

# **Presentation of improvements of luxury homes with Scandinavian design and energy management strategies**

## **Electricity**

It's hard to imagine life without electricity. In our homes, we rely on it to power our lights, appliances, and electronics. Many of us also use electricity to provide our homes with hot water, heat, and air conditioning. The current price in South Africa is around R0.5/kWh with expectation to increase with 50% spring 2008. Furthermore the DME is preparing various plans, enforcement in order to save energy for the home owner. Such as mandatory solar water heating for all new homes.

As we use more electricity in our homes, our electric bills rise and place strain on the power plants and the power grid. The continued reliance on and depletion of fossil-fuel resources threatens our energy security. For this we all need to be aware and introduce more renewable energy and control the loss of energy much better.

The Scandinavian countries are the world best in energy savings and use of renewable energy. And from here we would like to raise the issue of huge energy savings being highly relevant and possible in ZA.

## **Reducing Your Electricity Use/ Bill**

There are many ways you can reduce electricity use in your home and help reduce your energy bills. You can reduce electricity use in your home by focusing on where and how you use electricity in these areas:

### **1. Space heating and cooling**

Purchase energy-efficient electric systems and operate them efficiently. Incorporate passive solar design concepts into your home, which also include using energy-efficient windows. Properly insulate and air seal your home. Select an energy-efficient heating / cooling system that doesn't use electricity as the primary source.

### **2. Water heating**

Purchase an energy-efficient electric water heater and operate it efficiently. And combine such with solar power water heating. Use only solar power to heat your pool.

### **3. Insulation and Air Sealing**

Purchase an energy-efficient insulation technology and don't forget that in Scandinavia the zero-energy house is used in very cold climate (minus 30°C) with advanced ventilation systems and little or no heating system – at all!

### **4. Windows and Lighting**

Purchase energy-efficient products, operate them efficiently, and incorporate more day lighting into your home using energy-efficient windows and skylights.

### **5. Conclusion**

Cut electricity cost to only 25%.

With a careful designed luxury home and energy management system the energy cost may easily be reduced with more than 50% - in South Africa. Compared to the present standard of house building in ZA. These benefits at a cost of only 5-10% increased investment to the overall new luxury home price.

For both new and existing homes, it's becoming more and more important to maximize the energy efficiency of your home. This is the most cost-effective means of keeping your home comfortable, no matter what climate you live in.

## **1. Space Heating and Cooling**

Room cooling account for about 75% of the energy use in a high end ZA homes, making it the largest energy expense. A wide variety of technologies are available for heating and cooling your home, and they achieve a wide range of efficiencies in converting their energy sources into useful heat or cool air for your home. In addition, many heating and cooling systems have certain supporting equipment in common, such as thermostats and ducts, which provide opportunities for saving energy.

### ***1a. Selecting and Replacing Heating and Cooling Systems***

When replacing or upgrading an existing heating and cooling system, it's important to first consider the limitations imposed by your current system and available energy sources. When selecting a heating and cooling system for a new house, your options are generally much wider, although your builder or developer may place limitations on your choices.

### ***1b. Cooling Systems***

Depending on where you live, cooling your home can be as simple as opening a window or as complex as using a central air conditioning unit. A wide variety of cooling technologies are available world-wide, but not seen in use in ZA. Only the air-to-air systems are widespread in use not taking benefit of the overall energy management possibilities.

Although your first thought for cooling may be air conditioning, there are many alternatives that provide cooling with less energy use. A combination of proper insulation, energy-efficient windows and doors, daylighting, shading, and ventilation will usually keep homes cool with a low amount of energy use in all but the hottest climates. Although ventilation should be avoided in hot, humid climates, the other approaches can significantly reduce the need to use air conditioning.

### ***Ventilation***

Whether relying on natural ventilation or forcing air through your home with fans, ventilation is the most energy-efficient way to cool your house. Though off cause depending heavily on the outdoor temperature.

### ***Air Conditioning***

Air conditioners range from a small room air conditioner to a large central air conditioning unit. Most air-to-air conditioners operate at less than their maximum efficiency, presenting energy-saving opportunities. New air conditioning units are far more efficient than earlier models.

Two-thirds of all homes in the United States have air conditioners. Air conditioners use about 5% of all the electricity produced in the United States, at a cost of over \$11 billion to homeowners. As a result, roughly 100 million tons of carbon dioxide are released into the air each year—an average of about two tons for each home with an air conditioner.

Latest technology for air conditioning the house involves high-efficiency liquid-to-liquid, no piston pump, low noise technology for exceptional long life time. And combined with all of the here presented technology in combination with an energy management system the traditional outdoor noisy and space demanding air-conditioner condensers may be removed – even in ZA. Further benefits will be a much more comfortable indoor climate and energy savings by 20-50%.

### ***1c. Heating Systems***

Most homes in ZA do not use a heating system. By involving an overall energy management view the comfort could be increased at very low cost. And insure even temperature in your home year round.

### ***1d. Heat Pump Systems***

Heat pump systems provide both heating and cooling and offer the benefit of delivering more useful energy than they consume. Only the air-to-air systems are widespread in use in ZA absolutely not taking benefit of the overall energy management possibilities. High end houses involving the pool (as energy storage) into the energy management system will improve the overall comfort and reduce the energy consumption of the whole property significant.

### ***1e. Supporting Equipment for Heating and Cooling Systems***

Ventilation system, thermostats and ducts provide opportunities for saving energy. Dehumidifying heat pipes allow central air conditioners and heat pumps to deliver drier air.

## **2. Water Heating**

Water heating can account for 15%–50% of the energy consumed in your ZA luxury home. You can reduce your monthly water heating bills by selecting the appropriate water heater for your home or pool and by using some energy-efficient water heating strategies.

### ***2a. Selecting the correct Water Heater***

You have a lot to consider when selecting a new water heater for your home. You should choose a water heating system that will not only provide enough hot water but also that will do so energy efficiently, saving you money. This includes considering the different types of water heaters available and determining the right size and fuel source for your home.

- Conventional storage water heaters and their lack of sufficient insulation
- Solar power water heaters

### ***2b. Energy-Efficient Water Heating***

To lower your water heating bills, try one or more of these energy-saving strategies:

- Reduce your hot water use
- Lower your water heating temperature to 60°C
- Insulate your water heater tank or replace it
- Insulate hot water pipes
- Install heat traps on a water heater tank
- Install a timer and use off-peak power for an electric water heater
- Install a timer for the hot tap water circulation pump
- Install a drain-water heat recovery system

### ***2c. Swimming Pool Heating***

Heating a swimming pool can consume a lot of energy and add up to high heating bills. And in the modern ZA it will be impossible to use anything else than solar power. In general you can improve your swimming pool's heating and energy efficiency by doing the following:

- Install and use a solar power pool heater system only
- Using a pool cover when the pool is not in use
- Managing the water temperature
- Installing a smaller, energy-efficient circulation pump and/or operating it less
- Include the pool control into the energy management system of the house
- Design the pool for

Local produced latest technology invisible solar power water heating system with no negative aesthetic impacts will easily deliver as much power as the old fashion 20-30 kW electrical pool heater – with no energy cost! And give you the pleasure of a warm pool and show environmental awareness at the same time.

### **3. Insulation and Air Sealing**

You can reduce your home's heating and cooling costs through proper insulation and air sealing techniques. These techniques will also make your home much more comfortable.

Any air sealing efforts will complement your insulation efforts, and vice versa. Proper moisture control and ventilation strategies will improve the effectiveness of air sealing and insulation, and vice versa.

Therefore, a home's energy efficiency depends on a balance between all of these elements:

- a) Air sealing
- b) Insulation
- c) Moisture control
- d) Ventilation

A proper balance between all of these elements will also result in a more comfortable, healthier home environment.

#### **3a. Air Sealing**

Air leakage, or infiltration, occurs when outside air enters a house uncontrollably through cracks and openings. Properly air sealing such cracks and openings in your home can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment.

It is unwise to rely on air leakage for ventilation because it can't be controlled. During cold or windy weather, too much air may enter the house. When it's warmer and less windy, not enough air may enter. Air infiltration also can contribute to problems with moisture control. Moldy and dusty air can enter a leaky house through such areas as attics or foundations. This air in the house could cause health problems.

The recommended strategy in both new and old homes is to reduce air leakage as much as possible and to provide controlled ventilation as needed.

#### **3b. Insulation**

Properly insulating your home will not only help reduce your heating and cooling costs but also make your home more comfortable.

You need insulation in your home to provide resistance to heat flow. The more heat flow resistance your insulation provides, the lower your heating and cooling costs.

Heat flows naturally from a warmer to a cooler space. In the winter, this heat flow moves directly from all heated living spaces to adjacent unheated attics, garages, basements, and even to the outdoors. Heat flow can also move indirectly through interior ceilings, walls, and floors—wherever there is a difference in temperature. During the cooling season, heat flows from the outdoors to the interior of a house.

To maintain comfort, the heat lost in the winter must be replaced by your heating system and the heat gained in the summer must be removed by your cooling system. Properly insulating your home will decrease this heat flow by providing an effective resistance to the flow of heat.

In general your complete house must be insulated from top to bottom. Which means 200 mm fibre insulation inside the complete roof construction, 125 mm insulation within the cavity of all the outer walls, complete basement insulation, double glass windows, double glass doors, energy reflective glass in larger towards the sun pointing window area. Plus hundreds of tricks and tips only Scandinavia has experience in adding to your home.

### **3c. Moisture Control**

Properly controlling moisture in your home will improve the effectiveness of your air sealing and insulation efforts, and vice versa. Thus, moisture control contributes to a home's overall energy efficiency.

The best strategy for controlling moisture in your home depends on your climate and how your home is constructed. Before deciding on a moisture control strategy for your home, you may first want to understand how moisture moves through a home.

Moisture control strategies typically include the following areas of a home:

- Attics
- Foundation, Basement
- Walls

#### ***Moisture Control in Basements***

To effectively insulate your basement for energy efficiency and to create a comfortable space, you need to properly control moisture in your basement.

Most basement water leakage results from either *bulk moisture* leaks or *capillary action*. Bulk moisture is the flow of water through holes, cracks, and other discontinuities into the home's basement walls. Capillary action occurs when water wicks into the cracks and pores of porous building materials, such as masonry blocks, concrete, or wood. These tiny cracks and pores can absorb water in any direction—even upward.

#### ***Moisture Control in Walls***

It is a myth that installing vapour barriers is the most important step for controlling moisture in walls. Vapour barriers only retard moisture due to diffusion, while most moisture enters walls either through fluid capillary action or as water vapour through air leaks.

All climates require these moisture control steps:

- Install a polyethylene ground cover on the earth floor of houses with crawl spaces and slope the ground away from the foundations of all houses.

- Install a continuous vapour barrier, if your climate needs one (see map on this page) that has a perm rating of less than one.
- Place a termite shield, sill gaskets, or other vapour-impermeable membrane on the top of the foundation wall. This action will prevent moisture from wicking into the framed wall from the concrete foundation wall by capillary action.

### 3d. Ventilation

When creating an energy-efficient, airtight home through air sealing techniques, it's very important to consider ventilation. Unless properly ventilated, an airtight home can seal in indoor air pollutants. Ventilation also helps control moisture—another important consideration for a healthy, energy-efficient home.

#### *Purpose of Ventilation*

Your home needs ventilation—the exchange of indoor air with outdoor air—to reduce indoor pollutants, moisture, and odors. Contaminants such as formaldehyde, volatile organic compounds, and radon can accumulate in poorly ventilated homes, causing health problems. Excess moisture in a home can generate high humidity levels. High humidity levels can lead to mold growth and structural damage to your home.

To ensure adequate ventilation, most modern societies propose that your home's living area should be ventilated at a rate of 0.35 air changes per hour or ½ m<sup>3</sup> per person per minute, whichever is greater.

#### *Ventilation Strategies*

There are three basic ventilation strategies:

- **Natural ventilation**  
Uncontrolled air movement into a home through cracks, small holes, and vents, such as windows and doors. Not recommended for tightly sealed homes.
- **Whole-house ventilation**  
Controlled air movement using one or more fans and duct systems. Whole-house ventilation systems provide controlled, uniform ventilation throughout a house. These systems use one or more fans and duct systems to exhaust stale air and/or supply fresh air to every individual room of the house.

There are four types of systems within the house:

1. **Exhaust ventilation systems**  
Force inside air out of a home uncontrolled
2. **Supply ventilation systems**  
Force outside air into and through the home uncontrolled
3. **Balanced ventilation systems**

Force equal amounts quantities of air into and out of the home.

#### **4. Energy recovery ventilation systems**

Transfer heat from incoming or outgoing air to minimize energy loss, which is by far the preferred technology.

- **Spot ventilation**

Controlled air movement using localized exhaust fans to quickly remove pollutants and moisture at their source. Like from the kitchen in some areas. Otherwise typically used in conjunction with one of the other strategies.

Combined the *Whole-house ventilation* with the Energy recovery ventilation system and your home will offer you excellent comfort. No warm outdoor air escapes into the house during summer time. By far gives your home the best comfort available on the globe.

## 4. Windows, Doors, and Lightning

Energy-efficient windows, doors, and potential skylights—also known as fenestration—can help lower a home's heating, cooling, and lighting costs.

- **Exterior Doors**

Select energy-efficient doors or improve the energy efficiency of existing ones. An exterior door can contribute significantly to air leakage in a home—as well as some heat transfer—if it's old, not properly installed, and/or not properly air sealed. This can result in energy losses.

- **Skylights**

Select energy-efficient skylights with double or triple layer of float glass plus energy reflective coatings.

- **Windows**

Select energy-efficient windows or improve the energy efficiency of existing ones. Windows provide our homes with light, warmth, and ventilation, but they can also negatively impact a home's energy efficiency. You can reduce energy costs by installing energy-efficient windows in your home. Some energy efficiency improvements to existing windows can also help. Such as yet a secondary, wooden frame with glass on the inside of the primary window.

## 5. Conclusion

The present South African luxury house design standard is equivalent with the 1950 stile from Scandinavia!

Cut away 2 generations of Scandinavian building development and squeeze those 60 years of technology into a 6-24 month home building promotion project.

Our consortium can lift this task and insure the homeowners reduce their electricity consumption from present 100% to future 25%. And such tremendous achievement at only 10% increased investment for the homeowner.

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