GUIDELINE: ENERGY AUDITS FOR HOUSEHOLDS

Abstract

An energy audit for households is an extensive analysis that ultimately helps customers to improve the way they consume energy, increases awareness and suggests changes to induce savings. An energy audit conducted by a certified technician is a great way to show customers all the potential of a smart-grid enabled energy environment and deliver an approach with a clear return on investment to their households. This guideline informs utilities, energy service companies (ESCOs) and energy consultants of the main elements in an energy audit and what needs to be considered when introducing such a service.

What is it?

The energy audit is a service for customers who want to get a better understanding of their household energy consumption and want to reduce their energy bills. An energy audit consists of a home visit from an energy consultant – a certified technician from a utility or energy service company (ESCO) – who conducts an extensive survey and a critical analysis of the household's conditions for energy use and savings. The output is a report containing a detailed analysis of electricity and gas consumption by major equipment and lighting, along with a set of actionable measures and advices that have a direct impact on the energy consumption. The detailed proposal compiles a number of energy efficiency measures with quantified savings as well as some energy efficiency tips related to behavioural changes. The proposed measures can range from altering contractual features such as choosing an optimal tariff and contracted power to some general energy efficiency tips on performing housing investments like insulation or replacement of equipment.

When to use?

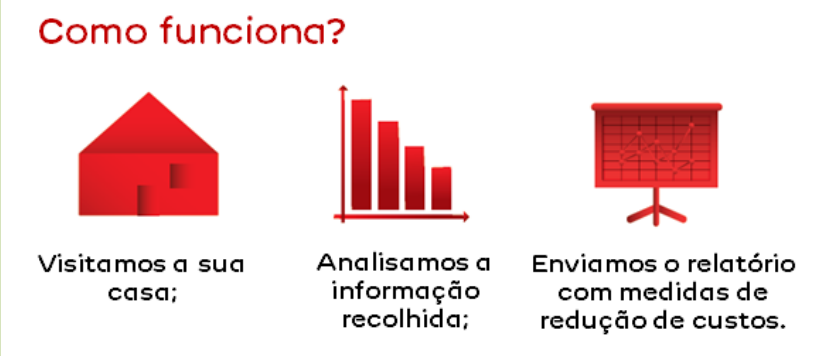
In certain EU countries (e.g., Portugal) it is legal to perform an energy audit whenever the registered consumption from one household is significantly higher than the average of a group comparable households and to use this as an improvement plan. It can also be initiated by interested customers who contact an energy consultant. In this case it is not the DSO who approaches the customer but the retailer, seeing that the retailer has a client-service provider relationship with the customer.

Regarding the size of a project or roll out, the timing of the energy audit might vary: In a project it is fruitful to perform energy audits at the beginning. It is a way to grant a greater enthusiasm towards the project because it provides concrete measures with lasting effects in enhancing energy efficiency. In case of a roll out, it could not

be viable to perform energy audits to the entire population, mainly because of its cost. This type of service cost can be equal to 5-7 months of an average energy bill. In this case, the project managers should respond to high discrepancy cases between comparing households. The average consumption of an European household is somewhere between 3kWh/y and 5kWh/y[1]. This gives you an average electricity bill of around 50-75€. The cost of an energy audit varies from €180 to more than €500 depending of the type and size of the household. This value obviously varies from country to country or marketplace to marketplace.

Easy and clear energy audit in three steps (EDP, PT)

EDP in Portugal offers energy audit services to its customer as an added value service. Although the service is much more complex it is communicated as a three-step approach: (i) House visit; (ii) Recovered data analysis and (iii) report with the proposed energy efficiency measures. Retailers and ESCos offer these services to customers as an investment with a clear payback.



EDP Comercial three-step energy audit

More information can be found on www.energia.edp.pt

What do you need to do?

If you want to provide energy audit services to your customers, there are some vital steps to keep in mind.

1. Plan and prepare

A home visit is scheduled in agreement with the customer, initialised either by you or the customer in question. The energy consultant prepares for the audit by collecting existing and available data about the household and performing a preliminary

[1] See https://www.wec-indicators.enerdata.eu/household-electricity-use.html

analysis based on historical records of the household energy consumption. The household load profile (smart meters can play a key role providing a more detailed energy consumption patterns) and available socio-demographic information about the household (such as members of the household, ages, geographic location, household type and characteristics).

2. Household visit

In short, an energy audit home visit by a specialized technician includes:

- On-site monitoring of the electricity consumption in order to detect any anomaly or excessive consumption by any equipment;
- Consumption analysis of all energy supply sources;
- Thermic characterization;
- Energy characterization:
  - Heating and ventilation;
  - Lighting;
  - Hot water sources;
  - Equipments and appliances;
  - Renewable energy sources (solar panels, etc.).

In order to identify possible reductions of energy use, it is necessary to collect consumption data of the major energy-using equipment in the household. In the household the energy consultant analyses the energy use by collecting a set of measurements and records that, together with the information that was previously gathered, formulate a diagnosis of the situation and will allow to:

- Determine the customer's load profiles, overall and by source of energy used, grid provided or micro generation;
- Determine the overall energy consumption and the consumption by energy source (heating, hot water, lighting and equipment) ;
- Characterize the main equipment's energy use;
- propose technical solutions leading to reduction of energy consumption while maintaining the same level of comfort;
- Propose the implementation of suitable energy efficiency measures with a viable return on investment. For instance a home energy management system connected to the devices and to a smart meter can monitor the energy consumption of each device.

3. Analysis and final report

After the fieldwork, the technical auditors organise and analyse the gathered information from the first two steps and prepares a report to be sent to the customers.

This report shall contain, in an organized manner:

- All the information obtained, as well as the analysis of the household energy consumption status;
- The situations/observations encountered and measurements made during the field work;
- The determination of specific energy consumption by installation or circuit and the identification of the equipment's and appliances with the largest energy use;
- A detailed proposal of possible energy efficiency measures, including technical characteristics, level of investments needed and quantified savings;
- Electricity tariff optimization to enhance future savings with no investment needed;
- A study on the housing potential for the installation of renewable power sources;
- Detection of further unconformities and conforming recommendations.

Preparation as a first step (E.On)

Best practices from energy audits come from the energy retail market, from Energy Service Companies (ESCOs) or utilities. For instance, E.On showcases a simple four-step approach.

a) The customer fills in an application form with details on the house or apartment;
b) A technician makes a home visit;
c) A meticulous report is written, containing advice on what improvements could be made in the house or apartment in order to make in more efficient;
d) The improvements suggested in the report are implemented by qualified technicians.

More information can be found on www.eon.de

Do's and don'ts

- **Provide feedback quickly.** A successful energy audit will provide fast feedback to the customer to avoid losing momentum.
- **Don't treat an energy audit as a push product.** This audit service is only viable from a customer point of view if it has a clear return on investment. With that in mind this service should be introduced only when a deviation from the norm is detected and not to the general population.
- **Don't see the energy audit as a stand-alone action.** Studies show that the impact from energy audits in households is mixed (Murphy, 2013). Thus, audits should not be introduced as a stand-alone action. Usually the energy audit points out areas of improvement on the household that have a direct impact in the energy consumption. The success or failure of an energy audit is linked to the fulfilment of the proposed improvement measures in the energy audit.

Further reading

- S3C Deliverable 3.4, Uyterlinde, M. et al. (2014). *Report on case analyses, success factors and best practices.* http://www.s3c-project.eu/Down.asp?Name={HYADKPEKMW-630201493832-FBPRIFTPZK}.pdf
- Murphy, Lorraine (2013). *The influence of energy audits on the energy efficiency investments of private owner-occupied households in the Netherlands.* Energy Policy 65 (2014) 398-407.

This guideline was developed in the S3C project, and is freely available from www.smartgrid-engagement-toolkit.eu.

S3C paves the way for successful long-term end user engagement, by acknowledging that the "one" smart consumer does not exist and uniform solutions are not applicable when human nature is involved. Beyond acting as a passive consumer of energy, end users can take on different positions with respective responsibilities and opportunities. In order to promote cooperation between end users and the energy utility of the future, S3C addresses the end user on three roles. The *smart consumer* is mostly interested in lowering his/her energy bill, having stable or predictable energy bills over time and keeping comfort levels of energy services on an equal level. The *smart customer* takes up a more active role in future smart grid functioning, e.g. by becoming a producer of energy or a provider of energy services. The *smart citizen* values the development of smart grids as an opportunity to realise "we-centred" needs or motivations, e.g. affiliation, self-acceptance or community.

S3C (2012-2015) performed an extensive literature review and in-depth case study research on end user engagement in smart grids, resulting in the identification of best practices, success factors and pitfalls The analysis of collected data and experiences led to the development of a new, optimised set of tools and guidelines to be used for the successful engagement of either Smart Consumers, Smart Customers or Smart Citizens. The S3C guidelines and tools aim to provide support to utilities in the design of an engagement strategy for both household consumers and SMEs. The collection of guidelines and tools describe the various aspects that should be taken into account when engaging with consumers, customers and citizens. More information about S3C, as well as all project deliverables, can be found at www.s3c-project.eu.