Introduction to Panel 7
Monitoring & evaluation: Counting beans or moving mountains?

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Introduction

As monitoring & evaluation (M&E) has gained more importance both for the implementation, controlling and optimisation of target orientated policies, as well as for better communication and sound legitimisation of policies, M&E has become a broader discipline. M&E experts are very productive in providing new, complex and elaborate methods to improve monitoring of energy efficiency. But are these methods really useful, are they understandable for non-scientific actors and are they suited for every-day policies? And last but not least: Are the employed methods cost-effective? Lars J. Nilsson, one of our authors, got to the very heart of it, asking the key question: Counting beans or moving mountains?

This panel is not only looking for best practice of policy assessment, this panel wants to encourage a discussion about the appropriateness of M&E with regard to multiple criteria: costs, effectiveness, efficiency and (non-) energy benefits and timely communication of M&E results.

Topics include:

- Implementation of the ESD, including top-down- and bottom-up-measurements.

- Measuring efficiency & energy savings in buildings.

- Reports on field trials on the performance of heat pumps.

- Monitoring of activities on energy efficient appliances, including labelling programs.

- Evaluation of utilities' efficiency programs.

- First results of the large national smart metering roll-out trials.

ESD: From the bottom to the top (or vice versa)?

At the end of June 2011, the Energy Service Directive (ESD) asks member states to deliver their second National Energy Efficiency Action Plan based on top-down- and bottom-up-evaluations. There are six papers which clearly show that the discussions of the last decade brought some progress to the question on how to organise the M&V process among 27 Member States. And among them there are several ideas how this process still can be further optimised.

The key question of panel 7 is raised by Lars J. Nilsson et al in paper 7-411 "Counting beans or moving mountains – the predicament of energy efficiency policy". Their key thesis is that "there is often a gap between rhetoric or broadly stated objectives in policy development and the narrow focus on verifying additional savings in evaluation. Ancillary benefits and costs are often overlooked and the primary criterium for impact evaluations is policies deliver additional and cost-effective savings. In practice, however, such impact evaluations are fraught with fundamental methodological difficulties and uncertainty."

Having these broadly stated policy objectives in mind, Didier Bosseboeuf and Jean-Sebastien Broc are in 7-185 "Energy efficiency binding target for Europe: Why and how to organise a burden sharing" discussing key issues of the coming discussions: indicative vs. binding target, options for the type of target, options for sharing the efforts among the Member-States, monitoring and evaluation issues. They come to the conclusion, that an indicative global target should be defined at European level in terms of final energy consumption and sectoral or specific targets should be defined at Member-States' level in terms of energy efficiency improvements.

To round up the discussion on the opportunities and limitations of top-down-approaches, Verena Graichen and colleagues are searching for a system of meaningful sectoral and

macroeconomic numbers and indicators for the case of Germany. In their paper 7-555 "Energy efficiency in Germany: How to crunch the numbers to find meaningful indicators?" they conclude that a harmonised set of indicators based on both macro and sectoral analysis by all European countries is highly desirable in order to monitor the progress made on EU level.

Coming from the top to the bottom, we are glad to present three interesting papers on the opportunities and limitations of bottom-up-approaches. Data availability is one of the most important reservations, that are often raised against bottom-up-methods. Andrea Jamek and Heidelinde Adensam present in 7-395 "Data collection and management for bottom-up energy efficiency monitoring" standardised bottom-up methods for selected energy-efficiency measures as well as an online-database for collecting data on energy-efficiency measures and calculating their energy savings. This online-database can hold a large amount of data from energy-efficiency measures implemented by the federal state, the federal provinces, energy suppliers and other parties subject to Directive 2006/32/EC.

Grégory Chédin is also intensively involved in bottom-up verification of the French energy policy measures. In his paper 7-079 "What is the inventory of the bottom-up evaluation in the energy efficiency sector in France?" he presents a first assessment of 71 measures and he sees clear limitations of current (French) evaluation practices. "It is urgent to change gear" is his conclusion and he asks for a scope of evaluations or meta-evaluations that covers all the overlapping policies.

In 7-348 "Making the results of bottom-up energy savings calculations comparable", Klemens Leutgöb et al are complaining about the "fragmented" approach with respect to bottom-up-calculations. Bottom-up savings are calculated inside a "black box" leading to non-transparent, non-comparable results. Klemens proposes a standard bottom-up calculation kernel for different energy efficiency improvement actions which at the same time makes different calculation options transparent in a structured way. We are looking forward to discuss this type of interesting proposals in panel 7.

Measuring energy efficiency in buildings – catching up with reality

Improving energy efficiency of existing and new buildings is expected to contribute significantly to meeting both energy efficiency and renewable energy targets. And the interest stems all the way back to the oil crisis in the early 1970's. Philip Brown et al. (7-086 "The SALFORD house: the impacts and contemporary implications of a 1970s low-energy house") present a case from Salford, United Kingdom that illustrates that local authority and university cooperation can leverage energy efficient building design at low extra cost. Follow-up on the building performance and energy use 30 years after construction reveals a variability depending on the residents' understanding of the dynamics of the buildings.

Steven März et al. (7-140 "Multicriteria analysis – identifying benefit optimized energy efficiency measures in public buildings") explore the role of the City of Dortmund, Germany, as a large consumer and a role model using multi-criteria analysis and three visions for the future image of the City of Dortmund,

namely Climate protector, Homo oeconomicus, and Role model consumer, in an effort to overcome the gap between short-term political gains and the need for setting long-term priorities.

Standardised and simplified methods can be very useful tools for calculating the energy characteristics of a building. However, the risk is that these are applied uncritically for predicting energy consumption.

Vibeke Hansen Kjærbye et al. (7-091 "Do changes in regulatory requirements for energy efficiency in single-family houses result in the expected energy savings?") present a unique analysis of actual energy consumption panel data sets using econometric modelling examining differences in heating energy consumption due to differences in building regulation requirements. The analysis documents that building regulation standards have contributed to significant reductions in energy used for heating. Interestingly, while ex-ante a 25 % reduction in natural gas consumption for heating was expected only a 7 % reduction has been realised.

According to ex-ante assessment of likely reduction in dwelling energy consumption resulting from introducing the Irish 2002 Building Regulation, a 20 % reduction could be expected relative to the 1997 Building Regulation. Using metered energy consumption data for houses built under the 1997 Building Regulations and the 2002 Building Regulations, Fionn Rogan et al. (7-520 "Ex-post evaluation of a residential energy efficiency policy measure using empirical data") show an ex-post reduction of only 10 %. Furthermore, the lack of compliance with the 2002 Building Regulation was found to be more than 11 % which has consequences for the expected impact of building regulation policies.

Cayre et al. (7-277 "There are people in the house! How the results of purely technical analysis of residential energy consumption are misleading for energy policies") argue that behavioural aspects must be considered in long-term simulation of residential energy consumption as opposed to purely technical characteristics such as building components and geographical location. The current French energy performance certificate for residential buildings does not include behavioural aspects, a flaw which leads to overestimating the actual energy consumption for space heating by 40 % according to the results of a time series analysis of energy consumption for space heating combined with a survey among households. Caution should therefore be applied when using the French energy performance certificate for long-term policy decisions.

Gireesh Nair et al. (7-472 "Policy instruments to promote building energy efficiency from an end-user point of view") have asked Swedish homeowners and chairmen of cooperative housing associations about their perception of the likely impact of various policy instruments in terms of persuading them to adopt energy efficiency measures. The poll was carried out using mail survey among homeowners that have received investment subsidies for window improvements and randomly chosen chairmen. Building regulations and energy performance certificates did not score very high nor low. Monetary incentives are not surprisingly the preferred policy while CO_2 tax is unpopular.

Heat pumps: Pumping heat or pumping efficiency?

Measuring energy efficiency is always the basis for the assessment of energy policies. The broad implementation of energy efficiency technologies as heat pumps gives rise to large field-trials. We cannot only learn about the coefficients of performance, but as well about the proper design of these field trials.

The Energy Saving Trust is undertaking the most comprehensive field trial of in-situ residential heat pumps in the UK. Jaryn Bradford et al report in 7-217 "The Energy Saving Trust heat pump field trial" about the results of the first phase. The data from the first year of monitoring yielded a wide spectrum of performance results. As a result of this field trial, the Energy Saving Trust will provide specific advice regarding best practice to consumers, installers, manufacturers, and government.

A multi-perspective cost-benefit analysis including an uncertainty assessment were carried out by Felix Suerkemper and colleagues. They report in 7-285 "Switching from fossil fuel boilers to heat pumps" about the evaluation of a regional energy efficiency programme in France. EDF provided refurbishment advice and financial incentives to the end-users as well as training courses and certification to local installation contractors. Together with EDF, the Wuppertal Institute analysed costs & benefits, both from the utility's, from participant's and from state perspective in a methodological ambitious set-up.

A Norwegian support scheme was giving financial support to more than 19,000 households and consumers willing to try new technology in 2003. Sverre Inge Heimdal describes in 7-556 "Reliability of air to air heat pumps and their contribution to energy savings in Norway" the results from a survey addressing receivers of subsidy after six years of operation. The results are generally good, however, there are indications that air-to-air heat pumps are not yet a mature technology.

Appliances & labelling – capturing and communicating a complex reality

In his paper Bruce Young (7-254 "Do energy labels have the capacity to mislead?") investigates the dilemma between the need for simplicity versus the need for accuracy in communicating energy characteristics through a uniform energy label. Increasing complexity in particularly heating and cooling systems but also intelligent operation pose special challenges for the design of energy labels and will at times require an expert interpretation.

Applying surveys among consumers and retailers, Steven Zeng et al. (7-579 "Evaluation of the comparative information label in China") explore customer awareness and perception of the Chinese mandatory energy label as well as the importance of an energy label in the purchase decision. Illegitimate labels appear to have had a negative impact on the consumer trust in energy labels in general. Lack of trust and higher prices are listed by both consumers and retailers listed among the main reasons for not choosing an energy efficient product.

Combining sales statistics with the information of the mandatory energy label, Jack Brown and Lloyd Harrington (7-459 "The greening of white goods – what is improving and what is not") explore the change in white goods energy efficiency over the last 17 years. A shift from vertical to horizontal axis clothes washers has had a much greater impact on energy consumption than the technological development within each of the two types of machines while dish washers are seemingly reaching a technological limit for energy efficiency with the current technological design. Energy efficiency has been steadily increasing except for clothes dryers but the arrival of heat pump driven dryers may change the picture.

Egil Öfverholm et al. (7-541 "The EU labelling system for household appliances and the reality") have used a different approach and have carried out field measurements in order to enable a comparison of actual usage patterns and the resulting energy consumption of white goods in Swedish households relative to the standard label tests. The analysis shows that consumer behaviour can vary significantly from the standard tests and Öfverholm argues that technology design should aim to discourage unnecessary energy consumption.

Minimum energy performance standards (MEPS) for non-ducted air-conditioning have had a significant impact on the energy efficiency of these units in Australia, according to the paper by Murray Pavia et al. (7-380 "A retrospective evaluation of the impact MEPS in Australia: non-ducted air conditioning"). Pavia arrives at this conclusion using sales weighted efficiency trends for two years prior to the introduction of a MEPS (baseline) to forecast the development trends which are then compared to sales figures after introduction of the MEPS. Updating of MEPS require developing new baselines.

Interconnectivity and continuous product changes call for flexible and adaptable approaches to MEPS if they are to avoid perverse effects. The team behind the Selina project, presented in the paper by Carlos Patrão et al. (7-486 "Standby and off-mode power demand of new appliances in the market"), carried out large scale monitoring in retail shops in order to characterise the low power modes (i.e. standby and off-mode) of new appliances. 6,000 measurements in 12 EU countries were compared against 2009 EU thresholds and the impact of EU regulation discussed. A questionnaire survey among the retailers revealed that bonus systems and stock management issues at times create an incentive for retailers to promote less efficient products.

Utilities & energy efficiency: They are working on it!

ESD is pushing energy utilities from selling more energy to selling more energy efficiency. But how does it work? Are utilities already familiar with the efficiency business case?

Wolfram Herppich from one of the major European utilities with 16 million customers finds in his paper 7-030, that "Smart information ignites significant energy savings". The author is working for the new established RWE Effiency Group ltd. and he is reporting on the evaluation of (one part) of the 150 M€ efficiency program of RWE: Lessons learnt from the utility perspective are going to be highlighted. On top, this paper provides key learnings on how to meet customer needs, how to run an energy efficiency program and how to make these structures "go live" within a large corporate organisation.

A long-term experience from an Canadian utility's perspective is given by Ken Tiedemann and Iris Sulyma, reporting of BC Hydro's Product Incentive Program, a large and long-term financial incentive program to encourage business customers

in "Delivering cost effective savings to the commercial sector" (7-056). The research design was a quasi-experiment with a treatment group of 62 participants and a comparison group of 202 non-participants, with comparisons based primarily on z-test for differences in sample proportions

Smart metering: Smart future or empty promises?

Smart metering and smart grids are often regarded as the solution for (nearly all) future problems of the energy sector: for energy efficiency, for load management, for better grid integration of renewables and as basis for new business cases for energy utilities. But is this really true? There are reasons to have a closer look.

In 7-524 "Large-scale testing of new technology: some lessons from the UK smart metering and feedback trials", Sarah Darby et al are reporting about the first results of one the most complex set of residential energy experiments ever conducted in the UK. Over a period of a little over two years, it has involved four major suppliers, over 50,000 'trial' households at the peak, and 10,000 control households. The authors draw out some lessons that can be applied in the planning for smart meter rollout, and that are relevant to the conduct of future trials.

Joana M. Abreu et al investigate in 7-466 "A contribution to better understand the demand for electricity in the residential sector" the impact of two interventions on households' behaviour: (1) providing feedback to participants on their own consumption, in real time, through a software on a computer and (2) installing a tool which provided a comparison of the household's electricity consumption with an "average household". For this purpose she employs a principal component analysis and eigenvalue analysis to analyse "routine patterns" of household behaviour.

In paper 7-271 "Smart metering in Germany – results of providing feedback information in a field trial", Joachim Schleich and colleagues present the first results from a field study on smart metering in Germany, focusing on the effects of providing feedback information on average electricity consumption. Econometric analyses are applied using a cross section of observations for about 600 households served by eight utilities. The results suggest that the feedback provided under the smart metering programme results in electricity savings of around 5 %.

Along with the increasing number of smart electricity meters in the homes the interest in reliable methods for scaling up data measured during a limited time of the year to annual values, will most likely increase. This is the reason why Peter Bennich et al see the "The need for seasonal correction functions when calculating the annual electricity use of appliances based on shorter period measurements". In their paper no. 7-553 they present an analysis of a set of appliances which nearly all display different seasonal effects. Lighting, cold appliances, washing machines, dish washers, TVs and PCs are analysed. Factors influencing the seasonality are discussed; either due to behaviour and/or technical parameters.