FORUM OF REGULATORS (FOR)

REPORT

ON

"DSM & ENERGY EFFICIENCY"

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FORUM OF REGULATORS (FOR)
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1 Introduction

The Forum of Regulators created under Section 166(2) of the Electricity Act 2003 consists of Chairpersons of all State Electricity Regulatory Commissions as members with Chairperson of the CERC as Chairman of the Forum. The Forum has been entrusted with the responsibility to evolve common and coordinated approach to various issues faced by the Electricity Regulatory Commissions in the country. With this objective, the Forum has established working groups to look into various regulatory issues affecting electricity sector with some State Electricity Regulatory Commissions as members of those Working Groups. The Forum of Regulators (FOR) decided in its meeting held on June 13, 2008 to constitute a Working Group on "DSM and Energy Efficiency" to deal with the issue of developing approaches for implementation of 'Energy Efficiency and Demand Side Management' in the distribution sector in the country. This Working Group consists of:

- Chairperson, CERC - Chairman of the Working Group
- Chairperson, DERE - Member
- Chairperson, GERC - Member
- Chairperson, MERC - Member
- Secretary, CERC - Member
- Deputy Chief (RA), CERC - Coordinator

Apart from the above mentioned members, Director General of Bureau of Energy Efficiency has been also invited to join the Working Group as a Permanent Invitee. Further, it was decided that Working Group would inter-alia consider the relevant provisions of the National Electricity Policy, Tariff Policy and various initiatives taken by the State Electricity Regulatory Commissions and would give its recommendations on following issues:

- Components in the tariff structure for incentivizing energy efficiency;
- Institutionalizing energy efficiency in the organizational structure of distribution utilities;
- Load Research, load forecasting and appropriate DSM options;
- Preparation of DSM plans and how to implement them;
- Special measures for promoting energy efficiency in pumping ground water for agricultural use;

The First Meeting of the DSM & EE Working Group was held on July 10, 2008 in the office of CERC. During this meeting, the background note prepared by Bureau of Energy Efficiency on "DSM and Energy Efficiency" was discussed. A copy of the minutes of the meeting is at **Annexure-I**. In that meeting there was a general consensus on the following:-

(i) Every distribution company (Discom) must create a DSM cell to plan, develop monitor and implement DSM initiatives on a sustained basis, and staff this DSM cell with dedicated staff and equip it with dedicated resources and budgets.

(ii) Every Discom should be directed to prepare DSM plan and provide budget for its implementation.

(iii) Recovery of cost on DSM should be allowed as a pass through in ARR. Pre-identified sources of funds such as penal interest on late payment of bills, load management charges could be earmarked for financing DSM activities.

(iv) DSM bidding mechanism should be developed and institutionalized for implementation of DSM projects aiming at targeted saving in terms of MW of load avoided and/or kWh of energy purchase avoided in identified places such as distribution transformers, feeders, or large bulk consumers such as airports, commercial complexes, etc. The cost could be partly funded by DSM plan of the utilities.

(v) Results of DSM programmes/projects should be verified after by a third party measurement and verification expert(s).

(vi) Load research should be taken up systematically because it would only provide data on impacts of DSM initiatives in terms of savings in energy and reduction in demand, but it would also provide insight in to consumer load profile and data on cost of service, data on profitability analysis, and would also help Discoms in rate design, load forecasting, load control and load management.

(vii) Power procurement plans should take into consideration the projected feasible savings through Energy Conservation and Energy Efficiency measures. Capacity building of staff of the SERCs and the utilities through domestic/international visits to places where DSM has been successfully implemented should also be included in DSM plans.

(viii) BEE should promote development of ESCOs for implementing DSM projects, especially in areas of energy efficient air conditioning in large office/commercial complexes and municipal street lighting.

(ix) SERCs may provide a special rebate in tariff to those building premises (both old and new) which are certified (on annual basis) by agencies authorized by BEE, to be compliant with Energy Conservation Building Code (ECBC)..

(x) Concerned authorities could consider mandating installation of star-rated energy efficient pump sets in those areas where continuous heavy pumping is required such as municipal water works, sewage works, and lift canals.

The Working Group also desired that details on the following may be placed before it by the secretariat for consideration in its next meeting:-

(a) A suggested list of functions of DSM Cell in utilities.

(b) Possible incentives to utilities for motivating them to undertake DSM activities.

The second meeting of the Working Group was held in Chandigarh on 19th September, 2008. In the meeting, the following presentations were made:

a) Reliance Energy made a presentation on DSM Initiatives at Mumbai in BSES area. A copy of the presentation is at **Annexure-II**. The presentation explained the various steps involved in formulating DSM Plan by a utility, DSM team composition within the organizational structure of the utility, a brief description on load research and the details of various DSM initiatives being taken by the utility such as CFL project, APFC capacitors, streetlight conversion, energy efficient refrigerator programme, DSM Bidding Programme for a substation, Energy Audit Scheme option for consumers and the awareness campaigns. The presentation highlighted the need for development of ESCOs in India for taking up integrated DSM projects, evolving standard procedure for monitoring and verification of DSM projects and making available required expertise and fund for DSM programmes.

b) BSES Delhi made a presentation on DSM Initiatives in the area of BYPL and BRPL distribution licensees in Delhi. A copy of the presentation is at **Annexure-III**. The presentation highlighted the capital investment being made by the utility for DSM with regulatory approval and its impact on containing the growth of demand despite of sharp increase in number of consumers. The presentation also highlighted the regulatory intervention for DSM such as KVAH billing for non-domestic and industrial consumers, load violation charges and lowering the HT

tariff as compared to HT tariff. The presentation also highlighted the positive impact which the rationally structured Government subsidy (which makes only those consumers eligible for subsidy who consume less than the specified units in a given period) on management of peak load. It was also highlighted that the successful implementation of large scale CFL programme required capital expenditure by the utility for addressing the aspects of harmonics and power factor.

c) A presentation was made by MD, Uttar Haryana Vidyut Vitran Nigam which highlighted the major initiatives being taken by the two distribution utilities of Haryana. A copy of the presentation is at **Annexure-IV**. The presentation focussed on the efforts being made for promoting energy efficient equipments such as CFL, efficient irrigation pumpsets, efficient lift canal irrigation pumps and amorphous core transformers. It also covered the proposed feeder segregation programme of Haryana and the efforts being made for promoting solar based power in the state. A major programme for covering whole of the state by CFLs through sale of CFL bulbs at Rs.15/- and with having a ten year warranty is being launched shortly. The remaining cost of the bulbs is proposed to be recovered by the manufacturers through CDM benefits.

   Another major programme proposed to be launched shortly (which is awaiting the standard notification by Bureau of Energy Efficiency for agricultural pumpsets) is to provide energy efficient agricultural pumpsets to the farmers almost at the same cost at which the farmers are buying the inefficient pumpsets presently. The cost differential is planned to be covered through three components (i) cost reduction by bulk procurement (ii) grant funding by the State Govt. which expects to save subsidy amount being given for power supply to agriculture at highly subsidized rates and (iii) a subsidy component by utility which expects to gain by way of reduction in subsidy for high paying consumers and also by reduction in short term power purchase cost of the utility. The pumps to be procured would have five year warranty. All the new connections are to be metered and the farmers already having connections could opt for the scheme if they accept the supply to be metered and through HVDS.

It was felt by the Group that the Demand Side Management involves actions at the level of consumers which would ultimately depend upon numerous factors. The report of the Working Group should focus on the necessary regulatory interventions

which have to be primarily in the areas of appropriate pricing of electricity and enabling regulatory framework for consumer-utilities partnership. Operational issues should be responsibility of the utilities.

The Working Group submitted its report after incorporating the above mentioned issues, which was considered by the FOR in its meeting held in September, 2008. The report as adopted by FOR covers the following chapters:

Chapter 2	Tariff Structuring to promote Energy Efficiency & DSM
Chapter 3	Financing of DSM & Energy Efficiency
Chapter 4	Possible Incentive Mechanism to encourage Utilities to undertake DSM & EE activity
Chapter 5	Preparatory Work for DSM Programme
Chapter 6	Implementation Methodology for Utility Driven DSM Programme
Chapter 7	Capacity Building of Utility
Chapter 8	Proposed Models for Implementation of DSM Programme in Agricultural Sector
Chapter 9	Scheme for DSM implementation
Chapter 10	Summary of the recommendations
Chapter 11	List of Annexure

2 Tariff Structuring to Promote EE & DSM

Demand Side Management or DSM is defined as a set of initiatives undertaken by the utility on the consumer side of the meter to bring about a desired change in consumer demand and/or demand profile maintaining, or even enhancing the service provided to the consumer in terms of quality, reliability and cost of service. DSM could result in conservation of electricity or its efficient utilisation which could be either reduction of kilowatt hours (kWh) of electricity consumption, or load i.e., the reduction of kilowatts of power demanded or a combination of both. DSM programmes could be broadly classified into following four types:

- Peak Clipping Programme
- Load Shifting Programme
- Strategic Conservation Programme
- Valley Filling Programme

The nature of these DSM programmes could range from a very simple programme such as public awareness campaign to complex DSM resource acquisition programme involving technology, fiscal incentives, intricate contracts and evolved measurement and verification (M&V) protocols. Since many utilities in India face chronic energy and peak demand shortages, peak clipping, strategic conservation and load shifting programmes emerge as the most suitable DSM programmes.

Electricity consuming sectors that lend themselves as target sectors for DSM are sectors where average realisation is lower than the cost of supply of electricity. The implicit logic is that, every additional unit of electricity consumed in such sectors means increase in cross-subsidy / subsidy requirement or reduction in profit or, alternately, every unit of electricity saved in such sectors means reduction in cross-subsidy / subsidy requirement or more profit. In most States in the country, these sectors are domestic, agricultural, water supply and street lighting.

Other sectors such as industrial and commercial category are usually not targeted by utilities for DSM measures as average realisation from these categories is higher than the average cost of supply. However, considering that India is facing severe power shortages and is dependent on imports for significant component of its energy requirement, utilities need to look at the macro perspective in the national interest and make every attempt to

save every unit of energy irrespective of the commercial gain / loss. Further, commercial and industrial sectors provide good opportunities for peak clipping as well as strategic conservation, due to their concentrated load. Moreover, under cost plus regulatory regime, any commercial loss due to the reduction in consumption by these consumers in the subsidizing categories could be recovered under the truing-up process.

As mentioned earlier, in India, electricity tariffs are skewed and involve high level of cross-subsidies. Further, tariffs to certain categories of consumers such as agriculture are far below the cost of supply, which encourages inefficient consumption. Further, charges such as minimum consumption charge do not provide any incentive to reduce demand on the system. It is an established principle that monetary incentives result in the most effective implementation of any policy. Since, retail tariff determination is a core function of the Electricity Regulatory Commission (ERCs) under Sections 61 to 64 and 86 of the EA 2003; ERCs can play a critical role in promoting demand side management by way of appropriate tariff structure. Following tariff structures may be utilised by the ERCs to promote energy efficiency and DSM.

- Time of Day Tariffs;
- Power Factor Incentive & Penalty / Reactive Power Charges
- Load Management Charges
- Rebates/ incentives for energy efficiency/ fuel switching
- Differential Pricing for Agricultural Sector

2.1 Time of Day Tariffs

As a DSM measure, Time of Day initiatives aim to change customers' energy-using behaviour, particularly to alter the times at which electricity is used. 'Time of Day tariff' is typically used to reduce the demand on the system during peak period.

Several Regulatory Commissions have recognized the importance of 'time of day' tariffs as DSM measure and have determined the charges for certain consumer categories under their jurisdiction. Generally, these charges have been introduced for large industrial and commercial category consumers. The status of implementation of 'ToD' tariffs has been presented in **Annexure-V**. While it is noted that several states have implemented 'ToD' tariffs, not significant information is available on impact of these tariffs on consumption pattern or load curve of the utilities. In many cases, 'ToD' tariffs determined do not factor load profiling to find out the loads which contribute to the peak requirement.

Further, several states are experiencing huge demand-supply gap. In order to manage this gap, most utilities have implemented measures such as feeder roastering, load shedding, etc. As a result, load curves of the utilities are more or less flat. Since power is available only during the night period, some utilities have resorted to purchasing of energy during night period (or overdrawing during night period) as a result of which these utilities have experienced peaking requirement during night period. Utility of 'ToD' tariffs during such situations needs to be ascertained.

Also, some of the utilities have peculiar load curves, for e.g. Chhattisgarh shows dip in power requirement at around 2pm in the afternoon. ToD tariffs can be designed to address such peculiar requirements. Such peculiar load curves need to be studied in detail to identify loads causing such dips, their nature and tariffs which could reverse the trend. Extensive load research which can help in meeting these objectives is unfortunately rarely carried out by utilities.

Another important issue about 'Time of Day' tariffs is reference supply curve. Ideally, utilities should design 'ToD' tariffs in such a manner that demand simulates supply curve. Ability of supply to absorb peaking requirement should be the primary criteria for 'ToD' tariff design.

2.2 Power Factor Incentive & Penalty / Reactive Power Charges

Power factor in alternating current circuits is the ratio of energy consumed (watts) versus the apparent power (volts-amp). Power factor correction aims to reduce the difference between the energy consumed and the apparent power so as to reduce energy wastage. Most power factor correction projects reduce overall demand across the whole electrical load curve.

Most States have incentive and penalty mechanisms for maintaining power factor within the desired limit. However, generally this mechanism is applicable to only industrial category consumers. As a result, many industrial category consumers have installed automatic power factor controller to maintain unity power factor.

Currently, different States have different methodologies to address this issue. While many states are using mechanism of power factor incentives and penalty, some states are using other methods such kVAh billing or separate charge for kVAh. It is necessary to analyze relative merits and demerits for large scale implementation for wide range of

consumer categories. Study of the most suitable methodology for levy reactive charges or power factor correction for consumers need be carried out.

2.3 Load Management Charges

Under Section 61 of the EA 2003, the Appropriate Commissions are required to determine tariffs in such a manner that these will encourage efficiency and economical use of resources. These provisions provide significant flexibility to Regulators in developing tariffs appropriate for promotion of EE and DSM. Electricity Regulatory Commissions (ERCs) have been empowered to give directives to the distribution utilities to ensure efficient supply and regulate consumption by the consumer. These powers could be effectively utilized by the ERCs to develop State Specific DSM policies. For example, in the State of Maharashtra, MERC issued directives to the State Utility to restrict consumption by the continuous process industries to 90% and non-continuous process industries to 80% of their average monthly consumption during previous one year. MERC also levied Load Management Charges on those consumers who did not restrict their consumption within the stipulated limits, and prescribed Load Management Rebate for consumers who restricted their consumption to below the stipulated limits. Depending upon the load curve and generation availability, the ERCs may design suitable directives for distribution utilities in the respective State.

2.4 Rebates/ incentives for energy efficiency/ fuel switching

Energy conservation could be achieved using variety of methods. Households / commercial consumers may install solar water heating systems to reduce heating load on the electricity network. Similarly, new buildings may be designed in such a manner that these buildings satisfy the criteria specified in 'Energy Conservation Building Code'. While such buildings consume less electrical energy, initial cost of such buildings is usually higher than standard buildings. However, it is necessary to encourage such buildings as well as measures such solar water heating systems, or solar rooftop systems.

ERCs should provide appropriate incentives for ECBC Compliant Buildings as well as such other measures as discussed above. It may be necessary to develop schemes other than commercial incentive mechanism for implementation of such mechanisms. For e.g. to encourage solar rooftop systems, not only commercial mechanisms is necessary but also required is technical scheme for integration with grid. Such schemes are generally referred to as 'net metering'. ERCs are encouraged to develop such mechanisms.

2.5 *Differential Pricing for Agricultural Sector*

The Regulator can target a particular category of consumers for implementation of DSM and EE measures. Tariff applicable to agriculture sector is usually the lowest and subsidised. Further, most distribution utilities in country are charging single tariff on Rs./HP/month basis for agricultural sector which creates perverse incentive for inefficient utilisation and unaccountability of the energy.

Some State Regulators have attempted to design tariff in such a manner that metered consumption gets incentive. The Regulators have initiated two part tariff involving Fixed Charges (Rs./HP/Month) and Energy Charges (Paise/Unit) based on the actual consumption. Andhra Pradesh Electricity Regulatory Commission in its Tariff Order for FY 2006 -07 incorporated two part tariff for the LT Agricultural Sector Category.

APERC directed distribution utilities that the Farmers eligible for free supply under Dry Land as well as Wet Lands have to comply with the demand side management measures specified by the Government of Andhra Pradesh and all new connections shall be given only if consumer complies with DSM measures (such as energy efficient pump sets and measures for improving the power factor) implemented with meters.

Similar measures may be considered by other ERCs for the agricultural DSM programme in the State. In fact, significant potential could be quickly achieved if DSM measures are implemented in Lift Irrigation Schemes or large pumping stations for water supply and sewerage. ERCs may encourage distribution utilities to explore options to develop DSM projects for these loads.

3 Financing of DSM & Energy Efficiency Initiatives of Utilities

Generally, all over the world it has been noticed that due to the uncertain nature of outcomes and inherent conflict with the objective of achieving increase in sales, distribution utilities are usually reluctant to undertake DSM measures. In India, the situation is further complicated as more than 90% distribution business is owned by public utilities which are often found wanting in responding to incentive structures. Also, the distribution utilities often lack necessary institutional capacity and funds to develop practical approach for undertaking energy efficiency and demand side management programmes.

Due to barriers relating to untested outcomes, lack of clarity about baseline data and M & V protocol, non-availability of financing options and huge demand – supply gap, DSM project implementation has not taken off. While costs associated with DSM project are usually not significant, due to poor cash situation, utilities find it difficult to arrange necessary funding. Hence, regulatory intervention to ensure adequate funds for distribution utilities for design, development and implementation of DSM programme is usually required.

Following four major financing sources are usually available to distribution utilities:

- Self financing or Recovery of Costs through Annual Revenue Requirement
- Development of Special Fund
- Grants from Government Agencies
- International financial institutions / development agencies

Of the abovementioned four sources, the regulator can play an active role in ensuring availability of funding in case of the first two sources. Further, regulatory approval to costs will greatly help in funding such projects in case of remaining two sources.

3.1 Self financing or Recovery of Costs through ARR

Direct costs associated with programme administration including design, implementation, monitoring, evaluation and incentives, if not recovered, could impact earnings of the utility. Reasonable certainty of cost recovery is necessary condition for utility program spending, as failure to recover any costs directly impacts utility earnings, and sends a discouraging message regarding further investment. Tariff Regulations, specified by the State Commissions for determining the ARR and Tariff, do not generally

have an exclusive provision under which the utilities can book the expenses incurred by it on DSM. Suitable provisions in the Tariff Regulations to allow recovery of DSM related expenditure as a part of Annual Revenue Requirement is one of the simplest way to create necessary funding for the implementation of DSM programme. It would be appropriate that the State Commission may indicate a percentage of the ARR to be utilized for DSM programmes. This percentage could be worked out on the basis of the indicated savings from the power purchase costs and peak clipping.

In case of approval of the expenses under ARR, the utility is certain about recovering of the costs through consumer tariffs. In this case, the utility funds capital expenditure using same financing principle as used for other capital projects of the utility. This method has been referred to as 'self financing'.

Apart from 'self financing', other methods of financing DSM projects are possible and have been described in the remaining part of this Chapter. In those cases, financing structures and ratios will be dependent on source of funds. However, it may be noted that in most other forms of financing also, approval of the State Regulator to expense budget will be required.

3.2 Development of Special Fund

Sometimes it may be possible to create Special Funds either within the utility or outside the utility which may be used by the utilities for design, development and implementation of demand side management programmes. An example of fund created outside the utility is Urjankur Nidhi created by the Government of Maharashtra by levy of cess of 4 paise on all units sold to commercial and industrial category consumers in the State of Maharashtra. State Energy Conservation Fund envisaged under Energy Conservation Act 2001 is another example of such fund.

Regulatory mechanism could be used for development of mechanism for creation of special funds. Such mechanism could involve levy or surcharge on existing consumption or incremental consumption or incremental demand, depending on the purpose of the fund.

An example of such fund is 'Load Management Charge' fund created by various utilities in the State of Maharashtra. In May 2005, under Section 23 of the Electricity Act 2003, MERC directed all consumers to reduce their consumption to certain level. The Commission levied surcharge of Rs. 1/kWh for consumption above norm specified by

the Commission. Similarly, the Commission directed rebate of Rs. 0.50 for reduction in consumption below norm set by the Commission. The Commission directed that the amount so collected by the utilities shall be used for promotion of energy efficiency, energy conservation and demand side management. The utilities in the State of Mumbai collected Rs. 70 crore during two months of May and June 2005. Till date, this amount is being utilized by the utilities to run EE/EC/DSM programmes in the State.

As mentioned earlier, though approval of costs by the Regulator will be required even in this case, the costs are neither borne by the utility nor passed on to the consumers. Accordingly, accounting treatment will have to be provided to the costs incurred on the DSM measures.

3.3 International Financial Institution and Development Agencies

Several international lending and donor institutions have created funds for promoting energy efficiency and conservation in developing countries as well as in countries with economies is in transition. Most of them have specific action plan and/or intervention strategies to support DSM programmes. These institutions include the World Bank Group, the Asian Development Bank, IFC, etc.

Similarly, industrialized countries have set up bilateral funding agencies whose mandate is to manage public assistance funds for development. These include, USAID (United States Agency for International Development) in the United States, DfID, CIDA, etc.

It is necessary to encourage utilities to approach these agencies for funding these projects not only for funding purposes but also to take benefit of technology, know how, systems and processes involved in evaluation and implementation of projects.

4 Possible Regulatory Mechanisms to Encourage Utilities to Undertake DSM & EE Activity

Sharp increase in electricity demand and inadequate generation capacity addition has led to huge demand-supply gap in the country. The situation is further aggrieved by the high T&D losses, fuel constraint, environmental concern, and financial constraint. In such a scenario, DSM provides an effective solution for optimal utilization of existing resources. Any DSM related activity, even in the nature of general consumer awareness activity, costs the utility to plan, develop and implement.

4.1 Regulatory Hurdles in Development of Regulatory Mechanisms

The Electricity Act 2003 has put significant emphasis on efficiency and optimal utilisation of resources. Issues related to regulatory treatment of costs and benefits however need clarity.

Distribution Utility's perception of losing revenue by way of DSM implementation is one of the reasons for their non-interest in this area. Most of the DSM programmes are centred around peak load reduction. However, utilities earn significant revenue by way of supplying power to the industries during the peak hours as tariff for such categories is linked to the time of use. In such case, fear of losing revenue from subsidizing category is also one of the reasons.

Distribution Utility does not get induced to implement DSM measures as they are neither directly related to their core business of electricity supply nor mandated under the legal framework. It is also felt that the cost plus tariff determination does not necessarily have adequate inducement for carrying out such measures.

Further, in most cases, the utilities are not able to visualise the impact of DSM programme but at the same time, investment in generation capacity addition has direct impact in terms of energy injected in the system. Therefore, focus is on capacity addition rather than implementing such programme.

Due to non-availability of protocols for monitoring and verification in India, the end result of any of the DSM programmes is rarely available. Therefore, there is always doubt about the success of such programme.

Direct cost associated with programme administration, implementation and incentives, if any paid to program participants impacts utilities earnings. Reasonable certainty of cost recovery is necessary condition for utility program spending, as failure to recover these costs directly results in reduction in utility earnings, and sends a discouraging message regarding further investment.

4.2 Regulatory Incentives for DSM/EE

There is an urgent need to develop regulatory mechanism which incentivises utilities to take up DSM. Following major initiatives are proposed as a part of Regulatory Framework to encourage distribution utilities to undertake DSM initiatives:

- Regulatory Commissions may make suitable provisions in the Tariff Regulations to include DSM related expenditure as a part of the Annual Revenue Requirement and develop simple mechanism to allow recovery of DSM related costs through tariffs.

- Regulatory Commissions may develop suitable incentive mechanism for utility to allow them to earn additional return on equity for procurement of DSM Resources in place of supply side resources. Such incentive could be in the form of additional return on equity (say 1% incremental Return on Equity) for DSM/EE programs in subsidised categories like Residential, Municipal & Agricultural Sectors.

- Higher incremental return on equity (say 2%) be provided to utility for investments in DSM programs in subsidizing categories like Commercial and Industrial Sector. This will encourage utilities to undertake DSM even in subsidized categories.

- Alternative incentive mechanism in the form of savings in costly power purchase may be developed where it is possible to identify costly power purchase. Utilities may be encouraged to develop peak load saving programs so that overall power purchase cost utility decreases. Utilities may be allowed to retain percentage of such saving.

4.3 Other Regulatory Measures

Apart from the regulatory incentives proposed above, following initiatives are also proposed as a part of Regulatory Framework to encourage distribution utilities to undertake DSM initiatives:

- There is a need to incentivise utilities to provide 24 hour continuous power supply or for that matter, to provide for disincentive or penalty for utilities if power is not supplied to its consumers. Regulatory framework for distribution utilities should provide penal mechanism if utilities fail to supply power to consumers. Such a framework will automatically encourage distribution utilities to undertake DSM measures.

- Distribution utilities may be encouraged to create their own Energy Service Companies (ESCO) as an unregulated activity and capture the business opportunities by implementation of demand side management and energy efficiency projects in their licensed areas.

- Utilities may be encouraged to design DSM/EE schemes where benefits through implementation of such measures will be large enough to allow sharing some of this benefit as a way to reduce utility risk. This way all stakeholders will be better off than if no investment is made. Such sharing of benefits could be on the lines of sharing of savings for controllable factors under MYT Regulations.

- It is necessary that Regulatory Commissions have necessary capacity to evaluate and approve DSM proposals submitted by the utilities. For this purpose, it is necessary that ERCs identify some persons within its staff for DSM related activities. Such members may be designated as DSM Cell within ERC

- FOR notes urgent need of capacity building of DSM Cells within utilities as well as ERCs. Unless such capacity building is undertaken, it would be difficult to design, develop and implement DSM Projects in the country. Therefore, FOR may undertake intensive training programmes of one week duration for staff of utilities and ERCs. Personnel from BEE, ERCs / utilities which have already implemented DSM measures, persons from academia and eminent experts as well as representatives from industry could act as resource persons for these training programmes. It will also be useful to associate the representatives of the State Governments in such training courses in order to enhance the acceptability of DSM programmes by government systems. If necessary, such training programmes may be conducted in different parts of the country.

5 Preparatory Work for DSM Programme

In India, almost all the States are not able to meet the electricity demand of the electrified areas, and this situation will further deteriorate if the efforts for covering all the households by electrification by 2011-12 as targeted by the Ministry of Power are not matched with required capacity addition. One can easily conclude that crippling energy shortage and peak shortage should be driving factor for implementation of DSM in India. However, it is not the case and Demand Side Management initiatives are still in nascent stage. Most of the programmes carried out by the distribution utilities/State Electricity Boards are either Pilot programmes or demonstration projects. There is generally little quality information available about actual project cost and practically no information about post implementation project performance.

The utilities do not have standard processes for evaluating, acquiring and implementing demand side management programmes. Hence, there is an urgent need to define the roles and responsibilities of various stakeholders i.e. distribution licensees & electricity regulatory commissions and consumers and to put in place an overarching framework for identification, development, implementation, monitoring and verification of DSM measures. Various preparatory works to be done for the DSM programme by Distribution Utilities and Electricity Regulatory Commissions are presented below:

5.1 Role of Distribution Utilities

Primarily, it is the responsibility of the distribution licensee to implement DSM measures. In order to capture the DSM potential, utilities will have to pursue DSM options that are more broad based; not only in those sectors where cost of supply is higher than prevalent tariffs but also in other sectors, where cost of supply is lower than the prevalent tariffs. Some of the specific activities that distribution licensees are expected to undertake are follows:

5.1.1 Development of Necessary Infrastructure for Implementation

Since it will be the responsibility of the utilities to implement DSM measures, utilities will have to develop necessary infrastructure for implementation, monitoring and verification of the DSM programme. It is suggested that utilities create dedicated DSM cells for various activities associated with DSM.

5.1.2 Load Research & Load Profiling

In order to undertake DSM programme, strong data base of consumer profile is required. It is necessary to undertake load research programmes on continuous basis to ascertain the pattern of consumption for consumers in the supply area of the utility. Energy Audits on sample basis are required to be carried out to identify the end use which consumes significant amount of energy and to identify the ways and means to capture those opportunities. Load research programmes also help utilities identify peculiar patterns of consumption. For e.g. TPC noticed that HVAC in offices constitute nearly one third of the total consumption in the city of Mumbai.

5.1.3 Market Survey

New and efficient technologies play very important role in implementation of DSM and EE measures. It is necessary that utilities are aware of technologies and competing products within technologies to be able to undertake appropriate DSM measures. For e.g. to implement efficient refrigerator program, utility should be aware of various types of refrigerators and their energy consumption. Market research programmes help utilities in identification of energy efficient technologies and their penetration in the market.

5.1.4 Consumer Awareness & Marketing Programme

Consumer awareness & marketing programme is important particularly in those projects where achieving the project objective involves encouraging large number of small end-use customers, such as commercial and/or residential consumers, to change the ways in which they use electricity or purchase electrical appliances and equipment. Similarly, DSM measures implemented through DSM Resource Acquisition technique impact limited number of consumers connected to a particular feeder or distribution transformer. As a result, information about such DSM Resource Acquisition programmes needs to be provided to only those consumers. Sometimes, it is necessary to enter into contract for implementation of DSM measure. DSM cell of the utility is required to undertake contract development, negotiation and execution. Similarly, DSM Cells are also required to undertake consumer awareness programmes for general energy efficiency issues as well as specific programmes.

5.1.5 Regulatory Approval

Every DSM programme will have associated costs and benefits. Due to the nature of DSM programme, benefits are likely to get assimilated in the business of the distribution company while costs, if not approved, will not be passed on to the consumers who have benefited due to DSM measures. It shall be the primary responsibility of the utility DSM cell to carry out cost benefit analysis for a particular demand side management

programme for participant, utility and societal point of view and present the same to the concerned State Electricity Regulatory Commission. Methodology for performing various Cost-Benefit analysis tests and their benefits and costs from participants, utility and societal point of view is presented below:

- **Total Resource Cost (TRC) Benefit-Cost Ratio:** measures the net cost of energy efficiency programme based on the total cost of the programme, including both participants and the utility costs.
- **Utility (U) Benefit-Cost Ratio:** measures the net cost of a demand side management programme as a resource option based on the cost incurred by the programme administrator (including incentive costs) and excluding any net costs incurred by the participants. The benefits are similar to the TRC benefits but costs are defined more narrowly.
- **Participants (P) Benefit-Cost Ratio**: measures the net value of the customer bill savings relative to the incremental cost of the technology. The benefits of participation in demand side management programme include the reduction in the customer's utility bill, any incentive paid by the utility or other third party.

5.1.6 Development & Implementation of DSM Programme

On receipt of necessary approvals, DSM Cell will be responsible for implementation of identified DSM programmes. DSM Cell may have to undertake procurement of equipment as well as engagement of agencies for execution of the particular component of DSM programme. For e.g. in case of efficient lighting program, utility may have to purchase efficient lighting equipment such as CFLs and engage agencies such self-help groups for distribution of CFLs. DSM Cell should have necessary capability to undertake these activities.

5.1.7 Development & Implementation of DSM Bidding Process

DSM could also be carried out by way of engagement of energy services companies. For e.g. DSM resources on feeders or distribution transformers could be acquired by engaging specialised Energy Services Company to undertake various activities on that particular feeder. Management of DSM programme in this case is a lot different than in case, where utility itself executes the DSM programme. This method of DSM implementation could be very effective for projects where load is uniform in nature. For e.g. agriculture pumping efficiency programmes could be effectively implemented where agriculture feeder separation has already been carried out. DSM Cells should have capabilities to execute DSM programmes using this methodology.

5.1.8 *Monitoring & Evaluation of DSM Programme*

Monitoring and evaluation is an important activity for any project. However, it is relatively simple and straight-forward activity in projects involving large capital outlays. For e.g. it is far easier to monitor construction of large generation, transmission or distribution project than monitoring of CFL distribution or municipal pumping efficiency improvement project. Expertise in special analysis tools, baseline data development as well as monitoring protocols will have to be acquired by DSM Cells.

5.2 *Role of the Electricity Regulatory Commission*

For an industry, whose operations are mandated by the conditions of the "licence", and whose operations on the cost and revenue side are regulated, it is imperative that any new activity, which has cost and revenue implications, is mandated by regulation. In India, electricity distribution industry is regulated and all costs as well as revenues need approval of the relevant Electricity Regulatory Commissions.

Electricity Regulatory Commissions (ERCs) are required to consider factors which would encourage efficiency and economical use of resources. Section 61 of EA 2003 specifies that guiding factors to be considered by the ERCs in setting tariffs should include "the factors which would encourage competition, efficiency, economical use of resources, good performance and optimum investments". Since DSM leads to efficient and economical use of utility resources, DSM and other energy efficiency measures should be considered by the Regulator while determining tariffs.

ERCs may adopt following measures while regulating distribution utilities within their jurisdiction:

- ERC may direct all distribution licensees under its jurisdiction to immediately form DSM Cells. Such DSM Cells should be headed by officer of the rank not lower than Superintending Engineer and shall be supported by the suitable staff. Distribution licensees may adopt the structure presented in this Report.
- ERCs may also direct all distribution utilities to submit DSM Plans along with ARR/APR Proposals for next tariff period. These plans should at the minimum cover broad DSM Measures such ToD Tariffs, Power Factor incentives/ penalties, load factor incentives etc. The utilities may be further directed to undertake detailed Load Research and submit proposals targeting specific consumer categories with detailed cost – benefit analysis.
- All DSM related activities, even in the nature of general information dissemination activity, involve costs for the utility to plan, develop and

implement. Hence, ERC may develop a mechanism to enable utilities to recover the costs incurred in performing DSM related activities.

- It will be essential to develop guidelines for evaluating DSM options. The ERC may develop guidelines / methodologies to be adopted for integrating DSM options with supply side options.
- Regulatory intervention would be needed to ensure that all utilities under its jurisdiction follow a consistent set of methods and procedures for DSM plan, design preparation, period, load research, consumer survey, cost benefit assessment, technology assessments, etc. ERC may issue necessary guidelines for this purpose.
- SERC may monitor and evaluate the DSM programme implemented by the Distribution Utilities under its jurisdiction. ERC may specify the methodology for monitoring and evaluation programme.
- In order to incentivise Distribution Utilities to undertake DSM activities, ERC may develop suitable incentive mechanism as stated in earlier Chapter, which will enable sharing of benefits between the consumers and the utilities.

5.3 Role of Bureau of Energy Efficiency

Bureau of Energy Efficiency which has been set up under Energy Conservation Act 2001, is an expert body in the area of energy efficiency, energy conservation and demand side management. Expertise of Bureau may to be requested for the following special tasks:

- Bureau may urgently undertake development of Monitoring and Verification protocols for various DSM programmes which may be undertaken by utilities.
- Bureau may also assist Forum of Regulators in preparation of draft of a suggested Regulation for implementation of DSM and Energy Efficiency in distribution sector in India including the guidelines/criteria for evaluation of various DSM proposals. The draft Regulation so prepared may be adopted by FOR as model draft Regulations. All ERCs may use this model draft Regulation for framing Regulation for DSM and EE in their respective states.
- Agriculture sector is a very important consumer segment from the point of view of DSM. BEE is already facilitating various agricultural DSM programs. BEE may continuously interact with Forum of Regulators to ensure that the proposed DSM programs are implemented in the successful manner and also are also replicated in other states. ERCs should provide support necessary to ensure success of such programme.

- Similar steps may be taken by BEE in respect of pilots being tried in different parts of the country for DSM resource bidding.

5.4 Role of the State Governments

Though the DSM plans are to be organized by the utilities within enabling regulatory framework created by the State Commissions, a proactive support from the State Government concerned would be necessary for success of the DSM programmes. The following could be the key areas for intervention by the State Governments:

- The State Governments may consider financially supporting the DSM programmes aimed at such category of consumers which are receiving tariff subsidy from the State Governments. This would obviously be in the long-term interests of the state finances.
- The State Designated Agency (SDA) have a key role in implementation of the Energy Conservation Act and also in implementing various other schemes. The State Governments need to take steps to enhance effectiveness of the SDAs.
- The State Governments may also consider reduction in taxes on energy efficient appliances.

6 Implementation Methodology

In this Chapter, we have discussed two broad implementation methodologies i.e. utility wide DSM programme and specific DSM Resource Acquisition Programme. While the first involve general DSM initiatives such as tariff programme, latter involve focused DSM program such as agricultural pump-set improvement, feeder based DSM resource acquisition, etc. Further, implementation of specific initiatives has been considered with involvement of Energy Service Companies.

6.1 Utility Wide DSM Programme

The growth in electricity demand has resulted in additional pressure on distribution utilities to meet the electricity demand either through the energy conservation, demand side management or through fresh capacity addition. Accordingly, distribution utilities have embarked on large capacity addition plans. While demand side management measures don't appear to be the primary option in this regard, utilities are slowly looking at these options.

The utilities are resorting to short term measures such as higher tariff for excess consumption, introduction of Time of Day tariffs, and adoption of planned load shedding /load regulation measures to curtain consumption or tie over the crisis of energy shortfall. These measures are usually proposed by the utilities on the basis of heuristic analysis to the State Electricity Regulator.

It has been found that data is very rarely collected in scientific basis.

6.2 DSM Resource Acquisition

DSM Resource acquisition is a mechanism to implement DSM projects through customers, ESCOs, NGOs, equipment manufacturers/ suppliers, or other private sector organizations, with payment made to them by the utility for the resultant energy and load reductions. The reasons for distribution utility for establishing a DSM resource acquisition programme are as follows:

- Distribution licensee may not have skills and capabilities to implement project;
- Private sector organizations (and NGOs) may implement programmes more efficiently and effectively;
- It is possible to free up valuable resources of the distribution utility for various other more productive activities;

- It is also possible to develop broad based Energy Service Companies which would benefit society at large;
- It is possible to conduct competitive bidding for DSM Resource Acquisition as a result of which resources could be obtained at minimum costs;

The DSM Resource Acquisition approach may be very useful for quickly achieving peak load reductions and may therefore represent an excellent option for States that are experiencing severe capacity shortages. Further, the competitive bidding approach offers the advantage that it may cost less to acquire the resources using this approach because of the market competition.

Implementation of the DSM bidding process requires innovation in the design of a monitoring and verification process that is not too complex. Also an international survey of DSM bidding programmes showed that a significant amount of information is required from the utilities to implement exhaustive programmes. This approach is very new in the Indian context and requires a greater level of attention in the technical analysis and putting a strong context around the implementation strategies. Under this approach, analysis of the identified DSM resource is to be carried out. Based on the analysis, implementation options need to be developed. On development of implementation options, DSM Resource will be made available to interested parties for management and implementation of DSM measures. The successful bidder will be selected on the basis of DSM potential committed. Detailed description of each of above mentioned tasks for feeder/ substation based DSM Resource is presented below:

I. Selection of Representative Sub-Station and Feeders (~5 MW):

Following tasks need to be carried out for sub-stations and feeders, to identify sub-station or feeder as the case may be to identify suitability for DSM Resource Acquisition.

- Metered energy consumption and losses (at transformer and user meters);
- Customer segmentation (classification as per class and average unit rate based on billing analysis);
- Recovery of bills, billing cycle and revenue losses;
- Mix of residential, small commercial, commercial and industrial consumers;
- Load profile and analysis of peaking and non-peaking segments;
- An initial analysis of the increase in demand over the past five years;
- Preparation of a list of sub-metering and power quality enhancement hardware;
- Development of performance factors for the feeder (cost of supply of electricity expressed in Rs./unit and plotting it against the recovery)

II. Review of End-Use Applications and Assessment of Potential Impacts

To identify end use applications having technical potential, following activities carried out by the consultant:

- Assembling of data on end-use applications and equipment, and development of load profile for different applications;
- Analysis of current efficiency levels and possible efficiency gains with changed stock of key equipment / appliances;
- Development of energy savings scenario vis-à-vis investments and net utility benefits for feeder based avoided costs (capturing the gap between cost of supply and recovery);
- Quantification of utility benefits from energy (kWh) and demand (kW) savings;
- Assessment of avoidance of greenhouse gas emission;
- Development of standard offers (Rs./kWh and/or Rs./kW saved) estimates (slabs) for energy and demand savings scenarios;
- Definition of regulatory treatment of payments to be made by utilities for DSM resources;

III. Preparation of Bidding Documents

This step involves the development of standard technical bidding documents (technical and commercial) that can be used by participating utilities considering following:

- Identifying existing standards for typical end-use applications (domestic and area lighting, domestic water pumping; refrigerators and air-conditioners) with a focus on combined benefits and impacts on the power quality;
- Developing a list of complementary metering and power quality enhancement equipment required to be purchased and installed by the utility or the proposed bidder;
- Developing a monitoring and evaluation protocol to form a part of the contractual agreements (M&E protocol to include spot and continuous energy monitoring/accounting);
- Developing contracts/ agreements between the utility and prospective implementers;
- Developing a methodology for short listing of bidders;
- Drafting expression of interest, notice inviting tenders and bid evaluation criteria for proposed DSM acquisition methodology;

The DSM Resource acquisition approach may be very useful for quickly achieving peak load reductions and may therefore represent an excellent option for States that are experiencing severe capacity shortages. Hence, it is necessary to develop such innovative mechanism for induction of private sector in various DSM measures. Bureau of Energy Efficiency may explore various options to increase private sector participation in DSM and energy conservation area.

6.3 DSM Bidding – Current Status

Currently, DSM Bidding is being attempted at various places. However, it is noted that this bidding has not drawn favourable response from energy services companies. Two main reasons cited for lack of response are non – availability of suitable financing mechanisms and lack of clarity on monitoring and verification protocol. Moreover, the suppliers of the equipment and appliances specialise in their areas and are reluctant to participate in bidding for the projects which require supply of appliances from several product lines. It has already been suggested that BEE should undertake development of monitoring and verification protocol which could be used for both i.e. projects implemented by utility on its own as well as projects implemented through energy services companies. Such M&V protocol will enhance confidence of energy services companies in participation in DSM Bidding.

With regard to financing of projects, BEE is in the process of development of 'Energy Efficiency Financing Platform'. However, this effort may not be sufficient given huge demands of energy efficiency sector. Therefore, it is inevitable that ESCOs will have to depend on the commercial lending institutions. In order to make projects attractive for commercial lending, it is necessary that lenders have confidence in contracts executed by the ESCOs seeking funding. Further, it is necessary to bring uniformity in bidding processes being adopted by the utilities. Therefore, it is suggested that BEE may undertake develop of Standard Bidding Documents as well as contracts for DSM Bidding.

7 Capacity Building of Utility

Except few large urban centres and State of Orissa, distribution utilities in the country are owned by the respective State Governments. This ownership structure is expected to continue for foreseeable future. Further, power sector is characterized by the demand-supply gap and inefficient operations. Barring few measures such as Time of Day Tariffs, PF incentives, distribution utilities have not implemented any specific DSM measure. As a result, distribution utilities in the country have very limited knowledge and understanding about DSM. These utilities are not in a position to conceive, formulate, design, plan, implement, monitor and evaluate DSM programs/projects. Organizationally, they neither have necessary infrastructure nor skill-set to undertake DSM activities. If utilities in India are to capture the available DSM potential on a sustained basis, utilities would need to institutionalize the DSM process by setting up a DSM Cell/Department within the utilities. Such a Cell or department would need to be staffed with dedicated staff and would need to be supported by dedicated infrastructure, resources and budget.

Utilities could either undertake all the DSM functions of planning, designing, implementing, monitoring and evaluating DSM programs by themselves or decide to outsource some or all functions. The strategy of the utility in this regard will dictate the DSM Cell structure, staffing and resource requirements. Utilities that wish to carry out DSM functions in-house will need to be staffed and structured to take care of various aspects such as engineering services, data services, load research, marketing and awareness, energy management services, project implementation services and administrative services. Depending on the nature and size of utilities DSM effort, suitable staff will need to be inducted, assigned or recruited for each of this aspect. It is, however, envisaged that, irrespective of how the utility wishes to perform its DSM function, to begin with, the DSM Cell within the utility would only need to be staffed with core staff of three individuals. One to Head the DSM Cell, one to perform load research, load shape analysis, market research and program evaluation tasks, and one to take care of DSM program design and implementation work. If the utility decides to outsource majority of DSM functions, then the DSM Cell would also require the services of a "Contracts" person whose job would be to manage/administer all "contracts" with respect to outsourced DSM work? Listed below are the possible tasks and the competencies that each of the three core staff would need to have.

7.1 Structure & Function of DSM Cell

7.1.1 DSM Cell Head

DSM Cell Head will have to perform following Tasks:

- Communication with Senior Management regarding DSM
- Obtaining necessary support and resources for the DSM Cell
- Understanding of Corporate Objectives/Strategy
- Evaluating and Choosing DSM Programs
- Liaison with generation/power planning, transmission & distribution
- Developing partnerships with ESCO's and Financing Companies
- Relationship building with customers, industry associations and trade groups

Skills & Knowledge Required:

- Leadership and Communication Skills
- Knowledge of business planning
- Understanding of power sector regulatory process and knowledge of EA-2003, Energy conservation Act 2001, and regulations made under these Acts
- Understanding of Generation, Transmission and Distribution Planning processes and data needs
- High level understanding of DSM and its role in all aspects of utility planning
- Customer Service and Marketing Skills
- Project management skills, including EE/DSM project appraisal skills
- Knowledge and understanding on using market research for DSM planning
- Knowledge and understanding about concepts of load shapes and diversity
- Value of load research and market research in utility planning
- Understanding of utility revenue requirements and tariff determination concepts and process
- Understanding and knowledge about measurement and verification (M&V) of savings obtained as a result of DSM/ energy efficiency projects
- Knowledge of Utility Accounting and Economics
- Negotiation Skills
- Value of load research and market research in utility planning

7.1.2 Research Analyst

Research Analyst will have to perform following Tasks:

- Load Research, Load Shape Analysis & Market Research
- Design and Implement program evaluations
- Participate in Choosing program options and designing DSM Programs

- Conduct pilot program evaluations

7.1.2.1 ***Skills & Knowledge Required:***

- Quantitative analysis/sampling design skills
- Understanding concepts of load shape and diversity
- Knowledge of DSM program evaluation methods
- Survey design & Knowledge of secondary research sources
- Ability to design program evaluations
- Research design methods
- Understanding of utility billing process and systems
- Knowledge of existing utility application process and databases
- Forecasting methods

7.1.3 ***Programme Designer/Implementer***

Research Analyst will have to perform following Tasks:

- Identify customer needs relative to energy use
- Identify opportunities for DSM programs based on customer knowledge/market research
- Determine program types to meet customer needs/achieve load shape objectives
- Assist researcher in conducting secondary research
- Prepare utility, technology, and customer data for DSM analysis
- Evaluate options and choose programs for further design
- Design programs, including delivery channel, partnership development, administrative procedures, promotion plan and evaluation plan
- Monitor pilot and demonstration programs
- Manage program implementation
- Manage any bid development, selection and contract management

Skills & Knowledge Required:

- Specific understanding of DSM principles
- Knowledge of customer service principles
- Understanding concepts of load shape and diversity
- Understanding purposes for load research
- Appropriate applications of market research in DSM planning
- Understanding of DSM program types
- Knowledge of Advertising and Promotion
- Knowledge of equipment and processes for appropriate sector(s)

- Knowledge of methods to calculate energy use in buildings, processes, appliances, lighting and other equipment in appropriate sectors
- Knowledge of energy use and appropriate energy efficient technologies
- Ability to conduct secondary research
- Knowledge of various methods of DSM program evaluation
- Understanding of utility billing process and systems
- Knowledge of existing utility application process and databases
- Understanding of financing methods for DSM

7.2 Capacity Building of DSM Cell

Development of DSM Cell is the first important step that utility should do and further training and capacity building of the personnel in that cell would be the second most important step. The positions in the DSM Cell provide an indication of the type of capacity building that would be needed for individuals occupying these positions. Thus, if the specific individual occupying the Head of DSM Cell position does not have say knowledge of business planning, customer service and marketing skills then these two areas get automatically recognised as capacity building areas for that specific individual occupying the position of Head of DSM cell. For the DSM Cell, it is envisaged that basic training on following topics would be needed. In the beginning of the formation of DSM cell, training may not be required on all the topics listed below. However, the training will need to be phased as per the progress and size of the utility's DSM efforts.

- **Comprehensive Course on DSM covering:**
  - DSM Basis & introduction to DSM
  - DSM overview and process
  - DSM plan preparation and elements
  - Broad DSM program design issues
  - Identification of Customer needs
  - Developing the program mix and target markets
  - DSM program design features
  - DSM program delivery and marketing strategies
  - DSM program implementation elements
  - DSM program monitoring and evaluation
  - DSM Case Studies

- Data requirement, collection and data base creation for DSM
- Load Research and analysis of Load Research data
- Standards and labelling for energy efficiency

- Procurement Practices (Life Cycle Costing)
- Energy Efficient Technologies and project implementation;
- ESCO concepts and Operation of ESCO;
- Measurement & Verification of Savings;
- Financial analysis of energy efficiency projects;
- Energy Efficiency project financing, including performance contracting;
- Introduction to software for DSM analysis;
- Market Research methods

To begin with, DSM cell personnel need to be provided training at least in DSM, Load Research, Data base Creation and Measurement & Verification protocols.

It is also necessary that information about various DSM implementations is circulated among various utilities. This will help utilities identify programmes suitable for implementation in their areas. Apparently, BEE has already undertaken exercise of collecting case studies on DSM Implementation in India as a part of 'International Energy Agency – Demand Side Management Implementing Agreement'. BEE is requested to share those case studies initially with ERCs and subsequently with all utilities in the country. BEE is also requested to develop outreach programme so that learnings from various programmes under IEA – DSM are available to Indian utilities.

8 Special Utility Measures for Promoting Energy Efficiency in Agricultural Sector

According to the General Statistics published by Central Electricity Authority (CEA) for 2005-06, sales to agriculture category was 90292 GWh out of total 411887 GWh which represent 22% of total sales. Further, according to 17th Electric Power Survey of CEA, sales by agriculture category are expected to contribute 20.23% of total sales by the FY 2011-12. The agriculture category is expected to be one of the most important categories of consumption of electricity. Further, aggressive rural electrification policy is likely to result in demand for agricultural connections.

The Agricultural tariff has grown from 21.2 Paise/Unit from FY 1996-97 to 41.6 Paise/Unit in FY 2001-02 while other categories such as industrial have shown increase from 275.5 Paise/Unit to 378.8 Paise/Unit during the same period as per the Annual Report on Working of State Electricity Board by Planning Commissions. In this regard, Agriculture sector assumes significance from the point of view of DSM not only because it is dominant category of consumption but also because of the fact that the tariff to this category of consumption is the lowest in probably all States in the country. As a result, there is no incentive for agricultural consumer to improve efficiency of equipment installed by him. Further, it has been observed that inefficiencies such as very high technical losses, poor voltage profile, etc in agricultural supply are very high. These inefficiencies, if factored into cost of service, result in effectively very high cost of service.

To capture the energy efficiency potential in the agricultural sector, two distribution utilities like Noida Power Company Limited (NPCL) & Southern Power Distribution Company of Andhra Pradesh Limited (APSPDCL) have implemented pilot projects. Brief description of efforts taken by the both the distribution utilities is presented below:

- **Pilot Project on EE & EC in Agricultural Sector by APSPDCL:**

The main objective of implementation of this pilot DSM project was to assess the potential of energy conservation by implementing various energy efficiency and energy conservation measures in Agricultural Pump sets and to identify the impact in the form of overall load reduction of Kadapa circle of APSPDCL. APSPDCL short listed twenty three agricultural pump sets of different capacity and then implemented various energy efficiency and demand side management measures on eighteen pump sets. APSPDCL

carried out performance evaluation of five 5 HP DSM sets with and without DSM pump sets to assess the energy conservation potential. Monitoring & Evaluation results showed that there was a 15.8% saving in energy consumption and 28% increase in the discharge in the newly adopted efficient system. Also increase in the discharge resulted reduction in the operating hours of the pump sets for the same extent of the land irrigated.

- **Agricultural Pump set Efficiency Improvement Programme by NPCL**

Noida Power Company Limited (NPCL) has been undertaking several DSM initiatives since 1996. The agricultural sector consumed about 12% of the total electricity demand of NPCL. Distribution system servicing the sector was characterized by the high technical losses as well as wastage of energy in running pump sets (7500 units per agricultural consumers), low revenue generation (selling cost 46 paisa per unit against purchase cost of 297 paisa per unit) and high cases of theft and pilferage. NPCL partnered with companies manufacturing energy efficient pumps and other equipment and financial institution for the implementation of this pilot DSM projects in agricultural sector. The main goal of undertaking Agricultural Pump Set Efficiency Improvement Programme was to achieve energy savings by as much as 59% from improving electrical performance of motor through high efficiency, maintaining unity power factor & to reduce line loss by increasing HT: LT ratio. Implementation of this pilot programme resulted in improved water discharge (from 17 to 21 litres/sec), cheaper cost of electricity due to reduced demand and metering, reduced peak load and energy demand, fostered customers relations & also contributed environmental benefits to the society.

8.1 Attractiveness of agriculture sector for DSM& EE measures

Overall agricultural supply is characterized by:

- Low reliability due to high cost of service and low or no revenue;
- Use of inefficient pumps by farmers due to lack of incentives, given the low or no cost power supply;
- The average extraction of water by such pumps are less than half that of China and is about 1.8% that of USA. As a result, number of pump sets required for the same output is multifold. Today, India has the highest number (at 20 million) of installed ground water extraction pumps in the world*;

* This part of the report is based on the research and implementation experience of PA Consulting under the WENEXA project of USAID (India).

- The unsustainable growth rate, low prices inevitably lead to a high subsidy burden on states.

These characteristics make agriculture sector particularly attractive to both utilities and State Governments for implementation of DSM measures. Further, given low tariffs and consequent low cash outflow, it is obvious that agricultural consumer will not make any investment in improving energy efficiency of the equipment installed by him. Therefore, the responsibility for the same has to be borne by the utilities and/or the State Governments in the interest of overall efficiencies in the sector as well as to protect their subsidy budgets.

8.2 Opportunities for EE & DSM in Agricultural Sector

Agricultural DSM promises immense opportunity in reducing the overall power consumption, improving efficiency of ground water extraction and reducing the subsidy burden on the states without sacrificing the service obligation to this sector. Several energy efficiency measures can be employed in agricultural pumping end use application. Possible energy saving measures emerging out of several studies studied by the team have been descried below:

8.2.1 Retrofitting of Pump-sets

Several demand side management and energy efficiency projects (Pilot Agricultural Pumpset Efficiency Improvement Programme of NPCL & APSPDCL, Pilot study by TERI & Preliminary Energy Audit of Agricultural Pumpsets in the State of Chhattisgarh by ABPS Infrastructure Advisory) executed to identify the areas where energy is wasted and identification of measures to improve energy efficiency in a pumping system. This research has shown that efficiency of energy utilization in pumping system is low due to inefficient operation & maintenance practices, poor system design, over sizing of equipment, improper selection of equipment, degradation of equipment due to age etc.

The average efficiency of the agricultural pump sets was found to be in the range of 20 – 25% only. It was possible to achieve saving potential in the range of 30 to 35% through major and minor retrofitting measures such as:

- Substitution of high friction GI/MS pipes by low friction PVC pipes;
- Use of low-resistant foot-valves;
- Improving the efficiency of the pump and the prime mover;
- Replacement of undersized pipes and fittings;
- Proper sizing of motors and pumps; and
- Use of efficient couplings between motors and pumps;

8.2.2 *Power Factor Correction*

Agricultural pump sets, which operate mostly at a power factor of about 0.7 or below, result in high losses, voltage drop of the line as these draw more reactive power. A power factor of 0.9 or more can reduce these effects significantly. An adequate power factor can be obtained either by using good quality motors or providing reactive power compensation in the transmission lines / by installing proper size of capacitors on pump and motor assembly. The subject assumes considerable importance in the view of increase in the demand for agriculture pump sets.

A pilot project was undertaken by TERI with the help of the Ministry of Power, Government of India, for the installation of LT (low tension) switched capacitors on a sample of distribution transformers supplying power to agriculture pump sets in Punjab and Tamil Nadu. A pilot demand side management project for the improvement of the power factor and energy efficiency of agricultural pump sets was also undertaken by Noida Power Company Limited. The finding of the studies reveals that there is considerable scope for improving the power factor, which would result in lower losses.

The improvement in power factor would not only lower the losses but would also result in availability of more KVA capacity of transformer, and reduction of KVAr requirement. Considering the economic benefits, the reactive power compensation by switched or fixed capacitors at the consumer or sub-stations end offers the most cost effective way to avoid new generation capacity.

8.2.3 *Load Management*

Demand Side Management, through load shifting from the peak demand to the off-peak period has the potential to reduce the peak demand and avoid the need for fresh capacity addition. Load Management through segregation of agricultural load and supply of power during the off peak period; regrouping the farmers and supply of power through roaster arrangements and by imposing time of day tariffs will substantially flatten the peak load and obviate the need for new capacity.

One of such programme was initiated by Government of Gujarat and implemented by Uttar Gujarat Vij Company Limited (UGVCL). UGVCL was facing the power shortage during the morning peak hours and not able to supply quality power to all the consumer categories leading to load shedding. In order to supply quality power for twenty four hours for development of all domestic, commercial and industrial consumers and also continuous and reliable eight hours power supply to agricultural sector for the development of farm sector, Government of Gujarat initiated "Jyotigram Yojana". In this

Scheme, Government of Gujarat decided to separate agriculture pump sets connection from the domestic light & fan (DLF) connection by constructing separate 11 KV feeder for agriculture pump sets for effective demand management. The main objective of implementing this demand side management programme was to flatten the load curve with enough margins for morning peak and evening peak by arranging the time schedule of Agricultural feeders round the clock. Erection of separate HT and LT lines and rearrangement of power supply schedule of agricultural feeders resulted in the maximum and minimum demand of 1850 MW/ 1450 MW compared to the 2100 MW / 900 MW and flatten load curve through out the day. This program has been successfully completed in the state and has achieved very good results.

8.3 Dimensions of the Challenge

The simplistic replacement methodology of inefficient pump by efficient one is fraught with many practical impediments. Some of them are listed hereunder:

- **Technological**: The desired working of efficient pumps is contingent upon a reliable power supply; else the promised output may not be available. A reliable distribution network, like HVDS, in a rural area becomes of dominant interest. In addition, supply chain of efficient pumps, adequate maintenance expertise of such pump-sets in rural areas is the associated issue linked to the technology intervention.
- **Economics:** The efficient pumps come with a high initial cost. Given the lack of incentives of the farmers on conservation of efficient use of electricity, the first cost bias enhances the barrier. Concomitantly, the low or no cost of electricity and uncertain availability of government subsidy does not enthuse the utilities either to step up efforts towards up gradation of rural distribution network.
- **Analysis of location specific baseline:** Potential savings are location-specific requiring adequate up-front analysis, extensive inspection, measurement and analysis of the existing stock of pumps, etc. Significant amounts of data collection are necessary to set a baseline to measure whether benefits were achieved and sustained. Measuring success often requires data on the number of acres under irrigation, total rain fall, cropping patterns, the type of irrigation (e.g. flood vs. drip) and other factors that influence the need for water and, thus, the amount of electricity used.
- **Monitoring:** this perhaps reflects the greatest concern in effective implementation of the Ag DSM. This is because of the following reasons:
  - Lack of incentives to farmers and utilities;
  - The quantification of results requires metering, which in the present regime of subsidy, is unlikely to be accepted by the farmers;

- Lack of awareness and information as well as low appreciation of the need to conserve water and electricity for sustainability.

- **Risks:** The above challenges inevitably enhance the risk associated with it and thereby preventing private investment on the performance contracting pay back model. The risks that need to be ring fenced are:
  - **Monitoring Risks**: Due to absence of standardized and verifiable protocols for monitoring, lack of incentives of key stakeholders, etc.
  - **Commercial Risks:** Due to lack of adequate financing, high upfront investment, uncertain revenues and risk mitigation instruments (like ESCROW);
  - **Political Risks:** As a result of the political economy of the agricultural sector poses a huge risk particularly in metering of feeders, individual pumpsets. Lack of collective action at the farmer level adds to this risk.
  - **Regulatory Risk:** Due to absence of regulatory incentives, oversight and uncertainty over favourable policy (if any)

8.4 Financing of Agriculture DSM & EE

Agriculture sector assumes significance from the point of view of DSM not only because it is dominant category of consumption but also because of the fact that the tariff levied to this category of consumption is probably the lowest in probably all States in the country. Distribution Utilities make loss on every unit of energy sold to this category of consumers and therefore need to aggressively target these consumers for DSM measures.

Distribution Utilities often lack necessary institutional capacity and funds to develop practical approach for undertaking energy efficiency and demand side management programmes. Various research and implementation of pilot projects identified that there is a significant potential exists for the improvement of energy efficiency by implementation of integrated demand side management programme. Hence, to grab the untapped potential, it is necessary to develop suitable financing mechanism for the development of agricultural specific demand side management programme. National Action Plan on Climate Change launched by the Prime Minister mandate Bureau of Energy Efficiency with creation of mechanisms that would help finance demand side management programme in all sectors by capturing future energy savings and developing fiscal instruments to promote energy efficiency.

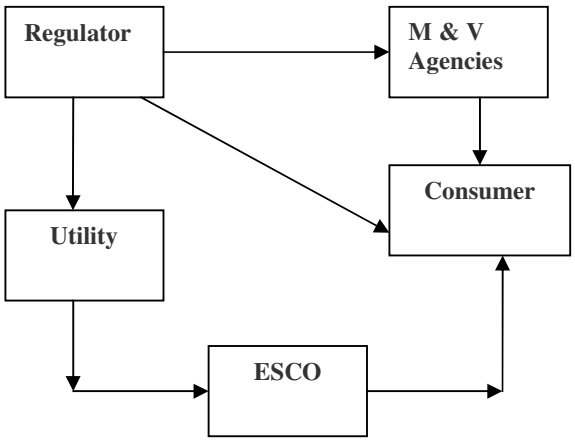
Consider that given estimate of 20 million pumps and an average cost of replacement of Rs. 30,000 per pump, the overall investment requirement is close to Rs. 30,000 Crores, presuming that 50% of the pumps may actually get covered initially over a 2-3 year a

period. To make such a huge investment, the Central & State Government and Bureau of Energy Efficiency must create a favourable policy environment for development of Energy Service Companies. It is possible that distribution utilities along with the Energy Service Companies carry out such a specific task such as replacement of agricultural pumpsets with efficient pump sets across predefined territory. Distribution Utilities may also identify the integrated demand side management projects and implement the same by engaging ESCOs through DSM Resource acquisition mechanism in which payment can be made to them by utility for the resultant energy and load reduction.

Also, for the implementation of the load management programme such as agriculture feeder separation programme can be implemented by engaging private sector participation through DSM Resource Acquisition mechanism. BEE, Central Government and State Government may create favourable policy environment to encourage private sector participation and to bring in financing for the implementation of energy efficiency and demand side management programme.

9 Scheme for DSM Implementation

There is an urgent need to bring together all possible stakeholders to address all the issues for the development and successful implementation of model specific to agricultural sector. Potential model and brief description of the same in the agricultural sector is presented below:



In this model, Regulatory Commission may give suitable directive to distribution utilities to carry out detailed load research and sample study for identification of options for energy conservation measures and estimation of savings though implementation of the same. Regulatory Commissions may also ask distribution utilities to submit the detailed cost benefit analysis for each identified energy conservation measures. Based on the analysis of the report, Regulatory Commission may give suitable target to the Distribution Utilities under its jurisdiction for implementation of identified integrated demand side management programme for certain percentage of consumers in that particular category.

Based on the directives given by the Regulatory Commissions, Distribution Utilities may carry out detailed load research programme to ascertain the pattern of consumption for the identified consumers before implementation of integrated demand side management programme. Distribution Utilities may formulate the baseline for the required water level depending upon the cropping pattern and base level of electricity needed in consultation with experts in the field. Distribution Utilities may launch innovative mechanism called demand side management bidding by inviting ESCOs and Equipment Manufactures / Suppliers to implement DSM projects through ESCOs and link payment made to them for

the resultant energy and load reductions. Distribution Utility will install all necessary metering devices for the measurement of the impacts of the implemented DSM project and submit the implementation status to the Regulatory Commissions for the targeted number of consumers.

For the successful implementation of the programme, Regulatory Commissions may allow distribution utilities to include demand side management related expenditure as a part of the Annual Revenue Requirement by carrying out suitable amendments to the Tariff Regulations. Regulatory Commissions may also develop suitable incentive mechanism for utility to allow them to earn additional return on equity (say 1% incremental Return on Equity) for implementation of DSM/EE programme. Regulatory Commission may also develop two part tariff structure to ensure recovery of the investment made by the distribution utilities and ESCOs. Regulatory Commission will have to monitor and evaluate the DSM programme implemented by the Distribution Utilities. Regulatory Commission will depute M&V agencies to find out deviation in the implementation from the targeted one.

10 Summary of the Recommendations

10.1 It was felt by the Group that the Demand Side Management involves actions at the level of consumers which would ultimately depend upon numerous factors. These recommendations therefore focus on the necessary regulatory interventions which have to be primarily in the areas of appropriate pricing of electricity and enabling regulatory framework for consumer-utilities partnership. Operational issues should be responsibility of the utilities.

10.2 The SERCs should direct all the distribution utilities to constitute a DSM Cell within their organizations, if not already constituted.

10.3 The SERCs should also identify some of their staff for handling the DSM aspects.

10.4 The SERCs may also direct all the distribution utilities to submit DSM Plans alongwith ARR rates for the next tariff period. Measures for increasing the consumer awareness about the importance of DSM should also be included in the Plans.

10.5 The Forum of Regulators should organize training courses in the area of DSM for capacity building of the personnel of the SERCs, the staff of DSM Cells of the utilities in which the representatives of the State Governments may also be invited.

10.6 The recovery of cost of approved DSM programmes should be allowed as pass-through in ARR. It would be appropriate that the State Commission may indicate a percentage of the ARR to be utilized for DSM programmes. This percentage could be worked out on the basis of the indicated savings from the power purchase costs and peak clipping.

10.7 The SERCs could also consider appropriate tariff interventions to support DSM. These could be TOD tariffs, power factor incentives and penalty/reactive power charges, load management charges, rebate incentives for energy efficient buildings/appliances and differential pricing for agriculture consumers. Special tariffs may also be designed to induce the concerned authorities towards

installation of star rated energy efficient pumpsets in the applications which involves heavy pumping such as municipal water works, sewage works and lift canals.

10.8 The SERCs could also consider giving a slightly higher return on equity for the investments made towards DSM measures. This would be largely offset by reduction in short-term power purchase costs. The State Commissions may provide for appropriate incentives for the management and staff of the utilities, particularly in case of Government owned utilities.

10.9 Distribution utilities may be encouraged to create their own energy service companies as unregulated activity.

10.10 It is recommended that the State Governments may also take proactive role in promoting DSM. They may consider the following:

- The State Governments may consider financially supporting the DSM programmes aimed at such category of consumers which are receiving tariff subsidy from the State Governments. This would obviously be in the long-term interests of the state finances.
- The State Designated Agency (SDA) have a key role in implementation of the Energy Conservation Act and also in implementing various other schemes. The State Governments need to take steps to enhance effectiveness of the SDAs.
- The State Governments may also consider reduction in taxes on energy efficient appliances.

10.11 Bureau of Energy Efficiency may be requested for the following tasks:

- Bureau may urgently undertake development of Monitoring and Verification protocols for various DSM programmes which may be undertaken by utilities.
- Bureau may also assist Forum of Regulators in preparation of draft of a suggested Regulation for implementation of DSM and Energy Efficiency in distribution sector in India including the guidelines/criteria for evaluation of various DSM proposals. The draft Regulation so prepared may be adopted by FOR as model draft Regulations. All ERCs may use this model draft Regulation for framing Regulation for DSM and EE in their respective states.

- Agriculture sector is a very important consumer segment from the point of view of DSM. BEE is already facilitating various agricultural DSM programs . BEE may continuously interact with Forum of Regulators to ensure that the proposed DSM programs are implemented in the successful manner and also are also replicated in other states. ERCs should provide support necessary to ensure success of such programme.
- Similar steps may be taken by BEE in respect of pilots being tried in different parts of the country for DSM resource bidding.

10.12 It is also necessary that information about various DSM implementations is circulated among various utilities. This will help utilities identify programmes suitable for implementation in their areas. Apparently, BEE has already undertaken exercise of collecting case studies on DSM Implementation in India as a part of 'International Energy Agency – Demand Side Management Implementing Agreement'. BEE is requested to share those case studies initially with ERCs and subsequently with all utilities in the country. BEE is also requested to develop outreach programme so that learnings from various programmes under IEA – DSM are available to Indian utilities.

10.13 In a number of states, a large proportion of supply is made to the agricultural consumers at highly subsidized rates. The utilities may be encouraged to develop DSM Plans for inducing the farmers to install energy efficient pumpsets. The scheme being developed by Haryana utilities (as briefly mentioned in the Chapter-1 of this report) could be one example. Such schemes would require support and approval from the SERCs.

11. ANNEXURE

MINUTES OF THE MEETING OF THE FOR WORKING GROUP ON "DSM AND ENERGY EFFICIENCY"

Venue : CERC, Conference Room, SCOPE Complex
Lodhi Road, New Delhi.

Date : 10th July, 2008

Members Present :

(1) Dr. Pramod Deo, Chairperson, CERC/FOR
(2) Shri Berjinder Singh, Chairperson, DERC
(3) Shri K.P. Gupta, Member, GERC
(4) Shri A. Velayutham, Member, MERC
(5) Dr. Ajay Mathur, Director General, Bureau of Energy Efficiency (BEE)
(6) Shri Alok Kumar, Secretary, CERC
(7) Shri Vijay M. Deshpande, Regulatory Expert (DSM), MERC
(8) Shri Sushanta K. Chatterjee, Deputy Chief (RA), CERC.

Initiating the discussion, Deputy Chief (RA), CERC briefed about the constitution and terms of reference of the Working Group on "DSM and Energy Efficiency" and on the background note prepared and circulated by FOR Secretariat to the Members of the Working Group.

2. Dr. Ajay Mathur, Director General, BEE presented the salient features of the National DSM Action plan prepared by BEE, with specific focus on utility driven DSM measures. Talking about sector specific DSM programmes, Dr. Mathur emphasised the need for utilities to encourage, under the oversight of the SERCs, implementation of DSM in agricultural and municipal sectors, as well as use of solar water heaters as replacements for electric geysers/water heaters. Dr. Mathur mentioned that, agricultural DSM would help in reducing the subsidy requirement because of savings in electricity supply. Dr. Mathur also mentioned that municipal DSM could reduce electricity bills of municipalities by as much as 50%. Dr. Mathur further mentioned that Government of

India, through BEE, has initiated agricultural and municipal DSM programmes which would help in developing a business model that can be used by utilities in capturing DSM potential in these two sectors. Talking about market transformation based DSM programmes, Dr. Mathur also discussed about the benefits of following the Building Code in terms of average reduction in energy use to the tune of 40-50%.

2.1 Dr. Mathur also highlighted certain issues which he felt were important and needed attention of the Regulators viz.,

(a) Development of a mechanism to enable utilities to recover the costs incurred in performing DSM related activities. Expenses in accordance with the mechanism set up for this purpose may be considered in ARR for tariff determination.
(b) Guidelines for evaluating DSM options and integrating DSM options with supply side options.
(c) Suitable incentive mechanism, which will enable sharing of benefits between the consumers and the licensee.

3. MERC representative made a presentation on "Maharashtra : DSM initiatives by MERC" and highlighted the various initiatives taken by MERC in promoting DSM and energy efficiency. He informed that MERC had directed under section 23 of the Electricity Act, 2003, implementation of several initiatives to promote adoption of Energy Conservation through utility DSM programmes. It was also informed that the two critical prerequisites that were put in place by MERC to facilitate Maharashtra utilities in undertaking DSM were – issuing regulatory directives for undertaking DSM and allowing all DSM related costs as pass through in the ARR for all Maharashtra licensees. It was also mentioned that the MYT tariff orders of April/May 2007 laid emphasis on having proposals on energy conservation and energy efficiency as an integral part of utilities long term power procurement plans. It was further mentioned that MYT tariff orders also directed the utilities to take up DSM initiatives and *Load research* on a sustained basis and as an integral part of operations. A copy of the presentation made by MERC is **enclosed** as Annexure-I.

4. Shri K.P. Gupta, Member, GERC also briefed the Group about the various initiatives taken by the utilities in Gujarat in regard to DSM. A copy of the initiatives taken is **enclosed** as Annexure-II.

5. After discussion, there was general consensus on the following :-

(i) Every distribution company (Discom) must create a DSM cell to plan, develop monitor and implement DSM initiatives on a sustained basis, and staff this DSM cell with dedicated staff and equip it with dedicated resources and budgets.

(ii) Every Discom should be directed to prepare DSM plan and provide budget for its implementation.

(iii) Recovery of cost on DSM should be allowed as a pass through in ARR. Pre-identified sources of funds such as penal interest on late payment of bills, load management charges could be earmarked for financing DSM activities.

(iv) DSM bidding mechanism should be developed and institutionalized for implementation of DSM projects aiming at targeted saving in terms of MW of load avoided and/or kWh of energy purchase avoided in identified places such as distribution transformers, feeders, or large bulk consumers such as airports, commercial complexes, etc. The cost could be partly funded by DSM plan of the utilities.

(v) Results of DSM programmes/projects should be got verified by third party measurement and verification experts.

(vi) Load research should be taken up systematically because it would only provide data on impacts of DSM initiatives in terms of savings in energy and reduction in demand, but it would also provide insight in to consumer load profile and data on cost of service, data on profitability analysis, and would also help Discoms in rate design, load forecasting, load control and load management.

(vii) Power procurement plans should take into consideration the projected feasible savings through Energy Conservation and Energy Efficiency measures. Capacity building of staff of the SERCs and the utilities through domestic/international

visits to places where DSM has been successfully implemented should also be included in DSM plans.

(viii)BEE should promote development of ESCOs for implementing DSM projects, especially in areas of energy efficient air conditioning in large office/commercial complexes and municipal street lighting.

(ix) SERCs may provide a special rebate in tariff to those building premises (both old and new) which are certified (on annual basis) by agencies authorized by BEE, to be compliant with ECBC.

(x) Concerned authorities could consider mandating installation of star-rated energy efficient pump sets in those areas where continuous heavy pumping is required such as municipal water works, sewage works, and lift canals.

6. The Working Group desired that details on the following may be placed before it by the secretariat for consideration in its next meeting :-

(a) A suggested list of functions of DSM Cell in utilities.

(b) Possible incentives to utilities for motivating them to undertake DSM activities.

7. It was decided that in the next meeting of the Working Group, some utilities, preferably Dakshin Haryana Vidyut Nigam Limited, Haryana and Reliance Energy Limited (REL), Mumbai as well as Delhi who have done some work on DSM be invited to make presentation before the Working Group.

8. It was also decided that the next meeting of the Working Group would be held in the second week of August, 2008.

The meeting ended with a vote of thanks to the Chair.


RELIANCE Energy
Anil Dhirubhai Ambani Group
DSM Initiatives at Mumbai
Presentation at Forum of Regulator Meeting
September 19, 2008


RELIANCE Energy
Anil Dhirubhai Ambani Group
DSM Initiatives at Mumbai & Delhi
Flow of Presentation
Reliance Energy Overview
DSM Team Composition
DSM Initiatives & Analysis
Issues
Regulatory Interventions

RELIANCE Energy
Anil Dhirubhai Ambani Group

Reliance Energy Overview

- Customer Base:
  - Consumers - 2.7 Million
  - Population covered - 9 Million
- License Area:
  - Spread - 384 Sq. Kms
  - 70 % of total Mumbai Area.
  - Local Area - Eastern & Western Suburbs of Mumbai and part of Thane District.
- Operational Parameters:
  - Max. Demand – 1443/1000 MW
  - Min Demand - 816/374 MW
  - Energy Input - 9207 MU
  - System Reliability – 99.9 %

3 confidential

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Background

- **2005**: Commission under Sec. 23 issued directions to restrict usage of power during peak hours.
- **Interim**: LMC/LMR introduced and restricted supply to hoardings, neon signs and Building floodlights and temporary supply for exhibitions/outdoor functions.
- **Directives** -
  - To conduct CFL pilot program through direct, subsidized purchase/sale of CFLs.
  - To interact with Local authorities to examine immediate measures for flattening of water & sewerage pump load curve and to improve pumping efficiency.
- **2006-2008**: Commission directed to -
  - all Utilities to undertake Mass Campaign on Energy Conservation.
  - conduct Load Research Activity.
  - establish dedicated DSM Team.
  - formulate DSM Short & Long term plans.
  - provide budget provisions for DSM activities.
  - target power purchase reduction through DSM (0.1% (07-08) & 0.3%(08-09 of input power)
  - quarterly Review of progress of DSM Implementation

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Demand Side Management (DSM) Plan

Load Research	Approach	Program Design & Implementation	Monitoring & Verification

• To know what contributes to peak.
• Helps designing sustainable Programs.
• Supports Regulatory & Internal Approvals
	• Define Objectives.
	• Strategy-
	  • Flattening load curve by peak clipping.
	  • Strategic Energy Conservation to reduce purchase.
	  • Concentrate on cross subsidised sector
		• Manpower & resource Building
		• Identification of areas of DSM.
		• Designing DSM Programs.
		• Weighing the programs based on DSM tests.
		• Project based Implementation.
			• Constant Monitoring.
			• Measurements.
			• Field verifications of impact.
			• Learning and course corrections, if required.

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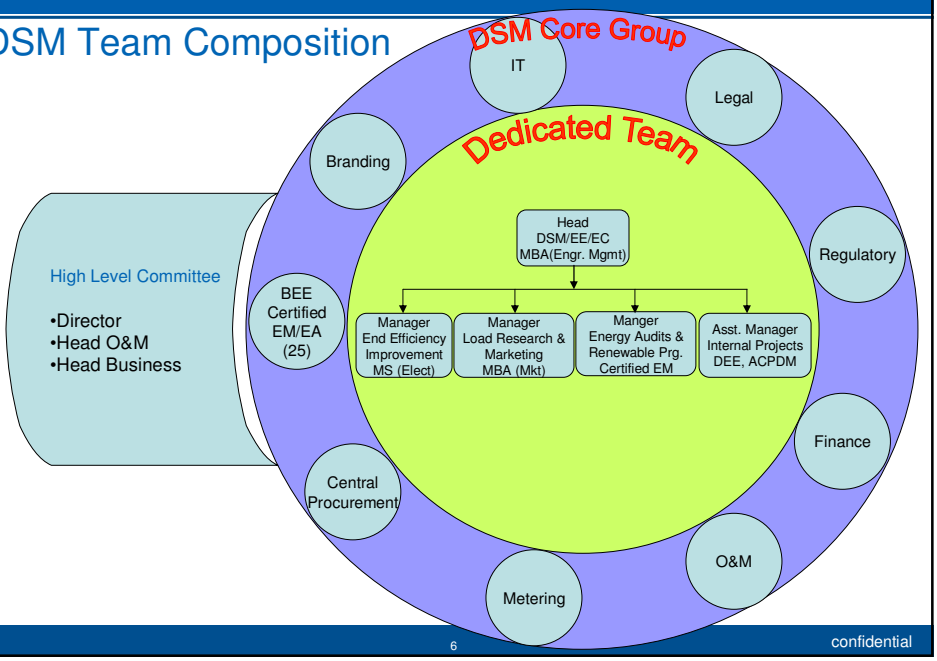
DSM Team Composition



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Load Research

What is Load Research:

It is the activity of collection and analysis of the load patterns of customers.

Objectives:

- Understand and predict how customer loads behave.
- Establish the correlation of consumer appliances with System Load Curve.
- Prioritize the end use DSM interventions.

Reliance Energy Load Research:

- Sample size 10,000.- Residential & Small Commercial Consumers
- LR Period Mar 2008 to May 2008.
- Analysis completed, report under preparation.

Outcome:

- Residential/Commercial DSM Potential identified.
- End use efficiency improvement project design developed.

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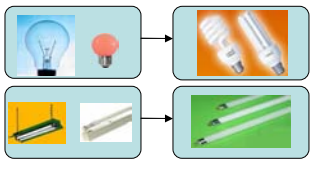
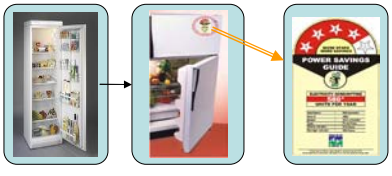
Demand Side Management (DSM) — Identified Potential

Domestic Sector

Sector	Program	Cons'r base	Existing		Proposed		Av. Nos per House	Hours of use	Usage Days	Diversity factor	DSM Potential	
			Tech'gy	Rating	Tech'gy	Rating					Demand MW	Energy MUs
Domestic	Efficient Lighting - CFLs	2200000	Incandescent lamps	0.06	CFLs	0.01	1.5	3	300	25%	38	137
	Efficient Lighting - FTLs	2200000	T12	0.05	T5	0.03	2.5	4	300	25%	29	139
	EE Refrigerators	2200000	Non-star	730	4-star	460	0.5	-	-	-	-	238
	EE Air-conditioners	2200000	Non-star	1.40	4-star	0.90	0.1	4	60	10%	11	21
Domestic Common	Efficient Lighting - CFLs	75000	Incandescent lamps	0.06	CFLs	0.01	2.0	4	365	30%	2	10
	Efficient Lighting - FTLs	75000	T12	0.05	T5	0.03	20	10	365	30%	9	115
	EE Water Pumping Program	75000	Inefficient pumping	7.50	Efficient pumping	5.00	2.0	2	365	10%	38	201
Total											127	860





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Initiatives based on DSM Plan

Continuous	▫ Energy Efficiency & Energy Conservation Awareness Campaigns. ▫ Workshops for community and consumers on Energy Conservation. ▫ Seminars for introducing EE Products		
Short Term	**Pilot Projects**	**Major Projects**	**Research Projects**
	▫ CFL program ▫ DSM Bidding Program ▫ Conversion of conventional traffic signals to LED ▫ LED Street lighting ▫ PV Solar systems for common loads of Residential buildings	▫ Installation of Capacitors at S/S ▫ Streetlight conversion- HPMV to HPSV. ▫ LED/CFL Program ▫ Capacitor Program for Industrial & Commercial consumers and High rise buildings. ▫ Energy Audit Scheme. ▫ Energy Efficiency program for RELIANCE ENERGY buildings	▫ Load Research.
Long Term	**Pilot Projects**	**Major Projects**	**Research Projects**
	▫ Water Pump efficiency improvement. ▫ Solar Water Heating systems for Residential Buildings. ▫ Participative programs for Green Building designs. ▫ Customer specific ESCo Model Programs	▫ EE Refrigerator Program ▫ T5 Tube light Program. ▫ Replacement of non-efficient ACs by Energy Efficient ACs. ▫ LED Street Lighting ▫ Demand Response program for large consumers ▫ HVAC Modification Program ▫ Energy Efficient Lifts Program	▫ Integrated Resource Planning (IRP) ▫ Municipal Water Pumping and Sewerage Systems.

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CFL Project

April 06 – May 06 and Jan 07 – Feb 07

Reliance Energy efforts:

- Price negotiation for 15 W CFL (Rs. 82 against Rs. 162 M.R.P)
- Warranty period of one year.
- Distribution arrangements with local dealers.

The Scheme:

- Consumer to exchange coupon printed on electricity bill against CFL at nearest dealer.
- Cost to be recovered from customers in 12 installments (Rs. 7x11+ Rs. 5x1).
- If first 9 installments paid in time, last 3 installments (Rs. 19) waived.

Consumers' Response:

- 6.17 Lac CFLs distributed.
- 2.05 Lac consumers participated.

Impact Assessment:

- 10.9 MVA load reduction.
- 10.8 MU per annum energy saving

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APFC Capacitors

Jan 06 – Mar 07

Reliance Energy efforts:

- Identification of low 'PF' Power Xmers, 11kV feeders & Distribution Xmers.
- Standardization of APFC Panels 300 KVAr & 450 KVAr.
- Continuous data logging to study performance of APFC Panels.
- AMC for ensuring working of APFC Panels

Salient Features of APFC

- Modular Construction consisting of Fixed and Switchable Units
- Units are cut in – cut off automatically based on Power Factor

Total KVAR	Fixed (KVAR)	Variable (KVAR)	Remarks
300	100	200	In steps of 25kVAR
450	150	300	In steps of 25kVAR

Execution:

- 750 Nos of APFC Panels installed at optimal locations.
- LT Panels & Substation modifications to accommodate APFC Panels.

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Reliance Energy

APFC Capacitors

Typical Benefits

- Performance of APFC Panel at Selected Locations

Name of Substation	PF Before	PF After	KVA Reduction
Gitanjali Nagar Substn (300kVAR)	0.8	1.0	55 KVA
RNP Park Substn (300kVAR)	0.85	0.99	36 KVA
Chandan Park (450kVAR)	0.6	0.99	50 KVA

Impact Assessment:

- 30 MVA Demand reduction.

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Streetlight Conversion – HPMV to HPSV

Mar 08 – Jul 08

Reliance Energy efforts:

- Bulk Price negotiated for Lamp and Lanterns.
- 37,266 No. conversion in 5 months.
- Convincing Municipal authorities for allowing such conversion.

The Project:

- Conversion of all HPMV lamps in streetlight network by lower wattage of HPSV lamp with higher lumen output.
- Various Wattages involved are-

HPMV Wattage	HPSV Wattage	Quantity Nos	Wattage saving per Lamp
80	70	17,644	8
125	70	19,622	57

Impact Assessment:

- 1.1 MW Maximum Demand Reduction.
- 4.56 MU per annum energy saving.
- Rs. 3.47 Cr. Annual Saving to Municipal authorities.

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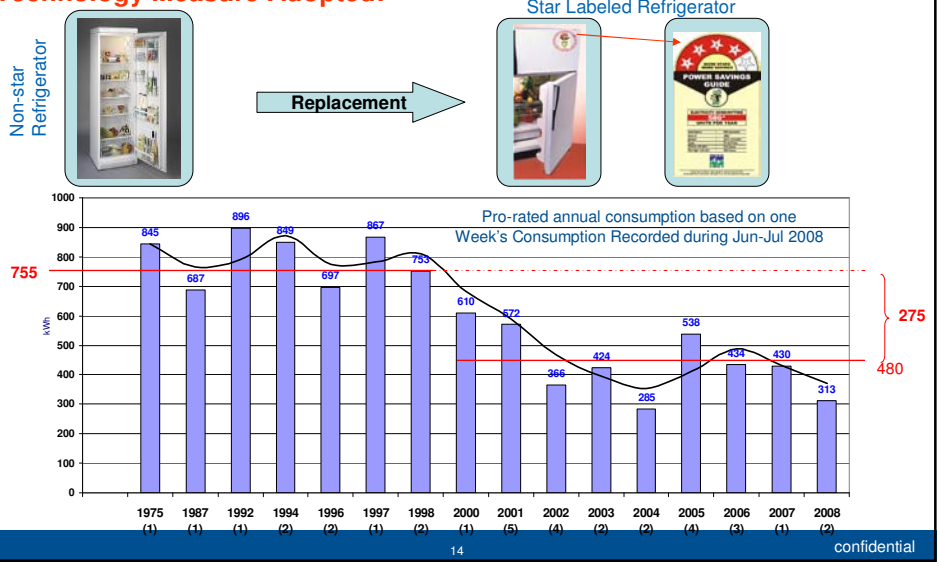
Energy Efficient Refrigerator Program

Technology Measure Adopted:



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Energy Efficient Refrigerator Program

Target Consumers:

- All Residential customer with no arrears.
- Refrigerator purchased/ manufactured on or before year 2000.
- Having refrigerator > 165 Liters.
- Willing to accept M&V procedure.

Proposed Replacement:

- 165 L to 230 L old refrigerator to be replaced by 230 L star labeled refrigerator.
- Old refrigerators of 230 L above size to be replaced by equivalent size of new star labeled refrigerator

Quantity Targeted:

- 50,000 Nos during 2008-09.

Program Impact:

- Rebate from Utility- Rs. 17.5 Cr, Cost of program administration Rs. 2.5 Cr
- 15 MU Savings per annum amounting to Rs. 8 Cr.
- Impact on Tariff Rs. 0.02 for first year.

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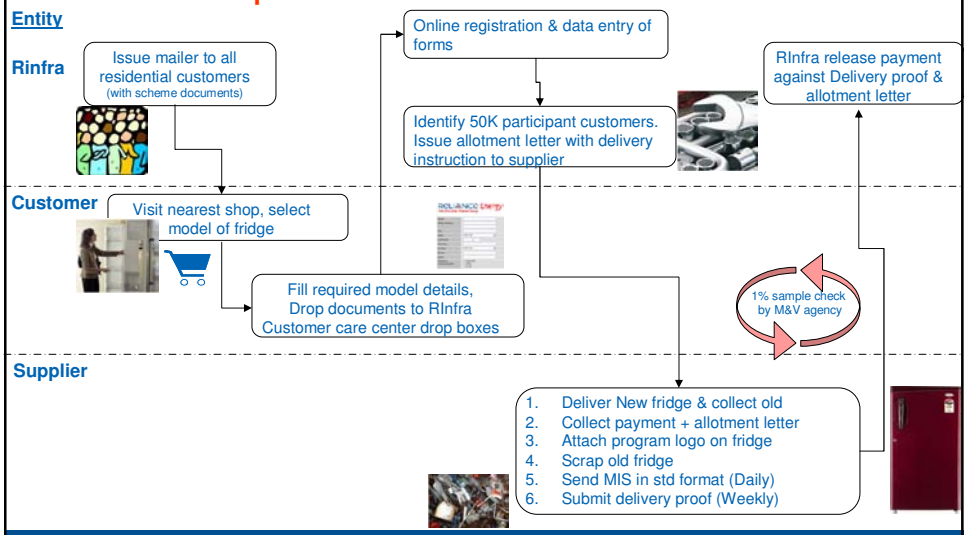
Energy Efficient Refrigerator Program

Overall Execution process:



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DSM Bidding Program (8th Road Khar Substation)

Objectives:

- Off-load the identification and implementation part to bidder.
- Get the DSM measures implemented at competitive price.
- Achieve optimal equilibrium on cost Vs savings.

The Project:

- Bidder to identify the EE measures for the area fed through 8th Khar Rd. DT.
- Bidder to bid for demand reduction and energy saving.
- Bidder to bid with cost for per KVA demand reduction and per KWh.
- Implement the suggested EE measures and get paid on the agreed terms.
- If the bided parameters not met pay penalties.

Expected Impact:

- 100 KVA demand reduction & 0.5 MU reduction per year.

Current Status:

- Many bidders discussed the project, but not bided.
- The project being modified based on same concept but appliances specific.

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Energy Audit Scheme January 2008 - ongoing

Reliance Energy efforts:

- Tie up with reputed Energy Auditing Firms at bulk negotiated cost.
- Fixed time lines for conducting audits & submitting reports.
- E-mailers to all the HT & Medium Consumers.

The Scheme:

- Consumer to sign MoU with Reliance Energy & initially pay 50% of audit fee.
- Energy audit conducted and report submitted to consumer.
- If consumer implements 50% of the measures suggested, 50% audit fee collected initially is refunded.

Consumers' Response:

- 14 Audits Completed, around 30 are under process.
- Around 100 consumers have collected scheme document & MoU

Impact Assessment:

- 1.3 MU.per annum energy saving identified
- Investment Estimated: Rs 3,600 to 30 Lac. Returns: Rs. 42,000 to 28 Lac.
- Payback: Immediate to maximum 26 Months

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Mass campaign

Mar 07

Reliance Energy efforts:

- "I Will, Mumbai Will" Campaign was launched in March 2007 by Reliance Energy, TPC and BEST.
- Reliance Energy coordinated entire campaign.
- Conceptualization and media creations by Reliance Energy's Branding Team.
- Print Media, Radio, Hoardings, Posters, Cinema Clips.

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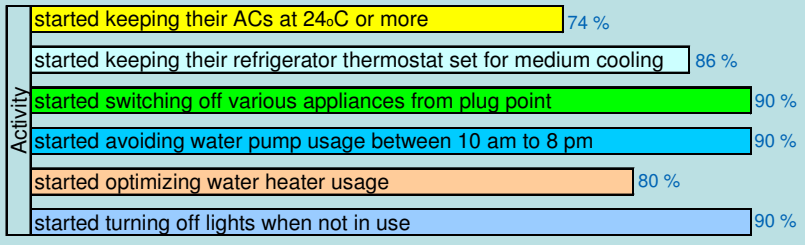
Mass campaign

Mar 07

Impact Assessment:

- Research was launched in May 2007 & June 2007.
- Based on the surveyed base, the campaign resulted in -



- 60 to 75 MVA demand reduction for the year.

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Energy Efficiency & Energy Conservation Awareness

- Energy Conservation week celebrations
- Energy Conservation Awareness program for School students
- Competitions on Energy Conservation
- Knowledge sharing session with Consumers – EE products are introduced during such sessions.
- Awareness workshops for social groups in local areas.

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Issues

- ESCOs in India are comfortable only with clear routine projects
- No standard procedure for M&V for DSM projects
- Manufacturers insist on assured purchase comforts from Utilities only
- Shortage of experienced DSM Consultants in India
- Funds required for implementing DSM Programs

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Roles

Utilities:

- Research & Analysis.
- DSM Plan & Program Design.
- Implementation & Monitoring.

Consumers:

- Proactively Participate in Utility DSM Programs.
- Cooperate for M&V.

Commissions:

- To approve DSM Programs as a part of ARR & Tariff determination.
- Suitable mechanism for incentives.
- Guidelines for –
  - regulatory approval,
  - M&V procedure,
  - criteria for evaluation of DSM projects,
  - budget provisions..

Govt. Statutory Authorities:

- Regulations regarding supply/manufacturing of EE Products
- Exemptions in statutory levies for EE Products.
- Soft Loans for funding DSM Projects.

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Thank you

September 19, 2008

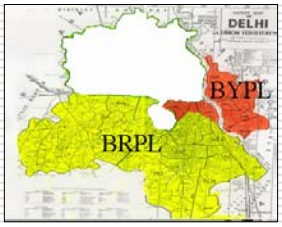
Demand Side Management (DSM) Initiatives – Delhi

Presentation to Forum of Regulators

Ramesh Narayanan
BSES Delhi
19th September'2008

BSES

Discom Snapshot



S.No.	Particulars *(Updated 2007-08)*	Unit	BYPL	BRPL	BSES Delhi
1	Area	Sq. km	200	750	950
2	Total Registered customers	Lacs	10.46	13.20	23.66
3	Peak Demand	MW	947	1697	2644
4	Consumption per year	MU	5283	9272	14555
5	Employees	Nos.	3312	3906	7218
6	Customer density	Cons/ sq. km	4230	1360	1964
7	Revenue (Excluding sale of power)	Rs. Crs.	1551	2871	4422

BSES

Statistics

>97% Domestic customers in number

Category Wise Number of Consumers

	Domestic	Industrial	Commercial	Agriculture
BRPL	9,72,857	14,911	1,78,948	5,056
BYPL	7,15,476	23,607	2,35,865	95

Complete 100% feeder metering at 11kV

	Feeders	Electro-Mechanical Meters	Electronic meters with communication facility	% metering completed
BRPL	**914**	**nil**	**914**	**100%**
BYPL	**654**	**nil**	**654**	**100%**

>95% DT Metering

Discom	No. of DTs	DTs with electronic meters & communication facility	% of metering completed
BRPL	**6569**	**6244**	**95.05%**
BYPL	**3458**	**3351**	**96.91%**

BSES

Capital Investment in system up gradation over 6 yrs

Rs 3400 cr CAPEX incurred in 6 yrs

S.No.	Parameters	UoM	BSES		
			2002-03	2007-08	Growth
1	**No. of Grids**	No.	103	118	15%
2	**No. of Power Transformers**	No.	244	317	30%
3	**EHV Capacity**	(MVA)	4899	6735	37%
4	**EHV Cable Laid**	(Kms)	1037	1835	77%
5	**66 & 33 kV Feeders**	No.	221	305	38%
6	**Shunt Capacitors**	(MVAr)	1383	2136	54%
7	**Distribution Transformers**	No.	7509	9301	24%
8	**Distribution Transformers Capacity**	(MVA)	4291	5887	37%
9	**11 kV Feeders**	No.	1209	1672	38%
10	**11 KV Cables laid**	(Kms)	2898	3662	26%
11	**11 KV Lines laid**	(Kms)	1711	1921	12%
12	**LT Feeders**	No.	25412	34364	35%
13	**LT Lines laid**	(Kms)	9971	14943	50%





BSES

DSM participants

- DISCOM Initiatives
- Regulator intervention
- Government intervention

BSES

Discom Initiatives

- ~ 700 MVAR capacity addition
  - BYPL reactive power drawl = Zero
- Electronic ballast on street light points (0.2 million no.)
  - >12 MW consumption saved
  - Switching ON/OFF automation saved additional 2.5 MU/yr
- Partnering with Indoasian & Finolex for CFL promotion
  - > 5 lac units distributed
  - ~22 MW consumption saved
- HVDS in 500 colonies
  - Improved HT/LT ratio
  - Unauthorized colony electrification
- Rigorous Enforcement drive
  - Theft deterrence
  - Reduced consumption
- Consumer education programs
  - School Gyan Abhiyaan
  - Organizing street plays

Benefits :

•Demand growth reduced from 10-12% earlier per annum to 2% p.a.

•Able to bank more power for shortage periods

BSES

Be a "Power Conservator" promote BSES' CFL scheme

The CFL scheme being launched at the delhi secretariat

Here's your chance to be a "Power Conservator!" Go ahead and spread the good news to your friends, relatives and neighbourhood that the CFL Buy One Get One Free offer has been extended till March 31, 2007.

BSES took the lead in "power conservation" by launching the Buy One, Get One Free CFL in association with Indo Asian Fusegear Limited - one of India's largest manufacturers and exporters of CFL's.

On 24 October, 2006, the Hon'ble Power Minister Shri Haroon Yusuf flagged off the scheme at the Delhi Secretariat.

The scheme is not only helping Delhi conserve scarce and precious electricity but is also helping BSES customers make substantial monetary savings. According to calculations, customers can save upto Rs 391 per CFL per year and Delhi a whooping 450 MW.

Just imagine the extra funds available for shopping at end of the year by simply switching to CFL's. Now go ahead and spread the good news to your friends and neighbours to head for the nearest Indo-Asian counters set up at our 33 Customer Care Centers and 32 select Cash Counters.

Substituting the normal incandescent bulbs with these low consumption, high brightness output CFL's will lead to massive savings. Savings accruing from the over 2.5 lakh CFL's sold from BSES' outlets will lead to a reduction in maximum demand by over 16 MW at a given point of time-enough to power five average shopping malls in Delhi and lead to energy saving of over 17.5 million units annually. Energy conservation is now a global issue and its importance can be gauged from the fact that leading international publications like NEWSWEEK are doing cover stories on the topic.

Prices for 2 CFL's

11 W	Rs 135
15 W	Rs 150
20 W	Rs 200

BSES

'Watt Bachao'
BSES Catches 'em Young

BSES is determined to make Energy Conservation a way of life. BSES has now taken the initiative to the next level by catching them young. To further broadbase its emphasis on Energy Conservation, BYPL has conceived *Bijli Gyan Abhiyan* — a mammoth initiative targeting thousands of students across 500 schools in East and Central Delhi.

March 3, 2008, saw Shri Arvinder Singh Lovely, Hon'ble Minister for Education, GoNCTD launching BYPL' *Bijli Gyan Abhiyan* at the Delhi Secretariat Auditorium. During the function, Dr A K Walia, Hon'ble Minister for Power, Government of the National Capital Territory of Delhi, along with Shri Arvinder Singh Lovely, released BSES' *Bijli Gyan* CD - an educative Audio Visual (AV) on energy conservation and an integral part of *Bijli Gyan Abhiyan*. Gracing the function were School Principals, Vice Principals, Teachers, senior government and BSES officials.

The contents of the professionally-made 10-minute long AV CD have been scripted by professionals in a manner that will be best understood and appreciated by young and impressionable minds. The format of the programme is appealing and fun for the students.

Besides covering topics like power outages and its reasons, power shortage and its reasons, power theft and the immediate need of energy conservation, the audio visual also covers topics on international concerns like global warming, rising carbon-di-oxide emissions and generation of electricity through renewable resources.

The audio visual film also outlines simple and easy-to-use everyday measures that a person can adopt to alleviate many of these concerns.

Congratulating BYPL for launching this initiative, Arvinder Singh Lovely said "It was the need of the hour. Electricity is a very scarce resource and we need to use it optimally. Children have a receptive mind and we must harness their potential to ensure

that our future generations learn how to use resources properly".

Hoping most of the schools in East and Central Delhi will participate in this initiative, Dr A K Walia said "Students can be good brand ambassadors for energy conservation. Energy conservation will not only help reduce the peak demand, it will also help alleviate many of the global concerns like Greenhouse Effect and CO2 emissions"

Bijli Gyan Abhiyan — an initiative based on partnership with schools — is yet another important Corporate Social Responsibility (CSR) initiative of BSES towards energy conservation. The initiative aims to sensitise thousands of students about the entire gamut of energy generation, transmission and distribution, giving special emphasis on energy conservation

To reach out to the maximum number of students, firstly, the *Bijli Gyan* AV CD is being gifted to all the enlisted schools — private, government and JJ — with a request to screen the AV to their students. This is not all: BYPL is also making special arrangements to screen the energy conservation AV in schools, which do not have access to audio video facilities.

- First Round, Based on the *Bijli Gyan* CD, schools in partnership with BYPL will conduct a written quiz in their respective premises. Two top scorers from each of the schools will qualify for the second round.
- Inter-School (Second) Round. Another written quiz will be conducted at a BYPL location. Thirty top scorers in this round will qualify for the third and the final round.
- Final (Third) Round. The Final oral round will be organised by BYPL in an auditorium amidst hundreds of cheering students, teachers and principals. This gruelling round, also based on BSES' *Bijli Gyan* AV on Energy Conservation, will witness six winners from Government, Private Schools and JJ Schools) - emerging as winners.
- Prizes. BYPL will give a total of six cash prizes of Rs 15,000, Rs 12,500 and Rs 10,000 - to those coming first, second and third respectively and schools of the victorious students will also be awarded a trophy each.

Thereafter, three rounds of quizzes will be conducted for the students of Classes 5 to 8 - based on the *Bijli Gyan* AV on Energy Conservation. Finally six students from Government, Private and JJ schools will be declared winners from amongst thousands who are expected to participate in the contest.

BYPL plans to make winning a memorable and a cherished moment for the winners, their parents and their schools.

The winners of these quizzes, their School Principals, Vice Principal, one Coordinator and their parents will get an opportunity to have a meal with Shri Arvinder Singh Lovely, the Hon'ble Minister for Education.

After this, the winners along with their School Principals will get an opportunity for a one-on-one interaction and a group photograph with the Hon'ble Chief Minister of Delhi, Smt Sheila Dikshit, who has graciously consented to interact with the winners.

BSES

Regulator interventions

- Kvah billing for non domestic and Industrial consumers.
- Implementation of Load violation charges.
- HT tariff lower than LT

BSES

Government intervention

- A subsidy of Rs. 1 per unit for 200 units during peak months and of Re.1 per unit up to 150 units during non-peak months for domestic consumers.
- >72% domestic consumers availed subsidy.

BSES

Support sought

- DSM projects are perceived as mere De-marketing drives whereas it requires to be promoted as efficiency drives.
- DSM projects are highly capital intensive, hence require special CAPEX support thru tariff / Govt. subsidy
- Need to mechanize incentive plan.
- More collective efforts required for energy labeling, audits and surveillances

BSES

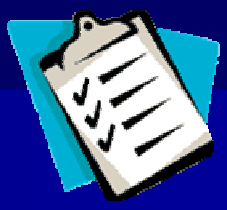
Thank you

BSES

DSM measures initiated by Haryana

Contents

- Energy Efficient Equipments
  - ✓ CFL, TFL and Fans
  - ✓ Motor-pump sets
  - ✓ Lift-Canal Irrigation System
  - ✓ Amorphous-core transformers
- Use of Latest Technology
  - ✓ Conversion to HVDS & Feeder Segregation
  - ✓ Organic oil in transformer
  - ✓ Street Light
- Solar based power
  - ✓ Solar Powered Generation Plant
  - ✓ Solar Hot water System
  - ✓ Solar Powered Street Light
  - ✓ Solar Home system
- Public Awareness
  - ✓ Energy Park: Themes & Features
  - ✓ DSM centre



Overview

Haryana Discoms are working towards promoting Energy Efficiency & conservation, DSM and use of Renewable Energy Sources. It has taken various measures in this regard, including: -

- Establishment of Energy Efficiency/ DSM cell
- Promotion of Energy Efficiency devices like CFL, energy efficient irrigation pump-sets etc.
- Conversion of LVDS system to HVDS and Bifurcation of feeders
- Promotion of Amorphous-core transformers and organic transformer oil
- Promotion of Solar Hot water system and Solar home systems, backed by financial incentives
- Use of latest technology in Street light including use of SPV powered lights, photo-sensors
- Proposal to establish Solar powered generation plant and Energy Park

Use of Energy Efficient Equipments

Why a CFL Campaign

- Nigams can reduce Loads on System
- Energy can be saved
- Reduced energy bills for Consumers
- Nigams can avail Carbon Credits
- Peak Load shaving

Potential of Efficient Lighting DSM in India

- Lighting – 40 crore lighting points in India - if replaced by CFL – reduction of load by 20,000 MW (source BEE).
- Environment impact = each CFL reduces carbon dioxide by 60 kg per year; hence 20 CFLs reduce 1 ton of carbon dioxide; total carbon emission reductions if 40 crore lights points changed = 2 crore tonnes of CO2.
- Haryana – one light bulb per household/consumer (40 lakh consumers) if changed to CFL – can reduce load by 320 MW and reduce carbon emissions by 2 lakh tonnes of CO2.
- 1 ton of CO2 = 1 CER
- Value of CER = 14 Euro

CFL Impact – Reduction in consumption

- 1 CFL reduces consumption by 84 units in a year (source: BEE)
- Hence 40 lakh CFLs = 336000000 or 33.6 crore units
- Hence reduction in bills of consumers

Stakeholders

- Consumers
- Nigam
- Manufacturers/Retailers
- Government

How to promote CFL

- Utility promoted or Manufacturer promoted or by Awareness Campaign
- Utility – "co-branding" model – low price
- Manufacturer supply at low price – CDM
- Utility – CFL procurement and distribution and cost recovery through bills
- Awareness Campaign

International Experience

- USA – 1985 to 1991- Utility promoted – free of charge distribution based on eligibility - 5 free to poor;
- Philippines – 2001 - Subsidized CFLs; 33% lesser than market; Consumers bought – upfront or installment; Only for "zero arrear" consumers; 18 month warranty; word of mouth spread on learning benefits;
- Sri Lanka – 1995 - customers pay in 12 installments; 2 year warranty; buy from dealer – utility subsidizes the dealer; only 4 CFLs per customer; 1.7 lakh sold;
- Mexico – 1994 - mass procurement by utility; 60% cheaper; customers bought from utility; 17 lakh sold;
- Poland – 1995 to 1998 -Three Municipalities and Utility – subsidy to manufacturer – reduced cost to consumer; objective to reduce load in distribution system of cities; discount coupons to consumers; 50% discount; 2 lakh sold;

Indian Experience

- BESCOM – 2005 - shortlisted suppliers; consumer to buy – upfront or installments; also 36 w tube light; 3 lakh sold;
- Maharashtra – 2006 – shortlisted suppliers; consumers with zero arrears eligible; not more than 5 per consumer; consumer to buy upfront or installment – 15 w= Rs. 100; 20w = 110; 3.80 lakh sold; 90% by installment and mostly 20w; but quality issues - 50% had fused in 100 days; 80% consumers said they bought it to reduce

Timeframes

- To shift all consumers to energy efficient lighting
- Each consumer to have one CFL by 2007-08
- Each consumer to have all CFLs by 2008-09

Barriers to CFL

- Low awareness
- Poor availability especially rural areas
- High Prices
- Disposal of CFL
- Life and Quality of CFL (no labels)

Options for Haryana

- Nigams – motivation campaign
- Nigams – Co-branding sales model
- Nigams – mass procurement and sale to consumers; Nigam takes CERs
- Nigam and Manufacturer – CDM route – subsidized CFLs and manufacturer takes CERs
- High VAT on bulbs; low on CFLs

Current Strategy for CFL

- DHBVN Promotes; Manufacturers Provide
- Manufacturer provides CFL at reduced price (lower than MRP)
- 11w = Rs 62.50; 15w = Rs. 75; 20 w = Rs. 100
- MoUs have been finalized with reputed CFL manufacturing firms
- Sales Outlets have already been established in various offices of DHBVN
- DHBVN takes CFLs to villages and colonies/sectors and ensures sale
- One year warranty on the CFLs

Awareness - Where to Use CFLs?

- CFLs should be used in Living Room/ Drawing Room/Most used Rooms to avail the maximum benefit in respect of Energy Conservation and ensure LOW MONTHLY ENERGY BILL
- CFLs give better light for natural colour
- Choose the appropriate wattage of CFLs according to usage at various places in House e.g. for reading us 20 watt CFL

Awareness – Impact of CFL on load

Assumption:-

- If we change one 100 Watt Incandescent Bulb with 19 Watt CFL, for all the 18.64 Lac DHBVN Consumers.
- Considering the average usage of 6 Hrs,

Result:-

The total energy saved is 330MW.

Awareness – camps/media

- Knowledge sessions
- CFL Logo finalized
- Leaflets on use of CFLs & it's Benefits are distributed in the individual house
- CFL awareness and sale camps are being held on Sundays in the Urban Areas as well as in the villages
- Location of CFL Sales Stalls are publicized in News Papers & Radios
- With FM Radio spreading to various location in the area under jurisdiction of DHBVN and it's increasing popularity in listeners, tie-up for Slogans, Rhymes and other publicities & awareness programs round the clock is under process.
- Energy Conservation Stickers on Cars/other vehicles

Awareness - Feedback

- Consumer Feedback: To monitor quality DHBVN provides Feedback forms to consumers on the purchase of CFLs (forms have unique serial numbers)
- Lucky Draws on these feedback forms are held every month

Awareness - Proper Disposal

- **CFL contains mercury in minute amounts (4 mg per CFL) – a poisonous substance which should be properly recycled in a treatment facility**
- **DHBVN is concerned about it and takes back the fused CFL and they are being stored till a national level facility for recycling mercury is not established**
- **Consumers are given serial numbered receipt for return of fused CFLs**
- **To motivate consumers to give back fused CFLs, lucky draw is to be held on receipt numbers of fused CFLs**

Experience of DHBVN

- DHBVN launched Energy Conservation campaign
- Village Binola achieved distinction of being first CFL village in the State of Haryana. It is now being claimed as the first CFL village in the country.
- Bhuna feeder in Sirsa became the first CFL feeder in the country
- Sirsa complete district on CFL
- First Town in India on CFL – Kalanwali
- 1000 villages on 100% CFL in DHBVN as on 31 January, 2008.

DHBVN

Some moments of CFL Promotion activity at A-5 power house Calony Faridabad.

Mr. Sudhir Chabra sharing benefits of CFL with Residents..

Residents of A-5 Power House Calony purchasing CFL. A total 255 CFL were purchased by residents of Calony.

Line Staff replacing the Bulbs with CFL

A week before it was requested to M/s Surya company by Mr. Vikas dahiya to prepare a small token such as Pen which they have arranged. These pen were distributed to the purchasers.

Residents returning back their Bulbs to Mr. Chabra. A total of 48 Bulbs were returned back . The acknowledgement slip will be handed over to residents tommorrow.

The staff of DHBVN and HVPN residing at A-5 put their heartiest efforts for this event. Specially Mr. Moolchand LM op Sub-Divn I/Area, and Mr. Arvind Tyagi GSA at 66 KV Jharsately power house personally do the door to door campaign for the event.

BINOLA EXPERIENCE

- Loading of Distribution T/f has been reduced by 50%
- Blowing of LT fuses due to overloading has vanished
- Status position of CFL Houses on 11 KV Binola feeder
  - **Total No. of Houses : 523**
  - **Total No. of connections : 523**
  - **No. of CFL houses : 375**
  - **No. of CFL introduced : 2203**

Drop in consumption on Binola feeder

a)	Month	Consumption (Kwh)	Remarks
	4/2006	166400	Only Binola was made complete CFL
	4/2007	156700	
Saving = 9700 units (6%)			

Month	Consumption (Kwh)	Remarks
5/2006 (Upto 10/5/06)	70600	Additional two No. villages namely Dhani Lal Singh and Dhani Mussepur were also made complete CFL
5/2007 (Upto 10/5/07)	62500	
Saving = 8100 units (11%)		

CFL feeder Bhuna, Sirsa

- DHBVN launched Energy Conservation campaign in district Sirsa and 11 KV Bhuna Feeder achieved unique distinction of being first CFL Feeder in the State of Haryana.
- With the replacement of conventional incandescent lamp with CFL following benefits were achieved:-
  - Load on Distribution T/F reduced by 50% during peak load hours.
  - Complaints of interruptions in supply reduced considerably.
  - Reduction of line losses.

The result achieved on 11 KV Bhuna Feeder in Sirsa Circle are tabulated as under:-

Hourly load of 11 KV Bhuna feeder w.e.f. 1/5/2007 with the date when provision of CFL started with comparison of the corresponding period of the last year under OP Circle, DHBVN, Sirsa
Load in Amps

Month	19.00 Hrs	20.00 Hrs	21.00 Hrs
1/5/2006	100	110	100
1/5/2007	70	60	60
2/5/2006	160	160	160
2/5/2007	70	90	60
3/5/2006	100	120	120
3/5/2007	85	80	60
4/5/2006	110	110	110
4/5/2007	50	100	70
5/5/2006	120	120	120
5/5/2007	70	60	60
6/5/2006	120	120	120
6/5/2007	40	80	60
7/5/2006	135	100	100
7/5/2007	100	80	90
8/5/2006	150	130	130
8/5/2007	70	60	60
9/5/2006	145	125	125
9/5/2007	50	80	70

Leadership

- The SE/GM operations has to play a role of leader
- Leader has to learn all about CFL – technical details; advantages/disadvantages; rates; etc
- Leader has to practice what he preaches – convert his own office & residence to CFL; and also the offices below him
- XENs & SDOs to play leadership role

Campaign Implementation

- DHBVN has provided a campaign work plan to its officials to guide them in implementing the campaign
- All officers work as per the plan

Involving stakeholders

- Involve all stakeholders – Nigam Staff; consumers; government; manufacturers
- Active involvement of District Administration – DC & SDMs to spearhead the campaign – first convert all government offices
- Active involvement of all staff – meetings & targets
- Active involvement of consumers – bulb back & lucky draw scheme; FM radio; pamphlets
- Involvement of local representatives – meetings with Sarpanches,Municipal Councillors/MLAs

Circle Work Plan

- Dedicated cell at circle office to monitor the campaign
- Active involvement of XENs including XEN Works
- Installation of supplier and stock of CFLs
- Procedure to take CFLs to consumer points (villages/colonies/sectors) and sale; arrangement of vehicle;
- Informing consumers in advance;
- Policy on BPL families – aid of Panchayat funds and donors

Motivating Villages

- First Survey – of consumers lighting devices – bulbs/tubes etc;
- Collection of statistical data of the village – census population/houses; electrical statistics – consumers, loads, distribution equipment;
- Install metering equipment on transformers and measure peak loads; also start recording peak feeder loads; maintain peak load registers at village and feeder; Put up transformer information signboard- before start of program;
- Use of village Nambardar & GVP to motivate villagers – they should distribute CFL promotion pamphlets
- Then motivate the Panchayat – explain CFL benefits; first the Panchayat has to shift its own office to CFL
- Then Motivate the village school teachers and children to shift school lighting to CFL; bring Energy Bus to school;
- Then Consumer Education – pivot of the whole program
- Small darbar cum CFL Camp - motivation exercise and sale camp to show benefits – long life; lower bills; less load on transformer – so better electricity supply; where to use – most used room only; which wattage bulb to be replaced by which wattage of CFL; warranty of one year – where to get it replaced from; distribute CFL FAQs;
- Routine work of release of connections, resolution of disputes etc to go on simultaneously during darbar
- Children's quiz/painting competition on same day – and CFL prizes
- After completion of shift to CFL – signboard to carry change in peak load data and change in types/numbers of lighting devices
- Calculate total benefits of the campaign to village in terms of reduced loads, carbon-di-oxide reduced and CER value and distribute "benefits" pamphlet to villagers

Motivating Urban colonies/sectors

- First survey – of consumers lighting devices – bulbs/lights; maintain data register
- Collect statistical data of the area with regard to consumers/loads/ distribution equipment; fix metering devices on transformers and maintain peak load register; distribute peak load transformer data to all consumers before start of program; maintain transformer information signboard before start of program;
- CFL promotion Pamphlets to each house by meter readers
- Contact RWA top management (all RWAs of the sector/colony) – and motivate them; show CFL advantages through write-up/pamphlet/presentation
- RWA to convince their consumers & tell children about children's competition
- Fix metering devices on transformers
- Use colony park – fix date for small darbars cum CFL sale cum quiz/painting competition camps
- Attractive tentage and sign boards
- Children quiz/painting competition; all prizes to be CFLs
- Once shift to CFL completed – update data register of the colony; distribute new statistical data of peak loads and lighting devices through leaflets
- Calculate total benefits of the campaign in terms of load reduction, carbon-di-oxide reduction and CER value and distribute "benefits" pamphlet

Motivating district administration

- Meet DC – show presentation & Govt order promoting energy efficient lighting
- Monthly meeting – show presentation and tell advantages of CFL
- In monthly meeting copy of govt. order be given to all officers
- Targets to be set by DC – all offices to convert to CFL within a month – i.e. by next meeting
- All old bulbs/fused CFLs to be given to Nigam – issue receipts – maybe some office will get prize in lucky draw
- Departmental officers to ensure their good office is used to promote CFL – e.g. DEO can ask all teachers to convert all schools to CFL; similarly DDPO can convert all Panchayat buildings to CFL;

Motivating Employees

- MD's letter to all employees with two free CFLs
- Meetings – give literature; show presentation; tell advantages & give pamphlets
- Do quiz – ask questions to see if they have all understood advantages and uses – e.g. which watt of CFL to replace which wattage of bulb? Give quiz prizes
- Inform about Incentive schemes – if village becomes CFL; if feeder becomes CFL; if whole subdivision becomes CFL – then one full pay
- Inform of need to take bulbs back – both working & non-working and lucky draw receipts
- Dhabas and hotels and establishments on main roads/main markets be targeted immediately to shift to CFL– this gives good impression when people travel on road at night
- Reriwallas, Sabziwallas etc be made to shift to CFL
- Religious places be made to shift to CFL

Motivating People's Representatives

- Meet MP/MLA of area
- Tell details of CFL – advantages etc for State, Nigam and Consumer – you can show Nigam's CFL presentation
- Meet Municipal Councillors, Zila Parishad, Panchayat Samitis and convince them to begin with their office buildings and homes

TARGETING CHILDREN

- MOST ORGANIZED COMMUNITY
- ENSURES MAXIMUM REACH
- BETTER CARRIER FOR THE MESSAGE
- FUTURE ENERGY EDUCATED SOCIETY

Children - strategy

- Stakeholders – teachers, children, deptt of education, Board, parents; Govt and Private schools;
- First convert all schools to CFL; schools demonstration with bulb and CFl and meters; 14th of month as energy conservation day;
- Department: DEO meet; Training of trainers;
- Teachers: Teacher training school; teacher's workshop; Literature; Teacher's quiz/essay;
- Children: Prayer time; PTA meetings; Child takes energy conservation literature to home; Stickers/Energy conservation day; conservation exhibit competition; quiz; essay;
- Board: Write to Haryana Education Board to incorporate in syllabus;
- Parents: PTA meets presentations;

Monitoring

- MIS formats issued; GM DSM monitors progress at head office
- Manufacturers to inform head office (GM DSM/Energy Audit) about any dispatch of CFL to circle offices
- Officers should keep an eye out in evening time to see lights in the localities – if many are still using bulbs, then convince consumers to shift to CFL – then and there replacement

Monitoring

- Feeder wise CFL strategy – loads are being monitored before the campaign and after the campaign
- Village loads are being monitored at transformers before CFL and after CFL

Public Support

- Overwhelming support of general public
- Rates are reasonable coupled with one year warranty
- FM radio outreach is generating interest
- Relocation of meters is itself ensuring energy conservation by shift to efficient lighting

Issues

- Leadership – some Nigam officials did better than others; Training & Motivation is felt necessary for the senior officials
- Manufacturers offload responsibility to local dealers – dealers do not provide staff to handle sales outlet or to travel with the Nigam staff to the villages
- Allocation of specific districts to a manufacturer is better than mixed approach
- Replacement of CFL within warranty – Nigam CFL van concept tried; later HESL given the responsibility – now carries CFLs in its cash collection vehicles

OSRAM CFL-CDM Project in UHBVN

- CFL-CDM project jointly developed M/S OSRAM, UHBVNL and BEE
- First Project of its kind in the World
- Project Area:- Yamunanagar & Sonepat circles
- Project Involves replacement of 5, 40, 000 GLS (bulbs) with OSRAM long life CFL lamps of 15,000 hours in registered domestic consumers of UHBVNL
  - 60Watt GLS by 15Watt CFL
  - 100 W GLS by 20 Watt CFL
- Nominal cost of Rs 15 per CFL shall be collected from the consumer
- M/S OSRAM shall recover the cost of lamp through carbon credits earned under the project

OSRAM CFL-CDM Project in UHBVN- contd

- UHBVN will benefit from sustainable energy savings in the project area (districts of Yamunangar and Sonipat)
- M/S OSRAM will provide CFLs, undertake Registration of project with UNFCCC and related issues
- UHBVN through HESL shall ensure the distribution of lamps, collection of CFL cost and related issues
- HESL shall get Rs. 6 per consumer for CFL distribution
- BEE will be the monitoring agency for the project
- Training for Lamp Distribution is completed

Agricultural Pump-sets

- DHBVN has identified the segment of Agricultural Irrigation Pump-sets as an area with large losses due to use inefficient pump-sets
- For efficient use of energy, DHBVN is promoting use of Wide voltage range motors, power factor correction units (capacitors) and winding techniques
- Tenders have been floated to appoint Project Manager for conducting detailed study on improving the Efficiency of Agriculture Pumping system. The scope includes: -
  - ✓ Inspection of total pump set assembly and connected load for energy conservation potential and reasons for the wastage of energy
  - ✓ Energy efficient engineering diagnostic study of the existing pump-set of the farmer
  - ✓ Recommendation for energy efficient pump-set based upon the diagnostic study

Lift Irrigation System

- Presently Lift Irrigation Canal system has 25 to 30 year old pumps and motors which leads to low efficiency
- DHBVN has appointed an agency to conduct Engineering audit of the old pumping systems of the irrigation department.
- Agency has completed Energy Audit of 79 nos. pump sets
- Irrigation department has given commitment to implement the recommendations of the agency.

2.1 Observations:

Following readings were taken:

Table-2.1: Estimation of Pumping Efficiency

Pump Identification	Flow m3/hr		Head mWC		Power kW		Efficiency %
	Rated	Actual	Rated	Actual	Std.	Actual	Actual
RD 88 Pump no. 2 Centrifugal Pump	1019.41	488.00	11.50	3.31	22.00	13.15	33%
RD 88 (Second Section) pump no. 3	1019.41	424.00	11.50	3.17	18.50	16.73	22%
RD 11.5 KAMOD Pump house no. 2, Pump No. 1	611.70	322.00	2.52	2.97	7.50	7.99	33%
RD 11.5 KAMOD Pump house no. 1, Pump No. 1	1019.50	746.00	3.20	3.16	15.00	15.96	40%
Loharu Indira Gandhi Canal, Main Pump House, Pump No. 3	3516.95	2202.60	6.14	4.63	93.25	68.08	41%

2.2 Recommendations:

i. RD 88 Pump no. 2 Centrifugal Pump:

The pump is not delivering as per rated flow and rated head and also consumes less power than the rated power. The efficiency is poor for centrifugal pump. The pump should be replaced with energy efficient pump with following specifications:

Flow = 500 m^3/hr.

Head = 3.5 mWC

Power = 6.8 kW

This shall save approximately 6.3 kW per hour.

ii. RD 88 (Second Section) pump no. 3:

The pump is not delivering as per rated flow and not generating head as per rated head and also consumes power less than the rated power. The efficiency is poor. The pump should be replaced with energy efficient pump with following specifications:

Flow = 2200 m^3/hr.

Head = 4.65 mWC

Power = 40 kW

This shall save approximately 11.4 kW per hour.

iii. RD 11.5 KAMOD Pump house no. 2, Pump No. 1:

The pump is not delivering as per rated flow but generating more head than the rated head and also consumes power slightly more than the rated power. The efficiency is poor for pump. The pump should be replaced with energy efficient pump with following specifications:

Flow = 325 m^3/hr.

Head = 3 mWC

Power = 3.8 kW

This shall save approximately 4.2 kW per hour.

iv. RD 11.5 KAMOD Pump house no. 1, Pump No. 1:

The pump is not delivering as per rated flow but generating head near to the rated head and also consumes power slightly more than the rated power. The efficiency is poor for centrifugal pump. The pump should be replaced with energy efficient pump with following specifications:

Flow = 750 m^3/hr.

Head = 3.2 mWC

Power = 9.35 kW

This shall save approximately 6.6 kW per hour.

v. Loharu Indira Gandhi Canal, Main Pump House, Pump No. 3:

The pump is not delivering as per rated flow but generating head near to the rated head and also consumes power slightly more than the rated power. The efficiency is poor for centrifugal pump. The pump should be replaced with energy efficient pump with following specifications:

Flow = 750 m^3/hr.

Head = 3.2 mWC

Power = 9.35 kW

This shall save approximately 28 kW per hour.

Use of Latest Technology

Conversion of system to HVDS

- Haryana Discoms has initiated conversion of LT to HVDS system in both urban and rural areas. Under this scheme, smaller capacity transformers are bein installed near the end-use consumers. Following benefits are envisaged: -
  - ✓ Reduction in technical loss (line loss)
  - ✓ Reduction in theft
- A pilot project has been started in a high-loss feeder of Hasanpur, to bifurcate (segregate) rural feeders into agriculture and rural-domestic loads. The likely benefits are: -
  - ✓ Correct estimation of irrigation load and loss, as many agricultural consumers are un-metered
  - ✓ Streamlining supply to irrigation load as per rostering schedule
  - ✓ Regular supply to rural households

Segregation of Feeders

- Plan to separate Agriculture feeders
- Physical and Logical segregation
- Physically separate feeder
- Logically separate feeder (RLMS units on tubewell transformers)
- Study by CPRI going on – pre segregation and post segregation; also study of inefficient motors scenario and efficient motors scenario w.r.t. impact on efficiency and groundwater extraction;

Organic Transformer Oil

DHBVN is undertaking an analysis of using organic oil (dielectric coolant) for distribution transformers. It has got the following advantages over conventional transformer oil: -

- Excellent dielectric characteristics
- High temperature stability
- Superior flash and fire resistance
- Excellent compatibility with solid insulating materials
- Environment friendly & Biodegradable
- Higher efficiency

Source: Biotemp, ABB

Amorphous-Core Transformers

- AMDT use metallic glass alloy in their cores.
- Amorphous metals can be defined as bulk, structural, metallic materials whose microstructure in the solid state is, unlike that of conventional metals, non-crystalline, amorphous or 'glassy'.
- As a result of this novel microstructure, amorphous alloys exhibit unique combinations of properties such as magnetic performance, hardness, strength, damage tolerance and corrosion resistance. This leads to reduce iron losses and enhanced efficiency.
- All new transformers being procured by Haryana Discoms are of amorphous core/CRGO type

Street Light

Following technologies are being tested on Pilot scale in the segment of Street Light:-

- Automated "SWITCH-ON-SWITCH-OFF" control mechanism to regulate street lights using photo sensors to avoid running of lights during day time
- Use of alternate street lights using automated circuitry during late night hours. This will lead to use of half of the street lights within an area, leading to a reduction in load
- Single phase transformers

Use of Solar Technology

Solar PV Power Plant

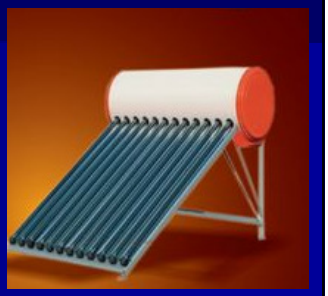
DHBVN is exploring the setting up of 1MW Solar Power Generation plant at Hisar

Features of SPP:

- Capital cost: Rs 30 Crore (indicative)
- Cost of generation: Rs 16 -18 /kWh
- Area required: 8000 m^2
- electricity units generated/ year: 1.5 MU
- CO_2 mitigation – 100 Ton/ year
- CDM benefits can be availed
- Help to meet HERC requirements for purchase of RE based power
- Generation based incentive offered from MNRE
  - Rs 12/ kWh for Solar PV
  - Rs 10/ kWh for Solar Thermal Power Plants

Solar Hot Water System

promoting use of Solar Hot Water System in the area under its jurisdiction



- Promotion: There are regular awareness campaigns by help of various media
- Enforcement: It is mandatory to use SWHS systems in all commercial establishments as per a Haryana Govt. Gazette Notification
- Incentive: Rebate is given in the monthly energy bills to the domestic consumers who use the Solar Water Heaters. Some incentive is also offered from the Govt of Haryana

Street Light

- Haryana is promoting use of Solar powered Street Light
- Pilot project has been initiated, wherein 180 Solar PV Powered street lights have been installed in Hisar

Photo Courtesy: TATA BP Solar

Solar Powered Home Systems

- Both the Discoms is exploring the use of Solar home systems in domestic households and commercial establishments
- These systems are designed to power Lights, Fans and TV
- Interest free loans are being facilitated for DHBVN employees to procure these systems

Photo Courtesy: TATA BP Solar

Implementation issues

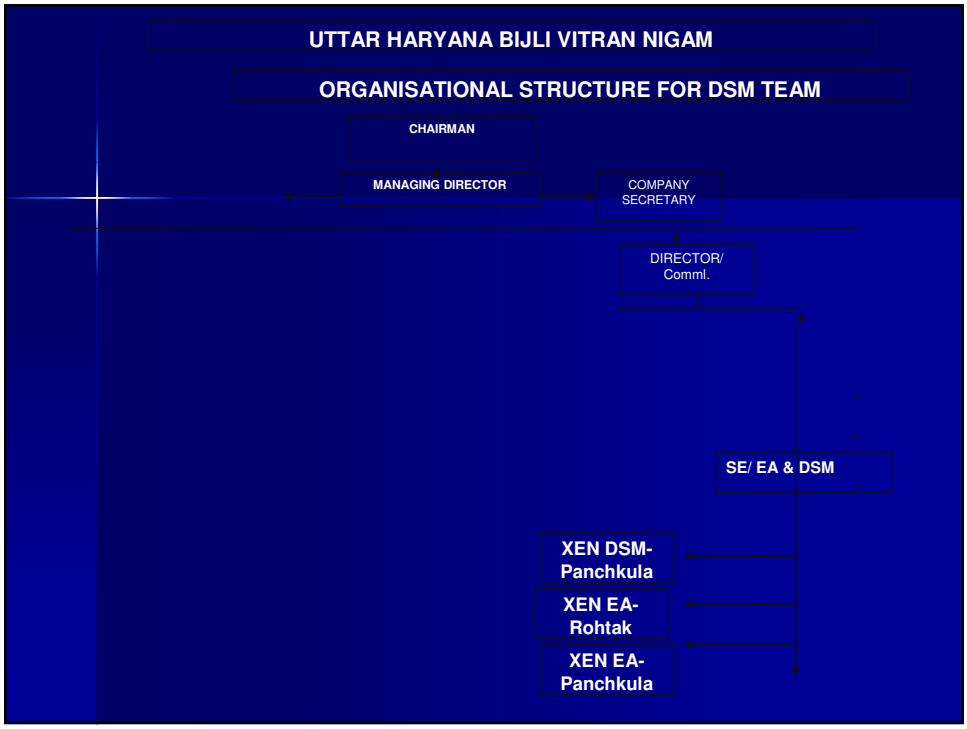
- Motivating employees
  - Meetings – give literature; show presentation
  - Tell advantages & give pamphlets and MD's letter
  - Quiz competitions
  - Monthly targets
- Motivating district administration
  - Meet DC – show presentation & Govt order promoting energy efficient lighting
  - In monthly meeting copy of govt. order be given to all officers
  - Targets to be set by DC – all offices to convert to CFL within a month – i.e. by next meeting

Implementation issues- Contd.

- Motivating people's representative
  - Meet MP/MLA
  - Tell details of CFL – advantages etc for State, Nigam and Consumer – you can show Nigam's CFL presentation
  - Meet Municipal Councillors, Zila Parishad, Panchayat Samitis and convince them to begin with their office buildings and homes
- Motivating HESL
  - Ex-Servicemen meter reading agency can play significant role
  - Meter reader to sell CFL and get incentive

DSM Center

- DHBVN is working towards establishing DSM centre in various circle offices
- They will a one stop shop for all technologies and information related to Energy Efficiency / conservation with display of equipments by manufacturers/ ESCO's
- There is also a proposal to sell the Energy Efficient Appliances and Solar Water Heaters at discounted rate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DIRECTOR/ Comml.
SE/ EA & DSM
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XEN EA-Rohtak
XEN EA-Panchkula


BEE-Retainer Consultancy for Agriculture DSM (Ag-DSM) in India

Overview of India's Agriculture Sector

- India's agriculture sector consumes 30%-40% of total electricity, up from 10% during the 1970's
- Limited or no growth in agriculture tariff since FY 92. Industrial & household tariffs increased at a rate of 11% over same period
- It has been one of the factors contributing to inefficiencies and thereby high AT&C losses of the State Utilities

Opportunity / Potential in Ag DSM

- DSM in Agriculture provides immense opportunity in
  - Reducing the overall power consumption
  - Improving efficiencies of ground water extraction
  - Reducing the subsidy burden of the states without sacrificing the service obligation to the sector
- Most of the pilot projects as well as other studies project potential of 45-50% by mere replacement of inefficient pumps
- **Overall electricity savings** (from 20 million pumps) is estimated at 62.1 billion units annually

Objectives of the Scheme

- Shelf of bankable DPRs to be prepared- 1 DPR in each states to stimulate the market
- Business model linked to subsidy reduction
- Create awareness amongst farmers about efficacy of adopting energy efficient practices and their easy pay back in terms of investment
- Share best practices in these areas to stimulate efforts at the local level
- Ring fence risks by a combination of policy initiatives, regulatory interventions, access to institutional finance, payment security mechanisms and demonstratives pilots

nsultancy for Agriculture DSM

The way ahead – I

- Model will be again sales promotion model with specially reduced rates
- Targeting the ceiling fans – replace 80/60 watt fans with 40 watt fans; also changing electro-magnetic regulators with five step electronic regulators;
- Targeting desert coolers – asked BEE to take up - issue star rating of coolers (fans/pumps)
- T5 promotion
- Agriculture DSM program in collaboration with BEE

The way ahead - II

- Ensure energy audit of all industries above 20 kw either through third party or Nigam's wing
- Efficient tubewelll motors
- Regulatory Support for investments, net metering, demand response mechanism,
- Recovery through consumer bills or tariff
- BEE needs to be proactive – labels/standards for motors, LED lighting devices, desert coolers, TVs, ceiling fan etc

Thank You

Status of TOD Tariff

S. No.	SERC	TOD Introduced	Summary
1.	APERC	No	Not yet introduced.
2.	AERC	Yes	Introduced TOD tariff for Industries (HT, HT-I & HT-II), Tea, Coffee, Rubber, Oil & Coal. TOD meters installed in all notified categories.
3.	BERC	No	Introduction of TOD will be considered in next year Tariff Order.
4.	CSERC	Yes	ToD compulsory for all HT industries as per tariff order for 07-08.
5.	DERC	No	Pilot study for implementation on voluntary basis is being undertaken.
6.	GERC	Yes	For HT consumers having contacted load 500kVA & above. Exclusive Night use tariff for HT (contacted load 100kVA a7 above). Night Time consumption rebate for LT water works.
7.	HERC	No	HERC has sought data for the consumer categories having TOD meters. It is under examination of the Commission.
8.	HPERC	Yes	TOD tariff started for LS in 2001-02. Implemented for all categories except Domestic and Agriculture consumers having connected load greater than 20KW.
9.	JSERC	Yes	TOD introduced in TO 2006-07 for HT and HTSS consumers. HT consumers can avail TOD tariff under which power in off peak periods will be charged at 89.47% of normal tariff and power in peak periods will be charged at 114.47% of normal tariff. HTSS consumers can avail TOD tariff under which power in off peak periods will be charged at 90.38% of normal tariff and power in peak periods will be charged at 115.38% of normal tariffs.
10.	J&KSERC	No	Introduction of TOD tariff to be considered in the 1st issue of Tariff Order by the Commission.
11.	KERC	Yes	ToD tariff is optional for LT & HT industries and for HT water supply.
12.	KSERC	Yes	TOD Tariff made mandatory for all HT & EHT consumers. LT TOD Tariff under consideration.

<table>
<tr><td>13.</td><td>MPERC</td><td>Yes</td><td>(a) TOD tariff is applicable to all HT consumers except Railways, coal mines, irrigations, public water works and bulk supply exemptees till Year 07-08.
(b) TOD surcharge of 15% on energy charges for four hours (06.00 PM to 10.00 PM) & rebate of 7.5% on energy charges for eight hours (10.00 PM to 06.00 AM next day) is applicable in the tariff for FY 07-08.</td></tr>
<tr><td>14.</td><td>MERC</td><td>Yes</td><td>TOD Tariff applicable to all HT consumers (excluding HT Agriculture). In LT category TOD tariff is applicable for LT- Industrial consumers.
Base energy charge for various HT categories and LT category of MSEDCL for whom TOD tariff is applicable are as under:

<table>
<tr><td>Category</td><td>Base Energy Charge in Paise/kWh</td></tr>
<tr><td>H.T- I Industries
Continuous
Non-Continuous</td><td>
310
340</td></tr>
<tr><td>HT-II Seasonal Industry</td><td>435</td></tr>
<tr><td>H.T.-IV Public Water Works
Express Feeders
Non Express Feeders</td><td>
300
320</td></tr>
<tr><td>L.T.-V Industrial
0-20 kW (upto & including 27 HP)
Above 20 kW (above 27 HP)</td><td>
300
400</td></tr>
</table>
TOD tariffs are as follows:
TOD Tariff (In addition to Base Tariff):
<table>
<tr><td>Time Slot</td><td>Revised ToD tariff (w.r.t. base tariff) Paise/kWh</td></tr>
<tr><td>2200 hrs - 0600 hrs</td><td>-(85)</td></tr>
<tr><td>0600 hrs - 0900</td><td>0</td></tr>
<tr><td>0900 hrs - 1200 hrs</td><td>80</td></tr>
<tr><td>1200 hrs - 1800 hrs</td><td>0</td></tr>
<tr><td>1800 hrs - 2200 hrs</td><td>110</td></tr>
</table>
</td></tr>
<tr><td>15.</td><td>MsERC</td><td>No</td><td>Not introduced.</td></tr>
<tr><td>16.</td><td>OERC</td><td>Yes</td><td>The Commission has accepted the principle of Time of Day Tariff since 01.04.2005 providing a rebate @ 10 paise per unit on consumption during the off-peak hours.</td></tr>
</table>

17.	PSERC	No	Large supply consumers pay extra charges for usage of electricity during peak hours. It is not considered feasible to allow discount for night use of electricity as there is no surplus power with the utility.
18.	RERC		The Commission has directed the Discoms to include the concept of TOD tariff in the next tariff petition for the consumers having contract demand of 1500 KVA or more to begin with.
19.	TNERC	Yes	▪ TOD tariff introduced & meters have been installed with incentives and disincentives for peak & off-peak hour for all HT industrial consumers. ▪ 20% extra on the energy charges for the energy recorded during peak hours and the duration for peak hours shall be 6am to 9am and 6pm to 9pm. ▪ Reduction of 5% on the energy charges as incentive for off peak hour consumption ie. Consumption during 22 hrs. to 0500 hrs. (night consumption) ▪ TNEB has been directed to submit data on TOD consumption along with the subsequent tariff application for all the consumers where TOD meters have been installed.
20.	TERC	Yes	For the purpose of attracting the differential tariff rate, the general provision has been kept in the Tariff Order costing differently for the peak hours (6 hours) and off peak hours (6 hours). Industry is yet to response to this TOD tariff mechanism..
21.	UERC	Yes	TOD introduced for all industrial and non-domestic consumers having load more than 25kW.
22.	UPERC	Yes	TOD rates were first introduced for large and Heavy Power Consumers in the Tariff Order 2002-03. In the Tariff Order for FY 2006-07 the off peak TOD rebate has been increased from (-)5% to (-)7.5% whereas peak TOD rates have been lowered from 20% to 15%.
23.	WBERC	Yes	Applicable to those who are under two part tariff i.e., Industrial, Public Utilities, Commercial & Agricultural. Generation tariff is also on ToD based system.