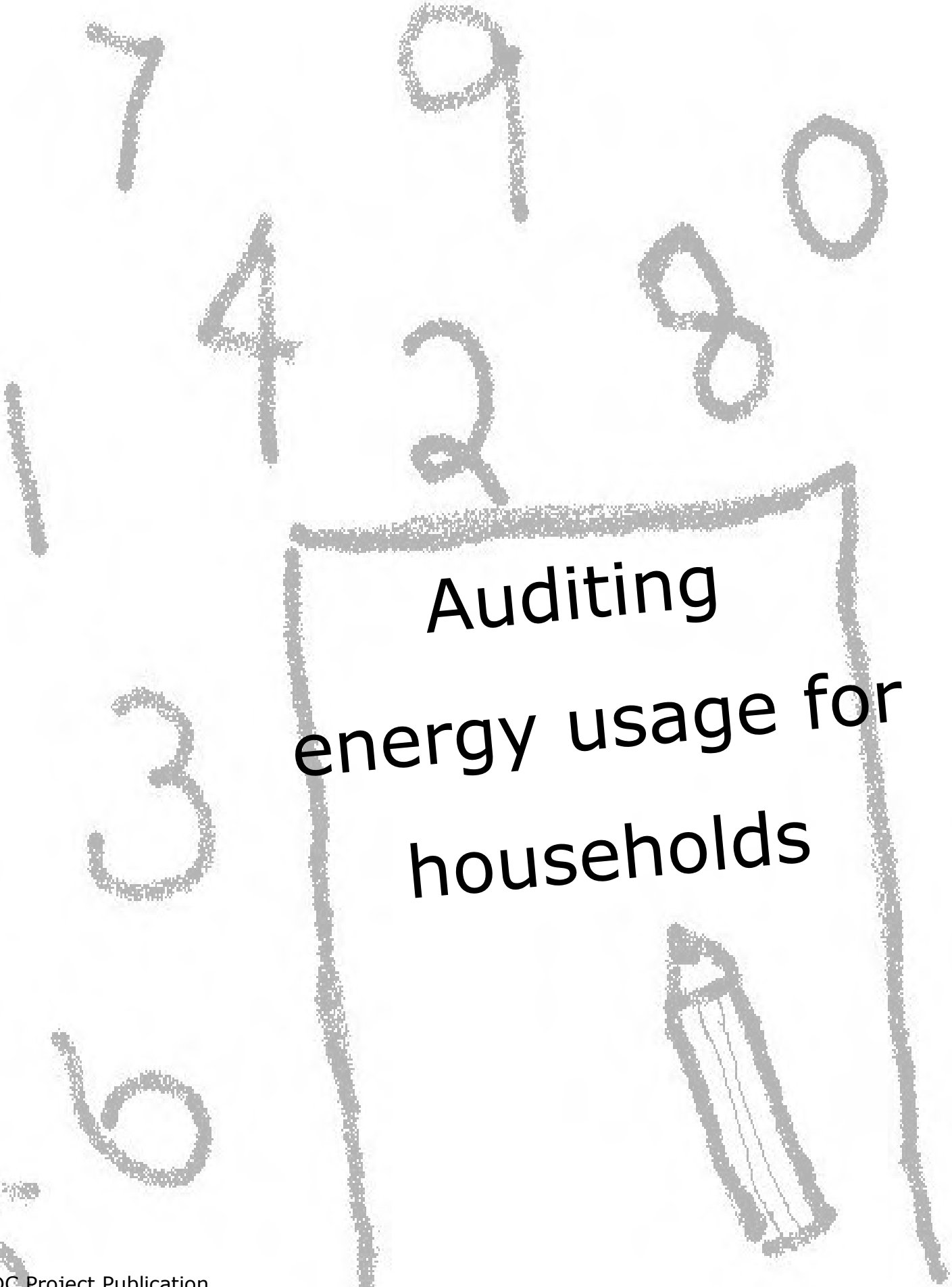
Auditing energy usage for households



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Auditing Energy Usage for Households

Energy consumption can be controlled and reduced by monitoring and adjusting the equipment operations and analyzing which equipment consumes most power. By making households more energy efficient, the negative impacts on the environment can be reduced.

Energy efficiency at home involves monitoring household operations and making adjustments. The first step is to audit energy consumption for every household equipment, and how it is operated. A blank energy audit form is provided at the end of this document to help you start this process.

Step 1

- Obtain equipment power rating
- Analyze and log the operation time for at least a month

Below is a list of some common household items and their corresponding average power rating. Your electrical items may have different power ratings.

Table A: Average Household Item Power Rating

Appliance Description	Watts
Air Conditioning Units	
Air Cooled Split Unit (1.0 hp)	750
Air Cooled Split Unit (1.5 hp)	1000
Air Cooled Split Unit (2.0 hp)	1200
Water Heaters	
Instant Water Heater	1000
Storage Water Heater (55 l)	3000
Kitchen Appliances	
Refrigerator	170-550
Microwave Oven	1050-2100
Hob Extractor Fan	144
Electric Kettle	1200-2400
Coffee Maker	1200
Food Processor/ Blender	400
Toaster (2 Slice)	1200
Rice Cooker	260-1550
Electric Oven	600-1000
Electric Whisk/Mixer	120
Cooker - Small Ring (Electric)	1250
Cooker - Large Ring (Electric)	2100
Hygiene	
Hair Dryer	750-1500
Hair Curler	750
Electric Toothbrush	6

General Household	
Clock Radio	5
Electric Iron (dry)	950-1100
Electric Iron (steam)	1200-1450
Washing Machine (top loading)	210-450
Washing Machine (front loading)	1150-1800
Electric Clothes Dryer	5750
Vacuum Cleaner	800-1600
Ceiling fan	71-95
Entertainment/Communications	
Television	80-175
Satellite System with auto orientation/remote control	45
Video Recorder (VCR)	30
CD Player, DVD Player	30
AC Powered Stereo (average volume)	55
AC Powered Stereo, surround sound system	500

Step 2

Then evaluate the existing equipment's power consumption such as if the equipment is put on standby. More generally, it is noting down the way your home is operated.

- Identify equipment(s) that consume a lot of power
- Identify equipment(s) that is normally put on standby power
- Analyze how the house is operated and categorise equipment or their usage pattern as “required” and “in excess”

Step 3

The third step is to come up with a plan on how power consumption in the home can be reduced. The plan can be put into action immediately or gradually to complement your lifestyle. There are currently no standards to adhere to. It is really up to you to categorise what is needed and what is in excess.

- Create a plan to reduce energy consumption based on your categorisation
- Implement the plan gradually or immediately

Step 4

The fourth step is a post mortem of the implemented plan.

- Record the new energy consumption profile of the house
- Reanalyze the plan and make amendments as necessary

At this point, you should be able to witness the reduction of energy consumption in your home.

Here is an example of how the audit form can be used:

Sample Energy Audit Form

Utilities and petrol bill. Crosscheck against calculated figures

Date of Audit	23rd Nov 2001					
House Owner	Sto'et Jinggo					
Address	5, East 4th Street, Chow YF Park, 90210 Kuala Lumpur					
House Type	Double Storey Link House					
No. of People	2 Adults 3 Children					
Ave Monthly Bill	**Electricity**	**RM 135.00**	**Gas**	**RM 19.00**	**Petrol**	**RM 300.00**
Item	**No.**	**Rating**	**Age of Equipment**	**Type of Energy**	**Usage (ave 30d)**	**Total Energy Used (per mth)**
		Watts	**Years**	**Electric / Gas**	**hrs / month**	**kwh**
Kitchen						
Refrigerator	1	300	5	Electric	432	129.6
Kettle	1	0	5	Gas	30	0
Rice Cooker	1	650	5	Electric	30	19.5
Microwave Oven	1	800	3	Electric	2	1.6
Oven (Elect./Gas)	1	2200	2	Electric	2	4.4
Stove	1	NA	5	Gas	30	0.5 cylinder
Toaster	1	1000	5	Electric	5	5.0
Blender	1	400	3	Electric	1	0.4
Dishwasher	0	0	0	Electric	0	0
Cooker Hood	1	300	5	Electric	30	9.0
Bathroom / Laundry						
Water Heater	1	2700	1	Electric	30	81.0
Washing Machine	1	2200	5	Electric	45	99.0
Iron	1	1000	5	Electric	15	15.0
Hair Dryer	1	300	3	Electric	8	2.4
Clothes Dryer	0	0	0	Electric	0	0
Living Rm / Bedroom						
Fan	6	45	5	Electric	300	13.5
Television	1	60	7	Electric	90	5.4
Radio	1	250	7	Electric	6	1.5
Computer	1	120	2	Electric	30	3.6
Air Conditioner (1.0hp)	0	0	0	Electric	0	0
Air Conditioner (1.5hp)	1	1000	1	Electric	60	60
Lighting						
Incandescent Lamps (60W)	0	0	0	Electric	0	0
Incandescent Lamps (80W)	0	0	0	Electric	0	0
Incandescent Lamps (100W)	0	0	0	Electric	0	0
Flourescent Lamps (18W)	2	18	0.3	Electric	240	4.3
Flourescent Lamps (32W)	6	32	0.3	Electric	900	28.8
Compact Flour. Lamps (5W)	0	0	0	Electric	0	0
Compact Flour. Lamps (11W)	6	11	0.3	Electric	450	5.0
Compact Flour. Lamps (15W)	0	0	0	Electric	0	0
Others						
Vacuum Cleaner	1	300	4	Electric	8	2.4
					Total (kwh)	**491.4**

Obtain rating from equipment label or user manual

Total usage of this equipment or a no of eq. in hrs per month

Total energy usage per type of equipment per month (kw x # hrs of usage)

Total energy usage per month (add all figures)

Calculate Electricity Cost

Current electricity charges by TNB

Usage Cost Breakdown	Up to 200 kwh	200 to 800 kwh	>800kwh	
Unit Cost	RM 0.218	RM 0.256	RM 0.278	
Calculated Units	200	291.4	0	
Calculated Cost	43.60	74.60	0	118.20

Crosscheck against electricity bill

Total Calculated Cost

Transportation

Item	No.	Engine Capacity (cc)	Age of Vehicle	Fuel Type	Mileage (km)	Total Consp (L)
Vehicle 1						
Work						
Leisure						
Vehicle 2						
Work						
Leisure						

Total amount of fuel used can be obtained from fill up receipts or from the amount paid for fuel divided by price per litre (RM 1.42)

Analysis

- Most power consuming equipment (combination of rating & operation)
  - Refrigerator, Water Heater, Washing Machine, Air Conditioner
- Equipment are fairly new
- Did not check energy rating of equipment when buying the equipment

Proposed plan for implementation

- Use cold rinse for washing machine
- Use water heater only on really cold days, and take quick showers
- Use air conditioner on really hot nights and set a higher temperature (can sleep without blanket), and put it on timer to turn off after 1 hr

Implementation (after 1 month)

- Manage to reduce operating hours for the following equipment
  - Water heater to 7.5 hrs
  - Air conditioner to 30 hrs

Post Mortem

- Average electricity bill has been reduced by RM 12.00 (saved 50 kwh x RM 0.257)
- Reduction of 50 kg CO2 equivalent released into the atmosphere (for each kwh of electricity saved, 1 kg CO2 is not released into the atmosphere)
- Will try to not use hot water heater and air conditioner at all
- Will change to more energy efficient refrigerator in the future
- Switch off standby powered equipment (Consumes 10% more power)

Audit your own home with this form!

Energy Audit Form **Page 1 / 2**

Date of Audit						
House Owner						
Address						
House Type						
No. of People						
Ave Monthly Bill	**Electricity**		**Gas**		**Petrol**	
Household Monthly Income (please circle)	Less than RM1000	RM1000 – RM2500	RM2501 – RM5000	RM5001 – RM8000	More than RM8000	
Item	**No.**	**Rating**	**Age of Equipment**	**Type of Energy**	**Usage (ave. 30d)**	**Total Energy Used (per mth)**
		Watts	**Years**	**Electric / Gas**	**hrs / month**	**kwh**
Kitchen						
Refrigerator					432*	
Kettle						
Rice Cooker						
Microwave Oven						
Oven (Elect./Gas)						
Stove						
Toaster						
Blender						
Dishwasher						
Cooker Hood						
Bathroom / Laundry						
Water Heater						
Washing Machine						
Iron						
Hair Dryer						
Clothes Dryer						
Living Rm / Bedroom						
Fan						
Television						
Radio						
Computer						
Air Conditioner (1.0hp)						
Air Conditioner (1.5hp)						
Lighting						
Incandescent Lamps (60W)						
Incandescent Lamps (80W)						
Incandescent Lamps (100W)						
Flourescent Lamps (18W)						
Flourescent Lamps (32W)						
Compact Flour. Lamps (5W)						
Compact Flour. Lamps (11W)						
Compact Flour. Lamps (15W)						
Others						
Vacuum Cleaner						
					Total (kwh)	

* This figure is 65% of 720 hours (24hours x 30 days). This is because the fridge compressor is not working all the 24hours a day.

Calculate Electricity Cost

Usage Cost Breakdown	Up to 200 kwh	200 to 800 kwh	>800kwh		
Unit Cost	**RM 0.218**	**RM 0.256**	**RM 0.278**		
Calculated Units					
Calculated Cost					**Total Calculated Cost**

Transportation

Item	No.	Engine Capacity (cc)	Age of Vehicle	Fuel Type	Mileage (km)	Total Consp (L)
Vehicle 1						
Work						
Leisure						
Vehicle 2						
Work						
Leisure						

Notes

- The estimated power consumption for equipment can be obtained from Table A if the equipment rating or the user manual is not available.
- Analyze energy usage space by space.
- It is much appreciated if you are able to forward a copy of your home's audit form to us. Your form will assist us in setting up a profile of energy usage in Malaysia. Rest assured, all information in the profile will be anonymous. You may send the form to us via:

  Post: 17, Jalan SS2/53, 47300 Petaling Jaya, Selangor
  Email: tcddc@cetdem.org.my
  Fax: 03-78754039