic signaling need be provided with meters immediately. It is also recommended that computation of the energy consumption be also computerized for which a very simple programme is needed. In short all energy accounting need computerization to avoid manual manipulation.

- It is also desired that meters need to be brought at the front of the premises of the consumer or even meters can be provided on nearby electric pole and consumer may be provided with meter repeat display for his information. Utilities during discussions have recognized the importance of above action in order to facilitate meter reading without disturbing consumer to the extent possible as well as tempering of the meter by dishonest consumers.
- Meter reading need be taken by Automatic Hand held Meter Reading Instrument and the readings need be downloaded direct in the Utility server without any manual interference and manipulation. For this purpose it is necessary to have an open protocol for all types of meter reading instruments and these should not be manufacturer-specific. It is therefore necessary that CEA should finalise specifications for a common protocol for all types and makes of meter reading instruments.
- TOD meters need be encouraged even for light and fan load in order to encourage a culture of load management by consumer. With introduction of smart grid consumer shall be playing a very important role by participation in grid management
- It is noted that earlier there was a failure on part of the utilities in taking meter readings especially in rural areas. As now it has been reported that meters are being provided in all new consumers including agriculture pump set, it need be monitored whether meter readings is being taken regularly. Otherwise very purpose of providing meters will be defeated in case meter readings are not taken regularly. It is suggested that in case a Utility is not in position of taking meter reading by its own staff the same may be done thru outsourcing but arrangement need be put in place that regular audit of the same is done departmentally or thru an independent third party.
- With R-APDRP program under implementation and integration of IT in system and process, it is worth increasing the use of Prepaid Meters, which eliminate efforts needed in taking metering and collection of revenue collection. However, it needs a proper network to be established for availability of prepaid meter cards as well as an inter communication to Utility Server, as the new card is inserted in consumer meter

panel continuous remote sensing of consumption as well so that a close watch is kept on consumer in case he is not getting his meter recharged within a reasonable time. Suitable rebate in tariff need to be given to these consumers. Prepaid meters can also be provided for agriculture pump sets as meter reading is very time consuming and therefore costly. However intelligence needs to be built up in meter for communication with CPU etc & easy availability of prepaid cards or their charging.

- With initiative being taken under R- APDRP scheme. System is already being taken to build up a program to carry out GIS based consumer indexing down right up to DT level so that energy audit is done regularly and action is initiated to bring down leakages in energy supply.
- It has been reported by many utilities that GIS based indexing system is time consuming as information need to be asked from individual consumer which takes time. It was also reported that there are limited number of service providers who are having experience in GIS mapping. However it is suggested that we need not wait for indexing to be completed on GIS mapping up to DT level as during discussions with utilities it has been found that even with present indexing system they are in position to carry out energy audit up to 11 KV feeders except for in towns when feeders are interchanged in case of a fault in particular feeder
- It is also desired that accuracy of meters is carried out at manufacturing works if required thru an independent inspection agency and meter be sealed at manufacturing works. As far as possible testing/ calibration of meters in the departmental laboratories should be dispensed with, to obviate any malpractices. It is desired that this department now be used as depository of meters received from manufacturers and issued to various consumers and also for tracing a meter history. All above work need be carried now electronically for which system shall be worked out under R- APDRP. Meter labs may be used only for random accuracy checking of meter before installation. For allocation of meter to a consumer the same should need be selected thru computerized system so as manual interference is minimized. It is also recommended that repair of meter be avoided in departmental labs. Meters damaged either disposed or returned to manufacturer work for repair and resealing
- Needless to say that revenue collection system need be properly organized so that consumers are in position to make payment especially in rural areas. There need a tying up with IT centers which are being built up in rural areas by Government of India initiative practically in all villages for revenue collection . Possibility need be checked up of using local Post office as revenue collection centers. Automatic money collection machines which can collect money against electricity bill in cheque or cash are now available. The same need be installed at suitable locations for convenience of the consumers

3.4 System Improvements:-

- It can be said that with GOI making funds available, distribution system has been strengthened to good extent. Also it is a continuous process as load on feeders shall go on increasing with addition of new consumers as well as consumers opting for new house hold electrical gadgets. Utility should take all measures for continuous strengthening and augmenting of infra- structure by:-

  a. Increasing the number of feeders or by reconductoring with higher size conductor.

  b. HVDS distribution need be adopted along with small DTs of 10, 16 and 25 KVA capacities on long feeders in rural areas. It need be adopted also in towns especially for high load and revenue consumers. Single phase HVDS system need be adopted to economize at places where most of the loads are for domestic and small commercial and industrial consumers.

  c. Maintaining higher HT/ LT ratio, as far as possible near to 1:1. High load consumers say above 50 KVA be supplied connection on 11 kV

  d. Capacitors be installed at all voltage level substations to minimize flow of inductive current and thus reduce T&D losses. Switch-able capacitor be introduced at 11/0.4 kV substation as well as consumer premises

  e. Length of a LT feeder should not be more than 300 Meters

  f. Installation of auto re-closers on 11 kV feeders is also recommended to avoid tripping of feeders on transient faults. Installation of Fault passage indicators is found helpful in determining of location of fault which otherwise need time consuming patrolling.

  g. ABC conductor be used in place of necked conductor to avoid direct tapping specially on 400/220 volts lines

- Demand side Management is MOST IMPORTANT and schemes introduced by BEE such as Bachat Lamp Yojana, efficient agriculture pumps etc need be given full encouragement. Utility should take a leadership role for encouraging such schemes. Further, there is need for staff well trained in managing efficiency as well as in auditing for efficient use of the system.

- It is always better to improve power factor at consumer level itself. Most of state regulators have provided incentives as well penalty in tariff of various type of consumers. It is normally an incentive above 90% pf and penalty below 85%.

- It is interesting to know that IT based equipment like computers with UPS etc have very low power factor until and unless they install capacitor in their premises to improve pf. It may also be seen that agriculture pump sets normally used in India are reported with pf as low as 50%. Some of the Utilities are insisting on agriculture consumers to install better and efficient pumps fitted with proper capacitor as well as starters to maintain proper voltage as well to control losses. As in most of the

states agriculture tariff is very low there is not much of initiative to go for better pumps. Recently many NGOs and companies are coming who are ready to work along with distribution Utilities for installation of these pumps and to recover their cost on basis of loss reduction. Bureau of Energy Efficiency is coordinating number of initiatives in this regards. Details are further elaborated in next chapter

- Central Power utilities like NTPC, POWERGRD are using quality assurance not only in purchase new equipment but for carrying out field level quality audits regularly. It has been seen that some distribution Utilities such as Eastern Andhra Distribution Company, NDPL Delhi are also carrying out technical audits of new constructed works as well as works under operation to verify quality measures taken by utility and same is paying in improvement of reliability in supply, reduction in down time as well as maintenance cost. It is recommended that all utilities adopt such technical audits regularly.

3.5 DEMAND SIDE MANAGEMENT (DSM)

In view of demand outstripping the availability of power in the country in short and medium term say in next five year DSM measures need to be taken in order to reduce energy consumption and peak power requirement. This is also be considered important in view of increasing input cost of fuel sources in generation of power thereby increasing cost of power purchase by a distribution Utility which forms about 85% of ARR requirement of the Utility.

It is considered that all measures taken to reduce power consumption be considered under this head including reduction of T&D losses as well as commercial losses properly known today as AT&C losses.

1) Proper metering is first important issue. As discussed earlier Electro mechanical meters are bound to slow down with time and regular replacement as well as there is difficulty in implanting IT based intelligence in these meters. In view of above that CEA has recognized that all new consumers be provided with Electronic meters. Detailed discussion on accurate metering discussed separately. It is emphasized again that priority be given in replacement of all old EM Meters. Privatization in Delhi had shown that in first few years of privatization demand had not increased but billing improved substantially and in 50% AT&C loss, commercial loss was more than 30 to 35% as compared to T&D Tech loss of the order of 15 to 20%. In commercial loss 30% was on account of poor metering and 30% was on account of poor billing, distribution of bills and collection issues i.e. poor Revenue Management and rest on account of direct theft. All these aspect are being taken care by introducing IT based system under R-APDRP including feeder and DT metering and Energy audit.

2) As regards Technical issues are concerned since beginning of APDRP program in early 2000 states are taking action in strengthening the distribution network which was badly suffering earlier on account of funds shortage. Good engineering practices are well known to field engineers. The same has also has been elaborated in details in CEA Document published recently on '' Discussion paper on commercial viability of

Distribution Sector'' as well as in '' Electrical Power distribution'' case studies published by USAID under its DRUM programme

Some of these are as follows:

a. HT/LT ratio should be near to 1:1 as far as possible as the tech losses are directly proportional to square of the current flowing in the conductor. Therefore, losses shall be low 0.13% of the losses at 11Kv as compared to the losses at 400 volts. High voltage also has advantage as possibility of un-authorized tapping of these lines is much less as compared to at lower voltage. It has been observed that even states like Tamilnadu has HT/LT ratio as low as 1:5. There is urgent need to correct the above position

   It is also recommended that High Voltage Distribution system (HVDS) system be introduced in rural long feeders so to reduce T&D loss instead of LT distribution system. It makes direct tapping of lines difficult and also improves voltage profile to consumers. This also improve consumer satisfaction who at present is not satisfied by quality of supply. Life of his electric appliances including agriculture pump sets is enhanced.

b. As and when the load on a feeder increases beyond optimum level, it is better to construct either a new feeder or carry out strengthening with higher size conductor.

   Better if ABC (Aerial Bunch Conductor) is used so that direct tapping is avoided to certain extent

c. Use of amorphous core Transformers be examined. It has advantage of low iron losses. As iron losses are there whether a transformer is partially or fully loaded, it has very high impact on total losses of the transformer. Eastern Distribution Company, AP has reported that it takes hardly two years in recovering the difference in higher cost of amorphous core transformers. It is necessary to inform that above company has reported losses below 10% in spite of very large agriculture consumers.

d. Capacitor should be used at consumer level as well as at substations at various voltage levels. Utilities like NDPL Delhi are using switching capacitors which are switched in and out to desired level depending on necessity and voltage condition. These Switching capacitor panels are IT based intelligence which monitor the load as well Power factor continuously. Above data made available used for knowing loading of the line as well losses etc.

   Of course, it is always better to improve power factor at consumer level itself. Most of state regulators have provided incentives as well penalty in tariff of various type of consumers. It is normally an incentive above 90% pf and penalty below 85%.

   As discussed earlier that IT based equipment like computers with UPS etc have very low power factor until and unless they install capacitor in their premises to improve pf. It may also be seen that agriculture pump sets normally used in India are reported pf as low as 50%. Some of the Utilities are insisting on agriculture

consumers to install better and efficient pumps fitted with proper capacitor as well as starters to maintain proper voltage as well to control losses. As in most of the states agriculture tariff is very low there is not much of initiative to go for better pumps. Recently many NGOs and companies are coming who are ready to work along with distribution Utilities for installation of these pumps and to recover their cost on basis of loss reduction. Bureau of Energy Efficiency is coordinating number of initiatives in this regards. The same is discussed below under Energy Conservation head.

e. Installation of auto re-closers on 11 kV feeders is also recommended to avoid tripping of feeders on transient faults. Installation of Fault passage indicators is found helpful in determining of location of fault which otherwise need time consuming patrolling.

3.6 ENERGY CONSERVATION

It is most important aspect of Demand Side Management. Government of India was one of a few countries who has enacted a separate Act in this regards as early as 2001 properly known as Energy Conservation Act, 2001,setting of Bureau of Energy efficiency & the National Mission for enhanced energy efficiency was carried out.

Energy Conservation Act, 2001 (52 0f 2001) providing the legal, institutional and Regulatory frame work at Central and State level to increase energy efficiency in various sectors of Indian economy The Act empowers GOI and state Governments to take following steps

- Notify energy intensive industries, other establishments and commercial buildings as designated consumers.
- To establish and prescribe energy consumption norms and standards for above consumers.

Direct designated consumers to:-

- Designate or appoint certified energy manager in charge of activities for efficient use of energy and its conservation.
- Get energy audit conducted by an accredited energy auditor in the specified manner and at regular intervals of time
- Furnish information with regard to energy consumed and action taken on the recommendation of the accredited energy auditor to the designated agency.
- Comply with energy consumption norms and standards, and if not so, to prepare and implement schemes for efficient use of energy and its conservation.

Buildings

- Prescribe energy conservation building codes for efficient use of energy and its conservation in commercial buildings.
- State Governments to amend the energy conservation building codes to suit regional and local climatic conditions.

- Direct owners or occupiers of commercial buildings to comply with the provisions of energy conservation building codes.

Appliances

- Direct mandatory display of label on notified equipment and appliances.
- Specify energy consumption standards and norms for notified equipment & appliances.
- Prohibit manufacture, sale, purchase and import of notified equipment and appliances not conforming to standards and norms.

ESTABLISMENT OF BUREAU OF ENERGY (BEE)

Under energy conservation act BEE was established on 1st March 2002 as nodal agency, with a mission to develop appropriate policies and strategies with a thrust on self regulation and market principles. The prime objective is to stimulate reduction of energy intensity in Indian Economy.

Broad functions of BEE are as follows:

- To be advisor to the central and state governments on energy conservation.
- To coordinate policies and programs on efficiency use of energy and its conservation with the involvement of stakeholders
- To plan, manage and implement energy conservation as envisaged in EC Act
- To assume leadership and provide policy framework & direction to national energy efficiency and conservation efforts.
- To demonstrate energy efficiency delivered mechanism, as envisaged in the Act thru Private- Public partnership
- To establish systems and procedures to measure, monitor and verify energy efficiency and conservation efforts and programs.
- To leverage multi-lateral, bi-lateral and private sector support in implementation of programs and projects on energy efficient use of energy and conservation.

Act also envisages the state Governments to notify an agency in consultation with BEE as State Designated Agency (SDA). SDA has regulatory, promotional and enforcement roles under the EC Act. So far, 31 states/UTs have notified SDAs for their states

SCHEMES FOR PROMOTING ENERGY EFFICIENCY DURING 2007-12

A target of reducing consumption by 5%, equivalent to about 10,000 MW of avoided capacity, had been kept by GOI by energy conservation measures. BEE has taken large numbers of initiatives to achieve above targets in following areas:

- House hold lighting,
- Commercial buildings,

- Standards and Labeling of appliances,
- Demand side management in Agriculture/ Municipality
- SMEs and large industries,
- Capacity building in SDAs

Brief summary of these initiatives are as follows:

(A) BACHAT LAMP YOJANA

In India, incandescent bulb(ICL) are normally used on account of their being cheap as compared to CFL lamps which has long life of about 6000 hrs and are more efficient. CFL bulbs consume about one fourth to one fifth of energy as compared to ICL bulbs to provide same level of light. Above scheme on implementation is expected to save 6000 MW of electricity generation translating into a potential saving of Rs 30,000 Cr in new investment. This will also result in saving of 20 million tons of CO2 from power plants considering replacement of about 400 million ICLs with CFLs. On the other hand consumer shall be benefited by paying less for electricity. It is expected that this saving itself means in recovering the high cost within a short period of maximum two years. However, in India it is not mandatory to use only CFLs. Therefore BEE has prepared a project design where three players namely BEE, the investors and Distribution companies come together and supply the households with CFL voluntarily. To bridge the gap of cost differential between market price of CFLs and the price of ICLs, the investor recovers the same by claiming Carbon credit thru clean development Mechanism (CDM). States are reported to have taken keen interest in encouraging the projects under above schemes. There is growing awareness in general public about the advantages in using CFLs. It is to be noted that lighting load is maximum at peak hours and above scheme helps in cutting the peak load and need encouragement by all stakeholders. Price of CFL has been kept for distribution to consumers at Rs 15 against market price of about Rs 100 per lamp and rest thru CDM and fast depreciation allowed by GOI.

(B) ENERGY EFFICIENCY IN DESIGNATED CONSUMERS

The major industries recognized as designated consumers are as follows:

(a) Aluminum (b) Fertilizers (c) Iron and steel (d) Cement (e) Pulp and paper (f) Chlor-Alkali (g) Sugar (h) Textile (I) Chemical (j) Railways (k) Port Trust (l) Transport sector including services (m) Petro chemical, Gas Crackers and Refineries (n) Thermal power plant (o) Common Commercial Buildings having load above 500 KW.

In India it has been observed that we have very lower energy efficiency even in large industries as earlier to 1990s there was no pressure to go for better and efficient plant machineries, but the things have changed and entrepreneurs, in view of competitors from other countries have realized the importance of the same. BEE is doing yeomen service by deliberating with the parties concerned and prescribing energy consumption norms for these industries. It is necessary for these industries to nominate one qualified manager, who

has good knowledge of the subject as well as who is answerable to BEE and all other concerned at central and states.

BEE has also carried out 7 National Certification Examinations across the country and has certified about 5500 Energy Managers out of which about 3500 are Energy Auditors. These examinations are held twice a year in May and November throughout the country. Energy audit is also mandatory for these industries from agencies that are certified as Authorized Auditor. Industries/Companies are required to furnish all data need by BEE or state designated agencies as well as to comply with points raised by Auditors.

(C) SMALL AND MEDIUM ENTERPRISES (SMEs)

These units are not much aware about the importance of energy efficiency measures. After deliberations with all stake holders, worked out plan to stimulate measures to be taken for these clusters. 25 State Designated Agencies developed cluster specific action plan and made manuals available to these units. Bankable DPRs shall be prepared so that funding can be arranged. Already work in 7 clusters is going on. Attempts are being made to involve investors who can provide expertise as well as fund and payment to be made on basis of future saving in energy use. The investor can also get other benefits such as CDM etc.

BEE is also encouraging promotion of ENERGY SERVICE COMPANIES (ESCOs) to help in providing and implementing of various projects. They are also accredited for taking energy audit of designated and other consumers.

(D) Energy Conservation / Agricultural pumps

In India share of ground water irrigation is 70% against 30% through canal system. The ground water use is increasing at alarming pace in view of increasing demand of food grains in the country as well as for the increase in canal irrigation is stagnant for various reasons and also as use of ground water is more convenient for farmers and does not depend on mercy of weather. However this is resulting in extensive exploitation of ground and lowering of water table. This means need of use of higher capacity pumps for lifting water and thereby increases in energy consumption. Lower energy agriculture tariff by most of the States also result in use of low efficiency but cheap pumps being used by farmers. Thus there is a case of misuse of both electricity as well as water.

On Agriculture Demand Side Management studies have been conducted under Water Energy Nexus Activity (WENEXA) project compiled by M/Tetra Tech with USAID assistance. The studies were conducted in association of Bangalore Electricity Supply Company (BESCOM) in Doddabalapur taluk and Solapur District in Maharashtra by MERC.

The studies shows that along with efforts on electricity side such as separation of feeders for agriculture supply of power at 11 KV voltage to every pump to the extent possible, replacement of present low efficiency agriculture pumps by efficient pumps, providing switching capacitors on 11 KV feeders etc. it is necessary to carry out improvement on water side as well. These improvement include by switching over to micro irrigation (sprinkle water system), creating check dams to store rain water, growing right crops keeping in view

of water, tree plantation and horticulture plantation etc. can help in optimize use of water and therefore energy consumption as well.

As ultimately it is affecting financially Distribution Utility as well as State Governments which have to provide for subsidies for lower tariff. It is recommended that distribution utilities can take lead role in whole scheme of agriculture system improvement.

Pilot schemes have shown the following improvements:

S. No.	Measures	Potential savings
1.	Efficient pumps sets	15%-20%
2.	Suction pipes and footvalves	5%-15%
3.	Efficient irrigation methods	15%-25%
	Total saving potential	35%-65%

It has been seen even if state present level of subsidy on use of electricity in agriculture is used as one time investment in replacement of low efficiency pumps by better efficiency pumps the scheme shall be viable. State Government has to insist on compulsory use of more efficient pumps in case farmers are to be provided any future subsidy. It has been seen that utilizing services of Energy supply companies (ESCOS) and NGOs for such projects where ESCOs shall be paid for savings from baseline data in use of energy consumption. NGOs are used for motivation and teaching farmers on various aspects of efficient farming. Pilot scheme in Karnataka have shown that such projects can be financially viable resulting in all round benefits to farmers, distribution utilities, state governments and country as a whole by conserving water as well as power thereby less requirement of additional power generation and thereby saving in CO2 emission etc.

It is also suggested that payment of state subsidy be made directly to farmers. With intelligent metering as well UID scheme launched by GOI, it is possible that a fixed subsidy per pump is paid to the farmer taking into account the measures to be taken under Energy Efficient Agriculture Pump Scheme discussed above.

(E) Under Municipal scheme wastes generated in urban areas are to be used for generation of electricity thru PPP model. The investor recover its investment by sale of GREEN HOUSE GAS (CGS) as well as other initiatives offered by GOI such as accelerated depreciation.

(F) As provided states are required under section of the Act to establish a State Energy Conservation Fund (SECF). BEE has supported above funds by contributing Rs 70 Cr as its contribution to meet administrative costs as well as to take up activities like training etc.

It has been reported that so far following savings had been achieved:

2007-08	2008-09
623 MW	1505MW

One of the aspects, which panel has been asked to examine was impact of geographical and spatial compulsions and determine their operational effect. Such areas in the country are hilly states in Northern and North-Eastern regions of the country as well as the desert area in Rajasthan and Kutch, Gujarat and islands of Andaman and Nicobar. However, there may be some areas in other states such as Sunderbans in West Bengal, Ravines in states of UP and MP and isolated pockets in heart of forests. Through RGGVY, it has been provided for special treatment by providing 90% grant for village electrification and therefore, it is expected that most of the villages will be covered up and get connected to state grid and there shall not much effect on finances of the state utility except there is chances of higher T&D losses as well slightly higher running cost for maintaining the consumer operationally as well as commercially. The impact of the same can be assessed by Utility /Regulator by getting special study carried out for this purpose and additional expenses allowed pass thru as expenses.

However, there shall still be isolated pockets left such as at hill top, desert and forest where still it would be uneconomical to provide connection with state Grid. In such places it shall be better that electricity is provided by Decentralized Distributed Generation (DDG). As per RGGY upto 90% grant is allowed for generation from non conventional energy sources as well as laying of distribution network in such in household pockets. Serving of BPL consumers including laying service line and meter board with CFL lamps is also provided. During discussions with Uttrakhand Renewable Energy Development Agency (UREDA) it was found that it has successfully electrified hilly remote places by SPV technology. UREDA during discussion also informed as how they have encouraged the development of water mills and micro hydro plants in remote hilly areas. So far 710 traditional water mills have been up graded with better efficiency impeller and another 500 water mills are under up gradation and shall be completed shortly. It was also informed that 37 nos. mini and micro hydel plants with composite capacity of 3.635 MW have been commissioned and are being operated by User Energy Committees/ Mandir Samities. More than 250 villages have been electrified so far in remote areas. Other technologies as biogas and biomass and windmills are also used under the above scheme.

It is pertinent to observe that today the wind installed capacity in the country is 14158 MW (March 2011). Most of the wind mills are located in coastal areas of Gujarat, Maharastra, Karnataka, Tamilnadu, AP and Orissa where high speed wind density is available. Some wind mills are also located in hilly areas of Himalayas as well as in Thar desert area of Rajasthan. Total potential in India is about 65000 MW. Therefore, wind energy can be a good source of power for supplying power to non grid connected as well as grid connected locations. Capital cost of Wind energy project approved by CERC was INR 5.15 cr/ MW for the year 2009-10. The Capacity utilization factor is about 20-30%. However the timing of availability of wind energy is uncertain and there is a battery backup for non. grid connected locations. However, wind mills are installed in big cluster in areas where suitable wind is available popularly known as wind farms. Some times wind energy can not be consumed locally and need be grid connected. For example, in South Tamilnadu Region generation of wind energy is of the order of 5000 MW and can not be locally utilized. Even some time this energy need

to be transmitted to other states thru inter-state and inter-regional transmission system. However, as it is difficult to envisage about timing of availability of wind power, power in such area need supply from the grid during the times when wind power is not available. The dynamics of power flow needs proper system study for stability of the grid. Recently, CERC has notified rates (REC) for trading in non conventional as well as solar power, while state regulators are notifying percentage of energy which a distribution utility or captive generator has to meet from these sources. This will encourage installation of solar power as well as wind power plants at more suitable locations. Thus wind power emerge a source of power at competitive rates but need utilsation as and when produced.

Solar power driven agriculture pumps are also a proven reality in India and are available in the range upto 22.5 HP thus meeting capacity requirement at most of the places. These pumps are DC brushless type are available in Indian market . Both submersible and centrifugal pumps are available. As solar energy is available only in day time for more than 8 hrs in most of the location in India for more than 300 days in a year, the pumps can operate without battery backup during day time. Therefore capital investment shall be less. Also as agriculture pumps are located in rural area there shall be less constraints for installation of solar PV panel for these pumps. Thus, solar pumps can become very attractive option for agriculture pumps. As per a recent study carried out by KPMG, solar pumps shall have parity with grid energy by 2017-18 as cost of electricity generation by PV panel is going down. CERC has fixed a rate of Rs. 17.91/ kwh for the year 2009-10, but as per open bids in August 2010 by NTPC Vidyut Vyapar Nigam Limited, the minimum prices offered were INR 10.95- Rs 12.76. According to study the rates are expected to be about INR 5.5-6.0 by 2017-18. As per the study, if encouraged, solar pumps shall be supplying more than 16,000 Mw load by 2021-22

Solar Power is quite competitive for powering Telecom Towers in rural India even today. Most of these towers are most of the time run on diesel DG sets even if connected with Grid as power supply in rural area is very unreliable. As 24x7 hrs reliable operation of telecom equipment in such towers which also need air-conditioned chamber for location of equipment, DG sets are must. Cost of power is therefore more than INR 15. There are about 3.1 lacs telecom towers in the country and same shall be about 5.5 lacs by 2012. The energy consumption of the telecom tower is more than 76% of energy consumption of telecom industry. PV Solar based DC power can be used to power these towers and can be competitive even today. Industry is upbeat for using solar energy in telecom towers especially in rural areas where may not be a big constraint for location of Solar panels. As per study, solar power can replace about 30% of energy consumption of telecom sector (2,286 MW).

Solar water heating (SWH) system has vast potential and becoming very popular as saves electricity energy as would have been required in case solar power is not utilized. As solar heating system is generally composed of solar thermal collectors, a water storage tank and inter connecting pipes is very cost effective and pay back period can be of six month to 12 months depending upon climatic condition. GOI thru Ministry of Renewable Energy is encouraging the scheme and provide subsidy on the same. It is expected that by 2022 about

24 million house holds will utilize SWH. Even if we consider use of 2 kW load per household it will result in a saving of 24000 MW of Electricity Capacity. It is desired that GOI need it compulsory of use of SWH for all i.e. Industrial, commercial as well as large household in urban areas. China for example has already made it mandatory on all new r rebuild buildings in Shengzhen, eastern Nanjing and Shiijiazhuang. China today boast of above system utilized by its 10% households.

Based on the above scenario, the committee feels that solar electricity based distributed generation has a lot of potential for electrifying the remote villages as it is the only energy source which is distributed all across the country and level of irradiance intensity is good for economic use of the solar power generation. Few highlights of the Committee are noted below:

- Technology for Solar PV is matured. Its system integration is fairly easy and a lot of vendors are available now. All equipment is freely available. The life of equipment is 25 years (minimum), though there would be light induced degradation @ 0.5% per year Equipments are suitable for remote application as they need hardly any maintenance. They are silent power generators. Moreover their performance can be remotely monitored by installation of inexpensive SCADA system
- Equipment cost has also come down drastically in recent past. Recent market trend shows that the same can be built at a cost of Rs 1.2 lakh/KW or Rs 1.2 Crore for electrifying a village with installation of 100 KWp solar PV systems.
- Each Solar 100 KWp system can generate approximately 450 units per day.
- Since it is day time power, it would need storage battery for meeting the evening load. The capacity of such battery will be 300 Kwh so that it can be operated with daily cycle mode (one discharge per day) with 60% depth of discharge.
- The cost of battery for the village with 100 KWp Solar PV system shall be Rs 20 lakh. But this would need replacement in every five years. So battery replacement cost will be additional Rs 80 lakh which will have to be counted in initial Capex.
- Total system cost for 100 KWp system with battery initial and replacement cost = Rs 210 lakh.
- Additional distribution inside the village shall be Rs 20 lakh.
- With the above capex of Rs 230 lakh for each village with 100 KWp system and 90% subsidy under RGVVY scheme the cost of electricity shall be Rs 3.55/kwh (Levelized) which is an affordable cost and a scheme where the villagers can get power in day/evening for at least 330 days on a year. The cost of electricity without any 90% grant is at Rs 17.65/kwh (on Levelized basis).
- Each such installation will generate 450 units per day and which can electrify around 200-300 families depending upon their use. This also shall increase their economic activities apart from other intangible benefits are because of distributed generation.

- Under this schemes the subsidy / grant which is to be provided is much lesser than the present subsidy being provided for kerosene which is explained below.
- It is strongly recommended to implement such remote solar projects with battery back-up a means for rural electrification.

Comparison of solar electricity with present kerosene use for lighting by direct burning:

- A Kerosene lamp needs 20 ml of kerosene in 1 hour. Suppose 1 house uses 3 lamps for 7 hours, 1 house shall consume per month : 12.5 ltr of kerosene
- Consider – 1000 villages with 500 houses in a village, it shall consume 75 Million litres per year
- At present

  BPL men pay for above Rs 100 crs @ subsidized rate

  Government pays Rs 126crs appprox. Rs 16.85 per ltr
- One kerosene lamp is equivalent to 1 LED of 2 watts in terms of lumens
- 10000 villages shall need energy thru LED lamps 2 (watt) X 3 (lamps) X 7 (hours/day) X 365 (days/year) X 500 (houses/village) X 1000 (villages) equal to 7.6 MU per year.
- @ Rs 226 crs generates lighting worth 0.76 Cr units of electricity, Its works out a rate of Rs 294 per Kwh; Or about Rs 164 per Kwh for government as subsidy.
- On the other hand, In case of power generation through Micro turbine / DG sets using kerosene , say available @ Rs 27/ltr, It is equivalent to about Rs 17 per Kwh (Around 1.58 kwh/litre). Further through solar its cost of generation is Rs 17.65/kwh.
- For 1000 villages we would need about 4.8 Million Ltrs of ethanol/ kerosene (7.6 MU / 1.58 litre/kwh) As against consumption of 76 Mil Ltr Kerosene every year at present.

Thus, it can be seen that for same lumen, as given by Kerosene lamps, same can be produced by generating electricity thru DG sets from 6% of kerosene, thus large saving in outflow of subsidy as well as import of crude oil. This will also reduce emission of CO2 to that extent the Project as a whole can get benefit of CDM. This shall further reduce with solar based electricity.

Not only for remote places, decentralized Distributed generation thru non conventional method such mini and micro hydel, Wind, SPV, Solar Thermal or bio-fuel or biomass is useful from environment point of view but also help in generation level nearer to consumer in case inter connected with state grid and therefore need much less transmission and distribution system strengthening. It helps in improving voltage profile and thus reduction in losses. Initiative under Jawaharlal Nehru National Solar Mission (JNNSM), it has come out with scheme for roof top and other small Solar power Plants connected to distribution network for 100 MW capacity addition in first phase where incentive is payable to distribution agency for power purchased under the scheme beyond base rate which shall be Rs 5.4 per unit in first fiscal year of commissioning (this also be passed on to consumers in

ARR). Similarly for other non conventional generation of power GOI has announced incentive scheme.

This distributed generation shall definitely make energy measuring and accounting for this and hence it calls for IT based intelligent metering system measuring not only on line energy generated, but also import and export of energy for designated consumers. Therefore evolvement of smart metering as well as Grid need immediate planning. Meters provided now onward should be suitable for such need. Smart grid shall be able to communicate both ways to Grid Load dispatch Center as well as with consumer and also with intelligent apparatus and appliances which can be switched on remotely depending upon availability of power and tariff prevailing at a particular time. In future it shall bring in more challenges to distribution utility but more convenience to consumers by making available more information to him on line.

During deliberation with states such as Rajasthan, Gujarat it was felt that remote hamlets/ pockets in areas as Kutch in Gujarat and Thar desert in Rajasthan and Sunderban in West Bengal need be given benefit upto 90% grant for electrification as given for Northern and North Eastern States .

3.7 Power Distribution Sector: Organization and Human Resources

From above it can be seen that with most of states agreeing to implement R-APDRP project, Power Distribution Sector has decided to introduce Information and Communication Technology in all important functional areas of its Business such as commercial, operation, maintenance, consumer services, Store inventory, procurement, finance, HRD, Project implementation etc. Final integration of all such activities shall be attempted by introducing overall ERP Solution. This shall mean complete change in working of the utilities, as this will bring vast data/ information about business near to the decision makers. This will result in improving overall efficiency in business management as well as transparency in its working. Next step shall be to increase automation and implement smart distribution grid, bringing in two way communication between Distribution Company and ultimate consumer enabling him to make his own choice in deciding to select generator option, time for switching on and off his house appliances etc. This will also enable Utility to improve reliability, efficiency and quality in its service.

However, if we look at human resources available with most of the utilities, their core competence is limited to project execution and operation and maintenance of power. Till some time back, except of use of computerization in consumer bill preparation, there was hardly any use of computerization in their working. Most of the records were being kept manually. Meter readings were taken only manually and then consumption data punched manually, there by leaving a lot of scope for manipulation and harassment of consumers. It is a fact that Power Sector was perhaps one of the last sectors to take advantage of advancement made in Information Technology. To make this changed management possible, a change in work culture shall be needed in the Utility and this will require a lot of changes in Human Resource Management by the utility. In this study discussions are limited to Public sector distribution utilities only. Following are the recommendations:-

- There is need to have in house core team of IT experts in the organization who can along with IT Consultants appointed under R APDRP Project not only can get Project implementation successfully completed but fully take care of IT system during its maintenance phase and also can make its own plan for its future expansion or improvement from time to time. It will be better if the multi functional team of Engineers, finance, HRD etc is kept along with the Core team who will gain experience in the IT use and understand both hardware as well as software aspects of IT in addition to its interaction with their respective functions.
- Under R-APDRP Project there is a provision that IT Consultant as well as IT Implementation agency shall be holding hand with Utility for next five years after commissioning but there is need to build up for utility its own team from the very beginning.
- Engineers as well employees working in Operation and Maintenance, Revenue management, Metering system, Finance, HRD areas need to be trained to work on computers to fulfill functional need. It is necessary that all new recruitment is done keeping in view above need. The present staff needs a properly developed orientation course to become familiar with the new system and get fully conversant on its operation. If required they should be given incentives to get conversant and operational on new system. All future selection, promotion as well as even increment in pay be made subject to employee passing necessary test in this regard.
- It is necessary that organization structure need be got examined as well as Human resources required to handle the requirement of new system keeping in view of R-APDRP Project and future vision as well as attend to consumer's facilities/ services and new developments in arising out of market competition.
- The new structure need to be lean with less tiers needed in making decision in view of multiple layers of information available on line .
- The corporate structure also needs to be reviewed for future requirement of International Financial Reporting system.
- This will require induction of a few Independent Directors on Board. Full time Directors also need be selected keeping in view of functional requirement thru an Independent selection process and consideration with main criteria should only be merit. If required, competent person be selected from private sector as has been done by West Bengal recently. There should not be any political interference in the selection.
- There is need to have transparent and all India base selection of Chief Executive of the Utility. Following selection committee is recommended for the selection :-
- Chief Secretary of the state –Chairman
- Chairman CEA/Member CEA

- Director of an IIT for technical posts/ Director IIM for financial and account post/ P&A posts
- One representative from Public Enterprises Selection Board, GOI

For selection of the Board Members of the Utility, instead of the Chief Secretary, Principal Secretary Energy should chair the Selection Committee with CEO as one of the members. The other members shall remain the same.

- Utility should have a full time CEO, competent to take and implement all executive decisions. Further, the CEO of the utility, under no circumstances should be the Chief Secretary of the State.
- Term for posting be for a period of five years. Govt. officials who are interested /selected in joining the utility have to agree serve full term of five year service, so that persons selected can be made responsible and answerable for the results. Termination or removal from service of such executive(s) shall also need to be cleared by the same committee.
- There is a need of at least 2 non executive independent directors from amongst the persons who have served in the power sector at Central level or in any other states.
- The utilities need be given proper delegation of power and should not function as for name sake as is happening at present working.
- There is need that utility is prepared to have at least 26% public share holding in next 5 year period.
- There is need of proper HR Department with persons having professional experience in dealing with Changed Management and new working culture and training needs. Similar is need for Finance Department as well as for induction of MBAs and ICWAs qualified personnel.
- During visits to various state utilities it has been observed that staff strength is very much on larger side and also perhaps average age of employee is above 50 years. It was also observed a large force of employees have no basic qualification and may not fit in new working environment. There is need that such states examine whether some of these employees can be made use of in some other state departments
- Scheme like voluntary retirement need be examined as was done in Delhi after privatization. Scheme adopted in Maharashtra where retiree employee's relation was allowed preference for new employment need be examined.
- There is need for function responsible for Quality and Safety in the company. All equipment and all material purchased should have quality built up. All work need be inspected for quality before any equipment or work is put in operation. Similarly all safety measures need be taken while carrying out plant operation
- Similarly as Demand Side Management is going to play very important role in functioning of the company, there is need for staff well trained in Managing Efficiency as well as in Auditing for efficient use of the system.

- To handle on the scale provided under R-APDRP scheme, Utilities need to completely change their day to day working i.e. it will need change in working culture. GOI has recognized the task involved in this direction. On one side there is a provision in R-APDRP of utilizing services of an expert IT Company as IT consultant to work out the road map of computerization in different areas in the organization and help Utility to prepare final specification from model specs prepared by PFC in consultation with all stakeholders enabling Utility float open bids and select Implementing Agency to cover up all aspect of the project which may require a number of specific service providers. PFC has in advance short listed competent and experienced IT companies thru an elaborate bidding process, who were allowed to bid for tenders to be floated by Utility. To select IT consultant, GOI has allowed states to decide the scope of the project on basis of present level of computerization already done as well as expertise available within Utility. Some Utilities like Maharashtra and AP distribution agencies were allowed to do their in house consultancy in view of in house strength of IT expertise within a Utility.
- However such expertise is missing in large number of distribution Utilities in the states. Some of these companies had gone for large induction of employees in seventies and early eighties to implement large scale of electrification especially in rural areas. At that time there was no concept of out sourcing and each and every activity needed by a Utility was to be done departmentally by employing labor including activities such as watch and ward, housekeeping etc. Even activities which can be done thru open tenders like purchase of poles or fabrication of tower had been under taken by establishing departmental fabrication shops. Of course it helped to some extent in achieving goal of fast electrification of rural feeders to energize Tube wells and helped the country overcoming worst food crisis but Utilities just forgot functioning on commercial lines as well as for adopting prudential good engineering practices.
- To be successful with adoption of IT in its working, Utilities need complete reorientation in its approach. It needs to decide in advance as how it will like to carry on future business. In case they want to carry out future business they need recruit proper and experienced man power or think of other alternative model such as privatization or Franchisee system in advance so that IT based process once completed, is continuously up dated. For example consumer data base needs updating DT wise as and when new consumer is added up, will have no meaning if not done on line and whole exercise shall need repetition again as experience of ADPRP has shown when number of Utilities made an attempt to prepare data base half heartedly without automatic updating, no useful purpose was served. Therefore it needs be emphasized on Utilities to have long term thinking on organization restructuring, suitable business model and suitable man power required in order to adopt new process and system which shall be implemented under R-APDRP to make it a success.

3.8 DISBURSAL OF SUBSIDY

- It is recommended that Distribution utility do the billing based on actual meter reading and cost of supply as fixed by state regulator for all consumers including agriculture. The state government needs to make arrangement for disbursing subsidy to these consumers directly, instead of paying to utility (which is most cases paid partially or not paid at all). Subsidy should be based on land holding rather than per pump set.
- Domestic consumers with consumption less than 300 units per month should be covered under cross-subsidization with a view to reducing the burden on State Exchequer.

3.9 POWER PURCHASE

Power purchase costs constitute the largest cost element for the distribution utilities. Timely and competitive procurement is expected to go a long way in reducing the overall cost of procurement as well as development of power market, the very objective of Indian Electricity Act 2003 and the National Tariff Policy.

The guidelines issued under Section 63 of Indian Electricity Act 2003 stipulate procurement of power through competitive bidding under case 1 and case 2 mechanisms. Case 1 is open and not specific to any location, technology or fuel. Competitive cost of power is the sole criteria. Case 2 is applicable for hydro projects, load centre projects and is specific to location and fuel such as captive mines, etc.

It has been observed that many utilities do not carry out timely, medium and long term planning, leading to excessive short term procurements. Power on short term is generally expensive. This leads to higher power procurement costs in the ARR. As such there is a need for every distribution utility to focus on planned procurement based on their CAGR of demand. Short term procurement should be resorted to as a contingent and unforeseen measure.

There is a need to organize a planning cell in the utility so as to look after day to day scheduling of power requirement and to do short term purchase or sale of power on basis of day to day fluctuations of load in most economical manner

3.10 CONSUMER CARE SERVICES

It had been in the past that consumers are very badly handled by the employees. With RAPDRP Project implementation it is expected that above issues shall be very well taken off. There is immediate need for implementing Call Centers where consumer can register his no current complaint. With software available, it is possible for call center to answer the query in case a planned shutdown has been taken or otherwise to communicate the fault to concerned maintenance gang. In case complaint is rectified within a given time the same is automatically upgraded to senior officer concerned. After rectification of fault a message is sent about the same to Call Center, who again checks up the position from consumer before closing the complaint. Daily reports are also computerized generated and made available to

all concerned for close monitoring. Such call centers are to be large town wise as well as Company wise.

Similarly consumer care centers need organized where consumer interact for getting a new connection, for increase or decrease in his sanctioned load, on billing issues etc. It has been observed that in states like Gujarat, AP, West Bengal, etc above facilities have been already commissioned. There is need that other states should also expedite the same without linking it with completion of RAPDRP Project.

4.0 OPEN ACCESS

Provision of non discriminatory open access for use in transmission and distribution system is a very significant feature of Electricity Act 2003.

National Electricity Policy and tariff Policy also lay emphasis on proper implementation of this competitive framework which has the potential of (i) desired market signal (ii) inducing improved service from existing utilities (iii) enabling consumers to get power from any source of their choice (iv) enable / permit captive generation and cogeneration units to freely sell surplus energy available to meet power shortage which most of the state distribution utilities are facing.

CERC had notified open access in inter- state transmission system since 2004. There had been large numbers of transactions involving the generating companies, traders and distribution companies. Most of the State Electricity Regulatory Commissions have also framed regulations for introducing open access up to 100 KW in phased manner in intra state transmission and distribution system. Transmission charges, wheeling charges and surcharge have also been determined by SERCs. However, implementation of open access at distribution level has not been encouraging so far. Keeping in view of importance of open access, Forum of Regulators (FOR) constituted a working group for detailed examination of the operational constraint in implementation of open access. The report was discussed by FOR in January 2009 at Chennai.

Main recommendations as adopted by Forum concerning the following issues :

i) Legal and policy provisions and status of their implementation
ii) Identification of problem areas with the conclusion, inter alia that weakest link is the state load dispatch Centre (SLDC), which unless made truly independent will frustrate all efforts at open access
iii) Measures for ring fencing of SLDC
iv) Structural and financing remodeling, including technological upgradation
v) Staffing pattern
vi) Incentives and disincentives scheme
vii) Fees and charges for SLDCs

Report also emphasizes the need for :

i) Rationalization of various open access charges including surcharge
ii) Uniform stand- by arrangement for back up supply to make open a reality
iii) Monitoring of open access transaction by the state commission
iv) Display of illustrative examples of charges for open access to help the potential consumer take an informed decision on open access option.

It has been informed that the work of up-gradation of SLDCs was taken up by POWERGRID under World Bank Funding in late 90's along with Unified Load Dispatch Centers at Regional level. All present activities of trading and open access had been possible on account of above initiatives. Now above system need up-gradation both at National, Regional and state levels. At national level and state level POWERGRID is carrying out the up-gradation. However, at state level it was left to the states to do the job. It was informed that under NREB forum all states of northern region have agreed for POWERGRID to manage above work for their state load dispatch centers, It was also informed some states such as Jharkhand, Orissa, AP, Kerala and Puducherry have agreed to appoint POWERGRID as their consultants for above job. Some states like Maharashtra, Karnataka and Tamilnadu perhaps want to implement the scheme of their own. There is nothing wrong in above approach but it needs be kept in mind that compatibility between various technology and hardware adopted by various vendors selected by states need to be there. It is suggested that in case states are not in position to fund such scheme, they can approach POWERGRID so that a unified approach can be adopted and up-gradation can be completed in a more systematic manner as well as in time.

However, it is to be noted that in SLDCs information will be available up to 132 KV system and may also give loading details about outgoing 66 kv, 33 Kv. However, in case open access is to be provided on 33and 11 Kv and 0.400 Kv distribution system, then perhaps every distribution utility needs a centralized load dispatch centre for demand projection as well as for managing its operation and maintenance functions including managing open access and energy accounting.

Under APDRP Project all IT and communication infrastructure is been provided down up to DTs level. SCADA system in large town having 4,00,000 population and energy consumption of 350 mus is also envisaged. Main Server along with stand by server for disaster management is also provided. It is hoped that every utility is also planning for Central LD&C Center facilitating open access is available up to 11 KV system to cater

open access up to a load of 100 KW (There is no mention of utility based LD&C centre in RAPDRP Project)

However recently some State Electricity Regulatory commissions like Punjab and Uttrakhand had allowed open access to Industrial Consumers for certain time block basis(during night time). This has resulted in monetary losses to state utilizes. Analysis has shown that tariff in these states were for such consumers was per unit for all time slots. It means that there is no difference in tariff for peak hours and non peak hours. This resulted in consumers opting for power import for non peak hours when power in open market was available at cheaper rate, though power was available in the concerned states which have to back down their own generation. This was not intended as per Act. Section 42(4) reads as follows

''Where the state Commission permits a consumer or class of consumers to receive supply of electricity from a person other than the distribution licensee of his area of supply, such consumer shall be liable to pay an additional surcharge on the charges of wheeling, as may be specified by the state commission, to meet the fixed cost of such distribution licensee arising out of his obligation to supply.''

It is, therefore, felt that SERC should fix up additional surcharge keeping in view long term power agreement entered by state utility has entered for long term power purchase agreement which has a fixed cost component. Better SERC fix up TOD tariff for such consumers reflecting cost of highest marginal cost for peak hours. Main intention should be able to get additional power to the state utility as most competitive rates to meet shortage of power.

There is an issue that number of states such as Karnataka, Tamilnadu are have issued orders under section 11 which had the effect of

i) Requiring private generators to compulsorily sell power to state distribution utilities
ii) Fixing the price at which power can be sold through executive dikat which is contrary to the provisions of the Act
iii) Imposing restriction on the third part sale
iv) Denial of open access

Section 11 Directions to generating companies read as follows

'' i) The Appropriate Government may specify that a generating company shall in extraordinary circumstances operate and maintain any generating station in accordance with direction of that Government

2) The above commission may offset the adverse financial impact of the direction referred to in subsection 1 on any generating company in such manner as considers appropriate'.'

The CERC and Appellate Tribunal for Electricity (APTEL) which are pre-eminent forum for adjudication of electricity related disputes (second only to the Supreme Court of India) have consistently upheld the objectives and principles of the Act and right to open access. A Task Force created by Planning Commission has stated in its report on "Report of the task Force on measures for open access in the power sector'' as follows :

" The task Force, therefore, felt that it would be e highly desirable to create appropriate price signals by opening the market for open access under which there would be no restriction on sale of electricity at an unregulated price to the final consumer. Once open access is effectively operationalised, it would provide a legitimate window for market forces in which knowledgeable consumers can choose between supply from the utility at regulated prices and unregulated supplies at negotiated prices…. It was agreed that the introduction of competition would only be achieved when bulk consumers are able to avail of open access."

It also upheld that

'' It was agreed that the introduction of competition would only be achieved when bulk consumers are able to avail open access under section 42 of the Act, and the Task Force, therefore decided to focus on operationalization of open access to consumers under section 42 as distinct from open access to transmission lines for transporting supplies to licensees.''

The above issue is very important and clarity on application of Section 11 needs clarity to prevent regulatory uncertainty.

The Ministry of Power, Government of India is aware of the issue but as the orders of APTEL on the issue pending before Supreme Court for decision, appropriate further action can only be taken after award of judgment by Supreme Court.

RECOMMENDATION

With the completion of RAPDRP Projects in states including a Utility level LD&C centre, it will be possible to facilitate open access upto 11 KV feeder and 100 Kw load. It is necessary that recommendation of FOR be implemented by states in order to promote

open access as provided in Act so as to bring competition and efficiency in Electricity Market.

However, SERC should decide proper TOD tariff for open access consumers or decided additional surcharge by SERC suitably keeping in view the obligation of state utility to supply power so as to cover up the fixed cost of such power.

Intention should be to make available additional power to state system to meet power shortage at most economical cost.