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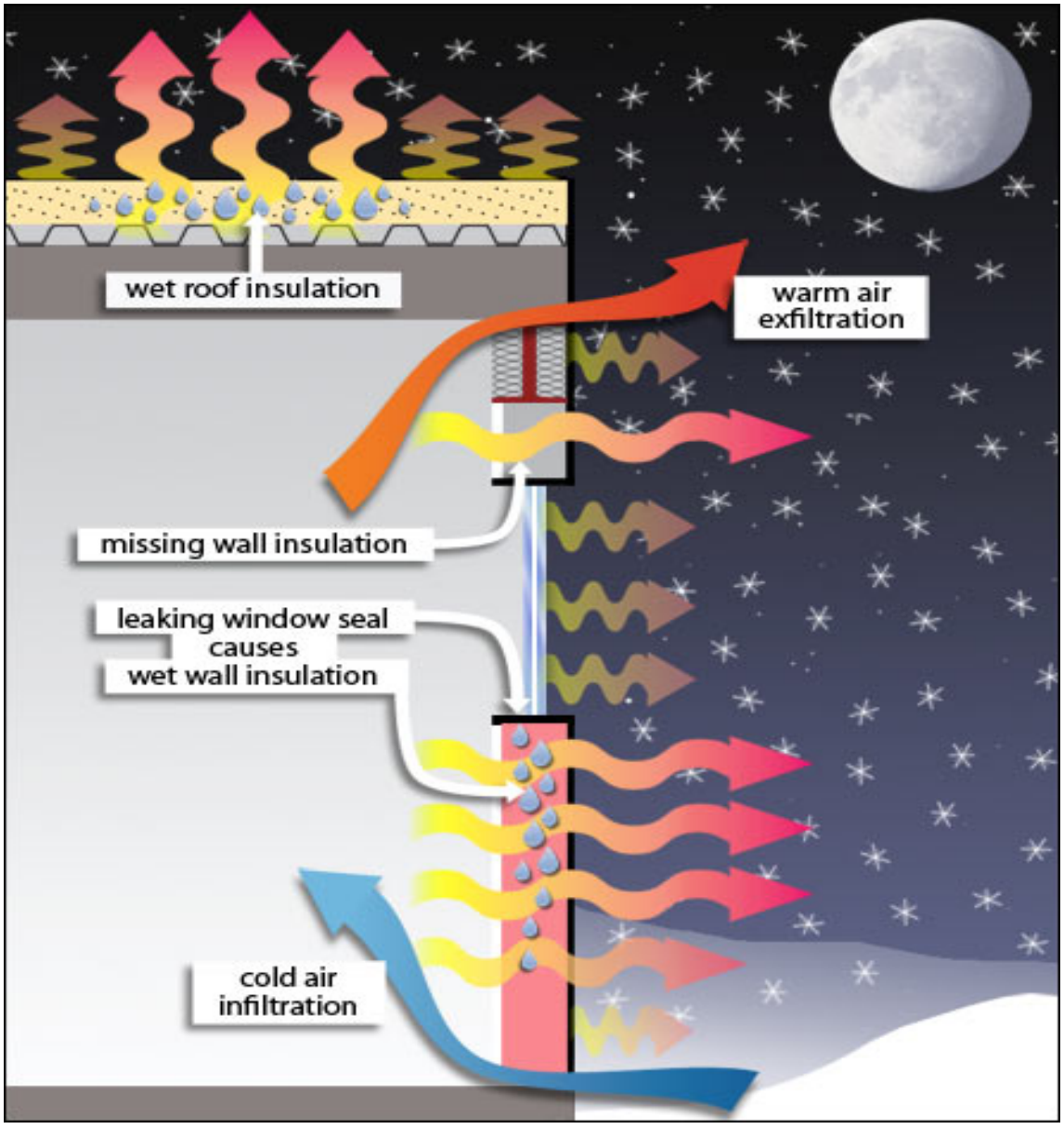


Heat losses from Building

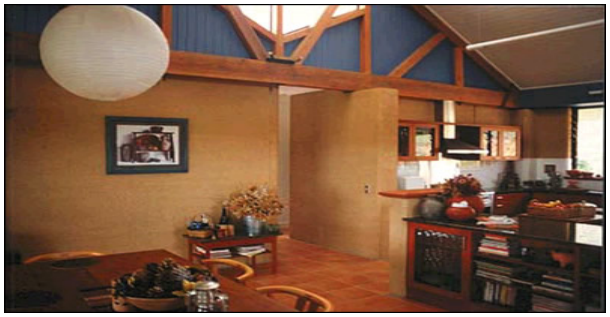
How to stop energy losses?

Introduction

Energy should be ecologically clean and safe
Energy conservation is money saving and environmental protection

Minor attempts made aimed at energy conservation in an everyday life will be very useful for each of us and will lead to positive changes in the future of our planet. **We can positively influence on providing better present and future.**

We should not forget that by applying every below listed simple method, each individual can contribute to solving energy efficiency problem common to all mankind hence contributing to softening global results of the impact of energy on the environment.



The energy efficiency means rational usage of energy and reduction of power and costs. An increase of the energy efficiency means improvement of the level and quality of our lives allowing us to have the same or more comfort with less energy and less expenses. The mankind is looking for the ways to effectively use energy. The energy efficiency is often associated with high technologies, when, in fact, by taking simple energy conservation measures, it is possible to achieve large scale of positive results. To-date, the main way to obtain energy, i.e. the main source of life, regardless of the considerable knowledge and experience gained by the mankind during the centuries, still remains fire – mineral (coal, oil, natural gas) burning process. Like in prehistoric times, to-date a human being heats up and cooks using fire.

Usage of the renewable energy resources (sun, wind, geothermal water, etc.) is very useful from environmental protection viewpoint therefore many efforts have been made for increasing the share of the renewable energy in common energy consumption. However, it should be noted that the renewable energy in a wide range won't replace non-renewable Mineral fuel reserves unlike the renewable energy sources are not unexhausted, in addition, due to the scale of their present usage and negative impact on the environment, modern society gives vital importance to the fuel usage i.e. effective fire usage problem.

It will be also interesting to focus on a double role that fire has in the mankind history: fire is life-bearing phenomenon, but, at the same time, fire products threaten to destroy life on our planet. Fire was the tool that together with thinking raised the human being over all living creatures. Fire was the first natural force on which the human being got based and this force is faithfully serving the human being even today.

Although, becoming the owner of fire - mysterious phenomenon necessary for life - the human being turned into its captive: the final fire product – **Green House Gas – Carbon Dioxide –CO_2**, incredible increase of the concentration of which in the atmosphere causes global warming is life threatening for the mankind. Environmental pollution getting catastrophic scales today is not a new phenomenon at all. The entire civilization, from fire set by primitive hunters to contemporary gas ovens at our homes and cars, is based on oxidation of carbon compounds (fire) which is followed by the environmental pollution.

The mankind still continues using fuel in much wider scales. The human beings would use natural resources during centuries debalancing the nature. Although, the negative environmental impact of the civilization in the past was not as global as it is now.

Scientific progress, raising of population's living level, are directly associated with the enhanced energy usage and the latter is followed by the increase of the amount of GHG in the atmosphere which has negatively affected the earth climate and the relating factors already –the climate became more severe and the intensity of tropical storms, the frequency and severity of droughts increased.

On the background of the mentioned problems common to the mankind, we will briefly touch some simple energy conservation measures and provide practical recommendations by applying of which each family may save energy and its own budget.

An experience of western countries which counts many years shows that by reviewing out our everyday actions and habits and by incurring modest costs (often without any costs) it is possible to significantly reduce energy consumption for household purposes.

This is not at all the deterioration of living standards or denying comfort, just on the contrary, the energy conservation means comfort and achieving the same service level with less power and respectively, less tariffs on power, the reduction of the emission of CO, CO_2 and other hazardous substance as well as energy import from foreign countries.

It is possible to reduce heat losses by **40**%-**50**% through thermal -insulation of the walls, windows, ceilings or attic in the house. **79**% of power consumed in the house comes on space heating, 15% - on heating processes (water heating, cooking, etc.), 5% is consumed by household electrical devices and **1**% - on lighting and radio and TV.

Each saved kWh energy equals to the power generated free of charge.

What does 1 kWh mean? **1 kWh electric power is consumed when**:
60 W capacity bulb is lit up for **17 hours**;
listen to radio for **50 hours**;

we watch color TV for **12 hours**;
we run electric shaver for **110 hours**;
we run electric vacuum cleaner for **2 hours**;

we heat up water by **6 degrees** in 150 liter tank;
we have shower for **5 minutes** (in case water is heated up with electric heater).

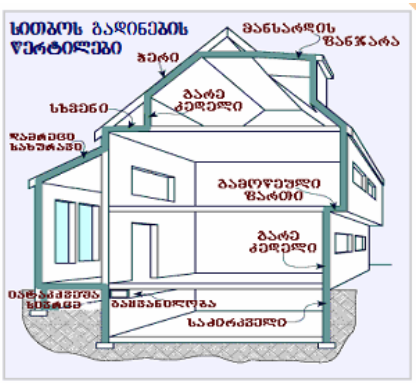
Energy saving on space heating

As mentioned above lion's share of the consumed energy in a building comes on ts heating. How should we reduce power consumption on heating? We cannot have any influence on weather, rain, snow and cold, however we can significantly reduce the energy consumption on house heating. The amount of energy necessary for heating the house can be reduced by **50%** by thermal insulation and by changing some of our habits. If there are heat radiators installed in our house, than it is necessary to set thermostat adjusting valve in order to adjust temperature in each room and reduce temperature in those rooms where less heat is required.

Air temperature

- For health purposes the temperature in the room should be useful for health and should range **from 18^0C to 20^0C**;
- The temperature in the bed-room at night should not exceed **15^0C-17^0C**;
- By reducing the temperature by **1^0C**, the energy consumption on heating reduces by **5%**.

Temperature of walls, doors, windows – the temperature of internal surfaces



The colder the walls, windows, doors, the warmer the air in the room for you to avoid discomfort. In case the temperature of interior plain of the room wall is just 13^0C, than you will feel cold within the room even at 22^0C and feel through air flows.

Probably all of us are aware of the problems that thin, uninsulated walls of our houses cause. More power is consumed at poorly insulated dwelling house: in winter it cools quickly and heat leaks out, and the opposite happens in summer, it heats up within the shorter period. You can improve internal insulation of the external walls of your apartments and thus save energy and money.

Below are some simple recommendations how to insulate the internal surfaces of the buildings' external structures and we also review the thermal insulation of new houses. If you intend to build a new house or run major repair at the apartment, do not save money on thermal insulation of envelope. You will get the desired comfort and save money.

A list of cheaper and the most effective thermal insulation materials available at Georgian market which can be used for insulating the interior walls is the following: foam plastic plates, timber panels, aluminum foil, gypsum cordon panels, thick fabric cover, etc.

Advantages of thermal insulation

The apartments with thermally insulated walls and ceiling (in case they are on the last floor) get warm very quickly. The temperature range in the insulated room compared to the uninsulated one is insignificant. This reasonably reduces power consumption on heating in winter and on air conditioning in summer:

- internal insulation is not subject to weather change;
- insulation works can be performed stage by stage (first of all insulate bays behind the heating radiators and then cold corners and ceiling; put foil behind the heating radiator and it will return heat generated by the radiator to the room).

Through air flows

The room gets cold quickly due to through air flows and large amount of power is Required for its heating. Cold air flows in and warm air flows out through the cracks existing within the doors and windows. That is why, it is necessary to provide sealing of the doors and windows.

From **25%** to **30%** of heat necessary for heating is consumed on neutralizing the heat losses from the windows. Dual glass or dual window systems reduce the heat loss, draught, water condensation and steam creation practically twice.

- Windows and doors should be fixed well.
- Identify through air flow points in the house. For this purposes, for instance, hold a lit up candle at the window, door, cables or any other place from where cold air might be coming in a windy day, and if the candle flare moves, this means that you ave identified the place of uncontrolled air flow;

- Your can use quite simple and cheap methods to cover the cracks and fractures in the windows, doors and to reduce air penetration: plug cracks between a window glass and a frame by silicone, tape or by special substance from both sides. It is reasonable to use special thermal insulation tape;
- Put tape on both sides of the cracked glass;
- Use additional transparent plastic material on glasses, by this you will considerably decrease the heat losses;
- Shut off chimney draft if you do not use it.

Air humidity and demand on fresh air

An individual feels comfortable in the room in case the relative air humidity within the interior ranges from **65**% to **35**%. Very dry air causes thirst, has negative impact on the health and increases costs on heating as "dryness" for providing comfort ultimately requires the increase of the interior temperature.

Remember, that cold air (at similar relative humidity) is drier than hot air. Therefore, frequent aeration of the room in large spaces reduces the air humidity in the room.

The walls, ceiling and floor get cold as a result of long aeration of the room in winter. You simply heat the street and throw out money from the window.

Interior aeration for fresh air is better by frequent and short-term opening of the window.

Clothes

Ideal and cheap source for the warmth at home is warm and comfortable clothes. One warm sweater saves **25**% of energy required for heating.

Energy saving during using hot water

Hot water is the second major energy consumer, it consumes **20%** of the overall nergy at our houses.

Do you know, that:

Approximately **2000 liters** of water are annually lost from a tap dropping hot water (**10 drops** per minute);
If each member of the two-member family leaves the tap open for **5 minutes** every day, it will lose **7 kWh** energy;

Taking shower is much cheaper than having bath; during having bath (140-180 liters) you consume **three times more** energy than you do during **5 minute** shower;

There are showers with water savers in Georgia enabling to reduce water consumption twice during having shower. Shut shower during soaping;

Sprinkling device set on the tap allows to efficiently consume hot water;

If you still have separate hot and cold water taps in the kitchen or bathroom, replace them by the mixed one.

Energy saving n during cooking

Main power losses during cooking are caused by:
- improperly chosen vessel 10%-15%;
- cooking in a vessel without cover 2%-6%;
- use of excess water 5%-9%;
- not using the remaining heat 10%-15%.

Do you know, that:

- Metal vessel with thin and straight bottom provides good contact with gas oven and conserves energy;
- A pot with uneven or rounded bottom extends the cooking process by **40%**;
- The vessel sizes should correspond to the sizes of the gas oven. More

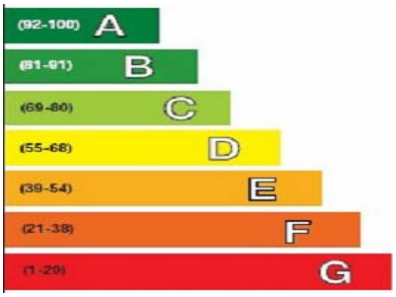
time is required for cooking in case the vessel is small. Up to 30% energy is lost in case the vessel is too big;

- energy is lost in case the vessel is too big;
- It is strange but a fact that the heat losses are the same when cooking with the vessel with **slightly opened cover** and **without the cover**;
- In case of using large amount of water, you make the cooking process longer and consume more energy;
- Usage of special vessels (quick boilers, water heating device, coffee-pots) allows to save **30%-40%** of energy and reduces cooking time by **60%**;
- Usage of microwave instead of a normal electric oven means saving **50%-60%** of energy;
- Cooking or water boiling on the gas oven saves more energy than doing the same on the electric oven. For instance **120 Wh** energy is required for boiling **0,5 liters** of water which in using electric power requires **441 Wh** of the primary energy and in using natural gas – **128 Wh** of the primary energy.

Saving electric power in using household electrical devices

Scale of energy efficiency

High Energy Efficient



Up to **9%-10%** of the total energy consumed by the family comes on the ousehold electrical devices. Potential of energy saving in household appliances is much less, than in heating , hot water supply and cooking, however electric power bills (receipts) show that such kind of the power usage costs quite expensive and it is very important to find the ays of rational power usage.

Given this, in purchasing the household electric devices, pay big attention to the power consumption indicator, the label, compare various models and manufacturers and buy the household electric devices with higher energy efficiency indicator**.**

Refrigerator

Refrigerator is the biggest power consumer out of the household electric devices as it is permanently switched on. The refrigerator consumes significant portion of capacity of the refrigerator is approximately **200 W** when the capacity of hair drier may reach **2000 W**, but if we compare the frequency of using these two devices, we will see that more power is consumed by smaller capacity refrigerator within a year and also will observe how important it is to operate it properly from energy conservation point of view.

The refrigerator functions depend on the conditions of its location. It is necessary for the air to circulate at the backside of the device, and it should located at a distance from heat exhausting sources or from the direct sun rays.

- Clean up the refrigerator's backside at least once a year;
- Clean up the refrigerator until the ice cover thickness achieves **3 mm**; by this you will save **30%** of power;
- Do not keep hot food and products in the refrigerator;
- Do not leave the refrigerator door open for a long time, otherwise the air for cooling of which you paid money will flow out and you will have to make double payment;
- Ensure that the refrigerator door is closed tightly. Ensure the refrigerator is sealed.

TV set

There is at least one TV set in each Georgian family. Like the refrigerator, this electric device has low capacity too, but the frequency of its usage promotes significant power consumption

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One TV set in a standby mode (without screen picture and with the control system switched on) consumes 15% of the power which it consumes during normal operation. Given this, it is necessary to turn TV set off when leaving the house, or when you do not watch it.

It is our advise not to turn the TV set off from the remote control only. It is desirable that several electric devices (TV set, mini system, video or DVD, antenna amplifier) are switched to one electric source using tee or other sources as by switching off the tee you will switch off all the devices connected to it and you will be able to save power which is the equivalent of several hundreds of Georgian Lari within a year.

Computers and mobile phones

Computer, monitor and printer consume electric power even when they are not in use. Therefore, if you want to save power, you should switch them off from electricity supply network when you do not use them.

Mobile phone charger consumes electric power even after disconnecting it from the mobile phone. Disconnect the charger from the electricity supply network after completing charging the mobile phone.

Air conditioner

Air conditioner is the device which is more and more used in the household sector of Georgia. The degree of the thermal insulation of our houses, their location direction and their design We advise you to consider the following:

- It is possible to save more than 30% of power during air-conditioning, if you hang awning on all the windows from where the sun comes, by doing so you will avoid the heat inflow into the house;
- Set cooling temperate on 25^0C;
- When switching on the air conditioner, do not set thermostat below the normal temperature; the house will not cool quicker if you do so, and such an effort will result in additional costs.
- Awning and jalousie hanging is an effective way to maintain coolness at your house;
- In summer aerate the house in the morning or at night, when the air is more fresh;
- For effective cooling, it is better to install the ceiling fan;
- Light color of the roof and outside walls will reflect solar radiation and avoid overheating of the internal sections;
- There are additional plates which if placed on the glass surface reduce the flow of hot air into the house and save biggest part of power required for air conditioning.

Washing machine

Washing machine is the household equipment which after the refrigerator and TV set consumes the most power.

Saving electric power during washing

- Fully load the washing machine with laundry. In fact, the consumption of the electric power does not depend on whether the washing machine is fully loaded or not, although the water consumption changes insignificantly.

- Check if it is necessary to use **90^0C** temperature water during washing or if **50^0C** would be enough. In case of using lower temperature water, you will be able to save **0,5-0,7 kWh** of power during each washing process.
- Hot water is necessary for washing just white laundry, colored laundry can be even washed in cold water.
- In choosing the washing machine program during washing, you should take into consideration not only the character and quality of the fabric to be washed, but its contamination degree as well. In such case, you can save operation time of the washing machine and hence, save power.
- Washing machines with water hoses measuring the degree of water pollution and change water if required, significantly reduce water and power consumptions.
- Regularly clean the washing machine screen. In such case, the machine would operate much better and conserve the energy.
- The most efficient method of laundry drying still is natural drying – drying on the rope stretched outside on the air or in a drying room. Electric drying is inefficient.

Saving electric power during ironing

Ironing requires comparably less electric power, but even in such case it is necessary to consider some recommendations:

- Categorize clothes by fabric type;
- Iron large amount of laundry and clothes at a time in order not to consume power on heating up the iron;
- Start ironing from low temperature;
- Do not leave the device switched on when suspending the ironing process;
- It is enough to use the remaining heat when ironing small items, i. e. you can turn off the iron and iron small items.

Saving electric power on lighting

Lighting is an integral part of our lives. The fifth of the electric power consumed by us is consumed on lighting. Usage of contemporary power saving lighting (power saving bulbs, lighting systems) allows to save up to 60% of the electric power on the household power consumption.

Practical recommendations:

- Use as much natural light as possible;
- Maintain cleanness of bulbs and lamps;
- Lighten your living space as per the requirement and give priority not to the general, but to the purposive lighting – in such case more comfortable environment will be created and the power will be saved. Multi-bulb chandeliers hung on the ceilings provide full illumination of the entire room, however consume a lot of power and at the same time create undesirable shadows for the person sitting at the writing table or sawing machine, when the purposive illumination regardless of low bulb capacity provide better illumination of the necessary space without any shadows;
- Replace flaming bulbs by low capacity (the so called economic) bulbs. You will save approximately 80% of power on achieving the same illumination quality, and such bulbs have longer life;
- Set economic bulbs in the rooms where the bulbs are switched on for a long time;
- Use day-light bulbs within the space where you need more light for longer time, for example in the kitchen, etc.
- In the entrances, garages and the places where people come and go frequently it is desirable to set detectors in order to provide automatic switching on/off of the light.

- Select bright and light colors when painting the walls and ceilings: by this you will be able to better use the day light and reduce artificial illumination.
- The brighter the room wall color is, the more light it reflects and the less capacity lighting is necessary for the space illumination: smooth white wall surface reflects **80%** of the light ray directed to the wall; dark green wall surface reflects **15%** of the light ray; black surface – just **9%**.
- Frequent switching on/off the flaming bulbs will result in its quick burning. Switching off an ordinary bulb is reasonable when you do not need light for at least 10 minutes;
- Turn off light in the room, if you do not need it. Totally switch off the devices not in use from the network.

Energy evaluation of new dwelling house

Remember, that:
Power used at the dwelling house has an impact on your life quality and a family budget. Therefore, when purchasing a new house or an apartment, request the information about power characteristics of the house.

The building should have its **Energy Passport** and respectively the price of the apartment should be classified according to energy conservation value. Get interested in not only the apartment price, space and location but in the degree of the building's energy effectiveness as well.

Ensure, that the envelope of the building (external walls, roof, floor) are filled by thermal insulation material.

Potential buyer of the thermally insulated apartment **will significantly gain** during the period of the apartment's exploitation, as quite significant money will be saved on heating and cooling the apartment by taking the measures relating to the increase of thermal resistance of the walls of the external structures.

If the building walls are not thermally insulated, the apartment owner will have to make **3-4** times more payment on heating and conditioning of the apartment during the entire life, **which is a huge load on the family budget**.

Get interested in what kind of heating is provided in the apartment. Gas heating is much cheaper that the electric heating. In case the radiators are already installed in he apartment, check if there is thermal control valves set on them enabling to regulate the heat discharge. If there is no such a valves set on the radiator, it is our advise to buy and install it. Originally, this may be associated with some costs, but energy saved as a result of installing it will overweight the initial investment.

Trying to cut energy costs ?