

ESCO's for households : a new phenomena in Europe ?

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Abstract

e-ster is a young Factor-4 energy services company which focuses mainly on households. Our main activities are energy audits in existing houses, followed by a wide range of services to improve the energy efficiency of electric appliances, lighting and installations. The energy audits are based on short-term measurements of most electric appliances, and on a close inspection of building shell, heating and DHW installations, appliances and lighting. After the energy-audit, the energy consumption is followed during 2 years.

Our clients are almost all families which want to reduce their energy consumption in a profitable way on a voluntary basis, without subsidies. So far, over 250 energy audits in private dwellings have been carried out. Of ca. 50 families, we have monitored the energy consumption on a bimonthly basis (almost) one year.

In this paper, some results with the focus on electric appliances and lighting will be presented.

Illustrated by case-studies, the following aspects will be treated : analysis of the electricity consumption, based on short-term end-use metering ; benchmarking of the electricity consumption ; realized electricity savings after one year.

The challenges for running an ESCO for households in a profitable way will be discussed. We will end with a reflection on the potential future of ESCO's for households in Europe.

1. Background

e-ster is a young Factor-4 energy services company which focuses mainly on households. With Factor-4, we refer to the concept of Ernst von Weiszacker, Hunter and Amory Lovins to use energy 4 times more efficiently than today [1]. With a doubling of the global welfare the coming 40 years, this would result in halving the world's energy use and related problems such as climate change, increasing geo-political tensions, terrorist risks towards radio-active material etc.

e-ster supports this concept and want to contribute its modest share in it. Our clients are almost all families which want to reduce their energy consumption in a profitable way on a voluntary basis, without subsidies.

Why is it important to focus on households in energy policy ?

A first reason of course is that households are important direct energy consumers (not just Domestic Appliances & Lighting). For the EU-25, the share of households in the final energy use is 26,4 % ; the energy consumption would increase with 27 % in a trend scenario [2].

Aside from the fact that they are important energy consumers, there are 3 other distinctive reasons why it is important to address households' energy consumption [3] :

- households contain **voters**. Households are not only the object of policies, but as a voter they also are a part of the policy-making process. They have a right to be informed about the reasons, aims and results of policies. And when they are better informed, they will in general accept them better, which in turn improves the effectiveness of the policy and might also protect it from being voted against it in elections
- households also contain workers or **professionals**. That is : people who also use energy at their job. So attitude or behavioral change in the homes might also influence energy use at work.
- A fourth reason is that families raise the energy consumers of tomorrow, namely **children**. Making energy efficiency an attitude among children and kids might indirectly promote future energy conservation.

2. Energy services offered by e-ster

Which energy services does e-ster offer to households ? Our main activities are energy audits in existing houses. A second service is sales and direct installation of A++/A+/hot-fill machines, hard-to-find CFL's and energy-efficient lighting. A third service is consultancy-on-demand e.g. advice for (r)enovation of dwellings, IR scans, blower-door tests, ...

Energy Audits in Dwellings

The energy audits are based on short-term measurements of most electric appliances, and on a close inspection of building shell, heating and DHW installations, appliances and lighting. The on-field energy audit takes on average 1,5 hour per dwelling. During this audit, all rooms are inspected where appliances with a significant energy use can be expected. During 2 weeks, the consumption is measured of typically 15 to 20 electric appliances.

The short-term measurements allow us to gather many data on the energy use of appliances, which we use to benchmark individual appliances (see e.g. figure 1)

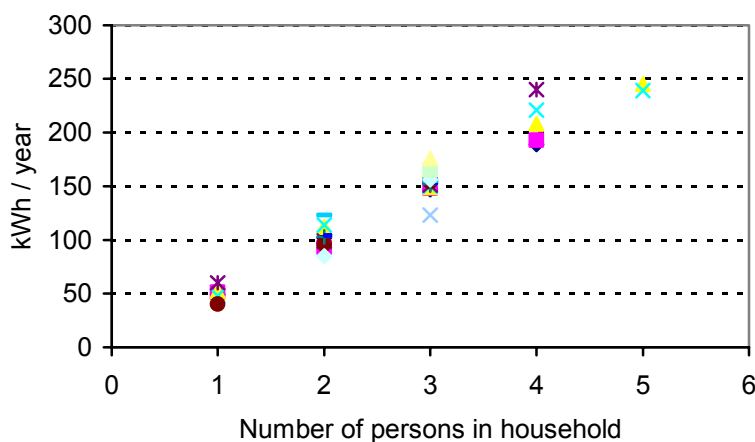


Figure 1 : Annual consumption of washing machines Source : e-ster bvba

An energy audit report is made which contains the following elements :

- benchmarking of the household's normalized fuel consumption and total electricity consumption (in function of dwelling type, fuel type for DHW and for cooking, and seize of household), and per appliance (for appliances with abnormal high/low consumption)
- end-use analysis for fuel and electricity
- main recommendations to reduce the energy bill
- cost/benefit analysis of the package of proposed measures.

In Annexes to the audit report, tailored information is given. E.g. if it advised to replace an energy-inefficient freezer, a list with the most energy-efficient freezers will be included.

After the energy-audit, the energy consumption is followed during 2 years. So far, over 250 energy audits in private dwellings have been carried out.

Sales and direct installation of A++/A+/hotfill machines and energy-efficient lighting

Our second service, sales and direct installation of A++/A+/hotfill machines, hard-to-find CFL's and energy-efficient lighting, is similar to delivering turn-key installations by large, 'traditional' ESCO's.

To our experience, this is very important to speed up the implementation of energy efficient appliances and lighting. As long as we did not offer this service and only gave advice, people went to their traditional shop, where the sales staff would say , "A++ freezers, we don't have that in stock Madame, we can order it but it will take 3 weeks, but look here we have a model which is almost as efficient , ...". And the opportunity for an A+ or A++ freezer would be lost for 15 years. Offering this service also generates profit for us, which allows us to lower the price of the audit.

3. Results, illustrated by some case studies

Fermette in Wilsele, drastically renovated in 2001-2002

This old farm was drastically renovated “by one of the most famous ecological architects from Flanders”. On demand of the owner, much attention was given, to lower the energy use : some features include a very good insulation of roof and walls, mechanical ventilation with heat recovery, and a solar boiler. The owner estimated the total extra-investment as 10.000 to 12.500 EUR. However, the energy audit done by e-ster showed that the energy use could be lowered significantly without lowering comfort. The main measures proposed and taken were stopping most leaking losses, replacing an old freezer, and replacing the most often used 20 halogen bulbs with CFL’s. In 1 year time, the electricity consumption decreased with 41 % (figure 2). To achieve this, the owners did an investment of netto 761 EUR (marginal costs) with a payback of 2 years. Also gas consumption will be lowered next year by replacing the 20-years old boiler.

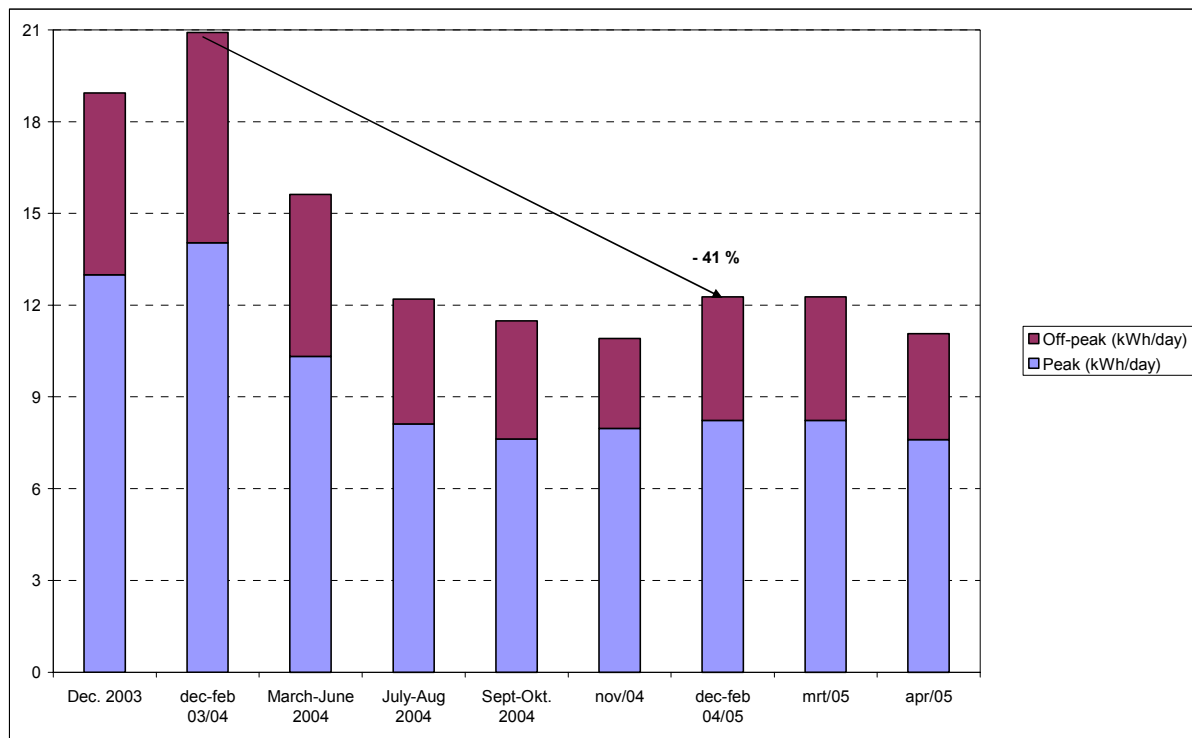


Figure 2 : Case-study 1 : Evolution of the electricity consumption

Source : e-ster bvba

Dwelling in Merelbeke, drastically renovated in 1995

This family has 3 children and lives in a semi-detached house. Before the energy audit, the fuel consumption (natural gas) was below average, and the electricity consumption was average. Heating was done with a 15-years old central boiler and an advanced wood stove. Domestic hot water (DHW) was produced with an old electric boiler which had to be replaced urgently.

The energy audit showed that the family could reduce its energy use drastically without comfort loss. Main measures proposed (and taken) were replacing the old boiler and the electric DHW boiler by one condensing gas system ; cutting many leaking losses (TV, fax, DVD, &) ; and replacing an old refrigerator. Total extra investment: 400 € with a payback time of 2 years¹. Still planned : replacing a part of the halogen lighting with an energy-efficient lighting system.

In figure 3, the results are shown for the evolution of the electricity consumption.

¹ Compared to replacing the gas boiler by a standard gas boiler and the electric DHW boiler by a new electric DHW boiler. The comparison is not entirely correct because the savings claimed should be for the savings over a modern non-condensing boiler. The latter is however unknown and could only be an estimate.

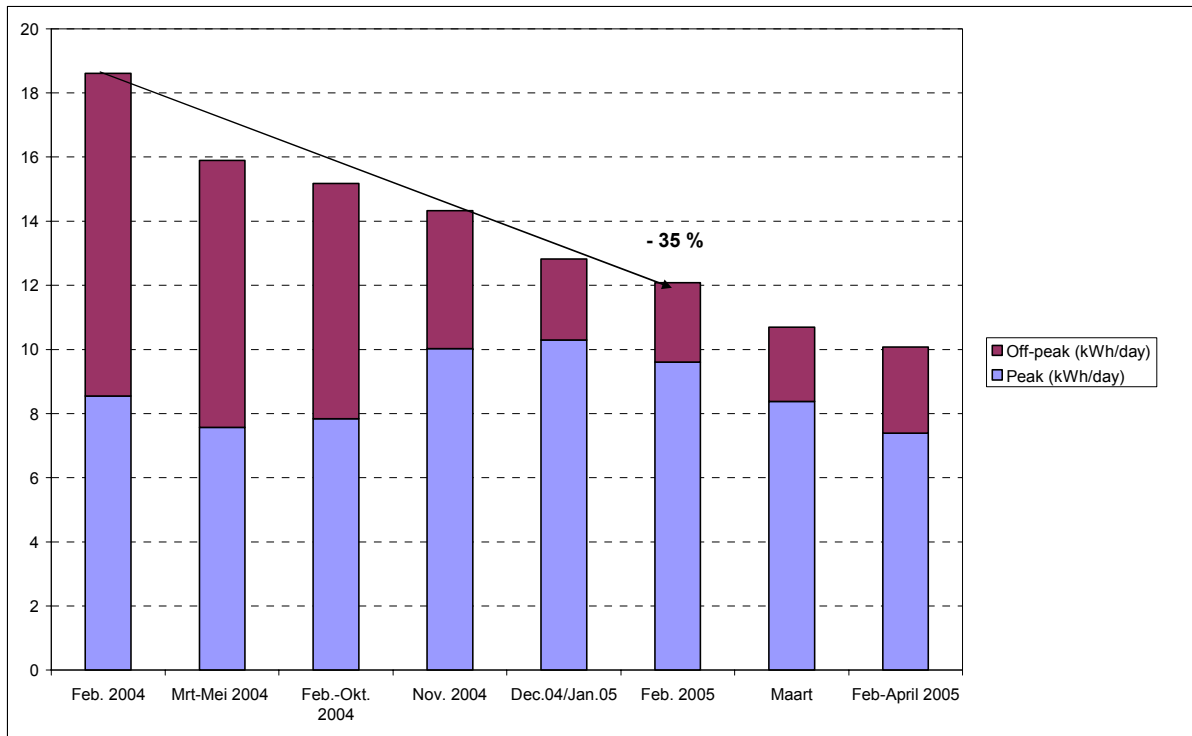


Figure 3 : Case-study 2 : Evolution of the electricity consumption

Domestic hot water is now produced with gas instead of electricity. Nevertheless, due to the new condensing boiler, the consumption of gas has not increased but on the contrary decreased with 32 % (figure 4).

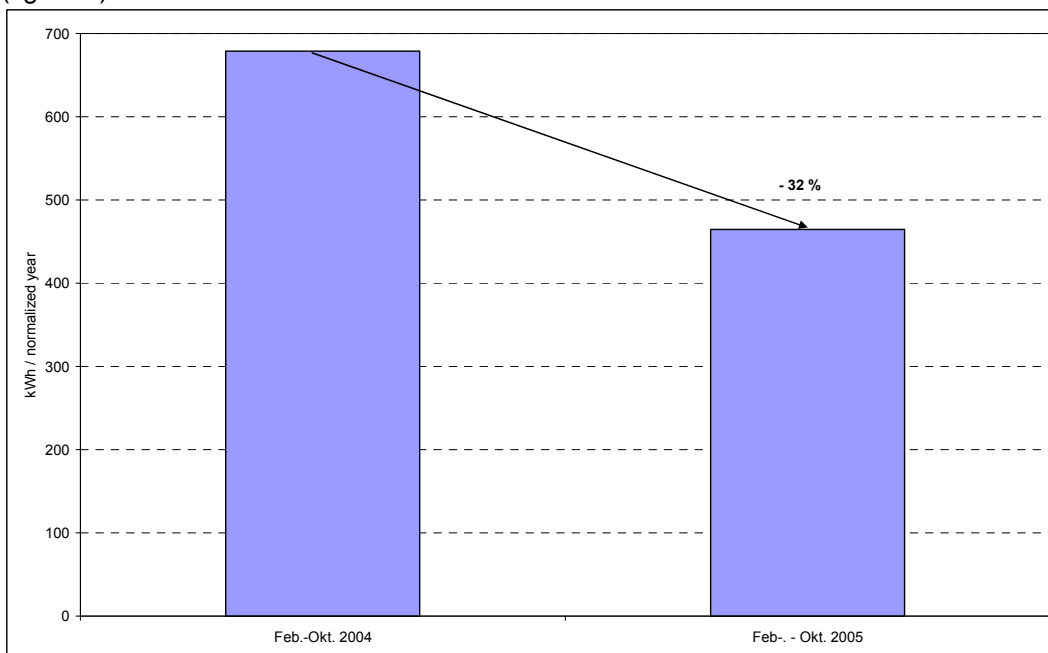


Figure 4 : Case-study 2 : Evolution of the (weather-normalized) natural gas consumption

4. Conclusions

From the more than 250 energy audits which have been done already, some trends appear. In figure 5, we compare simple pay-back time (although this is a very bad concept) of some main measures that we recommended.

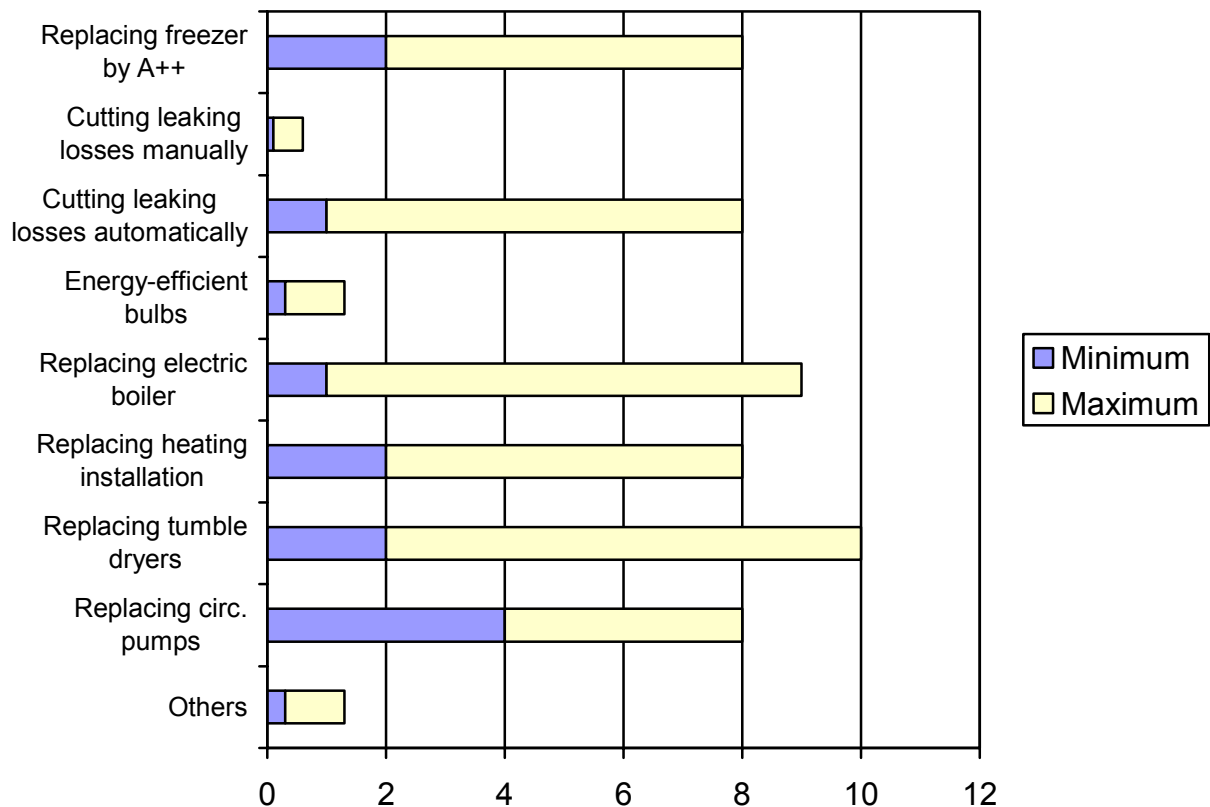


Figure 5 : Pay-back of selected recommended measures

Source : e-ster bvba

Figure 5 shows the first conclusion : only by measuring (or close inspection), it can be determined whether an energy efficiency measure is cost-effective. No one fits all !

Our second conclusion is that we confirm from our experience the most often quoted barriers for energy efficiency in households : a lack of time, and a lack of money. Roughly speaking, one could argue say that are two groups of households. The group which needs most desperately support to lower its energy bills, the poor, cannot afford an energy audit. The other group, middle and upper class, can afford it but often has no time for it : "Most human decision-making (...) is concerned with the discovery and selection of satisfactory alternatives ; only in exceptional cases is it concerned with the discovery and selection of optimal alternatives " [4].

Further perceived barriers for selling energy efficiency services to households are :

- energy services are unknown among households (new product)
- there are no guaranteed savings, and the monitoring costs by submetering seems for the moment too high
- subsidies, as this will create a distorted and artificial 'market'. E.g. in Belgium there is since recently a tax deduction for residential energy audits if these are carried out following a standard procedure set out by the government. This procedure takes typically 8 hours, as a result this type of energy audits costs 600 EUR and more, and almost no one is interested in such an expensive audit. The same phenomena has been observed in The Netherlands, where the 'market' for residential energy audits has collapsed after the Dutch government stopped the 80 % subsidies for it.

Some possible positive government incentives could be :

- giving the good example in public buildings (energy audits, followed by taking measures and disseminating the results)
- allowing ESCO's the CO2-credits which they save (on average 5 to 10 tons per dwelling if all recommended measures are taken). This would of course require a monitoring and verification protocol.

Is there a future for ESCO's for households in Europe ? We think so, if some things are kept in mind :

- energy services have to be seen in the broadest sense, not in the narrow sense of guaranteed savings [5]. We do however guarantee savings for specific amenities and

services. E.g. and old freezer with a measured consumption which we replace by an A++ freezer : in this case the savings are more or less guaranteed. The same for e.g. solar cells (photovoltaic's). We cannot guarantee savings on the total energy consumption in the house, because we cannot control behavior (including and especially the behavior when buying additional appliances and lighting).

- Information only does not work very effective and is too expensive. Our business model combines tailored information with selling and installing some of the best opportunities found. This is more effective (removing barriers for energy efficiency) and helps us to lower the price for a first energy audit
- fuel switching makes often sense from an primary energy point of view and also from a financial point of view. As one of the case-studies showed, it is often a golden opportunity for energy efficiency

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