



ENERGY EXPENDITURE REDUCTION THROUGH **ENERGY AUDITING**

BACKGROUND

Energy plays a significant role in the lives and livelihoods of homebased workers across the world. Access to modern fuel, like electricity, can augment income especially of homebased workers who work from home and often at night too, to meet commitments. Certain advanced tools and equipment required in production of goods also require electricity like sewing machines, mixers and grinders, beauty parlour equipments and so on. Within the home, electricity is also used for lighting, cooking, cooling, heating, mobile charging, television, ironing, water-motors, radio etc. For many households, the cost of electricity is very high and cuts into their productivity and quality of life. In most of the cases it is due to high tariffs, lack of access to quality and affordable products and high running costs. The same applies to cooking fuel. Energy efficient fuel like

Liquefied petroleum gas is used but many households still do not have access to it. Poor households have to rely on inefficient and harmful fuel like charcoal, wood and kerosene.

In spite of these factors, households can still reduce their electricity consumption, cooking fuel wastage and consequently reduce expenditure by adopting measures aimed at energy efficiency.

This publication is an attempt to reach out to Homebased workers and their organizations with guidelines aimed at reducing energy consumption at household level. 'Energy Audit' is a tool used to evaluate the household energy usage and expenses on energy (electricity, fuel, etc.). Over the years, these efforts have led to drastic reduction in electricity bills and reduction in cooking fuel wastage of many households. It is hoped that this document will equally help homebased workers of South Asia.

How to use this document ?

The organizations working with homebased workers can use the document in following ways :

1. Develop it into awareness material (pamphlet, poster) and distribute it among homebased workers.
2. Conduct community meetings with homebased workers and provide them overview on ways to reduce expenditure.
3. Capture quantitative and qualitative information on impact of energy management on lives and quality of life of homebased workers and disseminate it.
4. Train homebased worker leaders and others to do energy audit.
5. Develop and implement energy intervention programs for homebased workers who either have or don't have access to electricity.

These guidelines are based on learnings of Mahila SEWA Housing trust (MHT), Ahmedabad, who has implemented 'energy efficiency program' with informal economy women workers in the city of Ahmedabad, India to provide energy saving alternatives by understanding energy consumption of households.

ENERGY AUDIT

1.1 What is energy audit and why is it required ?

Energy audit is a simple process by which one can assess and improve household energy consumption pattern. Based on simple calculations, energy audit leads to assessment of users need, current situation of energy consumption and proposes alternatives. Energy audit can lead to better awareness and adoption of energy efficient products.

1.2 Who are energy auditors and what skills do they possess ?

The auditors can be external representatives (trained by the organisation) who visit households in urban and rural communities to identify energy related problem of its residents and recommend solutions. An energy auditor needs to be aware of basic mathematical operations like addition, subtraction, multiplication and division. She can use calculators, note/paper and pen to calculate energy consumption in a household. Homebased worker leaders or staff of their organisations can also become energy auditors after proper orientation/training.

1.3 How does Energy audit takes place ?

The 3 stages of energy audit are : (i) Gathering information by asking questions : (ii) Calculations, (iii) Application of knowledge and other technical skills to conclude a relevant solution. Let us examine the three stages one by one.

i. Gathering information by asking questions :

A energy auditor visits a selected household and seeks permission to conduct the audit. The auditor explains the benefits of the audit process to the household members. Residents of the household then show each portion of the house to the auditor. By doing this auditor takes note of all electric appliances being used in the house. The auditor asks probing questions to collect concrete information. If the auditor does not get proper responses, the same questions can be asked in different manner.

ii. Calculations :

An auditor needs to be aware of basic concepts of Watt, Ampere, Volt, Unit and Unit charge to calculate. She should also be able to identify and distinguish between various electric appliances like CFL, LED, as well as fixtures like holders, sockets, wire, bed switch, electric regulator, normal regulators and so on. Carrying tools like watt meter will be useful incase the watt are not specified on appliances. Following steps need to be carried out to calculate daily and monthly consumption of electricity by a household when an audit is being done by an energy auditor.

- Step 1** : Identify all the electronic appliances in the household.
- Step 2** : Identify Watt (W) consumed by electrical equipment. This is mentioned on the device.
- Step 3** : Ascertain number of hours the electrical appliance is used in a day.
- Step 4** : Calculate total watt consumed by the appliance in a day. This is Watt *total hours used in a day.
- Step 5** : Ascertain number of days an appliance is used in a month.
- Step 6** : Calculate total watt consumed by appliance in a month.
- Step 7** : Calculate 'unit' consumed by the appliance in a month. 1 unit= 1000 watt
- Step 8** : Undertake step 1- step 7 calculation for all electric equipments including bulbs, fan, television, CFLs, tube lights and so on. The calculation will generate total unit consumed by all electric equipment. Addition of total units of all appliances (i.e Column 7) will generate total units consumed by a household. To generate unit charge calculate (Total no. of units)* (per unit charge mentioned in the electricity bill).

Corresponding Table

Step 1 Appliance Detail	Step 2 Watt	Step 3 # of hours Used/ day	Step 4 Watt consumed in a day	Step 5 # of days used/month	Step 6 Total watt/ month	Step 7 Total unit/ month
Bulb in living room	60 watt	8 hours	=480 Watt (60*8)	30 days	=14400 Watt (30 days* 480 watt)	= 14.4 Units (14400 watt/ 1000)
Bulb in Washroom						
Fan						

Step 8 Sum total of Unit consumed /month on all appliances

iii.Application of knowledge and other technical skills to conclude a relevant solution.

On the basis of assessment conducted, an energy auditor provides solutions which household should adopt. The auditor also demonstrates how change in equipments has potential to reduce the wattage and units consumed. Based on electric appliances and fittings in the city of Ahmedabad, by way of an example, some of the inputs provided by MHT through their auditors are as follows:

Location in the House	Current Usage Option	Suggested Energy Efficient Alternative
Living/Main Room	- Tube light (36/40 W) - Bulbs (15/25/40/60/100 W) - CFL (20/25 W)	- Main light-CFL (15/11 W) In case of larger room an additional CFL (5/8/11/15 W) can be used.
Kitchen (or Cooking Space)	- Tube light (36/40 W) - Bulbs (15/25/40/60/100 W) - CFL (20/25 W)	- CFL (5 W)
Bathroom	- Bulbs (15/25/40/60/100 W)	- CFL (5 W)
Toilet	- Bulbs (15/25/40/60/100 W)	- CFL (5 W)
Courtyard/ Passage/ Balcony	- Bulbs (15/25/40/60/100 W)	- CFL (5/8 W)
Store room/Storage Space	- Bulbs (15/25/40/60/100 W)	- CFL (5/11 W)
Staircase/Ladder	- Bulbs (15/25/40/60/100 W)	- CFL (5 W)
Roof	- Bulbs (15/25/40/60/100 W)	- CFL (5 W)
Temple/Prayer Space	- Coloured Bulb often called zero watt bulb (15 W)	- Coloured LED
Space to Sleep	- Dimmed Bulb (15 W)	- Coloured/White LED
For Ventilation	- Ceiling Fan (90 W)	- Energy Efficient Fan (50 W)

1.4 Besides 'Energy Audit' what are other steps we can take for better energy efficiency?

There are a number of different things we can do to manage our energy needs and reduce costs. Please refer Annex-1 on Guidelines for Homebased Workers on Energy Management.

1.5 How does one benefit from energy audit

By adopting energy efficient alternatives one can drastically reduce wattage consumption of lighting and cooling. Some of the members who have used alternatives have reported a reduction in average wattage of 93 watts on lighting and 39 wattage on fans. As a result of which one can easily save Rs 150/month (\$ 2). Roof-top installation can lead to reduction in usage of lights by 8-10 hours a day. Gas saver is estimated to saves 1.5 Kg of gas/cylinder and can make cylinder last a week more.

TESTIMONIALS

Surekhaben Patel

Surekhaben and her husband Sanjaybhai Patel live on the outskirts of Ahmedabad, in the migrant area of Vishwas Nagar, Odhav. Sanjay bhai works at home as machine embroidery worker. An initial audit of their home revealed, use of inefficient 90 watt fan, a tube light of 53 watt and two incandescent bulbs of 15 watt each. The energy auditors recommended replacing their home appliances with an efficient 52 watt ceiling fan and package of CFL light (one of 11 watt, two of 5 watt and one of 8 watt). Two months later, Surekhaben had reduced her electricity bill by 25%.

Ranjanaben Mahendrabhai Narvare

Ranjanaben Mahendrabhai Narvare, age 38, purchased ventilation unit, Airlite. Prior to this purchase, the monthly electricity bulb consumption of her household used to be in the range of Rs 600. Due to poor ventilation and lighting in their home, her family of 5 persons, would turn on their room lights as early as 6 am before sunrise. The ceiling fan would turn on soon thereafter and would be kept on for at least 10 hours. This was because; there was no other source of lighting and ventilation in her house except the front door. After the purchase of Airlite, she feels that her room is no longer suffocating and there is noticeable change in air draft from the front door though open shaft created by Airlite. More significantly, her electricity bills has reduced to Rs.375/month because she no longer needs to turn the lights and fan on during early hours of the day.

Kaliben

Kaliben used to rely on a traditional wood stove for all her cooking. As a result , she was using 150 kilograms of wood per month at a cost of Rs. 600. She was introduced to Prakti wood stove, which has two burners and uses wood more efficiently. As a result, her wood consumption decreased to between 60-70 Kgs. per month, reducing her monthly expenditure by almost half.

Process of Energy Auditing

Krishnaben, is a trained energy auditor recruited by MHT. She lives in Madrasi ki chali (slum colony) in Ahmedabad and is a homebased worker. In adjoining picture, Krishnaben is conducting energy audit with a homebased worker-Shobhaben in Madrasi ki chali. Krishnaben first explains relevance of saving money to Shobhaben. She elaborates how saving in electricity bill is important.



A cluttered kitchen area with various items on the counter, including a large metal pot, a green plastic bag, and a green cabinet.

વિગતો ભવનની નક્કરી અને બલવા મટ્ટના સાધનોની વિગત										ચિત્ર પોટર સંક્રિત નં.	
સાધનમાં વપરાતા સાધનો			સાધનનો વપરાતા કાળાઈ / દિવાલ		તીવ્ર ભાગ કાળાઈ પોટરનું સુવન પોટરનું વિગત પૂર્ણ			ખવત		સાધન પોટર સંક્રિત	
ચિત્રની ક્રમાંક	કાળાઈ	પોટર	કાળાઈ	પોટર	પોટર	પ્રતિ દિવાલ	ખાસ નોંધ	પોટર	પોટર	પોટર	પોટર
ક્રમાંક	કાળાઈ	પોટર	કાળાઈ	પોટર	પોટર	ક્રમાંક	ક્રમાંક	ક્રમાંક	ક્રમાંક	ક્રમાંક	ક્રમાંક
CFL	3.7	15	8	CFL	15	0	0	0	0	0	0
3.7	3.7	15	5	CFL	15	33	165	1350	1350	1350	1350
3.7	3.7	15	24	3.7	3.7	52	38	912	3736	3736	3736
3.7	3.7	15	24	LED	2	13	312	3360	3360	3360	3360
3.7	3.7	100	1	CFL	8	12	92	2760	2760	2760	2760
3.7	3.7			CFL	5	2	10	300	300	300	300

A photograph showing two women. The woman on the left, wearing a green and gold patterned sari and glasses, is leaning over a white notepad and writing with a blue pen. The woman on the right, wearing a yellow and black patterned sari and glasses, is looking at the notepad. Both women have bindis on their foreheads. The background is a plain, light-colored wall.

(6)

Annex-1

**GUIDELINES FOR
HOMEBASED WORKERS ON
ENERGY MANAGEMENT**



Energy in the form of electricity is crucial for homebased workers. Electricity provides lighting and cooling in the house. This helps all home makers including homebased workers to perform household chores conveniently. Electricity is also used by children to study.

However, electricity is also essential for homebased workers, in the course of their production work which they do from their homes. All homebased workers require good light to work in, or else their eyes get strained and spoilt. Many HBWs use electric sewing machines to stitch clothes, or other electric appliances to process and store food items. Having a regular and affordable supply of electricity helps homebased workers to increase their productivity and quality.

However, the cost of electricity is constantly increasing. The electricity bill is a significant part of homebased worker's household expenditure as well as cost of production. Do you know that we can reduce electricity bills by adopting very simple changes in our household? This brief document will help our homebased worker sisters to understand some of the causes behind high electricity and how we can reduce them.

CHANGE 1

CHOOSE THE CORRECT KIND OF BULB

It is very important to use a bulb which can be most useful to us. There are three different kinds of bulbs which are available in the market.

Kinds of Bulbs	Regular Yellow Bulb or incandescent Bulb	CFL Bulb	LED Bulb
Kinds of Bulbs	 ❌	 ✅	 ✅
Wattage : Important – the higher the wattage the more expensive is the running cost.	60 watt (Most expensive running cost - Approximately Rs.1700 per year)	13-15 Watt CFL (Less expensive than Yellow bulb but more expensive than LED running cost)	6- 8 Watt LED (Least expensive running cost – Approximately Rs.180 per year)
Original Cost	Cheapest (Eg. Rs.15 in India)	More Expensive (Eg. Rs. 145 in India)	Most expensive (Eg. Rs. 350 in India)
Life Span	4- 6 Months	2-3 Years	15-20 Years
Brightness	Less Bright	More Bright	More Bright

In view of the above, it is better to replace yellow bulbs with CFL bulbs, and even better with LED bulbs, where feasible.

CHANGE 2

REPLACE ZERO WATT BULBS

It is a common misconception to think that zero watt bulbs consumes zero power. As a result, people use this bulb 24x7 near temple or religious area, decorative items, night-bulbs and so on. Remember these bulbs are adding to your electricity bill every minute they are on.



If one wants to keep lights on for the entire day and night, then LED lights which consume less wattage should be used. Compared to bulbs consuming 12-15 Watt of power, LED consumes only 1 watt of power. Recall from earlier information that higher the wattage, greater is the expense. So remember, if you want to keep a small light on all the time, don't use a zero watt bulb – use a LED instead.

CHANGE 3

USE FIVE STAR RATED ELECTRICAL APPLIANCES

Today, when we go to purchase an electrical appliance for our house, the number of choices available is confusing. We may be trying to buy a simple fan or a refrigerator or even a washing machine. We are heavily loaded with information on a large number of products. However it is important to know, not only how much a product will cost us when we buy it but what it will cost to run it/use it. If it is going to be expensive to run, it may defeat its purpose.

These days, manufacturers are required to place a label showing how much electricity the appliance will consume under certain conditions. Currently these labels are required for refrigerators, air conditioners, televisions, geysers, tubelights and fans among the household appliances. The labels contain a number of items. The highlight though is the 'STARS'. More the stars more efficient is the appliance and therefore the running cost will be the least. The label here is for a 3 star appliances.



The best and most efficient and economical appliances are those with a five star rating, so opt for a five star appliance when buying a household appliance.

CHANGE 4

FAN REGULATORS

There are two kinds of regulators used to control the speed of the fan. The regulators being an electric device, also consumes power. Care should also be taken in installing regulators of the fan. Round and big regulators consume more power as compared to electronic regulators. The electronic regulators are little expensive than the old style regulators but is more efficient.



Old Style Regulator (Not Recommended)



New Electronic Regulator (Recommended)

CHANGE 5

SWITCH OFF THE PLUG POINTS WHEN NOT IN USE!

When appliances like television, modem/set-top box, refrigerators, music-system, phone charger are not in use, it is natural to switch them off. However, we often leave the switch plug on. The switch plug of these appliances must also be switched off. There is considerable consumption of electricity when these plugs especially of mobile charger, television are kept on even though the appliances might are not in use. **So remember always switch off the main plug point of the appliance, when not in use.**



CHANGE 6

USE RENEWABLE ENERGY PRODUCTS

Renewable energy products like solar lantern, solar lamps, solar cookers and solar homelight system are widely being used in areas which are not connected to grid electricity. This can also be adopted in households where expenditure is more on lighting. These systems are environment friendly and energy savers. Though the initial cost is high, the running cost is zero as the system runs on the power of the sun. Many of these systems also have options for mobile charging. The device gets charged through solar energy, and is therefore not dependent on electricity and therefore doesn't cost anything to use.



Explore using renewable energy products which are solar operated to reduce electricity costs and be environment friendly.

CHANGE 7

USE NATURAL LIGHT AND VENTILATION, WHERE POSSIBLE

In slum communities where many homebased workers reside, houses are made very close to each other. This leaves little scope for windows for sunlight / natural light or air circulation. As a result households require cooling and lighting appliances even during the day time, thus increasing the electricity bill. One can create simple methods to increase indoor lighting and air circulation. A movable sheet can be placed on the roof in such a manner that it allows light and air to circulate.



This gap in the roof is protected by a dome shaped structure made from fiber sheets. Thus, it is durable. The above picture one can see the hollow structure on the roof that is covered from dome-(outside). The houses which have used this method have reported reduction in usage of lightining and cooling appliances.

Try to use simple techniques to use natural light and ventilation in a better way.

CHANGE 8

REDUCE COOKING FUEL WASTAGE

Cooking is another essential activity which requires energy. We may use traditional wood stoves, or kerosene or gas for cooking. No matter what the source of energy is; there are ways of reducing cooking fuel wastage and maximizing energy use.



For people using kerosene stove, it is important to ascertain the design of the burner. There are burners made with single tube which reduce kerosene consumption. These are recommended.

Energy efficient wood stoves are also available in the market which consume less wood and cause less indoor pollution and are therefore more efficient in more than one way.

When using a gas stove, if the color of the flame, is yellow or orange, the fuel is not being burnt efficiently. Clean the burner of the gas stove to remove any dirt, food or grease particles. Ensure the holes of the burner are clean and clear. Gas saver is a device available in market which has a knob made of magnet which avoids the leaking of gas.

No matter what the cooking fuel is, we can save energy by covering the cooking vessel, instead of keeping it open.



HomeNet South Asia Group (HNSA) comprises HomeNet South Asia Trust and the Association of Homebased Workers in South Asia. It is the regional network of organizations of homebased workers. It currently has a presence in 8 countries of South Asia. It works towards building regional solidarity among homebased workers, especially women workers, and empowers them to lead a life of dignity that is free of poverty by obtaining decent work and social protection within a rights based framework. HNSA Group strives to make homebased workers and their issues more visible, to ensure secure livelihoods for them and to strengthen their collective voice and organizing efforts in the region. It also advocates for the implementation of national, regional and international policies for homebased workers; inclusion of homebased workers in the existing policies and laws, as well as promotes access to homebased workers product to local, national, regional and international markets. For more information visit www.homenetsouthasia.net

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Inputs from Mahila Housing Sewa Trust

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