bigEE

Your guide to energy efficiency in buildings.

How to design and implement energy efficiency policies

Tips for designing and implementing policies for energy efficiency in buildings and appliances

Successful policy requires careful planning and design, schemes to ensure compliance, and monitoring and evaluation to learn what works and what can be improved. Read here what is good practice. The following chapters provide some general tips for designing and implementing policies for energy efficiency in buildings and appliances and refer to what is good practice.

Policy Planning

Well-planned policies tend to show better success. This holds good for energy efficiency policies just as for any other policy area. Based on existing research and empirical evidence, we recommend the following evolutionary cycle approach for policy planning, design and implementation. Policy evolution will thus be closely interlinked with policy implementation, monitoring and evaluation.

At the outset of any policy design we recommend to set a **target.** The target must be measurable and verifiable and thus requires indicators of success. It must also be realistically achievable, therefore the existing energy saving potentials should be analysed beforehand, and if possible, separately for each relevant sector. In many countries, even before analysing potentials of energy-efficient building designs, technologies or appliances, efforts need to be made to gather data on the energy consumption in the various sectors and forecasts of their evolution, as well as data on the specific energy consumption of conventional building designs and equipment, to determine the baseline for calculating potential energy savings.

Next, a **policy roadmap** including **sectoral targets** should be developed, based on the analysis of sectoral and priorities. As targets, we recommend both a sectoral vision – such as the **three** visions we propose:

For new buildings, mainstream ultra low energy buildings (ULEB).	For existing buildings, achieve high energy savings in retrofit and in operation.	And for appliances, mainstream highest energy efficiency levels.

And a quantitative target for the contribution of each sector to the overall national energy savings target for one or more future target years (e.g., 2020 or 2030). In addition, this plan should already comprise basic strategies for achieving the targets, provisions for **funding** and a concrete **timetable** for implementation.

After that, a **governance framework** and concrete **sectoral policy packages** need to be developed taking into account relevant target groups with their respective actor-specific barriers and incentives. To guarantee success, stable **funding** for the policies and measures is essential. Developing countries and emerging economies can explore the possibilities of climate finance here, such as Programmes of Activities under the Clean Development Mechanism or Nationally Appropriate Mitigation Actions. The expected energy savings, as well as the social, economic and environmental **impacts** of the policy, should be **assessed ex-ante,** i.e. before it is actually implemented, so as to enable adjustments to the policy design or the targets if necessary.

During the actual **implementation** phase, the policies' performance should be continuously **monitored.** Policy **impacts** must then be **evaluated** and the **implementation process** be **examined ex-post** using the data and insight collected through monitoring. On this basis, policy instruments should be regularly **revised** and improved.

The following figure illustrates how all these steps will follow each other in an ideal policy planning and learning process. This cycle shows the different steps to increase the energy efficiency for buildings and appliances.

In the illustration, the smaller, anti-clockwise arrows represent two opportunities for re-assessing the original policy design: The first feedback loop (on the right) allows for revision of the target especially when ex-ante calculations project over-achievement of the target. If under-achievement is impending, this feedback loop should trigger an analysis of additional potentials and further measures to activate them. The second feedback loop (on the left) indicates the stages where policy packages could be revised if ex-post evaluation reveals lower energy savings than required by the policy target.

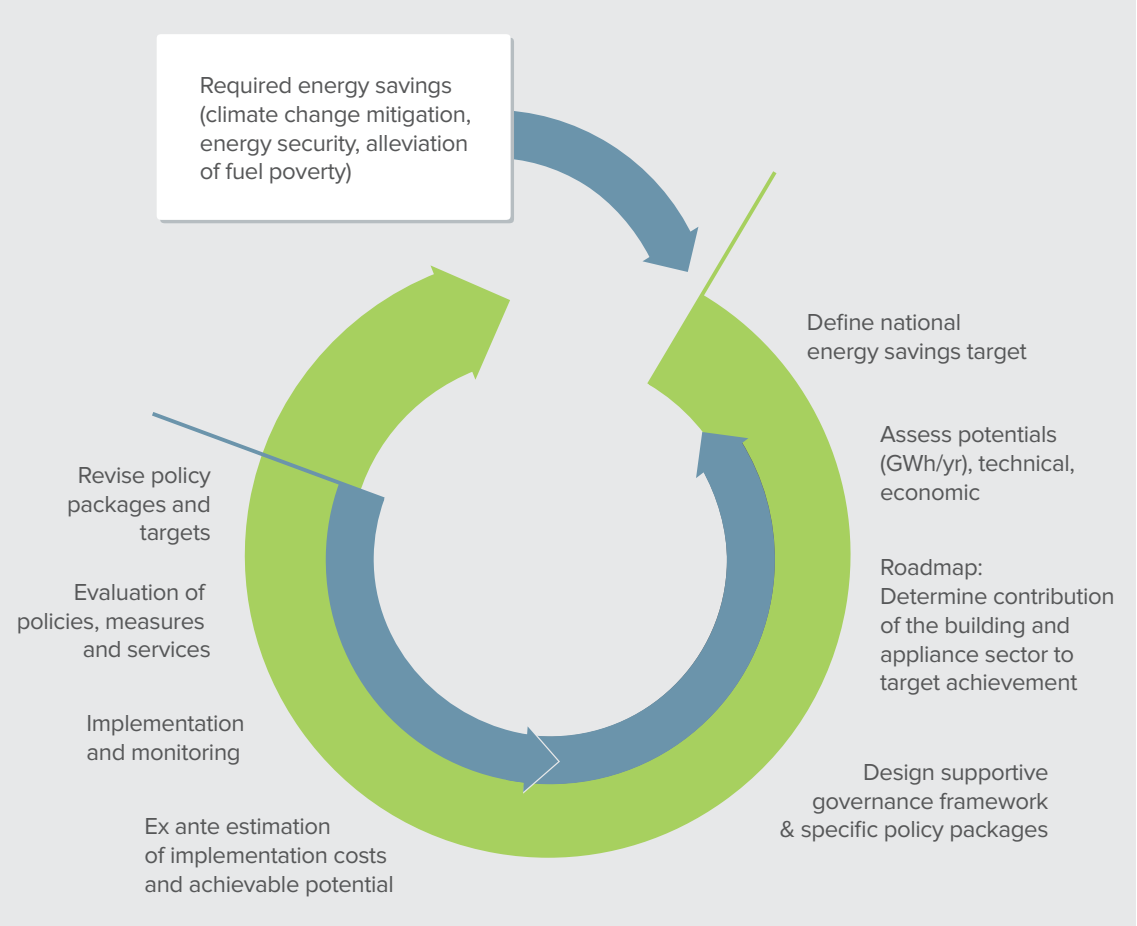

Figure 1: The policy planning, implementation, and learning cycle

Source: Wuppertal Institute (2012), adapted from Wuppertal Institute & Ecofys (2009)

One of the most important steps in the policy planning process is “Design supportive governance framework & specific policy packages for the buildings sector”, which usually includes several sub-steps:

- Establish a governance framework (see: IEA 2010a)
- Analyse markets, actors and barriers (see bigEE document “Why policy is needed”)
- Develop appropriate policy packages (see bigEE document “Policies need to interact”)
- Define monitoring, evaluation, and reporting methods and requirements
- Establish compliance control and enforcement

Some guiding general principles

Whatever the policy or measure to be designed or implemented, the following principles are useful to take into account. We recommend a throrough check of these guiding principles before designing and implementing a policy or measure.

- **Build confidence in stable framework conditions**
  Governments need to signal to the markets a credible commitment to energy efficiency as a long-term political goal. The lifetimes of policies and measures must be sufficiently long if they are to encourage manufacturers, builders, and end-users to make critical, long-term investment decisions. Policies that might not even survive the next changes of government will hardly motivate them to substantially change their business strategies, practices, and investment behaviour, because otherwise the risk of sunk costs is too high. An overall policy roadmap and target that provides a long-term framework for the individual policies and measures will provide guidance to investors and will further strengthen their confidence, as will a strong and stable organisation and funding for the policies and measures.

- **Determine priorities based on status quo analysis**
  In order to be able to choose priorities and set targets of energy efficiency policy wisely, we recommend that governments first analyse the status quo and specific circumstances in their country. For this purpose, data on energy consumption trends in the different sectors and subsectors should be collected and analysed, with a differentiation by end use as far as possible. For instance, countries with high rates of new construction should focus their policy efforts on improving the energy performance of new buildings, whereas such countries, in which the stock of old buildings with insufficient insulation and inefficient equipment is predominant, should focus on improving the building stock (UNDP 2010, p.48f.).

- **Involve the market and assess the needs of market actors**
  Relevant stakeholders (i.e., especially building professionals and manufacturers but also investors and end-users, energy (services) companies, wholesalers, banks, local authorities, and science) should be involved and regularly consulted in the design and implementation phase of policies and measures. This will help to ensure that policies are adequate and practically feasible, and may also increase the rate of compliance. However, legislators must make clear they will take the final decision. To involve the market, political decision-makers must have good knowledge of the relevant actors and thoroughly analyse the respective barriers and incentives faced by each of them. An effective policy package based on the findings of such analysis will combine strategies and mechanisms that specifically address the actor-specific barriers and strengthen incentives.
  Read more in bigEE document “Why policy needs to assist building and appliance markets to become energy-efficient”.

- **Make goals, instruments, and benefits transparent**
  Policies and measures should be clear, transparent, and easy to understand for all stakeholders. Consequently, each major policy or programme should be accompanied by an information cam-

paign about its concrete objectives, way of functioning, target groups and expected benefits. In order to increase acceptance and measure uptake, we further recommend that the overall goals of the national energy efficiency strategy, i.e. the achievable benefits for individuals, the economy and society as a whole should be communicated widely.

- **Increase uptake through highlighting co-benefits**
  When designing and implementing policies for energy efficiency improvement, decision makers should not only have the intended effects – like saving energy and costs, or reducing greenhouse gas emissions – in mind but also consider potential side-effects, which may be both positive or negative. Consequently, one should try to avoid the negative effects and highlight the positive ones, the so-called co-benefits. For example, in order to overcome the major barrier that, at least for the individual household, the achievable energy cost savings may appear too small to seriously motivate people to make home energy improvements, we recommend to pair energy efficiency with other benefits that are valued more by households. For instance, it proves especially effective to identify a problem the end-user already has such as, e.g. unhealthy indoor climate or cold rooms, and then offer them a solution to that problem, which will reduce energy consumption at the same time (Fuller et al. 2010, p.43f.). Co-benefits of energy-efficient appliances are especially the cost savings but also health aspects, lower noise, reduced water consumption etc.

- **Monitor, evaluate and review policies**
  Policies and measures should be constantly monitored and thoroughly evaluated on a regular basis. The necessary mechanisms such as reporting requirements and well-defined methods for measuring and verifying results need to be established, and corresponding resources allocated already in the design phase, i.e. before a policy actually enters into force. The results of the regular reviewing process must be fed back through updates or adaptations to the laws and their administrative instruments. The next chapters provide some additional information about monitoring and evaluation practices.

- **Policy dynamics, maximising benefits and minimising negative side effects**
  As policies are introduced, markets will adapt to them. But as long as there still is further potential for cost-effective energy efficiency improvement or from new technology and concepts, policy should not rest on past achievements. Instead, it will maximise the benefits of energy efficiency, if policy prepares and assists markets early on for the next steps towards ultra low energy new buildings, very energy-efficient renovation of existing buildings, and very efficient appliances, and then implements these next steps along its policy roadmap. This will also avoid that markets fall back to lower energy efficiency levels (called the “snap-back effect”) and reduce the problem that a static policy may continue to support energy efficiency levels that market actors would have achieved without it (known as the “free-rider effect”). Furthermore, policy should aim to enable markets to adopt further energy-saving action on its own initiative, leading to “spill-over effects”. Energy efficiency may also lead users to improve their desired thermal comfort (e.g., higher indoor temperatures in cold seasons or lower indoor temperatures in hot seasons) or increase trends towards bigger appliances, such as refrigerators or TV sets. These are called “rebound effects”, as they will reduce the amount of energy saved compared to expectations. Policymakers should assess, to which extent such increased comfort levels are a desirable benefit of the energy efficiency improvements, or whether to try and limit the “rebound effects”, e.g., through motivation and information campaigns on energy-efficient user behaviour.

- **Consider the social dimension**
  Depending on national or local circumstances, it may be worthwhile to consider combining the strategy for improving energy efficiency with activities for alleviating poverty: improving energy efficiency in buildings and appliances can have highly beneficial effects on the budgets of low-income households, which are especially sensitive to energy cost increases. Ideally, it can even reduce their need for social benefits/income support. However, vulnerable end-users will most likely need additional financial support that will allow them to finance the required upfront investments (based on UNDP 2010, p.51).

- **Take national or local circumstances into account** Every country has its own political and cultural surroundings and it is not possible to take into account all these differences. Therefore the information in this document is formulated in a very general manner and not applicable to every country-specific situation. Nevertheless policy makers can use this general information and adapt it to national circumstances. In order to realise energy savings in the appliances and building sectors, it is important to implement policies and measures, which are appropriate to national circumstances.

Some building specifics:

- Is the level of knowledge and skills of building sector professionals sufficient? If not, prescriptive minimum requirements for building components rather than performance-based standards may be the best way to start with legal energy efficiency requirements.
- Is there a track-record showing a capability of enforcing mandatory regimes? If not, it might be advisable to start with voluntary measures and during that initial phase build up a capacity for enforcement.
- What is the extent of informal/self-built housing? If there is a high share of informally built dwellings, policies and requirements should be kept as simple as possible to allow for implementation also by non-professionals; and extra effort should be directed towards providing adequate support to the latter.
- Are buildings mostly owner-occupied or rented? In countries with a high share of rental, policies must deal with the investment barrier of split incentives through mandatory requirements and/or significant financial incentives.
- What is the role of energy companies and regulators? In order to use the effective tools of energy saving obligations for energy companies or Demand-Side Management (DSM) programmes, regulators must be given legal authority and the skills to remove the 'natural' disincentive of energy companies to introduce energy efficiency programmes. Also, energy companies must be in a stable state (both financially and in terms of organisation) to be able to implement energy efficiency programmes effectively (based on UNDP 2010, p.50).

Some appliance specifics:

- If there is low knowledge about energy-efficient technologies, policies and recommendations should be kept as simple as possible to allow for implementation by non-professionals. In this context, an additional focus should be put on providing adequate support to the latter.
- Sometimes, national law prohibits energy efficient solutions. Examples could be the prescription of minimum washing temperatures, e.g., 40 °C, minimum brightness of computer screens, or the prohibition to hang out clothes to dry in the sun. Such legal barriers to solutions that can save a lot of energy should be re-examined and if possible removed.

Monitoring and Evaluation

It is important to regularly assess and adapt politicies to ensure that they are as effective as possible. Monitoring and evaluation (M&E) enables policy managers to demonstrate the programme's progress and its success or failure. M&E activities help to better understand the needs of target groups and to define intermediate objectives that are achievable and measurable. The effectiveness of policies in harnessing energy efficiency potentials and also their efficiency in terms of impact vs. effort are thus enhanced. Such a continuous learning and improvement approach is fundamental: it may ultimately determine the success or failure of a programme.

Hence, M&E of single policies and policy packages is a central part of policy implementation is. Therefore, this chapter will summarise information about these two topics. The chapter starts with a short introduction why monitoring and evaluation is important and then shortly presents the different monitoring and evaluation methods. Furthermore, some overall tips will be provided how to plan and conduct an evaluation.
Read on why monitoring and evaluation are so important and how M&E activities should ideally be planned and structured.

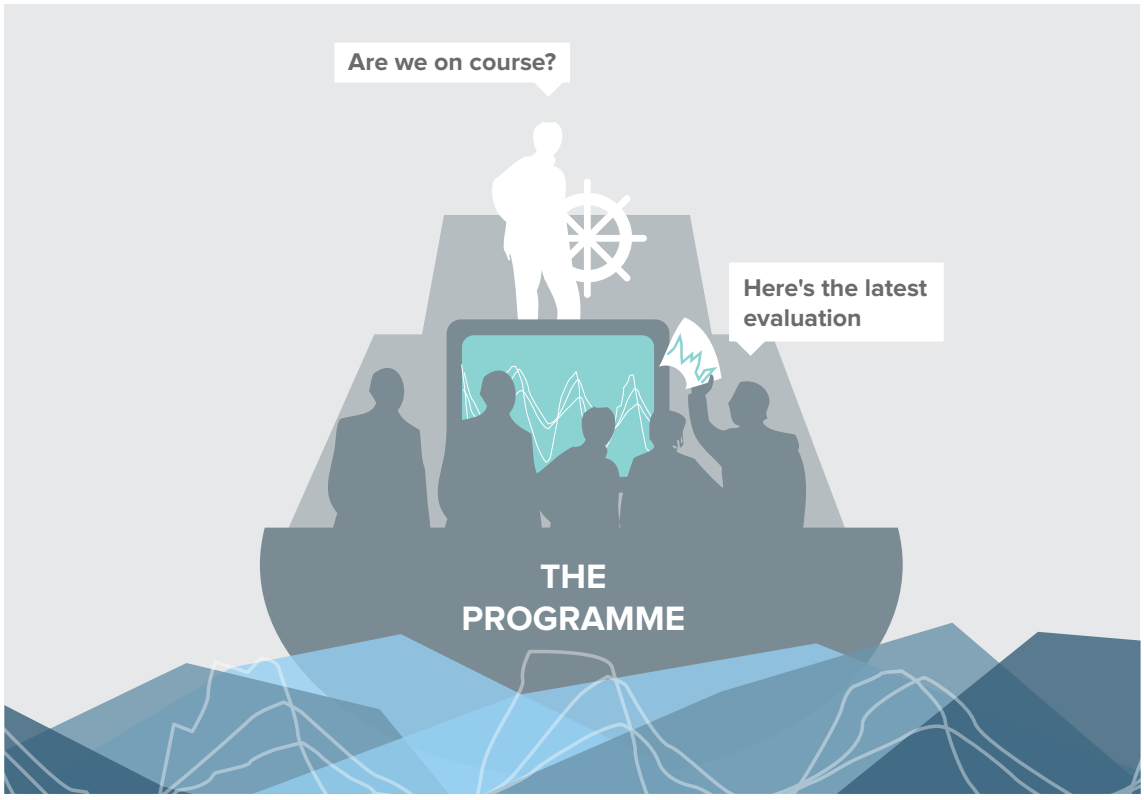

Figure 2: Evaluation will keep your programme on course
Source: Wuppertal Institute (2012)

What is Monitoring and Evaluation and why is it so important?

Policymaking does not end with the passing of a law or the launch of a programme. The policy manager must follow-up and make sure that the initiative is achieving its objectives, what side effects it may have and whether any changes become necessary.

In this context, policy implementation includes monitoring and evaluation as key elements. M&E are established tools for analysing the effectiveness of policies or measures, and they are required for verifying the planning assumptions and for quantifying the overall results. Furthermore, M&E helps to judge the performance, to fine-tune the implementation process and to provide experience feedback for future policies and programmes.

Monitoring means the on-going process of collecting routine data for project management and for ex-post evaluation.
Evaluation can be defined as the assessment of the outcome of a policy or measure and of the inputs required to generate such outcomes (US EPS 2007).

The main differences between monitoring and evaluation are in the timing and frequency of observations or assessment and in the purpose and questions addressed. The following bullet points illustrate these differences between ex-ante impact evaluation, monitoring, process evaluation, and ex-post impact evaluation. Definitions of these tools differ slightly in the literature. But they agree completely with regard to importance of M&E in all phases of an energy efficiency policy or programme - from initial policy planning throughout its implementation right up to its completion - and even beyond, for future policies and measures.

- Ex-ante impact evaluation aims at 'screening the landscape' and at guiding the design and implementation of a policy. The evaluation should start with calculating the economic and technical potentials and assessing how much of the identified potential can be realised by what kind of policy or measure (or policy package). Analysing the efficiency and saving potentials and defining concrete policies for their realisation should ideally be based on experiences from policy packages or single measures that have already been implemented. A programme theory of which actors are expected to take which action, and how the policy or programme will support them to take it, will be very useful to guide policy design and ex-ante assessment (Ecofys et al. 2006). Past experiences will also provide evidence for the programme theory, as well as for the costs and economic benefits that can be expected for the new policy. Such an ex-ante estimate of benefits and costs will be the final step in the ex-ante impact evaluation of a policy.

- Programme monitoring will assist project managers in following and controlling the process, in quickly identifying problems and in solving them. The database generated in the monitoring process will be useful both for process and ex-post impact evaluations.

- Process evaluations serve to more systematically analyse programme performance at longer intervals than the more continuous monitoring. They will be more credible and often more useful, if done by external evaluators, whereas monitoring is usually performed by programme managers themselves. Process evaluations can provide in-depth insights in whether a policy or programme

performs as expected, e.g., in a programme theory, which are very important for improving its design and implementation, its effectiveness and its rationale within the overall policy framework.

- Ex-post impact evaluation will show in detail whether a policy or measure has been effective in achieving its targets, e.g., as effective as anticipated in the ex-ante evaluation. It will thus compare the actual impacts with the previously calculated potentials. Impact evaluations deal with effects and outcomes such as behavioural changes or policy acceptance by target groups, energy and/or cost savings achieved in relation to programme expenditure, positive or negative side effects (for example rebound effects, free-rider effects and spillover effects). Obviously most important is the collection of data relating directly to the programme's primary objectives in order to judge its effectiveness in the ex-post evaluation.

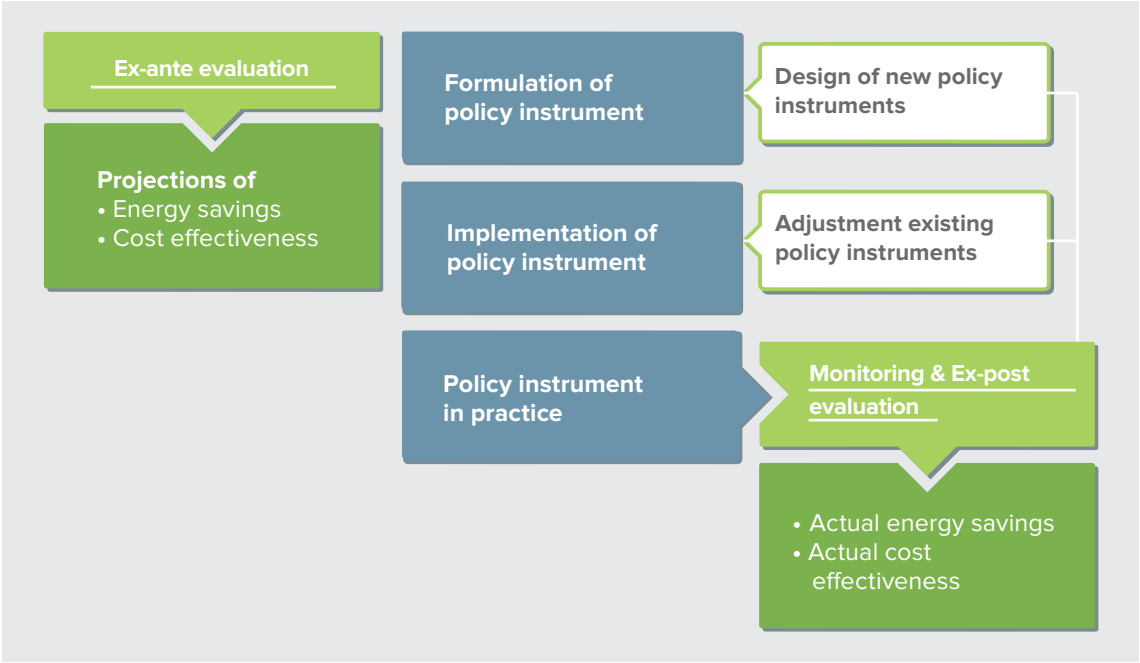

Figure 3: Why evaluation is important

Source: Wuppertal Institute (2012), adapted from Ecofys (2008)

The most effective way to assess the effectiveness of a policy is the **evaluation and monitoring of policy packages.** The advantage is that overlaps between policies and programmes can be taken account of, and double counting can be avoided. Taking account of such interactions between two or more policy instruments is important, because their result can be that the effectiveness and/or costs of the combined policy instruments are either higher, lower or equal to those of the single policy (Irrek & Jarczynski 2007).

Basic evaluation methods

Basic evaluation method	Short explanation
Bottom up	A bottom-up calculation method means that the energy savings obtained by a specific energy efficiency improvement policy or measure are calculated by the monitoring of standard or individual actions taken by end-users to improve energy efficiency and adding up the resulting energy savings (Vreuls et al. 2009). From these, energy cost savings can be derived and compared to programme and investment costs. Bottom up methods are used for an accurate calculation of the impact of a single policy or a sectoral policy package in terms of achieved energy savings, as well as the related benefits and costs. Bottom-up evaluation can include process evaluation of a policy or measure and thus provide insight in which improvements to it are required or possible.
Top down	In contrast to the bottom-up methods, a top-down method means that the amount of energy savings is calculated using the development of energy consumption indicators at national or larger-scale aggregated sectoral levels as the starting point. Top-down calculation of energy savings can be easier to apply, particularly in areas, for which many and overlapping energy efficiency improvement measures exist. However, it is often difficult to define the counterfactual against which to calculate energy savings, i.e., the reference trend of the underlying indicator that would have materialised without policy intervention. We therefore recommend top-down calculations as a potential alternative to bottom-up calculations only for appliances and solar water heaters but not for buildings (Wuppertal Institute 2009), and only in cases where a sufficiently long time series of statistics with very well-defined specific energy consumption indicators of sold appliances exists. The time series should cover at least 5 to 10 years before the energy efficiency policies on the appliances concerned were introduced

Planning and conducting an evaluation: What makes a good evaluation?

Monitoring and evaluation activities should be planned and implemented from the start of the design for a new policy or measure. This will make the collection of relevant data and the final evaluation easier and cheaper. It is necessary to develop an “evaluation culture” that integrates the impact, process, market and cost evaluations into the day-to-day process of energy efficiency planning, implementation and oversight. It takes some time to develop such an evaluation culture and to integrate it in the national institutional and regulatory structures

Many countries do not monitor and evaluate their policies at all, and others only carry out some general evaluation activities in the field of impacts, process, market trends, and costs. The benefits of systematic M&E must therefore be emphasised and an agreed evaluation process should be initiated within a country or a group of countries (IEA 2010). The latter common effort would significantly reduce the costs of setting up an M&E regime because participating countries could share the development cost of the methodology and would only have to adapt it to their specific needs and circumstances.

For practical planning, the **main elements of an energy efficiency evaluation** are as follows (adapted from IEA 2010):

- **An evaluation framework:** A coherent framework is necessary to describe a specific policy, its objectives, its programme theory, the desired outcome(s) and the interactions with other policies.
- **A specified analytical basis:** A test method with the corresponding indicators should be established for measuring the success or failure of a policy or of a set of programmes or measures.
- **A baseline:** An analysis of the status quo and the energy efficiency trends in the relevant buildings or equipment market is essential, to define an appropriate baseline and to compare the results with the baseline, so as to measure the success or failure of the policy.
- **Selection of an evaluation strategy:** An evaluation strategy should be carefully developed to make monitoring and evaluation activities more effective and control expenditure.
- **Evaluation criteria:** Results can be expressed in terms of energy savings, emissions reductions, or other plausible criteria for measuring impact.
- **Calculation of the cost-effectiveness:** The cost-effectiveness of policies such as through comparative analyses of benefits and costs, both for investors/consumers and the national economy perspective should be calculated.

Evaluation costs vary from policy to policy and from country to country depending on the design, the complexity and national circumstances. Other variables are the evaluation framework and the interactions with other policies and measures. Different studies worldwide calculate evaluation costs from 1% up to 5% of programme budgets (IEA 2010). The 5 % can be found in areas like energy efficiency obligations for energy companies in some states of the USA, where bonus payments to the companies depend on the impact and cost-effectiveness of the programmes. This requires a much more accurate calculation of impact and cost-effectiveness. Lacking such a requirement, 1 % or less of programme or policy budgets are more common, especially for larger programmes.

Ensuring Compliance with Policies and Measures

A missing or incomplete compliance system and sub-optimal monitoring procedures can have a major impact on the overall effectiveness of energy efficiency policies and measures: they hinder the full achievement of policy objectives and prevent the realisation of the full energy-saving potential. Furthermore, a missing or incomplete compliance system may also encourage free-riding, related economic losses and hinder market development (IEA & OECD 2008). Therefore, this topic has gained attention in recent years.

What does compliance mean?

In short, compliance means, "to indicate where an actor that is the subject of a policy (or measure, comment by bigEE) acts in accordance with the specification of that measure" (Ellis et al. 2009). When understood in this way, it is evident that compliance or non-compliance can be a relevant issue even if policies or measures are voluntary or not yet legally binding (Barnsley 2008).

A poor implementation and an inadequate compliance system can reduce a policy's or programme's impact by 20-50%. Indicative levels of non-compliance range from around 25% for appliance programmes to 50% for building regulation (Janssen, 2010).

Besides these negative impacts, there are several **other negative effects of non-compliance** for all market actors:

- **For governments,** non-compliance reduces not only the effectiveness of existing policies and measures. It may also require other policies to meet targets, thereby increasing the policy burden for all. The potential for energy savings and carbon dioxide and other emissions reductions cannot be fully exploited. Policies such as energy efficiency regulations and procurement, if not enforced, may lead to unfair competition.

- **For industry,** a missing or incomplete compliance regime may be seen to penalise the honest market actors. At the same time it encourages actors not acting in accordance with the rules. This can then cause free-rider effects and result in insufficient investments in innovations (Barnsley 2008).

- **For consumers,** a lack of compliance may mean that they pay for a product feature that they do not get. Energy efficiency programmes are based on the confidence of consumers and investors in the quality of information provided. Once that confidence is lost, it is difficult to establish this credibility again (IEA Workshop 2007).

For these reasons it is essential to establish a monitoring and compliance regime to ensure the effectiveness of policies and measures. Where monitoring procedures are in place, policies achieve better results and higher energy savings. For example, Australian governments conducted a national survey to determine the compliance rate with the energy rating label scheme. They tested the compliance rate in 2000 and 2001. The result of the survey was a correct labelling on 70% of products tested in 2000, while the second survey found correct labelling on 78% of the products (www.energyrating.gov.au). Similar results have been found in relation to the ENERGY STAR in the USA (Barnsley 2008).
Evidently the lack of an appropriate compliance and enforcement regime is the major reason for an insufficient result of the policy measure. So far, only very few programmes have a comprehensive, transparent compliance regime in place (Ellis 2009). Summarising: It is essential to establish a well-functioning compliance system.

Establishing a compliance system

To establish an effective compliance system, governments should ensure that energy efficiency policies are monitored, enforced and evaluated. Governments should already plan for adequate compliance when the policy is planned and designed. The first step is the establishment of an institutional framework to ensure that both policy and market actors comply with the energy efficiency requirements. This needs to take into account the respective target groups and their needs and resources. In particular, it is important to pay attention to potential barriers and to avoid making a policy measure too complex or difficult to understand or comply with (Ellis 2009).
A fair and transparent procedure must be guaranteed, including specification of the methods, the frequency and the scope of the monitoring activities. Regular and public reporting of monitoring activities should be integrated in this process. A suite of enforcement measures commensurate with the (potential) scale of non-compliance should be established as well as an adequate and clear system for evaluating the success of the policy during and after its implementation (OECD & IEA 2008). A test standard with understandable, representative and reproducible test methods and a tool or database with declared product or building performances should be established to ensure transparency (OECD & IEA 2008).
CLASP (2005) summarises the main steps to establish testing standards and a compliance regime for the example of appliance energy efficiency. These steps are testing, accreditation, certification and verification. The following figure illustrates these steps involved in setting up a compliance regime for appliances.

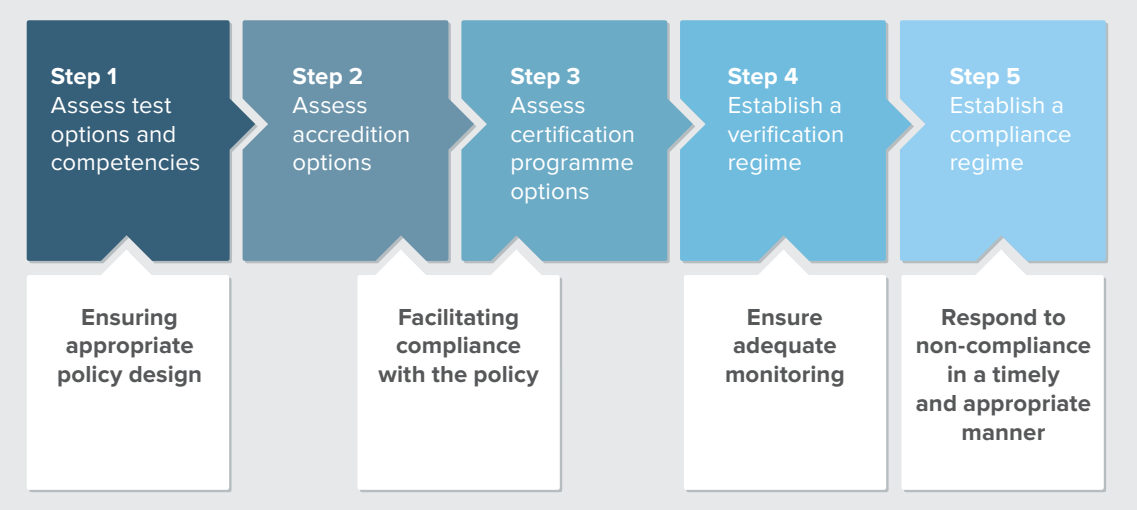

Figure 4: Steps involved in setting up a compliance regime
Source: Wuppertal Institute (2012), adapted from CLASP (2005)

Step 1: A test is defined by the International Standards Organisation (ISO) as a "technical operation that consists of the determination on one or more characteristics of a given product, process or service according to a specified procedure". Testing is performed in test laboratories (NB this is different for buildings, for which whole building energy performance can either be calculated ex ante by standardised simulation programmes or measured ex post in the building by metering and / or energy bills). To be credible, these test laboratories need to be independent third-party bodies.

Step 2: Accreditation confirms that a test laboratory is competent to do the specific and standardised test.

Step 3: Certification is the process of endorsing the validity of declared results. To be credible, agencies involved in accreditation and certification need to be independent third-party bodies too.

Step 4: A verification regime is the process specified by the agency authorising the policies and measures to determine whether the declared energy performance of appliances (or buildings or building components or equipment) available on the market is accurate.

Step 5: Finally, the aim of the compliance regime is to ensure that market actors follow the specific requirements of an energy efficiency programme or policy and that products (or buildings) are labelled with correct information. Testing, accreditation, certification and verification all belong to a comprehensive compliance regime, but completing the regime also requires measures to monitor compliance and address non-compliance. In order to establish a compliance regime, a legal basis should be developed and penalties for non-compliance should be defined. A public agency or another independent organisation should be established to coordinate the different steps (CLASP 2005).

Establishing a compliance regime can be relatively complex and expensive (standardised test methods, trained staff, etc.). Nevertheless, the majority of recent studies emphasises the cost-effectiveness of compliance. As non-compliance can be as high as 20% to 50%, compliance improvement is usually a more cost-effective option than regulating an additional product group (OECD & IEA 2010).

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Recommended further reading: Monitoring and evaluation

Due to the complexity of evaluation methods, we can only present a summary of the most important factors. For detailed information you may follow these links:

California Public Utilities Commission (CPUC) (2001): California Standard Practice Manual (CSPM):
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(here you find benefits and costs)

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Your guide to energy efficiency in buildings.

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bigEE is an international initiative of research institutes for technical and policy advice and public agencies in the field of energy and climate, co-ordinated by the Wuppertal Institute (Germany). Its aim is to develop the international web-based knowledge platform bigee.net for energy efficiency in buildings, building-related technologies, and appliances in the world's main climatic zones.

The bigee.net platform informs users about energy efficiency options and savings potentials, net benefits and how policy can support achieving those savings. Targeted information is paired with recommendations and examples of good practice.

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