

# Synthesis report on M&V schemes and coordination mechanisms in EU countries



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# Table of Contents

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I	Introduction	2
II	Results of the comparative analysis	3
II.1	Introduction	3
II.2	M&V schemes	5
II.3	Coordination mechanisms	13
III	Country Fact Sheets	19
Austria		20
Belgium		25
Bulgaria		32
Croatia		37
Cyprus		42
Czech		47
Denmark		50
Estonia		53
France		58
Finland		65
FYR of Macedonia		68
Germany		74
Greece		82
Hungary		87
Ireland		91
Italy		97
Latvia		102
Lithuania		108
Luxembourg		113
Malta		118
Netherlands		123
Poland		128

Portugal	132
Romania	136
Slovakia	140
Slovenia	144
Spain	148
Sweden	153
United Kingdom	156
<b>IV Conclusions</b>	<b>160</b>
M&V schemes	160
Coordination mechanisms	162
Lessons learnt	165

## List of Tables

**Table 1:** Overview of the completed and missing questionnaires and fact sheets. 4

## List of Figures

<b>Figure 1:</b> Implementation status of the M&V scheme.	5
<b>Figure 2:</b> Reasons for the establishment of the M&V scheme.	6
<b>Figure 3:</b> Responsible authorities for the administration of the M&V scheme.	7
<b>Figure 4:</b> Involved parties in the M&V scheme.	8
<b>Figure 5:</b> Administration of the M&V scheme.	9
<b>Figure 6:</b> Data sources for monitoring the energy efficiency measures.	10
<b>Figure 7:</b> Responsible authorities for data collection process.	11
<b>Figure 8:</b> Legal responsibility of energy policy formulation.	13
<b>Figure 9:</b> Assessment of aspects regarding the participation of the involved authorities in the energy efficiency formulation.	14
<b>Figure 10:</b> Assessment of the involvement of the authorities.	15
<b>Figure 11:</b> Incentives for the implementation of energy efficiency measures.	16
<b>Figure 12:</b> Assessment of financial and human capacities.	16
<b>Figure 13:</b> Assessment of access to data and evaluation.	17

## List of abbreviations

<b>AEA</b>	Austrian Energy Agency
<b>CRES</b>	Centre for Renewable Energy Sources and Savings
<b>EE</b>	Energy Efficiency
<b>EED</b>	Energy Efficiency Directive (2012/27/EU)
<b>EEO</b>	Energy Efficiency Obligation
<b>EI</b>	Ecologic Institute
<b>EIHP</b>	Energy Institute Hrvoje Požar
<b>EnR</b>	European Energy Network
<b>ESD</b>	Energy Service Directive (2006/32/EU)
<b>GIZ</b>	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
<b>IPE</b>	Institute of Physical Energetics
<b>LEI</b>	Lithuanian Energy Institute
<b>MACEF</b>	Macedonian Center for Energy Efficiency
<b>M&amp;V</b>	Monitoring & Verification
<b>RUC</b>	University of Roskilde
<b>SIEA</b>	Slovak Innovation and Energy Agency
<b>WP</b>	Work Package

# I Introduction

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The project **multEE - Facilitating multi-level governance for Energy Efficiency**, which is financed by the Horizon 2020 programme, aims at enhancing the consistency and quality of energy efficiency policy planning and implementation on different administrative levels in the beneficiary countries. Specifically, the multEE project intends firstly to introduce innovative monitoring and verification (M&V) schemes based on bottom-up data in order to ensure that the impact of energy efficiency measures is correctly evaluated and useable for future energy efficiency planning. Secondly, the vertical coordination between administrative levels shall be improved exploiting the full potential of the integrated M&V schemes and enhancing the overall quality of energy efficiency planning and implementation.

Within the framework of WP1 of the project, it is foreseen to conduct a thorough analysis of the status quo of the implemented M&V schemes and the established coordination mechanisms in the EU member states plus FYR of Macedonia. The aim of this analysis is to identify best practices and to utilise them for the development of more efficient M&V schemes in WP2 and country-specific coordination mechanisms in WP3. WP1 consists of three different tasks. In Task 1.1 the analytical framework for the mapping of the existing M&V schemes and coordination mechanisms and for the analysis of best practices has to be developed. Then, the mapping and analysis of the existing M&V schemes and coordination mechanisms has to be performed in Task 1.2 and finally the analysis of the identified best practices on existing M&V schemes and coordination mechanisms will be conducted in Task 1.3.

The **current deliverable (D.1.2) presents the results of the mapping of the existing M&V schemes and coordination mechanism in the 28 Member States plus the FYR of Macedonia**. The collection of the data for the mapping and the analysis of the existing M&V schemes and coordination mechanisms were performed with the common methodology, which was developed and presented in deliverable D.1.1. Specifically, the methodology was based on a specialized questionnaire facilitating the overall procedure of the mapping, while a specialized template was prepared in order to report efficiently the identified schemes and mechanisms.

Chapter 2 includes the main conclusions, which were derived by the mapping of the existing M&V schemes and coordination mechanisms, while Chapter 3 outlines briefly the main characteristics of them for the examined countries providing a fact sheet for each country separately.

## II Results of the comparative analysis

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### II.1 Introduction

The mapping of the existing M&V schemes and the coordination mechanism was performed according to the methodological framework, which was presented in D.1.1. Specifically, two versions of the questionnaire (the online and excel-based versions) were developed in order to facilitate its completion for the examined countries. It should be noted that the examined countries comprise the 28 Member States of the EU and the FYR of Macedonia.

The proposed data collection procedure consisted of two different stages. Firstly, the questionnaire was sent to specific key stakeholders, who deal with the energy efficiency issues in order to be completed according to their existing status of knowledge. Approximately 90 stakeholders were invited by a letter describing the main aims of the multEE project, pinpointing the necessity for the conduction of this action and asking kindly their contribution. The selected stakeholders are specialised experts in the field of energy efficiency working in official public institutions and authorities at national level, such as ministries and national research centres. Moreover, many of the stakeholders are members of the Concerted Action for EED project, the European Energy Network (EnR) and the official delegations of the MS in the EU, while some of them have been appointed as official representatives regarding the implementation of the Directives 2006/32/EC (ESD) and 2012/27/EU (EED) in their countries. The main criterion for the selection was the specialised knowledge and experience of the involved stakeholders, which has been acquired at official level through their involvement into the preparation of the National Energy Efficiency Action Plans and the incorporation of the ESD and EED into the national legislation.

CRES prepared a letter describing the main aims of the multEE project, pinpointing the necessity for the conduction of this action and asking kindly their contribution.

The questionnaire was sent centrally to the identified key stakeholders by the CRES and the questionnaires, which were returned, were distributed to each participating partner according to the allocation of the examined EU countries to the participating partners as specified in D.1.1.

Due to the fact that the response rate from the first approach was not sufficient for the analysis in Task 1.2 the participating partners conducted a bibliographical review in order to identify and record the available information for the allocated countries. The main sources for this bibliographical review included various sources, such as the National Energy Efficiency Actions Plans developed within

the framework of the ESD and EED, Country Profiles and National Reports from the ODYSSEE-MURE project, Sustainable Energy Action Plans, technical reports from EU studies and projects and publicly available documentations by national energy agencies and other authorities.

Moreover, each partner attempted to identify on his or her own stakeholders from the organizations or authorities, which are responsible for the development of the National Energy Efficiency Actions Plans, and to complement the questionnaire for the countries allocated to him or her. The targeted organizations or authorities consisted mainly of ministries and national research centres.

After the acquisition of all the necessary information, each participating partner completed - according to the allocation of the examined countries - the reporting template for the analysis of the identified M&V schemes and coordination mechanisms, which has been developed within the framework of Task 1.1 (Annex III of the D.1.1). The aim of this reporting template is the development of fact sheets for all the examined countries highlighting the main identified aspects derived by the examined M&V schemes and coordination mechanisms.

The questionnaire was completed for 29 countries and the corresponding 29 fact sheets, which were completed, are presented in the Chapter III.

Detailed information about the implemented procedure for the completion of the questionnaires and fact sheets is provided in the following Table.

**Table 1:** Overview of the completed and missing questionnaires and fact sheets.

Completed questionnaires by key stakeholders	Completed questionnaires by bibliographical review
Austria, Bulgaria, Croatia, Cyprus, Czech, France, FYR of Macedonia, Greece, Hungary, Italy, Latvia, Lithuania, Malta, Portugal, Romania, Slovakia, Slovenia, Spain	Belgium, Denmark, Estonia, Finland, Germany, Ireland, Luxembourg, Netherlands, Poland, Sweden, UK

It should be noted that the level of completeness of the questionnaires is assessed as satisfactory resulting in robust and reliable outcomes. For the case of M&V schemes the degree of completeness was approximately equal to 100%, while for the case of coordination mechanism it was lower in specific sections regarding the access to data and the evaluation of human and financial resources.

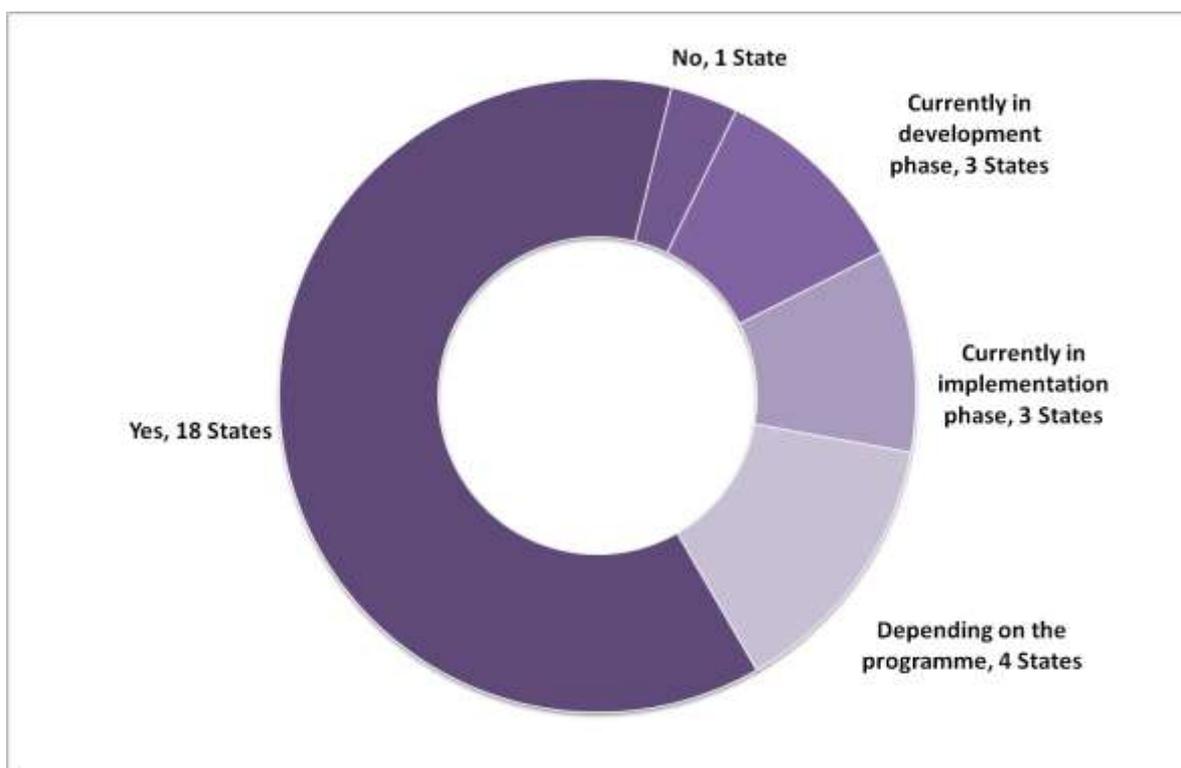
In any case the comparative analysis of the existing M&V schemes and coordination mechanisms was performed taking into account the valid responses of the completed questionnaires and the main results are discussed in the following sections. It should be mentioned that the interpretation of the findings

within the framework of this study does not depict necessarily the official opinion of the examined States.

## II.2 M&V schemes

The vast majority of the examined States have already introduced a general M&V scheme or a certain number of M&V schemes for different energy efficiency programs. As presented in Figure 1 18 States have already developed a M&V scheme, while the M&V scheme is currently in development phase and in implementation phase for 3 of the examined States.

Moreover, in 4 States the development of the M&V scheme depends on the implemented programs implying a diversification of the established M&V schemes in relation to the requirements of each energy efficiency measure. Finally, only one State has not set up a M&V scheme, but it has introduced rules for the monitoring of the energy efficiency measures. Therefore, all the States have experience with M&V schemes, as the establishment of the M&V schemes have been completed either wholly or partly indicating a significant degree of preparation for the monitoring of the achieved energy savings and the fulfilment of the energy efficiency targets.

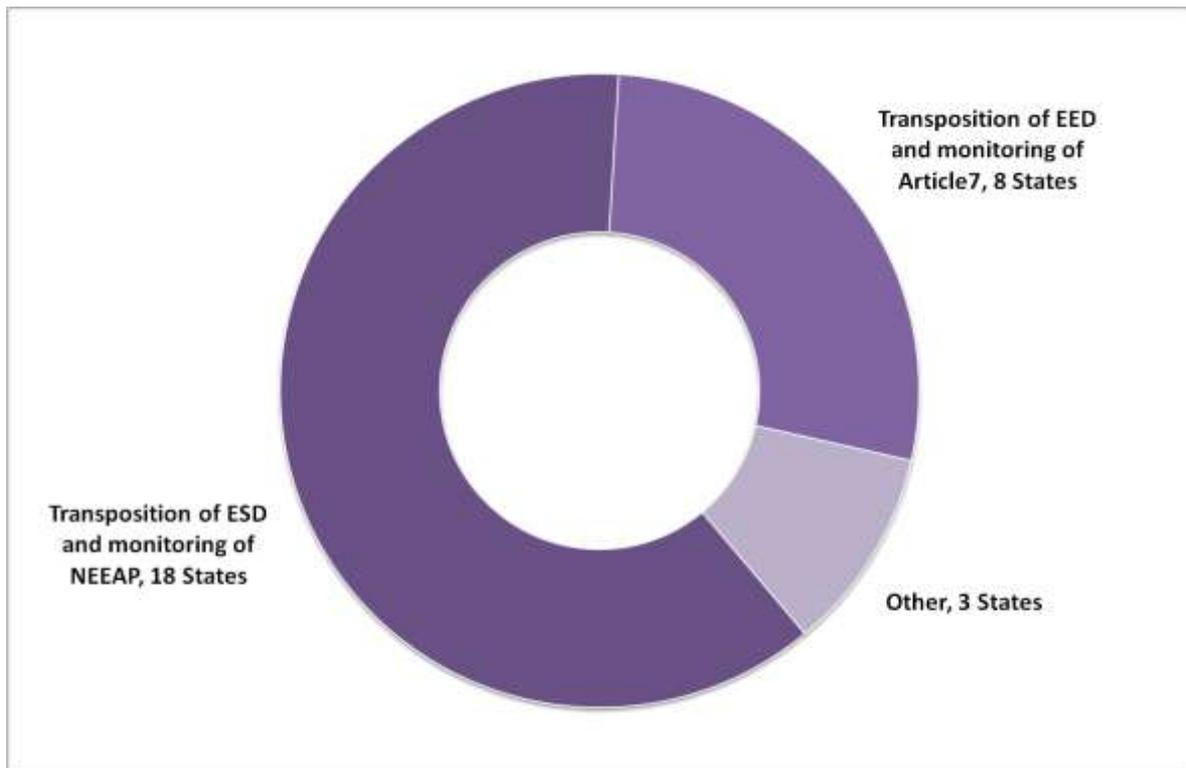


**Figure 1:** Implementation status of the M&V schemes.

Almost in all the States the developed M&V schemes are in compliance with the respective National Energy Efficiency Action Plans and the requirements as

derived during the implementation of the EED and ESD. Nevertheless, one State claimed that the degree of compliance with the corresponding European legislation depends on the implemented M&V scheme and their peculiarities, while respondents from one State admitted that the M&V scheme has not been defined in line with the respective National Energy Efficiency Action Plans.

According to the results presented in Figure 2, the existing M&V schemes have been established and introduced in the States either through the transposition of the ESD and the monitoring of the National Energy Efficiency Action Plans (18 States) or through the transposition of the EED and the monitoring of Article 7 (8 States). The majority of the States have adequate experience in the operation of the M&V schemes due to the fact that the establishment was performed within the framework of the ESD, which was adopted in 2006. Nevertheless, the experience of the States may not be considerable for the cases that the establishment of the M&V schemes was performed within the framework of Article 7 of the EED due to the short period of implementation. Moreover, in 3 States the monitoring of each energy efficiency measure was designed separately according to the operational characteristics and not within the framework of the ESD and EED.

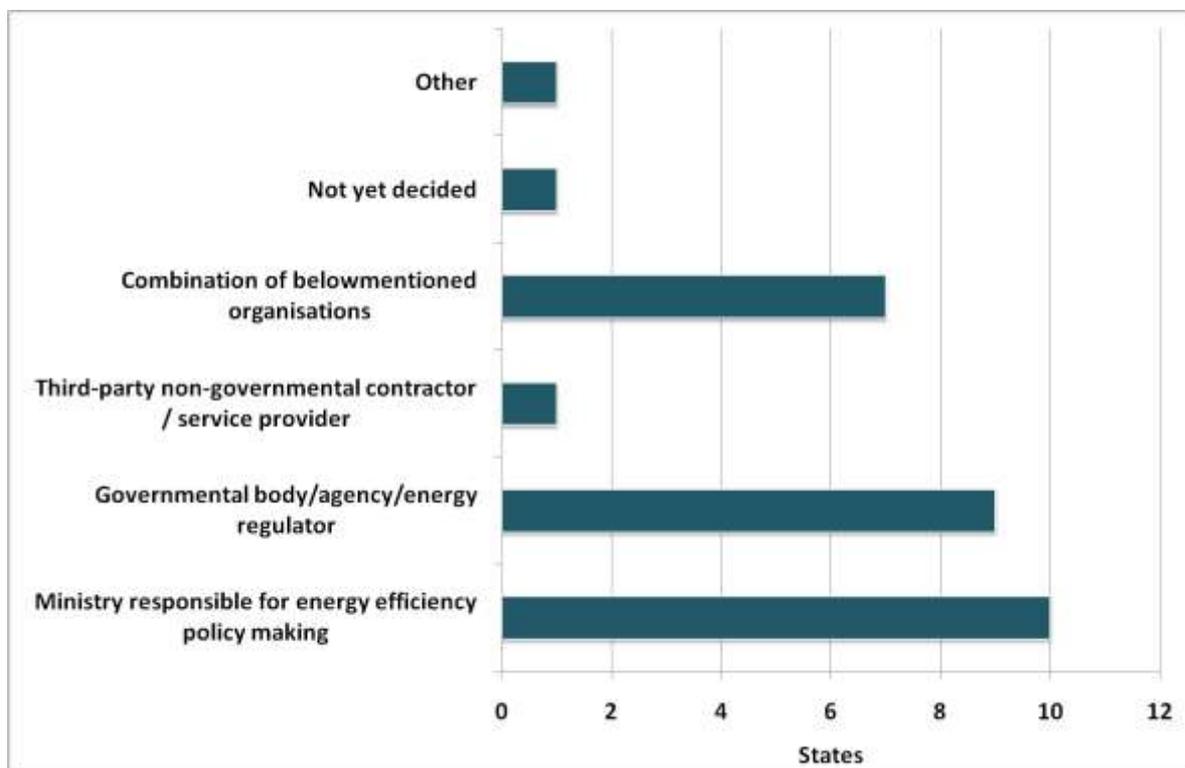


**Figure 2:** Reasons for the establishment of the M&V scheme.

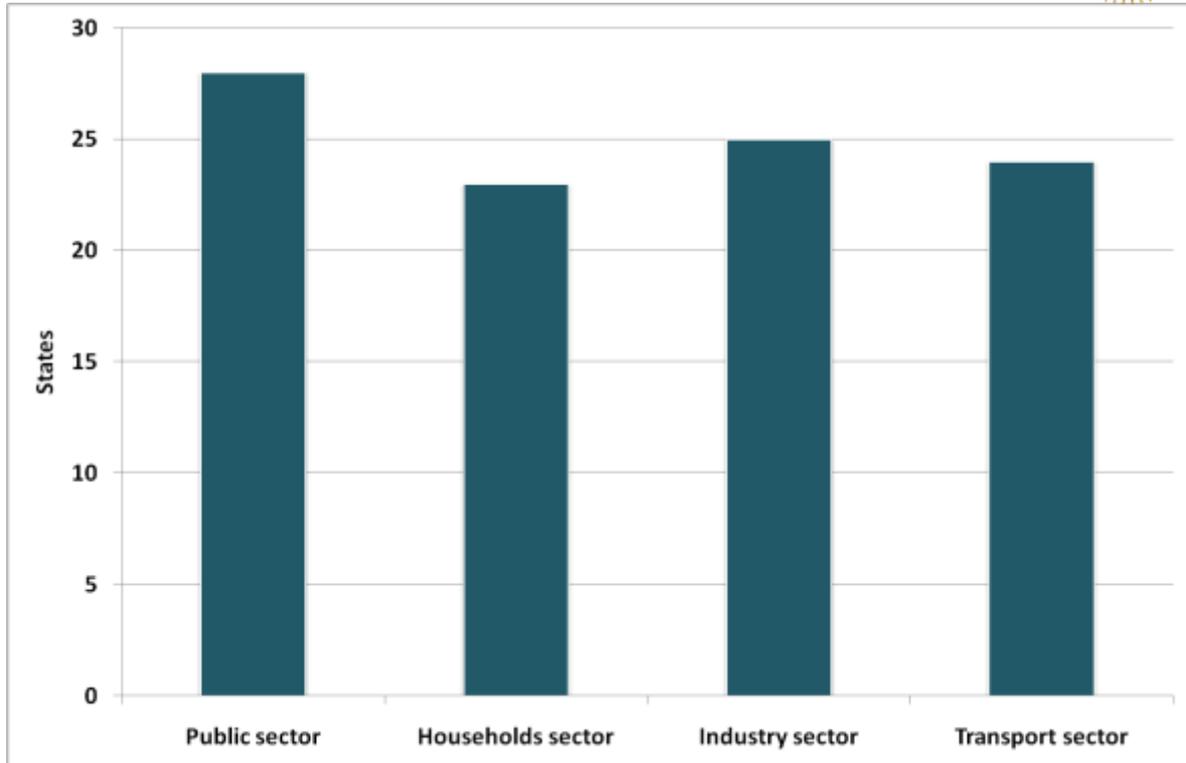
The ministries, which are responsible for the formulation of the energy efficiency policy, have undertaken the administration and coordination of the M&V scheme (10 States) as depicted in Figure 3. Moreover, 9 States have appointed

responsibilities to a governmental body or an agency or an energy regulator regarding the coordination and administration of the M&V schemes. Nevertheless, only one State has selected a third-party non-governmental contractor or a service provider for the role of administrator or coordinator. Moreover, a combination of the abovementioned organizations has been appointed for the coordination of the M&V schemes for 7 States. Finally, one State preferred to assign the responsibilities to different monitoring bodies according to the characteristics of the energy efficiency measures.

The existing M&V schemes cover implemented energy efficiency measures in public (28 States), residential (23 States), industrial (25 States) and transport (24 States) sectors (Figure 4). Consequently, all the sectors of final energy consumption have almost equivalent potential for the implementation of energy efficiency measures.



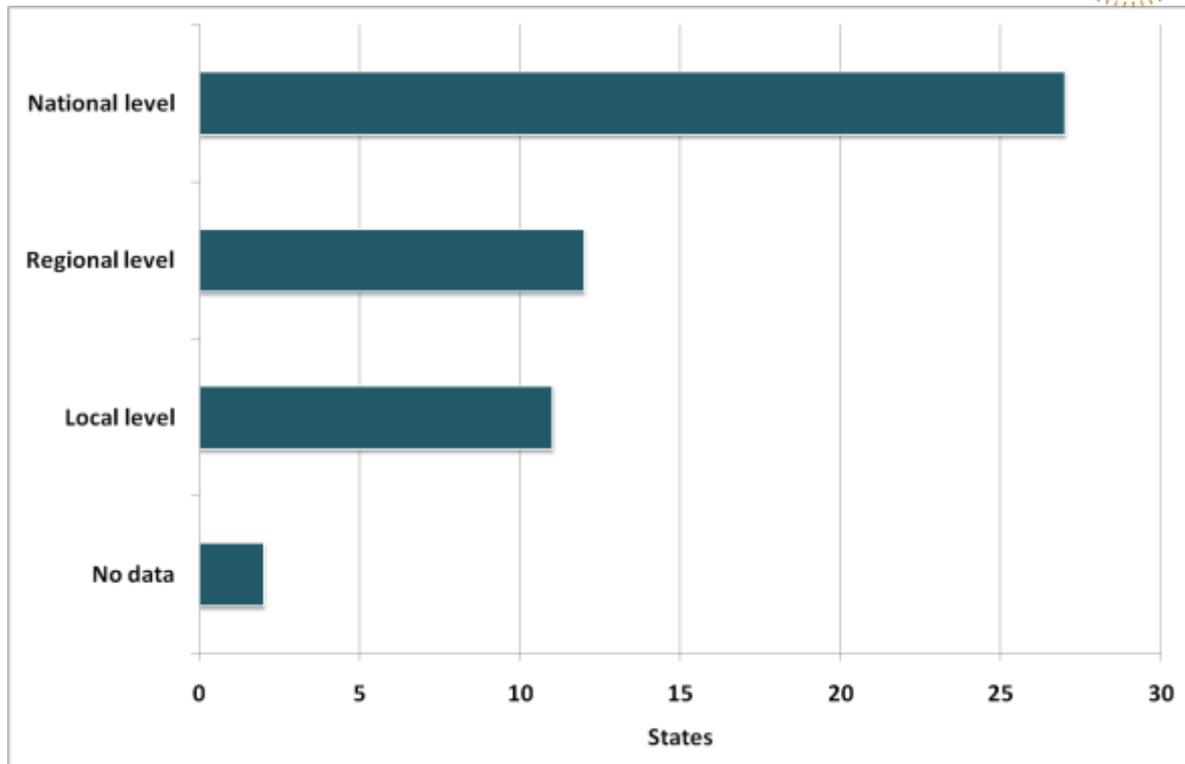
**Figure 3:** Responsible authorities for the administration of the M&V scheme.



**Figure 4:** Sectors covered by the M&V scheme.

Furthermore, 20 States have introduced energy efficiency measures in the four examined sectors, 4 States in three different sectors, 3 States in two different sectors and 2 States in one only sector.

The implementation of the energy efficiency measures, which are covered by the M&V schemes, is performed mainly at national level (27 States). Nevertheless, the implemented energy efficiency measures are coordinated also at regional (12 States) and local (11 States) level (Figure 5). The involvement of regional and local authorities in the administration of the M&V scheme can be assessed as limited.



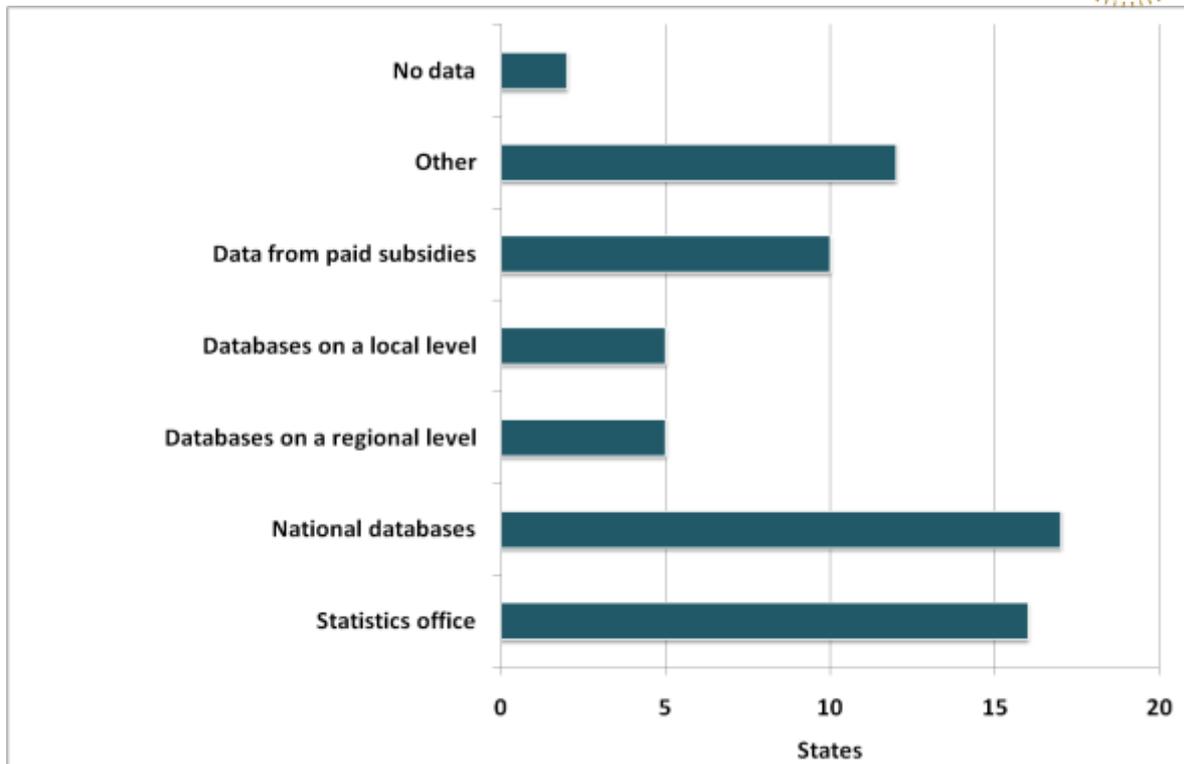
**Figure 5:** Administration of the M&V scheme.

It should be noted that the participation in the M&V scheme is mandatory for certain parties in the examined States, especially for those which have introduced Energy Efficiency Obligation Schemes according to Article 7 of the EED.

The most common energy efficiency measures comprise the energy upgrade of the building envelope in the residential and tertiary sector, the increase of the energy efficiency in the industrial sector and the further penetration of highly efficient vehicles. A variety of measures also are implemented including the conduction of energy audits, the installation of smart meters, the deployment of highly efficient street lighting, the establishment of energy management systems, promotion of highly efficient cogeneration of electricity and heat etc.

Especially for the case of energy efficiency measures in buildings, the most important technologies consist of the envelope's insulation, the upgrade of new heating/cooling and hot water systems and the further penetration of heat pumps and renewable energy sources.

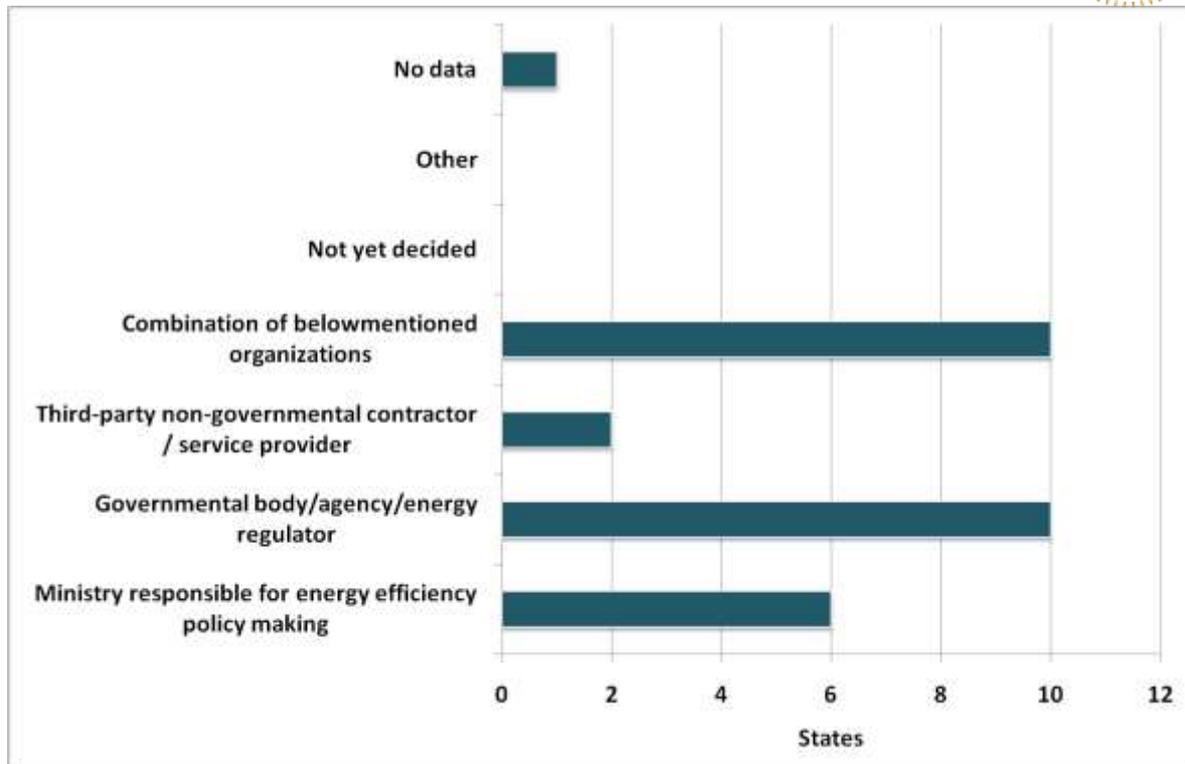
The main data sources, which are utilized for the monitoring of the implemented energy efficiency measures and the measurement of the achieved energy savings in different sectors comprise the official national statistics office (16 States), national databases (17 States) and data from paid subsidies (10 States). Moreover, data from databases at regional (5 States) and local (5 States) level are utilized at lower degree (Figure 6).



**Figure 6:** Data sources for monitoring the energy efficiency measures.

Furthermore, in 12 States additional data sources are utilised for the estimation of the achieved energy savings. Indicatively, these sources include the actual measured data provided by the conducted energy audits, the registries of Energy Performance Certificates, the provided data from the involved parties within the energy efficiency obligation schemes, the public sector enterprises and authorities and various other associations and chambers associated with the implemented energy efficiency measures.

According to the results presented in Figure 7, the Ministry, which is responsible for the formulation of the energy efficiency policy, has undertaken the coordination of the data collection process (6 States). Nevertheless, the involvement of a governmental body or an agency or an energy regulator is relatively higher (10 States), while the corresponding participation of a third-party non-governmental contractor or a service provider is limited (1 State). Finally, the combination of the above mentioned organizations constitutes the most popular alternative (10 States) due to the technical requirements, which are required for the coordination and application of the data collection process.



**Figure 7:** Responsible authorities for data collection process.

All the States have already established bottom-up procedures for the monitoring of the energy efficiency measures and the measurement of the achieved energy savings. This tendency can be considered mainly as the result of the implementation of Article 7 of the EED, which requires the obligatory evaluation of the energy efficiency measures and the quantification of the achieved energy savings with specific bottom-up methodologies. It should be noted that in few examined States bottom-up procedures were established earlier within the framework of National Energy Efficiency Action Plans as foreseen by the ESD directive. Nevertheless, almost half of the States continue to utilize top-down approaches for the monitoring of the energy savings targets according to the requirements of the ESD. Moreover, specific top-down approaches are implemented for the assessment of the energy efficiency measures on sectoral level.

Regarding the developed bottom-up procedures a common conclusion derived by the comparative analysis is the diversification of the selected approaches. Numerous bottom-up equations have been established for the same types of energy efficiency measures taking into consideration the specific peculiarities of each State. Nevertheless, due to the fact that the States attempt to comply with the requirements of Annex V of the EED the majority of the implemented bottom-up approaches are based on the four proposed methods (deemed, scaled, surveyed, and metered savings). This tendency confirms the necessity to deploy

homogeneous bottom-up approaches in order to be utilised from the States facilitating the comparison of the performed energy savings measures within EU.

Some aspects of specific bottom-up approaches can be taken into consideration in the development of a robust and effective M&V scheme, such as the potential utilization of the energy performance certificates before and after the interventions for each building separately in order to quantify the estimated energy savings. Furthermore, the developed bottom-up approaches within the framework of the Energy Efficiency Obligation and White Certificates Schemes should be further analysed identifying the most valuable aspects. Indicatively, it can be mentioned the development of bottom-up approaches for a specific catalogue of energy efficiency measures.

The authorities, that are responsible for the administration and coordination of the M&V scheme as well as for the implementation of the data collection procedure, have also developed the methodology and determined indicators used in the bottom-up procedures. Nevertheless, in some cases independent energy experts contribute also to the foreseen procedures for the development of the appropriate methodologies and indicators.

The most common utilized approach for the verification of the measured energy savings comprises the conduction of inspections of a representative sample of the implemented energy efficiency measures. These checks are performed by certified and qualified energy auditors independently. Moreover, the verification procedures include both the onsite controls of selected energy efficiency projects and the evaluation of the submitted reports on the energy savings by the beneficiaries or the administrators of the measures regarding their accuracy and completeness. Finally, in some cases the verification is performed through specialized models and algorithms in order to compare with the expected energy savings.

Almost all the States have established specific targets considering the implementation of the monitored and verified energy efficiency measures according to the requirement of Article 7 of the EED. It should be noted that the States should specify cumulative targets for two reporting periods at least, while the annual report assesses the progress on the implementation of the foreseen energy efficiency measures within the framework of the EED.

The reporting period for the majority of the States has been established on an annual basis (25 States) as driven by the reporting obligations of the EED. Nevertheless, in few States (4 States) the reporting period depends on the reporting requirements of each energy efficiency measure separately.

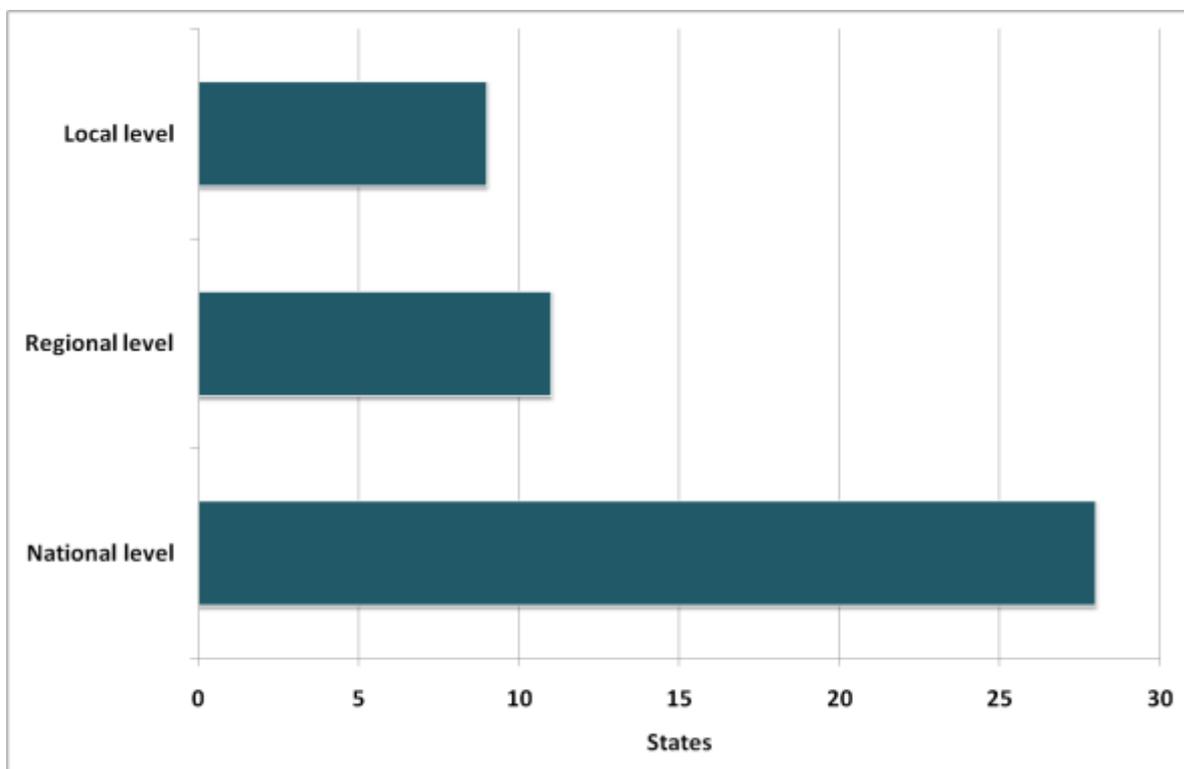
In 15 States no integrated tool for the homogeneous monitoring and reporting of the M&V schemes could have been identified. Nevertheless, in 10 States a type of tool (including various types of databases) is in operation and is utilized

facilitating the M&V procedures. Finally, no data was accessible for the case of 4 States.

Finally, few States have specified quantified estimates about the achieved energy savings in order to assess the effectiveness and the applicability of the existing M&V schemes. This can be justified by the fact that the actual implementation of Article 7 has just started in 2014 and many States have shown no satisfactory progress on the fulfilment of the energy saving targets yet.

### II.3 Coordination mechanisms

Regarding the coordination mechanisms, the legal responsibility for energy policy formulation lies mainly at national level (28 States).



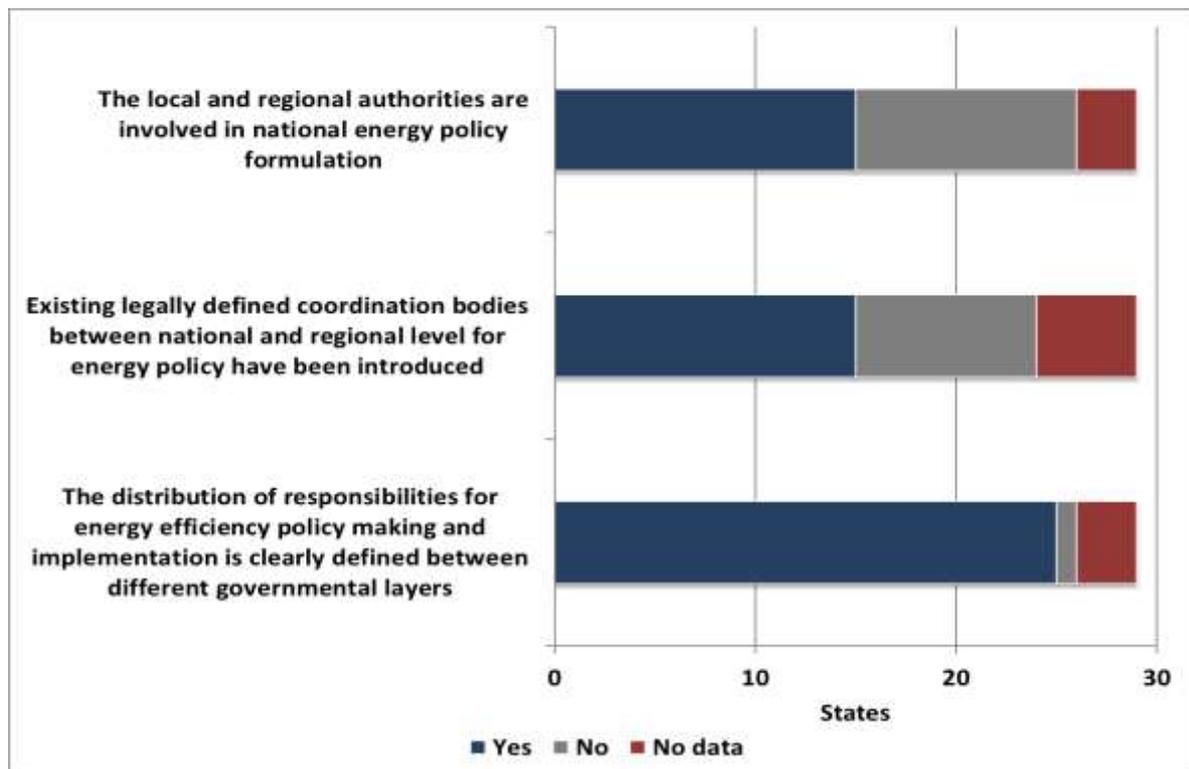
**Figure 8:** Legal responsibility of energy policy formulation.

Nevertheless, as depicted in Figure 8, in 11 States also the regional level has the legal responsibility to formulate energy efficiency policies, while in 9 States the local level has a legal responsibility to formulate energy efficiency policies as well.

Regarding the legal competence for EE policy formulation, it should be noted that in 12 States only one ministry has this legal competence. In the rest of the States more than one ministry is involved in the formulation of energy efficiency policies.

This is based on the fact that the majority of the energy efficiency measures focus on interventions in completely different sectors requiring the contribution of the responsible authority in order to ensure the applicability and effectiveness of the planned measures.

As presented in Figure 9, the responsibilities for energy efficiency policy making and implementation are clearly defined between different governmental layers for almost all the examined countries (25 States).

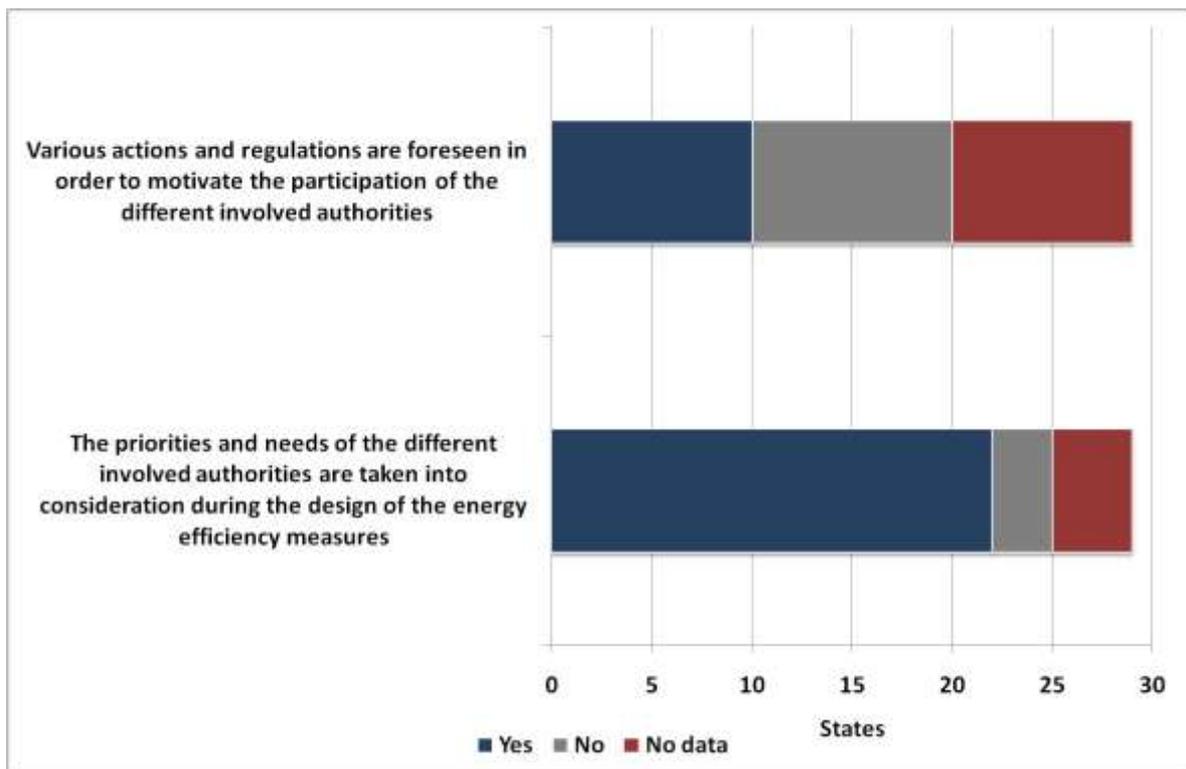


**Figure 9:** Assessment of aspects regarding the participation of the involved authorities in the energy efficiency formulation.

Moreover, 15 States have established specific formal or informal coordination bodies between national and regional level for the formulation of energy policy, while the local and regional authorities are involved or consulted in the one or other way in national energy policy formulation (15 States). No data were collected for 3, 5 and 3 States correspondingly during these questions.

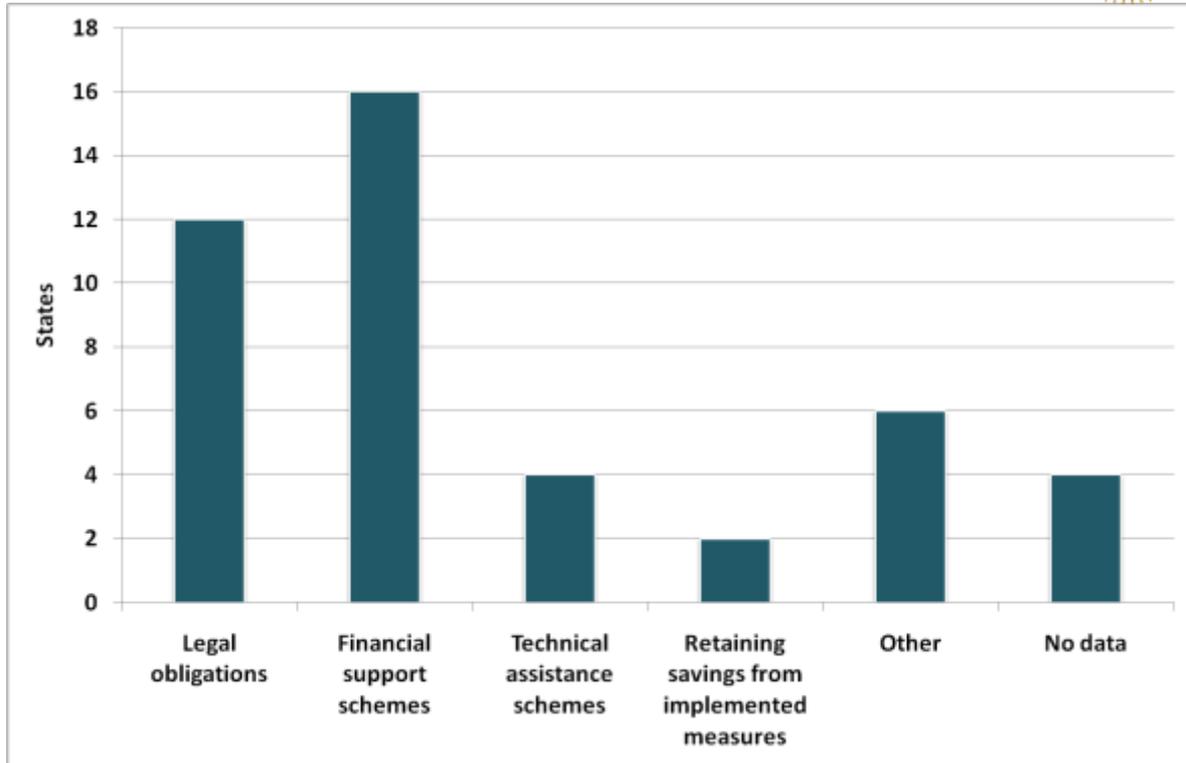
In the majority of the States (22 States) the priorities and needs of the different involved authorities are taken into consideration during the design of the energy efficiency measures. 3 States have not introduced such procedures, while no data could be collected for the case of 4 States. 10 States have organized actions and adopted regulations in order to motivate the participation of the different involved authorities (Figure 10).

The main initiatives, which have contributed to the fulfilment of these outcomes comprise the constitution of specialised working groups, the organization of public consultations, the development of regional and local energy plans etc. 10 States have not introduced such procedures, while no data were collected for the case of 9 States.

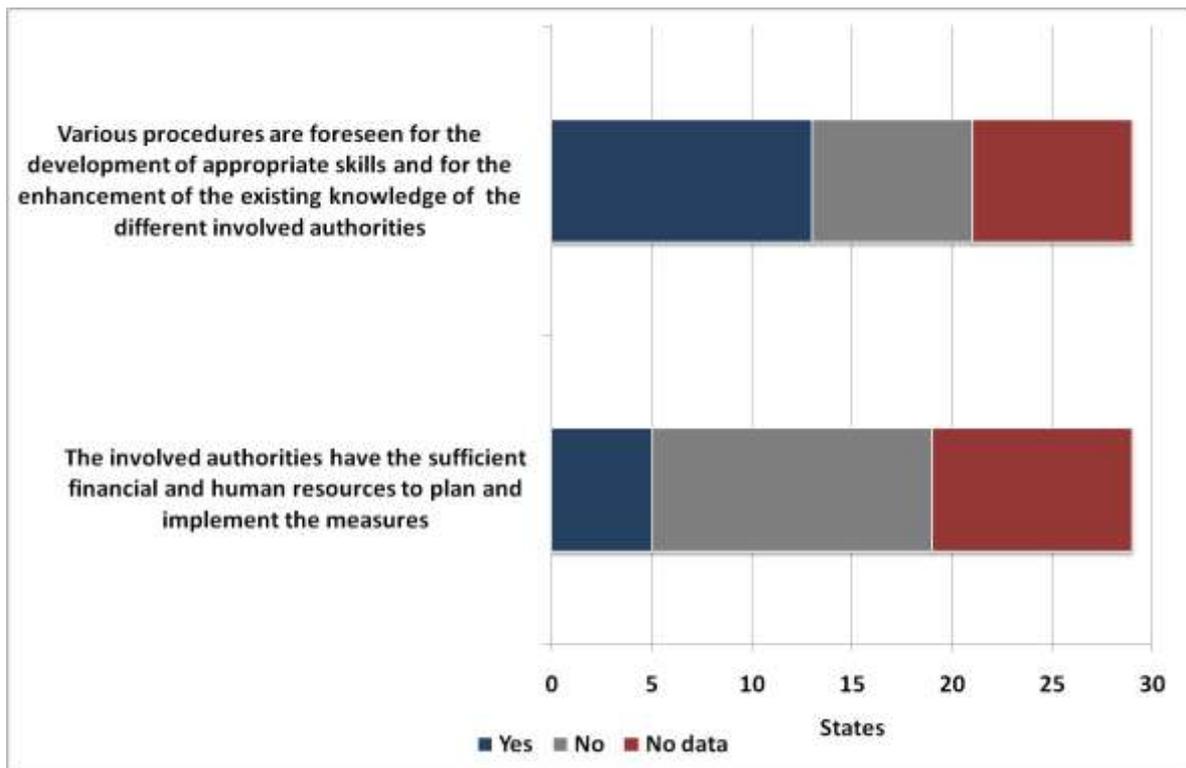


**Figure 10:** Assessment of the involvement of the authorities.

According to Figure 11, the majority of the States tend to incentivize the local and regional governments for implementing energy efficiency measures through the adoption of legal obligations (12 States) and the development of specific financial support schemes (16 States). Nevertheless, the mechanisms regarding the establishment of technical assistance schemes (4 States) and the exploitation of the retaining savings from implemented measures (2 States) have limited application. Finally, 6 States adopted additional mechanisms, such as the implementation of cooperative projects within the Sustainable Energy Action Plans and energy saving initiatives financed indicatively by the ERDF and the White Certificates Scheme. No data were collected for the case of 4 States.



**Figure 11:** Incentives for the implementation of energy efficiency measures.

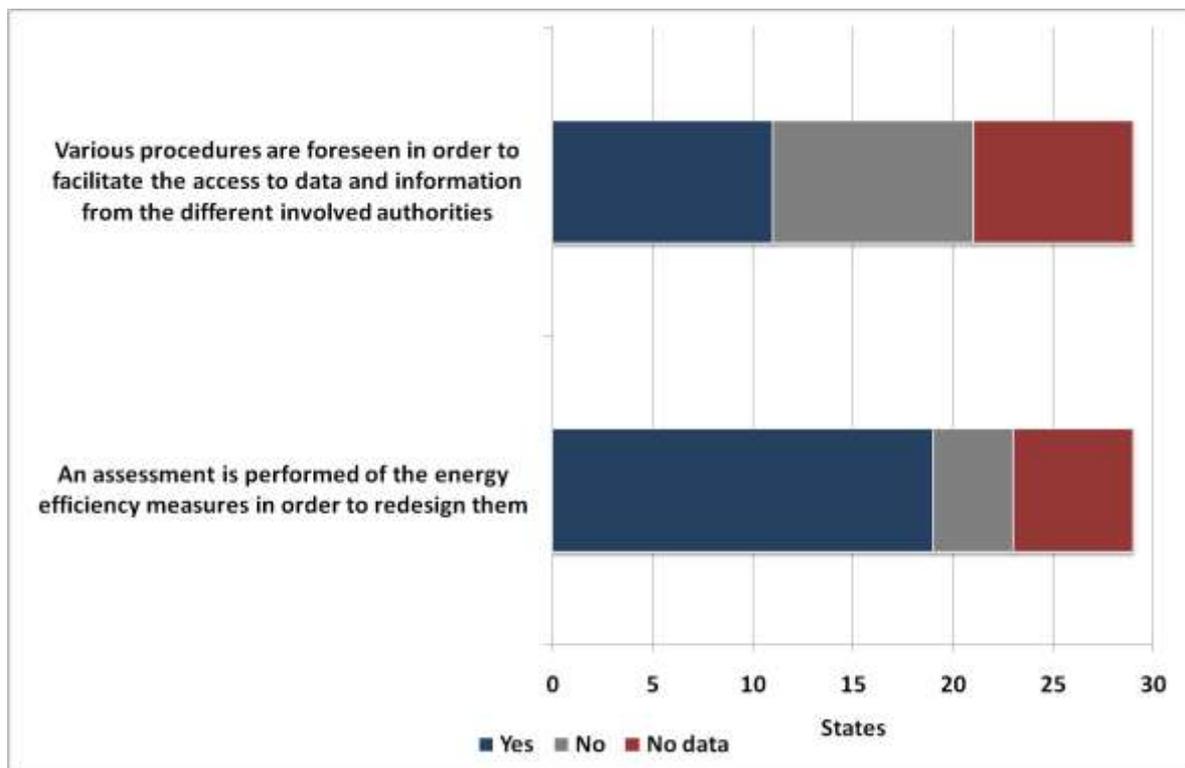


**Figure 12:** Assessment of financial and human capacities.

In 14 States the involved authorities do not have the sufficient financial and human resources in order to plan and implement the measures defined in national plans (Figure 12). Only for 5 States the current status of financial and human resources was assessed as capable constituting as crucial the elicitation of quantified figures about the required resources for the implementation of the energy efficiency measures. Finally, no data were collected for the case of 10 States indicating the difficulty in providing the necessary estimation.

Furthermore, 13 States have introduced procedures for the development of appropriate skills and for the enhancement of the existing knowledge of the different involved authorities during the planning and implementation phase of the energy efficiency measures. Contrariwise, 8 States have not established any such initiative. These initiatives include the conduction of workshops and training activities in order to raise the existing level of knowledge and skills. Finally, no data were collected for the case of 8 States.

An assessment of the energy efficiency measures among the involved authorities in order to redesign them is performed for 19 States during the implementation phase of the energy efficiency measures (Figure 13).



**Figure 13:** Assessment of access to data and evaluation.

This is achieved mainly through the compilation and submission of the annual reports for the evaluation of the progress on the fulfilment of energy saving

targets within the framework of the EED. 4 States have not introduced such a procedure, while no data were collected for the case of 6 States.

Finally, 11 States have introduced procedures so as to facilitate the access to data and information from the different involved authorities during the planning and implementation phase of the energy efficiency measures. These procedures include the constitution of specialised working groups and mechanisms for exchanging the necessary information, the signature of memorandums of understanding between the authorities and the development of specialised template facilitating the data collection within the developed action energy plans and the submitted reports. 10 States have not introduced such procedures, while no data were collected for the case of 8 States.

## III Country Fact Sheets

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The current section comprises the completed reporting templates for the mapping of the existing M&V schemes and coordination mechanisms for the 28 EU Member States and the FYR of Macedonia.

Totally, 29 fact sheets were completed presenting a brief outline of the main characteristics of the existing M&V schemes and coordination mechanisms as resulted by the conducted mapping.

## M&V schemes and coordination mechanisms

### Austria



#### I. M&V schemes

##### 1. General framework

In Austria, a national M&V scheme for energy efficiency measures was established firstly during the implementation of Directive 2006/32/EC on energy end-use efficiency and energy services (ESD). The M&V scheme consisted of an online database, which was used by all parties affected by the ESD to report the initiated energy efficiency measures (mostly through subsidy schemes) in the energy end-use sectors. For reporting the progress in achieving the 9% target of the ESD, Austria chose to follow a bottom-up approach and to calculate energy savings from energy efficiency measures mostly with nationally approved default values per individual measure through means of the online database. With the repeal of the ESD and the adoption of Directive 2012/27/EU on energy efficiency (EED), Austria has set up a new system for monitoring the implementation of the EED, which is compliant with the requirements of the EED and the Austrian Energy Efficiency Law transposing this Directive into the national legislation.

##### 2. Design

###### *2.1 Administrative authority*

The M&V scheme in Austria is administered and coordinated by the Austrian Energy Agency, which qualifies as a third party non-governmental contractor. The Austrian Energy Agency was designated by the Austrian Federal Ministry of Science, Research and Economy as national monitoring body in May 2015 after a national competitive bidding process.

###### *2.2 Sectoral and spatial analysis*

The regional and national administrative levels participate actively in the Austrian M&V scheme for energy efficiency, reporting energy efficiency measures they have subsidized to the national monitoring body on a yearly basis. Obligated parties of the M&V scheme are however only the federal bodies and the parties of the energy efficiency obligation scheme (energy providers) according to Article 7 of the EED. Local authorities and companies not falling under Article 7 of the EED are not required to implement and report energy efficiency measures. However, if local authorities and companies have received subsidies for implementing energy efficiency measures in their sphere of action, the effects of these measures are reflected in the savings reported by the national agency funding these measures.

The sectors targeted within the M&V scheme in Austria comprise all the end-use sectors households, services, industries, public sector and to a minor extent transport.

### ***2.3 Energy efficiency measures and technologies***

The M&V scheme according to the EED is just about to become operational in Austria. Therefore, it is not yet possible to state which measures and technologies are the most efficient. However according to Austria's latest National Energy Efficiency Action Plan, a substantial part of energy efficiency gains results from measures implemented in the area of space heating, i.e. thermal retrofit of the building shell (61.9%) and improvements of the heating systems (31.9%), including measures related to installing energy efficient boilers, heat pumps, solar thermal plants and connecting buildings to the district heating grid. Moreover, additional monitored measures and technologies consist of household appliances, energy audits for households and industry and lighting and heat distribution systems.

## **3. Implementation**

### ***3.1 Data collection and measurement procedures***

Most of the data on energy efficiency measures stems from the regional and national funding agencies, which provide subsidies for financing part of the investment cost of energy efficiency measures. Some data is also available in national databases.

The national monitoring body is responsible for setting up the data collection process and for informing all relevant stakeholders about the process. The national monitoring body is also responsible for developing and updating bottom-up calculation methods for quantifying the theoretical savings stemming from the energy efficiency measures reported to the national monitoring body. A great variety of bottom-up calculation methods was developed so far over the past years by the national monitoring body, which has also researched and defined national default values (e.g. average specific heating demand of residential buildings in stock, average energy efficiency of wet appliances in stock) in consultation with relevant stakeholders (e.g. advocacy groups of energy suppliers). In addition, the national monitoring body also calculates and updates appropriate energy efficiency indicators and uses national statistics available from the national statistical office to do so.

### ***3.2 Verification procedures***

The energy savings reported are verified by means of plausibility checks and in depth sample checks of statistically significant proportions of the implemented energy efficiency projects. Moreover, selected projects will be verified through on site visits.

With the implementation of an energy efficiency obligation scheme according to Article 7 of the EED in Austria, the obligated parties have to prove on a yearly basis whether they have fulfilled their stipulated yearly savings target.

### ***3.3 Reporting procedures***

The reporting of energy efficiency measures and savings is performed on annual basis.

## **4. Assessment**

### ***4.1 Energy performance***

As stated in chapter 2.3 it is not yet possible to evaluate the effectiveness of the implemented energy efficiency measures and technologies.

### ***4.2 Integrated tools***

The data on implemented energy efficiency measures are collected in a central online database.

## **5. Conclusions**

With the requirement to transpose the ESD at national level by mid-2008 and to monitor the progress made in achieving the energy saving target of 9% on a regular basis, Austria has established a bottom-up monitoring system for energy efficiency end-use measures, which becomes operational in late autumn 2015. This monitoring system has been completely revised and adapted to the requirements of the EED repealing the ESD as of December 2012 and the Austrian Federal Energy Efficiency Law of August 2014.

The Austrian Energy Agency is the national monitoring body for Austria, being in charge, among others, of setting up the entire monitoring process, developing a central online-database for the reporting of the implemented energy efficiency measures, developing and updating bottom-up calculation methods and reporting the savings to the Federal Ministry of Science, Research and Economy. Finally, the M&V scheme in Austria obliges the federal bodies and obligated parties of the Energy Efficiency Obligation scheme to report energy efficiency measures on a yearly basis. A statistically significant sample of these will be verified by the national monitoring body by means of plausibility checks, in depth checks and occasionally by means of on-site visits.

## II. Coordination mechanisms

### 1. General framework

Being a federal state, the regional levels in Austria (composed of 9 federal provinces) have a variety of competences that allow them to pass laws and decrees and to define policies in certain areas with energy being one of them. Therefore, energy policy making is not only within the legal responsibility of the national state, but also within the regional provinces. On the other hand, local authorities are free to develop their own energy policies suitable for their sphere of action. However, they have no legal competence and responsibility respectively to introduce laws and decrees. On national level, the Federal Ministry of Science, Research and Economy, the Federal Ministry of Agriculture, Forestry, Environment and Water Management and the Federal Ministry of Transport, Innovation and Technology have the legal responsibility in energy efficiency policy formulation.

### 2. Operational issues

#### *2.1 Involved parties and responsibilities*

Responsibilities for energy efficiency policy making and implementation are clearly defined between the Federal Ministries as well as between the national and regional administrations in Austria.

No coordination body exists between the national and regional level for energy policy making. However, the federal states are usually represented in task forces, strategic coordination groups and similar settings when important strategies such as the Austrian Energy Strategy are developed. In such cases, representatives from federal states are also involved in the development and/or adaption of energy efficiency measures, when participating in different working groups, each in charge of a different energy topic. On the other hand, regional energy strategies are usually formulated without involving representatives from the national level. Local authorities usually do not play a role in national or regional energy policy formulation either.

Improvements in energy efficiency at local and regional level often comply with local or regional energy targets that the respective administrative levels have set for their territory (e.g. stabilising energy consumption at the level of a certain year) and are eager to achieve what, in consequence, usually leads to the implementation of energy efficiency measures. In addition, subsidy programmes for local authorities have introduced, which cover up to 30% of the investment cost of their energy efficiency measure. Another instrument to incentivize energy efficiency improvements is the energy efficiency obligation scheme that obliges energy suppliers to achieve yearly energy savings of 0.6% of their annual energy sales to final customers by means of implementing energy efficiency measures in

end-use sectors. Measures implemented at local and regional level can account for the suppliers' energy savings target.

## ***2.2 Financial and human capacities***

Limited budgets often restrict the implementation of energy efficiency measures, especially of measures with high investment cost and long pay-back periods. On the other hand, it has been noted in Austria that subsidy funds are not always used up as other barriers obviously hamper the implementation of energy efficiency measures.

In general, the lack of financial and human resources is also hindering the implementation of energy efficiency measures defined in national plans in Austria to some extent. With regard to qualification of administrative staff, no procedures are foreseen or in place to develop appropriate skills and enhance the existing knowledge at administrative level during the planning and implementation phase of measures. However, such skills and knowledge can be originated from the market where a large network of qualified energy consultants exists.

## ***2.3 Access to data and evaluation***

In Austria, energy efficiency measures are not assessed during their implementation phase for their potential redesigning.

No procedures have been foreseen either to facilitate access to data and information from the different authorities involved during the planning and implementation phase.

## **3. Conclusions**

In Austria, energy policy making is not regulated through an established and institutionalized coordination mechanism. However, when important energy and/or climate relevant strategies and policies are developed at national level, representatives from the federal governments usually participate in such processes. Energy is though a matter which is not only the legal responsibility of the national administration but also of the federal provinces. They may adopt their own energy-specific laws and decrees and develop energy policies independent from those at national level – theoretically, in practice their strategic approach and measures are similar to the national ones, and sometimes even more ambitious. In addition, the 2,100 local authorities in Austria may also develop their own local energy policies and have to respect regional laws and decrees if they become relevant for the implementation of their policies. The implementation of energy efficiency measures at regional and local level is incentivized through subsidies schemes targeting, among others, local authorities, and the energy efficiency obligation scheme obliging energy suppliers to implement energy efficiency measures in the end-use sector including local authorities.

## M&V schemes and coordination mechanisms

### Belgium



#### I. M&V schemes

##### 1. General framework

Belgium is a federal state and is divided into three regions, namely the Flemish region, the Walloon region, and the Brussels-Capital region. The responsibility for the formulation of the energy policies related to the rational use of energy falls within the competence of these regions. They have drafted each their own National Energy Efficiency Action Plans and therefore also implement the Directives 2006/32/EC (ESD) and 2012/27/EU (EED) on their own territory. The monitoring related to the implementation of the EED is within the responsibility of each region.

##### 2. Design

###### **2.1 Administrative authority**

The administrative authorities for the monitoring of the energy efficiency policies, in particular the implementation of the ESD and EED are presented in the following sections.

***State level:*** The Federal Public Service of Economy, S.M.E.'s, Self-employed and Energy, DG Energy, more specifically the Directorate General of Energy, is charged with overall control and responsibility for overseeing the framework set up in connection with the implementation of the ESD and the EED within the federal government. The DG Energy is also responsible for the coordination of the transposition of the EED and the reporting on the implemented energy efficiency measures. In this context, the DG Energy maintains contacts with the other competent Federal Public Services.

***Brussels-Capital Region:*** The Brussels Institute for Environmental Management (IBGE-BIM) has expertise in environmental and energy issues of the Brussels-Capital Region. The IBGE-BIM is a public interest organization. One of the initial missions of the Brussels Institute for Environmental Management is to study the application and implementation of the rules of the European Union both on the environment and the rational use of energy.

***Flemish Region:*** The Flemish Energy Agency, abbreviated VEA, has been appointed to monitor the implementation of energy efficiency policies in Flanders.

VEA was founded by the Flemish Government Decree of 16 April 2004 and has been operational since 1 April 2006. It is an internal autonomous agency without legal identity within the Flemish Ministry of Environment, Nature and Energy.

*Walloon Region:* The Department for Energy and Sustainable Building from the operational Directorate General for Spatial Planning, Housing, Heritage and Energy of the Walloon Public Service is the department of the Walloon administration in charge of implementing the competencies allocated to Wallonia what regards energy issues according to the Special Law for Institutional Reform dated August 8<sup>th</sup> 1980 (art 6, VII).

## 2.2 Sectoral and spatial analysis

The sectors, which are covered by the M&V scheme within the implementation of the ESD and EED comprise the buildings sector, the industry sector including SMEs, the energy sector, the transport sector, the agriculture & horticulture sector and the public sector. Measures are implemented at regional and national level and are reported within the National Energy Efficiency Action Plans.

## 2.3 Energy efficiency measures and technologies

In Belgium, each region develops and implements its own energy efficiency action plans. The measures listed in the 3<sup>rd</sup> National Energy Efficiency Action Plans of Belgium, mostly related to Article 7 of the EED, are presented in the following table.

Region	Sector	Measures
Brussels-Capital Region	Buildings	BATEX (Construction and refurbishment of energy efficient building) PLAGE (Energy management plans for energy efficiency improvements in large buildings) Heating system control in residential and tertiary buildings Energy audits Energy House (Advice on energy efficiency measures) Energy subsidies (Implementation of energy efficiency measures in buildings) Charge for energy efficiency investments
	Energy	Energy efficiency obligations for oil suppliers paying money into a fund feeding the budget for energy subsidies
Walloon Region	Buildings	Heating system control Training and information Information on energy efficiency in public buildings Financial incentives for energy efficiency investments in buildings Investment subsidies for energy efficiency

Region	Sector	Measures
		measures in public buildings Energy consumption billing information
	Energy	Subsidies for cogeneration Green certificates Information and training
	Public	Public lighting
	Industry	Information on energy efficiency measures in industry Investment subsidies Voluntary agreements
	Transport	Management Contract SRWT (Société Régionale Wallonne du Transport) Energy efficiency transport measures in the public sector Information and training Financial incentives
Flemish Region	Buildings	Insulation standards and energy performance and indoor climate requirements
	Industry	Auditing and benchmarking agreements
	Energy	Imposition of Efficient Energy Use through obligation scheme on the system operators Promotion of high-efficient CHP Promotion of photovoltaic solar panels by means of a system of renewable energy certificates
	Mobility	Promotion of mobility and improvement of the environmental performance of transport
	Agriculture	Subsidies for energy-saving measures in greenhouse cultivation

### 3. Implementation

#### 3.1 Data collection and measurement procedures

In Belgium, mainly bottom-up methods are used for calculating energy savings of energy efficiency measures. Top-down methods are applied only for the case of transport sector. However, the approach of calculating savings differs from one region to another.

In the Brussels Capital region a modelling approach is pursued using two IBGE-BIM projection models: a fixed-source projection model and a projection model relating to transport. The first model projects energy demand and atmospheric emissions from fixed sources. In this model, variations in consumption in the energy vectors used in the Brussels-Capital Region and their associated emissions are determined by the variation in parameters that define the consumption of each sector. The second model is used for projections of fuel consumption of transport and emissions of atmospheric pollutants. In addition to the modelling approach, the Brussels-Capital Region applies bottom-up calculations methods

recommended by the EU Commission for evaluating the effects of the measures “Energy Subsidies”, “Exemplary Buildings” and “Local Action Plans for Energy Management”.

In the Walloon region the energy savings are monitored using bottom-up calculation methods at the level of each individual action. All data related to individual actions is gathered in a central database. Whenever a formula was recommended by the EU Commission, it is preferred its utilization. If not, an alternative formula was developed, based on the same approach as the Commission’s formula. For the building sector, the proposed formulae by the Commission are applied. For the industry sector, energy savings are mainly calculated according to the methodology which was defined within the framework of Voluntary Agreements with the industry. For the energy sector, data on the Green Certificates allocation directly collected from the official regulator on the gas and electricity markets is used. For the transport sector and public lighting, the savings are calculated based on an own developed methodology.

Finally, in the Flemish region the energy savings for the transport sector are calculated top-down, using the methods recommended by the EU Commission. For the sectors buildings, industry, energy and horticulture, bottom-up methods are applied as input data for each individual measure is available. Again, the EU recommended methods are used for the bottom-up calculation of the achieved energy savings. If EU recommended methods are lacking or if the Flemish data is not available for the application of the EU methods (in the case of new lighting), alternative calculation methods are used.

### **3.2 Verification procedures**

The three regions and the federal government each appoint their own bodies to control the reporting and monitoring of the overall energy savings framework and supervision to ensure the exemplary role of the public sector.<sup>1</sup> For the regions of Brussels Capital and Walloon, no information could be publicly found on the verification procedures established. In the Flemish Region, the Verification Office is charged with monitoring the proper implementation of the energy policy agreements with the industry. It is an independent, neutral organisation appointed by both the Flemish Ministers of Energy and of Economy. For the alternative measures that were notified by the Flemish Region to the EU Commission in fulfilment of Article 7 of the EED, the verification procedure is described for each of these measures in the Third Flemish Energy Efficiency Action Plan.

### **3.3 Reporting procedures**

No information about the reporting period is provided for the Brussels-Capital and Walloon regions. In the Flemish region, the data (number of supported measures per sector, energy savings per sector) of the previous calendar year needs to be reported annually.

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<sup>1</sup> Second National Energy Efficiency Action Plan Belgium, p. 6.

## 4. Assessment

### 4.1 Energy performance

For the Brussels-Capital Region, the implemented energy efficiency measures resulted in 851 GWh final energy savings in 2012 with the measure energy subsidies in buildings contributing the most to the savings.<sup>2</sup> For the Walloon Region, the final energy savings amounted to 5,384 GWh in 2012 and resulted mainly from the provision of financial incentives for investments in the rational use of energy in buildings and the voluntary agreements in the industrial sector.<sup>3</sup> In the Flemish Region, the achieved energy savings in 2012 were equal to 16,499 GWh, which were derived mainly from the imposition of obligations on the electricity distribution system operators.<sup>4,5</sup>

### 4.2 Integrated tools

Even if no single integrated tool for the homogeneous monitoring and reporting of the M&V schemes seems to exist, several databases seem to be used within the three regions for the collection and monitoring of the implemented energy efficiency measures.

## 5. Conclusions

As each of the three Belgian regions developed/develops its own Energy Efficiency Action Plan, each region has also set up its own M&V scheme. The monitoring approach mainly applied in the Walloon Region and Flemish region is a bottom-up approach. The EU recommended bottom-up formulae are used by these regions most of the time for quantifying the energy savings of implemented energy efficiency measures; only when the data at hand does not fit the recommended bottom-up formulae, alternative formulae are applied, developed by the monitoring bodies in the regions itself. A top-down approach is mainly applied for the transport sector. Energy efficiency measures suggested and implemented mainly target the building sector, however, substantial energy savings are also reported in the energy, industrial and transport sectors.

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<sup>2</sup> Troisième Plan d'Action en Efficacité Énergétique, Région de Bruxelles-Capitale, p. 8.

<sup>3</sup> 3e Plan d'Action en Efficacité Énergétique Wallon selon les directives ESD 2006/32/CE et EE 2012/27/EU (Mars 2014), p. 15.

<sup>4</sup> The Flemish Energy Efficiency Action Plan, p. 8-9.

<sup>5</sup> The Flemish Region has been implementing an Energy Efficiency Obligation system since 2003, obliging electricity distributors to meet annual primary energy savings targets. In 2011 the EEO system has been fully replaced. The energy saving targets for electricity distributors were eliminated and replaced by specific "action obligations," specific actions set forth by the Flemish Government that distributors must implement.

## II. Coordination mechanisms

### 1. General framework

The federal structure and the distribution of competences in the field of energy in Belgium have made it necessary to organise a consultation between the Regions and the Federal State. As far as national issues are concerned, the policies implemented by the Regions and the Federal State need to be coordinated and made coherent. As regards European and international matters such consultation makes it possible for Belgium to adopt a position view, commonly agreed on by the Regions and the Federal State. This consultation takes place within the «Interministerial Conference for Economy and Energy», which set up the working group CONCERE/ENOVER (Consultation between the Federal State and the Regions on energy matters) in 1991 through a cooperation agreement. This working group holds regular meetings and has set up various groups of experts for the preparation of the necessary positions on European issues, the validation of the reports to be submitted to international bodies and designate the Belgian representatives, the harmonization of certain provisions, the provision of joint financing for some research or study projects and the dissemination of information about projects and supporting measures implemented within their respective competences.

The ESD and EED, though applying to the Member State Belgium, mostly concern regional competences and must therefore be transposed into regional law.

### 2. Operational issues

#### *2.1 Involved parties and responsibilities*

The Energy Efficiency Action Plans of Belgium were developed by the working group CONCERE/ENOVER. As the plans concern mostly regional competences, they are implemented at regional level.

The tasks of the working group CONCERE/ENOVER as regards the development of the National Energy Efficiency Action Plans according to the ESD consist of the interpretation of the formulae of the European Commission for the calculation of energy savings, of carrying out a consultation concerning input data and parameters used in the formulae and of harmonizing these parameters, and of conducting a case study on the applicability of the proposed top-down indicators.

The three regions and the federal government appointed each their own bodies to control the reporting and monitoring of the overall energy savings framework and to ensure the exemplary role of the public sector. The bodies are the Federal Public Service of Economy, SMEs, Self-employed and Energy, DG Energy at federal level, the Brussels Institute for Environmental Management IBGE-BIM for the Brussels-Capital Region, the Operational Directorate General for Spatial

Planning, Housing, Heritage and Energy of the Walloon Public Service for the Walloon Region and the Flemish Energy Agency for the Flemish Region.

The local authorities do not play a role in federal energy policy formulation, neither are they represented in the CONCERE/ENOVER

The local authorities are promoted to implement energy efficiency measures, but not in a very active way. Moreover, the local authorities take their own initiatives and align their objectives with regional regulations and subsidies.

## ***2.2 Financial and human capacities***

No information is available about the financial and human resources to plan and implement the measures, nor about the procedures foreseen for the development of appropriate skills and the different involved authorities during the planning and implementation phase of the energy efficiency measures.

## ***2.3 Access to data and evaluation***

No information is available whether energy efficiency measures are assessed among the involved authorities in order to redesign them. Furthermore, no information is available about the procedures for the facilitation of the access to data and information from the different involved authorities during the planning and implementation phase of the energy efficiency measures.

## **3. Conclusions**

In Belgium, coherence related to energy efficiency policy making is assured through the working group CONCERE/ENOVER within the Interministerial Conference for Economy and Energy which allows consultation between the Federal State and the Regions on energy matters. This multi-level-governance institution allows them to share competences over energy and supports them in finding common positions and produce unified reports. Even if this format allows communication among federal and regional levels, the municipalities are not involved.

## M&V schemes and coordination mechanisms

### Bulgaria



#### I. M&V schemes

##### 1. General framework

In Bulgaria, a M&V scheme for energy efficiency measures has been developed in compliance with the Directives 2006/32/EC (ESD) and 2012/27/EU (EED). Specifically, the M&V scheme was established during the transposition of the ESD and the monitoring of the achieved energy savings within the framework of the National Energy Efficiency Action Plans. The M&V scheme was introduced by the Energy Efficiency Law. It should be noted that a combination of an obligation scheme and alternative policy measures has been selected for the fulfillment of the target of Article 7 of the EED.

##### 2. Design

###### **2.1 Administrative authority**

The Ministry of Energy is the responsible authority for the administration and coordination of the M&V scheme in Bulgaria. Generally, the mission of the Ministry of Energy is the formulation of energy policy with a transparent way protecting with the most efficient way the State and the public interest.

###### **2.2 Sectoral and spatial analysis**

The main energy efficiency measures, which are monitored and measured within the M&V scheme, comprise implemented interventions in the public and industrial sectors. Moreover, the implementation of the energy efficiency measures is performed at national level.

###### **2.3 Energy efficiency measures and technologies**

The most important energy efficiency measures in terms of energy savings, which are covered by the M&V scheme, consist of the deep renovation of buildings in the public sector, the replacement of technological equipment in the industrial sector, the energy upgrade of technological units and facilities in the industrial sector and the increase of energy efficiency of appliances for measuring, monitoring and control both in the public and industrial sectors. All the above mentioned energy efficiency measures are considered as the most efficient in terms of the expected energy savings as resulted by the M&V scheme.

The most widespread technologies in the public buildings are the replacement of window panelling, the reinforcement of the heat insulation including the restoration of flows and roofs, the energy upgrade of heating and ventilation systems, the replacement of conventional with energy-saving lighting systems, the gasification and the installation of solar panels for the provision of hot water. The implemented measures in the industrial sector focus on the improvement of the energy efficiency of the lighting systems, the replacement of the technological equipment and facilities, the introduction of monitoring and control systems and the heat insulation of the corresponding installations.

### **3. Implementation**

#### ***3.1 Data collection and measurement procedures***

The main data sources for the monitoring of the implemented energy efficiency measures consist of the official statistics office, various national databases and the actual measured data as provided by the conducted energy audits. The overall coordination of the data collection procedure has been undertaken by the Ministry of Energy in collaboration with the Sustainable Energy Development Agency (SEDA). The SEDA has the obligation to verify the quality of the energy audits and the qualification of the energy auditors. Moreover, the companies, which conduct the energy audits, are involved also in the data collection procedure.

For the monitoring of the energy efficiency measures specific bottom-up procedures have been developed. Specifically, twelve energy-saving assessment methodologies were introduced and adopted enabling the estimation of the energy savings through the determination of energy consumption before and after the implementation of the examined measures. The utilised procedures foresee the conduction of the appropriate standardised adjustments according to the impacts of the specific climate conditions on energy use. These bottom-up methodologies can be applied to individual measures and groups of measures in order to calculate and report the energy-saving effect of each individual measure. Moreover, these specific methodologies include a mechanism to allocate energy savings to each year of the lifetime of the concerned measure. The specific methodologies are based both on measurements data and engineering calculations. The measurements include the definition of measurement points and intervals, the types of measuring devices, the measurement reports, the measurement methods, the utilised techniques and additional equipment, the accuracy and measurement procedures to ensure the necessary quality of the measurements, the required forms for reporting and documenting the results. Furthermore, the engineering estimates require the definition of preconditions and assumptions, the characteristics of the site and the types of energy efficiency measures to be assessed, the climate data and the incorporation of other external and internal factors into the analysis.

The specialized methodologies are developed by the energy auditors or the SEDA and should be adopted by the respective Minister.

### **3.2 Verification procedures**

The foreseen verification procedure includes the conduction of energy audits, which must be undertaken in accordance with the requirements in Energy Efficiency Law and its ordinances. Specifically, the measured energy savings are verified by the certified and qualified energy auditors, who are registered in the special register maintained by the SEDA.

Individual specific targets have been established for the implementation of the monitored and verified energy efficiency measures on annual basis within the framework of Article 7 of the EED. These targets have been specified for three groups of obligated persons, namely owners of public and municipal buildings, owners of industrial enterprises with annual energy consumption more than 3,000 MWh and energy dealers with annual sales to the final consumers more than 20 GWh.

### **3.3 Reporting procedures**

The reports derived by the M&V scheme must be compiled when the obligated persons request a Certificate for Energy Savings. Considering the public buildings with total floor area more than 250 m<sup>2</sup> it is foreseen the conduction of an energy audit and the implementation of the proposed energy savings measures within the period of the next three years. After the implementation of the measures a second energy audit is required for the verification of the savings. All the audit reports should be submitted to the SEDA.

## **4. Assessment**

### **4.1 Energy performance**

According to the submitted data through the annual report for 2014, 222 projects were completed by the central government bodies and 824 by the local governments resulting in 59.54 GWh of energy savings annually. Moreover, 104 obligated industrial system owners declared that 105.9 GWh of power was saved in 2014 due to the implementation of energy efficiency measures. Finally, the impact of the energy saving measures for the case of energy dealers was amounted equal to 173 GWh annually.

### **4.2 Integrated tools**

An integrated tool for the homogeneous monitoring and reporting of the M&V scheme has been developed. Specifically, the energy audits are undertaken only by qualified auditors with special equipment and with special software. Moreover, the specialized methodologies are integrated into a specially designed calculator published on the SEDA's website in a standardized template for the calculation of the achieved energy savings.

## 5. Conclusions

Summarizing, the M&V scheme in Bulgaria has been developed according to the requirements the ESD and EED. The overall evaluation of the M&V scheme can be characterized as positive taking into consideration the period of implementation, the development of specialized bottom-up methodologies and the organization of the necessary verification procedures with the activation of the SEDA.

## II. Coordination mechanisms

### 1. General framework

The legal responsibility for energy policy making lies at national level. The legal competence for energy efficiency policy formulation has been distributed mainly to the Ministry of Energy and supplementary to the Ministry of Environment, Ministry of Transport, Ministry of Economy and the Ministry of Regional Development depending on the characteristics of each energy efficiency measure and the targeted sector.

### 2. Operational issues

#### *2.1 Involved parties and responsibilities*

The distribution of responsibilities for energy efficiency policy making and implementation is clearly defined between different governmental layers. Specifically, the Ministry of Energy is responsible for the design and implementation of energy policy including the field of energy efficiency. The SEDA supports the Ministry of Energy facilitating the activities for the achievement of energy efficiency targets. The Ministry of Economy is responsible for the promotion of measures in small and medium enterprises, as well as in industrial systems, while the Ministry of Regional Development has as a mission the development and implementation of technical regulations and standards in the field of energy performance of new and existing buildings, the implementation of projects related to the renovation of residential buildings and the improvement of energy efficiency in residential buildings. Finally, the Ministry of Transport and Communications is responsible for the formulation of the policy in the transport sector.

Nevertheless, no coordination bodies between national and regional level for energy policy has been established.

The local authorities are involved in national energy policy formulation through their participation into the arranged public discussions or through their representatives in the mutual working groups with the public authorities. The local and regional authorities have certain obligations under the Energy Efficiency Law to implement energy savings measures and plans. As a result, their priorities

and needs are taken into consideration during the design of the energy efficiency measures. For the facilitation of this procedure each ministry has undertaken the design and implementation of energy efficiency measure on its own field. For example, the Ministry of Transport and Communications defines the necessary measures on transport sector.

Specific actions and regulations have been introduced in order to motivate the participation of the involved authorities. To this purpose special working groups have been created in order to exchange ideas and information during the design phase of the measures. Moreover, specific templates for the submission of the necessary information were developed for the corresponding authorities with foreseen obligations. The obligation for annual submission of information about the implementation of energy savings measures has been defined by the Energy Efficiency Law.

Finally, the local and regional governments are incentivized for the implementation of energy efficiency measures through the imposition of specific legal obligations and the provision of financial support schemes.

## ***2.2 Financial and human capacities***

The involved authorities have not had the sufficient financial and human resources to plan and implement the measures as defined in national plans. Specific procedures are foreseen for the development of appropriate skills and for the enhancement of the existing knowledge of the different involved authorities during the planning and implementation phase of the measures. Furthermore, the SEDA has organized several training seminars for energy managers in the public and municipal administrations.

## ***2.3 Access to data and evaluation***

During the implementation phase, there is a procedure for the assessment of the energy efficiency measures among the involved authorities in order to redesign them. Specifically, The National Energy Efficiency Action Plan is developed with the participation of all the involved authorities, while it is conducted a specialized process of public discussions before its official adoption. Finally, specific actions have been performed in order to facilitate the access to data and information from the different involved authorities during the planning and implementation phase of the energy efficiency measures.

## **3. Conclusions**

No specific coordination mechanism for efficiency policies exists in Bulgaria. Nevertheless, the local authorities are involved in the national energy policy formulation through their participation into arranged public discussions or through their representatives in mutual working groups with national authorities.

## M&V schemes and coordination mechanisms

### Croatia



#### I. M&V schemes

##### 1. General framework

Croatia has introduced an M&V scheme in the form of an IT-tool called SMIV (System for Monitoring, Measurement and Verification for Energy Savings). The SMIV is currently in its implementation phase, while it is in line with the Croatian National Energy Efficiency Action Plan as requested by the Directive 2012/27/EU (EED) and with the requirements of the Article 7 of the EED. The legal implementation of energy efficiency started with the Directive 2006/32/EC (ESD) and Croatia's first Act for efficient energy use in the final consumption (OG 152/2008). The M&V was facilitated as a project developed in cooperation with GIZ, and SMIV has become the official Croatian M&V tool through the new Energy Efficiency Act (OG 127/2014).

##### 2. Design

###### *2.1 Administrative authority*

Croatian Ministry of Economy is responsible for the energy efficiency policy formulation, while the Energy Efficiency Act has appointed the Croatian institution Centre for Monitoring Business Activities in the Energy Sector and Investments (CEI) as the National Energy Efficiency Authority. As a result CEI monitors and develops the SMIV, as well as train the end users.

###### *2.2 Sectoral and spatial analysis*

Public, residential, industrial and transport sectors are covered by the Croatian M&V scheme at all administrative levels (local, regional, national).

It is mandatory for the entire public sector, for companies offering energy service contracts, institutions giving subsidies/loans for energy efficiency measures. The utilization of this scheme has as a result the measurement of all the energy efficiency measures. Only private initiatives, which finance the implementation of the energy efficiency measures with their own funds, are not taken into consideration into the calculation of the total achieved energy savings.

### **2.3 Energy efficiency measures and technologies**

The most important energy efficiency measures and technologies in terms of energy savings are covered by the M&V schemes. All the measures mentioned in the Rulebook for M&V have the algorithms placed in SMIV. There are 20 measures including building renovation, replacement of housing appliances, boiler replacement, eco-driving etc.

Currently, until the system is filled with data (which will be the case by the end of 2015), CEI has mentioned the Croatian ECO Fund as the most efficient energy efficiency measure. Currently, ECO Fund has financed energy efficiency projects in renovating homes and multi-apartment buildings. In 2014, 3,400 households and 774 multi-apartment buildings have got, on average, 40% subsidies to perform an energy efficiency refurbishment. It has to be noted that most of these measures include deep refurbishment or integrated renovation.

Data from all these successfully finished projects have already been introduced into the SMIV and will be available online. The savings are measured ex-ante, or through expected deemed savings.

## **3. Implementation**

### **3.1 Data collection and measurement procedures**

Data for monitoring and implemented energy efficiency measures in different sectors are obtained by paid subsidies. All data from actual project plans are entered into the SMIV, which constitute real, bottom-up collected data.

The responsible organisations for data collection processes consist of the National Energy Efficiency Authority and part of the Centre for Monitoring Business Activities in the Energy Sector and Investments, which was founded by Ministry of Economy and appointed for monitoring and data collection through the Energy Efficiency Act. However, the data are not entered there, but by end-users who are trained to use the system. The Centre then administers and develops the system. It is a bottom-up monitoring procedure and the methodology was developed in cooperation with many relevant institutions and was build upon the already existing rulebook. Finally, it was officially proposed by the Ministry of Economy and adopted by the Minister of Economy.

### **3.2 Verification procedures**

The measured energy savings are being verified through specific algorithms in the SMIV.

Targets for each measure in the SMIV are related to those same measures planned through the National Energy Efficiency Action Plan.

### **3.3 Reporting procedures**

The reporting is performed on an annual basis from the interpretation of the SMIV data.

## **4. Assessment**

### **4.1 Energy performance**

All data for all energy efficiency measures from 2014 up to now will be entered into the SMIV and verified until the end of 2016. CEI is currently in the phase of training end-users how to use the system appropriately.

### **4.2 Integrated tools**

The integrated tool is the SMIV.

## **5. Conclusions**

Croatia has implemented an integrated IT-tool, the SMIV, for the homogenous monitoring and reporting of the M&V schemes, which will be entered and verified until the end of 2016. Croatia is currently in the process of training the end-users in using effectively the tool.

## **II. Coordination mechanisms**

### **1. General framework**

The legal responsibility for energy policy formulation lies on national and local level.

Ministry of Economy is responsible for the establishment of national energy efficiency targets, but all counties, as well as all cities larger than 30.000 citizens are obliged to make yearly energy efficiency plans.

Although there are no set goals for them to achieve in terms of savings, the Plan is obligatory and there are incentives in form of the ECO fund large subventions for various energy efficiency measures.

Ministry of Construction is responsible for building codes, energy audits and other related to EPBD, while the Ministry of Environment for public procurement issues.

## **2. Operational issues**

### ***2.1 Involved parties and responsibilities***

The distribution of responsibilities for energy efficiency policy formulation and implementation is clearly defined between different governmental layers. Once the National Energy Efficiency Authority was established, it is clearer on who has what responsibilities, but it is also easier to share information. For the purpose of visibility and openness, National Energy Efficiency Authority is currently in the process of making a National INFO WEB site for all matters related to energy efficiency - from information about subsidies for citizens, to information about energy efficiency legal framework.

There are existing coordination bodies between national and regional levels for energy policy. There are many now successful regional energy and development agencies that help the local community implement energy efficiency measures. But the only official body for energy efficiency is the National Energy Efficiency Authority.

Local authorities are involved in national energy policy formulation, since they are obliged by law to develop annual and three-year energy efficiency plans.

The priorities and needs of the different involved authorities have been taken into consideration during the design of the energy efficiency measures. Since energy efficiency plans from local authorities (counties) already existed, the measures mostly mentioned in the plans were taken into account. Also, it was inspected to identify which measures on the ECO fund are preferred by the local authorities.

Certain actions and regulations have not been foreseen in order to motivate the participation of the involved authorities. All energy efficiency plans need to be approved by the National Energy Efficiency Authority on annual basis.

Finally, the local and regional governments have been incentivized by financial support schemes.

### ***2.2 Financial and human capacities***

Human resources always come up as a problem in public authorities, especially when it comes to smaller and poorer counties and cities. However, there are now many developed and successful energy agencies and regional development agencies, which are familiar with the topic and are usually subcontracted to develop energy efficiency plans and help with their implementation.

Also, no measure from the National Energy Efficiency Plans are obligatory for the local communities. Instead, they are obliged only to plan whatever they wish in energy efficiency, and then to monitor what they have done through the SMIV.

Finally, several financial mechanisms exist providing the possibility of co-funding for energy efficiency measures, ranging from 40 to 80% in the forms of subsidies, loan, grants and financial aid.

### ***2.3 Access to data and evaluation***

During the implementation phase, there is an assessment performed of the energy efficiency measures among the involved authorities through the SMIV. Moreover, the National Energy Efficiency Authority assesses the energy efficiency plans, which are compiled by local authorities annually.

## **3. Conclusions**

There is a developed coordination between the different bodies in Croatia, although the only official body is nationally defined – the National Energy Efficiency Authority. Local authorities are involved by making three-year and annual energy efficiency plans, which are legally required and evaluated by the National Energy Efficiency Authority. Nevertheless, they are not obligated to implement the energy efficiency measures as defined by the National Energy Efficiency Action Plans. An additional barrier is the limited human resources at local level, while significant opportunities for the co-funding of energy efficiency measures are available.

Indisputably, the coordination will be improved at local and regional level if the SMIV has access to fully fledged and completed data for the evaluation, monitoring, measurement and verification of the implemented energy efficiency measures.

## M&V schemes and coordination mechanisms

### Cyprus



#### I. M&V schemes

##### 1. General framework

In Cyprus, the M&V scheme for energy efficiency measures is currently in development phase. The M&V scheme will be in compliance with the respective National Energy Efficiency Action Plans and the requirements of the Directive 2012/27/EU (EED). Specifically, it will be established in order to comply with the requirements for the implementation and the monitoring of energy efficiency interventions within the framework of Article 7 of the EED.

##### 2. Design

###### ***2.1 Administrative authority***

The Ministry of Energy, Commerce, Industry and Tourism is the authority, which is responsible for the formulation of energy efficiency policy including the administration and coordination of the M&V scheme.

###### ***2.2 Sectoral and spatial analysis***

The energy efficiency measures aim at the promotion of corresponding energy savings interventions in the public, residential and tertiary sectors, while the spatial coverage of these measures is at national level.

###### ***2.3 Energy efficiency measures and technologies***

The most important energy efficiency measures, which are covered by the M&V scheme comprise the measures for the promotion of energy efficiency investments and the further penetration of RES in public buildings, businesses and households, the installation of photovoltaic systems and an integrated AMI system with the installation of 500 thousand smart meters. Even if the effectiveness of these measures has not been quantified yet, these measures can be considered as the most efficient in terms of the achieved energy savings.

The most important technologies consist of the promotion of roof thermal insulation, wall thermal insulation, thermally insulated window frames, shading systems, technical electro-mechanical systems (air conditioning, heating, ventilation, residential hot water and lighting), electronic systems for monitoring

energy consumption, energy storage for distribution at peak hours, and high efficiency electricity and heat co-generation. The installation of RES systems will be promoted, wherever is technically feasible, through the auto production method in public buildings, while the deployment of systems for offsetting energy consumption against energy generation from renewable sources (net-metering mechanism) is foreseen in the residential sector.

### **3. Implementation**

#### ***3.1 Data collection and measurement procedures***

The main data sources, which are utilised for the monitoring implemented energy efficiency measures in different sectors include the obtained data from the official statistics office, national databases and programs, which have undertaken the financing of the implemented energy efficiency measures.

The Ministry of Energy, Commerce, Industry and Tourism is responsible for the establishment of the data collection process and the development of the appropriate methodology for the estimation of the achieved energy savings including the utilised indicators.

The measurement of the implemented energy efficiency measures is performed through the establishment of bottom-up methodologies for each energy efficiency measure separately.

Specifically, for the majority of the measures the calculation will be performed through the implementation of the scaled method and the adoption of the necessary engineering estimates of the achieved energy savings according to the requirements of Annex V of the EED. Moreover, in some energy efficiency measures the deemed savings method is preferred for the calculation of the achieved energy savings, while in limited cases the metered savings method is utilised. The climate variability is taken into consideration during the calculation methods, when this is required, while the specification of the lifetime of each measure is performed according to the requirements of the EED.

#### ***3.2 Verification procedures***

The verification of the measured energy savings will be performed by the Energy Service Department of the Ministry of Energy, Commerce, Industry and Tourism. The verification procedure includes the conduction of inspections at least once on annual basis.

Especially for the cases of the photovoltaic systems and the grants schemes, the technical evaluation of the submitted applications and the estimation of the energy savings are performed by the Cyprus Institute of Energy. Additionally to this procedure, the Energy Service Department of the Ministry of Energy,

Commerce, Industry and Tourism conducts sample checks on the implemented applications and calculations in order to ensure their correctness.

Specific targets have been set for the implementation of the monitored and verified energy efficiency measures on annual basis until 2020 according to the requirements of the Article 7.

### ***3.3 Reporting procedures***

The reporting period of the M&V scheme has been established on annual basis. Specifically, the Ministry of Energy, Commerce, Industry and Tourism requires an annual report by the involved bodies in relation to the implementation of the implemented energy efficiency interventions and measures including the corresponding estimates about the amount of the achieved energy savings.

## **4. Assessment**

### ***4.1 Energy performance***

The most important results according to the submitted annual report for 2014 in respect of the achieved energy savings consist of the installation of photovoltaic systems (2,380 toe) and energy efficiency interventions in buildings (72 toe). It should be noted that the deployment of many of the foreseen measures has not started yet in order to evaluate the effectiveness of the energy efficiency measures.

### ***4.2 Integrated tools***

No integrated tool for the homogeneous monitoring and reporting of the M&V schemes has been introduced in Cyprus.

## **5. Conclusions**

Summarizing, the establishment of the necessary M&V scheme in Cyprus is performed according to the requirements of the EED. The majority of the critical aspects of the M&V scheme have already been introduced and can be assessed positively especially for the case of the data collection, measurement and verification procedures.

## II. Coordination mechanisms

### 1. General framework

The legal responsibility for energy policy making lies exclusively at national level, while the Ministry of Energy, Commerce, Industry and Tourism has the legal competence for energy efficiency policy formulation including the obligations in the field of energy efficiency.

### 2. Operational issues

#### *2.1 Involved parties and responsibilities*

The responsibilities for energy efficiency policy making and implementation are clearly defined between different governmental layers. Although the Ministry of Energy, Commerce, Industry and Tourism has undertaken the coordination of the energy efficiency policies, various other public authorities have additional duties and responsibilities. Specifically, the promotion of energy efficiency in public purchases is performed by the Treasury of the Republic of Cyprus, the implementation and design of measures in transport sector by the Department of Road Transport of Ministry of Transport, Communications and Works and the implementation and design of measures in agricultural sector by the Department of Agriculture of Ministry of Agriculture, Rural Development and Environment.

Nevertheless, no specific coordination bodies between national and regional level for energy policy has been introduced yet.

The local authorities are involved in national energy policy formulation through their participation into a consultation process, which is organized under the coordination of the Ministry of Energy, Commerce, Industry and Tourism.

The priorities and needs of the different involved authorities are taken into consideration during the design of the energy efficiency measures through the public consultation process for the funding schemes. Especially for the public sector the energy efficiency measures are designed and implemented according to the proposed interventions by the energy performance certificate as resulted by the conducted energy inspections.

Regarding the motivation of the involved authorities in order to participate into the energy efficiency measures no certain actions and regulations have been implemented.

Finally, the local and regional governments are incentivized for the implementation of the energy efficiency measures either through the imposition of legal obligations or the provision of financial support schemes.

## **2.2 Financial and human capacities**

The involved authorities have not had the sufficient financial and human resources to plan and implement the measures, which are defined within the national action plans.

Moreover, no specific procedures are initiated for the development of appropriate skills and for the enhancement of the existing knowledge of the different involved authorities during the planning and implementation phase of the energy efficiency measures.

## **2.3 Access to data and evaluation**

During the implementation phase, an assessment procedure is performed evaluating the effectiveness of the energy efficiency measures among the involved authorities in order to redesign them. This procedure is implemented on annual basis in conjunction with the submission of the annual report regarding the progress on the fulfillment of the target of Article 7.

Finally, the access to data and information from the different involved authorities during the planning and implementation phase of the energy efficiency measures has been facilitated as the necessary information is available upon request to any interested stakeholder.

## **3. Conclusions**

The absence of a coordination mechanism for the design and implementation of energy efficiency measures is obvious in Cyprus. Nevertheless, specific public consultation processes have been established in order to facilitate the involvement of the local authorities and to incorporate their needs and priorities into the formulation and implementation of the energy efficiency measures.

## M&V schemes and coordination mechanisms

### Czech



#### I. M&V schemes

##### 1. General framework

Czech Republic has not an existing M&V scheme for energy efficiency yet. The Directive 2012/27/EU (EED) is still being transposed into the national legislation. As a result, no experience regarding the administration, effective use and evaluation of the M&V mechanisms exists. Their use will depend on the successful implementation of pilot projects, while their development is on progress complying with the requirements of the corresponding EU legislation.

##### 2. Design

###### *2.1 Administrative authority*

Three different authorities are involved in the implementation of the foreseen procedures of the M&V schemes, namely Ministry of Industry and Trade, Ministry of Environment and Ministry for Regional Development. All the before-mentioned authorities supervise the corresponding public authorities or their delegated bodies.

###### *2.2 Sectoral and spatial analysis*

The implemented energy efficiency measures consist of interventions to residential, industrial, tertiary, transport, agricultural and transport sectors. For each sector different ministry is responsible for the monitoring of the implemented measures.

###### *2.3 Energy efficiency measures and technologies*

The alternative schemes will support the implementation of energy efficiency measures in the industrial sector (introduction of energy efficient technologies and improvement of buildings' energy performance), in the tertiary sector (improvement in energy performance of buildings, introduction of energy efficient technologies including the outdoor lighting) and in residential sector (improvement of buildings' energy performance).

The renovation of buildings is considered as the most efficient measure.

## **3. Implementation**

### ***3.1 Data collection and measurement procedures***

The establishment of the data collection and measurement procedures will be performed in relation with the potential savings of each sector and their cost-effectiveness. The proposed four options from the EED will be implemented (deemed savings, metered savings, scaled savings, surveyed savings). Specifically, deemed savings are reported in an on-line questionnaire and documented by invoices for the technology purchased, labour, energy in previous periods, etc. Metered savings will always be calculated ex-post by a qualified energy auditor. Moreover, scaled savings will be used only in cases where establishing robust measured data for specific installation is difficult. Finally, surveyed savings will be applied to non-investment support targeted at information campaigns.

### ***3.2 Verification procedures***

Verification process will be performed by implementing public authorities checking the correctness of the specified and measured data.

### ***3.3 Reporting procedures***

The reporting of the implemented energy efficiency measures is required on annual basis.

## **4. Assessment**

### ***4.1 Energy performance***

The most important energy efficiency measures in terms of energy savings consists of the renovation of buildings and use of Best Available Technologies.

### ***4.2 Integrated tools***

According to the available information no integrated tool is used for the monitoring of the implemented energy efficiency measures. Nevertheless, the reporting of the energy savings within the framework of the obligation scheme is performed with the utilization of an on-line questionnaire.

## **5. Conclusions**

The M&V scheme has not been established yet in Czech despite the requirements of Article 7 of the EED. Nevertheless, various procedures have been established regarding the measurement and verification of the implemented energy efficiency measures.

## II. Coordination mechanisms

### 1. General framework

The general responsibility for energy efficiency policy making according to available information lies at national level and has been undertaken by the Ministry of Industry and Trade, the Ministry of Environment and the Ministry for Regional Development.

### 2. Operational issues

#### *2.1 Involved parties and responsibilities*

No information was identified on this issue.

#### *2.2 Financial and human capacities*

Several financial mechanisms have been introduced for the implementation of energy efficiency measures including the different Operational Programs, the state programs etc.

No information was identified on the other examined issues.

#### *2.3 Access to data and evaluation*

No information was identified on this issue.

### 3. Conclusions

In Czech no indication for the existence of a coordination mechanism was identified.

## M&V schemes and coordination mechanisms

### Denmark



#### I. M&V schemes

##### 1. General framework

In Denmark a M&V scheme for the monitoring of the energy efficiency measures has been developed according to the requirements of the National Energy Efficiency Action Plans as derived by the Directives 2006/32/EC (ESD) and 2012/27/EU (EED).

##### 2. Design

###### *2.1 Administrative authority*

The Climate, Energy and Building Ministry is responsible for the administration and coordination of the M&V scheme.

###### *2.2 Sectoral and spatial analysis*

Energy efficiency measures in the residential, public, industrial and transport sectors are covered by the M&V scheme, while the participation of the involved parties is performed at national level.

###### *2.3 Energy efficiency measures and technologies*

The most important energy efficiency measures comprise:

- Unit consumption per dwelling in households
- Unit consumption for space heating in households
- Unit electricity consumption per dwelling
- Energy intensity in the service sector
- Specific consumption for electrical appliances
- Saving obligations for energy utilities (cross-cutting)

Taxes are considered as the most efficient measure.

### **3. Implementation**

#### ***3.1 Data collection and measurement procedures***

The data are collected by national databases, while the Climate, Energy and Building Ministry is responsible for the data collection process and for the methodology of the used indicators.

Specifically, top-down calculations have been carried out for selected sectors and a bottom-up calculation for the estimation of the achieved energy savings by the obliged energy companies.

For all other instruments, bottom up calculations have not been developed yet.

#### ***3.2 Verification procedures***

The measures are verified by the energy statistics and specific targets are set for the implementation of the monitored and verified energy efficiency measures.

#### ***3.3 Reporting procedures***

The reporting period has been set on annual basis.

### **4. Assessment**

#### ***4.1 Energy performance***

The most important results in respect of energy savings are identified during the energy upgrade of the residential sector.

#### ***4.2 Integrated tools***

An IT-tool has been used facilitating the M&V scheme.

### **5. Conclusions**

Denmark has already developed and implemented a M&V-scheme for the monitoring of the implemented energy efficiency measures at national level. Various top-down and bottom up methods have been used for the effective measurement of the achieved energy savings. Finally, an IT-tool has been developed for the effective monitoring of the implemented energy efficiency measures.

## II. Coordination mechanisms

### 1. General framework

The Climate, Energy and Building Ministry has the responsibility for the formulation of the energy policy including the legal competence for energy efficiency issues.

### 2. Operational issues

#### *2.1 Involved parties and responsibilities*

The distribution of responsibilities for energy efficiency policy making and implementation is clearly defined between different governmental layers.

There is no existing legally defined coordination body between national and regional level for energy policy.

The local authorities are not involved directly in national energy policy. Nevertheless, the priorities and needs of the different involved authorities have been taken into consideration during the design of the energy efficiency measures. Such an initiative is coordinated by the Ministry of Environment, which use specific climate categories for the effective deployment of energy efficiency measures.

The local and regional governments are incentivized for implementing energy efficiency measures through the constitution of financial support schemes and the provision of technical assistance.

#### *2.2 Financial and human capacities*

No information was identified on this issue.

#### *2.3 Access to data and evaluation*

No information was identified on this issue.

### 3. Conclusions

The national level has the legal responsibility for the formulation and implementation of energy policy including the energy efficiency measures. Even if the local authorities are not involved directly in national energy policy, various initiatives have been undertaken into order to realize and take into account their priorities and needs during the formulation of the energy efficiency measures.

## M&V schemes and coordination mechanisms

### Estonia



#### I. M&V schemes

##### 1. General framework

In Estonia, a M&V scheme is foreseen in order to evaluate and verify the impact of energy savings measures contributing to the effective monitoring of the progress of Article 7 of the Directive 2012/27/EU (EED). Currently this M&V scheme is in development phase and shall be finalized in the near future. Moreover, this M&V scheme will be in compliance with the requirements of the Article 7 of the EED. It should be noted that a combination of an Energy Efficiency Obligation Scheme (EEOS) and alternative policy measures has been selected for the fulfillment of the target of Article 7 of the EED.

##### 2. Design

###### **2.1 Administrative authority**

The Ministry of Economic Affairs and Communication (MEAC) is responsible for the formulation of the energy efficiency policy and has undertaken the administration and coordination of the M&V scheme.

###### **2.2 Sectoral and spatial analysis**

The targeted sectors for energy savings under the EEOS might be all the end-use sectors and the energy transformation, distribution and transmission sectors. The energy savings will be triggered by interventions in the public, residential and industrial sectors.

The administration of M&V scheme will be performed at national level.

###### **2.3 Energy efficiency measures and technologies**

The most important energy efficiency measures and technologies comprise the energy upgrade of apartment buildings, the improvement of energy efficiency in companies and the renovation of street lighting. These interventions are considered as alternative policy measures, which have to be implemented during the obligation period and thus shall be monitored.

The distribution of the envisaged energy savings - among these alternative measures is presented in the following table.

Energy efficiency measure	Cumulative savings for the period 2014-2020
Energy upgrade of apartment buildings	1,051 GWh
Improvement of energy efficiency in companies	459 GWh
Renovation of street lighting	211 GWh

Furthermore, the adoption of energy and CO<sub>2</sub> taxes is foreseen also as alternative policy measures. The anticipating energy savings from these tax system measures correspond to 4,758 GWh in 2020 assuming one year lifetime.

Finally, companies obligated by EEOS will contribute approximately 1,200 GWh of energy savings cumulatively for the 2014-2020 period.

### 3. Implementation

#### 3.1 Data collection and measurement procedures

The main data sources for monitoring the implemented energy efficiency measures in different sectors consist of the Statistics office (*Statistics Estonia*), as well as other national databases, data from paid subsidies and the submitted reports by the EEOS obligated parties.

The main source of input data for calculation of top-down indicators is the Statistics Estonia.

For the indicators, calculated by bottom-up method, the entities implementing various energy efficiency programmes and measures (e.g., Environmental Investment Centre (EIC), KredEx (Estonian Credit and Export Guarantee Fund, state enterprise), Riigi Kinnisvara AS (provider of real estate service to the executors of state authority), EEOS obligated companies) collect data continuously and analyse and report these data. The MEAC will gather all the data needed to evaluate the impact of energy saving measures into a consolidated report and disclose the results.

Data for evaluating the impact of alternative measures will be collected by public authorities engaged in implementing the alternative policy measures (Tax and Customs Board, KredEx, the EIC) whose will ascertain the impact of the measures and forward the information to the MEAC.

Regarding the EEO scheme, it is proposed the supervision of the obliged energy utilities should be undertaken by the Competition Authority, as the energy market regulator. The Competition Authority compiles national consolidated data on the EEOS in Estonia and submits them to the MEAC. Moreover, it advises the

obligated companies on the preparation of reports and contributes to the improvement of the evaluation of the triggered impacts.

The MEAC develops the impact evaluation methodologies, advises the authorities engaged in the implementation of the alternative policy measures regarding the development and improvement of impact evaluation methodologies and provides to the Statistics Estonia the necessary data.

Bottom-up procedures are utilised for the measurement of the achieved energy savings. Specifically, bottom-up indicators are proposed for residential, public and industrial sectors. In the residential sector bottom-up indicators for the consumption of electricity, district heat, natural gas and various other fuels have been developed based on the data collected about the "Energy Efficiency in Housing" implemented measure by KredEx Unit. Correspondingly, specific bottom-up indicators of electricity consumption, district heat consumption, natural gas consumption and other fuels consumption have been specified for the case of public buildings. Finally, in the industrial sector the energy (electricity, heat and various fuels) consumption of industrial subsectors expressed per unit of production have been proposed based on the data collected about the financial support programmes implemented by the EIC.

It should be noted that the achieved energy savings from appliances should not be calculated in order to avoid double counting, as their consumption has been taken into account during the estimations of the above mentioned sectors. Furthermore, there is the possibility to calculate bottom-up indicators for the implemented energy efficiency measures within the framework of EEO scheme.

Finally, methodologies and benchmarks for engineering estimates have been developed according to the available studies and methods.

Supplementary to the bottom-up approaches, the top-down monitoring of the implemented energy efficiency measures is conducted. The utilised top-down indicators are based on standard methodology defined by the guidelines of the EC.

Furthermore, specific approach will be developed for the quantification of the achieved energy savings from the adopted tax measures. The estimation of the energy savings is based on assumptions about the price of energy, the final consumption quantities, the tax rates and the temporal constancy of the price elasticity coefficient. The energy savings to be achieved as a result of tax effects are not regarded as cumulative savings, as the lifetime of tax measure is considered equal to one year.

### ***3.2 Verification procedures***

Only limited information is available regarding the planned verification procedure. The duty to control and verify the results could be performed by an entity in the area of administration of the MEAC or by impartial experts. In arranging the M&V scheme, the authorities will be guided by the Estonia Administrative Procedure Act.

There is plan of envisaged annual savings, to be provided by three alternative measures noted above, to reach specific cumulative savings for the 2014-2020 period. Pursuant to Article 7(10) of the Directive, there are suggested three intermediate periods: the first one will last three years and the next periods two years. Energy savings targets are specified for intermediate periods also.

The KredEx has experience regarding sampling procedure within 2007-2013 EU Funds programming period. Namely, the KredEx performed sampling monitoring of 5% of those residential buildings, which had received the financial support for energy efficiency improvements.

### ***3.3 Reporting procedures***

The reporting is performed on annual basis.

## **4. Assessment**

### ***4.1 Energy performance***

No information was identified on this issue.

### ***4.2 Integrated tools***

No information was identified on this issue.

## **5. Conclusions**

The M&V system in Estonia is under development for monitoring the implemented energy efficiency measures within the framework of EED, including the monitoring of Article 7. Nevertheless, some aspects have already been introduced, such as the necessary bottom-up approaches especially in residential building sector and the verification activities.

## **II. Coordination mechanisms**

### **1. General framework**

The Ministry of Economic Affairs and Communication (MEAC) has the overall responsibility for the formulation of energy policies, while it is responsible for co-ordinating the implementation of the National Development Plan for the Energy Sector and national action plans within the energy sector.

The Ministry of Environment is supervising the Green Investment Schemes, which promotes measures for the improvement of energy efficiency.

The Estonian Competition Authority is the energy market regulator and is responsible for the supervision over energy market participants' compliance.

The administrative division of the territory of Estonia is the division into counties, rural municipalities and cities. State administration in counties is carried out by the county governors and government agencies pursuant to law.

Local government administration in rural municipalities and cities is carried out on the bases provided for in the Local Government Organization Act.

## **2. Operational issues**

No information was identified for the operational characteristics of the coordination mechanism in Estonia.

## **3. Conclusions**

No aspects of a coordination mechanism are identified regarding the design and implementation of energy efficiency policies and measures in Estonia.

## M&V schemes and coordination mechanisms

# France



## I. M&V schemes

### 1. General framework

The Energy Policy Act of 13 July 2005 introduced the Energy Saving Certificates (ESCs or white certificates) in France as a mean of reducing final energy consumption. It is considered as the main policy instrument to reach the 2020 targets. The ESC scheme is implemented and overseen by the Directorate General for Energy and Climate (DGEC) an affiliate of the French Ministry of Ecology, Sustainable Development and Energy.<sup>6</sup> Beside the ESC scheme France has implemented further energy efficiency measures. A more complete description of energy efficiency measures can be sought over in the 2014 National Energy Efficiency Action Plan.

A M&V system has been introduced in France. It is not one single monitoring and verification system, but the system varies depending on each specific energy efficiency measure. The M&V schemes are defined in line with the respective national action plans. The M&V schemes were designed and set up when the different measures were launched.<sup>7</sup>

### 2. Design

#### 2.1 Administrative authority

The monitoring body depends on the measure. It can be conducted either by a ministry (esp. Ministry of Ecology, Sustainable Development and Energy), by the energy agency (ADEME), by a regulator (TSO) or by banks (distribution of soft loans).

The Energy Savings Certificate (ESC) scheme is implemented and overseen by the Directorate General for Energy and Climate (DGEC) within the French Ministry of Ecology, Sustainable Development and Energy. To oversee scheme operations, the DGEC created the PNCEE (National Authority for Energy Saving Certificates) on October 2011, which authorizes the DGEC to manage the high level policy aspects of the scheme. In its role managing the scheme, the PNCEE also elicits assistance from ADEME (on technical issues e.g. saving calculations and the

<sup>6</sup> ENSPOL, Evaluation of existing schemes, p.52

<sup>7</sup> ENSPOL, Evaluation of existing schemes, p.68

validation of special operation declarations) as well as a group known as the Energy & Environment Technical Association (ATEE) (for general issues e.g. for the proposal of new standard measures and development of the technical sheets). The ATEE is a stakeholder group that includes energy suppliers, energy service companies, equipment manufacturers, engineering and technical consulting firms, local authorities and district heating networks.<sup>8</sup>

## **2.2 Sectoral and spatial analysis**

France has introduced the Energy Saving Certificates in 2006 in order to reduce final energy consumption in sectors with dispersed activity. While the main focus of this policy is to reduce energy uses in residential, commercial and public buildings, the scheme also includes light industry, agriculture and transport activities.<sup>9</sup> France is one of the few Member States that obliges suppliers of automotive fuel to achieve energy savings. Including them in the scope of the EEO, allows targeting a much more ambitious objective, while increasing the competition between obligated parties and the diversity of offers and business models developed to reach final consumers.<sup>10</sup>

## **2.3 Energy efficiency measures and technologies**

France has developed a multitude of energy efficiency measures and technologies. The Energy Savings Certificate scheme is one of the key measures generating the biggest share of the achieved savings. Further key measures comprise the Improved Energy Efficiency in new vehicles, the Thermal Regulation 2012, the Tax Credit for energy transition (CITE) as well as the provision of soft loans to households and social housing. A full list of measures can be sought over in France's 2<sup>nd</sup> NEEAP.

# **3. Implementation**

## **3.1 Data collection and measurement procedures**

The main data sources for monitoring implemented energy efficiency measures in different sectors are statistical offices, national databases, and data from paid subsidies. Bottom-up methods (modelling, surveys, etc.) and other tools to measure, monitor and report results are in use according to the requirements of the energy efficiency measures. Moreover, top-down evaluations are utilised in order to assess energy efficiency trends in the different consumption sectors and to estimate the fulfilment of 2016 energy efficiency targets from the ESD. Nevertheless, the ODYSSEE database does not assess directly the efficiency of specific energy efficiency measures.

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<sup>8</sup> ENSPOL, *Evaluation of existing schemes*, p86

<sup>9</sup> ENSPOL, *Evaluation of existing schemes*, p52

<sup>10</sup> ENSPOL, *Evaluation of existing schemes*, p14

The institutions, which are involved as administrative authorities, are also responsible for the data collection process.

France works with a set of standard measures containing predefined calculations in order to simplify the declaration process and eliminate the need for precise monitoring of an installation. The savings attributed to the project are based on an average established by the installers and users of that technology. Standard project proponents are not required to submit usage data or savings measurements for the operation when requesting ESCs.

Concerning the “special projects”, with no standard calculation as a basis, PNCEE asks for data to back up their savings hypotheses (but it is not explicitly required). As a result, most submissions of “special” projects tend to include from 2-3 months’ worth of monitoring data to justify their calculations. Given that these submissions require one year to be treated and can often involve a significant volume of ESCs, the project proponents prefer to submit the data to ensure their submission is as complete and transparent as possible. This means that the submissions typically take place at least 3 months after the project is completed, to allow time for this data to be collected. As such, this is the only monitoring that takes place in the French scheme.

The white certificates are only materialised when registered on the national white certificates electronic registry ([www.emmy.fr](http://www.emmy.fr)).

### **3.2 Verification procedures**

The monitoring body depends on the energy efficiency measure as stated in section 2.1. Each monitoring actor uses its own verification process. There are specific targets being set for the implementation of the monitored and verified energy efficiency measures on annual basis.

ESCs are awarded for energy savings achieved in projects that can either be

- from a catalogue of “standard operations” or
- case-by-case i.e. “special operations” where the savings must be calculated more precisely.

For the case of standard operations, individual information sheets for measures are developed and proposed by different stakeholders participating in the ESC scheme (professional bodies, industrials etc.). Once the proposed operation is accepted and verified for technical accuracy by ADEME and after being validated by the Ministry, the standardised measure is published for official use in the scheme in a ministerial decree in the French “Journal Officiel”. Currently there are 304 possible standard energy saving measures, defined such as condensing boilers, roof insulation or double glazing operations, included in the official catalogue. The French administration regularly updates the list so as to account for technical progress by 1) removing measures that no longer provide significant

savings as compared to the regulated standard, 2) modifying existing measures to better represent the present circumstance, and 3) adding newly approved measures. The full list of standardised measures is provided in the following link: <http://www.developpement-durable.gouv.fr/1-le-secteur-du-batiment.html>.

Special operation requests are sent to the National Authority for Energy Saving Certificates (PNCEE), which validates the requests for ESCs with support from ADEME on the highly technical portions of the project.

The ESCs are only awarded to a qualified project proponent (an obligated or eligible party) after a professional installer finishes the operation and the PNCEE validates the eligible energy savings.

The PNCEE reserves the right to audit works that have received ESCs at a future time but to date; no such audits have been completed. As such, beyond the desk based verifications at the PNCEE, there is no on-site verification of the energy savings to ensure that the equipment is properly installed and that the savings are actually being realized. The only certitude is that the installer and beneficiary attest that the energy saving measure has been implemented. In addition, when there is a suspicion of cheating, in-depth controls are undertaken within the framework of a judicial procedure.

At the end of each period, the PNCEE verifies that each obligated party holds at least the amount of ESCs on the Emmy, the national white certificates electronic registry, as is required by their obligation.

The most dominant verification methodology being used to certify energy savings in white certificate schemes in France is the deemed savings: This approach follows using an ex-ante methodology, taking into account defaults for free riding, delivery mechanisms and persistence. The standardized savings are being updated according to the evolution of the baseline. Nevertheless, the modifications do not affect the previously certified measures.

For the strategic measures, each monitoring actor uses its own verification process.

### ***3.3 Reporting procedures***

The reporting period of the M&V schemes depends on the considered energy efficiency measure. As far as the ESC scheme is concerned targets are set for each obligated party for a three-year period. Within this period, there are no annual deadlines to be respected, the targets being verified only at the end of the period.

## **4. Assessment**

### **4.1 Energy performance**

Emmy, the national registry, collects data on the number of ESC generated by each obligated party, the type/number of operations declared, and the operations by region. An analysis shows that most ESCs are awarded for measures performed in the building sector.

The ESC scheme permitted to save 78.8 TWh and 19.9 Mt CO<sub>2</sub> between July 2006 and December 2013, cumulating the impact of ESCs attributed each year and of those of ESCs attributed the previous years.

### **4.2 Integrated tools**

No integrated tool for the homogeneous monitoring and reporting of the M&V schemes has been identified.

## **5. Conclusions**

The governance of the scheme [Ministry, ADEME and ATEE (representing obligated parties)] seems to give the scheme a strong support. The catalogue of standardized operations listing 304 best practices in terms of energy efficiency measures and the savings that can be expected from these measures facilitate the monitoring and verification process. But hardly any quantitative ex-post evaluations have been run on the ESC scheme, France is missing the concrete knowledge on the actual savings triggered by the M&V scheme. Nevertheless, standard operations sheets are regularly updated, which allows to take into account some feedback from their implementation and to review their calculations monitoring of the achieved energy savings.

## **II. Coordination mechanisms**

### **1. General framework**

The legal responsibility for energy policy making lies at national Level. The following ministries have a legal competence for EE policy formulation: Ministry of Energy (also part of ministry of environment and ministry of transport) and Ministry of Housing.

## **2. Operational issues**

### ***2.1 Involved parties and responsibilities***

Responsibilities for energy efficiency policy making and implementation are clearly defined between the different governmental levels in France.

Laws, decrees, orders and tax credits define the responsibility of the national level. Local authorities implement regional schemes regarding air, climate and energy, in coordination with the national framework. They can also be part of the Covenant of Mayors. They can have their own financial support scheme. They also contribute to finance "one-stop-shops" network that give advice to households wishing to refurbish their homes. Local public societies can also be involved in the third party financing of building refurbishment.

There are existing coordination bodies between national and regional level for energy policy. Local authorities are represented through some associations (associations of mayors, associations of departments, associations of regions).

Local authorities are involved in national energy policy formulation. A dedicated consultation body ("CNEN" - Conseil national d'évaluation des normes) aims at taking into account the point of view of local authorities regarding energy policy. Moreover, regulations require local authorities to implement regional schemes and local action plans regarding energy, air and climate.

The priorities and needs of the different involved authorities have been taken into consideration during the design of the energy efficiency measures through the above quoted "CNEN".

Certain actions and regulations have been foreseen in order to motivate the participation of the involved authorities.

### ***2.2 Financial and human capacities***

Limited budgets often restrict the implementation of energy efficiency measures, especially of measures with high investment cost and long pay-back periods. On the other hand, energy efficiency measures are on the top priorities of public bodies.

In general, the lack of financial and human resources is also hindering the implementation of energy efficiency measures defined in national plans in France to some extent.

With regard to qualification of administrative staff, no procedures are foreseen or in place to develop appropriate skills and enhance the existing knowledge at administrative level during the planning and implementation phase of measures. However, such skills and knowledge can be sourced from hired shared energy

experts. Some initiatives of cities network are also implemented in cooperation with the French energy agency. Specifically, resources centres are made available by the ADEME regarding local energy and climate plans, GHG assessment, Cit'ergie® process or the "Climat Pratic" tool.

### ***2.3 Access to data and evaluation***

During the implementation phase there is an assessment performed of the energy efficiency measures among the involved authorities in order to redesign them. Regulation modifications follow the consultation pathway through the above mentioned "CNEN".

## **3. Conclusions**

In France, there are existing coordination bodies between national and regional level for energy policy when it comes to energy policy making. Local authorities are represented through some associations (associations of mayors, associations of departments, associations of regions). The implementation of energy efficiency measures at regional and local level is incentivized through subsidies schemes targeting to local authorities and the energy efficiency obligation scheme obliging energy suppliers to implement energy efficiency measures in the end-use sector including local authorities. Finally, the involvement of the local authorities in national energy policy formulation is performed through the dedicated consultation body "CNEN".

## M&V schemes and coordination mechanisms

### Finland



#### I. M&V schemes

##### 1. General framework

In Finland, a M&V scheme for the monitoring of the energy efficiency measures have been developed according to the requirements of the National Energy Efficiency Action Plans as derived by the Directives 2006/32/EC (ESD) and 2012/27/EU (EED).

##### 2. Design

###### ***2.1 Administrative authority***

The Energy Department of Ministry of Employment and the Economy and the governmental agency "Motiva OY" are responsible for the administration and coordination of the M&V scheme.

###### ***2.2 Sectoral and spatial analysis***

Measures in residential, public, industrial and transport sectors are covered by the M&V scheme, while the participation of the involved parties is performed at national and local level.

###### ***2.3 Energy efficiency measures and technologies***

The most important energy efficiency measures comprise:

- Building code D3: Energy Efficiency of Buildings in households
- Buildings codes C3+C4: Thermal insulation in households
- Energy Auditing Programme in industrial sector
- Subsidies for Energy Audits and Energy Investments in industrial sector
- Energy Efficiency Agreements and Programme of Municipalities
- The ESCO concept (cross-cutting)

### **3. Implementation**

#### ***3.1 Data collection and measurement procedures***

The data are collected by national databases, while the Motiva OY is responsible for the data collection process and for the development of the methodology for the utilised indicators.

Top-down approaches are used according to the recommendations by the EC in accordance with the ESD.

Practically all evaluations of energy efficiency measures are based on bottom-up methodologies, but the methods vary.

For energy audits, energy agreements of efficiency, investment subsidies, monitoring is used. For other measures such as building regulations, modelling is utilised.

#### ***3.2 Verification procedures***

The measures are verified by the implementation of the established bottom-up procedures and specific targets are set for the implementation of the monitored and verified energy efficiency measures.

#### ***3.3 Reporting procedures***

The reporting period has been set on annual basis.

### **4. Assessment**

#### ***4.1 Energy performance***

No information was identified on this issue.

#### ***4.2 Integrated tools***

An IT-tool has been used facilitating the M&V scheme.

### **5. Conclusions**

Finland has already developed and implemented a M&V-scheme for the monitoring of the implemented energy efficiency measures at national and local level. Various top-down and bottom up methods have been used for the effective measurement of the achieved energy savings.

## II. Coordination mechanisms

### 1. General framework

The Ministry of Employment and the Economy has the responsibility for the formulation of the energy policy at national level including the legal competence for energy efficiency issues.

### 2. Operational issues

#### *2.1 Involved parties and responsibilities*

The local authorities are not involved directly in national energy policy. Nevertheless, the priorities and needs of the different involved authorities have been taken into consideration during the design of the energy efficiency measures.

Moreover, specific actions and regulations have been foreseen in order to motivate the participation of the different involved authorities.

The local and regional governments are incentivized for implementing energy efficiency measures through the provision of the appropriate financial support.

#### *2.2 Financial and human capacities*

Specific procedures have been foreseen for the development of the appropriate skills and for the enhancement of the existing knowledge of the different involved authorities during the planning and implementation phase of the measures.

#### *2.3 Access to data and evaluation*

No information was identified on this issue.

### 3. Conclusions

Various aspects of a coordination mechanism were identified for the current status regarding the design and implementation of energy efficiency policies, such as actions and regulations for the motivation of the involved stakeholders and procedures for the enhancement of the existing level of skills and knowledge.

## M&V schemes and coordination mechanisms

### FYR of Macedonia



#### I. M&V schemes

##### 1. General framework

In FYR of Macedonia, the Rulebook on energy audit prescribes the MVE methodologies, which are developed according to the EU methodologies. The M&V scheme is in line with the National Energy Efficiency Action Plan. Specifically, the national M&V scheme was set up for transposing the Directive 2006/32/EC (ESD) and for the monitoring of National Energy Efficiency Action Plan.

##### 2. Design

###### ***2.1 Administrative authority***

The administrative authority for the M&V scheme is the Energy Agency of Republic of Macedonia.

###### ***2.2 Sectoral and spatial analysis***

Measures in public, residential, industrial and transport sectors are covered by the national M&V scheme. On administrative level, the local authorities and the national authorities are included in the process.

###### ***2.3 Energy efficiency measures and technologies***

The most important energy efficiency measures and technologies in terms of energy savings, which are covered by the M&V scheme, consist of the adoption and implementation of building codes, the reconstruction of existing buildings in terms of energy efficiency, the penetration of solar water heaters and geothermal heat pumps, the combined heat and power production, the improvement of performance of industrial processes and the promotion of sustainable transport systems in urban areas.

The most efficient measures according to the results from the M&V schemes comprise the combined heat and power production, the promotion of sustainable transport systems in urban areas and the reconstruction of existing buildings in terms of energy efficiency.

### 3. Implementation

#### ***3.1 Data collection and measurement procedures***

The responsible body for data collection is the State Statistic Office. For the case of energy related statistic, the local self-governments are also responsible to gather data and submit reports.

Moreover, data from other sources are used such as data from public sector enterprises, data for imported devices and appliances in FYR of Macedonia by the Custom of the Republic of Macedonia, data from distributors of electrical devices and appliances, data from separate industries which are received through bigger Chamber of Commerce, data from the Ministry of Economy for solar water heaters for which subsidies are provided.

For the data collection process, especially for the energy related data from the local self-governments, the responsible body is the Energy Agency of the Republic of Macedonia.

Two procedures are utilised for the monitoring of the measures. Firstly, there is developed and adopted bottom-up methodology, which is consisting part of the Rulebook on energy audit. It consist 20 different methods which can be used in order to measures effects of implementation of energy efficiency measures in different sectors of the final energy consumption. These methods are the following: 1) New residential buildings, 2) Improvement of the envelope of the residential buildings, 3) Boilers on biomass, 4) Installation of condensing boilers for water heating in closed system in residential buildings, 5) Energy efficiency cooling machines and washing machines, 6) Sanitary hot water in households - Solar water heaters, 7) Sanitary hot water in households - Heat pumps, 8) Improvement of the heating system in water cycle in non-residential buildings (tertiary sector), 9) Improvement of lighting systems (in tertiary sector), 10) Improvement of central acclimatization (in tertiary sector), 11) Office equipment, 12) Energy efficient motors, 13) Variable speed drives, 14) Energy efficient vehicles, 15) Changing the transport mode of passengers, 16) Eco-driving, 17) Intelligent meters in households, 18) Energy audits, 19) Replacement and installation of new lamps in residential buildings and 20) Replacement and installation of new systems for public lighting.

Moreover, a top-down methodology has been developed and adopted, which is part of the Rulebook on energy audits. It is completely developed according to the EU methodology, i.e. the EU Recommendation to develop this methodology. There are separate indicators developed to monitor EE measures in the different sectors of the final energy consumption. For monitoring the residential sector are developed 5 preferred indicators (P1, P2, P3, P4 and P5) and 2 minimum indicators (M1 and M2). For monitoring the service sector are developed 2 preferred indicators (P6 and P7) and 2 minimum indicators (M3 and M4). However, because of not sufficient data, only minimum indicators are used for this sector. For monitoring the transport sector are developed 6 preferred (and

alternative) indicators (P8, P9, P10, P11, P12 and P13) and 2 minimum indicators (M6 and M7). For monitoring the industrial sector is developed 1 preferred indicator (P14) and 1 minimum indicators (M8). However, because of not sufficient data, only preferred indicator is used for this sector.

For the development of the methodologies, the responsible body is the Ministry of Economy – the Energy Department. The existing methodology (bottom-up and top-down) is developed with technical assistance by GIZ and with supervision of separate working groups in which, in addition to the other members, participated representatives from the Ministry of Economy and Energy Agency of the Republic of Macedonia.

### ***3.2 Verification procedures***

The verification of energy savings is performed through the officialization of results of measurements, as presented in the annual reports for the achieved energy savings prepared by the Energy Agency of the Republic of Macedonia. Also, as verification could be treated the adoption of each Energy Efficiency Action Plan in which consisting part is information for achieved energy savings for the previous period of 3 years.

There is only a national indicative energy saving target of 9% until 2018 and intermediate national energy saving target for 2012. For 2015 new intermediate national energy saving target has been defined in the draft second Energy Efficiency Action Plan, which has not yet been adopted.

### ***3.3 Reporting procedures***

The reporting period for the M&V scheme is on annual basis. In addition to the annual reports, report for the achieved energy savings for the period of 3 years is provided in each separate Energy Efficiency Action Plan.

## **4. Assessment**

### ***4.1 Energy performance***

Until 2012 (results for achieved results are given in draft second Energy Efficiency Action Plan) the main energy savings are achieved from the following measures: the combined heat and power production, the replacement of existing fleet of vehicles, the promotion of sustainable transport systems in urban areas and the reconstruction of existing buildings in terms of energy efficiency.

### ***4.2 Integrated tools***

There is no IT tool for the homogeneous monitoring and reporting of the M&V schemes. However, there is a distinct excel tool for applying the top-down methodology and a developed IT tool for applying the bottom-up methodology.

## 5. Conclusions

A M&V scheme has already been defined in the legislation in FYR of Macedonia. The obligations of the different responsible bodies are defined, while all the secondary legislation has been adopted. Several aspects can be improved, as it is the potential development of a universal IT tool for measuring the savings and in addition for reporting. Nevertheless, in practise, the M&V scheme is still not functioning on full scale.

## II. Coordination mechanisms

### 1. General framework

The energy policies in FYR of Macedonia and the policy making can be identified at local and national level. The general legislation and national policies are created at national level, but all municipalities participate in the policy formulation by the development of Action Plans and strategies for energy efficiency, local development etc.

At national level, the Ministry of Economy has the legal competence for the formulation of energy efficiency policy.

### 2. Operational issues

#### *2.1 Involved parties and responsibilities*

The distribution of responsibilities for energy efficiency policy formulation and implementation are clearly defined between different governmental layers. The Energy Law clearly defines who prepares and who adopt the national energy efficiency policy and who prepares and adopts local energy efficiency policy.

The Energy Agency of the Republic of Macedonia and the Ministry of Economy examine whether the preparation and adoption of local energy efficiency policies is in accordance with the national energy efficiency policies. Each municipality after preparation of Energy Efficiency Program submit it on opinion to the Energy Agency of the Republic of Macedonia and after receiving of this opinion the Council of the municipality could adopt the program. The purpose of this opinion is to ensure that municipal Energy Efficiency Program for the period of 3 years is in accordance with the national Strategy for energy efficiency and national Energy Efficiency Action Plan.

The local and regional authorities are not involved in national energy policy formulation. However, local authorities could follow the process of preparation of

energy policy, through the participation on public debates and the submission of official opinion upon each draft proposal.

The national authorities (e.g. Ministry of economy) in the process of preparation of the Strategy for energy efficiency and National Energy Efficiency Action Plans submit them for consultation by the relevant stakeholders, including the association of local self-governments. Also, draft documents are being published on the web site of the Ministry of economy. In that process local self-government units have the right to give their opinion and to express their needs and priorities.

There are some energy efficiency measures and regulation foreseen in Energy Efficiency Action Plans, which are intended to motivate participation of different authorities and which have been implemented. As an example, providing subsidies for buying and installation of solar water heaters in households targets to motivate people to install solar water heaters in their homes. Also, the Energy Law establish strict obligations in the field for energy efficiency, as the obligations in the building sector are implemented through the Rulebook on energy performance of buildings, obligations for public sector entities, etc.

The local and regional governments have the legal obligation for fulfilling and implementing energy efficiency measures. In some cases, technical and financial support for implementation of energy efficiency measures from international financing institutions and donors is available, while the relevant national authorities provide possibilities to all local self-governments to use it.

## ***2.2 Financial and human capacities***

The majority of the authorities do not have the sufficient human and financial resources dedicated to plan and implement energy efficiency measures. The technical and financial support from international financing institutions and donors was utilised in the past, while very rarely the authorities have their own budgets especially for the implementation of energy efficiency measures.

In the Energy Efficiency Action Plan (first and draft second) the necessity to train the employees in all relevant authorities is defined for the purpose of planning and implementation of energy efficiency measures. As an example, it is described the need to train the employees in public sector entities, inducing municipalities for using the web-based software tool for the monitoring and the management of the energy consumption (i.e. the information system). The Ministry of Economy in 2015 is implementing energy efficiency campaign, which, in addition to other, includes such type of trainings. Also, in the Energy Efficiency Action Plan (first and draft second) trainings for relevant authorities are proposed for using the software tool for the monitoring and the verification of energy savings from implemented energy efficiency measures.

## ***2.3 Access to data and evaluation***

On the base of article 134-a of the Energy Law as well as the Rulebook on establishment of information system for the monitoring and the management of

the energy consumption in the public sector entities, each public sector entity needs to collect data and to fulfil them into the information system, i.e. the web-based software tool. This database will be used for the purpose of monitoring the energy consumption and the energy efficiency measures as well as for the formulation of effective local and national energy efficiency policy.

Finally, an assessment of energy efficiency measures for the potential redesign is prepared within the framework of the second Energy Efficiency Action Plan.

### **3. Conclusions**

The most important operational issue in FYR of Macedonia is the lack of capacity, both financial and human. Various measures have been introduced in order to address this problem in several national strategies inducing municipalities for using the web-based software tool for the monitoring and the management of the energy consumption.

## M&V schemes and coordination mechanisms

### Germany



#### I. M&V schemes

##### 1. General framework

In Germany several M&V schemes are combined due to the fact that different objectives have been established, which must be regularly monitored and the obtained results have to be published in annual monitoring reports. The monitoring is more intense and detailed for bigger and expensive policy measures and less intense for soft accompanying measures. Moreover, the reporting is implemented within the National Energy Efficiency Action Plans according to the requirements of the Directive 2012/27/EU (EED).

On federal state level, several states have added regional monitoring and verification. Depending on the focus of the regional energy and climate strategies, the M&V systems vary in terms of focus (energy or greenhouse gas aggregates) and level of analysis. Finally, at local level a large number of cities and communes have set up energy balances, however not in a harmonised way and with a strong focus on fitting their local needs.

##### 2. Design

###### *2.1 Administrative authority*

At federal level, the Ministry for Economic Affairs and Energy is responsible for energy policy design. The ministry is coordinating its policies with other relevant ministries such as the Ministry for Environment or the Ministry for Transport and Infrastructure. The administrative implementation of the monitoring for the National Energy Efficiency Action Plans is devolved to the subordinate Federal Energy Efficiency Centre and the national energy agency (dena – Deutsche Energieagentur).

At federal state level, the responsible ministries for energy coordinate existing M&V schemes at regional level. At local level, cities and communes are responsible for setting up and coordinating M&V schemes within their constituency. However, there is no obligation in order to establish the appropriate M&V schemes.

## **2.2 Sectoral and spatial analysis**

In general terms, the M&V system covers all relevant energy consumption sectors (public sector, industry sector, households and transport). According to the energy statistics law, the energy providers and industry consumers are obliged to cooperate with the government authorities on the provision of data. The administration of the implemented energy efficiency measures is mandatory at national and regional level and voluntary at local level.

## **2.3 Energy efficiency measures and technologies**

The most important energy efficiency measures in terms of the achieved energy savings comprise the energy upgrade of existing buildings (557 PJ), the KfW support scheme for the increase of energy efficiency in industries (61 PJ), the promotion of energy audit advise scheme for the industrial sector (54 PJ) and the energy saving ordinance for new buildings (144 PJ).

# **3. Implementation**

## **3.1 Data collection and measurement procedures**

The monitoring is responsibility of the Federal Statistics Office, but to a large extent is covered by data established in a public private partnership, the "Working Group on Energy Balances" (AGEB). This working group combines energy suppliers, research institutes, several federal offices, the Federal Office for Statistics and is led by the Federal Ministry of Economic Affairs and Energy.

For the monitoring of the National Energy Efficiency Action Plans, the Federal Energy Efficiency Centre signs out studies with research consortia who collect, harmonise and analyse the M&V data of the key energy efficiency instruments. They are supported by the dena.

AGEB data is used to monitor and analyse the major energy efficiency trends at federal level. Regional and local data are fed into this working group via the Federal Statistical Office that acts as coordinator for the statistical offices of the federal states, which, in turn, consolidate local data in a similar working group on regional energy statistics. The final set of data is updated monthly and published by the Federal Ministry of Economic Affairs and Energy. In addition, reports and analyses provided by research consortia are regularly taken into account.

Annually, the data is condensed and interpreted in a "monitoring report on the energy transition". Apart from analysing the major energy aggregates tracked for energy savings, this report places a special emphasis on energy efficiency in buildings, where the biggest economic energy saving potentials are expected. Biannually, the monitoring report is stepped up by a complementary chapter on the future strategic steps to fulfil the targets of the energy transition ("progress report"). The annual reports are validated and commented upon by an external council of energy experts.

In addition to the backward-looking monitoring, the federal government has adopted a National Action Plan on Energy Efficiency (NAPE), designed to propose additional policies and measures to safeguard that the 20% primary energy reduction target will be met. This plan is substantiated by projections and energy saving estimates for the individual measures analysed by a research consortium and complements the typical backcasting M&V stance with a forward-looking impact analysis.

The monitoring of historic trends does not include a review of individual programmes and measures but rather stays at macroeconomic or sectoral level. At regular intervals, all major energy efficiency programmes are monitored and verified. This monitoring is usually performed by research institutes specialised in the energy and climate change field. Depending on the importance of a programme the monitoring is performed annually, biannually or on an ad hoc basis. The key idea behind the different intervals is to allow for a cost-effective monitoring which is less resource-intensive than a constant surveillance mechanism.

Since the implementation of the ESD into national German law, the National Energy Efficiency Action Plans serve as overview document for the key energy saving measures and saving impacts. The latest German National Energy Efficiency Action Plan lists some 90 energy efficiency measures and their energy saving impact. The National Energy Efficiency Action Plan was prepared by the Federal Ministry of Economics, in cooperation with the Federal Energy Efficiency Center and the dena. The energy saving calculations are based on individual research studies and estimates assembled by a research consortium. Whereas mainly federal programmes and measures are listed in the National Energy Efficiency Action Plan, the 2011 and 2014 versions list a number of major federal state programmes. These programmes were analysed by a research consortium and updated for the 2014 National Energy Efficiency Action Plan. To date this study remains the only consolidated and methodologically harmonised overview of energy efficiency policies and measures at state level.

At federal state level, monitoring and verification is not harmonised. This implies that depending on the political focus of a federal state the monitoring and verification varies and places an emphasis on parameters like budget spent, number of measures implemented (e.g. number of energy audits installed, number of energy networks put in place, number of energy counselling sessions solicited), energy savings or CO<sub>2</sub> impact. With several federal states having adopted regional climate protection programmes or even regional climate protection laws, a strong focus is usually placed on avoided CO<sub>2</sub> emissions rather than energy savings. This is for example the case in North Rhine-Westphalia and Baden Wuerttemberg. Like at federal level, both regional policy strategies and the individual programmes and measures are usually assessed through research consortia.

At local level, a systematic tracking of energy efficiency is not comprehensively implemented. Whereas all major local entities like bigger cities or agglomerations collect and monitor energy data, the review of energy saving programmes is not

systematically installed. Rather than tracing energy savings many local governments stick to the regional focal point of climate policies and monitor the CO<sub>2</sub> reduction efforts of their constituency. This however includes a broader set of measures ranging from the deployment of renewable energies, energy efficiency to adaptation measures. In the case of North Rhine-Westphalia and Baden Wuerttemberg the responsible federal state ministries have provided the communes with licences for an online CO<sub>2</sub> measuring tool which collects the CO<sub>2</sub> reduction efforts in a harmonised way.

Energy efficiency monitoring is implemented mainly in the local entities participating in the European Energy Award and having taken up a dedicated reporting obligation in this framework. More surprisingly, an evaluation of the 57 Sustainable Energy Action Plans (SEAPs) which are drafted as part of the adherence to the European Covenant of Mayors shows that here again the clear focus is on carbon-reduction monitoring rather than tracing energy efficiency. According to our SEAP evaluation, energy monitoring is performed systematically only in 22 cities and communities. All of these actors rely on individual methods (bottom up or top down, depending on the case) for tracking energy efficiency progress.

### ***3.2 Verification procedures***

There are no specific targets set for the implementation of the energy efficiency measures on annual basis. The verification of fulfilment is obtained by top down monitoring of statistics, while for the case of the most important programmes the bottom up provision of energy auditor data is foreseen.

### ***3.3 Reporting procedures***

The reporting of the macroeconomic aggregates is continuous and updated regularly on-line. It is publicised in annual monitoring reports. Policies and measures and reviewed periodically. These reviews serve as inputs for the National Energy Efficiency Action Plan reporting.

## **4. Assessment**

### ***4.1 Energy performance***

The 2014 National Energy Efficiency Action Plan estimates total primary energy savings which can be tracked in a bottom up manner at 810 PJ by 2016.

The public authorities interviewed argued that an M&V system is a necessary element for compliance control but not a means to directly trigger energy savings. In this sense, they do not consider a seamless M&V system as an end in itself. Rather, costs and benefits are considered to ensure that programmes delivering the highest amount of savings are monitored closely whereas supporting “soft” measures are monitored in a looser and less costly way.

#### **4.2 Integrated tools**

An integrated tool for a heterogeneous monitoring of energy savings does not exist in the framework of energy efficiency policies. At federal state and local levels some constituencies have developed integrated tools for CO<sub>2</sub> monitoring.

### **5. Conclusions**

Owing to the federal structures, a uniform monitoring and verification process is so far not established in Germany. The existing structures combine ad hoc verification and systematic monitoring based on national methods. These methods are linked closely to the ESD/EED methodology for tracking energy savings but are first and foremost adapted to national circumstances. A key feature of all M&V mechanisms in place is their emphasis on cost-effectiveness. Public authorities do not consider a seamless M&V system as an end in itself. Rather, costs and benefits are considered to make sure that programmes delivering the biggest amount of savings are monitored closely whereas supporting measures are monitored in a looser way. This guarantees that the available resources are optimised and used for setting up and running policies and measures rather than establishing statistics.

## **II. Coordination mechanisms**

### **1. General framework**

Unlike in centralised countries, the federal structures of Germany imply that all levels of government (federal government, regional federal states and local level) have competencies in the various fields of energy policy. Partly these are shared competencies and partly they are exclusive competencies. In the case of energy efficiency policies, the federal government and regional states act as co-legislators.

Federal laws usually define the bulk of energy efficiency policies and are implemented at regional and local level. However, any federal state has the opportunity to adopt more ambitious legislative provisions in comparison with the corresponding at national level. Moreover, the local governments can design and implement additional energy efficiency programs than the already been established at federal and regional level.

### **2. Operational issues**

#### **2.1 Involved parties and responsibilities**

Formal vertical coordination is performed largely in the legal context set up by the shared competences of the federal level and the federal states for energy

efficiency. Most laws on energy efficiency action require the approval of the Bundesrat, the second chamber of Parliament, where the federal states are represented. In the process towards adoption of legislation the respective committee on economy and energy or environment and climate change will ensure that the federal state ministries in charge of energy issues provide the federal government with their comments and amendments for the given legislation and finally cast a vote on the legal proposal from the federal government. Along this line the federal states will assure that the monetary and human resources needed to transpose a federal law will be granted to them by the federal level or will negotiate compensations in case the transposition is to be financed by their own resources.

In case local governments are impacted by this legislation, the federal state ministries will ensure coordination with the respective associations of local level representatives (Städtetag – German Association of Towns and Cities etc.). As this process of law-making is common to most fields of policy, it is an established procedure in law making which proves to be relatively slow in comparison to centralised states but highly effective in terms of coordination and concentration.

To underpin the formal law-making, the Federal Ministry of Economic Affairs and Energy hosts an annual working group of the responsible government officials of federal and federal state level (Bund-Länder-Arbeitskreis Energieeffizienz). Key aims of this working group are smoothening the policy process, informing about intended policy changes or amendments and to exchanging best practices on a regular basis. Supplementary to the formalised annual meetings, the working group can be called upon at ad hoc basis if need be. Additional working groups have been set up for dedicated sub-topics on energy efficiency, such as the implementation of energy efficiency in buildings or the combination of energy efficiency and renewable energy sources.

A formal horizontal coordination of energy efficiency policies is assured both on federal and on federal state level. Once the lead ministry drafts a legislation (including legislation to set up a financial support programme), it is obliged to install an inter-ministerial working group (Interministerielle Arbeitsgruppe, IMA) with all ministries concerned to ensure policy coherence. This horizontal coordination process is used as well to inform the concerned federal state ministries on legal proposal by the responsible lead ministries for energy efficiency in the federal states.

At local level a direct horizontal coordination is organised only in an indirect manner. Here, the coordination and dissemination of information is usually taken up by the associations representing cities and communities.

The German formal coordination mechanisms are by and large designed to guarantee smooth law-making which is closely oriented at the subsidiary principle. Whereas this general framework was sufficient for the last decades, the increasing need for a constant exchange on energy efficiency policy making as well as monitoring and implementation has led to the emergence of supplementary informal coordination mechanisms at all levels of government.

Owing to the informal and non-binding character of these mechanisms the group of involved actors has in many cases been enlarged to include researchers, industry associations, consumer associations and NGO representatives.

Following concerns on the implementation and monitoring of the energy system transformation, the Federal Ministry for Economic Affairs and Energy has established a number of informal “coordination platforms”, among those the coordination platforms for energy efficiency and energy efficiency in buildings. Key tasks of these platforms are to develop and discuss joint solutions together with the relevant stakeholders from business, civil society, science, the affected public departments and the federal states.

This informal coordination mechanism was activated for the first time for the development of the NAPE. Via these platforms, federal states, associations and non-governmental organisations submitted a variety of proposed measures for NAPE and the Energy Efficiency Strategy for Buildings in a standardised format, including estimates on energy saving impacts. These have been evaluated and included in the working process on the NAPE. The proposals were subsequently circulated and discussed among the platform participants so as to assess additional innovative approaches.

Similar informal coordination mechanisms exist at federal state level, although energy efficiency is often only one cornerstone in a larger climate policy context.

At federal state level, many regional strategies and programmes were established and discussed in a similar stakeholder setting. Most notably the Climate Change Plan of North Rhine-Westphalia was drafted, discussed and finally adopted in an extremely comprehensive stakeholder platform process including the feedback of individual citizens. Adding to the presented coordination approaches, an internal coordination is in the process of being established. At federal state level, informal coordination is used to guarantee a best practice exchange between the senior civil servants dealing with energy. A horizontal informal coordination of the regional directors for energy is supposed to complement the formal horizontal coordination on ministerial level.

With changing federal state governments the responsibility for the energy dossier is often shifted from one ministry to another, or attached to different ministries. As the traditional meeting formats foresee formal exchange fora of energy ministers or environment ministers etc., they fall short of assembling energy efficiency competence in case this field is attached to an energy ministry in one federal state (e.g. Bavaria) but attached to climate and environment ministries in other federal states (e.g. Baden Wuerttemberg and North Rhine Westphalia). This gap in the formal horizontal coordination will be bridged by the informal director meetings.

Finally, at local level, informal horizontal coordination starts to play a growing role with common exchange topics and European fora such as the Covenant of Mayors or the Energy Efficiency Award meetings. These coordination platforms are however at present not comprehensive and rather ensure a stronger

coordination of the frontrunner cities and communities for climate change and energy efficiency.

### ***2.2 Financial and human capacities***

With the formal vertical co-law making structure, the federal states will ensure that the monetary and human resources needed to transpose a federal law will be granted to them by the federal level or will negotiate compensations in case the transposition is to be financed by their own resources.

### ***2.3 Access to data and evaluation***

Authorities interact to safeguard access to data and information. This usually is performed informally and on ad hoc basis.

In general terms, all major energy efficiency instruments are assessed in regular intervals in order to allow for redesigning them.

## **3. Conclusions**

In terms of policy coordination, the traditional formal vertical and horizontal coordination of government layers used for law-making in Germany also strongly defines energy efficiency policies. Especially with the energy transition, additional informal coordination mechanisms occur which complement the formal mechanisms. As these informal mechanisms define informal coordination in a wider sense, including civil society at large, they might prove an interesting and effective instrument which could serve as best practice for other countries.

## M&V schemes and coordination mechanisms

### Greece



#### I. M&V schemes

##### 1. General framework

In Greece the implementation of the M&V schemes for energy efficiency measures depends on the implemented programs. Specifically, several M&V schemes have been designed and established within the framework of the implemented energy efficiency measures according to their discrete requirements and characteristics. The main categories of energy efficiency measures, which are already on progress, consist of the provision of financial incentives mainly from the Operational Programs within the framework of National Strategic Framework and the exploitation of the available Structural Funds and the imposition of legislative and regulatory measures. Even if the implemented M&V schemes have been established independently, it can be considered that they are in compliance with the Directives 2006/32/EC (ESD) and 2012/27/EU (EED). Specifically, the proposed M&V schemes were established and introduced in the energy efficiency policy for the effective monitoring of the energy efficiency measures during the preparation of the National Energy Efficiency Action Plans according to the requirements of the ESD.

Although the EED has not been transposed into the national legislation, the appropriate M&V schemes have already been developed in order to monitor the energy efficiency measures. Especially, all the necessary procedures for the efficient monitoring and verification of the foreseen alternative measures until 2020 within the framework of Article 7 of the EED have already been established for the existing measures and have been designed for the planned energy efficiency measures ensuring the fulfilment of the energy saving target.

##### 2. Design

###### *2.1 Administrative authority*

The Ministry of Environment and Energy is responsible for the implementation of the ESD and EED at national level for the design, facilitation and monitoring of the implemented energy efficiency measures and for the establishment, administration and coordination of the required M&V schemes.

## **2.2 Sectoral and spatial analysis**

The implemented M&V schemes focus on energy efficiency measures, which promote the implementation of energy efficiency interventions in the public (including tertiary), the residential and the transport sector. Regarding the spatial coverage of the M&V schemes, they focus on energy efficiency measures at regional and national level.

## **2.3 Energy efficiency measures and technologies**

The most important energy efficiency measures consist of the "Energy Savings at Home" and "Substitution of old private cars with new high efficient" programs. The "Save Energy at Home" program provides financial support to households in order to implement interventions for the improvement of the energy efficiency of their buildings. The foreseen eligible technologies includes the replacement of the window frames with new more efficient, the installation of shading systems, the thermal insulation of the building envelope, including the roof and the pilotis and the upgrade of the electro-mechanical equipment of the heating and hot water systems. The "Substitution of old private cars with new high efficient" program aims at the replacement of the public and private old passenger vehicles fulfilling EURO III standards with new more efficient vehicles fulfilling EURO V standards. Under this program, it is foreseen the partial or the whole exemption from the specific registration fee of the new technology passenger vehicles. Moreover, the old vehicles have to be sent for scrapping under the approved system for alternative management of End-of-Life Vehicles.

## **3. Implementation**

### **3.1 Data collection and measurement procedures**

The main data sources for the monitoring implemented energy efficiency measures and the measurement of the achieved energy savings in different sectors consist of the corresponding unit of the Operational Programs, which are responsible for the implementation of the programs and the Hellenic Statistical Authority. Moreover, the Registry of Energy Performance Certificates is utilized as additional source for the acquisition of necessary data regarding the implementation of energy efficiency interventions in buildings. The Ministry of Environment and Energy with collaboration of the Hellenic Statistical Authority are responsible for the coordination and the implementation of the data collection process.

The monitoring of the energy efficiency measures is performed through the establishment of specialized bottom-up procedures. These procedures were developed from the Ministry of Environment and Energy. The foreseen approaches were improved according to the requirements of the Article 7 of the EED. The bottom-up approach for the case of "Energy Savings at Home" program is based on the analysis and the evaluation of the EPC data for these buildings, which are financed by each Operational Program. Specifically, for each building it is estimated the savings in final energy consumption by the provided savings in

primary energy consumption through a specialised calculation procedure utilizing specific reference values. For the case of "Substitution of old private cars with new high efficient" program the bottom-up approach is based on the total number of replaced vehicles and on assumptions about their mean specific consumption and their average covered distance on annual basis.

### ***3.2 Verification procedures***

The measured energy savings are verified within the framework of the M&V schemes through the conduction of random inspections to a representative sample of the participating either building or vehicles. In any case the details about the verification procedure are specified by each energy efficiency program separately complying with the requirements of each Operational Program and the National Strategic Framework (both for the programming periods of 2007-2013 and 2014-2020). To this purpose each Operational Program has established a corresponding unit, which is responsible for the verification of the implemented actions and interventions.

Specific targets have been set for the monitored and verified energy efficiency measures on annual basis during the establishment of the energy savings targets within the context of Article 7 of the EED.

### ***3.3 Reporting procedures***

The reporting period of the M&V schemes is determined by the requirements of the Operational Programs and the National Strategic Framework for the programming periods of 2007-2013 and 2014-2020. Specifically, this reporting period requires the monitoring of the financed action by 6-month period with the submission of standardised reports and the quantification and monitoring of specific indicators.

## **4. Assessment**

### ***4.1 Energy performance***

According to the submitted annual report within the framework of EED the most important results of the energy efficiency measures in respect of energy savings in 2014 comprise the "Energy savings at Home" program (22.0 ktoe) and the "Substitution of old private cars with new high efficient" program (29.3 ktoe). Nevertheless, a deviation was noticed in comparison with the initially specified annual targets.

### ***4.2 Integrated tools***

No integrated tool for the homogeneous monitoring and reporting of the M&V schemes is available.

## 5. Conclusions

Summarizing, the establishment of the necessary M&V schemes in Greece is performed according to the requirements of each energy efficiency measures and depends on their unique characteristics. As a result the homogeneous implementation of a robust M&V scheme is considered as a prerequisite for the efficient implementation of the EED and the fulfilment of the corresponding energy efficiency targets. As noted in the last submitted National Energy Efficiency Action Plan for all the developed energy efficiency measure a specific M&V scheme has to be developed according to the requirements of Article 7 of the EED.

## II. Coordination mechanisms

### 1. General framework

The Ministry of Environment and Energy has the legal competence for the energy efficiency policy formulation. Specifically, the Ministry is responsible for the transposition of the relevant directives and their implementation including the design, implementation, monitoring and verification of the foreseen energy efficiency measures. As a result the legal responsibility for energy policy making is concentrated on national level. The financing of the energy efficiency measures is performed at national level through the National Strategic Framework for the programming periods of 2007-2013 and 2014-202 and the specific Operational Programs, such as the Operational Program of Competitiveness and Entrepreneurship and the Operational Program of Environment and Sustainable Development.

Nevertheless, various energy efficiency measures are performed at regional level through the financing from the regional Operational Programs, which have the flexibility and duties to implement their regional energy efficiency strategy according to their needs and priorities. The formulation of energy efficiency policies at local level is limited through the conduction of Sustainable Energy Actions Plans, while the financing of the proposed measures is implemented mainly by the National Strategic Framework and the corresponding regional Operational Programs.

### 2. Operational issues

#### *2.1 Involved parties and responsibilities*

The responsibilities for energy efficiency policy making and implementation among the different governmental layers have not been clearly distributed, as the energy efficiency policy making and implementation is performed separately at regional and national level. Moreover, no official coordination bodies between

national and regional level for energy policy has been established, while the local authorities have not been involved in the national energy policy formulation.

No transparent framework for the specification of the priorities and needs of the different involved authorities, which must be taken into consideration during the design of the energy efficiency measures, has been identified. The priorities are formulated mainly by the general objectives of the Operational Programs, while no certain actions and regulations have been foreseen in order to motivate the participation of the involved authorities.

Finally, the necessary energy efficiency measures from the local and regional governments are implemented either through the imposition of legal regulations or through the financial support from the Operational Programs.

## ***2.2 Financial and human capacities***

The involved authorities have not had the sufficient financial and human resources to plan and implement the measures as defined in the national plans, while additional obstacles constitute the limited number of personnel and the lack of specialization on energy efficiency issues.

Moreover, no specific and recurring procedures have been foreseen for the development of appropriate skills and for the enhancement of the existing knowledge of the different involved authorities during the planning and implementation phase of the energy efficiency measures.

## ***2.3 Access to data and evaluation***

The continuous assessment of the implementation progress of each energy efficiency program is performed according to the submitted reports fulfilling the requirements of the Operational Programs. The aim of this assessment procedure is obviously the redesign of the implemented energy efficiency measures. Such an initiative was performed within the framework of "Energy savings at Home" program. More specifically, in 2012 some prerequisites for participation into the program have been modified in order to facilitate the participation into the program increasing the overall effectiveness in terms of energy savings. Finally, no procedures are foreseen in order to facilitate the access to data and information from the different involved authorities during the planning and implementation phase of the energy efficiency measures.

## **3. Conclusions**

No coordination mechanism for the design and implementation of energy efficiency measures has been developed yet in Greece.

## M&V schemes and coordination mechanisms

# Hungary



## I. M&V schemes

### 1. General framework

Hungary has started the development of a M&V scheme, which will be in line with the National Energy Efficiency Action Plan, while its introduction was performed within the framework of Article 7 of the Directive 2012/27/EU (EED).

### 2. Design

#### *2.1 Administrative authority*

The ministries, which have undertaken the energy efficiency policy formulation are responsible for the administration and coordination of the M&V scheme.

#### *2.2 Sectoral and spatial analysis*

The M&V scheme covers energy efficiency measures in public, residential, industrial and transport sectors. The participation of the involved parties is mandatory for all the governmental bodies, which are responsible for energy efficiency programme are ministries and for the managing authorities, which are responsible for the administration of specific operational programmes.

#### *2.3 Energy efficiency measures and technologies*

The most important energy efficiency measures consist of refurbishment of buildings (including public buildings), public procurement of governmental institutions, measures in the field of transport (bicycle roads, railway related development, etc.) and household energy efficiency device replacement programme. The most efficient measure according to the results of the M&V is the refurbishment of buildings.

### 3. Implementation

#### *3.1 Data collection and measurement procedures*

The main utilised sources for the collection of the necessary data for the monitoring of the implemented energy efficiency measures in different sectors

comprise national databases and databases of Hungarian energy and Public Utility Regulatory Authority. The Hungarian Energy and Public Utility Regulatory Authority is responsible for the data collection procedure.

Bottom up methodologies are utilised for the measurement of the implemented energy efficient measures, while the developed methodologies and indicators depend on the types of measures.

### ***3.2 Verification procedures***

The verification process of energy savings is based on the proposed calculation by the Directive 2010/31/EU (EPBD). It should be noted that the verification procedures may differentiate among the implemented energy efficiency measures.

Moreover, approximately 20 different energy efficiency targets have been specified for the different energy efficiency measures such as the imposition of target for public buildings, energy saving, road taxes, etc.

### ***3.3 Reporting procedures***

The reporting requirements for the M&V scheme has been established on annual basis.

## **4. Assessment**

### ***4.1 Energy performance***

No assessment about the effectiveness of the implemented energy efficiency measures has been conducted.

### ***4.2 Integrated tools***

No integrated tool for monitoring and reporting of the M&V schemes has been introduced.

## **5. Conclusions**

The M&V scheme in Hungary is in compliance with the requirements of the EED, while specific elements of this scheme can be assessed positively such as the procedures for the measurement and verification of the achieved energy savings.



## II. Coordination mechanisms

### 1. General framework

The responsibility for energy efficiency lies at regional and national levels. The ministries, which are responsible for the energy efficiency policy formulation, consist of the Ministry of Energy, the Ministry of Environment, the Ministry of Industry, the Ministry of Transport, the Ministry of Economy and the Ministry of human Capacities. The involvement of each ministry depends on the implementation of the energy efficiency measures in individual sectors.

### 2. Operational issues

#### *2.1 Involved parties and responsibilities*

The responsibilities for energy efficiency policy formulation are clearly defined and distributed between different governmental layers. Hungarian Energy and Public Utility Regulatory Authority is appointed as the coordination bodies for energy policy at national and regional levels.

The local authorities are not involved in the national energy policy formulation, while their needs are taking into consideration during the conduction of public consultations.

Certain actions and regulations were not foreseen to motivate the involved authorities due to their non involvement.

Finally, the Sustainable Energy Action Plans on local/regional level provide the necessary incentives for the implementation of energy efficiency measures.

#### *2.2 Financial and human capacities*

No adequate human and financial resources are available for the design and the implementation of the energy efficiency measures.

#### *2.3 Access to data and evaluation*

Ministry of National Development is responsible for the assessment of the implemented energy efficiency measures, while none representative from the national and regional level is involved in this procedure.

Finally, no procedure for the facilitation of the access to data and information is foreseen from the different authorities.

### **3. Conclusions**

No elements of a coordination mechanism have been identified in Hungary.

## M&V schemes and coordination mechanisms

### Ireland



#### I. M&V schemes

##### 1. General framework

Ireland currently has implemented the well-developed system of M&V schemes, which are defined in line with both National Energy Efficiency Action Plans and Directive 2012/27/EU (EED), including Article 7 monitoring of the Directive. Specifically, three different M&V schemes can be identified, namely the public sector energy monitoring & reporting system, the monitoring & reporting system for Energy Efficiency Obligation Scheme (EEOS) and the monitoring & reporting system LIEN (Large Industry Energy Network).

The abovementioned M&V schemes are in compliance with the requirements of the Directives 2006/32/EC (ESD) and 2012/27/EU (EED).

##### 2. Design

###### *2.1 Administrative authority*

The governmental agency Sustainable Energy Authority of Ireland (SEAI) is appointed as the monitoring body responsible for the administration and coordination of the M&V schemes.

###### *2.2 Sectoral and spatial analysis*

All end-use sectors – public, residential, industrial, transport sectors – are included. The public sector energy M&R system aims at the public sector bodies and partially to transport sector including the public transport fleets and the vehicle fleets fulfilling public services. The M&R System for EEOS refers to energy distributors and retail energy sales companies, which have market sales in Ireland of greater than 600 GWh final sales in any relevant year, regardless of the sector they supply. It should be noted that the obligated energy suppliers are required to deliver energy efficiency savings in non-residential (75%), residential (20%) and energy poverty (5%) sectors equivalent to 550 GWh per annum through to 2020. Finally, the voluntary M&R system of LIEN focuses on industrial sector. Totally 166 companies are participated in the LIEN, while the LIEN membership accounts for approximately 51% of Ireland's national industry primary energy requirement.

The SEAI ensures the operation of the M&V scheme at national level. Moreover, the Education & Training Boards (ETB) are obliged to report within the framework

of energy M&R system on behalf of all of the schools within its aegis (in aggregate). Thus, this regional level is considered as administrative party regarding this particular type of public body (schools, which are not members of ETB, reports submit individually to the system). Finally, the local authorities must submit reports within the framework of public sector energy M&R system.

### ***2.3 Energy efficiency measures and technologies***

According to provided information by SEAI, the 2013 submitted reports by public bodies showed a particular emphasis on improvements in building envelope, lighting systems and structured energy management. Other areas targeted comprise ICT systems improvements, more efficient procurement and interventions in energy supply, transport and water services. Many projects included an integrated approach with a combination of energy efficiency measures. Through the HSE (Health Service Executive) heating fuel conversion programme, hospitals have been benefited from the installation of combined heat and power systems or the upgrading of existing fossil fuel burners using biomass. SEAI, working with Local authorities and Local Energy Agencies, has identified three key high consumption areas to help achieve significant reductions in their energy demand. These areas consist of the water services, the public lighting and the ICT. Regarding the implementation of measures within the framework of EEOS, SEAI has identified within Energy Saving Credit Table as the most efficient measures the penetration of heat pumps, the installation of efficient heat boilers & heating control upgrades and walls insulation. Significant energy savings can be achieved during the implementation of efficient room heaters, windows replacement, solar water heating installation, roof and floor insulation. The implemented measures within LIEN comprise interventions such as the establishment of operation & maintenance procedures, the promotion of high efficient equipments, the provision of energy services, control, the process change and the installation of energy management systems.

## **3. Implementation**

### ***3.1 Data collection and measurement procedures***

The SEAI is responsible for the overall data collection process. The SEAI in collaboration with the Department of Communications, Energy & Natural resources (DCENR) have developed the energy M&R system. Public bodies are responsible for reporting at an organisational level in due time for all fuel types of energy sources.

The obligated energy supplier within EEOS provides aggregated statistical information on the final customers of that energy supplier. The requested information may include information, which allows the monitoring of energy services and will facilitate the design and implementation of energy efficiency measures.

Bottom-up procedures are implemented in EEOS including all principal methods, namely, deemed, metered, scaled and surveyed savings, as proposed by the

EED. The deemed savings method is utilised mainly for energy efficiency measures in the residential sector. The metered savings method is implemented in non-residential new and innovative initiatives, while the surveyed savings method is applied to specific residential projects emphasising on the measurement of behavioural measures. The implementation of the scaled savings method is performed through specific application, which are available by SEAI website, targeting also to smaller non-residential projects where proven technologies are being deployed in certain set circumstances.

Top-down indicators are utilised in the public sector energy M&R system. Two key reporting indicators are calculated for each organisation annually, namely the Energy Performance Indicator and the Total Primary Energy Requirement. SEAI provides technical advice regarding the estimation of the indicators.

The implemented energy efficiency measures within LIEN Network are measures both with bottom-up and top-down approaches. The data on specific energy savings measures during the bottom-up procedure are collected via the annual LIEN questionnaire. The top-down approach is based on the estimation of the Energy Performance Indicators.

### **3.2 Verification procedures**

The main elements of the verification procedure comprise:

- High quality software assistance for the measurement of the achieved energy savings from each measure.
- Validation rules integrated into the reporting software.
- Requests to submitters and on-site reviews.
- Auditing by SEAI a statistically significant sample of measures within EEOS.
- Each EEO party within shall measure and verify the energy savings of projects using an agreed internationally recognised measurement and verification protocol as agreed with the SEAI, and shall report them to the SEAI in the manner and at the frequency required by the SEAI.
- Agreement in advance shall be done between the obligated parties in the EEOS and the SEAI considering the verification method of energy savings in the case of complex project.
- The obligated parties in the EEOS must prepare specific Quality Assurance Schemes.

### **3.3 Reporting procedures**

The reporting is required on annual basis. Specifically, the public sector bodies are required to report annually on their energy usage and the implemented energy efficiency measures. The obligated parties within EEOS have to provide not more than once each year aggregated statistical information. Finally, the LIEN prepares voluntary annual reports.

## 4. Assessment

### 4.1 Energy performance

No enough information was found on this issue.

### 4.2 Integrated tools

The SEAI's online system of public sector energy M&R system was launched in July 2013. Since 2013 all public bodies (except schools) had been required to report detailed energy consumption data on an annual basis using this system. From 2014 onwards, this requirement is being extended to include all schools. Enabling public bodies to report and track their energy data annually, the system provides senior management with a scorecard that presents a powerful snapshot of both the organisation's progress to date and its performance compared to its peers. The system gives every public body online access to its annual electricity and natural gas consumption data and (optionally) allows them to share relevant data with other national reporting systems, such as the Office of Government Procurement's energy procurement framework and, in future, EPA's Carbon Management Tool. The system includes a National Public Sector Energy Database, which informs the development of national policy and programmes, facilitates the generation of national statistics and the fulfilment of Ireland's international reporting obligations and encourages the development of the energy services market.

A IT system has been developed for the obligated parties within the EEOS.

## 5. Conclusions

Ireland has developed a multi-functional, based on IT-application, M&V system. Bottom-up approaches are utilised, while specific verification procedures have been established. The quality of verification is provided by defining issues, which are crucial for verification quality, and by combining important factors in order to ensure verification. Among them there is clear scope of actions to be undertaken by the SEAI, responsibilities of report submitters, role of high quality IT-tool in validation of projects, and others relative issues.

## II. Coordination mechanisms

### 1. General framework

The responsibilities among the administrative levels are divided in the following manner:

- *National level*: Adoption of legislation, formulation of policy including energy issues & establishment of national targets.

- Regional level: Provision of guidance, formulation of policy including energy issues & promotion of broad spatial concepts for the region.
- Local level: Specific designations & local implementation of national & regional policy including energy issues.

Three main bodies, which are responsible for the formulation and implementation of the government's energy policy, comprise the Department of Communication, Energy and Natural Resources (DCENR) at central governmental level, the independent Commission for Energy Regulation and the SEAI.

## 2. Operational issues

### 2.1 Involved parties and responsibilities

Responsibilities among parties can be considered as clear. DCENR is the lead ministry with responsibility for the formulation and development of energy efficiency policy, which is implemented through the NEEAP. The DCENR is also responsible for co-ordinating energy efficiency policy across other institutions, drafting legal proposals and acting the lead department for the transposition of EU energy labelling legislation. The SEAI as national energy agency has a mission to promote and assist with the development of sustainable energy.

The Building Standards Unit, with the Department of the Environment, Community and Local Governments (DECLG), has lead responsibility for ensuring good quality housing in sustainable communities and reducing CO<sub>2</sub> emissions in the built environment. Specifically, it is responsible for updating and improving the energy efficiency requirements for domestic and non-domestic buildings under Buildings Regulations. The Climate policy unit, within the DECLG, has lead responsibility for co-ordinating progressive development of national policy and legislation in response to climate change, including the pursuit of early and transition management to a low-carbon, climate-resilient future.

The Competitiveness and Climate Change Unit, within the Department of Enterprise, Jobs and Innovation, is responsible for monitoring economic and policy developments.

Another involved authority is the Association of Irish Energy Agencies, which has as members 14 Local Energy Agencies in Ireland including 1 in Northern Ireland with 3 local offices.

The County and City Management Association (CCMA) is the “representative voice” of the local government management network. It is a non-statutory body, which has the target to ensure that the influence of local authority chief executives is brought to bear on the development and implementation of relevant policy. It operates through a number of established committees. Each committee interfaces with senior management of the DECLG and other relevant departments and organisations. The CCMA represents its members on external committees, steering groups and organisations and develops evidence-based positions and makes submissions on relevant issues.

The Office for Local Authority Management (OLAM), a division of the Local Government Management Agency (LGMA) provides support and acts as point of contact for the CCMA. OLAM supports the committee structure, while influences and implements the Association's work program through targeted research and identification of best practice. The Local Government Management Agency (LGMA) is a state agency of the DECLG to provide a range of services to the Local Government Sector.

Local Authorities and Regional Authorities can be active, i.e., for their viewpoint submission on the Green Papers on Ireland National Energy Policy.

Furthermore, the SEAI provides important Technical Assistance to Local Authorities.

In 2011, the SEAI and the City and County Managers' Association surveyed the status of energy management in all Local Authorities. SEAI Best Practice support for Local and Regional Authorities include: Energy Efficiency Working Groups; Energy Efficient Design Service; Best Practice Guidance Documents; Best Practice Procurement. Energy Efficiency Working Groups are in operation to help all Local authorities identify, analyse and implement energy saving measures.

Other important SEAI action for Local Authorities is Sustainable Energy Communities (SEC) Programme, which stimulates a national boost towards sustainable energy practice through demonstration of six exemplar SEC. Any local authority can use the SEC Programme approach and transit towards a more sustainable pattern of energy consumption and supply.

Financial support schemes are utilised for incentivizing of local and regional governments for implementing are. The 2015 programme was launched on January 2015 and incorporate Better Energy Communities, Warmer Homes Area Based type projects and a new Innovative Finance strand.

## ***2.2 Financial and human capacities***

No enough information was found on this issue

## ***2.3 Access to data and evaluation***

No enough information was found on this issue

## **3. Conclusions**

The role of the SEAI during the energy efficiency policy implementation is rather crucial, as it ensures the operation of the M&V schemes. SEAI provides technical assistance for Local Authorities and coordinates various financial assistance schemes. Other partners in the development and formulation of energy efficiency policies consist of local authorities, local energy agencies united within the Association of Irish Energy Agencies and the CCMA.

## M&V schemes and coordination mechanisms

### Italy



#### I. M&V schemes

##### 1. General framework

In Italy, different M&V schemes have been established for the various implemented energy efficiency measures. Specifically, three different M&V schemes have been developed for the three main incentive programs, namely the white certificates scheme, the tax deduction measure for energy upgrading of buildings and the thermal account program.

These M&V scheme have been established taking into consideration the characteristics of each energy efficiency measure and in any case are compatible with the requirements of the Directives 2006/32/EC (ESD) and 2012/27/EU (EED). Moreover, the M&V schemes have been introduced within the framework of ESD in order to monitor the implemented energy efficiency measures according to the requirements of the National Energy Efficiency Action Plans.

##### 2. Design

###### 2.1 Administrative authority

The monitoring bodies, which are responsible for the administration and coordination of the M&V schemes depend on the energy efficiency measures. Specifically, the GSE (Gestore dei Servizi Energetici), which is a state-owned company and the Energy Service Operator are responsible for the overall management of the white certificates scheme, including the measurement, control and verification of the implemented energy efficiency measures.

The ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development) and the RSE (Ricerca sul Sistema Energetico) provide technical support for the validation and certification of the achieved energy savings. In the tax deductions measure, the ENEA is responsible for the technical support of the measure, including the quantification of energy savings and the compliance with the mandatory technical specifications. Moreover, the Italian Revenue Agency has undertaken the technical support from the fiscal point of view in collaboration with the ENEA. Finally, in the thermal account program, the GSE coordinates the implemented projects with the technical support of the ENEA.

## **2.2 Sectoral and spatial analysis**

The sectoral coverage depends on the implemented energy efficiency measures. Specifically, the white certificates scheme mainly imposes an obligation to the industrial units so as to increase their energy efficiency. Furthermore, the tax deduction measure for energy upgrading of buildings addresses mainly to households, while the thermal account program focuses mainly on public sector. The participation of the involved parties lies on national level and is mandatory.

## **2.3 Energy efficiency measures and technologies**

The most important energy efficiency measures and technologies in the white certificates scheme include the heat generation and recovery for industrial processes, the installation of solar thermal for domestic hot water, the walls and roof insulation, the penetration of high efficiency boilers and the installation of double glazed windows. In the tax deduction measure the installation of double glazed windows and high efficiency boilers and the walls and roof insulation measure are promoted. Finally, high efficiency boilers and walls and roof insulation are introduced mainly through the thermal account program. The most efficient energy efficiency measures according to the results of a M&V schemes include the heat generation and recovery for industrial processes in the white certificates scheme and the penetration of double glazed windows and high efficiency boilers in the tax deduction measure.

## **3. Implementation**

### **3.1 Data collection and measurement procedures**

The main data sources for the monitoring of the implemented energy efficiency measures include data from paid subsidies. The authorities, which are responsible for the data collection process, are the administrative authorities which have undertaken the overall coordination of the M&V schemes.

For the abovementioned energy efficiency measures, the quantification of the achieved energy savings and the monitoring of their progress are performed with the utilization of bottom-up approaches. Specifically, the documentation and the analysis of the bottom-up equations are provided within the technical validation of each submitted energy efficiency project. Nevertheless, the procedure is more complex within the framework of the white certificate scheme. Specifically, in standard projects the evaluation is performed with reference to technical data sheets, which set out preliminarily the specific saving of the single reference physical unit. In analytical projects, certain measured physical parameters are measured and the savings are obtained analytically by means of standardized methodological sheets. In projects with ex-post calculation, all the necessary parameters are calculated through an ad hoc measurement program requiring a more extensive and complex technical assessment in comparison with the standardized and the analytical methods. Considering the tax deduction measure and the thermal account program, the delivered energy savings by each action are estimated according to the expected savings based on the preliminary

calculation of the savings as resulted by similar applied technologies in equivalent conditions.

The central government administration (Ministry of Economic Development and the Ministry of the Environment and Protection of Land and Sea) in collaboration with the administrative bodies, which are responsible for the management and the coordination of the different M&V schemes, are responsible for the development of the appropriate indicators ensuring their applicability and effectiveness.

### ***3.2 Verification procedures***

The required verification is performed on the basis of a representative sample. It should be noted that within the framework of the white certificates scheme, the GSE checks that each obligated party holds a number of certificates corresponding to its assigned annual obligation. Furthermore, an annual program of verifications has to be approved by both the Ministry of Economic Development and the Ministry of the Environment and Protection of Land and Sea. This activity includes document verification and on-site checks through the conduction of inspections so as to verify that all the actions are performed appropriately. Moreover, the on-site verifications must be related only to energy efficiency projects with at least 3,000 toe of energy savings annually. The reported energy savings in the tax deduction measure are verified for congruity by the ENEA, while the Revenue Agency performs audits in order to verify the rightness of the tax deductions in comparison with the invoiced expenses. In the thermal account program the GSE inspects the subsidized actions on the basis of an annual program, while the audits, which can be implemented with the assistance of the ENEA or other specialized bodies, cover at least 1% of the approved applications.

The targets for the implementation of the monitored and verified energy efficiency measures on annual basis are specified in the National Energy Efficiency Action Plans according to the requirements of the Article 7 of the EED.

### ***3.3 Reporting procedures***

The reporting requirements have been determined on annual basis.

## **4. Assessment**

### ***4.1 Energy performance***

According to the submitted annual report, the most effective energy efficiency measure in respect of energy savings is the white certificates scheme, which has led to the achievement of 3.4 Mtoe of energy savings annually during the period 2005-2013. The tax deduction measure contributed 0.9 Mtoe of energy savings annually the period 2007-2013 due to the 55%/65% tax relief and to 0.5 Mtoe of energy savings annually the period 2006-2013 due to the 36%/50% tax relief for the case of 4-star boilers.

#### **4.2 Integrated tools**

No integrated tool for the homogeneous monitoring and reporting of the M&V schemes has been introduced.

### **5. Conclusions**

Summarizing, the implemented M&V schemes in Italy can be evaluated very positive, as they operate for many years proving their effectiveness especially for the case of the white certificate scheme. Moreover, these M&V schemes have been developed in accordance with the requirements of the ESD and EED. The implemented bottom-up procedures and verification procedures can be considered as successful aspects of the M&V schemes. Even if a homogeneous M&V scheme does not exist, the operation of separate M&V scheme according to the peculiarities of each energy efficiency measure seems to be an effective strategy for the development of similar M&V schemes.

## **II. Coordination mechanisms**

### **1. General framework**

The legal responsibility for energy policy making lies on national and regional level. The ministries, which have a legal competence for EE policy formulation, consist of the Ministry of Economic Development and the Ministry of the Environment and Protection of Land and Sea.

### **2. Operational issues**

#### **2.1 Involved parties and responsibilities**

The distribution of responsibilities for energy efficiency policy making and implementation is clearly defined among the different governmental layers, while a coordination body between national and regional level for energy policy has been established. Specifically, the Conferenza Stato Regioni is a joint committee established by the State, the regions and the autonomous provinces of Trento and Bolzano. The aim of this committee is to foster the cooperation between central and regional administrations and to deal with all aspects of EU policy, constituting the basis for the conduction of political negotiations among the central and regional governments.

The local authorities are involved in the formulation of the national energy policy through the energy section of the committee Conferenza Stato Regioni. The priorities and needs of the different involved authorities have been taken into consideration during the design of the energy efficiency measures through the constitution of a public consultation procedure. The aim of these national public consultations is to motivate also the participation of the involved authorities.

Finally, the local and regional governments are incentivized for the implementation of energy efficiency measures through the imposition of legal obligations. Specifically, the rationale of the burden sharing is adopted at regional level having as a result the fulfillment of a specific assigned energy saving target by each region.

## ***2.2 Financial and human capacities***

The involved authorities seem to have the sufficient financial and human resources to plan and implement the energy efficiency measures, which are foreseen into the National Energy Efficiency Action Plans.

Nevertheless, no specific procedures are foreseen for the development of appropriate skills and for the enhancement of the existing knowledge of the different involved authorities during the planning and implementation phase of the energy efficiency measures.

## ***2.3 Access to data and evaluation***

During the implementation phase, an assessment procedure of the energy efficiency measures among the involved authorities is performed in order to redesign them. This procedure is based on the findings and the results of the annual report regarding the progress of the planned and implemented energy efficiency measures. This procedure can lead to the continuation of the existing new measures, to the adoption of new more efficient, to the cancellation of some of them and to the modification of the existing measures, which are characterized by planning defects.

Finally, specific procedures are foreseen in order to facilitate the access to data and information from the different involved authorities during the planning and implementation phase of the energy efficiency measures.

## **3. Conclusions**

Various aspects of a coordination mechanism have already been introduced for the design and implementation of energy efficiency measures in Italy facilitating the fulfillment of energy efficiency targets at national and regional level. Indisputably, the development of the coordination mechanism can be based on the committee Conferenza Stato Regioni exploiting the current degree of experience. Finally, the involved authorities have the sufficient financial and human resources to plan and implement the energy efficiency measures.

## M&V schemes and coordination mechanisms

### Latvia



#### I. M&V schemes

##### 1. General framework

The Republic of Latvia Cabinet of Ministers Regulation (CMR) No923 "*Procedures by Which State Energy End-Use Savings Shall Be Measured and the Operation of the Energy Efficiency Monitoring System Shall be Ensured*", which came in force October 2010, transposed the Directive 2006/32/EC (ESD) and established the appropriate framework for the monitoring of the National Energy Efficiency Action Plan (NEEAP) and the achievement of the national indicative target for energy savings. All the energy savings reported in National Energy Efficiency Action Plans using bottom-up methodology were calculated by using the monitoring system defined by given CMR No923. The draft of new "Energy Efficiency Law", which contains legal norms arising from the Directive 2012/27/EU (EED), was recently (June 2015) adopted by the Latvia Saeima (Parliament) in the 1<sup>st</sup> reading and currently is under further content's elaboration procedure for final readings. After the adoption of this Law the new Cabinet of Ministers Regulation shall be introduced including the establishment of the M&V scheme for monitoring the Article 7 of the EED as well.

##### 2. Design

###### **2.1 Administrative authority**

The operation of the energy efficiency monitoring system shall be ensured by the Ministry of Economics Republic of Latvia (Article 3 of the CMR No923).

###### **2.2 Sectoral and spatial analysis**

The energy efficiency measures, which are covered by the M&V scheme comprise public, residential and industrial sectors. The energy efficiency measures are implemented at national level.

###### **2.3 Energy efficiency measures and technologies**

The most important energy efficiency measures in terms of energy savings, which are covered by the M&V scheme consist of the energy upgrade of multi-apartment residential buildings and public buildings and the energy upgrade of

industrial buildings and the installation of energy efficient equipment in the industrial sector.

### **3. Implementation**

#### ***3.1 Data collection and measurement procedures***

The main data sources for monitoring implemented EE measures comprise data from paid subsidies as well as data from the national Statistics Office (*Latvia Central Statistical Bureau*) and other national databases.

Due to the fact that the implemented energy efficiency measures are co-financed by EU Funds or national budget (e.g., Climate Change Financial Instrument (Green Investment Scheme)), there is the obligation for any involved party to provide information regarding the energy consumption of the relevant facility, if the relevant project is completely or partially implemented using such types of support, as specified in the Section 8 of the Energy End-use Efficiency Law. It should be noted that for the case of the buildings the energy savings calculation is based on the buildings heat balance calculation. All information on energy savings are gathered by project administration institution, acting on national level and then provided to the responsible Ministry – Ministry of Economics.

The submission the required information is performed according to a 2-step process. In the first step the information for the involved party shall be submitted by each individual implementer of the project to the Responsible Institutions (RI), which has granted or provided any type of financial aid. In the second step the RI examines and compiles the individual reports, thus eliminating the risks of double counting of savings, and submits the reports to the Ministry of Economics. Moreover, voluntary provision of information is foreseen by the Article 9 of the CMR No923, which states that the involved parties, which are not referred as the RI, shall inform the Ministry of Economics about the energy savings achieved by the energy efficiency projects, utilising specific saving report forms.

Bottom-up methodologies are implemented for the measurement of the achieved energy savings. Deemed-savings method and the metered savings method are considered as the most suitable for Latvia. Metered savings method is already being used. Several financing programs have been implemented in Latvia, which assessed the energy savings using the ex-post method. This method is used to assess the energy savings from an individual or set of energy efficiency measures that correspond to any of the following features, namely the replacement of existing energy consuming equipment with newer and more efficient equipment, the improvement of existing energy consuming equipment or improvement of energy efficiency of the buildings and the installation of new efficient energy consuming equipment or construction of new energy efficient buildings. The correction factors triggered by external circumstances (climate conditions, load of usage of equipment or buildings, and other) are also taken into account. CMR No348 (2013) presents the methods for the calculation of the energy efficiency of

a building. Finally, the deemed savings method is under development and shall be finalized soon, while a deemed energy savings catalogue has been developed.

Furthermore, top-down methodologies are also implemented. The total energy savings are calculated based on statistical indicators and their variation over time. Before performing top-down calculation procedure, the different factors impacting the numerical value of the indicators but not directly related to the energy efficiency issues, such as heating season degree days, change in production structure etc., are filtered out. EC's suggested indicators for energy savings calculation are used in the industrial, transport and residential sectors. EC's mandatory indicators are used in tertiary sector. The selection of particular indicators depends on the available aggregation level of the information necessary for the calculation. The main data sources for top-down method are data stemming from the Latvia Central Statistical Bureau and the ODYSSEE data base.

The development of the methodology and the indicators used was the result from the cooperation of the Ministry of Economics, the Ministry of Environmental Protection and Regional Development, the Institute of Physical Energetics, the Latvian Energy Efficiency Association and the University of Latvia.

### ***3.2 Verification procedures***

The CMR No923 sets specific guidelines in order to ensure that the provided information in the energy savings reports is reliable and that the energy savings can be checked and evaluated. Specifically, the involved parties should complete specific forms and utilise documented information (heating and electricity accounts, project reports, notifications, energy audit reports, other documents). Currently, the CMR No382 (2013) established a specific auditing procedure with the involvement of almost 100 independent experts in the area of energy efficiency of buildings.

There are not specific targets being set for the implementation of the monitored and verified EE measures on annual basis.

### ***3.3 Reporting procedures***

The reporting is performed on annual basis. The Ministry of Economics shall by 1 May each year compile information regarding the energy savings achieved in the State in each of the end-use sectors (Article 11 of the CMR No923).

## **4. Assessment**

### ***4.1 Energy performance***

The largest energy savings, which had been reported by the M&V scheme, were obtained within the energy efficient renovation of public (municipal buildings and schools) buildings and multi-apartment buildings. In year 2013, all reported

savings in public buildings had been calculated by applying the bottom-up methods. Nevertheless, in residential sector only 1.3% of the total calculated energy saving has been obtained by applying the bottom-up method.

#### **4.2 Integrated tools**

There is no any integrated tool for the homogeneous monitoring and reporting of the M&V schemes.

### **5. Conclusions**

Latvia has in place M&V system since 2010, based on the ex-post evaluation of the achieved energy savings. However, the scope of covered measures includes currently only energy efficiency improvements in buildings. After five years of application of ex-post evaluation for energy efficiency measures in buildings, the most important problems related to the M&V systems operation have been solved. The existing M&V system covers only those energy efficiency measures and projects, which are co-financed by the EU Funds or by national public budget support. Finally, specific procedures for the verification and the auditing of the achieved energy savings have been developed.

## **II. Coordination mechanisms**

### **1. General framework**

The legal responsibility for energy policy making lies on national level. The Ministry of Economics is the leading state administrative institution in the field of economic policy, including energy policy, formation in Latvia. The Ministry promotes sustainable development of structurally and regionally balanced national economy. The Ministry of Economics is responsible for energy efficiency objectives.

At local level, the municipalities have the right to elaborate the local energy plans (regional or local energy efficiency plan, SEAP) but it is not mandatory duty. According the "Energy Law" municipalities has mandatory function to organize heat supply in their territories. There is promoted the linkage between integrated local development planning and energy efficiency planning, namely, in the framework of the new Latvia Operational Program "Growth and Employment 2014-2020" it is facilitated (co-financed) the increase of energy efficiency in municipal buildings in accordance with the integrated development program of the municipality.

The supervision of the implemented and on-going energy efficiency measures is divided among several ministries. The Ministry of Economics is responsible for the majority part of them. Ministry of Environmental Protection and Regional

Development supervises the implementation of energy efficiency improvements in municipal public buildings. In addition, the Ministry of Agriculture, within Latvia Rural Development Program 2014-2020, is responsible for the energy efficiency improvement program targeted to food processing enterprises.

## **2. Operational issues**

### ***2.1 Involved parties and responsibilities***

The distribution of responsibilities for energy efficiency policy making and implementation is clearly defined between different governmental layers, however some aspect is still missing. Namely, there is no specific energy efficiency policy implementation institution and thus the Ministry of Economics is also responsible for the policy implementation.

When designing energy efficiency policy the Ministry of Economics cooperates with the Latvian Association of Local and Regional Governments (LALRG), the Association of Large Cities, the Association of District Heat Producers (AHP) and other social partners, who have legally binding requirements for such coordination. The LALRG and the AHP are active in preparing their opinions on new legislative acts, e.g., they had submitted their opinions/proposals regarding the new draft "Energy Efficiency Law". Also the LALRG submits its opinion on those CMRs regarding details in the procedure and quantitative criteria of energy efficiency measures co-financed by EU Funds, etc.

The priorities and needs of the different involved authorities are taken into consideration during the design of the energy efficiency measures and the assessment of the policy priorities and the planning financial resources.

Financial support schemes are the main instruments in order to incentivize local governments for implementing energy efficiency measures. For the EU funds of the programming period 2014-2020 financial support for the implementation of energy efficiency measures in municipal buildings as well as for the improvement of the efficiency of district heating systems is foreseen. During the period 2010-2015 the Ministry of Environmental Protection and Regional Development had realized several programs for municipalities by using financing from Green investment scheme (national Climate Change Financial Instrument) promoting interventions such as street lightning renovation, public building renovation, municipal school and kindergarten renovation, etc.

### ***2.2 Financial and human capacities***

The involved authorities have insufficient financial and human resources to plan and implement the measures defined in national plans. For the implementation of energy efficiency measures only EU Funds are utilised and these funds are not enough to reach energy efficiency targets.

There are no special procedures, but starting from 2010, there is an information campaign "Let's Live Warmer!" focusing on multi-apartment buildings. During the regular workshops, different involved authorities during the planning and implementation phase of the measures may receive information on different energy efficiency measures and energy efficiency policy development.

### ***2.3 Access to data and evaluation***

According to the CMR No923, the Ministry of Economics is obliged to publish every year the results of energy savings in the previous year. The obtained data, including the statistical data from the Central Statistical Bureau of Latvia, are used during the planning and implementation phase of the energy efficiency measures.

Specific actions in order to redesign the implemented energy efficiency measures have been performed during the implementation of the EU Funds for the programming period 2007-2013. Specifically, the program for the renovation of the district heating systems was redesigned in order to increase the eligible number of the industrial boiler installations. Furthermore, the threshold criterion for the annual heat energy consumption for heating after implementation of the projects within the framework of the program "Increasing Heat Energy Efficiency in Multi-Apartment Buildings" was changed in order to enhance the higher return of investments and higher energy savings within this programme.

## **3. Conclusions**

Latvia has no separate coordination body for energy policy development and energy policy implementation. Nevertheless, the Latvian Association of Local and Regional Governments as well as the Association of District Heat Producers are active partners contributing by their opinions and comments in the development of legislative documents/acts. Finally, information campaigns have been arranged in order to enhance the existing level of skills and knowledge of the involved stakeholders.

## M&V schemes and coordination mechanisms

### Lithuania



#### I. M&V schemes

##### 1. General framework

In Lithuania, M&V schemes for energy efficiency measures are not implemented yet. There is an overall monitoring but it is not specific for different measures. There are rules in place for calculating state – wide energy saving and monitoring of efficient energy and resources use. These rules are applied to all efficiency measures implemented. Rules mentioned above were created in accordance with the requirements laid down in the Directives 2006/32/EC (ESD) and 2012/27/EU (EED). Moreover, they were set up for transposing ESD and for the monitoring of Lithuanian National Energy Efficiency Action Plan.

##### 2. Design

###### *2.1 Administrative authority*

The Ministry of Energy of the Republic of Lithuania is responsible for the development and administration of M&V rules, but the administration and coordination tasks are delegated to the State Enterprise Energy Agency according to decision of the Ministry of Energy.

The State enterprise Energy Agency, which was founded in 1993, has participated in the development of the first National Energy Strategy, while the incorporator of the Energy Agency is the Ministry of Energy of the Republic of Lithuania.

Under instructions of the Ministry of Energy, the Energy Agency deals with programs regarding the improvement of efficient use of energy resources, the promotion of renewable and waste energy resources and the preparation of legal, economic and organizational energy efficiency measures within the framework of the national energy policy.

Moreover, the Energy Agency is engaged in the administration of Ignalina NPP Decommission Fund and in the implementation of European Union financial aid in the field of the trans-European energy networks.

## **2.2 Sectoral and spatial analysis**

Energy efficiency measures, which are implemented in public, residential, industrial and transport sectors, are covered by the M&V rules. The monitoring process involves authorities, which are financed by financial support from programs, the public authorities or bodies, which administrate the implemented programs and the Ministry of Energy of the Republic of Lithuania.

After the completion of the implemented energy efficiency measures, the authorities, which received financial support from programs, have to register the appropriate indicators for the current and the next year and to transmit the data to the administrator of the respective programs.

The collected information from the implemented energy efficiency measures consists of the type and number of the implemented measures, the various energy characteristics and the necessary investments for the realization of the measures. Then, the administrators of the programs evaluate the provided indicators, review the progress of the programs, complete the monitoring reports regarding the energy consumption and deliver these reports to the Ministry of Energy.

## **2.3 Energy efficiency measures and technologies**

The most important energy efficiency measures and technologies comprise the multi-apartment building renovation program (insulation of the exterior, renovation of heating systems), the program for renovation of public buildings (insulation of exterior, renovation of heating and ventilation systems) and the voluntary agreements with energy providers (modernization of energy production processes, renovation of energy supply infrastructure).

# **3. Implementation**

## **3.1 Data collection and measurement procedures**

The main data sources for the monitoring of the implemented energy efficiency measures consists of the national statistical office and other national databases. Most of the data are submitted by the institutions, which are the administrators of the energy efficiency measures and the participating authorities in the planning and implementation of energy efficiency measures.

Bottom-up approaches are utilized for the measurement of the achieved energy savings. These approaches are based on the estimation of the reduction of the final energy consumption after the implementation of measures. As already mentioned the required data are collected from the beneficiaries or the administrators of the energy efficiency measures.

The State Enterprise Energy Agency is responsible for the monitoring and verification procedures. These procedures comply with the Recommendations

from EC and with requirements of the corresponding EU legislation. Draft methodologies are developed by Energy Agency and adopted by the Ministry of Energy of the Republic of Lithuania.

### ***3.2 Verification procedures***

The required verification is performed on random checks of the submitted reports regarding the energy savings by the beneficiaries or the administrators of the energy efficiency measures.

All the targets regarding the implementation of the monitored and verified energy efficiency measures or programs on annual basis are specified in the Lithuanian National Energy Efficiency Action Plans according to the requirements of the Article 7 of the EED.

### ***3.3 Reporting procedures***

The reporting requirements have to be determined on annual basis.

## **4. Assessment**

### ***4.1 Energy performance***

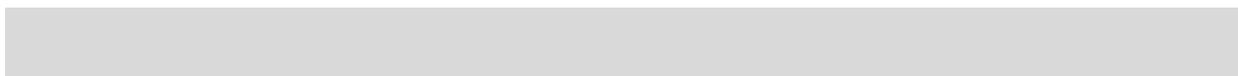
Since 2008 all implemented energy saving measures achieved 1805 GWh energy savings (final energy, not cumulated). The highest potential is identified in the residential buildings (heat savings) and in industry (heat and electricity savings).

### ***4.2 Integrated tools***

No an integrated tool for the homogeneous monitoring and reporting of the M&V schemes has been introduced yet.

## **5. Conclusions**

Summarizing, the existing M&V rules in Lithuania have been developed in accordance with the requirements of the ESD and EED. The overall evaluation of the foreseen rules can be characterized as positive taking into consideration the development of specialized bottom-up methodologies and the organization of the necessary verification procedures.



## II. Coordination mechanisms

### 1. General framework

The legal responsibility for energy efficiency policy making lies at national level. The ministries, which have the legal competence for energy efficiency policy formulation, consist of the Ministry of Energy, the Ministry of Environment and the Ministry of Economy.

The Ministry of Energy is responsible for the overall formulation of energy efficiency policy formulation including the implementation of projects in public buildings and infrastructure. The Ministry of Environment is responsible for residential and other buildings and for energy production, while the Ministry of Economy is responsible for energy efficiency measures in industry.

### 2. Operational issues

#### *2.1 Involved parties and responsibilities*

The distribution of responsibilities for energy efficiency policy making and implementation is clearly defined among the different governmental layers. Generally, there is a consensus about the distributed responsibilities incorporating various overlaying and jurisdiction issues.

Furthermore, agencies facilitate the implementation and coordination of energy efficiency policy between national and local levels. Nevertheless, the local authorities demonstrate limited interest in energy efficiency policy formulation.

Specific public consultations are organized, while relevant stakeholders are invited to participate in the drafting of regulations. The majority of the implemented energy efficiency measures have an inbuilt support mechanism (loans, subsidies, grants, etc.). Moreover, several agencies (depending on the type of measure and financing model) provide guidance for the effective implementation of energy efficient measures.

#### *2.2 Financial and human capacities*

Every national strategy/plan/measure has its own implementation program or action plan with clear responsibilities and financial resources. The financing sources consist of the State budget, EU Structural, Cohesion and other funds.

#### *2.3 Access to data and evaluation*

During the implementation phase, an assessment procedure of the energy efficiency measure among the involved authorities is performed in order to

redesign them. This procedure can lead to the continuation of the existing new measures, to the adoption of new more effective, to the cancelation of some of them and to modification of the existing measures, which are characterized by planning defects.

### **3. Conclusions**

The legal responsibility for energy efficiency policy making lies at national level in Lithuania, while the distribution of responsibilities for energy efficiency policy making and implementation is clearly defined among the different governmental layers. The role of the agencies during the implementation and coordination of energy efficiency policy between national and local levels is crucial. Finally, various public consultations have been organized, while relevant stakeholders have been invited to participate in the preparation of the regulations.

## M&V schemes and coordination mechanisms

### Luxembourg



#### I. M&V schemes

##### 1. General framework

The M&V scheme in Luxembourg distinguishes between early, new and planned measures as described in National Energy Efficiency Action Plan.

##### 2. Design

###### *2.1 Administrative authority*

Ministry of Economy is the responsible authority for the administration and coordination of the M&V scheme.

###### *2.2 Sectoral and spatial analysis*

Luxembourg has decided to introduce a national energy saving obligation scheme in accordance with Article 7 of the Directive 2012/27/EU (EED). The energy suppliers in the electricity and gas sectors are assigned as obligated parties undertaking the public service task of achieving the energy savings target imposed under Article 7 of the EED.

Energy savings may be achieved by the obligated parties through the implementation of energy efficiency measures in the residential, service, industrial and transport sectors.

###### *2.3 Energy efficiency measures and technologies*

The most important energy efficiency measures and technologies consist of:

**Households:** New builds in accordance with W D2008 (B1) and New builds in accordance with W D2012 (C4)

**Trade, commerce and services:** New builds and building renovation in accordance with W D2008 (B4) and New builds and building renovation in accordance with W D2010 (B14)

**Industry:** Voluntary agreement (B16)

**Transport:** Kyoto Cent (B7)

Promotion of low-CO<sub>2</sub> cars (B9)

### 3. Implementation

#### ***3.1 Data collection and measurement procedures***

On 1 March of each year, the obligated parties must report on the energy savings achieved during the preceding year. This annual report must be compiled by each individual obligated party and must contain information about the sector, the type of energy, the energy-saving measure, the type of action, the actions performed by third parties, as well as details of program costs and the effect of the actions.

Standard notification forms are published as required on the website of the Ministry of the Economy. Supporting documentation regarding the savings declared must be retained by the obligated parties and produced in the event of an inspection.

The calculation model consists of four different modules, corresponding to the following 4 consumption sectors: Households, Trade, commerce and services (TCS); Industry and Transport. It includes the historical development regarding the achieved energy savings from 2001 to 2012 and forecasts up to 2020.

*Households:* The calculation of the development of energy consumption is based on the detailed Luxembourg housing statistics. Three residential building types (single-family houses, terraced houses and apartment blocks) and three building age groups (before 1970, 1971–1995, after 1995) were formed, which are characterized by different specific final energy consumptions (kWh/m<sup>2</sup>).

*Trade, commerce and services:* The energy consumption baseline is determined on the basis of the energy balances for 2001–2012 published by the Statistical Office, which were climate-adjusted for this purpose. The development of the number of persons employed in the tertiary sector is applied as a driver for the forecast for 2020, taking into account the autonomous trends observed in the case of heat (falling) and electricity (rising).

*Industry:* To calculate the development of energy consumption in industry, industrial production or value added were applied as drivers and autonomous trends were taken into account. Industry was divided into 4 subsectors: Cement, steel, glass and other. For each subsector, specific energy source-related final energy characteristics were taken into consideration.

*Transport:* The calculation of the energy consumption baseline is based on detailed statistical data on vehicles registered in Luxembourg. A distinction is made among four different types of vehicles (passenger cars, lorries, motorcycles, other) and two types of fuel (petrol and diesel). For each of these

vehicle categories, data are available on the vehicle population, fuel consumption (l/100 km) and annual mileage (km/a). In the absence of official forecasts, the development observed since 2001 has been extrapolated to 2020.

### ***3.2 Verification procedures***

On the initiative of the Ministry of the Economy, a random annual inspection of a statistically significant and representative sample of the energy-saving measures may be carried out by an independent expert.

### ***3.3 Reporting procedures***

On 1 March of each year, the obligated parties must report on the energy savings achieved during the preceding year.

## **4. Assessment**

### ***4.1 Energy performance***

The energy efficiency measures, which provided the best results, are presented in the section 2.3.

### ***4.2 Integrated tools***

No an integrated tool is utilized for the efficient monitoring and measurement of the achieved energy savings with the exemption of a simple annual questionnaire.

## **5. Conclusions**

Luxembourg has implemented a M&V scheme, which imposes obligation on obligated parties (energy suppliers) and energy savings may be achieved in the residential, service, industrial and transport sectors. Main coordinating body is Ministry of Economy, while the monitoring and reporting are performed on annual basis via a questionnaire.

## **II. Coordination mechanisms**

### **1. General framework**

The legal responsibility lies at national level for energy policy formulation. Ministry of Economy has the legal competence for energy efficiency policy formulation and myenergy as the national advisory body.

## **2. Operational issues**

### ***2.1 Involved parties and responsibilities***

The main administrative body at national level, which is responsible for energy efficiency, is the Ministry of Economy.

myenergy is the national advisory body in the energy sector, whose duties involve raising awareness, informing and supporting households, enterprises, municipalities and professionals regarding energy savings, the use of renewable and sustainable energy and the development of sustainable residential construction.

The web portal [www.oekotopten.lu](http://www.oekotopten.lu) was launched in 2007 on the initiative of the Mouvement Ecologique and the Pafendall Eco-Centre, with the support of the Ministry of Sustainable Development and Infrastructure and Intelligent Energy Europe. The portal introduces consumers to the most efficient and environmentally friendly products in various fields (e.g. household appliances, office equipment, mobility, entertainment, lighting, construction) and has been constantly expanded in recent years. It is also designed to be an incentive for providers to offer the most energy-efficient and environmentally friendly products.

Based on the qualification and certification schemes various market participants, such as tradesmen, architects, engineers and energy advisors, are involved in the provision of appropriate information and advice to energy consumers. For their part, customers have the opportunity to receive market guidance in the selection of energy service providers by means of a number of certifications (from advice, by way of planning, through to implementation). The myenergy advisors inform customers about the existing certification schemes.

### ***2.2 Financial and human capacities***

In Luxembourg, households, enterprises and municipalities are all encouraged by support programs in order to invest in energy efficiency. Households are supported mainly by investment aid for energy renovation, the construction of a passive or low-energy house and the use of renewable energy. Investment by enterprises in energy efficiency and renewable energy are also supported by means of investment aid via two support programs. The support program of the Environmental Protection Fund finances measures in municipalities for increasing energy efficiency and the use of renewable energy.

Irrespective of the owner's articles of association, the electricity generated from renewable energy is paid for at statutorily regulated tariffs. To further boost investment in renewable energy and energy efficiency, the government program is also considering the creation of a public financial institution. Specifically, the Climate and Energy Fund, which was established by the amended Act of 2004 helps to finance the flexibility mechanisms of the climate agreement, national

measures to reduce greenhouse gas emissions and support measures for renewable energy.

### ***2.3 Access to data and evaluation***

A catalogue of standard measures is currently under preparation, which will specify the energy savings that can be assigned to specific measures. Initially, the catalogue will contain a limited number of measures.

In principle, it will be adapted or expanded each year to take account of the most recent data on energy efficiency measures. The catalogue will focus mainly on technical measures of which the effects can be easily measured and documented. Without completely prohibiting them, measures aimed at changing behavior will be taken into account only to a limited extent, as they are difficult to measure and may have a time limited effect.

## **3. Conclusions**

In Luxembourg an established energy policy at the national level was identified, while various comprehensive information campaigns have been organised in order to inform and educate consumers through the involvement of various energy agencies and the constitution of specific information points.

## M&V schemes and coordination mechanisms

### Malta



#### I. M&V schemes

##### 1. General framework

The M&V scheme for energy efficiency measures in Malta has already been developed according to the requirements of the Directives 2006/32/EC (ESD) and 2012/27/EU (EED). All the necessary procedures for the efficient monitoring and verification of the foreseen energy efficiency measures until 2020 have been established within the framework of Article 7 of the EED. It should be noted that Malta has selected to introduce a combination of an obligation scheme and alternative measures in order to ensure the fulfilment of the energy savings target of Article 7.

##### 2. Design

###### *2.1 Administrative authority*

The Ministry for Energy and Health is responsible for the formulation of the energy policy in Malta including the implementation of the ESD and EED at national level, the design, facilitation and monitoring of the implemented energy efficiency measures and the establishment, administration and coordination of the M&V schemes.

To this purpose, it was set up the Sustainable Energy and Water Conservation Unit (SEWCU), which is responsible for the implementation of functions related to the design, implementation, assessment and dissemination of water, conventional energy and alternative energy policies. Moreover, the SEWCU has also the obligation to design, develop and coordinate the conventional and alternative energy policies and measures across and within ministries, departments and government entities and to monitor, verify and evaluate the energy policies in accordance with the EU obligations and the general international requirements.

###### *2.2 Sectoral and spatial analysis*

The M&V scheme focuses on energy efficiency measures, which promotes the implementation of energy efficiency interventions in the public (including tertiary), residential, industrial and transport sectors. Regarding the spatial analysis of the energy efficiency measures, the M&V scheme is focused at national level. Except from the involvement of the Ministry for Energy and Health,

the participation of other relevant ministries to the implemented energy efficiency measures such as the Ministry for Finance and the Ministry for Sustainable Development, the Environment and Climate change is essential for the implementation of the M&V scheme. Moreover, the participation is mandatory for the Enemalta Corporation within the framework of the established obligation scheme and voluntary for other government-owned industries and authorities such as Transport Malta, Water Service Corporation, WasteServ etc.

### ***2.3 Energy efficiency measures and technologies***

The most important energy efficiency measures consist of the improvement of the vehicle fleet efficiency (Measure Grand Scheme to Improve Vehicle Fleet Efficiency), the upgrade of the sewage effluent treatment (Measure Upgrading the Quality of Treated Sewage Effluent to Replace Desalinated RO Water for Non-potable Uses), the refurbishment of the residential buildings, the reverse osmosis improvements (Measures Upgrading of RO High Pressure Pumps and Energy Recovery Systems and Reduction of Power Requirements through Replacement of RO Auxiliary Pumps), the installation of smart meters and the encouragement of wise energy use (Enemalta Corporation's programs) and the penetration of energy efficient street lighting (Measures Street Lighting Retrofitting Gozo and Street Lighting Retrofitting All Malta). Especially for the measure of the energy upgrade of residential buildings is foreseen the installation of double glazing, roof insulation, solar water heaters and heat pumps. Considering the rest of the above mentioned measures the most important technologies include the promotion of cogeneration plans and the further penetration of more efficient vehicles.

## **3. Implementation**

### ***3.1 Data collection and measurement procedures***

The main data sources for the monitoring of the implemented energy efficiency measures and the measurement of the achieved energy savings in different sectors comprise the National Statistics Office, various national databases and specific type of information compiled from the managing authorities within the framework of Article 7 of the EED.

The Ministry for Energy and Health via the SEWCU is responsible for the coordination, monitoring and implementation of the data collection process including the specification and development of the necessary indicators for the measurement of the achieved energy savings. Specifically, the measurement of the effectiveness of the energy efficiency measures in terms of energy savings is performed through the establishment of specialized bottom-up procedures. For each energy efficiency measure a bottom-up procedure has been developed according to the proposed methods and principles for calculating the impact of energy efficiency obligations schemes or other policy measures of Annex V of the EED. A mixture of method is utilised including the estimation of deemed, scaled and meter savings. Indicatively, it is assumed an average electricity reduction of 5% for the case of the installation of smart meters, while actual data about the street lighting load are taken into consideration during the estimation of the

savings in the measure of Street Lighting Retrofitting. Furthermore, various other studies were taken into account providing engineering estimates for the estimation of the achieved energy savings.

It should be noted the crucial role of the team, which is established by the Ministry for Energy and Health with the participation of relevant authorities and entities (such as the Institute for Sustainable Energy of the University, the Malta Intelligent Energy Management Agency) and the National Statistics Office having as mission to identify existing energy studies and statistics, to conduct studies and to develop the appropriate models in order to quantify changes in consumer behaviour and to calculate the corresponding energy savings.

### ***3.2 Verification procedures***

The SEWCU is entrusted with the establishment of the necessary verification protocols specific to each implemented energy efficiency measure. The measured energy savings are verified within the framework of the M&V scheme through independent verification by energy experts according to the requirements of the National Audit Office. The managing authorities are involved during the implementation of the verification protocols in collaboration with the established team by the Ministry for Energy and Health and the SEWCU, which have undertaken the provision of technical support. The role of this team is crucial for the case of the measures in order to increase the awareness of the customers and to upgrade the residential buildings. Furthermore, for the case of measures, which targets to the further penetration of cogeneration units it is utilised the Guarantees of origin certification system for the monitoring and verification of the achieved energy savings.

Specific targets have been set for the monitored and verified energy efficiency measures on annual basis during the establishment of the energy savings targets within the context of Article 7 of the EED.

### ***3.3 Reporting procedures***

The SEWCU is also responsible for the reporting of the monitored and verified measures and the achieved energy savings. The reporting period of the M&V scheme has been established on annual basis.

## **4. Assessment**

### ***4.1 Energy performance***

Generally, the implemented energy efficiency measures contribute to the improvement of the energy dependency and to the reduction of the environmental pollutants including the CO<sub>2</sub> emissions. According to the submitted annual report within the framework of EED the most important results of the energy efficiency measures in respect of energy savings in 2014 include the

energy upgrade of the residential buildings (calculated savings of 675 MWh) and the Grant Scheme to Improve Vehicle Fleet (calculated savings of 1,171 MWh).

#### **4.2 Integrated tools**

No integrated tool for the homogeneous monitoring and reporting of the M&V schemes is available.

### **5. Conclusions**

Summarizing, the establishment of the necessary M&V scheme in Malta has been performed according to the requirements of Article 7 of the EED. Nevertheless, its effectiveness should be evaluated after the implementation of the majority of the planned energy efficiency measures as the limited introduction of energy efficiency technologies may not be representative for the fruitful assessment of the potentially weak and strong points.

## **II. Coordination mechanisms**

### **1. General framework**

The Ministry for Energy and Health has the legal competence for energy efficiency policy formulation. Specifically, the Ministry is responsible for the transposition of the relevant directives and their implementation including the design, implementation, monitoring and verification of the foreseen energy efficiency measures. It should be noted that the legal responsibility for energy policy making is concentrated on national level.

### **2. Operational issues**

#### **2.1 Involved parties and responsibilities**

Even if the distribution of responsibilities for energy efficiency policy making and implementation is clearly defined between different governmental layers according to the Legal Notice 196 of 2014 regarding the transposition of the EED, the energy policy is solely coordinated exclusively at national level due to the small geographical size of the country, which does not make it feasible the coordination at regional level.

Moreover, no official coordination bodies between national and regional level for energy policy exist, while the local authorities have not been involved in national energy policy formulation. Nevertheless, specific procedures for the formulation of a transparent framework for the specification of the priorities and needs of the different involved authorities have been initiated. Specifically, a consultation process has been established for the specification of the necessary energy efficiency policies with the involvement of all the interested stakeholders and as a

result feedback and recommendations from the managing authorities and other stakeholders are taken into consideration during the design of EE measures. Moreover, the SEWCU is working closely with other ministries and stakeholders in the design and implementation of policies and projects with the public and private sectors for the further promotion of energy efficiency. Finally, the local councils are incentivized mainly through cooperative projects such as Sustainable Energy Action Plans and through energy saving initiatives including, but not limited to, ERDF support.

## ***2.2 Financial and human capacities***

The involved authorities have not had the sufficient financial and human resources to plan and implement the energy efficiency measures defined in national plans. The limited administrative structure and the financial resources hamper the compliance with the obligations as derived by the EU and national legislation.

Specific and recurring procedures have been foreseen for the development of appropriate skills and for the enhancement of the existing knowledge in the different involved authorities during the planning and implementation phase of the measures. Specifically, consultation exercises and trainings are organised so as to enhance the participation of the managing authorities as well as stakeholders. The SEWCU has undertaken the obligation to implement such initiatives.

## ***2.3 Access to data and evaluation***

During the implementation phase no specific procedures for the assessment of the implemented energy efficiency measures and the potential redesign are foreseen by the involved authorities.

The access to the necessary data and information is facilitated through memorandums of understanding among the involved authorities.

## **3. Conclusions**

Various aspects of a coordination mechanism were identified in Malta, such as the establishment of consultation procedures, the vital role of the SEWCU, the conduction of consultation exercises and trainings and the signature of memorandums of understanding among the involved authorities.

## M&V schemes and coordination mechanisms

### Netherlands



#### I. M&V schemes

##### 1. General framework

In Netherlands an overall monitoring procedure is performed, but it is not specific for every energy efficiency measure. There are rules in place for calculating state-wide energy savings and for monitoring the utilization of the energy resources. These rules are applied to all implemented energy efficiency measures. Rules mentioned above were created in accordance with the requirements laid down in the Directives 2006/32/EC (ESD) and 2012/27/EE (EED). This monitoring procedure was set up for transposing the ESD and for the monitoring of National Energy Efficiency Action Plans.

##### 2. Design

###### **2.1 Administrative authority**

The Ministry of Economic Affairs and the Ministry of the Interior and Kingdom Relations are responsible for the administration and coordination of the energy efficiency policy making. The energy saving calculations are delegated to the Netherlands Enterprise Agency (bottom-up methods) and the Energy Research Centre of the Netherlands, ECN (top-down methods). These organizations provide technical support additionally for the implementation of energy saving measures.

###### **2.2 Sectoral and spatial analysis**

The energy efficiency programs and measures, which are monitored by the M&V rules, are implemented in public, residential, industrial and transport sectors. The requirements set out in the M&V rules are mandatory for all administrative levels.

###### **2.3 Energy efficiency measures and technologies**

The most important energy efficiency measures and technologies include energy saving in buildings, industry and SME. These measures include:

- Energy tax (all sectors)
- Energy Investment Allowance (EIA, all sectors)

- Long-Term Agreements (trade, services and public bodies, industry, transport and agriculture)
- Green investment and finance (VAMIL (Random Depreciation of Environmental Investments) /MIA (Environmental Investment Allowance))
- Green Deal (all sectors)

The Energy Tax is a levy on energy consumption, which improves the cost-effectiveness of measures aiming at the promotion of energy efficiency and renewable energy. Taxing energy use facilitates the achievement of energy efficiency (by changing behavior or investing in energy-saving measures), as it becomes more attractive. The use of energy-saving techniques is more cost-effective for the investment.

The Energy Investment Allowance (EIA) is a fiscal measure, which offers the possibility of an additional allowance on taxable profit. EIA applications can be made for the purchase of designated energy-efficient equipment and equipment for the generation of renewable energy. From 2014 investments in renewable energy are supported only by SDE+ (the Stimulation of Sustainable Energy Production).

The Long-Term Agreements entered into with various sectors can play an important role in raising awareness regarding the energy savings. The LTA encourages more economical and rational decision-making on energy-saving techniques by increasing knowledge of the triggered benefits by the increase of energy efficiency.

Moreover, several instruments are used to support the agreement, such as the Renewable Energy Production Incentive Scheme (SDE), MIA/VAMIL and EIA.

The umbrella term "Green Investment" covers both green saving and investments and also green finance. To be eligible for green finance, projects must have a "green statement", which shows that they meet certain criteria. Green Investment is made possible by two schemes: the Green Funds Scheme and the Green Projects Scheme.

### **3. Implementation**

#### ***3.1 Data collection and measurement procedures***

The main data sources for the monitoring of the implemented energy efficiency measures comprise the national statistical office and other national databases. Most of the data are submitted by the institutions, which are the administrators of the measures and entities participating in the planning and implementation of energy efficiency measures.

For standard projects the evaluation of results is performed with reference to technical data sheets, which set out preliminarily the specific saving of the single reference physical unit. In implemented projects the measured data are collected. Savings are calculated in two ways. The total ESD saving is determined for the Netherlands as a whole, and by sector, on the basis of national statistics and evaluation models. For selected measures, the savings are then mapped in more detail with bottom-up monitoring, allowing more direct connections to be made with policy measures. The measures, which are monitored with bottom-up procedures, constitute a large part of the total savings achieved (more than 30% of the total energy savings).

### ***3.2 Verification procedures***

The required verification is performed on random checks of the reports on the energy savings submitted by the beneficiaries or the administrators of the energy efficiency measures and programs.

No specific targets have been established regarding the implementation of the monitored and verified energy efficiency measures on annual basis. All targets for the implementation of the monitored and verified energy efficiency measures or programs on annual basis are specified in the National Energy Efficiency Action Plans according to the requirements of the Article 7 of the EED.

### ***3.3 Reporting procedures***

The reporting requirements have been determined on annual basis.

## **4. Assessment**

### ***4.1 Energy performance***

According to the submitted annual report in 2010 all implemented energy saving measures achieved 11,376 GWh energy savings (summary of energy saving under the ESD). The majority of the saving achieved in built environment sector (12,705 GWh), while the contribution of agriculture and horticulture sector, transport sector and industrial sector and SME is equal to 7,469, 5,490 and 833 GWh correspondingly.

### ***4.2 Integrated tools***

No integrated tool for the homogeneous monitoring of the M&V schemes has been introduced.

## **5. Conclusions**

Summarizing existing M&V schemes in Netherlands can be evaluated as positive. Existing schemes are developed in accordance with the requirements of the ESD and EED. For selected measures, the savings are then mapped in more detail with

bottom-up monitoring, allowing more direct connections to be made with policy measures. Moreover, specific verification procedures have been established. A homogeneous M&V scheme at present time does not exist, so the operation of separate M&V scheme according to the peculiarities of each energy efficiency measure seems to be an effective way for the development M&V.

## **II. Coordination mechanisms**

### **1. General framework**

The legal responsibility for energy efficiency policy making lies at national level. The ministries, which have a legal competence for energy efficiency policy formulation, consist of the Ministry of Economic Affairs and the Ministry of the Interior and Kingdom Relations, with the support of the Ministry of Infrastructure and the Environment.

### **2. Operational issues**

#### ***2.1 Involved parties and responsibilities***

The distribution of responsibilities for energy efficiency policy making and implementation is clearly defined among the different governmental layers. Generally, there is a consensus about the distributed responsibilities incorporating various overlaying and jurisdiction issues.

Furthermore, agencies and research centers facilitate the implementation and coordination of energy efficiency policy between national and local levels.

Specific public consultations are organized, while relevant stakeholders are invited to participate in the drafting of regulations.

#### ***2.2 Financial and human capacities***

Every national strategy/plan/measure has its own implementation program or action plan with clear responsibilities and financial resources.

The responsible authority seems to have sufficient financial and human resources for the planning and the implementation of the energy efficiency programs/measures, which are foreseen into the Netherlands National Energy Efficiency Action Plans.

#### ***2.3 Access to data and evaluation***

During the implementation phase, an assessment procedure of the energy efficiency measure among the involved authorities is performed in order to redesign them. This procedure can lead to the continuation of the existing new

measures, to the adoption of new more effective, to the cancelation of some of them and to modification of the existing measures, which are characterized by planning defects.

### **3. Conclusions**

The legal responsibility for energy efficiency policy making lies at national level. Nevertheless, the distribution of responsibilities for energy efficiency policy making and implementation is clearly defined among the different governmental layers. Furthermore, agencies and research centers facilitate the implementation and coordination of energy efficiency policy between national and local levels, while various public consultations have been organized. Finally, the responsible authority has the sufficient financial and human resources for the planning and implementation of the energy efficiency measures.

## M&V schemes and coordination mechanisms

### Poland



#### I. M&V schemes

##### 1. General framework

M&V scheme for energy efficiency measures is currently being implemented in Poland. The M&V scheme in Poland is in line with the National Energy Efficiency Action Plans, while it set up for transposing the Directives 2006/32/EC (ESD) and 2012/27/EU (EED) and for the effective monitoring of the National Energy Efficiency Action Plan.

##### 2. Design

###### *2.1 Administrative authority*

The administrative authority for the M&V scheme are the Energy Regulatory Office and the Ministry of Economy.

###### *2.2 Sectoral and spatial analysis*

The energy efficiency measures, which are covered by the M&V scheme, are implemented in the residential, public, industrial and transport sectors.

On administrative level, the local and national authorities are involved in the process.

###### *2.3 Energy efficiency measures and technologies*

The most important energy efficiency measures and technologies in terms of energy savings which are covered by the M&V scheme are:

- Energy efficiency certificates scheme (white certificates)
- Information and educational campaigns
- Green Investment Scheme (Part 1) – energy management in public utility facilities
- Exchange of fleet in municipal transit companies and the promotion of eco-friendly driving

The white certificate scheme supports energy-efficient investments, such as modernization of local heating grids and heat sources, buildings, lighting, household appliances, as well as energy recovery and modernization of industrial devices and installations. The President of the Energy Regulatory Office is entitled to issue and redeem white certificates.

Property rights resulting from the certificates are subject to trading, and they are considered a commodity subject to trading on the commodity exchange market or on the regulated market. A detailed list of projects which may be submitted in the tender procedure will be the subject of a notice by the Minister for Economy. The Minister of Economy will have an additional task related to system monitoring: to calculate the achieved energy savings, as well as to prepare reports and submit them to the European Commission.

### **3. Implementation**

#### ***3.1 Data collection and measurement procedures***

The national databases constitute the main data source for monitoring implemented energy efficiency measures in different sectors in Poland.

For the data collection process, the responsible body is the National Statistical Office. Some statistical duties have attributed also to the National Statistical Office and the regional governmental administration.

Responsible authority for the development of the methodology and indicators used in Poland is the Energy Regulatory Office with the cooperation of the Ministry of Economy.

#### ***3.2 Verification procedures***

In accordance with Article 23 of the Act, audits confirming energy savings achieved, as well as declarations, are subjected to a verification procedure by the President of the Energy Regulatory Office, or at his request. The Act foresees penalties for energy savings lower than indicated in the declaration of interest as resulted by the verification procedure.

In the National Energy Efficiency Action Plan of Poland, two energy savings targets are identified:

- the first target set on the level of 9% for the year 2016
- the second (intermediate) target for the year 2010 was set at 2%.

#### ***3.3 Reporting procedures***

The reporting period for the M&V scheme is on annual basis.

## **4. Assessment**

### ***4.1 Energy performance***

The energy efficiency certificates scheme is considered as the most efficient measure.

### ***4.2 Integrated tools***

No information was identified on this issue.

## **5. Conclusions**

The M&V scheme for energy efficiency measures is currently being implemented in Poland, while some of the introduced aspects can be assessed positively such as the foreseen verification procedures.

## **II. Coordination mechanisms**

### **1. General framework**

The legal responsibility for energy policy making lies at national and local levels.

At national level, the Ministry of Energy has the legal competence for energy efficiency policy formulation.

### **2. Operational issues**

#### ***2.1 Involved parties and responsibilities***

The distribution of responsibilities for energy efficiency policy planning and implementation is clearly defined between different governmental layers.

The Ministry of Economy is responsible for the energy policy formulation and the monitoring of the implemented measures. The Energy Regulatory Office is involved in the white certificates scheme, while the National Statistical Office deals with the data collection procedures.

No existing coordination bodies between national and regional level for energy policy have been constituted, while the local authorities are involved in the national energy policy formulation through the mandatory preparation of an energy efficiency plans and strategies.

Several actions and regulations have been introduced in order to motivate the participation of the different involved authorities. Indicatively, the development of

the central register helps the potential clients to seek more effectively licensed specialists facilitating the efficient verification of certificates and the inspection protocols. It will also be used for reporting tasks connected with the improvement of energy efficiency of the public sector.

Finally, the local governments are incentivized for implementing energy efficiency measures through the imposition of legal obligations and the promotion of financial support schemes.

## ***2.2 Financial and human capacities***

Several procedures have been initiated for the development of appropriate skills and for the enhancement of the existing knowledge in the different involved authorities during the planning and implementation phase of the energy efficiency measures. Specifically, the campaigns are organized by the Ministry of Economy, the Ministry of Environment, and the Ministry of Infrastructures and Development, while other institutions are involved in the programs including local governments, non-governmental organizations, energy producers and distributors. These campaigns are implemented by professional companies supported by the knowledge of consulting firms.

## ***2.3 Access to data and evaluation***

The Ministry of Economy has the obligation to calculate the achieved energy savings, as well as to prepare reports and submit them to the European Commission assessing in this way the implemented energy efficiency measures. Furthermore, some statistical duties have been attributed to the National Statistical Office and the regional governmental administration.

## **3. Conclusions**

The distribution of responsibilities for energy efficiency policy making and implementation is clearly defined between different governmental layers. Certain actions and regulations been foreseen in order to motivate the participation of the involved authorities, while emphasis has been given on the enhancement of the existing level of skills and knowledge through the conduction of specific campaigns.

## M&V schemes and coordination mechanisms

### Portugal



#### I. M&V schemes

##### 1. General framework

Portugal has selected the implementation of the alternative energy efficiency measures according to the Article 7 of the Directive 2012/27/EU (EED), but it is not clearly defined whether the M&V scheme can deliver the energy savings data on annual basis, nor is the M&V system explained in any of the official EU reports. Previously, Portugal has monitored their energy efficiency programs through various individual forms such as the submission of evaluation reports, the provision of data, the conduction of periodic surveys and audits etc.

##### 2. Design

###### ***2.1 Administrative authority***

It has not yet been decided which administrative authority will be responsible for the administration and coordination of the M&V scheme. One possible candidate is the Ministry of Environment, Spatial Planning and Energy and it has so far been responsible for delivering the majority of the foreseen obligations within the framework of EED.

###### ***2.2 Sectoral and spatial analysis***

The sectoral and spatial analysis for energy efficiency measures covers first and foremost the industry sector in Portugal and it is being monitored at national level.

###### ***2.3 Energy efficiency measures and technologies***

The most important energy efficiency measures include:

- Transport: upgrading of cars, urban mobility, transport energy efficiency system
- Residential and services: upgrading of house and office, EE system in buildings, "instant renewables"
- Industry: Energy efficiency system in industry and other sectors

### **3. Implementation**

#### ***3.1 Data collection and measurement procedures***

The data are collected by the Ministry, which is responsible for energy efficiency policy with the support from the Energy Agency (ADENE). Facilities operators are obliged to conduct an energy audit and elaborate an Energy Consumption Rationalization Plan (PREn) establishing targets for energy and carbon intensity and specific energy consumption and including the energy rationalization measures. Moreover, they have to present this information through a website ([www.adene.pt/sgcie](http://www.adene.pt/sgcie)) to the Directorate General of Energy and Geology (DGEG) from the Ministry of Environment, Spatial Planning and Energy, as well as through the submission of biennial execution and progress reports.

#### ***3.2 Verification procedures***

There are no specific targets being set for the implementation of the monitored and verified energy efficiency measures on annual basis. The measurement of the achieved energy savings is performed through various forms including the submission of evaluation reports within the mandatory schemes for intensive consumers (industry and transport), the provision of data by industry associations (e.g. windows, solar thermal, electrical equipment, appliances and office supplies), the conduction of periodic surveys (domestic sector, industry, services and energy production) the collection of data from specific observatories (energy efficiency in public administration), the conduction of audits (buildings), etc.

The necessary verification procedures are performed by the Directorate General of Energy and Geology.

#### ***3.3 Reporting procedures***

The monitoring of this system is performed through progress reports, which have to be presented every 2 years. Penalties are foreseen for those who won't fulfil the targets.

Energy audits, Energy Consumption Rationalization Plans and biennial execution and progress reports have to be elaborated by auditors recognized by DGEG according to their academic education and professional experience. This is regulated in a specific legislation (Ordinance n.º 519/2008, of June 25th) and until the end of 2013 there are 492 auditors recognized.

### **4. Assessment**

#### ***4.1 Energy performance***

Until the end of 2013, DGEG approved 779 Energy Consumption Rationalization Plans which became Rationalization Agreements for Energy Consumption

(ARCEs). The implementation of these ARCEs will lead to a reduction of 93.225 toe in energy consumption and 340.916 tCO<sub>2</sub> of GHG.

#### **4.2 Integrated tools**

There is no integrated tool for the monitoring and reporting of the M&V schemes.

### **5. Conclusions**

Portugal does not have a M&V scheme currently in operation for the energy efficiency measures nor is it in its implementation phase, apart from the reporting schemes to the DGEG. Instead there are periodic surveys and evaluation reports in the mandatory schemes for public consumers along with data collection on specific facilities, such as energy efficiency in public administration.

## **II. Coordination mechanisms**

### **1. General framework**

The legal responsibility for energy policy formulation lies at both national and local levels. DGEG and the Ministry of Environment, Spatial Planning and Energy have the legal competence for energy efficiency policy formulation.

### **2. Operational issues**

#### **2.1 Involved parties and responsibilities**

The distribution of responsibilities for energy efficiency policy making and implementation is clearly defined between different governmental layers, but there are no existing coordination bodies between national and regional level for energy policy.

The local authorities are included in national energy policy formulation by means of formal consultation.

The priorities and needs of different involved authorities have been taken into consideration during the design of energy efficiency measures. The ministries, which are responsible for environment, agriculture, buildings, transport and industry areas, are involved in the definition of the priorities for specific sectors and they took part in the design of the national efficiency energy measures.

The local and regional governments are incentivized for implementing EE measures by the imposition of legal obligations, the provision of financial support schemes and the retaining savings from implemented energy efficiency measures.

## ***2.2 Financial and human capacities***

There is a deficit of human resources in public administration to ensure better implementation of these energy efficiency programs. It is urgent to strengthen this aspect. Nevertheless, specific funds are available from the European structural funds for investments in the area of energy efficiency.

No procedures are foreseen for the development of appropriate skills and for the enhancement of the existing knowledge in the different involved authorities during the planning and implementation phase of the energy efficiency measures.

## ***2.3 Access to data and evaluation***

During the implementation phase, there is an assessment performed of the energy efficiency measures among the involved authorities in order to redesign them. For some measures it was necessary to re-evaluate them in order to fulfil new requirements or new European or national regulations.

Procedures have not been foreseen in order to facilitate the access to data and information from the different involved authorities during the planning and implementation phase of the measures.

## **3. Conclusions**

The status of coordination mechanisms between different governmental levels for energy efficiency measures is still at their early stages in Portugal. Although there is communication between administrative levels by formal consultations, no coordination mechanism has been established yet.

## M&V schemes and coordination mechanisms

### Romania



#### I. M&V schemes

##### 1. General framework

A M&V scheme for energy efficiency measures is currently being implemented in Romania. The M&V scheme in Romania is compliant with the National Energy Efficiency Action Plans. The M&V scheme was set up for transposing the Directive (2006/32/EC (ESD) and for the monitoring of the National Energy Efficiency Action Plans.

##### 2. Design

###### ***2.1 Administrative authority***

The administrative authority for the M&V scheme is the energy regulator of Romania.

###### ***2.2 Sectoral and spatial analysis***

Energy efficiency measures in the public, industrial and transport sectors are covered by the M&V scheme. On administrative level, the local and national authorities are included in the process.

###### ***2.3 Energy efficiency measures and technologies***

The most important energy efficiency measures and technologies in terms of energy savings which are covered by the M&V scheme are:

- Energy management in industry, including certification of energy managers and fleet managing in transport
- Industrial boilers and furnaces rehabilitation
- Variable speed drive systems
- Industrial and public lighting
- Steam traps systems

- Industrial and public building rehabilitation.

### **3. Implementation**

#### ***3.1 Data collection and measurement procedures***

National databases constitute the main data sources for the monitoring of the implemented energy efficiency measures in different sectors.

Considering the data collection process, the responsible body is the energy regulator of Romania.

The utilized procedure for the monitoring of the energy efficiency measures in Romania is based on the annual reporting including the energy consumption, the implemented measures in the last 3 years, the planned measures and related investments and the updated energy efficiency master-plans on annual basis.

The authority, which is responsible for the development of the methodology and indicators is the energy regulator with the cooperation of the Energy Efficiency Department.

#### ***3.2 Verification procedures***

There are no requirements for verification for the measured energy savings.

Moreover, no specific targets have been established for the implementation of the monitored and verified energy efficiency measures on annual basis.

#### ***3.3 Reporting procedures***

The reporting period for the M&V scheme has been set on annual basis.

### **4. Assessment**

#### ***4.1 Energy performance***

No information was identified for this issue.

#### ***4.2 Integrated tools***

An integrated tool for the homogeneous monitoring and reporting of the M&V schemes is under development.

## 5. Conclusions

M&V scheme for energy efficiency measures is currently being implemented in Romania. Even if this scheme attempts to fulfill the requirements of the corresponding EU legislation various aspects should be improved such as the obligation for verification for the measured energy savings and the establishment of specific targets being set for the implementation of the monitored and verified energy efficiency measures.

## II. Coordination mechanisms

### 1. General framework

The legal responsibility for energy policy making lies at national and local levels. At national level, the Ministry of Energy has the legal competence for energy efficiency policy formulation.

### 2. Operational issues

#### *2.1 Involved parties and responsibilities*

The distribution of responsibilities for energy efficiency policy making and implementation is clearly defined between different governmental layers. No coordination bodies between national and regional level for energy policy have been established, while the local authorities are involved in national energy policy formulation through the mandatory preparation of an energy efficiency master-plan.

The priorities and needs of the different involved authorities in this process are taken into consideration during the design of the energy efficiency measures through various initiatives such as the support for investments in district heating and RES utilization and the implementation of pilot projects through Energy Performance Contracts. Moreover, certain actions and regulations are foreseen in order to motivate the participation of the involved authorities.

Finally, the local governments are incentivized for implementing energy efficiency measures through the imposition of legal obligations and the promotion of financial support schemes.

#### *2.2 Financial and human capacities*

The majority of the involved authorities do not have sufficient human and financial resources in order to plan and implement energy efficiency measures.

No procedures are foreseen for the development of appropriate skills and for the enhancement of the existing knowledge in the different involved authorities during the planning and implementation phase of the energy efficiency measures. Toward this direction can contribute the conduction of the awareness campaign for energy efficiency.

### ***2.3 Access to data and evaluation***

During the implementation phase, an assessment was performed of the energy efficiency measures among the involved authorities in order to redesign them. The assessment was performed during the implementation of the national program for the reduction of energy costs for the population by increasing energy efficiency and using renewable sources of energy (period 2000-2009).

Several procedures and measures were initiated in order to facilitate the access to data and information from the different involved authorities during the planning and implementation phase of the energy efficiency measures such as the conduction of workshops and training activities, mainly addressed to members of Energy Cities Network (OER).

## **3. Conclusions**

The distribution of responsibilities for energy efficiency policy formulation and implementation is clearly defined between different governmental layers. Certain actions and regulations have been foreseen in order to motivate the participation of the involved authorities. Nevertheless, the most important operational barrier is the lack of capacity, both financial and human hindering the more efficient formulation and implementation of energy efficiency measures.

## M&V schemes and coordination mechanisms

### Slovakia



#### I. M&V schemes

##### 1. General framework

In Slovakia a M&V scheme for energy efficiency measures is currently implemented as adopted by the Energy Efficiency Act no. 321/2014. The M&V scheme is in compliance with the requirements of the corresponding EU legislation, while it was set up during the transposition of the Directive 2006/32/EC (ESD) aiming at the monitoring of National Energy Efficiency Action Plans.

##### 2. Design

###### ***2.1 Administrative authority***

The responsibility for the administration and coordination of the M&V scheme is allocated to various governmental bodies consisting of the Ministry of Economy, the Ministry of Transport, Construction and Regional Development, the Slovak Innovation and Energy Agency and the Regulatory Office of Network Industries. The Ministry of Economy has the overall responsibility for the M&V scheme.

###### ***2.2 Sectoral and spatial analysis***

The energy efficiency measures, which are covered by the M&V scheme, are implemented in public, residential, industrial and transport sectors. These measures are implemented at the three different administrative levels and the involved parties consist of representatives from municipalities (local level), from higher territorial units (regional level) and from ministries (national level). The participation into the M&V scheme is mandatory facilitating the provision of data and information according to the specified targets.

###### ***2.3 Energy efficiency measures and technologies***

The most important energy efficiency measures comprise of the energy upgrade of buildings (block of flats, households, administrative buildings, schools, kinder gardens, hospitals, hotels, restaurants etc.), the conduction of energy audits, the energy upgrade of public buildings, the substitution of white appliances with new more efficient, transport measures (modernization of public transport parks, development of non-motorized transport, modernisation of transport infrastructure) and last but not least the adoption of policy measures and the

provision of subsidies. No assessment is available about the contribution of each energy efficiency measure to the fulfilment of the established energy efficiency target.

### **3. Implementation**

#### ***3.1 Data collection and measurement procedures***

The statistics office and national databases constitute the main sources for the collection data for the M&V scheme. It should be noted that the collection and provision of data and information is mandatory according to the corresponding law. As a result, any involved party for each different sector is obliged to provide the necessary data to the M&V system. Moreover, specific interdepartmental working groups are established in order to collect the necessary data for the monitoring of the implemented energy efficiency measures.

The measurement of the achieved energy savings is performed with bottom up approaches. The implementation of these bottom-up approaches is performed through specific information systems.

Specifically, the measurement of the achieved energy savings in buildings is achieved by the INFOREG system and by the ITMS system (Information and Technical Monitoring System). The Ministry of Transport, Construction and Regional Development has undertaken the administration of the INFOREG system the ITMS system. The estimation of the achieved energy savings is based on estimates about the energy consumption of buildings taking into consideration the database of energy certificates. The calculation of the energy savings interventions takes into account the energy consumption of each building for the two preceding years and the minimal requirements about the energy performance of buildings.

Regarding the measurement of the achieved energy savings in the industrial sector, the ITMS system is utilised, which is verified by the Ministry of Transport, Construction and Regional Development according to metered indicators. Similarly, for the case of interventions in the public sector metered indicators are determined for the monitoring of the energy efficiency measures.

The measurement of the achieved energy savings in the transport sector is based on the differences of the unit consumption of the new high efficient vehicles with the corresponding unit consumption of the older vehicles taking into consideration the annual utilization of these vehicles.

#### ***3.2 Verification procedures***

The verification process is a part of the M&V scheme. The provided data are verified and validated before their introduction into the information systems. Specific targets for implementation of the monitored and verified energy efficiency measures on annual basis have not been set.

### **3.3 Reporting procedures**

The reporting requirements have been established on annual basis.

## **4. Assessment**

### **4.1 Energy performance**

The most important energy efficiency measures comprise of the renovation of buildings residential and public sectors.

### **4.2 Integrated tools**

An integrated IT tool for the monitoring and reporting of the M&V schemes has been developed (MSEE – Monitoring System of Energy Efficiency).

## **5. Conclusions**

The implemented M&V schemes in Slovakia has some aspects, which can be assessed positively. Specifically, the implemented bottom-up and verification procedures contribute to the fulfilment of the achieved energy savings targets, while the developed IT tool indisputably facilitates the effective operation of the M&V scheme.

## **II. Coordination mechanisms**

### **1. General framework**

The legal responsibility for energy efficiency policy making lies at national level. Specifically, the Ministry of Economy and the Ministry of Transport, Construction and Regional Development have undertaken the responsibility for the energy efficiency policy formulation and implementation. The Slovak Innovation and Energy Agency provide technical support to the ministries in the field of energy efficiency.

Moreover, the responsibility for energy efficiency lies at sectoral level also with the involvement of the Ministry of Energy, the Ministry of Environment, the Ministry of Industry, the Ministry of Transport, the Ministry of Economy and Ministry of Human Capacities.

## **2. Operational issues**

### ***2.1 Involved parties and responsibilities***

The responsibilities for energy efficiency policy formulation and implementation are clearly defined between different governmental layers. The Ministry of Economy is responsible for energy efficiency and the Ministry of Transport, Construction and Regional Development is responsible for energy performance of buildings.

A coordination body has been established between national and regional levels for energy policy formulation and implementation. Specifically, the interinstitutional group for energy efficiency has been set up for preparation of National Energy Efficiency Action Plans including representatives for the ministries, the regional administration and the municipalities. Moreover, the local authorities can participate in the interinstitutional group. The members of this group propose energy efficiency measures taking into consideration the needs and the priorities of the various involved parties.

The involvement in the interinstitutional group motivates the active participation on energy efficiency measures and regulations. Additional incentives for the implementation of the energy efficiency measures consist of the imposition of legal obligations, the promotion of financial support schemes and the deployment of technical assistance schemes.

### ***2.2 Financial and human capacities***

The financial and human capacities of the involved authorities cannot be considered as sufficient for the planning and implementation of energy efficiency measures and plans. Moreover, the implemented training of the inter-institutional group's members improved their skills and enhanced the existing level of knowledge.

### ***2.3 Access to data and evaluation***

The assessment of the implemented energy efficiency measures is performed on annual basis by the inter-institutional group in cooperation with other experts in order to redesign them potentially. Furthermore, the inter-institutional group facilitate the access to data and information during the planning and implementation phase of the energy efficiency measures.

## **3. Conclusions**

The responsibilities for energy efficiency policy formulation and implementation are clearly defined between different governmental layers and the inter-institutional group facilitates the effective coordination of the energy efficiency measures.

## M&V schemes and coordination mechanisms

### Slovenia



#### I. M&V schemes

##### 1. General framework

Slovenia has an M&V scheme for energy efficiency measures, which is in line with the respective National Energy Efficiency Action Plans according to the requirements of the Directives 2006/32/EC (ESD) and 2012/27/EU (EED). The M&V scheme was set up for transposing the ESD and for the monitoring of the National Energy Efficiency Action Plans.

##### 2. Design

###### ***2.1 Administrative authority***

The Ministry of Infrastructure, which is responsible for energy efficiency policy formulation, has undertaken the administration and coordination of the M&V scheme.

###### ***2.2 Sectoral and spatial analysis***

Energy efficiency measures in the industrial and transport sectors are covered by the M&V scheme at national level.

The implementation of the M&V scheme is mandatory for energy distributors.

###### ***2.3 Energy efficiency measures and technologies***

The most important energy efficiency measures and technologies in terms of energy savings, which are covered by the M&V scheme, comprise the substitution of boilers with more energy efficient ones and the promotion of heat pumps and lighting systems.

The measures that are the most efficient according to the results of the M&V scheme consist of energy audits and lighting.

### **3. Implementation**

#### ***3.1 Data collection and measurement procedures***

The main data sources for the monitoring of the implemented energy efficiency measures in different sectors consist of national databases and data from paid subsidies.

The Ministry of Infrastructure is responsible for energy policy formulation, while the bottom-up monitoring of the implemented energy efficiency measures is performed using specific methodologies for the calculation of energy savings as prescribed by the corresponding regulations and acts.

The utilised methodology and indicators are under the supervision and responsibility of the Ministry of Infrastructure along with the involvement of external experts.

#### ***3.2 Verification procedures***

The energy distributors have to report to the Energy Agency and the Agency has to enforce control of the reported energy savings.

Specific targets have been established for the implementation of the monitored and verified energy efficiency measures on annual basis. Specific amounts of energy savings must be achieved by the obliged energy distributors and the Energy Agency is responsible to monitor and control the fulfilment of those obligations.

#### ***3.3 Reporting procedures***

The reporting is performed on annual basis.

### **4. Assessment**

#### ***4.1 Energy performance***

No information was identified for this issue.

#### ***4.2 Integrated tools***

There is no integrated tool for the homogenous reporting and monitoring of the M&V scheme.

### **5. Conclusions**

There is no integrated tool and the national level is the only one which is truly integrated into energy efficiency measurement and verification.

## II. Coordination mechanisms

### 1. General framework

The legal responsibility lies at national level for energy policy formulation. The Ministry of Infrastructure has the legal competence for energy efficiency policy formulation.

### 2. Operational issues

#### *2.1 Involved parties and responsibilities*

The distribution of responsibilities for energy efficiency policy making and implementation is clearly defined between governmental layers.

The local energy agencies act as coordination bodies for energy policies as they are responsible for the implementation of energy policies at local level. The local authorities are involved in national energy policy formulation, since they have to prepare Local Energy Strategy, which has to be confirmed by Ministry of Infrastructure.

The priorities of different involved authorities have not been taken into consideration during the design of energy efficiency measures. Certain actions and regulations are not foreseen in order to motivate the participation of the involved authorities.

The local and regional governments are incentivized for implementing energy efficiency measures by the provision of financial support schemes and subsidies for energy efficiency measures from the EU Cohesion Fund.

#### *2.2 Financial and human capacities*

The involved authorities do not have the sufficient financial and human resources to plan and implement the energy efficiency measures defined in national action plans, since the Ministry of Infrastructure has a huge deficiency due to austerity measures.

Further procedures have currently not been foreseen for the development of appropriate skills and for the enhancement of the existing knowledge in the different involved authorities during the planning and implementation phase of the energy efficiency measures.

### **2.3 Access to data and evaluation**

During the implementation phase, an assessment of the energy efficiency measures was performed in order to redesign them through the conduction of public consultations about the utilised calculations methods.

However, no procedures have been foreseen in order to facilitate the access to data and information from the different involved authorities during the planning and implementation phase of the energy efficiency measures.

### **3. Conclusions**

Even though there is an established energy policy at local level, the coordination mechanisms are at their very early stages and the resources are very scarce due to austerity measures.

## M&V schemes and coordination mechanisms

### Spain



#### I. M&V schemes

##### 1. General framework

In Spain, a M&V scheme for energy efficiency measures has already been developed, which is compliance with the requirements of the Directives 2006/32/EC (ESD) and 2012/27/EU (EED). Specifically, the M&V scheme was developed in order to monitor the implemented energy efficiency measures within the framework of Article 7 of the EED. It should be noted that the fulfillment of the foreseen target of Article 7 will be achieved with a combination of an obligation scheme and alternative policy measures.

##### 2. Design

###### **2.1 Administrative authority**

The Spanish Institute for Energy Diversification and Saving (IDAE) is the administrative authority, which is responsible for the administration and coordination of the M&V scheme. The IDEA is a publicly owned business-structured entity reporting to the Ministry of Industry, Energy and Tourism through the General Secretariat for Energy. The mission of the IDAE is the promotion of energy efficiency and the rational use of energy in Spain, while it provides technical consultancy to the government at national, regional and local level. Within the framework of Article 7 of the EED, the IDAE has been defined as the managing authority of the obligation scheme supervising the fulfilment of the energy efficiency obligations by the obligated retail companies and issuing and registering the required energy efficiency certificates.

###### **2.2 Sectoral and spatial analysis**

The implemented energy efficiency measures, which are covered by the M&V scheme, focus on the promotion of energy savings interventions in the residential, industrial, tertiary and transport sectors. Moreover, these measures are performed both at regional and national level.

###### **2.3 Energy efficiency measures and technologies**

The most important energy efficiency measures and technologies in terms of energy savings include the Aid Program for the Energy Renovation of Existing Buildings (PAREER), the Efficient vehicle incentive program (PIVE), the Aid

Program for municipal public lighting, the Aid Program for SME and large companies of the industrial sector and the Aid Program for transport. The promotion of energy savings interventions in the industrial sector constitutes the most important energy efficiency measure in terms of the achieved energy savings.

It should be mentioned that the last three measures has been financed by the Energy Efficiency National Fund. This fund is supervised by the Ministry of Industry, Energy and Tourism, via the State Secretariat for Energy, and is managed by the IDAE. According to the Law 18/2014, the obligated parties (gas and electricity utilities, wholesale petroleum product operators and wholesale liquefied petroleum gas operators) are required to contribute on annual basis to the fund in order to fulfill the imposed energy saving obligation.

The most widespread energy efficiency technologies consist of the improvement of the energy performance of the thermal envelope, the energy upgrade of the heating and lighting installations, the replacement of conventional energy with biomass and geothermal energy in heating installations and the further penetration of high efficient conventional, hybrid, plug-in hybrid, electric and extended range electric vehicles passenger cars and light commercial vehicles.

### **3. Implementation**

#### ***3.1 Data collection and measurement procedures***

The main data sources for monitoring the implemented energy efficiency measures in different sectors include national databases, databases on regional level and data from paid subsidies.

The Ministry of Industry, Energy and Tourism, which is responsible for the formulation of energy efficiency policy, have undertaken the monitoring and operation of the data collection process in collaboration with the IDAE.

Specialized bottom-up monitoring approaches are utilized in order to measure the achieved energy savings from the implemented energy efficiency measures. The development of the bottom-up approaches has been performed according to the proposed methods of ANNEX V of the EED. Specifically, the determination of the energy savings is performed with the implementation of various methods (scaled, deemed, surveyed savings methods) depending on the type and the characteristics of each measure separately. Indicatively, for the Aid Program for the Energy Renovation of Existing Buildings (PAREER) the Energy Performance Certificates before and after the implementation of energy saving technologies are taken into consideration for the calculation of the achieved energy savings. It should be noted that the bottom-up equations have been developed for a predefined catalogue of eligible measures, while various other issues are taken into account such as the climatic variations and the lifetime of the measures. Moreover, additional measures can be incorporated into the catalogue including the corresponding bottom-up approaches.

Finally, the IDAE is responsible for the development of the appropriate methodology and the utilized indicators ensuring in any case their effectiveness and applicability.

### ***3.2 Verification procedures***

As managing authority of the energy efficiency obligation scheme, the IDAE is responsible to inspect and supervise the proper implementation of the energy saving and efficiency measures. The IDAE verifies the implemented energy efficiency measures in order to issue energy efficiency certificates for the obligated parties with the prerequisite that there is the evidence that the measure has led to the final consumers the specific amount of energy savings. The IDAE may be supported from external entities or specialists in order to complete the appropriate verification procedures.

For the case of the alternative policy measures, the IDAE follow up and monitor the aid granted by means of sampling, without prejudice to any procedures, which must be in compliance with the Law 38/2003. Indicatively, these audits may include the control of the energy performance certificates, the invoices and the bank documents providing evidence for the realization of the payments.

Moreover, the accepted savings (deemed savings), which are included in the catalogue for each of the measures, are utilised as a benchmark in order to perform an independent check in similar installations and energy efficiency interventions regarding the achieved energy savings.

Finally, specific targets have been set for the implementation of the monitored and verified energy efficiency measures on annual basis as required by the Article 7 of the EED.

### ***3.3 Reporting procedures***

The results and the main findings of the implemented methodology have to be reported on annual basis.

## **4. Assessment**

### ***4.1 Energy performance***

The most important results of the energy efficiency measures are the triggered energy savings from the implementation of the Efficient vehicle incentive program (PIVE) in 2014, which is amounted to 115 ktoe annually.

#### **4.2 Integrated tools**

No any integrated tool for the homogeneous monitoring and reporting of the M&V schemes has been developed or utilized.

### **5. Conclusions**

Summarizing, the M&V scheme in Spain has been developed according to the requirements the ESD and EED. The overall evaluation of the M&V scheme can be characterized as positive taking into consideration the period of implementation, the development of specialized bottom-up methodologies and the organization of the necessary verification procedures. Finally, the role of IDAE seems to be essential for the effectiveness of the M&V scheme.

## **II. Coordination mechanisms**

### **1. General framework**

The legal responsibility for energy policy formulation lies on local, regional and national level.

Various ministries have the legal competence for the formulation of energy policy in the field of energy efficiency. These ministries include the Ministry of Industry, Energy and Tourism, Agriculture, Food and Environment, the Ministry of Public Works and Transport, the Ministry of Economy and Finance. This allocation of the imposed responsibilities is owned to the fact that the planned and implemented energy efficiency measures promote energy efficiency interventions in several different sectors.

### **2. Operational issues**

#### **2.1 Involved parties and responsibilities**

Despite the fact that numerous ministries are involved in the field of energy efficiency, the responsibilities for energy efficiency policy planning and implementation are clearly defined among the different governmental layers.

Moreover, various initiatives acting as coordination bodies between national and regional level for energy policy have been organized. Specifically, the Sectoral Conference meetings on energy enable the fruitful coordination between the governmental and the regional administration facilitating also their relations and communication channels with the local levels of administration.

Furthermore, the Coordination Commission of Climate Change Policies is an advisory body assuring the effective coordination within the central

administration, the autonomous communities and the local authorities for the crucial issues of the climate change and the policies, which have to be adapted. Finally, the Consultative Commission of Energy Saving and Efficiency has a similar target facilitating the coordination of the different governmental layers leading to the adoption of more effective energy efficient policies and measures.

The above mentioned initiatives trigger the active involvement of the local and regional authorities into the formulation of the national energy policy. Moreover, the priorities and needs of the different involved authorities are taken into consideration through these actions during the design of the energy efficiency measures.

Nevertheless, no specific actions and regulations are foreseen in order to motivate the participation of the different involved authorities.

Finally, the local and regional governments are incentivized for implementing EE measures both through the imposition of legal obligation and the provision of financial support schemes.

### ***2.2 Financial and human capacities***

No specific procedures are foreseen for the development of appropriate skills and for the enhancement of the existing knowledge in the different involved authorities during the planning and implementation phase of the measures.

### ***2.3 Access to data and evaluation***

During the implementation phase it is performed an assessment of the energy efficiency measures among the involved authorities in order to redesign them. This procedure is performed in conjunction with the annual report, which assesses the progress on the fulfillment of energy efficiency targets within the framework of the EED.

Finally, no specific procedures are foreseen in order to facilitate the access to data and information from the different involved authorities during the planning and implementation phase of the energy efficiency measures.

## **3. Conclusions**

Various aspects of a coordination mechanism have already been introduced facilitating the fulfillment of energy efficiency targets at national level in Spain. Specifically, several initiatives have been organized to this purpose, such as the Sectoral Conference meetings on energy, the Coordination Commission of Climate Change Policies and the Consultative Commission of Energy Saving and Efficiency.

## M&V schemes and coordination mechanisms

### Sweden



#### I. M&V schemes

##### 1. General framework

In Sweden, a M&V scheme for the monitoring of the energy efficiency measures has been developed according to the requirements of the National Energy Efficiency Action Plans as derived by the Directives 2006/32/EC (ESD) and 2012/27/EU (EED).

##### 2. Design

###### **2.1 Administrative authority**

The Energy Ministry is responsible for the administration and coordination of the M&V scheme.

###### **2.2 Sectoral and spatial analysis**

Energy efficiency measures in the residential, public, industrial and transport sectors are covered by the M&V scheme, while the participation of the involved parties is performed at national regional and local levels.

###### **2.3 Energy efficiency measures and technologies**

The most important energy efficiency measures comprise:

- Energy and CO<sub>2</sub> tax in the residential sector
- Programme for energy efficiency in industry
- Support of energy efficiency and renewable energy in tertiary sector
- Revised construction regulations in households
- Energy declarations in households

The adopted energy and CO<sub>2</sub> tax in the residential sector, the programme for energy efficiency in industry and the support of energy efficiency and renewable

energy in tertiary sector are considered as the most efficient measures in terms of energy savings.

### **3. Implementation**

#### ***3.1 Data collection and measurement procedures***

The data are collected by national databases, while the Ministry of Energy is responsible for the data collection process and for the development of the methodology with the utilised indicators.

Top-down approaches are used according to the recommendations by the EC in accordance with ESD.

The evaluation of energy efficiency measures is based on bottom-up methodologies. Nevertheless, for the case of households and services it has been decided to change the calculation method from bottom up to top-down.

#### ***3.2 Verification procedures***

The measures are verified by impact assessments from the MURE Database.

Specific targets are set for the implementation of the monitored and verified energy efficiency measures.

#### ***3.3 Reporting procedures***

The reporting period has been set on annual basis.

### **4. Assessment**

#### ***4.1 Energy performance***

The most important results in respect of energy savings have been implemented in households.

#### ***4.2 Integrated tools***

An IT-tool has been used facilitating the M&V scheme.

### **5. Conclusions**

Sweden has already developed and implemented a M&V-scheme for the monitoring of the implemented energy efficiency measures at national, regional and local level. A combination of top-down and bottom up methods has been used for the effective measurement of the achieved energy savings.

## II. Coordination mechanisms

### 1. General framework

All administrative levels have a legal (but different) responsibility for energy policy making, the Ministry of Energy has the legal competence for energy efficiency policy formulation.

### 2. Operational issues

#### *2.1 Involved parties and responsibilities*

The distribution of responsibilities for energy efficiency policy making and implementation is clearly defined between different governmental layers.

The local authorities are involved in national energy policy formulation by a program of sustainable municipality, which is a cooperation between the Energy Agency and 38 municipalities. Furthermore, the priorities and needs of the different involved authorities are taken into consideration during the design of the energy efficiency measures.

Actions and regulations are foreseen in order to motivate the participation of the different involved authorities.

The local and regional governments are incentivized for implementing energy efficiency measure by several types of networks.

#### *2.2 Financial and human capacities*

Specific procedures have been foreseen for the development of the appropriate skills and for the enhancement of the existing knowledge of the different involved authorities during the planning and implementation phase of the measures.

#### *2.3 Access to data and evaluation*

No information was identified on this issue.

### 3. Conclusions

The local authorities are involved in national energy policy formulation in Sweden, while specific actions have been implemented in order to encourage their involvement, to take into consideration their needs and priorities and to enhance the existing level of skills and knowledge.

## M&V schemes and coordination mechanisms

### United Kingdom



#### I. M&V schemes

##### 1. General framework

In UK a M&V scheme for the monitoring of the energy efficiency measures has been developed according to the requirements of the National Energy Efficiency Action Plans complying with the Directives 2006/32/EC (ESD) and 2012/27/EU (EED).

##### 2. Design

###### ***2.1 Administrative authority***

The Governmental Department of Energy & Climate Change collates energy savings for measures across the UK Government and Devolved Administrations and where necessary applies a policy ranking to adjust pre-policy demand for lower ranked policies in the merit order to avoid double –counting of savings. The Department further set up the Energy Efficiency Deployment Office (EEDO) with the aim to drive energy efficiency. The EEDO is supporting the coherent delivery of the UKs existing energy efficiency policies and is developing the UK Governments energy efficiency strategy.

###### ***2.2 Sectorial and special analysis***

Energy efficiency measures in residential, public, industrial and transport sectors are covered by the M&V scheme, while the participation of the involved parties is performed at national level.

###### ***2.3 Energy efficiency measures and technologies***

The most important energy efficiency measures comprise:

*Energy efficiency in buildings.* The UK has a wide range of policies which encourage energy efficient renovations of the existing building stock. In addition to this, the Government is committed to introducing strict energy efficiency requirements for new buildings. Building regulations are devolved across the four UK administrations, but energy standards are broadly comparable in content, scope and in the levels of improvement delivered over past decades across in the UK.

*Energy Efficiency in Public Bodies.* The UK has adopted the alternative approach provided under Article 5(6) of the EED. It has calculated a target which, as required, is based on the energy savings that paragraphs 1 to 5 of Article 5 would generate. The UK has estimated the target saving to be achieved by 2020 at 163.6 GWh. The UK currently expects to deliver an amount of energy savings considerably in excess of the target.

*Industry.* Over the last twelve months the Government has taken action to ensure that UK businesses have access to the support and information they need to install cost-effective energy efficiency measures. This has helped businesses cut costs and improve their bottom line whilst becoming more energy efficient. For example, industrial energy consumption is projected to fall by 12% over the next two decades due to opportunities in Combined Heat and Power (CHP) and process, energy and material efficiency.

*Transport.* The transport sector has a key role to play in improving UK energy efficiency. Already, as a result of Government action, the transport sector is seeing increasing take up of energy efficiency measures. Specifically, the efficiency of new cars in the UK has improved by 27% between 2002 and 2012, allowing new car owners in 2012 to drive, on average, 14 miles per gallon more than new car owners in 2002. Regulations have been established since 2009 requiring the automotive industry to produce more efficient vehicles and resulting on average to a saving of 15 pence per litre. By 2020 this will increase to around 42 pence per litre.

### **3. Implementation**

#### ***3.1 Data collection and measurement procedures***

National databases constitute the main data sources for the monitoring of the implemented energy efficiency measures, while the Department of Energy & Climate Change collates energy savings to measures across the UK Government and Devolved Administrations.

For all measures, bottom-up calculations have not been developed yet.

#### ***3.2 Verification procedures***

The measures are verified by the energy statistics and specific targets are set for the implementation of the monitored and verified energy efficiency measures.

#### ***3.3 Reporting procedures***

The reporting period has been set on annual basis.

## **4. Assessment**

### ***4.1 Energy performance***

The most important results in respect of energy savings have been implemented in buildings sector.

### ***4.2 Integrated tools***

No integrated tool for the homogeneous monitoring and reporting of the M&V schemes has been introduced.

## **5. Conclusions**

Summarizing the implemented M&V schemes in the UK can be evaluated positive. Existing M&V schemes have been developed in accordance with the requirements of the ESC and EED. Even, if a homogeneous M&V scheme does not exist, the operation of separate M&V scheme according to the peculiarities of each energy saving measure seems to be an effective strategy for the development of existing M&V schemes.

## **II. Coordination mechanisms**

### **1. General framework**

The legal responsibility for energy policy making lies at national level. The governmental Department of Energy & Climate Change collates energy saving policy across the UK.

### **2. Operational issues**

#### ***2.1 Involved parties and responsibilities***

The distribution of responsibilities for energy efficiency policy making and implementation is clearly defined between different governmental layers.

The regional and local authorities are incentivized for implementing energy efficiency measures through the provision of the appropriate financial support.

#### ***2.2 Financial and human capacities***

Specific procedures have been foreseen for the development of the appropriate skills and for the enhancement of the existing knowledge of the different involved authorities during planning and implementation phase of the energy efficiency measures.

### **2.3 Access to data and evaluation**

Evaluation procedures are based on the findings and the results of the annual report regarding the progress of the planned and implemented energy saving measures. This procedure can lead to the continuation of the existing new measures, to the adoption of more efficient, to the cancelation of some of them and to the modification of the existing measures, which are characterized by planning defects.

### **3. Conclusions**

No aspects of a coordination mechanism were identified for the current status regarding the planning and implementation of energy saving policies in the UK.

## IV Conclusions

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The main conclusions, as were derived by the completion of the mapping of the existing M&V schemes and coordination mechanism, are presented in the following points:

### **M&V schemes**

- The vast majority of the States have already introduced a M&V scheme or a certain number of M&V schemes indicating a significant degree of capability to monitor and verify the energy efficiency measures and the achieved energy savings.
- Almost all the examined States declared that the developed M&V schemes are in compliance with the requirements of the EED and ESD. Nevertheless, this argument must be verified by the EC during the actual implementation of the EED.
- The ministries, which are responsible for the formulation of the energy efficiency policy, undertake mainly the administration and coordination of the M&V scheme. Nevertheless, schemes with shared responsibilities involving other authorities such as energy agencies or subordinate bodies constitute another popular alternatives for running the M&V scheme.
- All sectors of final energy consumption are covered by the different existing M&V schemes though not all national schemes are covering all sectors.
- The majority of the examined states have introduced energy efficiency measures in all examined sectors (public, residential, industrial and transport sector).
- The administration of the M&V schemes is performed at national level and in limited cases at regional and local levels.
- The official national statistics office, national databases and data from paid subsidies comprise the most common data sources utilised.
- The coordination of the data collection process is undertaken mainly either by a governmental body, an agency, an energy regulator or by a combination of the involved authorities including the corresponding ministry.

- All the States have already established bottom-up procedures for the monitoring of the energy efficiency measures and the measurement of the achieved energy savings.
- Almost half of the States continue to utilize top-down approaches for the monitoring of the energy savings targets as foreseen by the ESD. Nevertheless, the utilization of top-down indicators targets to the estimation of the achieved energy savings at sectoral level.
- A diversification of the implemented bottom-up approaches was identified as attempt to comply with the requirements of Annex V of the EED.
- The authorities, which are responsible for the administration and coordination of the M&V scheme and for the implementation of the data collection procedure, have also undertaken the development of the methodology and indicators used in the bottom-up procedures.
- The most common approach for the verification of the measured energy savings comprises the conduction of inspections of a representative sample of the implemented energy efficiency measures.
- The reporting period has been established on annual basis for the majority of the States.
- More than half of the States do not utilise an integrated tool for the homogeneous monitoring and reporting of the M&V schemes but rely on various types of databases and on-line questionnaires for the monitoring of the implemented energy efficiency measures.
- No experience exists regarding the effectiveness and the applicability of the existing M&V schemes due to the short implementation period of the EED and the lack of relative assessment reports. Nevertheless, considerable experience has been gained within the framework of ESD regarding the collection of the necessary data and the implementation of the proposed top-down and bottom-up approaches.

Generally, all the examined States have already introduced bottom-up approaches in order to measure the triggered energy savings from the implemented energy efficiency measures complying with the requirements derived from Article 7 of the EED. Nevertheless, taking into consideration that the implementation of the Article 7 of the EED has started only in

2014, the current degree of compliance can be assessed as low for the majority of the Member States, as depicted by the submitted annual reports in April 2014. There is the evidence that the effectiveness of these M&V procedures is questionable. However, for the case of some States there is the strong evidence that the established bottom-up systems are efficient and can be considered as best practises such as in the case of France, Austria, Italy and Spain. Moreover, an additional conclusion is that the established bottom-up approaches have introduced many different methodological issues and aspects due to the fact that the proposed methods and principles from the Annex V of the EED seem to be too general without specific guidelines allowing the development of diversified approaches. This variety of bottom-up calculations highlights the necessity for a homogeneous bottom-up approach for all the Member States and for all the energy efficiency measures leading to comparative and robust estimates of the achieved energy savings. As a result all the examined States within the framework of the performed analysis are expected to benefit from the proposed bottom-up methodologies, which have been developed within WP2 (D.2.1).

Furthermore, another valuable conclusion derived by the analysis is that 15 States have no integrated tool for the homogeneous monitoring and reporting of energy savings. Indisputably, these States can benefit directly from the IT tool for the bottom-up monitoring of the implemented energy efficiency measures, which will be developed within the framework of the multEE project. Nevertheless, the States, which have already introduced similar tools, may have an indirect interest for the developed IT tool improving their architecture and their functionalities. As it was mentioned, it is crucial to develop a homogeneous M&V procedure among the Member States accompanied with an IT tool for the efficient monitoring and verification of the achieved energy savings. Elements from existing IT tools in other countries should be further analysed when developing the IT tool for improving its effectiveness and expanding its functionalities.

Summarizing, all the identified aspects for the M&V schemes will be further analysed within the framework of Task 1.3 and the elaboration of the selected best practises will result in more concrete recommendations to be taken up in WP2 of the multEE project.

## **Coordination mechanisms**

- The legal responsibility of energy policy formulation lies mainly at national level and in limited cases also at regional and local level.

- More than one ministry is involved in the formulation of energy policies in the majority of the examined States.
- The responsibilities for energy efficiency policy making and implementation are usually clearly defined between different governmental layers.
- Formal or information Coordination bodies for the formulation and/or implementation of the energy efficiency policy between national and regional level for energy policy are existing in the one or other form in most of the examined States.
- Regional (especially in federal states) and to a lesser degree local authorities are involved generally in national energy policy formulation and implementation though in different intensity ranging from formal collaboration in working groups to possibility of voicing their opinion in public consultation procedures.
- The priorities and needs of the different involved authorities seem to be taken into consideration during the design of the energy efficiency measures in most of the examined States.
- The motivation of the different involved authorities for participation into the formulation and implementation of the energy efficiency measures is achieved through specific organized actions and adopted regulations.
- The most common instruments for the incentivisation of the local and regional governments for implementing energy efficiency measures consist of the adoption of legal obligations and the development of specific financial support schemes.
- Generally, the involved authorities especially on the local level seem to lack sufficient financial and human resources in order to plan and implement the energy efficiency measures foreseen in national plans.
- In almost half of the States specific procedures for the development of appropriate skills and for the enhancement of the existing knowledge of the different involved authorities during the planning and implementation phase of the energy efficiency measures are introduced.
- An assessment of the energy efficiency measures among the involved authorities in order to redesign them is performed for the majority of the States.

- Specific procedures for the facilitation of the access to data and information from the different involved authorities during the planning and implementation phase of the energy efficiency measures are implemented in some States.

All the above-mentioned issues, which were identified during the analysis of the existing coordination mechanism, have to be taken into consideration within the framework of WP3 of the multEE project improving the existing coordination mechanisms within the participating countries.

In most of the States surveyed some kind of exchange between national and regional and to a lesser degree local level could be observed with regard to energy efficiency policy formulation and implementation. Though this exchange varies significantly from country to country with regard to intensity, grade of formalisation and inclusiveness of the coordination process. Only few examples could have been identified in which energy policies have been developed and are implemented in an inclusive and participatory manner.

Toward this direction, the collected information for some identified good examples should further be elaborated emphasizing both on the horizontal and vertical dimensions of these mechanisms and on the vital aspects during the planning and implementation phases of the implemented energy efficiency measures. The identified aspects and procedures (including consultations, committees, working groups etc.) as derived by the performed analysis should be further analyzed and clustered by criteria such as administrative structure, size, political culture etc. and could serve as inspirations for proposals on how to improve coordination mechanisms in other countries. Indicatively, the working group CONCERE/ENOVER in Belgium, the consultation body CNEN in France, the inter-ministerial working group IMA in Germany, the local government management network CCMA in Ireland, the committee Conferenza Stato Regioni in Italy and the advisory body Coordination Commission of Climate Change Policies constitute promising examples, which might be taken into consideration in WP 3.

Summarizing, all the identified aspects for the coordination mechanisms will be further analysed within the framework of Task 1.3 and the elaboration of the selected best practises will result in more concrete recommendations to be taken up in WP3 of the multEE project.

## Lessons learnt

Generally, the implemented methodology for the conduction of the analysis considering the current status of the M&V schemes and coordination mechanisms in EU can be assessed as satisfactory taking into consideration the complexity of the examined issues. Especially, the lack of a common definition for the case of the coordination mechanisms constituted an additional obstacle for the most effective elicitation of the necessary contributions from the involved stakeholders.

The selection of the participating stakeholders was appropriate taking into account that all of them have remarkable knowledge and experience in the field of energy efficiency. Nevertheless, the achieved response rate (18 out of 29 States) probably is an indication that an alternative approach had to be implemented in order to ensure the most effective engagement.

Obviously, the majority of them are considered as high-level experts, as they participate directly into the formulation of energy efficiency policies and the compilation of the action plans, and the provision of essential incentives is crucial so as to lead to the more active participation into such initiatives. Probably, the official constitution of a committee or an advisory board with the participation of experts from all the involved States may foster their more efficient involvement, facilitate the exchange of information and increase the possibilities to fulfill the established objectives.



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