

# Demand Side Management In Electricity Sector



Ethiopian Electric Power Corporation



# Compact Fluorescent Lamp (CFL) Program

LDP Banner 2' x 3'

**BELP**  
Compact Fluorescent Lamp Program

## Switch to CFLs\*

(Compact Fluorescent Lamps)

# SAVE 3 WAYS

Money • Electricity • Environment

**Simple steps to save up to 80% energy**

**Save electricity and pay for CFLs at no additional cost with your electricity bill!**

1. Call a BELP number (listed by the BELP office at the Service Counter at the nearest BELP sub-station office).
2. An in-home service visit will be scheduled with a BELP technician. The technician will bring a sample lamp (provided at no additional cost) to the service visit. The technician will also provide you with a sample bill showing the amount you will pay for the CFLs with the regular BELP utility rates.
3. The amount of money saved will be credited to your BELP account.

EPCO

**Save on direct purchases.**

1. Call a number (listed by the BELP office at the nearest BELP sub-station office).
2. Go to the nearest retail shop selling lamps under the BELP utility. Check out (bring in) the receipt, check to make sure the amount is correct, and pay for the CFLs with your electricity bill. The amount you pay for the CFLs will be credited to your BELP account.

**How much do I save by using this environment friendly technology?**

Type of Lamp	Power Consumption (W)	Equivalent Incandescent (W)
15W CFL	15	75
25W CFL	25	100
35W CFL	35	150
45W CFL	45	200
60W CFL	60	275
75W CFL	75	350
90W CFL	90	450
100W CFL	100	500

\* Equivalent of incandescent 1.3 power

**Attractive Incentive**  
 The amount of money saved will be credited to your BELP account.

**Customers can choose any one of the following options:**

Option	1	2	3	4	5	6	7	8	9	10
15W CFL	15	25	35	45	60	75	90	100	150	200
25W CFL	25	35	45	60	75	90	100	150	200	275
35W CFL	35	45	60	75	90	100	150	200	275	350
45W CFL	45	60	75	90	100	150	200	275	350	450
60W CFL	60	75	90	100	150	200	275	350	450	500
75W CFL	75	90	100	150	200	275	350	450	500	550
90W CFL	90	100	150	200	275	350	450	500	550	600
100W CFL	100	150	200	275	350	450	500	550	600	650

The energy rebate credited your account BELP office at your nearest sub-station office at your electricity supplier.



# Demand Side Management

## General

- Demand side management or DMS refers to active efforts by electric utility to modify customers' energy use patterns. In the utilities DSM programs have aggressively promoted to adoption of energy –saving technologies and practices. The Utility DSM program began modestly in the 1970s in response to the growing concerns about dependence, on foreign sources of oil and environmental consequences of electricity generation, especially nuclear power in the United State of America.
- Utility DSM programs grew rapidly during the late 1980s as state regulators provided incentives for utilities to pursue least-cost or integrated resource planning principle.
- We expect DSM programs to continue on two parallel paths reflecting the changing business interests of electric utilities in the restructured industry as well as continuing public interest in the environmental consequences of electricity regulation.
- This presentation focuses on the case study of DSM program in Ethiopia and some other African countries experience to overview the status of Ethiopian Electric Power Corporation changes in respect to the Demand side Management application.



# Demand Side Management on African Context.

In this presentation, Uganda, South Africa experiences and Ethiopia case study on CFLs introduction will be discussed in respect to the application of Demand Side Management in the Electricity Sector.

## **I. UGANDA Experience**

*From the Demand side management prospective, Government of Uganda through the Ministry of Energy and Minerals Development planned a massive Country wide distribution of compact fluorescent lamps (CFLs) commonly known “energy saver” in 2006.*

*Compact fluorescent lamps ( CFLs) offer consumer lighting through lamps that have a longer life and consume considerably less energy than conventional lamps.*

*In preparation of this program ,a study on Residential customer lighting was conducted to establish the following:-*

- 1. The types and nature of residential lighting presently used*
- 2. The normal lighting practice*
- 3. The extent of consumer awareness of energy savers those are available in the market*



## African context cont...

### Survey Strategy

*The survey sample was taken from Kampala city which had 140,000 consumers out of about 220,000 in the UMEME power system excluding large and medium industries.*

*At least 500 households and small commercial business were sampled, 100 households and small commercial business from each of the 5 divisions of Kampala City.*

*The survey work and final study report submission completed within one month due to urgency of the project.*

### Survey results

*Based on the survey result, consumers typed grouped according to their category and number of replaceable lamps in each category identified.*



## African Context cont...

### *Conclusion on CFLs application case study*

- 1. The survey mainly targeted households in Kampala City. These were 527 in total.*
- 2. Incandescent bulbs take the largest percentage of use in the households, 2919 lamps were found, of which 58.6% were incandescent bulbs, 23.9% were compact fluorescent lamps and 17.4% were fluorescent tubes and other lamps*
- 3. On average three incandescent bulbs were required per household.*
- 4. The awareness level of energy saving by use of the compact fluorescent lamps was very low in the low income residential households.*



## African Context cont...

5. *The low income residential households mainly purchase lamps from local shops, while the middle and high income households make their purchase from lamp dealers and supermarkets.*
6. *Many of the households use incandescent bulbs mainly because they can not afford the compact fluorescent lamps (CFLs).*



## African Context cont...

### III South Africa Experience

*The south African ESKOM has been implementing the following demand side programs :-*

- 1. CFLs exchange*
- 2. Solar Water Heating*
- 3. Energy Efficient Motors*
- 4. Residential Load Management*
- 5. Load Limiting pilot Project*

*In this presentation we will concentrate on CFLs exchange practice to view the experiences of the above mentioned African Countries on specific demand side program.*



## African Context cont...

*Eskom embarked on a National programme to exchange incandescent lamps with CFLs in selected areas.*

*Since the program began in 2004 more than 18 million CFLs have been exchanged for incandescent lamps. The National programme was recently implemented in the Western cape, North province, Gauteng and Free town where four million CFLs were exchanged for incandescent lamps.*



# Demand Side Management In Ethiopia

## Back Ground

**The electricity supply system in Ethiopia is confronted by the problems ranging from inadequate service reliability to serious shortage in the face of accelerating demand.**

**Incompatible supply to demand and inefficient production and utilization of electricity is also bearing a strong negative effect on the environment. Consequently these required high level and long term investment which is beyond the present financial capability of the Corporation.**

**In the context of the demand side management and as a pre condition on effectively deal with demand side management tasks, general customers servicing management should be soundly footed as long as program benefit from the infrastructure of the servicing system.**



## Demand Side Management In Ethiopia Cont...

**Demand side management, as it requires the customers affiliation and involvement, the utility has to approach the Customer through these systems that it uses to make business contract. How efficient this program operates also affects the ability to win the confidence on any demand side program.**

**From the experience of the Corporation, customer marketing and sales service centers composed of different Regional marketing and sales Offices who has direct and indirect contact with the customers has to address the defined service requirement.**

**Customer side demand management program is relatively innovative subject in its form of introducing technique of energy optimization and also introducing investment to promote sales of efficient lamp or appliance by the customer with a view of saving energy**



# Demand Side Management In Ethiopia

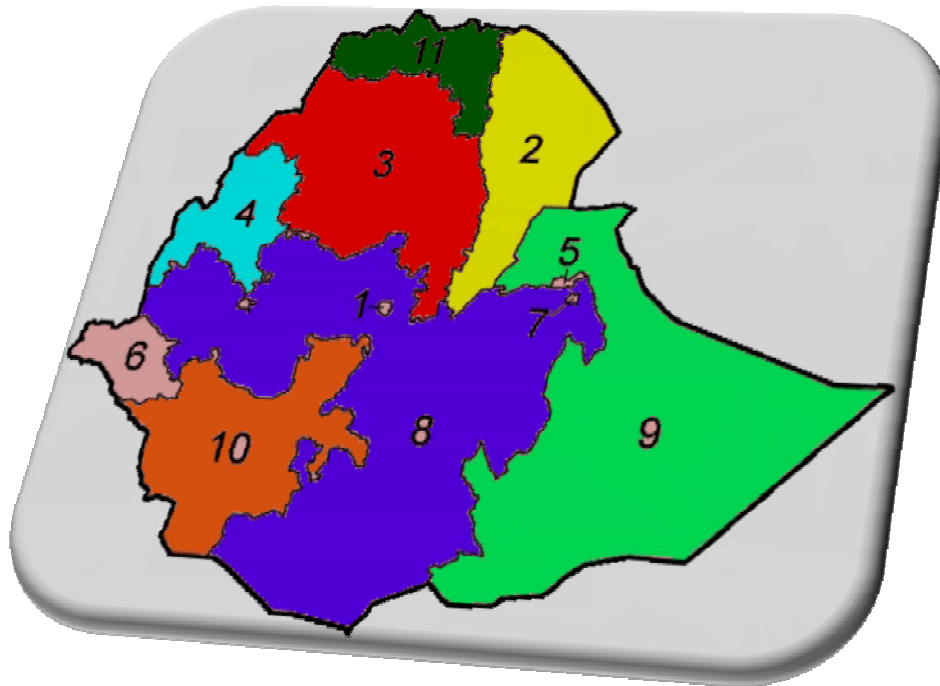
## **CASE STUDY ( Promoting use of Compact Fluorescent lamps)**

### Survey Sample

*The survey sample was taken from all regions of EEP Co which can represent the whole political regions of the country. From Addis Ababa which has more than 500,000 customers taken customer data from its all region “Addis Ababa North, East, West and South”. From each region 200 samples were taken and analysed. The representatives of the samples are 68 percent for the domestic, 24 percent for the commercial and 8 percent for the Industrial customers.*



# Demand Side Management In Ethiopia



- 1.Addis Ababa
- 2.Afar
- 3.Amhara
- 4.Benshangul-Gumuz
- 5.Harari
- 6.Gambela
- 7.Dire Dawa
- 8.Oromia
- 9.Somali
- 10.Southern Nationalities, and People's Region
- 11.Tigray



# Demand Side Management In Ethiopia

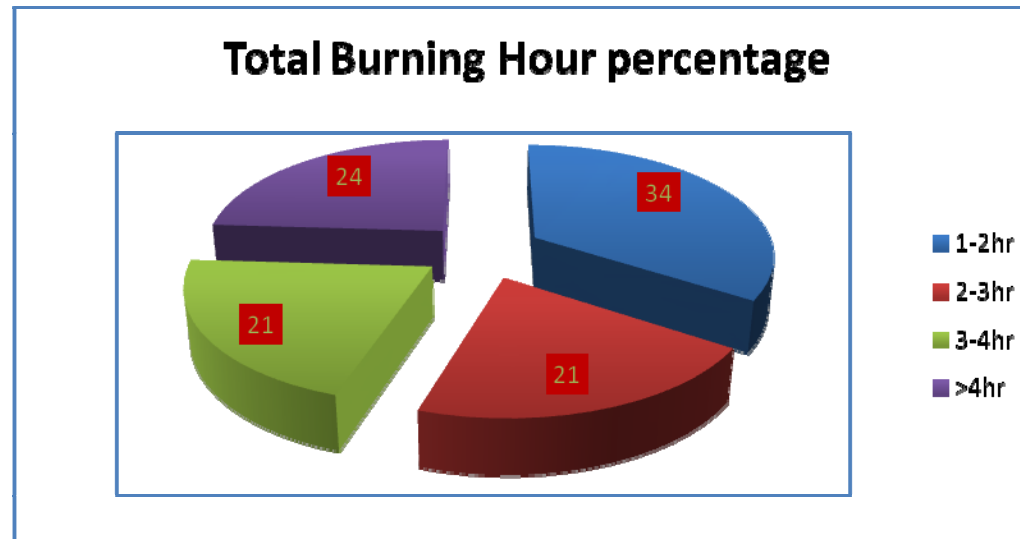
## *Some relevant data of the survey analysis:*

- 62.34% are house owner
- 37.43% are rent payer
- 0.23% Are rent free households
- 26.95% of houses are brick made
- 72.88% of houses are made from mud
- 0.23% of houses are made from wood
- No house in the sample is makeshift
- 72.64% of the household lives more than 5 Years in the house
- Average population per household is 6.32 people.
- Average number of rooms per household is 4.49.
- Average number of wage earners 1.28
- Average household income Birr per month 1944.63
- Percentage with indoor toilet 17.11%
- Percentage monthly income below 320 19%
- Percentage purchase electricity through third party 17.59%



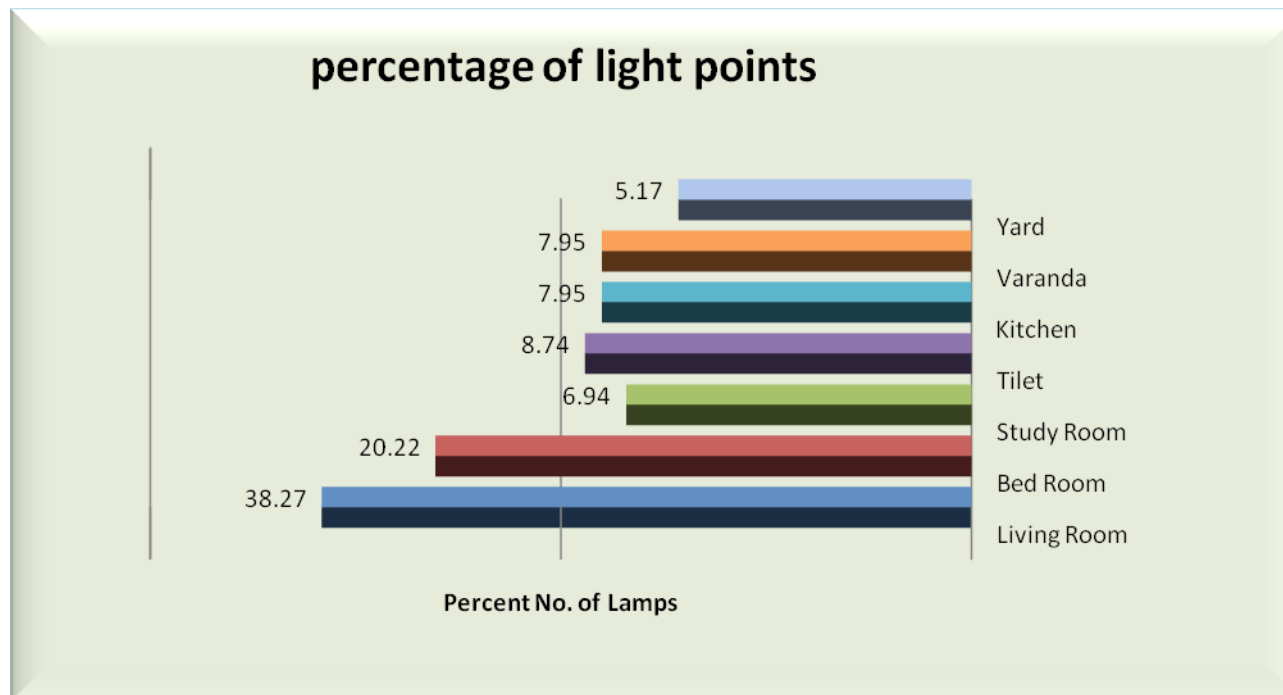
# Demand Side Management In Ethiopian

*One of the determining factor of this survey is for how long the household lights its bulbs in different parts of its rooms. Majority of the households burn their bulb for two hours, from the survey except the yard lighting they are coinciding with night peak. The following figure showed the sample burning hour.*





# Demand Side Management In Ethiopia





# Demand Side Management In Ethiopia

## Survey Results

*The income bands of the households were indicated during the survey. The domestic household is grouped in to three categories (in the first category households who have total annual income of Birr 3600 are categorized, in the second group their annual income between Birr 3601 – 14400 is categorized, finally in the third group their annual income more than Birr 14400 is categorized. All kinds of income the household generate is incorporated for the sake of this assessed and added during the survey. The following graph showed the household annual income by their in come band. From this the higher the income the hhs earn the higher the light points. Income and the number of the light points are highly correlated.*



# Demand Side Management In Ethiopia

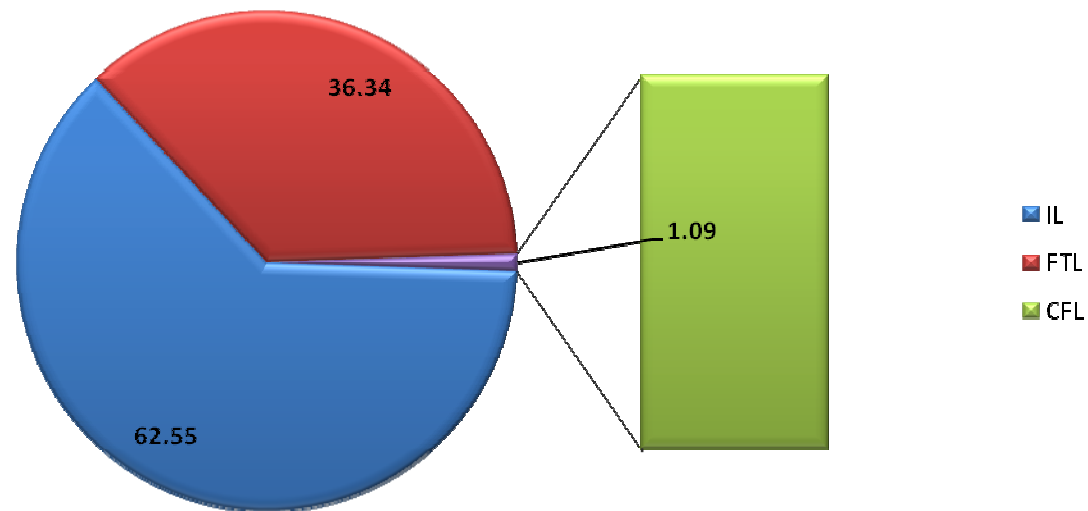
**Percentage Distribution of Household Income**





## Demand Side Management In Ethiopia Cont...

From the total sample the share of each kinds of lamp is shown below.





# Demand Side Management In Ethiopia Cont...

## *Lesson Learned*

- *Previous knowledge by the household of the survey is very important – Households informed ahead of time ensure a good reception of the surveyors and more trust hence allowing greater access within the home. Announcements could be made on radio mentioning the specific area in which the survey can be carried out.*
- *Local authorities should also be informed.*
- *Training of surveyors by the developers of questionnaires is crucial – in some regions on some questionnaires the important elements was not filled. So, the case study team forced to discard some questionnaires. In this case, the team proposed for the future work enough time shall be allocated in order to transfer directly to the evaluators.*



# Demand Side Management In Ethiopia Cont...

## *Conclusions*

- The survey targeted households through out the country using the corporations' regional offices as medium of communication.
- Incandescent bulbs take the largest percentage of use in the households. Totally 28,266 lamps were found, of which 62.55% were incandescent bulbs, 1.09% were compact fluorescent lamps, and 36.36% were fluorescent tubes lamps.
- On average, three (3) incandescent bulbs for lower income hhs, 6 for middle income hhs and 10 for higher income hhs is required.
- The majority of fittings found in the households were screw. 100% of incandescent bulbs had screw fittings.



## Demand Side Management In Ethiopia Cont...

- *25W, 40W, 60W and 100W were the predominant sizes of incandescent bulbs found. 1.26% of the bulbs were 100W, 0.35% was 75W bulbs, 24.8% were 60W bulbs, 53.33% were 40W and 20.26% were 25W bulbs. But for the better lighting of CFLs we refrained from not using the 25W equivalent rather it is proposed to use 40, 60 and 100watt equivalent CFLs.*
- *The awareness level of energy saving by use of the compact fluorescent lamps was very low in the low-income residential households. Some middle and high-income residential households had at least an energy saver or lamps of low watt-sizes.*
- *The low and middle -income residential households mainly purchase lamps from local shops, while the majority of high-income households make their purchases from lamp dealers and supermarkets*



## Demand Side Management In Ethiopia Cont...

- *Many of the households use incandescent bulbs mainly because they cannot afford the compact fluorescent lamps. Incandescent lamps are mainly purchased from local shops at a price of 2.5 Birr. CFLs are mainly purchased from lamp dealers at a price up to 50 Birr. Customers purchase fluorescent lighting from local electrical shop for long more than 15 Birr and for small 10 Birr..*
- *Energy, environmental and monetary savings' benefits of compact fluorescent lamps should also be stressed in the advertising campaigns.*
- *Uganda's Methodology on survey and application of CFLs exchange for incandescent lamps are found similar approach with Ethiopian Experience*

### **Recommendations**

*In view of the results and conclusions drawn from the survey, the following are some general recommendations to be considered when developing the implementation strategy for the CFL program:*



## Demand Side Management In Ethiopia Cont...

- *According to the survey, 17547 lamps met the criteria for replaceable lamps i.e. they were incandescent bulbs of 40W, 60W and 100W. Further more it was also established that the average distribution of incandescent lamps was estimated to be 5. But, in the first phase the case study team proposed to change the incandescent lamp and postpone the fluorescent tubes bulbs to the second phase.*
- *To be cost effective the distribution has to be made in the district and service centre rather moving to the customer premises to change.*
- *The replaced incandescent lamps has to be collected to be more effective on power saving.*
- *The survey covered mainly residential households, commercial and Industrial. The first concern has to be the households because of its higher coincidence factor.*



# Demand Side Management In Ethiopian Cont...

- *The survey established that the replaceable incandescent bulbs were of watt-sizes 40W, 60W, and 100W. These should be replaced by compact fluorescent lamps of watt-sizes 11W, 15W, and 20W respectively. The required number of lamps should also be 55%, 44% and 1%.*
- *It was also concluded that the households sampled had 100% incandescent bulbs with screw fittings and 100% fluorescent bulbs with pin fitting. It is therefore recommended that of the compact fluorescent lamps introduced to replace incandescent lamps has to be 100% screw fittings respectively.*

Energy Efficiency Analysis on Lighting

## **Expected Energy Savings from CFL introduction .**

Number of units.....	4,600,000
Unit Peak saving (Watts).....	40.0
Unit Yearly Energy Saving (KWH).....	58.4
Total Yearly Savings (MW).....	129
Total Yearly Energy Savings (GWh).....	269



# Demand Side Management In Ethiopian Cont...

## Energy Efficiency Analysis on Street Lighting System

(EEPCO Current Program )

<i>Net number of light point proposed.....</i>	<i>16000</i>
<i>Unit Peak savings (W).....</i>	<i>150</i>
<i>Unit Yearly energy savings (KWh).....</i>	<i>657</i>
<i>Peak coincidence Factor.....</i>	<i>1.0</i>
<i>Total Peak savings (MW).....</i>	<i>2.4</i>
<i>Total Energy Savings (GWh).....</i>	<i>10.5</i>
<i>Investment per point (US\$).....</i>	<i>200</i>
<i>Investment Costs (MUS\$).....</i>	<i>3.2</i>



# Demand Side Management In Ethiopia Cont...

## EEPCo's Current Program Cont.....

- *Capacitors Introduction*
- *Demand side management of large loads*
- *Demand side management of injera baking stoves*



# Demand Side Management In Ethiopia Cont...

## Actual CFLs Distribution and its Benefits



# Demand Side Management In Ethiopia Cont...

District Service Center No	CFLs Type			Total No. Of CFL	Total No. of Customers	Remark
	11W	15W	20W			
1	25,287	21,121	5	46,413	11,819	
2	29,425	23,300	0	52,725	13,472	
3	17,705	14,898	100	32,703	9,514	
4	29,416	21,790	0	51,206	13,037	
5	25,955	18,749	30	44,734	11,366	
6	16,746	13,592	0	30,338	3,707	
7	15,533	14,472	0	30,005	5,934	
8	17,980	13,100	0	31,080	7,784	
9	12,720	12,710	0	25,430	4,494	
<b>Total</b>	<b>190,767</b>	<b>153,732</b>	<b>135</b>	<b>344,634</b>	<b>81,127</b>	

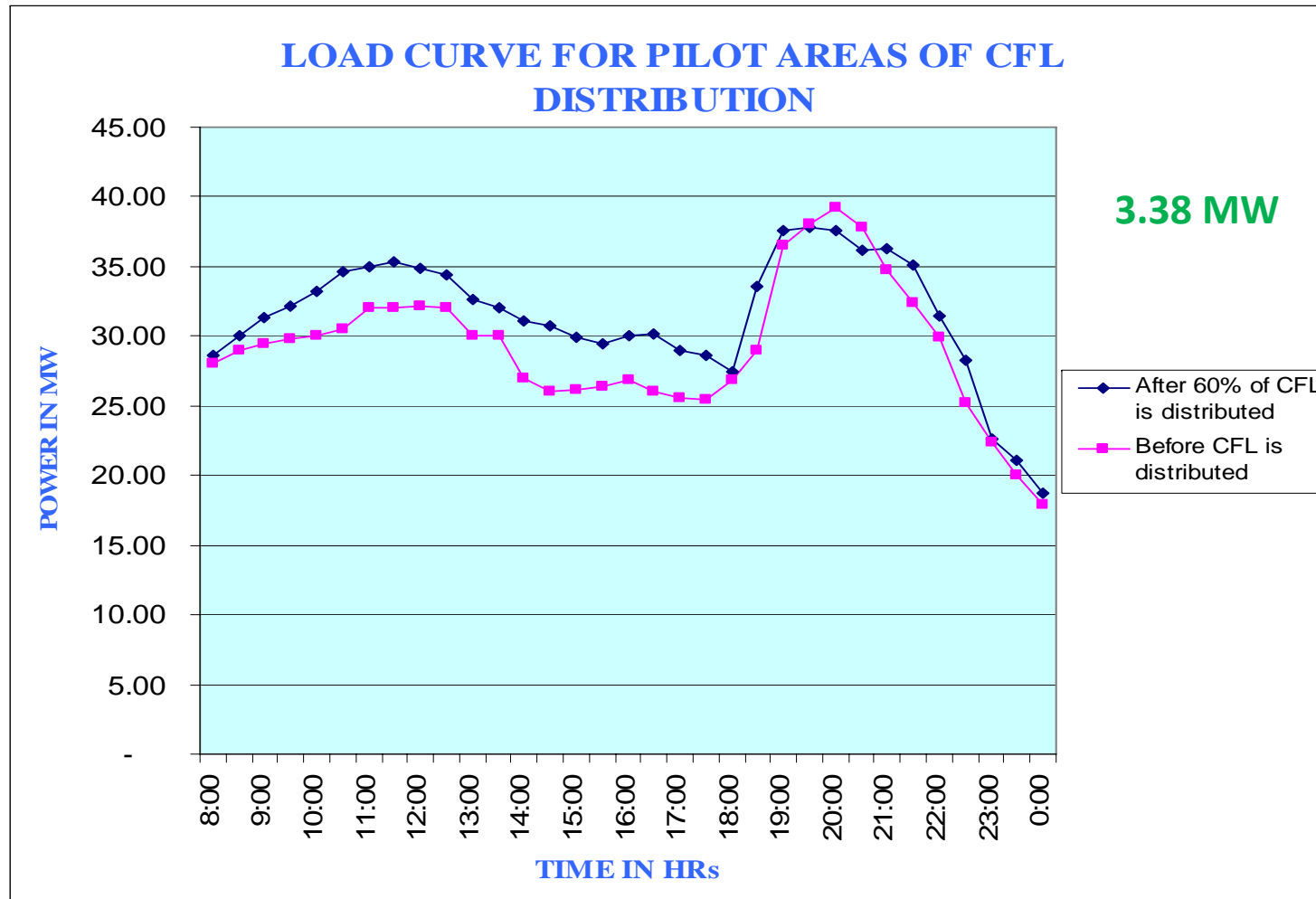


# Demand Side Management In Ethiopia Cont...

Service Center No.	Sampled Qty	CFLs Received Customers		Used Customers In %	Remark
		Used	Not Used		
1	1198	1198	0	100	
2	1380	1355	25	98	Customer advised to use CFL
3	508	493	15	97	Customer advised to use CFL
4	1200	1200	0	100	
5	2781	2781	0	100	



# Demand Side Management In Ethiopia Cont...





# Demand Side Management In Ethiopia Cont...

## Customers Electricity Monthly Bill Reduction

50 Customers were taken as a sample to analyze their electricity monthly bill before and after CFLs distribution. Based on the assessment 80% of the customers have been confirmed that their monthly electricity bill are considerably reduced.

**Thank you**