

Linkage between M&V tools (data collection) and evaluation (complementary analysis)

EPATEE topical case study illustrated with examples

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Summary – Key ideas

The objective of the case study is to analyse the linkage between data collection related to monitoring of energy savings and evaluation on energy efficiency policies. In an ideal scenario, this topic has to be considered **as early as possible in the policy cycle**, when preparing the policy and planning the related monitoring and evaluation activities (particularly the data collection).

One of the main issues regarding the linkage between regular data collection through monitoring and evaluation is the bridge to **combine the two**. Namely data verification as to how the data is being collected and what kind of results it shows, and how to subsequently present the data as a reliable evidence base to the decision makers. This can be an issue for evaluators, especially in terms of *how* to ensure data reliability and to present verified data to policy makers who will then decide on future implementation of evaluated energy efficiency policies.

From the examples shown in this topical case study, it can be relevant to focus on:

- the data collected from ex-post analysis of energy savings,
- the question of data being collected through intertwined systems and/or platforms that deal with monitoring, verification and evaluation of data, where data is collected through a common methodology and verified through automatized checks and carefully specified search filters,
- to conduct a thorough final analysis with an assessment (or at least an approximate consideration) of net energy savings, exploring to what extent the baseline used to estimate the energy savings reflects a counterfactual of what would have happened in the absence of the policy measure (see more details in the EPATEE case study about *Evaluating net energy savings*: Voswinkel et al., 2018).



This final analysis may serve as a convincing point for the policy makers to continue, adapt (or cancel) the energy efficiency policies and programmes. This establishes evaluation as a necessary and crucial step alongside measurement, monitoring and verification of energy savings in order to finally have a successful long-term policy, taking advantages of the evidence base from monitoring and evaluation for **continuous improvement and fine-tuning**.

Monitoring is indeed commonly used to organise a regular feedback loop and reporting, that provides information to know if the policy is on track to its target(s), to detect changes in trends about actions implemented, costs and other monitored indicators, and to see if changes in policy settings are needed.

Monitoring might have two limitations:

1. it is often based on declared or self-reported data from the participants;
2. it is difficult to change the type of data collected, as it might require complicated or costly changes in the monitoring tools and processes, and it might increase administrative burden for both, participants and the public authority in charge of the scheme.

The first point is often tackled by verification and control processes. The second point calls for further and specific data collection and analysis that are the core of evaluation works. In some cases, evaluation is also used to complement verification processes or check if they are robust enough.

On the basis of evaluation, policy makers may move forward with the energy efficiency policy even if the targets have not been necessarily achieved, since evaluation can serve as a launching point to correct faults found in the data collected and to achieve those targets in the long-term. Nevertheless, one cannot focus on evaluation as the only tool in achieving a comprehensive outlook of all errors and frauds within the process, but its main goal can be to take notice of that these may exist and can be corrected. Above all, **evaluation** can provide analyses complementary to monitoring. Particularly to investigate issues raised along monitoring and for which regular data collection is not enough.

Table 1. Pros and cons of linking regular data collection to evaluation.

Pros	Cons
<ul style="list-style-type: none"> • Direct availability of data ready for evaluation • Transparency on the type of data collected through the implementation of consistent methodologies • Basis for the future advancement of energy efficiency policies • Improvement on the existing policies through evaluation of carefully collected data • Early identification of issues worth to be investigated through ex-post analysis 	<ul style="list-style-type: none"> • Question of validity of data collected (particularly in case of self-reported data) • Possible confusion between different administrative levels responsible for various aspects on advancing energy efficiency policies (policy makers, data managers, evaluators, funds...): need for good coordination and communication
	Further caution
	<ul style="list-style-type: none"> • Data collected on a regular basis might not be enough to evaluate all aspects (and particularly net energy savings)

Brief description of the examples

The **Croatian example** focuses on a potential future merge of two online platforms. One focusing on monitoring and verification of energy savings (System for Monitoring, Measuring and Verifying Energy Savings - SMiV), and the other on reporting data on energy consumption in the public sector (Energy Management Information System - ISGE). The advantage in this case would be to automatize data collection and processing of energy savings, and to have both ex-ante and ex-post perspective: SMiV calculates energy savings based on engineering estimates, while ISGE can offer ex-post data from billing analysis. This can however cause additional administrative costs (but also reducing these costs in the long-term) and preliminary confusion among different administrative levels responsible for the management of these tools.

The **Austrian example** was triggered by the EED and subsequently by the implementation of an EEO (Energy Efficiency Obligation) in Austria. In order to provide obligated parties with a reporting system that minimises their administrative costs, an online database with standardised reporting spreadsheets was created. It is worth noting that the database is also used by companies for the reporting of the energy audit obligation according to EED Article 8 and by public authorities reporting energy savings from alternative measures (for EED Article 7). The database is adapted regularly according to experiences and needs of both the National Energy Efficiency Monitoring Agency and front-end users of the database.

The **Finnish example** provides insights to the long-running monitoring system for voluntary Energy Efficiency Agreements and the Energy Audit Programme. The system underwent a major overhaul ten years ago when a monitoring system with a common web-based database for the two policy measures was established. This entailed multiple benefits in terms of data collection, processing and utilization both by administrators and rapporteurs. There is one designated webmaster (Motiva Oy) who has been assigned to maintain and develop the database and who is able to process the raw data from the database for various ex-post and ex-ante reporting needs.

The **French example** deals with data collection in the framework of the white certificates scheme. It gives an overview of data collected by public bodies to frame and monitor the scheme, and of processes implementation.

Scope and definition

The objective of this topical case study is to analyse the linkage between regular data collection related to monitoring of energy savings and evaluation of energy efficiency policies. Specifically, the analysis focuses on:

- the **organization of data collection** between monitoring (focusing on regular data collection) and evaluation (focusing on detailed and specific analysis of data collected),
- **selection of data to be collected** in the regular monitoring processes, taking into account the objective to minimize administrative burden and costs for participants and policy administrators,
- methods to ensure the quality of the data collected (verification) and how evaluation can provide feedback to optimize **quality insurance processes**,
- issues related to interoperability and **linkage between databases** (e.g. through an online platform),
- challenges related to **coordination mechanisms** between various administrative bodies.

The topic of this topical case study is **transversal**, meaning it relates to any type of policy instrument and any type of sector.

The issues should be considered **as early as possible** in the policy cycle, when preparing the policy and planning the related monitoring and evaluation activities. Improving or optimizing the monitoring of a programme or policy is a continuous process. Therefore, the issues covered in this case study can also be raised when revising the management of the programme or policy, preparing the next period of implementation or preparing an ex-post evaluation.

Monitoring and evaluation (M&E) are two complementary but distinct processes, where **monitoring** refers to the regular collection of data to assess energy use, GHG emissions and socio-economic benefits and costs that occur as a result of actions or projects counted for a given policy or programme. **Evaluation** on the other hand pertains to impact and process assessments of the effects of a policy measure, typically entailing a more in-depth analysis of action or project impacts vs. a baseline or counterfactual representing what would have happened in the absence of the policy or programme (Vine and Sathaye, 1999).

The case study offers specific examples from four different EU countries (Croatia, Austria, Finland and France) and their experience on data collection and evaluation of EE policies.

Insight from the literature

One example of how monitoring and evaluation are defined and how these two aspects complement each other is described in the UNDP Handbook on Planning, Monitoring and Evaluating for Development Results (UNDP, 2009). According to UNDP, **monitoring** is an **ongoing process**, where the lessons are discussed periodically and used to inform actions and decisions. **Evaluations** should be used for **programmatic improvements** while the policy or programme is still ongoing and also inform the planning of new policies or programmes.

According to the World Bank guidebook on Building Better Policies (Lopez-Acevedo et al., 2012), a successful M&E system has three defining characteristics:

- **intensive utilization of the M&E information provided:** if M&E information is not being used, it is important to discover the reasons why, leading to the second point;
- **reliability and quality of information:** implementation of a quality control mechanism and standards that can be used to assess the reliability of the information that a M&E system produces;
- **sustainability of a M&E system:** likelihood that the M&E system will survive a change in administration, government ministers or top officials.

Monitoring and evaluation often have to be conducted under budget, time and data availability **constraints**. A study from an Independent World Bank Evaluation Group (Bamberger, 2006) considers among others the following threats that are particularly relevant for the topic of monitoring and evaluation of energy savings:

- threats to overall quality of the evaluation design and implementation due to resource constraints, pressures to cut data collection costs or reducing supervision (e.g. checking on adequacy of secondary data sources);
- generalizability of findings, increasing the risk of coming to wrong conclusions about whether the policy or programme could be replicated.

These threats lead to the conclusion that certain minimum requirements have to be met for a successful M&E implementation, as defined by the Monitoring and Evaluation Guidance for NAMA (Nationally Appropriate Mitigation Action) Support Projects (GIZ, 2015):

- projects need to have an **M&E plan** in advance, which will contain relevant indicators and baseline targets, expressed in absolute figures;
- tentative **date for evaluation** must be set;
- **quality assurance mechanism** and risk monitoring must be included.

Evaluation follows monitoring and data collection based on the aforementioned requirements. The most usual general evaluation criteria investigated are:

- **relevance**: the extent to which the intervention is suited to the priorities and policies of the target group
- **effectiveness**: measure of the extent to which an intervention attains its objectives;
- **efficiency**: qualitative and quantitative outputs in relation to the inputs;
- **impact**: the positive and negative changes produced by the project;
- **sustainability**: measuring whether the benefits of the projects are likely to continue.

European Commission's [Better Regulation toolbox](#) also emphasises five key evaluation criteria, as shown in the figure below, where they are represented along the intervention chain

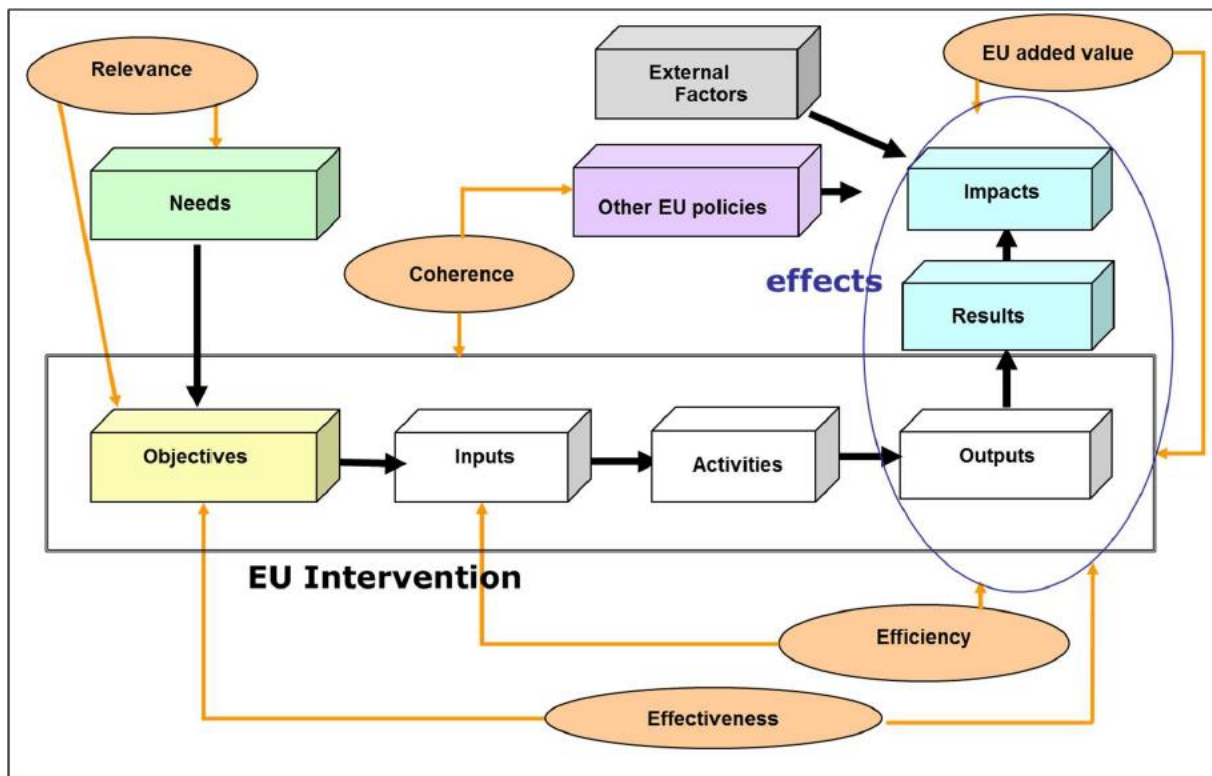


Figure 1. Simplified view of the intervention and the 5 key evaluation criteria (European Commission, 2017).

The focus of the evaluation depends on the evaluation objectives chosen by the evaluation commissioner(s), and often as well on the information and conclusions from previous studies.

Regarding the efficiency and impact criteria in particular, one notable aspect of the evaluation process and how it can provide additional data on a policy or programme is the difference in the estimated baseline when assessing “gross” and “net” energy savings.

Monitoring usually provides results in terms of **gross energy savings**, i.e. energy savings from all energy efficiency actions monitored for the policy or programme without taking into account causality or attribution issues. In some cases, the calculation methods used for monitoring might take into account additionality criteria in the definition of the baseline (e.g., setting the baseline as minimum energy performance requirements set in the EcoDesign regulations, or as the average energy performance of products available on the market). Monitored savings can then be considered **additional savings**, i.e. additional compared to a predefined baseline. Likewise, the calculation methods might include values based on previous studies or other assumptions to take into account adjustment effects such as free-rider or spill-over effects (e.g., using predefined gross-to-net ratios). In this case, monitored savings can be considered **net savings**, i.e. savings calculated compared to an assumption of what would have happened in the absence of the policy or programme.

Evaluation usually aims at assessing the impacts that can be attributed to the policy or programme (net energy savings). It then requires further analysis and data collection (compared to the regular monitoring). More details about how to evaluate net energy savings can be found in the corresponding topical case study (Voswinkel et al., 2018).

Aside from impact evaluation, **process (or theory-based) evaluation** can be considered. The summary report of the AID-EE project (Harmelink et al., 2007) recommends process evaluation whose important element is policy theory. **Policy theory** describes how a policy instrument is expected to lead to energy efficiency improvements. The added value of process evaluation is particularly in terms of better understanding of how the policy works, what worked and what did not work as expected. This can for example provide a basis for the causality assessment to evaluate net energy savings or cost-efficiency, and insights about difficulties encountered in the policy implementation or with participation rates. A process evaluation can also be focused on investigating issues or blind spots that could not be tackled with the feedback loop of monitoring. This enables to identify further ways to improve the policy or programme.

The Horizon 2020 project **multEE** covered the topic of data collection through the integration of **innovative monitoring and verification schemes**, alongside recommendations on improved coordination between different administrative levels (local, regional, national, supranational). Through the activities of multEE project, various European countries such as Macedonia, Lithuania and Slovakia, are in developing or implementing stages of installing an M&V platform on energy savings. The Croatian SMiV (see Croatian example in this case study) is the M&V platform in line with what is being considered to be implemented in the aforementioned countries. The improvements on the vertical (between local, regional and national levels) and horizontal (between various national coordinating bodies such as ministries or state agencies) coordination for the implementation of M&V platform is a topic that can also be relevant for the evaluation of said M&V efforts. More to be found at:

<http://multee.eu/publications/monitoring-and-verification-schemes>

and EU Best Practice for M&V Schemes and Coordination Mechanisms:

http://multee.eu/system/files/EU_Best_Practice_for_M%26V_schemes_%26_Coordination_Mechanisms_1.pdf

As an example of one of the chief outputs of the project, the multEE Policy Brief on Data Collection highlighted five recommendations on data collection (stipulating potential evaluation staples) - (https://multee.eu/system/files/multEE_Policy%20Brief_Data_Collection.pdf) :

1. when defining country-specific default values, include relevant stakeholders (e.g. energy suppliers, energy regulators, companies, etc.);
2. shape the document with the calculation methodologies for the energy efficiency measures in a user-friendly manner so that stakeholders (e.g., obliged parties for an EEO scheme) can easily use it, but offer the possibility of using project-specific energy saving figures for those parties that have them;
3. define the data collection process and the monitoring and verification process of the reported energy efficiency measures before you implement the IT-solution;
4. consider the requirements for the IT-tool regarding data collection, data processing, reporting and subsequently the monitoring and verification of data material;
5. carry out the verification and control process at different levels (plausibility check, detailed checks, on-site checks) in order to increase the effectiveness of the process.

Additional important multEE report for the topic at hand is the summary of data collection process on bottom-up monitoring, available at:

https://multee.eu/system/files/D2.3_Data_collection_process_for_bottom-up_monitoring_online_0.pdf

It includes descriptions of relevant bodies for data collection in countries such as Croatia, Greece, Latvia, Lithuania, Macedonia or Slovakia.

Common approaches

Geographical and administrative differences between countries make that monitoring, and more specifically data collection, practices are most often adapted to the national (or even local) context. Despite these differences, experience acquired in one country can still be informative for other countries. The following practices could be a source of inspiration for stakeholders setting data collection processes, or looking at ways to improve current processes.

- **Defining what data should be collected, how and by whom:** the public authorities usually define minimum requirements that enable the monitoring of the scheme (Finnish case for example). Then the way to collect/report these data and the possibility to collect other data can be discussed with stakeholders, for example within working groups or through consultation.
- **Organising a feedback loop to ensure continuous improvement:** the managing authority of the scheme usually provides opportunities for stakeholders to give feedback or make suggestions, either through contact forms on a website, regular consultation or satisfaction survey, etc.
- **Using online platforms to make data collection processes more efficient,** and possibly including a part of **automation** in processing the data: this is usually done when it is clear that the scheme will last several years. It should be noted that upfront cost of the online platform is most often only worth it if the platform is used for a sufficient number of years.
- **Implementing quality insurance/processes:** these quality processes are usually done at two levels. A first level is under the responsibility of the stakeholders in charge of reporting the data (e.g., obliged parties in an EEO scheme, participants to voluntary agreements, qualified installers for a subsidy scheme). This might include internal audits for example. Then a second level is under the responsibility of the managing authority, and will usually include a review of the documentation submitted by the stakeholders, and external audits or verifications on sample of projects, etc.

- **Preparing the data set that can be used as a basis for evaluation:** making the link between monitoring and evaluation usually requires to select the data relevant for the evaluation, in terms of period, level of details, etc. It also requires to ensure that the documentation of the data enables a clear analysis and interpretation. Feedbacks from public bodies managing policies show that the preparatory work to provide evaluators with clear and comprehensive information about the policy to be evaluated can require significant time investment from policy officers. But this is worth the effort, as this ensures that evaluation results and conclusions will reflect a good understanding of the policy and its background. This avoids in particular to get conclusions or recommendations that would be disconnected from the reality of the policy.
- **Using evaluation to question data collection processes and identify ways to improve the monitoring:** this comes on top of monitoring's regular feedback loop, usually by using an external look (or at least standing back from the daily routines to get a broader view of the scheme)

The review of the EPATEE case studies about practical examples of evaluations provides a detailed feedback about evaluation practices (Broc et al., 2018). Stakeholders interviewed for these case studies emphasised the importance of monitoring and data collection to provide the basis for evaluation. Experiences found in the case studies show examples of difficulties encountered as well as good practices, as listed in the tables below. The corresponding case studies can be found at:

<https://epatee.eu/case-studies>

Table 2. Examples of difficulties encountered with data collection or monitoring.

Examples of difficulties encountered	Cases where the examples are mentioned
Various reporting frameworks and timelines creating additional work	EE programmes of Vienna (AT), Primes Energie (BE)
Need to justify the resources (time and budget) needed to collect data / Budget and timelines limiting the possibility for data collection	Primes Energie (BE), EEO scheme (DK), Agreement for freight companies (FR)
Energy efficiency not always the priority objective of the scheme (some data needed to evaluate energy savings are not monitored)	Primes Energie (BE), Fiscal incentives for cars (NL)
Finding the right balance between procedures ensuring data quality and minimizing administrative burden	Primes Energie (BE), Multi-year agreements (NL)
Data providers might not trust the evaluators	Primes Energie (BE)
Technical issues to connect or match different databases / Technical issues with handling large data sets	Energy renovation of public buildings (CR), Primes Energie (BE), Better Energy Homes (IE), Subsidy scheme for housing corporations (NL)
Challenges to verify the situation before actions are implemented	EEO scheme (DK)
Data limitations with time series due to changes in data specifications over time, or to lack of disaggregated data	EEO scheme (DK)
Investment cost and time needed to develop web platforms	Voluntary agreements (FI), Voluntary energy audits (FI)
Changes in the projects or programmes along the evaluation process	"Future investments" programme (FR), WAP (US)
Time needed to observe the results of the actions	"Future investments" programme (FR), EE Network initiative (DE)
Conditions to access to billing data (e.g., privacy issues)	Better Energy Homes (IE), WAP (US)

Examples of difficulties encountered	Cases where the examples are mentioned
Errors and frauds in data reported by stakeholders / data quality not ensured along the whole collection chain	EEO scheme (DK), White certificates (IT), Subsidy scheme for housing corporations (NL)
Finding the right contact to get the data (cf. large organisations, staff turnover)	Subsidy scheme for housing corporations (NL)

Table 3. Examples of good practices related to data collection and monitoring.

Examples of good practices	Cases where the examples are mentioned
Use of standardized data collection procedures	Environmental Support scheme (AT), EE programmes of Vienna (AT), Voluntary agreements (FI), Voluntary energy audits (FI), EEO scheme (DK), White certificates (IT)
Preparation work by the policy officer to ensure all information needed about the scheme will be available to the evaluators	Environmental Support scheme (AT), Voluntary agreements (FI)
Clear quality insurance processes (requirements, verifications)	Environmental Support scheme (AT), White certificates (IT), Voluntary agreements (FI), Voluntary energy audits (FI)
One body in charge of coordinating data collection from various services or organisations	EE programmes of Vienna (AT), EE Fund (DE)
Clear definition of the indicators to be monitored (and related data requirements)	EE programmes of Vienna (AT), EE Fund (DE)
Use of web platforms to facilitate data collection / reporting	Environmental Support scheme (AT), Voluntary agreements (FI), Voluntary energy audits (FI)
Quality of the database(s) (clear structure, documentation, automatic or regular checks, compatibility with other databases)	Environmental Support scheme (AT), Primes Energie (BE), Energy renovation of public buildings (CR), Voluntary agreements (FI), Voluntary energy audits (FI), Supplier Obligations (UK)
Monitoring and verification procedures enforced by law	Energy renovation of public buildings (CR), Renovation programmes (LT), Supplier Obligations (UK)
Early planning/definition of data collection procedures and requirements	Voluntary agreements (FI), Voluntary energy audits (FI), Supplier Obligations (UK)
Training of stakeholders to ensure quality of data reported	Voluntary agreements (FI), Voluntary energy audits (FI)
Recognition of the commitment to the scheme is conditioned to meeting data requirements	Agreements for freight companies (FR), EE Network Initiative (DE)
Defining clearly who is responsible and subject to penalties (in case of problems with reported data)	White certificates (IT)
Suggestions that incentives should be conditioned to data requirements	Better Energy Homes (IE), Multi-year agreements (NL), Subsidy scheme for housing corporations (NL)
Cooperation between countries	Nordsyn
Taking into account the diversity in the complexity of the projects, by adapting data requirements to main types of projects	White certificates (IT), EEO scheme (DK), Capacity Markets (US)
Incentives that can cover the costs of strict data requirements	Capacity Markets (US)
Optimising the contacts with stakeholders (to avoid overburdening them)	WAP (US)

The review of how monitoring and data collection are organised reminds the no-brainer that it is essential to **plan data collection** when designing or adapting the policy measures. However, organising data collection upstream can be challenging. First because priority might be given to implementation, making that monitoring issues are dealt with later. Second because it is not always obvious to identify what data will be needed for further analysis (see next message about selecting the data to be collected).

The analyses done in the case studies also led to distinguish two main practices related to monitoring and ex-post evaluation:

1. **Regular reviews**, usually done annually and based on the verification and compilation of data from on-going monitoring and/or annual reports prepared by participants (voluntary agreements) or obligated parties (energy efficiency obligation schemes).
2. **In-depth ex-post evaluations**, usually covering a multi-year period, and including further data collection (e.g., surveys, interviews) and analysis.

The case studies show a broad consensus on the need to implement regular reviews due to reporting needs, but also to get a quick feedback loop to detect potential problems. The table below includes examples showing the possible **complementarities** between regular reviews and multi-year ex-post evaluations.

Table 4. Examples of complementarity between annual reviews and multi-year evaluations.

Examples of complementarity between annual reviews and multi-year evaluations	Cases where the examples are mentioned
Annual reviews used to get a regular feedback look and monitor achievements. Ex-post evaluations used to analyse further the results and investigate more in details specific issues.	Environmental Support scheme (AT), EE programmes of Vienna (AT), EEO scheme (DK), EE Fund (DE)
Annual reviews/monitoring provide the basic data or starting point for ex-post evaluations.	Environmental Support scheme (AT), EE programmes of Vienna (AT), Primes Energie (BE), EEO scheme (DK), Agreement for freight companies (FR), EE Network Initiative (DE), EE Fund (DE), Purchase tax on new cars (NL), Supplier Obligations (UK)
Ex-post evaluations or studies used to assess actual energy savings (based on metered data), to verify (and possibly update) energy savings based on engineering calculations.	Individual heat metering (CR), Better Energy Homes (IE), Subsidy scheme for housing corporations, WAP (US)
Ex-post evaluations made to review the monitoring and verification procedures	Environmental Support scheme (AT), EE programmes of Vienna (AT), EEO scheme (DK), WAP (US)
On-going monitoring used to review data from each project. Ex-post evaluation used to assess the overall impact of the scheme.	“Future investments” programme, EE Fund (DE)
Annual reviews/monitoring focused on energy savings. Ex-post evaluations bringing complements to assess cost-effectiveness.	EEO scheme (DK), Better Energy Homes (IE), Agreement for freight companies (FR), Multi-year agreements (NL), Nordsyn
Ex-post evaluations or studies used to complement monitoring with qualitative analysis	Primes Energie (BE), Better Energy Homes (IE), Multi-year agreements (NL)

The need and **periodicity** or **timing** for in-depth ex-post evaluations can vary. 17 of the 23 case studies include at least one dedicated and official ex-post evaluation. In 6 cases, this was done only once. In 4

cases, ex-post evaluations are done upon request. For the remaining 7 cases, ex-post evaluations are organised on a regular basis, mostly at the end of each period of the scheme or due to reporting requirements (periodicity mostly included between 3 to 5 years). The Supplier Obligations in UK is an interesting example where ex-post evaluations are done at mid-term of the periods, to let time to take into account conclusions for the next period.

Some of the interviewees indeed pointed the difficulty to organise ex-post evaluations in a relevant timing, particularly because more time might be needed to observe the impacts of the scheme, whereas consultation with stakeholders often requires to get conclusions and recommendations early enough when preparing the next period of a scheme.

Concrete example n°1: [Croatia] Connection between the System for Measuring and Verifying Energy Savings (SMiV) and the Energy Management Information System (ISGE)

Background

One of the most important aspects that link evaluation to monitoring and verification is data collection, and the interpretation of said data. Among its various analyses, a typical evaluation of energy efficiency policies attempts to conclude whether the data collected to calculate the energy savings is credible and verified. In correlation to this, one should emphasize that the EPATEE project is focusing on ex-post analysis of energy savings.

Therefore, the next step in the data collection for energy savings in Croatia would be to compare the data from the System for Measuring and Verifying Energy Savings (SMiV) and the Energy Management Information System (ISGE).

Evaluation to practice

The data collection is defined in the Croatian legislation as part of the Energy Efficiency Act. Responsible authorities from the public sector (namely the National Coordination Agency, now absorbed by the Ministry of Environmental Protection and Energy), energy service providers (i.e. ESCO companies) and institutions providing grants for energy efficiency projects (i.e. the Environmental Protection and Energy Efficiency Fund) are obliged by legislation to enter the data (ex-ante engineering estimates) into SMiV. In practice, the data is not voluntarily given, but prescribed by legislation.

To clarify, **SMiV** is a web application defined by the Croatian Energy Efficiency Act (Official Gazette 127/2014) as the national system for measuring, monitoring and verifying energy savings. Croatian case studies, analysed for EPATEE, namely the “Individual heat metering in multi-family buildings” and “Energy renovation programme for public sector buildings” (see: <https://epatee.eu/case-studies>), have their energy savings – based on **engineering estimates** – calculated and submitted to the SMiV application. It is mandatory for the authorised energy efficiency agency to report the energy savings from projects that have been co-financed by the Energy Efficiency Fund. According to the Energy Efficiency Act (Article 22(2)), responsible persons from the public sector, energy service providers and institutions providing grants for energy efficiency projects are obliged to report about the implemented projects through SMiV. SMiV was managed and coordinated by the National energy efficiency coordination body, which has been absorbed by the Ministry of Environment and Energy in mid-2018. Many of the measures and energy efficiency projects, based on bottom-up methodology, are submitted by the Environmental Protection and Energy Efficiency Fund (FZOEU), which is co-

financing more than 90 per cent of the projects recorded in SMiV through various energy efficiency programmes, such as the abovementioned ones on energy renovation and individual heat metering.

ISGE is a web application for supervision and analysis of energy and water consumption in public sector buildings in Croatia, managed by the Croatian Real Estate Agency. Data from **monthly bills on energy and water consumption** is submitted to ISGE on a monthly basis by responsible persons (energy advisors/managers) within public buildings, covering both central government buildings and local/regional authority buildings as well as public lighting. The billing analysis in ISGE can thus show ex-post data on actually achieved energy savings for particular public buildings that were part of the energy efficiency programmes, whose results were submitted in SMiV.

Data from ISGE can estimate energy savings on the basis that the data is corrected by climate and weather conditions. ISGE can therefore assess whether the energy savings are actually achieved and whether ESCOs should receive their compensation on the basis of actual results.

Lessons learnt / added value of the monitoring for the evaluation of the scheme (and vice-versa)

This brings the idea of combining the SMiV and ISGE applications into one system. The compared data can then provide a more detailed and ex-post-based picture of the implemented energy efficiency programmes and policies, and therefore have a more successful linkage between evaluation and data collection. Moreover, the system would, through comparison of data on energy consumption before energy efficiency action, ex-ante estimates of energy savings and energy consumption after energy efficiency actions, enable further refinement of M&V bottom-up methods and update of the relevant regulation. Improved M&V methods would certainly reduce currently observed difference (positive or negative) between estimated and metered energy savings from energy efficiency actions.

One possible challenge is the establishment of a coordination mechanism that will secure a viable linking of data between SMiV and ISGE. Coordinating different responsibilities of institutions managing the respective applications is an essential component. Not only public utilities can be included in this system, but also those buildings and bodies which have received financial assistance from the state (e.g. through the FZOEU), whose savings can be established on submitted data before and after the implementation of the energy efficiency actions. Data would be submitted for a certain period of time on a compulsory basis to assess the longevity and effectiveness of reported actions. Ultimately, this would provide either a basis for a more elaborate evaluation, or be used as a point for recommendations and future solutions within an actual evaluation report. This can therefore bring forth long-term advancements in energy efficiency policies where the results are clearly demonstrated and checked through an all-inclusive monitoring system.

Concrete example n°2: [Austria] – Central monitoring programme (AEA)

Background

In the course of the implementation of the ESD (Energy Services Directive, 2006/32/EC), the Austrian Federal Government concluded voluntary agreements with interest organisations of energy companies. In these voluntary agreements, energy providers committed themselves to achieve quantitative energy savings targets at final customers. In addition, the Federal Government concluded an agreement with the Austrian Provinces to report and collect information on actions and savings from energy efficiency schemes in a **central database** to monitor the achievement of the indicative

savings target of the ESD. A central database was thus created at the Austrian Energy Agency to collect information on energy efficiency actions originating both from the voluntary agreements and from Federal and provincial schemes. With this database, stakeholders could easily report actions in standardised spreadsheets.

For implementation of the EED (Energy Efficiency Directive, 2012/27/EU), Austria decided to introduce an EEO (Energy Efficiency Obligation), thus moving from a voluntary agreement approach to an obligation. The underlying Energy Efficiency Act of 2014 introduced the creation of a new database for the reporting of the EEO. Based on the experiences of the database used for the ESD, a **new database** was implemented **within the Austrian portal for e-government**. This makes that this database complies with the highest security and data protection standards. The system is used for both companies' reporting of the energy audit obligation according to EED Article 8 and the EEO according to EED Article 7. Companies report implemented energy saving actions in standardised spreadsheets. Federal institutions are obligated to use the database as well for alternative measures used for implementing EED Article 7. Provincial institutions use the database on a voluntary basis.

Data collection practices

The following description focuses on the data collection process for the EEO.

The data that companies have to document for energy savings actions reported to comply with the quantitative savings target of the EEO are defined in Austrian Federal Energy Efficiency Act in §27. The minister in charge of the EEO issued a decree to concretise and refine the documentation and reporting requirements according to §27 of the Energy Efficiency Act.

The Federal Energy Efficiency Act also requires obligated energy companies in the EEO to report data only through the newly established portal (see above). Thus all requirements related to the documentation and reporting of energy efficiency actions are regulated by law.

Stakeholders (obligated companies and other institution using the database) are however consulted when it comes to design issues and functionalities of the database.

The **data collected** includes:

- Data on the company: amount of energy sold in the previous years for obligated companies in the EEO, information on employees and turnover/balance sheet for non-SMEs.
- Data on energy efficiency actions implemented: proofs of implementation, number of actions, date of implementation, details of the final customer where the action has been implemented, incentives provided and proofs for calculation values used. The level of details required depends on the calculation methodology for the different types of energy efficiency actions.

To verify/control the data reported, the Monitoring Agency performs a number of **checks**:

1. A plausibility check over all data entered. This is done mainly through automatic checks to identify suspicious data sets and possible double counting.
2. A desktop data check. The Monitoring Agency choses a representative sample over all types of measures and obligated parties and verifies the reported documents and proofs on paper files.
3. A limited number of on-site checks to verify implemented measures in companies.

The data reported is primarily used to check compliance of companies with their obligations. In addition the data is used for the following purposes:

- Derive savings eligible for EED Article 7 for Austria.
- Report achievements of the EEO to different stakeholders in Austria (e.g. Parliament, public).

Lessons learnt

The main prerequisite for a central database collection process to work is that actors are required (ideally **by law**) to report the data via the system. The Austrian Federal Energy Efficiency Act defines the database as the only reporting tool for obligated companies and Federal authorities. Also the Federal Energy Efficiency Act defines what information has to be provided and what data has to be reported.

The database was designed to **limit the burden** for reporting parties keeping in mind the information that is needed from the National Monitoring Agency to monitor and verify savings and evaluate target achievement related to the EED.

The database is updated and refined regularly based on feedback both from the reporting parties as well as the National Energy Efficiency Monitoring Agency. To this end, an **experience sharing workshop** is organised at least once a year.

It can be concluded that such a comprehensive database should be designed in a **step-by-step** approach and be built flexibly enough to allow for **regular adaptations**.

Added value of the monitoring for the evaluation of the scheme (and vice-versa)

Currently the main use of data from the database is on monitoring, control and tracking of Austria's target achievement. However the Federal Energy Efficiency Act also foresees regular evaluation reports that have to be presented to the Austrian Parliament. These reports partly go beyond mere target achievement reporting and include elements of impact evaluation. The step-by-step approach in the design phase ensured that no data has to be collected in addition to the one reported via the database.

The database enables obligated parties and public authorities to report data on implemented energy savings actions in a way causing relatively little administrative burden. The database gives each actor an overview of reported measures and the respective energy savings as well as a functionality to download the reported data in excel format to make further analysis.

Concrete example n°3: [Finland] - Monitoring of the voluntary agreements and energy audits programme

Background

Both the Energy Efficiency Agreements (1997-) and the Energy Audit Programme (1992-) have been important long-running national initiatives providing proven significant energy savings. The monitoring and evaluation of both programmes were planned and implemented at the outset. Until the second Energy Efficiency Agreement period starting in 2008, there were two separate Access databases for the policy measures and data collection was made via Excel forms. After that, there has been a **common web-based database** for both policy measures.

Participants to the Energy Efficiency Agreements report each year data on their energy saving actions and respective savings through an online data interface. Data on realised savings arising from the

Energy Audit Programme is collected from the implemented audits via a standardised Excel-form and transferred in electronic format into the same database.

If Agreement participants have implemented an energy audit, they can see on their individual reporting platform all proposed end-use actions and related savings calculated by the energy auditor. In their annual reporting for the Energy Efficiency Agreement, they will report status of the end-use actions proposed in the audits (implemented; decided to be implemented; under consideration; will not be implemented). In addition, they report possible other energy efficiency actions they have implemented during the previous year. The coverage of the Agreements is very high meaning that the vast majority of energy savings originating also from the energy audits is captured by the annual reporting by the Agreement participants. After the databases for the two policy measures were combined, it also made it very easy to avoid double counting between the two policies.

Data collection practices

The monitoring data is used for evaluating energy saving impacts from end-use actions implemented by Agreement participants arising either from energy audits or other saving activities. Results are reported annually in national reports and used in reporting for international energy efficiency and climate commitments.

In addition to the data needed for evaluating savings impacts, a lot of other monitoring data is collected, e.g. related to energy management practices by the Agreement participants (see the case study about Energy Efficiency Agreements in Finland for more details: <https://epatee.eu/case-studies>).

Motiva Oy designed the monitoring and evaluation framework together with the predecessor of Ministry of Employment and the Economy, which is the ministry competent in energy policy. The data needs for annual reporting of Energy Efficiency Agreements were defined based on the agreement obligations for the participants. Monitoring data needs were defined on technical grounds so that the data collection could provide data in such a way that it can be used flexibly for various reporting needs. Due attention has always been paid to avoiding double counting and taking action lifetimes into account.

Data is reported to the database by an expert (rapporteur) designated by the organization or company participating to the Agreement scheme. Motiva has prepared instructions for calculating energy savings and annually provides training to the rapporteurs.

All implemented end-use actions reported to the monitoring database (on average over 2 300 actions per year) are reviewed by Motiva. For example, the realism of the order of magnitude of reported savings is checked. When needed, additional information is asked from the rapporteur, e.g., on the savings calculations. On average one hundred (about 5%) of actions are subject to an independent audit each year.

The savings achieved by the energy saving actions are not usually verified by subsequent measurements, since it is most often difficult to make measurements in practice and it generates significant additional costs.

Lessons learnt

The monitoring and evaluation system set up has proven to be very effective and flexible to use for various reporting needs both nationally and internationally, including the National Energy Efficiency Action Plans (NEEAPs) and reporting for greenhouse gas commitments. However, it remains necessary to remind the Agreement participants to report their data promptly and to provide continued technical support in the process.

The shift from excel reporting to web-based interface has entailed multiple benefits. It has significantly reduced administrative manual work both in data collection and processing. Pre-filling and distribution of Excel forms is no more needed. Each Agreement participant now sees automatically all actions proposed in their energy audits because the implemented energy audits for each agreement participant can be easily linked within the database by the operator of the system (Motiva Oy).

Agreement participants can report their actions throughout the year whereas before they could do this only once a year and for the whole year at the same time. The participants find the feedback data available through the database interface useful: they are able to access and download their own data (e.g. to Excel) and monitor the fulfilment of their own energy savings targets.

Added value of the monitoring for the evaluation of the scheme (and vice-versa)

From the point of view of Agreement participants, the data systematically collected to the database is of value. Data can be downloaded electronically for further processing for their own reporting needs, e.g. environmental reporting or for production of graphs etc. for communication purposes. The participants would appreciate if the data was processed even further or additional analytical functions would be available, but these are not in the pipeline at present.

If another country were to develop a similar monitoring and evaluation tool and process, adequate time and resources need to be allocated for definition, implementation, testing, launching and training. The system will not be ready after one development round but it is most likely that there will be further development needs. Furthermore, maintenance requires continuous resources. There should be one webmaster responsible of the database and its development and able to download raw data for processing and various analyses with different definitions. This shifts any risk of administrative confusion between different administrative levels.

Concrete example n°4: [France] – White Certificates scheme

Background

Energy Saving Certificates (ESC, *Certificats d'Economies d'Energie* or *CEE* in French) were introduced by the Energy Policy Law of July 13th 2005, with the aim of achieving energy savings in various sectors such as building, industry, agriculture and transport. The scheme obliges **energy suppliers and fuel retailers** (called “obligated parties”) to achieve energy savings targets by encouraging consumers (households, local authorities or companies) to implement energy efficiency actions. The obligated parties can choose to partly or totally delegate their obligation to a third party, called **delegate companies** or deal with “**eligible parties**” that can claim ESC for actions they or a third party perform.

Energy saving targets are **assessed in kWh_{cumac} of final energy** (“cumac” means “cumulated and actualized”), and correspond to the **energy savings cumulated over the lifetime of the implemented operation and actualized at a rate of 4%**. ESC are delivered by the **National Authority for Energy Saving Certificates (PNCEE)**, an entity depending from the Ministry for energy. ESC are then registered

on an **online platform (called “EMMY”¹)** where ESC can be exchanged between obligated parties, delegate companies and eligible parties.

To facilitate the monitoring of the energy-saving actions, stakeholders of the ESC scheme such as ADEME, energy suppliers and/or professional federations contribute to the evaluation of the potential energy saved thanks to the implementation of **“standardized actions”**. These **ex-ante estimations** are frequently updated², and each change is notified by ministerial order. In addition, ESC can also be delivered to **specific actions** that are not included in the catalogue of standardized actions. In this case, PNCEE relies on ADEME’s expertise to review the energy savings reported for these specific actions. In order to help stakeholders to prepare their requests for specific actions and optimize the appraisal process, a **methodological guide**³ for specific operations is available. A third option to get ESC is for obligated parties to contribute to so-called **ESC programmes**. The possible scopes for these programmes are defined by the Ministry: activities related to information, training, innovation and tackling fuel poverty. The Ministry issues calls for proposals and select the programmes that can be submitted by any type of stakeholders. Obligated and eligible parties can then fund these programmes and get ESC on a fix basis (given amount of ESC per amount of funding). A threshold is defined for each period to limit the total amount of ESC that can be delivered through ESC programmes (for more details, see [Article L. 221-7](#) of the French Energy Code).

Data collection practices

There are many types of data collected:

- Data used to set objectives per period which are based on past and future market evolutions (e.g., potential evolutions in market shares) for markets covered by the scheme, particularly the markets covered by the catalogue of standardised actions. When data are missing or too uncertain, the assessment is based on the extrapolation of data regarding the certificates delivered in the past;
- Data used to carry out the ex-ante assessment of the potential energy savings due to the implementation of standardized actions, which is based on peers’ expertise (including ADEME & ATEE⁴’s expertise);
- Data declared on the EMMY platform regarding exchanged ESC; and
- Administrative data declared by eligible & obligated parties (including effective volumes of sold energy by obligated parties) to PNCEE.

¹ www.emmy.fr/public/registre

² For action types that no longer provide significant savings as compared to minimum energy performance requirements set in current regulations, and action types that do not represent the present circumstance (e.g., market trends).

³ See [Guide pour la constitution d'une demande de certificats d'économies d'énergie relative à une opération spécifique](#)

⁴ ATEE (Technical Association for Energy & Environment) coordinates working groups per sector (buildings, industry, transports, agriculture, local authorities). These groups prepare new or revise existing forms defining the standardized actions and related deemed savings, that are further reviewed by ADEME before being validated by the Ministry.

Focus on data collected from eligible & obligated parties

Only parties having registered an Emmy account can apply for ESC whatever their type (standardized, specific or ESC programme). The documents to submit (and archive) are described in [article 4 of decree from September 4th 2014](#) (updated by [order from December 29th 2017](#)) and gathered in the Table below:

Table 5. Documents required to get ESC in the framework of the third period of the scheme (2015-2017).

Type of data	Standardized operation (see annex 2 of decree from September 4th 2014 and annex 5 of for document to keep for controls)	ESC programme
Documents & information to deliver to PNCEE to get ESC	<ul style="list-style-type: none"> - Document proving the ID of the applicant (+mandate if a third party set a request for ESC on behalf of an eligible party) - Proof of the applicant eligibility (declaration of volumes of energy for consumption or sold on the national territory during the year before the application, copy of the registration certificate to the trade and companies register...) - List of the implemented energy saving operations - Certificate on honour ensuring the compliance with the provisions of the order specifying the list of the documents to provide and keep to apply for ESC and with the requirements set by the decrees defining the standardized actions included in the application. <p>Applications whose volume of energy saving certificates is lower than a certain threshold must include a certificate on honour signed by the applicant specifying that no other application with a volume below this threshold has been filed and will not be filed during the calendar year of the application.</p> <p>When several eligible parties have grouped together to reach the minimum volume of energy savings, additional documents must be sent to the PNCEE.</p>	<p>If the request is related to a contribution to one or more ESC programme(s), it must prove that:</p> <ul style="list-style-type: none"> - funds were paid by the applicant to the operator of the programme as well as the date of the payment(s); - or that the expenses have been paid by the applicant and the date(s) of payment(s) when the applicant operates the programme. <p>NB: the justification for payment is provided by a certificate of honour issued by the operator of the programme. When the applicant operates the programme, this certificate on honour is co-signed by an accountant or an auditor, or by a public accountant for local authorities and their groupings. This certificate mentions the programme reference as set by decree.</p> <p>The justification for payment must specify the period (one year max).</p>
Documents to keep during 6 years ⁵	<ul style="list-style-type: none"> -ID of the beneficiary -Proof of the effective implementation of the actions -Proof of the active and incentive role of the applicant towards the final customers (cf. materiality) -Proof of dates of commitment and completion of actions -Certificates on honour -Proof of compliance with the requirements set by decree, and of non-accumulation with other schemes (+ when relevant, proof of compliance with the conditions set by decree for ESC targeting households in fuel poverty situation) 	N.A.

⁵ For the first request, all documents must be transmitted

Focus on specific actions

Almost the same documents as for standardized actions are required for specific actions by the PNCEE.
 NB: documents required by annex 5 of the decree must be transmitted and not simply kept as for standardized operations.

In addition, documents specifying the situation before and after implementing the action(s) are required such as:

- Document determining the **situation before** implementing the action(s):
 - a) When the action is conducted in an established fixed location, the situation before the action must be specified by an energy audit in accordance with ADEME guidelines, French or European standard for energy audits.

The energy audit must describe the different technical solutions planned to be implemented, specify their energy performance and the related indicative costs. The energy audit is established by a person with certified skills working in an appropriate organization.

NB: the transparency and objectivity of the energy audit can be satisfied either by a call to a third party or by an organizational separation within the applicant's company to ensure that the person who carries out the energy audit acts objectively and independently. This audit must be carried out less than four years before the start of the action.

- b) When the action is not implemented in a fixed installation, the applicant must provide documents proving the situation before implementing the action.

- Document determining the **reference situation**:

The reference situation must be described in accordance with the provisions of [Article R. 221-16](#) of the Energy Code (see Table below).

Table 6. Variables to consider for the reference situation specification.

Cases	Variables to consider for specifying the reference situation
The operation improves the thermal performance of the envelope of an existing building	The overall condition of the building stock of the same type and the level of performance of the materials or equipment installed at the most recent time for which data are available
Control, regulation or energy recovery devices are installed on existing fixed or mobile equipment	The overall level of performance of the stock or fleet of such existing equipment is considered
In all other cases	The technical and economic state of the market for the product or service at the latest date for which data are available, or the performance requirements imposed by the regulations in force when the latest data known for the market do not incorporate the effects of regulation.

The reference situation may be described by following the methodology used for a standardized action provided that it can be shown that the standardized action is representative of the specific action reported. In certain cases, particularly when the specific action does not correspond to a homogeneous market or fleet, the situation before the operation will be considered as the reference situation.

- The documents used to determine the **situation after the operation**, and in particular the description of the recommendation implemented, calculation elements used for sizing the action, its operation and the expected performance.
- A **certificate on honour** signed by the professional implementing or managing the action specifying its commitment to provide exclusively to the applicant the documents needed to report this action to get ESC and not to sign a similar certificate of honour with another legal entity within the framework of the ESC scheme (to avoid double counting).

At the end of each period, a process of "administrative reconciliation" is organized to verify whether the obligated parties have individually reported enough ESC to achieve their obligation. This process includes the statements of energy sales volumes for all types of energy to calculate the energy saving obligations. They must be certified by a chartered accountant or an auditor (or by a public accountant for state-owned companies).

When the amount of ESC available on the EMMY account of the obligated party is not enough to meet its obligation, the obligated party is officially requested to get ESC (see [art L.221-3](#) of the Energy Code). In case of failure to comply with reporting requirements and energy saving obligations, penalties may be given (for e.g. 0.015 euro per missing kWh_{cumac})⁶.
NB: the penalties for non-compliance are expected to be reinforced.

Lessons learnt

The monitoring and control procedures of the French ESC scheme have been improved continuously to take into account the feedback from the different periods of the scheme, from the conclusions of public consultations and from the recommendations of the Court of Auditors. Thus, the third period (2015-2017) has simplified the system by standardizing of documents and switching to a declarative process when applying for ESC, coupled with ex-post controls. Whereas up to 2015, all documents were to be sent to PNCEE for review before validating and issuing the ESC. The consultation launched for the fourth period (2018-2020) has allowed in particular to reinforce control procedures and protect very small fuel retailers (which usually delegate their obligation to third parties), to reinforce the efficiency of the scheme (by defining each year a plan to revise a selection of standardized actions), reinforcing qualifications requirements of auditors, improve its visibility especially to households, and improve the transparency of the scheme by reinforcing the publication of data (every semester for data regarding the obligation coverage per energy + every year for specific operation analysis).

Added value of the monitoring for the evaluation of the scheme (and vice-versa)

All these data will be analysed in the framework of the in-depth ex-post evaluation to be launched within the end of 2018. They will be complemented by on-site visits of final customers, online surveys

⁶ See decree n°2012-23 from January 2012 regarding control and penalties for more details <https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000025114619&dateTexte=&categorieLien=id>

of final customers, manufacturers and technical consultancies, and interviews with key stakeholders. The main evaluation objectives will be⁷ (Nauleau et al., 2018):

- To assess actual energy savings (based on data from the on-site visits) and compare them with the energy savings estimated for monitoring and issuing ESC (for a selection of types of standardized actions);
- To assess the impacts (energy savings and others) of the scheme, taking into account a causality assessment based on the various sources of new data collected for the evaluation;
- To assess the cost-effectiveness of a selection of strategies to produce ESC;
- To provide recommendations for the next period of the scheme (post-2020).

The data from the regular monitoring of the scheme will be used in a first stage of the ex-post evaluation for a detailed assessment of the outputs of the scheme. This will be used to target the sampling of the on-site visits on the most important types of standardized actions in the periods under evaluation (2011-2014 and 2015-2017). This analysis of the scheme outputs will also be combined with a review of previous studies about the scheme in order to define detailed evaluation questions and hypothesis to investigate through the collection of new data.

Connection within data coming from other schemes that can potentially interact with the ESC scheme (such as the energy transition tax credit and 0-interest rate loans for energy renovations) could also be useful for cross analyses, and particularly as inputs for the causality assessment.

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