[England] Warm Front

About the measure

Policy instrument	Sector	Starting date and status
Financial (grants)	**Residential**	**[June 2000] – [January 2013]**

The Warm Front scheme was the primary Government tool to **alleviate fuel poverty** in England, with a secondary objective to reduce CO_2 emissions from housing. It was funded by the Government and **administered by contractors**. A Warm Front Network Team worked with key stakeholders to support the generation of referrals to enable access to the most vulnerable households.

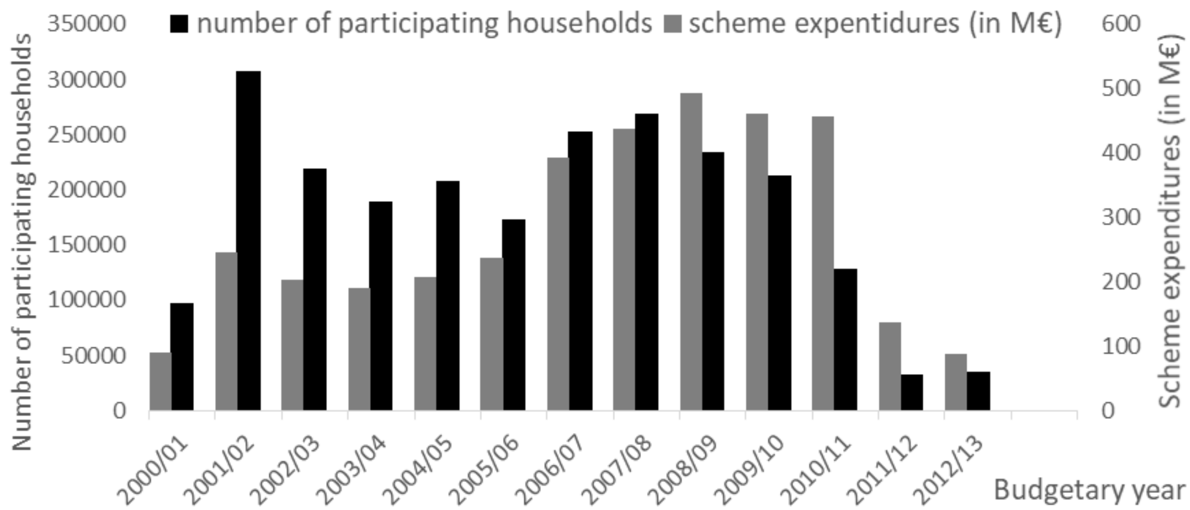
The scheme provided **CFLs** (up to the end of 2010) and **grants for energy efficient heating and insulation measures** (except solid wall) to households living in **private housing** (owner-occupiers or tenants of private-rented dwellings) and in **receipt of certain benefits**. From April 2011, the eligibility criteria were narrowed and criteria about the energy efficiency of the dwellings were added, following the recommendations made in the evaluation by the National Audit Office (NAO, 2009). **Grants could cover the full action costs up to given grant ceilings** (between €4300 and 7500 depending on the type of dwelling and heating system, and the period). When needed, the remainder could be paid by the households or by a third party (mainly local authorities or charity organisations).

Processing the applications included a check of households' eligibility and then an **on-site visit** (survey) to assess what actions were relevant and eligible (based on technical criteria). Survey results were processed by the scheme administrator who allocated the works to installers registered for the scheme.

The scheme also included a post-installation inspection of the heating systems and a **2-year aftercare service**.

Expected energy savings in 2020	Benchmark
8.4 TWh/year (from actions over 2000-2013) (source: National Energy Efficiency Action Plan – NEEAP 2011)	About 11% of English households were assisted by the scheme (over 13 implementation years).

Means and outputs



Source: data from (House of Commons, 2013). Exchange rate used for this case study: 1 £=1.25€.

Figure 1. Annual participation and expenditures of the scheme (2000-2013: 13 budgetary years).

The EPATEE project has received funding from the European Union's Horizon 2020 Research and innovation programme under grant agreement No 746265.

- **Scheme expenditures** = grants (83% of the expenditures in 2007/2008 (NAO, 2009)) + administration costs (fees of the scheme manager; 9%) + supporting services provided to the beneficiaries (surveys, post-installation inspections and benefit entitlement checks; 8%)
- From June 2000 to January 2013 (13 implementation years), the scheme assisted about **2.3 million households** for total public expenditures of **€3.75 billion** (House of Commons, 2013).
- About 2.6 million actions were installed with a Warm Front grant between April 2005 and March 2013 , whose about **1 million CFL** (39%) and **1.6 million "major actions"** (boiler replacement: 18%; other heating measures: 21%; insulation measures: 16%; draught proofing: 5% and insulation of hot water tank: 1%), mostly in owner-occupied dwellings (88%) (Ipsos MORI and UCL, 2014).
- From **75 to 97% of the actions** (other than CFLs) could be **fully funded by the grants**, depending on the years (NAO, 2003 and 2009).
- The application process of the scheme enabled to collect data to monitor many indicators (number of actions per action types, average cost per action type, etc.)

Data about energy savings

Unit	Main source of data
cumulated annual final energy savings (TWh/year)	NEEAPs

- **NEEAP 2011**: **cumulated annual final energy savings of 8.0 TWh/year**, as a result **from actions installed over 2000-2010**. This was estimated based on the data from the annual monitoring. It corresponds to "theoretical" energy savings, i.e. energy savings calculated using a simplified engineering model and assuming normalised heating behaviours.

- **NEEAP 2014** (p.134, about Warm Front): "*the latest estimates of energy savings from this policy show* ***negligible changes in energy consumption due to high comfort taking*** *following the installation of energy efficiency or improved heating systems in this programme targeting households in fuel poverty*". This statement is consistent with the results of the qualitative survey of beneficiaries in the final process evaluation (Ipsos MORI and UCL, 2014). However the results from this survey cannot be considered representative (small sample used to get qualitative insights).

The particularities of the Warm Front scheme (with the objective of alleviating fuel poverty) therefore led to the reporting of two different results:
1) high theoretical energy savings (when assuming normalised heating behaviours and considering the improvements of dwellings' energy efficiency);
2) no significant energy savings, when taking into account comfort and underperformance factors (i.e. estimates based on changes in energy consumption as observed on energy bills).

Sources of uncertainties about energy savings

The main sources of uncertainties for the simplified engineering calculations are related to:
- overestimation of the heating consumption before intervention (for ex., due to restriction behaviours), also called "prebound effect" (see for ex., Sunikka-Blank and Galvin, 2012);
- underestimation of the heating consumption after intervention (for ex., due to comfort taking/rebound effect, defaults in the installation of the actions, etc.).

Evaluation of the energy savings

Calculation method(s) and key methodological choices

- the annual results reported by the scheme administrators are based on simplified engineering calculations done for each participating dwelling, using the SAP (Standard Assessment Procedure) methodology (**scaled savings**, **method 5**);
- baseline = before/after comparison (SAP rating defined by the survey before the intervention, then modified using standardised average values per action type)
- studies were done to assess the differences between the theoretical energy savings monitored and the actual energy savings (estimated in different ways, see below *Focus on the comparison between theoretical and metered energy consumption*)

Ex-post verifications and evaluations

Quality assurance processes included post-installation inspections, covering 558 793 dwellings between April 2005 and March 2013, i.e. 61% of the dwellings that received at least one eligible action type other than CFL (Ipsos MORI and UCL, 2014). These inspections were meant to guarantee the quality of the actions, but did not included ex-post verifications of energy savings.

Ex-post evaluations:

- a study of changes in energy consumption for a sample of participants was made within the broader evaluation of health impacts (for more details, see below *Focus on the comparison between theoretical and metered energy consumption*)
- DECC (Department of Energy & Climate Change) then asked BRE (Building Research Establishment) to make a study where a modelling more sophisticated than the SAP rating was used, including a reduction factor to take into account direct rebound effect and possible underperformance of insulation actions (see below "*reductions in CO_2 emissions*" for more details)

In both approaches, the evaluations did not include an explicit causality assessment, assuming implicitly that all the actions getting a Warm Front grant would not have been installed in the absence of the scheme. This assumption seems to be confirmed for most of the participants surveyed in the health impact evaluation and in the process evaluation. But a few surveyed participants felt they would have been able to afford the actions without help from Warm Front or other sources. As the evaluators did not mean these surveys to be representative (Ipsos MORI and UCL, 2014), their conclusions were qualitative ("most of…", "few of…") and did not include quantitative estimates about this.

Moreover, the causality issue in the case of the Warm Front scheme was not to be analysed in terms of "usual" additionality or free-rider effects (participants who would have done the action anyway) but in terms of targeting, as the priority objective of the scheme was to alleviate fuel poverty: did the scheme provide grants to households that were in situation or at risk of fuel poverty?

Other indicators monitored and/or evaluated

Indicator	Explanations
Reductions in CO_2 emissions	DECC (Department of Energy and Climate Change) asked BRE (Building Research Establishment) in 2008 to estimate the reduction in CO_2 emissions. This was done by using scenarios to modify the 2001 English House Condition Survey (EHCS) dataset. The installation of Warm Front actions was simulated by adjusting the base data to an improved situation. The CO_2 emissions before and after the installations were calculated from the energy consumption for space heating and domestic hot water estimated with a simplified engineering model. The calculations included a reduction factor, made of a 40% "comfort factor" (assumed direct rebound effect) and, in the case of the insulation actions, of a 41% "underperformance factor". Actions were randomly allocated to dwellings of the EHCS stock and repeated runs were performed in order to achieve convergence around a mean amount of CO_2 saved. Final result: 0.49±0.07 $MtCO_2$ saved per year as a result of the actions (cavity wall insulation, loft insulation and installation of oil and gas central heating) installed between 1 June 2000 and 31 March 2008 (DECC, 2008). The confidence interval provides an estimate of the statistical uncertainty due to the approach based on a random distribution of the actions in the dwelling stock. However, it does not take into account other sources of uncertainty (for ex., due to the default reduction factor).
Health impacts	An external evaluation focused on the health impacts of the scheme was undertaken between 2001 and 2006 by a multi-disciplinary team of researchers (Warm Front Study Group) who combined several approaches. Several studies investigated the targeting of the scheme; the experience feedback of the applicants about the application process; the level of satisfaction about the actions installed; the impacts of the actions on humidity level/risk of dampness; the impacts of the scheme (through the actions installed) on stress, well-being, physical and mental health. For more details, see (Green and Gilbertson, 2008) for a synthesis of the evaluation, and (Gilbertson et al., 2006 ; Hong et al., 2006 ; Oreszczyn et al., 2006 ; Hong et al., 2009) for the results of the different studies done for this evaluation.
Targeting of the scheme	The scheme has been subject to debates about its targeting through its eligibility criteria. For example, the National Audit Office (NAO) pointed the following issues in the data and results observed for the period from June 2005 to March 2008 (NAO, 2009): - according to the 2006 English House Condition Survey, nearly 75% of vulnerable households eligible for the Scheme were not fuel poor; - over 236 000 participants (i.e. about 37%) were eligible through non-means tested benefits only, meaning that they may have had resources to fund the actions they received ; - £34 million (i.e. about 5%) were paid in grants to households (18% of the participants) whose properties were already comparatively energy efficient. Following these analyses, the eligibility criteria were tightened from April 2011: households had to receive means-tested benefits, and the energy efficiency of the dwellings was to be lower than a given threshold. This likely limited the risks pointed by NAO (2009), but only applied for the two last scheme years, when the budget was decreased. This also led to a decrease in the applications.
Satisfaction of the participants	The overall satisfaction rate monitored annually by the scheme manager through the satisfaction questionnaires remained above 90% over the whole duration of the scheme, most often between 92 to 94%. This was also confirmed by the share of beneficiaries (also above 90%) who would have recommended the scheme to family and friends.

Other aspects evaluated

The **performance of the scheme** was monitored and assessed through:

- annual reports produced by the scheme administrators (including in particular: number of households assisted, number of actions installed by action type, energy efficiency improvement of the dwellings, theoretical energy and CO_2 savings);

- key performance indicators about the scheme administration by the contractors;
- governance arrangements including regular meetings with stakeholders' groups;
- quality assurance reports by independent assessors;
- National Audit Office reviews (NAO, 2003 ; NAO, 2009) (with a focus on the service provided to customers, cost management and management by DECC of the contract with the scheme administrators).

DECC also commissioned a **final process evaluation** of the scheme (Ipsos MORI and UCL, 2014). The objective was that lessons could be learned to **inform the delivery of future energy efficiency schemes targeting the fuel poor** (in particular for the Energy Company Obligation). The evaluation focused on the period in which the scheme was managed by a single contractor, from 2005 until the scheme closure. The evaluation investigated, through a combination of quantitative and qualitative research methods, the strengths and weaknesses of scheme processes: **effectiveness of management and delivery**; **value for money** in comparison with the general market; any benefits or negative **impacts on the supply chain** (for ex., on turnover, jobs, etc.); the **extent to which the scheme met beneficiaries' expectations**.

For example, the qualitative research showed that most surveyed beneficiaries had not undertaken any further work to improve the energy efficiency of their home after receiving Warm Front actions, though a few ones had installed further actions (replacing the front door, the glass in their windows, and installing draught-stripping) through other government schemes or paid by themselves. Some stated that they did not think there was much else they could do to improve the energy efficiency of their dwelling, while a few ones would have liked to take further action but could not afford to. In a small number of cases Warm Front installations seemed to have increased the interest of the households in energy saving. However, this was not the case for most applicants (Ipsos MORI and UCL, 2014). The spill-over effects at the level of the participants would thus be very limited.

At the opposite, the high level of satisfaction of the participants may have however led to significant spill-over between households (word-of-mouth), with several surveyed beneficiaries reporting that they recommended the scheme and installers. But this effect was mostly contributing to generate applicants to the scheme, probably much less to generate actions outside the scheme.

The evaluators highlighted that these results were only qualitative, and not meant to be representative.

Focus on the comparison between theoretical and metered energy consumption

The annual monitoring of the energy and CO_2 savings was based on a before/after comparison using a **simplified engineering modelling** that calculates **conventional energy consumption**, i.e. for normalised behaviours (setpoint temperatures, etc.) and weather conditions. The scheme manager therefore presented these results as "potential" energy and CO_2 savings (or theoretical energy and CO_2 savings), as they **did not represent the changes in energy consumption experienced by the participants**, in particular due to the differences between their heating behaviours and the normalised behaviours assumed in the model. In order to investigate these differences, part of the evaluation done about the health impacts was focused on analysing the changes in thermal comfort and fuel consumption after Warm Front interventions.

A quantitative survey collected 3489 sets of household and property condition data over two successive winters (2001/2002 and 2002/2003) by a combination of surveying, interviewing and monitoring of 3099 dwellings participating in the scheme. Part of these dwellings had received the

Warm Front intervention and the others were due to receive the intervention (awaiting participants): these dwellings formed the sample used for a **cross-sectional comparison** (participants/control group). In addition 390 properties were surveyed before the intervention and then again after: these dwellings formed the sample used for a **longitudinal comparison** (before/after) (Hong et al., 2006). The heating consumption were then estimated with two approaches for comparison purposes: 1) simplified engineering calculations using the SAP methodology, and 2) based on metered data.

The analyses of changes in energy consumption were mainly based on the data directly metered for the study, i.e. data over 2–4 week periods. Data over longer periods of 1 or 2 years could be collected only for a smaller sample of 100 dwellings. The quantitative survey also recorded self-reported thermal comfort and indoor temperature in the living room and in the main bedroom twice daily at 8 a.m. and 7 p.m. over 11 consecutive days. The conclusions were that the scheme was effective in increasing the mean indoor temperature from 17.1°C to 19.0°C leading to an **increase in the proportion of households feeling thermally comfortable or warmer** from 36.4% to 78.7% (Hong et al., 2009). Another conclusion was that the SAP rating (energy performance rating) appeared to be the most significant predictor of indoor temperature (Green and Gilbertson, 2008).

Green and Gilbertson (2008) highlighted that the results led to **contradictory evidences**, with most of the surveyed participants reporting that they both reduced their fuel costs and increased their indoor temperature, whereas the analyses based on metered consumption showed on average an increase in the fuel consumption after intervention. In parallel, the calculation using the SAP methodology estimated a theoretical 60% reduction for the same dwellings.

These results questioned the estimations of energy savings made for the annual monitoring. However, they should be taken with caution, because the representativeness of the data was not discussed by the evaluators. The **data limitations** (consumption mostly metered on short periods of 2 to 4 weeks, indoor temperature not monitored in all rooms) may have create bias in the results.

The researchers suggested **possible explanations about the difference between theoretical and observed energy savings**:

- the various factors/assumptions used to normalise the metered data may be incorrect (in particular assumptions used to take the comfort improvement into account);
- the simplified engineering model may be too simplistic;
- insulation may not have been installed completely or correctly: a preliminary analysis of infrared thermography images taken on the insulation condition of 72 post-intervention dwellings indicated that not all of the exposed exterior wall and loft space was completely insulated following the upgrade work whereas the theoretical assessment of insulation normally assumes 100% insulation of the building envelope;
- increased dwelling air infiltration rate following the installation of a gas central heating system: air infiltration rate measurements of 191 participating dwellings demonstrated that despite the introduction of insulation actions, the air infiltration rate could rise, for example due to pipe work laid under the suspended floor boards (when installing gas central heating system) offsetting the impact of draught stripping;
- unexpected behaviours, such as increased window opening in warmer centrally heated dwellings or continued use of inefficient heating systems even when a more efficient system was introduced;
- heating before the Warm Front intervention may have been partially provided by secondary heating systems whose consumption were not metered (but this option was considered by the researchers to be a minor reason for the differences observed).

Hong et al. (2006) pointed in their conclusions that the scheme has been criticized for not being sufficiently targeted on households in situation of fuel poverty. They mentioned that it could partly explain the lack of decrease in the normalised fuel consumption after a Warm Front intervention, as "non-fuel poor" households may be less conscious of energy cost than "fuel poor" households.

The conclusions of Hong et al. were based on data collected in 2001/02 and 2002/03. Significant changes of the scheme occurred in particular from 2005 that could have improved the results of the Warm Front actions in terms of energy efficiency improvement and energy savings, in particular:

- efforts done to ensure the quality of the actions installed and to improve the advice and explanations provided to the participants;
- efforts to better target households in situation of fuel poverty;
- changes in the distribution per action type of the number of actions installed, together with changes in the specifications of the actions.

Therefore the conclusions from Hong et al. (2006) may not completely apply for the results of the scheme over its whole duration.

Experience feedback from stakeholders

Interview with Pr. Tadj Oreszczyn (University College London, evaluator)

1. **How and why was the evaluation/research done in 2001-2006 decided?**

The general context was the increasing issue of fuel poverty in the early 2000's, and particularly excess winter deaths that were estimated to be related to fuel poverty (about 20 000 per year at that time).

The driver for this large research project was the government's interest in the health impact of energy efficiency and the potential for the Health Departments involvement in the scheme including contributing to its costs. The aim was to evaluate the health benefits, which could save lives. This assumption was therefore to be tested as if the Warm Front interventions were a kind of medicine. This meant that the general evaluation question was to investigate if the scheme was cost-effective in delivering the expected health benefits.

Ideally, this was to be done by using large control trials like for medicine assessments, and focusing on health aspects. Evaluating the Warm Front scheme in this view was a particular case. And the research team managed to convince the administration that it was also needed to look at intermediate aspects and indicators, such as changes in indoor temperatures and fuel consumption. That is how one of the studies included in this research project could look at the energy-related aspects.

It is interesting to note that it is now possible to get doctors in effect prescribe a new boiler. This happened because health benefits from this type of intervention could finally be demonstrated to be cost-effective by NICE (National Institute for Health and Care Excellence) by evaluating data collected from a range of trials like Warm Front.

2. **What were the main lessons learnt from the evaluations?**

Overall, Warm Front measures – insulation and better heating systems - had a positive impact on improving mental health, improved thermal comfort and internal temperatures which in turn are linked to excess winter deaths, and lowered relative humidity. Through fuel switching, fuel costs were reduced but energy use did not reduce.

About the energy-related aspects, the installation of central heating, although more efficient, increased temperatures which increased energy use. Also, draught stripping which should have reduced the heat loss was offset by increased air infiltration during the boiler installation due to new holes being drilled.

This led to the recommendation that boiler replacement and other interventions should be done before interventions on airtightness.

More generally, the evaluation confirmed that health impacts were larger than impacts on fuel consumption. The main improvements for the participants could indeed be found in terms of higher indoor temperature and better comfort.

About health impacts, in-depth interviews found explanations for positive impacts on mental health. For example, interventions on boilers made that households were less worried about the risks of boiler's breakdown. Improvements to dwelling's energy efficiency often made possible to heat more rooms, while it was too costly before. This improved family life (less tensions, more privacy, etc.).

The research project delivered very rich materials, in various fields. About 20 academic papers were published. And a synthesis report summarized the main results [*see (Green and Gilbertson, 2008)*].

3. What were the lessons learnt in terms of evaluation practices?

This research showed the usefulness to make evaluation with a broad scope. Evaluations are often focused on a limited set of indicators that might not be the most relevant.

This is usually because funding for evaluation is often limited. Therefore, evaluation is ordered with a restricted approach and the main objective to assess whether the policy worked or not. However, this is only one part of what evaluation should be. Most of the time, it would be more important to understand WHY the policy worked or did not work.

In general, politicians do not want to be told that their policy is a failure. Their focus, in terms of evaluation, is to know the results of the policies in order to communicate about them. This makes that less attention is paid to the question of why and how these results were achieved (or not).

Focusing evaluations on the "did it deliver" question leads, in terms of evaluation methodology, to a focus on sample size and representativeness. The main issue being to ensure that the method, and thereby the results, are robust enough.

In practice, two constraints make that ideal conditions for a perfectly robust evaluation are very rarely met: money, and often even more importantly time. If we take the example of evaluating impacts on heating consumption. This requires monitoring consumption over at least one heating season before and one heating season after the intervention. Which already means a 2-year experiment. Then a third year is probably needed for the analysis and addressing issues in data collection, etc. But the evaluation customer normal wants results within one year, or less.

There is a need to balance between a rigorous statistical analysis with practical time and money constraints. These constraints should be considered when designing the evaluation, defining sample sizes, etc.

Moreover, it is not rare to see large data collection ending in providing data that cannot be used for rigorous data analysis, due to various problems in the measurement and data collection chain. Such risks should not be neglected.

So, one important lesson from the research project was that it could be more relevant to use smaller sample, but to collect more robust data and going more into the details. This makes possible to get a better understanding of how the policy works and why results are achieved or not. Which is often more valuable to policy officers than getting only a view on what was achieved.

4. **If you had to do this evaluation/research again, what would you do differently?**

The first point would be to improve the measurements, particularly about indoor temperature. With the budget available, it was chosen to monitor temperatures in 1 or 2 rooms per dwelling. This meant the implicit assumption that there was no change in temperature in the other rooms. This is a critical assumption, particularly when evaluating a policy tackling fuel poverty. In-depth interviews indeed confirmed that one of the results of the Warm Front interventions was that households could heat more rooms. So, it would be needed to monitor more rooms per dwelling to capture all the main changes that can affect energy consumption [*about the indoor temperature issue, see for example (Hutchinson et al., 2006) and (Oreszczyn et al., 2006)*].

The second point would be to work with smaller samples, but going more into the details. This would help to better understand changes in heating behaviours and energy consumption.

The third point would be to consider another evaluation approach, using the methodology of action-based research. This is closely linked to clarifying evaluation objectives and timing: is it to decide about future funding of the policy? or is it to identify how to improve the policy? In the first case, evaluation can be done on a period with no major change to the policy, with the main objective to observe its impacts. In the latter case, the earlier sources of improvements are identified, the better. But then changes to the policy may be done frequently, making it difficult to assess the impacts due to the decisions taken.

Moreover, the first case cannot be used when working on time-limited problems such as climate change. Targets are high, and timelines are tight. We cannot afford to monitor long time series on large samples like usual academic criteria would require. We need to explore other ways to collect feedbacks, to be able to improve policies on an almost on-going basis.

One difficulty we encountered in the research project was that the policy changed over the duration of our studies, partly due to our results. This meant that we were not totally in the conditions for an academic methodology where researchers are supposed not to be affecting the object they are investigating.

Using an action-based methodology means assuming that the researchers can have an influence on the policy and/or on the results they investigate. Researchers get involved in the process, and thereby have more interactions with stakeholders and participants. Which makes possible to identify problems sooner. Using large samples and long-time series is not the most appropriate way in all cases.

For example, there is no need to use large sample to find that the interventions are not done in the right order, creating risks on airtightness. This can be found with a limited number of interviews, and this can be directly used to improve the scheme.

5. **Based on this experience and the other research you did, what would be your recommendations about comparing engineering methods and statistical methods to assess energy savings? (and what references would you recommend about this topic?)**

Both methods have their advantages. Choosing the most appropriate approach should consider the constraints (budget and time) and the evaluation objectives. What would be the most useful for the evaluation customers/recipients: knowing the impacts? or understanding the impacts?

There had been a kind of fairy story about the use of computer modelling in the 1980's and 1990's. With the development of computer capacities, there was an increasing use of modelling. However the ability to validate engineering data from modelling does not cope with measured ("real") data. Research of the last decade showed that it is essential to get "real" data to analyse complex systems such as energy use in buildings. Energy consumption cannot be explained by the description of the technical systems alone. There are interactions between technical systems, and above all between technical systems and occupants. This complexity is difficult to model.

That's why efforts were made to collect more systematically measured/metered data. A good example is NEED (National Energy Efficiency Data-Framework) in the UK, that now makes possible to have "real" data for a very large share of the building stock, and that represent a rich basis for comparisons with modelling [*For more details about NEED, see (BEIS, 2017) and the EPATEE case study about the UK Supplier Obligations*].

In this field, our research team has been championing the approach of "energy epidemiology". The idea is to take back the concept of "epidemiology" from the health sciences. Initially, epidemiology stood for "study of a population and what happens in a population". Extensive use of epidemiology by health sciences made that the concept is now most often understood as "study of a population to investigate health impacts in a population". The approach of energy epidemiology focuses on empirical research, using large population datasets [*For more details about energy epidemiology, see for example http://www.energyepidemiology.info/what-is-energy-epidemiology*].

This research can for example be used to analyse the differences between energy consumption as measured in laboratory tests and energy consumption as measured in field conditions.

6. Are there other cases that you would recommend in terms of interesting experience feedback of evaluations of energy efficiency policies?

Interesting experience feedbacks about the use of large samples can be found in the evaluation of the Renewable Heat Premium Payment (RHPP) scheme and the evaluation of the UK legislation requiring all domestic boilers installed from April 2005 to be condensing boilers.

The RHPP case shows the challenges of doing large scale evaluation with a complex technology like heat pumps [*see (Lowe et al., 2017) for more details*]. The case about condensing boilers was an analysis of the impact of this specific regulation using national energy data, investigating whether the impacts of a detailed energy efficiency policy can be detected in national energy data [*see (Elwell et al., 2015) for more details*].

To go further

About the measure

- Official page on the Government website about the Warm Front scheme (in the archives of the website ; including links to the scheme annual reports from 2002 to 2011):

http://webarchive.nationalarchives.gov.uk/20121205174605/http://www.decc.gov.uk/en/content/cms/funding/warm_front/warm_front.aspx

- Last annual report available about the scheme:

https://www.gov.uk/government/publications/the-warm-front-scheme-annual-report-2011-12

- Dedicated page on the website of the National Audit Office:

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