Developing a Process For Harmonised Bottom-Up Evaluations in European Union Member States

Harry H.J. Vreuls, SenterNovem, The Netherlands
Jean-Sébastien Broc, Ecole des Mines de Nantes, France
Stefan Thomas, Wuppertal Institute for Climate, Environment and Energy, Germany

Abstract

The new EU Directive on energy end-use efficiency and energy services (2006) stimulates the thinking in the Member States about how they could evaluate the energy savings from energy efficiency programs and energy services in order to contribute to achieving the target of 9 % energy savings in the ninth year. Late 2006 the European commission started a three year project (EMEEES) that includes the development of such concrete methods (combination of bottom-up and top-down).

This paper holds the intermediate results.The analysis of good practices in EU evaluations -to be finalized by summer 2007 – are based on methods and results from detailed evaluation studies as well as the simplified ex-ante methods like those for the obligation/white certificate systems in several countries.

The work on EU harmonised bottom-up evaluation methods (the second main element of the project) is organized in three steps.The *process* for developing a harmonised bottom-up evaluation method; concrete bottom-up evaluation *methods* for 20 end-use technologies, policy instruments and/or energy services types;and a set *of harmonised default values and benchmarks* for specified years. A specific topic is the acceptance by the Member States of harmonised bottom-up evaluation methods and. the definitions of key values needed for a certain method: either for all Member States, or specific for each Member State but in a consistent way; ex ante or ex post - and how they should be used. We also presen a draft structure for the MS progress report to the European Commission by mid 2011.

Introduction

In 2006 the EU Directive on energy end-use efficiency and energy services (2006/32/EC; for the remainder of this paper abbreviated as the ESD) was finalized. The target is to enhance the cost-effective improvement of energy end-use efficiency in the Member States (MS) and set indicative targets of 9% energy efficiency improvement in end use energy by 2016. Savings will be achieved in both the private and public sectors, using a framework of measures. These measures should expand the use of energy services such as energy-efficient and cost-effective lighting, heating, hot water, ventilation and transportation. They will also improve the market uptake of energy-efficient technology and integrate energy efficiency criteria into public procurement practices. The Member States have to draft Energy Efficiency Action Plans (EEAP's) by July 2007 and update these plans and report on progress in 2011 and 2014.

This Directive has raised concerns among the Member States about how they could evaluate the energy savings from energy services and other energy efficiency improvement measures implemented in order to contribute to achieving this target. Additional to the ESD, the European Commission started a three year project that includes the development of concrete methods for the evaluation of single programs, services and measures (mostly bottom-up), as well as schemes for monitoring the overall impact of all measures implemented in a Member State (combination of bottom-up and top-down). In November 2006 the project "Evaluation and Monitoring for the EU Directive on Energy End-Use Efficiency and Energy Services" (EMEEES) started. The 21 project partners include energy agencies, a ministry, two energy companies, and several research institutes and consultancies.

First, we introduce of the seven main elements of the EMEEES project: 1) analysis of good practices, 2) distinction of measures by type of evaluation method, 3) the bottom-up and 4) top-down evaluation methods, 5) the integration of these two methods, 6) the planning and reporting requirements and 7) the pilot testing. Next we summarize the results of the first two main elements dealing with existing and applied evaluation methods and evaluated results. The main content of the paper deals with two elements of the bottom-up element: the selection of the process to be used for the harmonised bottom-up evaluation method and up to 20 examples on concrete bottom-up evaluation *methods* for end-use technologies, actions, policy instruments and/or energy services types. We conclude with an assessment of the structure for the bottom-up evaluation in the progress on the realized energy savings the countries have to report to the European Commission by mid 2011.

The Seven Main Elements of EMEEES

The EMEEES project supports the European Commission in developing an harmonised monitoring and evaluation system for reporting MS energy savings. This 3 year project is subdivided into 7 main tasks:

1. a collection and comparative analysis of good practice in monitoring and evaluation methods;
2. a process for the development of harmonised bottom-up and top-down evaluation methods,
3. the concrete development of up to 20 different methods for bottom-up and up to 15 methods for improved top-down evaluation, harmonised across the EU,
4. combined top-down/benchmarking and bottom-up evaluation methods to prove achievement of the 9 % target, both ex-ante and ex-post,
5. six pilot tests on real programmes, services, or other measures, for the methods developed
6. a proposal for the structure and methodology of the Energy Efficiency Action Plans to be delivered by the Member States in order to show compliance with the Directive, and
7. a proposal for a methodology that can be used by the Commission in order to assess the plans and results reported.

These tasks are interrelated, but the focus will be on bottom-up methods, since this is a relatively new field compared to the development of detailed top-down indicators in the EU supported ODYSSEE consortium. The EMEES project started in November 2006 and the first two tasks are well underway. The draft results from the analysis of applied evaluation methods will be finalised in the second half of 2007. The process for harmonised bottom-up evaluation is provided in an internal workbook. The May 2007 version will be used during the third task, developing concrete examples, and will be updated given the experiences in using the draft. A more final version will become available by early 2008. The 15-20 bottom-up examples will be available by December 2007, together with the top down examples. The main activities in the year 2008 will address the integration of the top-down and bottom-up evaluation methods, and the six bottom-up pilot tests. With these experiences and input from the several tasks, drafts will be available for comments in mid 2008, and by early 2009 the final set of harmonised methods should be completed.

The Existing and Applied Evaluation Methods in the EU

More than 25 case studies were selected in order to provide an overview of existing practices in monitoring and evaluation (Nilsson et al, 2007). The cases were selected to obtain a balance between sectors (residential, tertiary[1], industrial, and transport) and types of Energy Efficiency Improvement (EEI) measures. Other guiding criteria for the selection were the availability of information and the expectation

[1] Commercial sector including trade, hotels, public services, health and education.

that there would be well documented quantifications of savings.

A single EEI promotion measure, or mechanism, can address more than one sector. Most measures entail regulatory (R), financial (F), as well as informative (I) elements at the same time: one is an energy service, actually a mobility service (S). For example, a white certificate scheme has a strong regulatory component although the financial incentive is also very central, rendering it an R/F classification. Furthermore, one promotion measure or mechanism may have several target end-uses and technologies, (e.g., lighting, ventilation, ICT). The quantification of savings for each such end-use may be more or less thorough and documented. Hence, the qualifications given on which bottom-up evaluation method has been used is based on our overall assessment of evaluations of the respective measure.

It should be noted that saving energy is not the only, or even the primary objective, for all the promotion measures listed. Therefore, quantification of savings is typically only one of several factors addressed in evaluations. For example, the overall objective of one of the KfW buildings programs is to provide soft loans for the general modernization of buildings in the Eastern parts of Germany. Consequently, an accurate quantification of savings has not always been a priority. However, our list is dominated by cases where energy savings have been a clear and stated primary objective. Most evaluations rely on deemed savings and surveys, with an element of ex-post verification in some cases. Direct measurements are not common but this is hiding the fact that deemed estimates are generally based on direct measurements, at least in part, and deemed estimates can therefore be quite accurate.

It appears that technology-focused EEI promotion measures in the residential sector are generally easier to evaluate than measures in other sectors. In campaigns with financial incentives for improved lighting, insulation retrofits, or efficient appliances, participation rates can be monitored, free-riders estimated, and average savings calculated on the basis of measurements and samples. EEI measures in industry are typically based on voluntary approaches and entail energy audits, energy management systems, and sometimes financial support for investments. However, in industry it seems more difficult to isolate the impact of a promotion measure. Frequently, the savings are calculated based on self-reported information concerning investments made and ex-ante enhanced engineering estimates resulting from the energy audit. It is difficult to establish if EEI investments would have, or should have, been made without the promotion measure. Required rates of return may vary with business cycles, non-energy benefits may be an important motivation for investments made, and changes in production may complicate ex-post evaluations. Firms themselves typically provide the information on investment options and pay-back times, and information asymmetry can prevent the agency in charge, or the evaluator, from verifying the information.

In addition to assessing how savings are calculated, we are also investigating the use of *gross-to-net correction factors*. For bottom-up methods, these include corrections for double-counting, multiplier effects, free-riders, and direct rebound effects. Direct rebound effects that are well known, for example increased indoor temperature due to lower heating bills, are typically considered. The level of free riders can be relatively easily estimated against a baseline in a campaign which is limited in time. It is more difficult to determine in a long-running program such as the one by Elsparefonden, where subsidies are given for switching away from electric heating with simultaneous market transformation efforts to reduce investment costs. It is likely that multiplier effects from lower prices compensate for free riders, but in cases like this it is difficult to establish a clear baseline.

Overall, the case-studies show that savings can be calculated bottom-up, albeit with various difficulties associated with various promotion measures and sectors. In some cases (free energy audits in DK), efforts have been made to also measure the effect from the top-down by comparing aggregate indicators such as electricity use per employee with a comparison group. In this case, the macro-level and econometric analysis was inconclusive, whereas an incomplete bottom-up evaluation based on a non-representative sample of participants could quantify savings in the sample. It should be noted that a clear

strength of the bottom-up approach to evaluation is the information it can yield on opportunities for improving the promotion measure and adjusting it to changing market conditions.

The EU Harmonized Bottom-up Evaluation Method

The ESD makes a distinction between two main approaches to assess energy savings: "top-down" and "bottom-up" calculations. "A top-down calculation method means that the amount of energy savings is calculated using the national or larger-scale aggregated sectoral levels of energy savings as the starting point. A bottom-up calculation method means that energy savings obtained through the implementation of a specific energy efficiency improvement measure are measured in kilowatt-hours (kWh), in Joules (J) or in kilogram oil equivalent (kgoe) and added to energy savings results from other specific energy efficiency improvement measures".

Top-down methods involve starting from global data (e.g. national statistics for energy consumption or sales of equipment), then going down to more disaggregated data when necessary (e.g. energy efficiency indicators) and correcting for non-policy effects such as autonomous savings to assess policy-induced energy savings[2]. Whereas bottom-up methods start from data at the level of an EEI measure, mechanism or programme, (e.g. energy savings per participant and number of participants) and then aggregates results from all EEI measures and programmes reported by a MS to assess total energy savings in a specific sector.

In concrete terms, the difference between the approaches can be expressed in the way they calculate energy savings:

- top-down methods monitor the evolution of energy efficiency indicators, and then they calculate energy savings as: total energy savings = energy efficiency index * global energy consumption
- bottom-up methods monitor the results at the level of a measure (or a package of measures), then they calculate energy savings as: total energy savings = energy savings per action/unit * number of actions/units

In the ESD, the European Commission has set a target to develop an initial harmonised model for bottom-up evaluation by January 2008, covering 20-30% of annual inland energy consumption. These initial harmonised bottom-up evaluation methods will be improved over time as they will have to cover an increasing percentage of inland energy consumption. The EMEEES project is one of the main inputs for this EU harmonised model. The task dealing with harmonised bottom-up evaluation methods is organized in three steps, and includes review and feed back from stakeholders. The first step concentrates on the *process* for developing a harmonised bottom-up evaluation method. During the second step the focus is on concrete bottom-up evaluation *methods* for end-use technologies, policy instruments and/or energy services types. During the development of the examples a set *of harmonised default values and benchmarks* for specified years will be constructed, and these will be finalized after the pilots. Five of the bottom-up evaluation methods will be tested during the pilot in different MS. In addition, the experiences from the top-down examples and the integration of the two approaches will be an input for determining these harmonised default values and benchmarks.

The Process for EU Harmonized Bottom-up Evaluation Methods

The ESD holds a lot of statements related to the bottom-up evaluation. For that reason it was decided to start with the *process* of how an harmonised bottom-up evaluation method should be developed between the MS. One topic is acceptance by the MS as some countries have a longer history in monitoring and

[2] Top-down methods can not distinguish effects from several promotion measures targeting the same top-down indicator.

evaluating energy efficiency policies, measures, actions and projects than others. Another topic is the relationship of energy efficiency evaluation with methods for evaluating policy measures reducing GHG emissions and the UNFCC reporting system for the climate change. The third topic deals with the definition of key values needed for a certain method (such as energy savings per measure, annual hours of use, lifetime, amount of free-rider and spill-over effects): either for all MS, or specific for each MS in a consistent way; ex ante or ex post, and how they should be used.

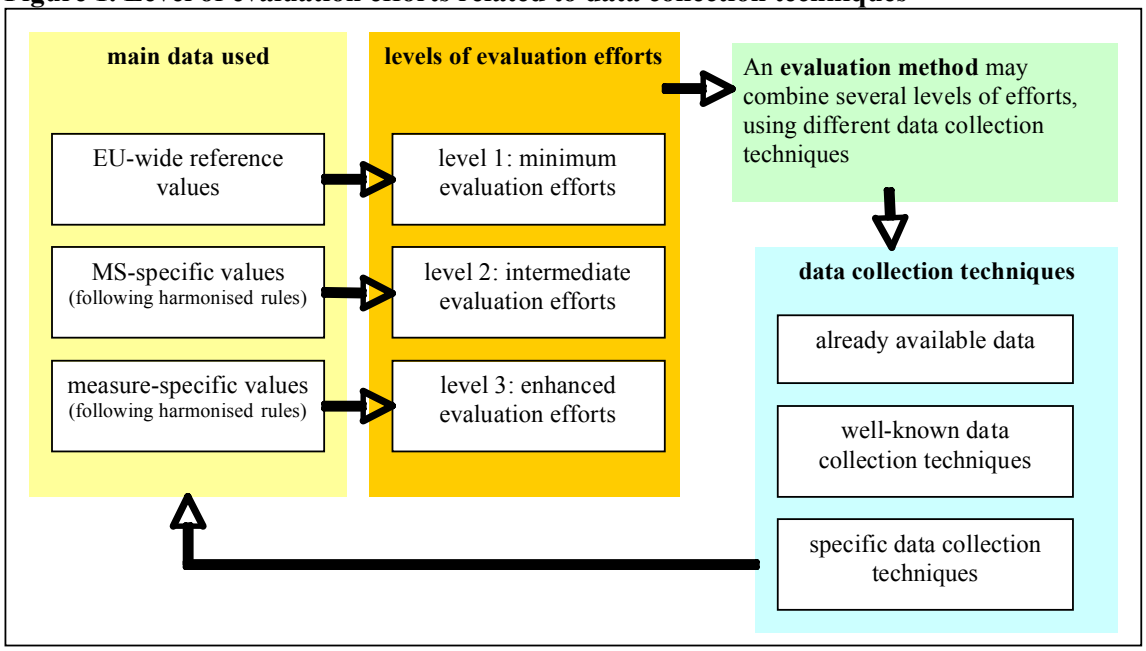
One of the requirements of ESD related to evaluation is that its evaluation system has to be cost-effective. Costs of evaluation methods should be assessed, and minimised as much as possible, taking into account the related uncertainties, as noted below.

- "standardised methods which entail a minimum of administrative burden and cost" should be developed (ESD annex IV (1.1))
- "the acceptable level of uncertainty required in energy savings calculations is a function of the level of savings and the cost-effectiveness of decreasing uncertainty" (ESD annex IV (3))

So the EU methodology has to take into account that the aim is not to provide results with maximum accuracy, but to find a compromise between evaluation costs and accuracy. Simplifying assumptions may then be used when relevant. However a method can be cost-effective to use (requiring easy-to-collect data and using easy-to-perform calculation models) and use a sophisticated approach (based on reference data and underlying assumptions) ensuring a good accuracy level.

In general, for data to be generated in order to apply one of the bottom-up methods, three levels of accuracy are distinguished as presented in Figure 1.

Figure 1. Level of evaluation efforts related to data collection techniques



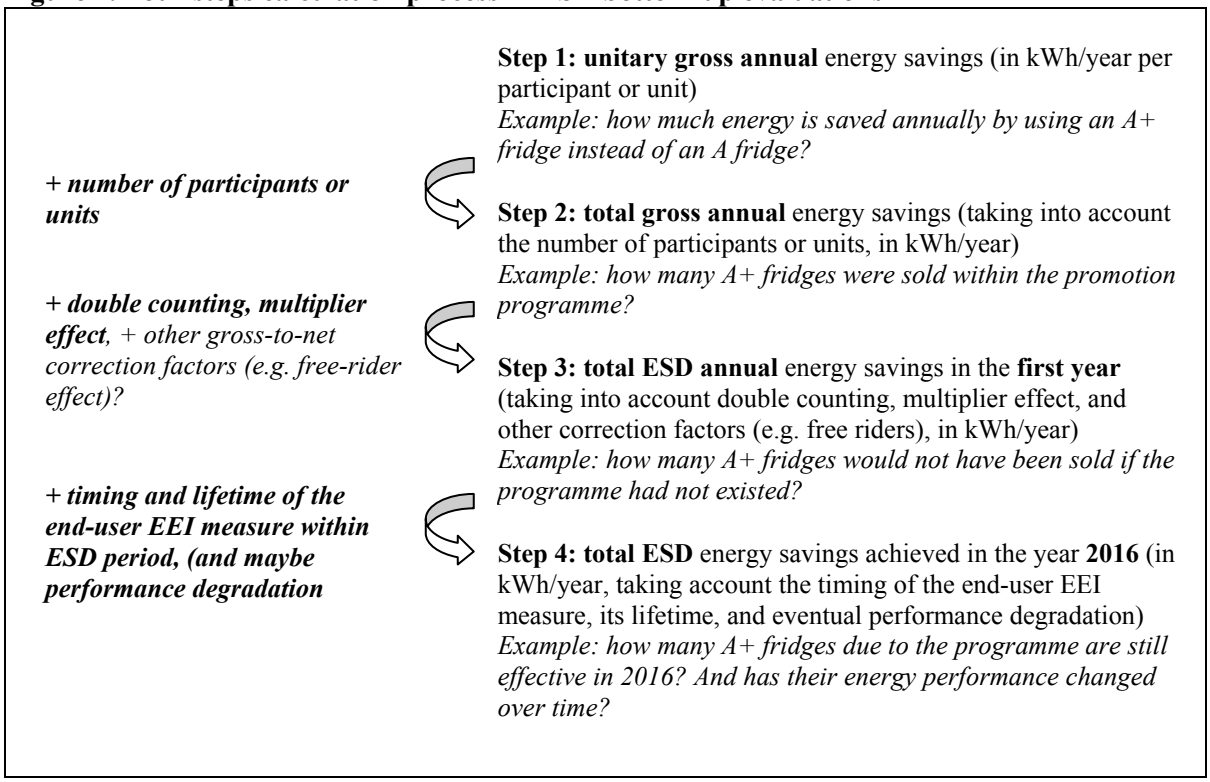
Source: Broc, 2007

Calculating energy savings requires a formula or model based on several assumptions (e.g. defining a baseline), and using several parameters (e.g. duration of use, average load). Each of these parameters or assumptions may be defined according to the three levels of effort. So an evaluation method may combine different levels of effort within its calculation model. Selecting the most relevant evaluation effort depends on evaluation conditions such as data availability and accepted threshold for uncertainties on results.

Example: for the evaluation of a program promoting A+ refrigerators and freezers, many parameters may affect the resulting energy savings. For each parameter, a different level of data/effort may be used. For instance, the average lifetime of the A+ fridges may be a harmonised EU-wide value (level 1), the average size and energy savings compared to the baseline of the fridges a national value (level 2), and the net number of A+ fridges sold (especially an eventual multiplier effect) a program-specific value (level 3).

The level of evaluation effort is taken as an example from the "cook book", presenting the recommended process of how to develop a bottom-up evaluation method taking into account the levels of evaluation efforts as presented before, that is under preparation. In figure 2 we present the four steps of a bottom-up evaluation process as an example of the templates. Consequently, the report for a method that has been developed as an example in the EMEEES project or elsewhere will contain the necessary information on how to deal with these four steps. For example, the basic formula for calculating the unitary gross energy savings and the total ESD annual energy savings for the first year, and methods for collecting the data needed for these calculations in a way that ensures consistency between the 27 EU Member States.

Figure 2. Four steps calculation process in ESD bottom-up evaluations



Source: Broc, 2007

Step 1 "Unitary energy savings" means energy savings resulting from a unitary end-user installing an EEI measure. The unit of an end-user EEI measure may be:

- either energy-efficient equipment (e.g. a CFL or an appliance) or a specific end-user EEI measure (such as thermal insulation of a single family home), or
- a participant's premises (dwelling, building, company) such as a single family home being insulated or a company taking part in an energy audit program).

Step 2 "Gross energy savings" refer to the point of view of final users, which means energy savings as observed by the final users taking advantage of an EEI measure. These energy savings take account of normalization factors as defined in ESD calculation methods, such as changes in heating-degree days or

building occupancy, growth in production volume, and the like. These changes affect the energy consumption, and so the amount of energy savings as perceived by the end-users.

For the ESD, however, what counts are the net energy savings in the whole country that are due to the EEI measures (Step 3). These can either be higher or lower than the gross savings. Gross-to-net correction factors have, therefore, to be evaluated. These include factors correcting for double-counting and multiplier effects, explicitly mentioned in the ESD, and possibly for free-rider effects as well.

In Figure 3 we present the classification of bottom-up methods. The columns relate to the first three of the four steps of a bottom-up evaluation method as defined above. The classification has benefited from existing literature. Typical methods for estimating gross-to-net correction factors are I) surveys of participants (and comparison group and other market actors) to find out reasons for implementing end-user EEI measures as well as II) monitoring of participants and EEI actions to avoid double-counting.

It will often be possible to gather the necessary data at quite limited costs, if the monitoring is planned before implementing an EEI measure. Even participant surveys can be combined with the contacts occurring anyway to provide an EEI measure to the participants. Furthermore, it will only be necessary to evaluate the influence of the whole package of EEI promotion measures targeting a specific end use or end-user EEI measure. For the ESD, there is no need to distinguish, for example, the energy-saving effects of an information campaign on energy-efficient lighting in tertiary buildings from the effects of an audit program and/or a financial incentive program targeting the same building. It is, therefore, a task for the analysis of each specific method - as presented in the next section - to find a solution for the monitoring that is a good compromise between evaluation cost and accuracy. In Figure 3, only a very broad characterization of the costs and data collection issues can be given based on experience, which should be treated with caution.

Figure 3. Classification of bottom-up evaluation methods for energy savings

Methods for measuring or estimating unitary gross annual energy savings	**Methods for collecting number of units or participants**	**Methods for estimating gross-to-net correction factors**	**Applicable unit is:**	**Characterization of costs and data collection**
1 direct measurement a) without normalization b) with normalization	A) monitoring of participants and savings per participant	I) and II)	participant (usually)	can be costly; suitable for large buildings or sites, or as a basis for deemed estimates
2 analysis of energy bills or energy sales data (sample or all participants) a) without normalization b) with normalization	A) monitoring of participants and savings per participant	I) and c) comparison with a non-participant group; or d) discrete choice modeling and other in-depth billing analysis	participant (usually)	can be very costly to collect and analyze, particularly d); may be the only way for information campaigns
3 enhanced engineering estimates for individual units (e.g., calibrated simulation)	A) monitoring of participants/number of measures and savings per participant/measure	I) and II)	participant or specific end-user EEI measure/ equipment	can be costly; however, if an energy audit is done anyway, small extra cost of monitoring results
4 Mixed deemed and ex-post estimate, e.g. based on sales data, inspection of samples, monitoring of equipment purchased by participants	A) monitoring of number of measures and savings per measure	I) and II)	specific end-user EEI measure/ equipment (usually)	costs depend on level of accuracy and gross-to-net correction required; monitoring usually straightforward
5 Deemed estimate, e.g. based on sales data, inspection of samples before implementation of the EEI promotion measure being evaluated	A) monitoring of number of measures and savings per measure	maybe II; always simplified; maybe inclusion of correction factors in deemed savings per unit	specific end-user EEI measure/ equipment (usually)	costs can be quite low, monitoring of number of measures and savings per measure may be combined with

Methods for measuring or estimating unitary gross annual energy savings	Methods for collecting number of units or participants	Methods for estimating gross-to-net correction factors	Applicable unit is:	Characterization of costs and data collection
				"anyway" contacts
6 surveys of population samples: end-user EEI measures taken in total and induced by EEI promotion measures	B) stock data (e.g., national statistics)	modeling of energy savings through end-user EEI measures taken in total and induced by EEI promotion measures, based on survey results	participant (usually)	modeling has medium costs, but surveys can be costly if done especially for the evaluation

Source: Thomas, 2007

Within these templates, the following elements from the ESD are kept in mind:

1) evaluation methods should be designed with a view to ascertaining the impact of individual measures;
2) evaluation methods should be designed to use, to the extent possible, data which are already routinely provided by Eurostat and/or the national statistical agencies;
3) it should be taken into account, to the extent possible, existing experience in evaluating EEI measures, especially information submitted by MS;
4) bottom-up evaluation methodology should aim to propose standardised methods which entail a minimum of administrative burden and cost;
5) a distinction is made between methods measuring energy savings and methods estimating energy savings, where the latter is the more common practice;
6) MS may choose to use the method of quantified uncertainty, where the acceptable level of uncertainty required in energy savings calculations is a function of the level of savings and the cost-effectiveness of decreasing uncertainty;

In bottom-up calculations of energy savings as part of EU ESD, the concept of 'saving lifetime' is introduced. Saving lifetime is defined as the number of years the measure is actually used in calculations of bottom-up energy efficiency improvements. The saving lifetime can take into account, explicitly or implicitly, factors that influence the energy savings during the saving period of EEI measures or measure types (Vreuls 2007). For this saving lifetime three options are suggested: an EU harmonised saving lifetime figure for all EU countries, country specific calculated lifetime figures and EU default saving lifetime figures. *EU harmonised saving lifetime* figures constitute an average saving lifetime for a given EEI measure type across all EU MS, to be used in the context of the ESD after acceptance by the European Commission. For commonly applied EEI measure types, a harmonised saving lifetime has been defined and *country specific calculated lifetime* figures result from a prescribed process taking into account (almost) all relevant factors that might influence the saving lifetimes of specific EEI measure types. To use a country specific lifetime, a MS should follow a specific procedure to ensure that the results will be transparent. *Default saving lifetime values*, based on a conservative estimate of actual lifetimes, are used in those cases where neither a harmonised lifetime nor a country specific saving lifetime is available. Default saving lifetimes for the most relevant EEI measure types are included in CEN 2007, in case there are no harmonised saving lifetimes.

The Examples of EU Harmonized Bottom-up Evaluation Methods

At the time of writing this paper, only the choice of which methods shall be developed has been made. The publishable results can be viewed at www.evaluate-energy-savings.eu. In Figure 4, we present a

list of potential measures to be addressed by the bottom-up methods. The choice is based on criteria such as coverage of sectors and end uses with high energy savings potential, low administrative burden, and coverage both of a selection of end-use EEI actions and EEI measures. Out of this long list, at least 15 and up to 20 concrete measures will be chosen for bottom-up methods that the EMEEES project will develop.

Figure 4. Potential measures for the bottom-up evaluation methods the EMEEES project will develop

End-use or end-user EEI actions	Sector	Organization
Building envelope improvement (residential buildings)	Residential	A.E.A
Energy-efficient white goods (appliance purchased anyway)	Residential	Ademe
(Rest) Improvement of heating system (may include circulator)	Residential	AGH-UST
Hot water: solar water heaters, heat pumps, water-saving faucets	Residential	AGH-UST
Improvement of ventilation/air conditioning system, including heat recovery, free cooling (non-residential buildings)	Tertiary	Armines
Improvement of ventilation/air conditioning system, including heat recovery, free cooling (non-residential buildings)	Industry (buildings)	Armines
Condensing Boilers	Residential; (tertiary)	Armines
Improvement of lighting system	tertiary (and industry)	eERG
Heating system circulators	residential, tertiary	eERG
Office equipment	Tertiary	Fraunhofer
High efficiency electric motors	Industry	ISR-UC
Variable speed drives separate, including for industrial pumping systems	Industry	ISR-UC
Energy audit programs (or as commercial energy efficiency service)	Tertiary and industry	Motiva
Energy performance of new buildings	Residential	SenterNovem
Voluntary agreements with end use sectors	Tertiary and industry	SenterNovem
Energy performance of new non-residential buildings	Tertiary	SenterNovem
Eco-driving	Transport	SenterNovem
Energy performance contracting	Tertiary and industry	Stem
Traffic reduction	Transport	Stem
Vehicle (car, bus, truck) energy efficiency (engines, tyres, lubricants)	Transport	Wuppertal Institute
Modal shifts in passenger traffic, including towards non-motorized traffic	Transport	Wuppertal Institute

The Provisional Structure for the Bottom-up Evaluation in Future MS Progress reports

We conclude with a preliminary structure for the bottom-up evaluation report on the realized energy savings the countries will report to the European Commission, for the first time by mid 2011. The national energy efficiency action plans (NEEAP), that each MS has to prepare, fulfil a two-fold purpose. On the one hand, the NEEAPs hold the MS provisions for instruments and policies to be implemented in order to fulfil the ESD target (starting with the EEAP in 2007). On the other hand, the MS need to present the results achieved in terms of energy saving related to the intermediate and final target in the NEEAPs 2011, 2014 and 2017.

Taking into account the requirements of the ESD, we feel the following elements should be included in the NEEAP from 2011 onward:

- Sectoral assessment of EEI programmes and energy services. The sectors to be included are structured according to the ESD: residential sector, tertiary sector, industry sectors (excluding those segments of end-energy use, which are covered by the European Trading scheme on Emissions) and the transport sector. The outline for reporting is then the same for all sectors. It consists among others of the following.
  - A description of single EEI measures: a comprehensive description of each EEI measure that will

have an effect on energy savings during the years 2008 – 2016 including a notion on the status of implementation.
    - An assessment of total ESD energy savings in the sector realised since 2008 and expected for the remaining period 2008-2016. For the bottom-up assessment the effects of single EEI measures are summed up and corrected with gross-to-net correction factors (measure interaction / double counting, free-rider effect, multiplier effect, differing lifetimes). The MS will then use for the first time the new harmonised bottom-up evaluation methods.
    - Methodologies applied. The bottom-up as well as the top-down assessment needs to include an analysis of the methodologies applied, i.e. shortcomings of the methodology (per measure/programme), data gaps (per measure/programme) and a description of the activities planned to overcome methodological shortcomings and data gaps.
- Description of 'horizontal' measures: Several measures (e.g. energy taxes or general information campaigns) have a cross-sectoral impact. Therefore they should get additional attention. The energy saving impact of these horizontal measures can often be accomplished by a top-down evaluation. The assessment of horizontal measures is simply a cross-sectoral summary of the sectoral top-down assessments[3].
- Specific measures according to the ESD. The ESD contains obligatory measures[4] (promotional activities, qualification, accreditation and certification of energy services providers, removal of impeding transmission and distribution tariffs etc.) and compulsory optional measures (involvement of the utilities and of the public sector), which need to be disposed by all MS. Although these measures should already be included in the description and assessment of the sectoral and horizontal measures, from the point of view of easy monitoring of ESD implementation it seems to be reasonable to summarise these "specific ESD-measures" in a separate chapter.
- Institutional provisions. This point refers to the assignment of one or more verifying bodies in the MS.

Conclusions

In the first round of Energy Efficiency Action Plans for EU MS, the "energy savings" plans to achieve the 9 % target over 9 years will be presented. By mid 2011 the MS have to report on progress using a combination of top-down and bottom-up evaluations and in future reports more and more should be based on bottom-up evaluation. One should keep in mind that the target under the ESD is a very special one. The methods to prove achievement of the target by achieving a certain amount of ESD energy savings will, therefore, be very special methods for this objective. One may expect the evaluation methods to be pragmatic in order to minimise administrative burden and particularly the cost of monitoring.

It will often be possible to gather the necessary data at quite limited costs, if the monitoring is planned before implementing an EEI measure. In addition, it will only be necessary to evaluate the influence of the whole package of EEI promotion measures targeting a specific end use or end-user EEI measure. For the ESD, there is no need to distinguish, for example, the energy-saving effects of an information campaign on energy-efficient lighting in tertiary buildings from the effects of an audit programme and/or a financial incentive programme targeting the same building or sector. It is, therefore, a task for the analysis to find a solution for the monitoring that is a good compromise between evaluation cost and accuracy.

On the other hand, methods on the same type of EEI measure must be consistent between MS: this is

[3] How these measures are also included in the bottom-up evaluations is under investigation.

[4] MS are not obliged to report on the disposition of these measures before 17 May 2008 except for a few selected issues, that need to be reported already in the NEEAP 2007)

the task of "harmonisation". Here, the concept of the three levels of evaluation efforts and accuracy will be crucial. For each of the evaluation methods developed an assessment of which parameters can be defined as EU level averages, or should be evaluated at national or even lower level will be conducted. Such Member State-specific evaluations will need to use harmonised methods, i.e., methods that allow considering differences between MS, but do not favour one MS over the others, and making the results comparable between MS.

This paper summarizes the results to date of the ongoing work for harmonised bottom-up evaluation methods that will be discussed with the MS and with the expert public in a series of workshops and conferences, and products will be available as soon as they are publishable at www.evaluate-energy-savings.eu.

References

Broc, Jean-Sébastien Vreuls, Harry and Thomas, Stefan, Definition of the process to develop harmonised bottom-up evaluation methods, EMEEES report D4, draft version March 2007, final version to be published by end of 2007

CEN, Workshop 27 Business Plan Lifetimes of Energy Efficiency Improvement Measures in bottom-up calculations, WS 17 N001 Rev. Version 4 2006-08-30
CEN, Final CWA draft (CEN WS 27) Saving lifetimes of Energy Efficiency Improvement Measures in bottom-up calculations, version March 2007

European Commission, Directive 2006/32/ECc of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services (ESD), Official Journal of the European Union 27.4.2006, L 114/64

Lars J. Nilsson, Carlos Lopes, Paula Fonseca, Mark Araújo and Nicola Labanca, Briefing on existing evaluation practice and experience, EMEEES report 31 May 2007

SRCI, NOVEM, Electricity Association, MOTIVA, et al., 2001, A European Ex-Post Evaluation Guidebook for DSM and EE Service Programmes, SAVE Project No. XVII/4.1031/P/99-028, April 2001

Stefan Thomas, Lars J. Nilsson, Wolfgang Eichhammer, Harry Vreuls, Jean-Sébastien Broc, Didier Bosseboeuf, Bruno Lapillonne and Klemens Leutgöb, How much energy saving is 1 % per year? Proceedings ECEEE summer study 2007

Vreuls, Harry H.J., Boonekamp Piet, G.M. and Pauwels Harold J.M.G., Energy savings lifetimes of measures: will the new European harmonised lifetimes account (too) less energy savings to the policy induced energy savings measures? Proceedings IEPEC 2007

Vreuls Harry et al., 2005, Evaluating energy efficiency policy measures & DSM programmes volume I: evaluation guidebook and Volume II: country reports and case examples used for the evaluation guidebook, Reports for the IEA-DSM subtask 9, October 2005. Available at: http://dsm.iea.org

Acknowledgements

The authors wish to thank the European Commission for the financial support to the EMEEES project, and all partners of the EMEEES project for their contributions to the results presented here.