

Case Study 25

Eco n'Home: Energy service for European households in the UK, Italy, Belgium, France, Portugal and Germany

The Netherlands



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Project co-funded by the European Commission within
THE SEVENTH FRAMEWORK PROGRAMME
THEME ENERGY.2007.9.1.2
Energy behavioral changes



Changing Behaviour



Work package 2

Development of the conceptual model: Analysis of success factors,
underlying models and methods in target group interaction

Case Study 25:

Eco n'Home: Energy service for European
households in the UK, Italy, Belgium, France,
Portugal and Germany

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March, 2009

Grant agreement no: 213217

Project acronym: CHANGING BEHAVIOUR

Project full title: *Contextualising behavioural change in energy programmes involving intermediaries and policymaking organizations working towards changing behaviour*

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Summary of the case

The aim of the European research project Eco n'Home, supported by the IEE (Intelligent Energy Europe) Programme, was to monitor and reduce the energy consumption of 940 households across Europe between January 2006 and December 2008. A second aim was to evaluate current methodologies and deliver a new method for advising households on sustainable energy in their dwelling and travel.

The overall method consisted of an initial contact (1) between household and energy advisor, an Energy Audit (2), an Audit report (3), an Action Plan (4), a Follow-up (5) and a Final evaluation report (6). The strength of the method is the personal contact and long term focus (the measures recommended are measured after 1 and 2 years, but are intended to have further impact). The nine project partners implemented the six step Eco n'Home method in a flexible way in nine samples in six European countries.

40% of the 940 participating households withdrew during the project mainly due to personal circumstances. This led to a number of 268 households on which the evaluation of the outcomes is based. These households met the target (10%) on heating reduction (13% per household, on average). The other targets on the reduction of total energy consumption, the specific use of electricity, transports and CO₂ emissions were not met:

- Total energy reduction was 9% (target was 10-20%)
- CO₂ emission reduction was 0,8 ton (target was 1 ton)
- Specific use of electricity reduction was 140 kWh (target was 300 kWh)
- Transport energy saving was 5% (target was 15%)

(All outcomes per household, on average (AGENEAL, 2008, p14)).

Apart from these general outcomes, the nine samples had diverse outcomes on specific aspects that in many cases can be explained by the variations of the overall method used in practice and the different local contexts of the samples, for example local policy or stakeholders involved.

Apart from the data evaluation the project partners of the Eco n'Home project also performed a self evaluation on the method. This led to 10 recommendations and lessons for future energy service projects focusing on for example the recruitment of participants, the Audit Report and Action Report, the relation between energy advisor and household, etc.

Step 1: Context of DSM programme

National context in general

The Eco n'Home project was a European project of which the target group consisted of 940 households in six different west and southern European countries: France (Montreuil, Montpellier and one across France), Belgium (Gent), UK (Shrewsbury and Leicester), Germany (Heidelberg), Portugal (Almada) and Italy (Turin). These countries have different economic, demographic, institutional, infrastructural, social, cultural and political characteristics.

When the Eco n'Home project started in 2006 there were large differences in the electricity and gas prices in the participating countries. The price for a kWh for households in the UK (€0.08) was almost half the price of a kWh in Italy (€0.15). In the other countries electricity prices per kWh were: €0.11 (Belgium), €0.14 (Germany), €0.13 (Portugal) and €0.09 (France). The average electricity price in Europe (Europe 27) was in 2006 €0.11 per kWh (Eurostat via ec.europa.eu/eurostat). The price per GJ of gas was also lowest in the UK (€7.8) compared to €10.8 (Belgium), €12.3 (Germany), €13.8 (Portugal), €10.8 (France) and €10.4 (Italy). The average European gas price was €10 per GJ.

All participating countries have a relatively high density of population, between 100 inhabitants per square kilometer (France) up to 348 in Belgium. This means that almost all (except France) are above the European average of 113 in 2006.

For an overview of all the relevant ongoing policies in the participating six countries during the project, please refer to annex 3 of the final report of the project (downloadable from www.econhome.net).

Local and specific context of the project

The Eco n'Home project was implemented by the project partners locally. These project partners had been active in the region with energy services before. They used their existing networks of households and stakeholders and experiences in for example the recruitment of participants and the involvement of other local stakeholders. For example households that had been involved in earlier energy programmes were contacted directly to participate in the Eco n'Home project by MVE in Montreuil (France). Another possibility is the involvement of the municipality in the different samples which led to a grant scheme in the case of the Leicester sample. For more details of the adaptations done by the project partners to adapt the method to the local context, we would like to refer to Chapter 3 of the final report (AGENEAL, 2008).

Step 2: focus of DSM programme

The Eco n'Home project lasted 36 months from January 2006 until December 2008. The project involved 10 partners from six different European countries and was coordinated by the Association Maitrisez Votre Energy (MVE) in France. MVE is a relatively small local energy agency east of Paris aiming at reducing energy use, promoting energy efficiency and the use of renewable energy within households, sustainable transport and the public sector. The other project partners were local and regional energy agencies, energy service and energy consultant companies in France, Belgium, Portugal, Italy, Germany and the UK. 50% of the budget of 1,160,000 euros of the project was financed by the Intelligent Energy Europe (IEE) Programme the other 50% was financed by the project partners. Some of the partners also found additional sponsors for executing the energy audits and measurements in households within their country.

The primary aim of the project was to decrease the energy use of the dwelling and transport of around 1,000 households in Europe by saving:

- 10-20% of the total energy use,
- 1 ton CO₂ emissions,
- 10% heating,
- 300 kWh of specific use of electricity,
- 15% of energy used for transport

All these targets were set per year per household, on average. The secondary aim of the project was to overcome the barriers that households have to change their energy behaviour. These barriers may be psychological, financial, social, information and behavioural (see the project guide at www.econhome.eu). A third aim was to evaluate existing methodologies which the project partners were using in order to decrease the energy use in households and develop a new method based on this evaluation. Herefore an extensive self-evaluation was done by the partners. All partners described their experiences with the different steps of the method and the method as a whole and gave recommendations for improvements.

During the first period of the project the methods on how to decrease the energy use in households and the households themselves were selected. Then a year was spent on implementing the action in the houses (indicated in the method as year t-1). The next year was a follow-up year to evaluate the results of the actions (year t). In some cases the effects of the actions were further evaluated in the following year (year t+1).

The target group consisted of 940 households in Europe recruited by the nine project partners in their own country. Each partner used a different method to recruit the households, for example via existing networks of households that were involved in other energy project, via an invitation send with the energy bill and via information evenings. General conditions for the participating households were that they needed to live at least a year in the house and that they were planning to stay there for at least five more years. Apart from these general conditions the target group was not very homogeneous and ranged from house owners to renters, from elderly to young families, from apartments to larger villas, from richer families to poorer ones, etc.

Step 3: design of programme

The method of the Eco n’Home project to reduce energy use and CO₂ emissions in the households consists of six different instruments (Figure 1).

The first instrument used by the partners of the Eco n’Home project in all the households was an energy audit. After the *initial contact* with the household a personal energy adviser paid one or more visits to the family to perform an *energy audit*. The advisor then collected the relevant data for the energy and carbon baseline and later evaluation. These data include an overview of the existing appliances in the household, the age and daily activities of the members of the household, the location of the house, the energy use of the last years for heating, cooking, power and transport, etc. The advisors used a combination of electronic and manual tools developed within the Eco n’Home project for accuracy in this collection.

The next instrument was writing and presenting an *Energy Audit Report* for each household by the Energy adviser. This included the current energy profile of the household in terms of energy (kWh), CO₂ emissions (kg) and costs (euro). A combination of text and graphics made the information easily assessable for all household members.

The Energy advisor then wrote a *Personal report* describing the measures recommended to reduce the annual energy consumption and CO₂ emissions of the particular household. Fourthly the Personal Plan was discussed with the members of the household and they were asked to sign an *Action Plan* describing the measurements they promised to take over. These measures were divided into behavioural habits, insulation, space heating, ventilation, domestic hot water, electricity and transport.

During the following 12 months (the *follow-up*) the energy advisors encouraged the participating households in their energy and CO₂ emission reduction by taking away possible barriers. This was done via organizing events, mailing newsletters, websites, and competitions to encourage the group interaction and social learning but more importantly also via direct personal contact for example by frequently taking meter readings.

After 12 months all the actions undertaken by the households were identified and measured to determine the amount of energy and CO₂ emissions saved. The Energy advisor presented these data in the *Evaluation* report to the household including recommendations to further reduce the energy use and emissions the following years.

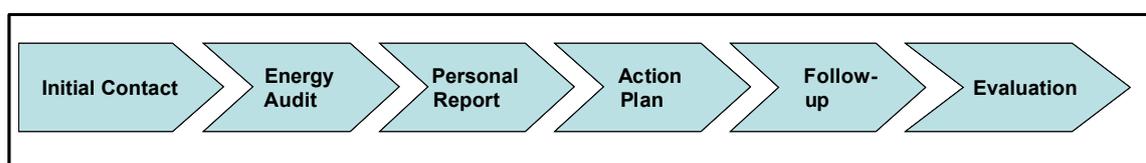


Figure1: six steps of the Eco n’Home method

To support the project partners in their role as an energy advisor several tools were developed within the Eco n’Home project. These tools, for example a household data collection form and formats for the Action Plan and Evaluation Reports, help the energy advisors to execute all the above mentioned instruments. Using common tools not only saved the project partners a lot of time with data input but also made it easier to compare the data of the different households and different countries. The Eco n’Home methodology and tools are freely available via www.econhome.eu.

After the final data collection and evaluation of these, the Eco n'Home project also included a self evaluation by the partners on the methodology and experiences they had. This resulted in some lessons and recommendations for replication of the method.

Step 4: process of programme

The Eco n'Home methodology was developed as a flexible methodology that can be used in different contexts in different countries. The project partners implemented the six steps of the overall methodology of the Eco n'Home project in their own local context and based on former experiences. This led to the so called nine experimental areas in six different countries in which the methodology was used and adapted to the local context: MVE (Montreuil - France), E-STER (Gent - Belgium), MEA (Shrewsbury - UK), KLIBA (Heidelberg - Germany), GEFOSAT (Montpellier - France), AGENEAL (Almada - Portugal), EEA (Turin - Italy), LEA (Leicester - UK) and FLAME (across France).

The adaptation of the method to the local context resulted in differences in the recruitment of the households (for example via existing networks or information evenings), the energy survey and audit (for example sending a questionnaire before the personal visit or not and time spent on the visits), the reports and action plans (for example focus on short or longer term investments and availability of grants for the investments) and the follow up activities (for example group meetings, personal visits, information and stimulation leaflets and other forms of communication, etc).

Apart from the flexibility within the six steps some partners also managed to engage other stakeholders, for example the municipality or a local energy company who supported the project with money (for example providing grants for measures in the action plan) or other services (for example free dissemination).

Although none of the project partners stepped out of the project, many of the participating households did for different reasons like moving, a change in the family situation, no time available, no motivation to be involved, not willing to invest time and money in the proposed measures, etc. Many project partners consider this the result of the free service Eco n'Home provided. Households were offered to join the project for free. When households pay for energy audits and related services their commitment and motivation is larger and they will not step out of such a project as easily. Households that did not fulfill the complete programme were also not included in the evaluation and results of the project.

Step 5: outcome of process

40% of the 940 participating households withdrew during the project mainly because of personal circumstances (see step 4). There are thus no final data available of this group and therefore they are also excluded from the saving analysis of Eco n'Home. Apart from these the Eco n'Home project partners also decided to exclude the participants who did not achieve energy savings and those who did not return the evaluation survey at the end of the project. This led to a number of 268 households (only 28% of the participants) on which the evaluation is based.

It is important for the reader to realize that excluding these 672 households (72%) of the evaluation has a large effect on the outcomes of the project. Especially due to the exclusion of the participants that did not achieve any energy savings. The below presented outcomes of the project are thus much more positive than reality and all numbers in this section should be read within this context. Another critical point regarding the evaluation is that no baseline was used to come to relative results. All outcomes were calculated in absolute terms and thus differences in starting points (energy use baseline of households) were not taken into account.

The 268 households on which the evaluation is based met the target (10%) on heating reduction (13% per household, on average). The other targets on the reduction of total energy consumption, the specific use of electricity, transports and CO₂ emissions were not (at all) met:

- Total energy reduction was 9% (target was 10-20%)
- CO₂ emission reduction was 0,8 ton (target was 1 ton)
- Specific use of electricity reduction was 140 kWh (target was 300 kWh)
- Transport energy saving was 5% (target was 15%)

Per household, on average (AGENEAL, 2008, p14).

A part of the participating households kept on installing and using the methods advised in the Action Plan in the year after the evaluation. During that year (year t+1) the savings increased and this demonstrates that the period of 12 months is not enough to implement and evaluate all the measures and the impact of the Eco n'Home project. Many participants indicate that they were willing to implement further actions within their homes the years after the project.

In general about 45% of the measures the participants agreed upon were realized. These measurements can be divided in different types:

- Measures related to *heating systems*¹ had the highest contributions to the total savings (54%). 60% of the participants agreed upon measures on of this type while only 36% realized it mainly because of the high investment costs of these measures and necessary 're-building' for installing a different heating system.
- Measures related to the *building fabric*² contributed 23% of the total savings. 45% of the participants agreed upon measures in relation to the building but only 19% have realized it. This low percentage can be explained by the relatively high investment costs and long pay-back times of these measures.
- Measures related to *specific electricity use*³ lead to 11% of the total energy savings. 44% of the households realized these measures that are often cheap and easy to do for the participants.

¹ These include thermostat in water tank, fit solar thermal systems, improve hot water distribution, installation of heat pump or storage heater, replacement or insulation of older elements of heating system, etc.

² These include draught proofing, fit curtains and shutters, floor insulation, wall insulation, roof insulation, other insulations improvements (front door, etc) and double and triple glazing.

³ These include the installation of microgeneration units, replacement of older appliances with new more energy efficient ones, replacement of light bulbs, turning appliances off instead of standby, etc

- Measures related to *transport*⁴ led to 11% of the total energy savings. 92% of the participants that agreed upon measures of this type did follow these. This can be explained by the fact that most of the transport measures are behavioural changes of the participants that do not need any financial investment.
- 1% of the total energy savings was achieved by measures by means of *ventilation*.

The cost effectiveness of the project was calculated on the costs (of the project) per amount of energy saved. This resulted in € 0.18 per kWh saved after the first year and € 0.15 per kWh saved after the second year. Measures recommended in the project but implemented after this period and measures taken by participants that did not hand in the final data (and that were thus excluded from the final evaluation) were not included in these numbers. The Eco n' Home consortium estimates that due to long-term and high-scale use of their method the costs may further drop to € 0.13 per kWh saved. Most of the costs of the method were staff costs. It is thus recommended to save money on the time spent per household. The samples show that there is no relation between the time spent on a household and their energy savings. Saving time (and thus money) can thus be done by using experienced energy auditors and effective tools for data collection and feedback.

A survey at the end of the project to investigate the social learning of the participants indicates that the majority of the participants (>80%) says that the project has contributed to their knowledge about energy. They learned particularly more about the reduction of energy use at home and in transport. The survey also indicates that 71% of the participants changed their behaviour in relation to energy due to the project: 32% of the participants now turn off lights when not in use, 42% replaces broken bulbs with low energy ones and 40% switches the television off in stead of stand-by. The services of the project partners towards the participants were evaluated as good or very good by 69% of the participants.

Although the service delivered by the Eco n'Home project partners to the participants was evaluated as successful, the energy saving targets were not met by the participants. Only in two of the nine samples more than 50% of the participants had reached the project targets (10-20% energy reduction and more than 1 ton CO₂ emission reduction): LEA (81%) and MVE (58%). The success of the British project partner LEA can be explained by the effectiveness of the Action Plans that included grants for the participants to execute the measures in the Action Plan (75% of the measures were financially supported). Another reason might be large energy inefficiencies in the housing stock of LEA at the start of the project. Some other remarkable outcomes from the different samples are:

- The sample of the Belgian project partner E-STER showed very good results in terms of energy and CO₂ emission savings. Also the majority of the Belgian participants considered the service of the company as good. These good results might be the effect of the quality of the available tools to perform the data analysis and the fact that many of the recommended measures in the Action plan consisted of short term pay back measures (less than 3 years).
- The highest electricity reductions were achieved by MEA. This is probably due to their service to bring energy efficient bulbs to the households and offer an easy way to purchase them.
- There was a difference between the results of the samples of the project partners who addressed transport and who did not. Although a better focus could be put on the energy use in the house (and large reductions were achieved) when transport was excluded, focusing on transport also helps in making people aware of the amount of energy that transport consumes. For example due to the information MEA gave the participants on the energy use of transport, many of them changed their habits in this respect.

⁴ These include making car use more sustainable, reduce annual mileage, replace old car with more energy efficient one and use alternative transport or carpooling.

- The outcomes of the Portuguese sample of AGENEAL were relatively low. Still the percentage of measures realized was relatively high. This can be explained by the fact that AGENEAL mostly recommended cheaper measures that saved small amounts of energy (for example switching off stand-by functions and replacing bulbs). When looking at the effect on behavioural change it can thus be said that recommending cheaper measures is successful.
- The sample of the Italian project partner EEA shows bad energy saving outcomes (only 14% of the participants reached the project targets) but the survey shows that a large majority of the participants have changed their behaviour towards energy and have increased their knowledge on the topic⁵. For the participants it thus felt as a successful programme. This might be the effect of the fact that energy is not high on the agenda of Italian households and any information and education on this is thus already a big step forward.

It must be stated that the less successful Portuguese AGENEAL and Italian EEA case both had a low average energy use of the participants before the project started (low baseline). The participants in the best sample, the British LEA, had on the other hand the highest average energy use. This difference is probably due to the difference in the housing stock. LEA's sample consisted mainly of terraced and semi-attached houses while the former two consisted mainly of apartments. The possibilities to save energy are therefore greater in LEA's case.

Apart from the evaluation of the project by the participants also an evaluation of the project by the project partners took place (AGENEAL, 2008, p.55-76). The main outcomes of this self-evaluation were translated into recommendation and lessons learned for organization that want to replicate this or similar methods in the future (MEA, 2008). The 10 recommendation of the Eco n'Home consortium are:

1. *Use strong recruitment methods.* Funding and using existing networks are efficient ways to recruit participants. Public events, door-to-door and speculative letter writing proved to be less efficient.
2. *Understand participant's motivation.* The motivation of participants defines their demands. A household motivated for financial reasons may be interested in a different package of actions than another one motivated by environmental concern. Those paying for the services are generally more likely to be co-operative and act upon the advice given.
3. *Relate climate change to individual circumstances.* Not only knowledge but also attitudes of households determine their behaviour towards climate change. Information on the impact of an individual to climate change should therefore be given in understandable language avoiding jargon and with a positive tone.
4. *Use effective auditing and data collection methods.* To reduce the time spent on the energy audit it is recommended to ask participants to fill in a questionnaire and provide data before the audit. Collecting data on historic energy use may be faster via contacting the energy supplier. Also a staff training on the software may improve the time spent on the audit.
5. *Produce a meaningful Audit Report.* The audit report must be attractive, not too technical and include graphics that illustrate the effectiveness of the measures proposed. Participants' motivation of increases when a first step is made immediately, for example replacing a bulb with an energy efficient one by the energy advisor after presenting the audit report.
6. *Use the Action Plan.* To increase participants' motivation the action plan should be signed. The document is also handy during the evaluation as it is an overview of measures that the participant intended to take.

⁵ As the surveys have been filled in by the participants themselves and these outcomes have not been checked by the project partners, the positive reactions of the participants to the project in the survey may also be the effect of people answering the desirable way of being 'good citizens'. Especially when no

7. *Implement an effective follow-up.* An effective follow-up is crucial for the success of the Eco n'Home service. This would include a number of ongoing actions as regular contact between advisor and household, encouraging contact between participants, communicate about success stories, provide practical support, etc.
8. *Build up a positive relation between advisor and household.* The advisor should have a good understanding of the personal situation and motivation of a household and adjust the advised measures and support on this.
9. *Optimise methods of obtaining information.* It is crucial for the evaluation and effectiveness of a project that the right information on energy use is collected. Herefore it is recommended to use meter reading tools. When this is not possible close contact with the participants is needed to get the final data.
10. *Produce a useful Evaluation Report.* The Evaluation Report must be positive and rewarding and stimulating the participants to continue with their efforts by including recommendation for future savings.

Step 6: analysis and conclusion

1. The Eco n'Home case shows that when *financial grants* are provided (like in the experimental area of LEA in Leicester, UK) to the participating households to implement the measures advised by the energy experts, more measures are taken and more energy savings take place.
2. Linked to the first point it should also be taken into account that the commitments of participants may improve when they have to *pay for the services*. In the Eco n'Home project the services were provided for free to the participants and this is often led to a lack of commitment and motivation of the participants during the audit, the action plan and the follow-up according to the project partners.
3. Compared to other energy efficiency services that offer energy audits mentioned in for example the SErENADE project⁶, the Eco n'Home methodology seems to be more effective in terms that more households invest in energy savings measures after the audit (AGENEAL. 2008). This might be the result of the *personal contact* between the energy advisor and the household when compiling the audit which results in adapted recommendations and design suitable schedules of work with knowledge about the family's habits and situation.
4. Although the different outcomes of the nine samples can be explained by the different versions of the Eco n'Home methodology used by the partners, the differences can also be explained by other external factors like:
 - a. The involvement of third parties (public or private) in the design of the audit and the execution of the energy measures (for example a bank and foundation who offered to help with the dissemination).
 - b. The existing policies in each country regarding energy savings (for example the facilitation of investments in energy efficiency measures or the public awareness by education and information of the government).
 - c. The evolution of gas and electricity prices (for example the shorter pay-back period for energy saving measures due to higher energy costs).
 - d. The differences in baselines (some could easily save more in comparison to others).
 - e. The difference in availability of alternative transport.
5. The Portuguese AGENEAL case shows that when the recommended measures are relatively cheap, more measures are realized by the participants. In terms of changing the behaviour of the participants this is thus successful. However due to the fact that the cheaper measures often reduce less energy than more expensive investments, the total amount of energy reduction is relatively low compared to the other cases.

⁶ SErENADE is a European project that offers an overview of energy advice services in Europe. www.energy-advice.org

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Websites

www.econhome.net

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<http://ec.europa.eu/energy/intelligent>

official website of the IEE (Intelligent Energy Europe) programme of the EU.

Interviews

Telephonic interview with Wim de Groot, director of E-STER bvba, one of the Eco n'Home project partners (23rd February 2009).