Case Study 1 "Ki" nari House - Zero Energy Concept

Objective: To design a house which maximises the use of solar energy and natural ventilation.
Location: Okayama, Japan
Website: http://www.caddet-ee.org/nl_pdf/994_08.pdf

Description:
The "Ki" nari house is an experimental home built in the suburbs of Okayama. It is designed to harmonise with the environment and is geared towards a zero-energy concept by making maximum use of solar energy and natural ventilation. The wooden house has a roof covered by Sedum rock plants, large windows and doors on the south side, interior mud walls with mineral wool insulation, and floors heated by a solar collector. The thermal capacity of the building is enhanced by a concrete slab, which minimises the need for mechanical heating and cooling.

The simple gable roof has a green covering of small rock plants belonging to the "Sedum" family, which are rooted into mats. A series of solar collector panels are also mounted on the south-facing roof. A garden with a brook in front of the house is designed as a biotope (a self-supporting micro-habitat). Herb and vegetable gardens are located on the east side of the plot. The north-facing roof of the workshop, built on the southern side of the garden, is also covered with herbs.

To enable direct solar heat gain from the winter sunshine, the house has large windows and doors on the south side. Meanwhile, to reduce heat losses, the window area on the north side has been kept as small as possible. During the summer, deep eaves (1.5 m long) prevent the sun from shining directly onto the windows and wall. Deciduous Keyaki (Zelcovas) trees planted on the west side of the site also shade the house from the afternoon sun. Skylight windows on the south side are completely shaded by the deep eaves during summer, but allow the sun to reach the northern interior walls in winter.

To reduce heat loads in summer, in addition to the deep eaves, rooftop greenery and deciduous trees on the west side of the site, air vents are incorporated into the roof and the external walls. Wind blows through the house from the windows at ground level, flowing through the open ceiling in the northern part, to the skylight windows in the uppermost part of the north side. This makes mechanical cooling almost unnecessary. However, during the hot and humid Japanese summer there are some sultry days when natural cooling and ventilation are insufficient, and mechanical air conditioning is required. The house can also be ventilated by an auto-ventilation system.

Case Study 2 Second Generation Passive Solar Energy Houses in the Subsidised Housing Sector

Objective: To develop a demonstration project of low-cost passive solar housing.
Location: Spijkenisse; The Netherlands
Website: http://www.opet.net.cn/energy/solar/Europe/innovative/case1.htm
http://www.opet.net.cn/energy/solar/Europe/innovative/
http://www.caddet-re.org/assets/no64.pdf

Description:
In the summer of 1991, 66 sunspace homes were completed in the Dutch municipality of Spijkenisse.

The main focus was to achieve a simple low-cost second skin design with integrated sunshading/night insulation, suitable for mass production. This was done in co-operation with a Dutch producer of greenhouses for agriculture. Sunspaces and natural ventilation have been economically optimised in the sunspace houses in Spijkenisse. In the sunspace, ventilation air is pre-heated according to weather conditions and the supply of heat through the front facade between the sunspace and the house. Monitoring and evaluation took place during 1992 and 1993.

The sunspaces face south, are two storeys high and consist entirely of vertical single glazing. A separate kitchen, entrance hall and (internal) storeroom face north and have limited window areas.

The buildings are naturally ventilated by ducts in the kitchen, bathroom and toilet and by controlled air inlet openings operated by the occupants. Space heating is provided by a hot water radiator central heating system.

The indoor environment is kept balanced by the prevention of overheating in summer. The interior climate is maintained by keeping temperature gradients to below 2^{o}C and by preventing cold draughts through the careful routing of the natural ventilation.

In wintertime, ventilation air is directed from the sunspace through tilting windows in the living room and bedrooms. This air having passed through the sunspace, is a lot warmer than the outside air. The air is exhausted through ventilation ducts in the kitchen, bathroom and toilet. To maintain good ventilation all inner doors have crevices. In summertime the tilting windows are shut during daytime.

Case Study 3 Solar Village

Objective: To provide energy-efficient housing.
Location: Ugie, South Africa
Websites: http://www.sustainabledesign.com/ases98/usv-text.htm,
http://www.sustainabledesign.com/rsa-haus.htm
http://www.sustainabledesign.com/ases98/ases-pap01.htm

Description:
The homes un Ugie are designed to replace the tin and mud shacks in which more than half of the people currently live. Since the majority of people in this community are unemployed and could not qualify for a mortgage, the basic home costs no more than the subsidy. The home is 570 square feet and contains two bedrooms, a kitchen, bath, and living room. The direct gain passive solar heating system provides 100% of the heating. Shading, coupled with good ventilation and thermal mass, keeps the home cool in the hot summer months. Cooking is done in a solar oven built into the north-facing wall. Passive solar heating and the solar oven helps reduce the need for traditional kerosene heaters and cook stoves, which emit dangerous levels of carbon monoxide. Optional passive solar water heating and PV systems are also available.

The insulation, mass, and solar window area were optimized using Energy-10 Version 1.2 energy analysis software, an 8760 hourly simulation programme. Since hourly weather data is not currently available for South Africa, ASHRAE design data (maximum and minimum temperature and relative humidity) were used for the location and compared to U.S. cities with the same latitude (north latitude) and the same design conditions.

Additional features of the house include:
Local materials used in construction as far as practicable. Candidate materials include soil cement blocks and bricks made on site and rammed earth.

Well-ventilated for indoor air quality

Passive solar heating - all homes are oriented to the north and have large windows on the north side so homes remain warm all winter with no supplemental heat.

Natural cooling - homes are well shaded in the summer with a combination of overhangs, arbors, trees, and other shade devices. Most of the lots around the houses are shaded in the summer to create cool islands around the homes. All rooms have flow-through ventilation to capture the summer breezes, so the homes remain comfortable all summer.

The house plan is easily expandable to adapt to growing family needs.

Case Study 4 Saving Energy Education Programme

Objective: To educate the public on ways to save energy.
Location: Ghana
Website: http://www.ase.org/ghanaef/programmes.htm

Description:

The success of any efficiency initiative depends on how information on the latest technologies and methods as well as the benefits of energy efficiency gets to energy consumers.

The Energy Foundation therefore has an elaborate plan of action to educate the public through seminars and workshops, print and electronic media adverts and campaigns, billboards, bumper stickers, calendars, newsletters, films, good practice case studies and various forms of greeting cards and an Internet website to highlight the activities of the Foundation.

Energy Efficiency & Environmental Conservation Club (EECHO Club) programmes in primary and secondary schools, polytechnics and colleges are organised to get information to the people through school children and students.

As a first step the Energy Foundation has organised a series of public education programmes. Notable among them are the 'Save a Watt' campaigns, which involve radio, TV and newspaper commercials on tid bits to improve efficiency of energy use in the home.

During a three-month campaign undertaken in 1998, consumers were encouraged to read their electricity meters daily, take steps to reduce consumption and also establish targets for their monthly consumption levels.

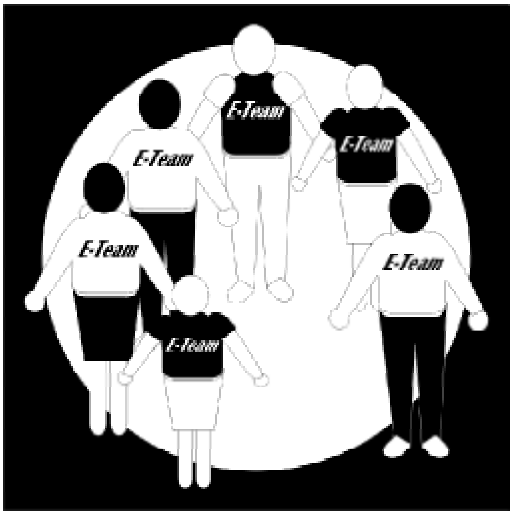
The results of the campaign have confirmed that given the right information at the right time, the Ghanaian consumer is capable of reducing electricity consumption by between 25 -75%.

The Foundation has also produced a brochure *EnergyWise* which includes easy tips and guides that will enable electricity consumers reduce electricity consumption and save money. Similar material is being developed for the transport sector.

Case Study 5 Energy Advice and Consultancy Programme

Objective: To reduce the energy consumption of low-income earners.
Location: Gouda, The Netherlands
Website: http://www.eaue.de/winuwd/

Description:



In 1991, the Gouda energy advice task force, the so-called E-Team, was set up in order to achieve two basic goals. Firstly to reduce the energy consumption of low-income earners through information provision and the implementation of simple, but effective energy saving measures (eg. installation of draught excluders and piping insulation). Secondly, the programme should help to create new employment chances for a group of long-term unemployed.

Since then E-team has become a permanent organisation which continues to deal with people on a personal basis, but which now fulfils a consultative rather then an executive role. In each district neighbourhood, residents are personally advised about the potential for energy saving at home. An energy saving report is provided to residents as part of this consultation.

An eco-team structure functions at the grassroots level. An eco-team consists of around six households, which, under an appointed guide, are encouraged to practice responsible eco-management at home. Energy saving is of course a vital element in all this. The first Eco-teams are already operational.

Case Study 6 Home Rating Scheme -
The Austin Energy Green Building Programme

Objective: To rate homes according to the energy efficiency measures and other environmental criteria in order to encourage greater builder and consumer awareness.
Location: Austin, Texas, USA
Website: http://www.ci.austin.tx.us/greenbuilder/suepaper.htm

Description:

In 1991, the City of Austin, Texas recognised the direct local environmental impacts associated with residential building. This realisation and the need to protect dwindling natural resources prompted the City's efforts in establishing the Green Building Programme. To date, the programme has rated 1,800 homes, 1,400 apartment units, and 10 commercial buildings and has consulted on 85 other commercial projects.

The programme is based on a market-pull mechanism whereby the Green Building Programme promotes green building practices, rates buildings that feature these practices, thus creating more demand from the public because these buildings are perceived as more attractive products for people to buy. Technical staff provide design guidelines and rating systems in easy to understand language for each type of building construction. Staff also provide technical assistance to the public and participant building professionals, as well as assist in marketing and promoting green projects.

Green Building Membership
Membership in the programme allows technical, logistical, and marketing assistance for participating building professionals, as well as serving as a means to assure that building professionals are educated to a base level of expertise to practice sustainable building.

Rating System
A menu of sustainable options is available in an electronic spreadsheet for members. It self calculates a Green Building rating. In addition, the commercial building sector is offered a cash incentive and technical support for using a design checklist, which insures an integrated team approach.

The sustainable building movement is beginning to reach a critical mass in the United States. Currently, there are now eight green building programmes in the country, with new ones being planned.

Case Study 7 Mandatory Standards and Labeling

Objective: To lower energy consumption through compulsory standards and labeling of appliances.
Location: South Korea
Website: http://www.clasponline.org/standard-label/general-info/success-stories/korea.php3

Description:

For several years, South Korea has run one of Asia's most aggressive energy conservation programmes. Since the mid-1970s, there has been more than one hundred separate conservation initiatives across all energy end-use sectors in the country.

One of the most powerful programmes has been Korea's mandatory standards and labeling programmes.

By late 1993, the minimum efficiency levels had been reached by 91% of domestic products, and the 1995 target levels had been reached by 30% of products. Due to standards and labels, energy consumption for refrigerators and air conditioners dropped by 11% and 24%, respectively. The programme has reduced Korea's national energy consumption by 1.8% from 1992-1993.

Additional information is available from the Collaborative Labelling and Appliance Standards Programme (CLASP) website on Australia, Europe, the US, Koreaand the Philippines' mandatory standards and labeling at http://www.clasponline.org/standard-label/general-info/success-stories/index.php3.

Standards and labels are tools for transforming the market. Establishing a minimum efficiency standard "pushes" the market by eliminating the least efficient models. To maintain sales and revenue, manufacturers are forced to produce more of the models that pass the minimum energy performance standard. Setting a standard does not result in higher production of high efficiency models; most models will still be medium efficiency.

Energy labels encourages customers to purchase energy efficient products. This will indirectly encourage manufacturers to produce and market more efficient models, thus, "pulling" the market towards high efficiency. As a result, of the complementary market "pull" and market "push," the average energy performance of models on the market improves. Standards and labels can be used together to achieve significant market transformation.

Case Study 8 Energy Efficiency Building Codes

Objective: To improve the efficiency of new buildings through the application of energy efficiency building codes.
Location: Leichhardt, Australia
Website: http://210.9.33.124/environ/energy.html

Description:
Development Control Plan 17 (DCP17), Energy Efficient Housing, was adopted by Leichhardt Council on 24th May, 1994 and came into operation by public notification on 8th June 1994. Whilst the DCP relates specifically to the design and development of housing in Leichhardt, it reflects Council's broader concern for the conservation of the environment.

The Plan controls apply to development applications and building applications for new dwellings and for alterations and additions to existing dwellings, where the work involves new extensions; major internal renovations; minor internal renovations where the window area significantly increases, insulation measures apply, or timber framing is proposed.

An Energy Efficient Checklist must be completed for all applications to which DCP 17 applies.

Vision
Leichhardt Council supports energy efficient housing design and practices that reduce the use of non-renewable fossil fuels for energy, and minimise air pollution and carbon dioxide (C02) emissions.

Aims and Objectives
This DCP aims to:
- Encourage the design of energy efficient housing in Leichhardt

The Objectives of this DCP are:
- To encourage residential site planning and building design that optimises solar access to land and buildings.
- To reduce total energy use in residential buildings, by reducing heat loss, and energy consumption for heating and cooling purposes.
- To encourage the use of building materials and techniques that are energy efficient, non-harmful and environmentally sustainable.

Case Study 9 Energy-efficient Saarbrücken:
Rate Structure of Energy Charges in Saarbrücken

Objective: To establish a rate structure that provides incentives for consumers to save energy.
Location: Saarbrucken, Germany
Website: http://cities21.com/egpis/egpc-152.html

Description:
Following the example of Wien, Austria and Zürich, Switzerland, the City of Saarbrücken introduced a linear and time-variable electricity charge in 1991.

Most rate structures for energy charges do not provide many price incentives for the client to save energy. This is because of high standing charges that have to be paid by the consumer, independent of the actual consumption levels. The utility of Saarbrücken recognised that this does not correspond with the principles of sustainable development and that there was a need to reform the rate structure. Their intention was to motivate people to save resources and money at the same time. Of course, any new tariff structure could not increase costs for the utility so this led to the introduction of a linear and time-variable rate structure.

The aim of a linear electricity charge is to influence consumer behaviour by offering financial incentives to save energy. Adjusted charges should support anybody who uses less energy or at non-peak-times and to charge more from large scale users using energy at peak times. Benefits may also be included in a comprehensive tariff system to reward those who provide renewable or highly efficient energy sources. Moreover, the linear tariff represents a simple system which can be introduced easily, because there is no need for new equipment or extra staff.

The utility initiated a model calculation for a new tariff system and investigated the possible social impacts. A working group with the utility, the municipality and other utilities in the region discussed all problems concerning the rate structure and decided to give it a try. The model project was successful and the linear time-variable tariff was implemented in full once it had been approved by the state government (being the authorising body for price control).

Results have shown that clients are reducing energy consumption in order to cut their bills. The policy is contributing to Saarbrücken's aim of staying independent of nuclear energy and, in the long term, relying exclusively on renewable energy.

Case Study 10 Energy Efficient Housing Grants

Objective: To provide grants for energy-efficient renovations
Location: Leicester, England
Website: http://www.eaue.de/winuwd/

Description:
Energy efficiency stock profiles have been prepared for the domestic sector. This has involved undertaking sample surveys of the entire housing stock of the City of Leicester, and calculating the National Home Energy Rating (NHER) using stock profile software. An NHER profile of the Council's housing stock has enabled the Housing Department to prioritise the measures needed to be undertaken to further improve the energy efficiency of its stock.

These measures have resulted in substantial improvements and have included insulating all the cavity-walled dwellings, loft insulation, boiler replacements, double-glazed windows and on a limited number of houses, external wall insulation. The NHER scale was also used to measure the energy performance of the Council's newly built housing. Originally a standard of a NHER of at least 8 was adopted and this was subsequently raised to an NHER of at least 9.

The same standards as those in House Renovation Grants are applied. The City Challenge housing is predominantly pre-war, solid brick wall housing with gas central heating. Homes in Renewal Areas are also solid brick wall construction. They typically achieve 1 to 3 on the NHER scale before any energy efficiency improvements. Following energy efficiency improvement measures they can reach up to 7 on the NHER scale, through a combination of loft insulation, heating control improvements and heating system improvements. Such a package of measures has been offered as discretionary grant to the mandatory housing renovation grant. These measures do not include wall insulation, because of its relatively high cost.

One of the initial problems encountered with the energy efficiency house renovation work was that building workers and heating technicians were unaware of the new advances in materials and components. They thus required training in these new methods, which was provided in training courses the City Council arranged. The trainees are also able to use the skills gained during the training to help them with other installation work within the city.

Case Study 11 Block-by-Block Weatherisation Programme

Objective: To provide or improve insulation in existing homes for low-income households.
Location: Portland, USA
Website: http://www.sustainable.doe.gov/success/block.shtml
http://www.greenhouse.gov.au/yourhome/technical/fs16c.htm

Description:
The Block-by-Block Weatherization Programme (BBB), administered by the City of Portland Energy Office, provides free basic weatherisation and energy-use education to needy, low-income households in Portland neighbourhoods. BBB targets households not already served by other low-income weatherisation programmes.

Many low-income individuals and families in the Portland area - those who can least afford high heating bills - live in older homes with little or no insulation and inefficient heating systems. In Portland, there are as many as 60,000 low-income residents living in 20,000 such homes. While local utilities and local, state and federal agencies have established programmes to serve this population, limited funds have historically restricted the scope of these programmes. State and federal programmes combined, for example, are only able to serve about 400 of these homes annually with free weatherization. Utility incentive programmes pay only 25% of weatherization costs and reach only a handful of low-income residents. BBB was created to bridge the gap between need and available resources for affordable, energy efficient homes.

Each year, about 120 homes are weatherized through the BBB programme. Recruitment for the BBB programme is performed in one of two ways. Representatives from a local nonprofit organization canvass neighborhoods, recruiting households for participation by going door-to-door. Direct recruitment has the added benefit of encouraging residents to become involved in neighborhood community groups and local projects that help improve the urban environment. Recruitment also occurs at the city's energy fairs held each autumn. Fair attendees who meet the programme's income requirements receive a visit from the weatherization crew that installs ceiling and wall insulation and seals all air leaks. To keep programme costs low, a complete overhaul is not performed at each location; only the most critical areas are attended to.

In addition to providing insulation, BBB gives each participant a weatherisation kit that includes low-flow fixtures, weather stripping, and storm window kits. Finally, the programme provides participants with in-home education in energy-efficient practices, such as lowering water heater and refrigerator thermostats, changing furnace filters, and drying clothes in the sun. One of the programme's main objectives is to motivate residents to develop their own energy action plans.

Case Study 12 Energy Smart Homes Programme - Rebates for Solar Hot Water Heaters

Objective: To encourage greater use of solar hot water heaters through a rebate system.
Location: New South Wales, Australia
Website: http://www.energysmart.com.au

Description:
The Energy Smart Homes Programme is a model energy efficient housing policy that Councils can voluntarily adopt to reduce the quantity of greenhouse gas emissions generated by local residents. It does this by ensuring that minimum energy performance requirements are met for all new residential developments.

Energy Smart Homes use the best combination of insulation, shading, ventilation, energy-efficient appliances and lighting, and solar, heat-pump or gas water heating to make them cheaper to run and greenhouse-friendly.

If you are building or renovating a home in an Energy Smart council area, you may be eligible for $500 off a solar or heat pump hot water system. If you install a gas boosted solar, you may be eligible for a $700 discount. The initiative, which is a joint effort between the Sustainable Energy Development Authority (SEDA) and participating manufacturers, aims to encourage development applicants to install Energy Smart water heaters.

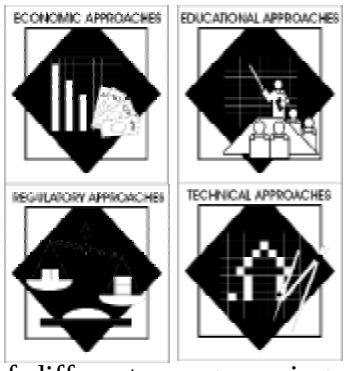
Under SEDA's Energy Smart Homes Programme, the installation of low greenhouse gas emission water heaters is required for all new residential development approvals.

Water heaters that make the grade are:
- Solar Water Heaters
- Heat Pump Water Heaters
- Natural Gas

The discount is available on presentation of a voucher for solar and heat pump water heaters which:
- meet technical equipment standards
- are made by participating manufacturers
- are sold by a participating hot water retailer
- are installed at private residences in respect of which a Development Approval has been obtained, as indicated by a number on a voucher, in an Eligible Local Council area. A maximum of ten vouchers may be presented with respect to any one Development Application.

The discount can only be claimed at point of sale. It is not a reimbursement.

Case Study 13 An Integrated Approach



Objective: To achieve energy savings by integrating a range of different energy savings strategies.
Location: Viernheim, Germany
Website: http://www.eaue.de/winuwd/62.htm

Description:
In recent years a number of energy saving activities have been developed in Viernheim ranging from pilot projects to routine measures of energy savings. Examples include:

An ecological residential pilot project was created in the new residential area using low energy construction methods.

An old people's home was built with an useable area of some 12,000 m² and energy consumption below 50 kWh/m².

Five low energy houses were built as part of a support programme for the Viernheim Public Utilities. Two semi-detached houses, two residential and office buildings and a building with 32 local authority flats were granted subsidies as low energy houses.

Through the rational arrangement of buildings or central heating supply in the construction plan, influence was exerted on the energy needs in other new residential areas.

By introducing a linear electricity tariff, Viernheim Municipal Utilities has provided customers with an increased incentive to introduce electricity saving measures. In addition, an attractive night time use tariff was introduced.
An energy information office was opened by the Municipal Utilities providing information for all customers on energy saving measures. The information offered by the office ranges from advice for home builders to the best choice of electrical appliances.