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IMPACT ASSESSMENT

Accompanying the document

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on energy efficiency and amending and subsequently repealing Directives 2004/8/EC and 2006/32/EC

{COM(2011) 370 final}
{SEC(2011) 780 final}

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LIST OF ABBREVIATIONS

BAU	Business As Usual scenario
BAT	Best Available Techniques
CHP	Combined Heat and Power (generation)
DSM	Demand Side Management
DSO	Distribution System Operator
EE	Energy Efficiency
EEP	Energy Efficiency Plan 2011
EPBD	Energy Performance of Buildings Directive
ESCO	Energy Service Company
ESD	Energy Services Directive
EU	European Union
ETS	Emissions Trading Scheme
GDP	Gross Domestic Product
GHG	Greenhouse Gas
IA	Impact Assessment
IAB	Impact Assessment Board
IED	Industrial Emissions Directive
JRC	Joint Research Centre of the European Commission
MS	Member States
NEEAP	National Energy Efficiency Action Plan
NRP	National Reform Programme
SME	Small and medium sized enterprise

Disclaimer: This report commits only the Commission services involved in its preparation and does not prejudge the final form of any decision to be taken by the Commission.

1. INTRODUCTION AND POLICY CONTEXT

EU leaders, realizing the important benefits of energy efficiency and savings for the EU's social, economic and environmental agendas, have committed to reach the **objective of 20% primary energy savings in 2020** compared to a baseline[1]. This translates into a saving of 368 million tons of oil equivalent (Mtoe) of primary energy (gross inland consumption minus non-energy uses) by 2020 compared to projected consumption in that year of 1842 Mtoe.

The target is thus expressed in terms of **energy savings** (i.e. an absolute decrease of energy consumption). However, the majority of it can be reached through **energy efficiency** improvements (i.e. using less energy input for an equivalent level of economic activity or service). It is on the realisation of this potential that EU action is focussed. Realizing the 20% energy savings objective would in addition help to realize EU's 2050 vision of a resource efficient and low carbon economy as set out in the Low Carbon Roadmap 2050[2].

The Energy Efficiency Action Plan (EEAP) of 2006[3], endorsed at the Spring 2007 European Council, was an **important first step towards reaching** the 20% objective[4]. The Plan contained 85 policy measures, together forecast to permit about a 14% reduction by 2020. A good deal of work has been done to implement the plan, including via implementation of the Energy Services Directive of 2006 (the ESD) and the Co-generation Directive of 2004 (the CHP[5] Directive)[6]; revision of the Ecodesign Directive, the Energy Performance of Buildings Directive and the Energy Labelling Directive (adopted in 2009-2010)[7]; and the development of the Energy Efficiency Plan 2011 (adopted in 2011).

The **Energy Efficiency Plan (EEP)** includes measures that **need to be implemented through new legislative proposals**. These include the setting of clear political objectives; development of the energy services market; increasing the role of the public sector; improving consumers' awareness of their energy consumption; and increased efficiency in energy supply.

The measures needed to implement these policy initiatives are closely related to the scope of two existing legal instruments: the ESD and the CHP Directive. The two Directives already contain provisions that address the above mentioned issues: but their mid-term evaluation shows that in their current form these will not be sufficient to reach the policy objective of 20% savings. That is why their revision is required. The purpose of this impact assessment (IA) is to provide analytical input for the preparation of the Directives' revision.

The Energy Efficiency Plan also identifies policy initiatives that will be realized through other instruments including financial instruments, and implementation measures under the existing Ecodesign, Energy labelling and Energy performance of buildings Directives.

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1 7224/1/07, REV 1, the baseline is PRIMES 2007
2 COM(2011) 112 final
3 COM(2006)545
4 SEC (2006) 1174
5 The terms co-generation and CHP (combined heat and power) are used interchangeably in this IA.
6 Directive 2006/32/EC and Directive 2004/8/EC, respectively
7 Directives 20009/125/EC, 2010/30/EU and 2010/31/EU respectively

1. PROCEDURAL ISSUES AND CONSULTATION OF INTERESTED PARTIES

1.1. Organization and timing

This impact assessment has been drafted by DG ENER with the support of an Interservice Steering Group[8]. The policy instrument that is the subject of this IA is strategic priority item 16 of the Commission Work Programme for 2011.

1.2. Stakeholder consultation

Broad ranging **stakeholder** consultation provided valuable input to the formation of the policy approach and development of concrete proposals for the new policy instrument(s). The process began with an online public consultation (8 June - 3 August 2009) for the revision of the 2006 Energy Efficiency Action Plan which contained questions on the policy measures discussed in this IA (Annex I). It received 207 replies. A majority of stakeholders were supportive of further binding measures and targets on energy efficiency. Additional information, especially on the readiness of people and companies to apply energy efficiency measures, was then extracted from the Commission's stakeholder consultation (27 October - 8 December 2010) in preparation of the Low Carbon Economy Roadmap 2050[9] to which almost 300 responses were submitted. A broad consultation exercise on the role of national energy efficiency action plans and on the role of energy companies was also launched in January 2011 by the working groups of the Bucharest forum on sustainable energy (which include Member State representatives and stakeholders)[10].

In parallel, **targeted meetings** with stakeholders were organised to discuss in detail what further measures on energy efficiency could be introduced at EU level and what their design should be. These included targeted meetings on financing, buildings and utilities (June 2009); on financing (December 2010); on energy saving companies (ESCOs) (January 2011); and with industries in the energy efficiency sector (February 2011). Finally, the EEP and the follow-up legal measures were discussed with more than 200 stakeholders at a dedicated conference at the EU Sustainable Energy Week on 13 April 2011 (See Annex II).

Member States' (MS) views were sought and obtained notably through discussion in the Council's Energy Working Group both before the adoption of the EEP and in the development of Council conclusions on the Plan. Detailed information on progress in implementation of the ESD by MS was gained through the ESD Concerted Action project (closed-door project for ESD implementing authorities) and on both Directives through questionnaires sent in November 2010 to the relevant Committees.

A detailed account of stakeholders' views is provided in Annex I. A short summary of the responses is included in Chapter 5 along with the discussion of the effectiveness, efficiency and coherence, and respect of subsidiarity of the options analysed.

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8 Composed of SG, LS, ECFIN, ENTR, CLIMA, INFSO, OIB, REGIO, TAXUD, ENV, MOVE, BUDG, EMPL, MARKT

9 SEC(2011) 287 final

10 The draft report on NEEAPs is available at http://ec.europa.eu/energy/efficiency/bucharest/bucharest_forum_telephone_interviews.pdf . It contains important insights on the importance of NEEAPs for MS and also on the scope and content of the second NEEAPs to be submitted by 30 June 2011.

1.3. Main analytical sources

This IA is based on a very broad range of studies and evaluations, e.g.:

- the IA for the EEP[11] (which included a review of more than 300 data sources)
- mid-term evaluations of the ESD and CHP Directives (Annexes III and IV) and external studies of various policy options (Annexes XII and XIII);
- three models (PRIMES market equilibrium model for energy supply and demand; Energy-Environment-Economy Model for Europe (E3ME); and Built Environment Analysis Model (BEAM));
- studies of the Commission's Joint Research Centre on energy savings obligations, metering and billing, energy efficiency in public procurement, and voluntary agreements[12], and examples of best practice from Intelligent Energy-Europe supported projects[13];
- the National Energy Efficiency Action Plans submitted in the framework of the ESD in 2007 and 2008, and national reports under the CHP Directive. Evaluations of these reports were prepared by the Commission[14];
- Member States' National Reform Programmes, reported to the Commission as part of the Europe 2020 Strategy process.[15]

1.4. Opinion of the IA Board

The IA was discussed at a meeting of the IA Board (IAB) on the 13th of April 2011. The IAB , in its first opinion, asked for a revision of the document along three main lines. Based on this the following modifications were made: (i) the analysis of the problem was strengthened (in Chapters 2 and 3); (ii) the intervention logic was presented better and the design of options was explained in more detail (in Chapter 4); and (iii) the assessment of impact was strengthened by adding more data from the modelling results for each option, where available, and for the overall package (including data on sectoral and geographical split) (in Chapters 5 and 6). The discussion of the administrative costs, based on existing experience in the Member States, has been strengthened for all relevant options.

Based on these improvements the IAB issued a second opinion on the 6th of May 2011 in which the improvements made to the text were acknowledged. A number of further clarifications were required. To this end the following issues were modified: (i) the way in which current policies were taken into the baseline was clarified (in Section 2.1); (ii) more information was added on the barriers to higher CHP market penetration (in Section 2.2), on the expected contribution of the 9% ESD target and the relationship between of the 20% energy efficiency target and the other energy and climate targets (in Sections 2.3 and 5.3.1); (iii) an explanation of why effective enforcement of the current provisions is not possible was added (in Section 2.3); (iv) additional data on impacts of the options related to energy audits

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11 SEC(2011) 277

12 The four studies are published online at: http://ec.europa.eu/energy/efficiency/end-use_en.htm

13 http://ec.europa.eu/intelligentenergy

14 SEC(2009)889, JRC, Synthesis report, 2009, and SEC(2011)276.

15 COM(2011) 11 - A1/2, http://ec.europa.eu/europe2020/tools/monitoring/annual_growth_survey_2011/

and for the overall package were added (in Section 4.3.2. and Chapter 6); (v) the interaction between existing requirements and the new measures were better explained (in Sections 4.2.1 and 6.3); (vi) stakeholders' views were reflected throughout the discussion of the policy options (in Chapter 5). The executive summary was aligned with the main IA report.

The EU standard cost model could not be used to quantify administrative costs due to the high input data intensity it requires. Therefore, as explained above, the analysis is based on data from the existing experience. Further splitting of the benefits and costs for the overall package was not possible due to constraints of the modelling tools used.

2. PROBLEM DEFINITION

2.1. What is the problem?

The main problem identified in the EEP IA is that the EU's 20% policy objective for energy savings will not be met with present policies - and thus that the related environmental, social, security of supply and economic benefits will not be realised. That IA showed that this is not because of the lack of economic potential[16] but because of market and regulatory failures[17].

Table 1 below shows that the 20% target will not be reached in 2020 and the economic potential will not be fully used. Progress can be assessed through a comparison of the original projections made in 2007 (i.e. PRIMES 2007) and the most recent ones (i.e. PRIMES 2009 energy efficiency (EE) scenario). The PRIMES 2009 EE scenario includes EU and national policies and measures that had been adopted up to the end of 2009, including the implementation of the ESD and CHP Directives, plus the recast of the EPBD and the Ecodesign and Energy labelling measures that were adopted in 2010. The model does not allow the individual impact of each policy measure to be distinguished but establishes their overall impact on the demand and supply sectors (as presented in the table below). The impact of the economic crises is also included in the scenario. This forecast was the basis of the assessment used in the Energy Efficiency Plan.

[16] The Fraunhofer ISI *et al.* 2009 study uses the term "economic potential" to refer to measures that can be achieved with the application of the best available technologies that are economic for the consumer under today's usual market conditions reflecting consumer preferences and barriers – displayed by a discount rate of 8-15% or higher.

[17] Ibid 11

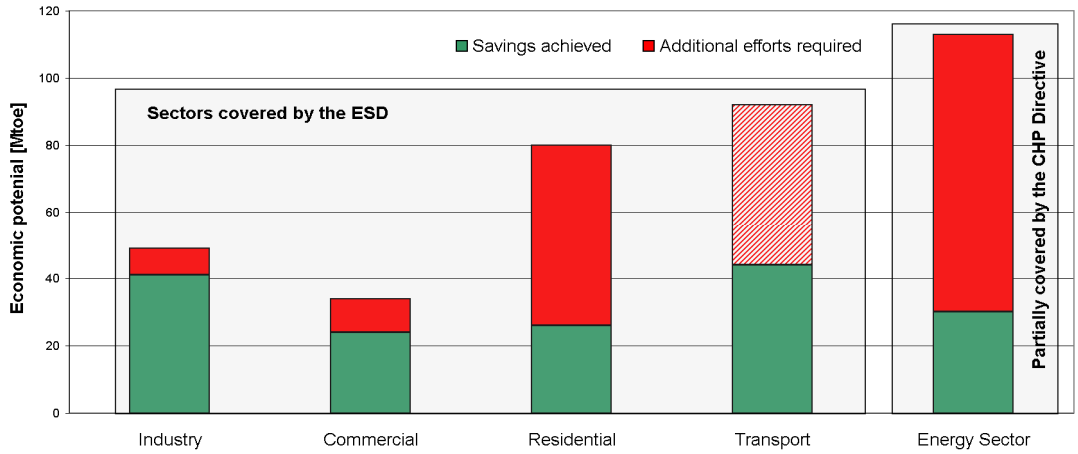
Table 1. Projected developments and energy savings potential in 2020

	2020 (PRIMES 2007) [Mtoe]	2020 (PRIMES 2009 EE) [Mtoe]	Expected progress in 2020 without further action [%]	2020 Economic potential [%]	2020 Technical potential [%]
	1	2	3 [=(2-1)/1*100]	4	5
Gross inland consumption minus final non-energy use	1842	1678	**-9%**	**-20% (EU target)**	n.a.
Final Energy Consumption, of which:	*1348*	*1214*	*-10%*	*-19%*	*-25%*
Industry	368	327	**-11%**	**-13%**	-16%
Transport	439	395	**-10%**	**-21%**	-28%
Residential	336	310	**-8%**	**-24%**	-32%
Tertiary	205	181	**-12%**	**-17%**	-25%
Energy transformation, transmission and distribution	494	464	**-6%**	**-35%***	n.a.

Sources: PRIMES for columns 1,2 and 3 and Fraunhofer Institute for columns 4 and 5.
*The data on the economic potential in the energy transformation sector are based on DG ENER calculations.

Therefore, the main problem that will be studied in this IA is how to close the gap towards the 20% objective by using the economic potential. Figure 1 below illustrates the remaining efforts that need to be realized for each of the final and supply side sectors to this end. The ESD already contains measures that address all final use sectors (excluding defence) and the CHP Directive partially covers energy generation (as presented in the figure below). It has been concluded that a revision of these Directives would be the most obvious mechanism to tackle the remaining potential in these sectors, subject to a detailed analysis.

Figure 1: Expected improvements in 2020 and need for additional effort per sector[18]



A new legislative instrument aimed at creating the right market conditions and legal environment so that **the 20% objective is fully realized in 2020 is therefore analysed**. To achieve the 20% saving, all end-use (residential, commercial and industry) and energy generation sectors will be covered with the exception of transport which is subject to a number of individual measures stemming from the White Paper on Transport[19]. As the ESD already contains measures that address all final use sectors (excluding defence) and the CHP Directive partially covers energy generation, the possibility of amending one or both of these is studied.

18 Sources: PRIMES 2007, 2009 and Fraunhofer ISI *et al.* 2009
19 SEC(2011) 358

The energy sector is also covered to a certain degree by the ETS and the new IED. This will be taken into account when measures for the relevant sectors are analyzed and proposed.

2.2. What are the drivers for the problem?

The ESD and CHP Directives already address important barriers in these sectors, including:

- Insufficient political commitment, policy coordination and long-term political planning to reduce investment insecurity[20].
- Insufficient incentives for consumers to realize energy efficiency improvements and to tackle high upfront costs and the split incentives problem[21].
- Insufficiently developed markets for energy efficiency improvements[22].
- Low awareness of energy saving opportunities: poor knowledge of the benefits and costs makes people reluctant to make energy efficiency investments even though they are cost-effective[23].
- Insufficient price incentives for uptake of energy efficiency measures among energy suppliers[24].
- High transaction costs because of lengthy administrative procedures (e.g. for cogeneration) or a high number of separate units (e.g. energy efficiency improvements in households)[25].
- In particular for co-generation: this is more expensive than single generation (even though economically plausible) and is a complex technology which produces simultaneously electricity and heat (and sometimes cooling) and thus requires its operators to sell the output to two (or three) different and complex markets. This increases transaction costs and investment risk.
- Cultural barriers: mistrust of new technologies and lack of willingness to adopt energy savings measures (especially households), historic low penetration of district heating because of the prevalence of individual heating solutions.

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20 Jollands N. and Ellis M. 2009. Energy efficiency governance – an emerging priority. ECEEE 2009

21 For example, IEA. 2007. Mind the gap. Quantifying Principal-Agent problems in energy efficiency; Allcott, H. and Mullainathan. 2010. S. Behavior and energy policy. 1204-1205. Science, 327; Duerinck J. Electricity and fuel consumption in Europe: a panel error correction model for residential demand elasticities; and Boardman B. 2007. Home truths. University of Oxford

22 Marino A., Bertoldi P. and Rezessy S. Energy Service Companies Market in Europe. Status Report. JRC 2010

23 For example, see WBCSD. 2007. Energy efficiency in buildings, business realities and opportunities. Cited at: http://www.wbcsd.org/DocRoot/qUjY7w54vY1KncL32OVQ/EEB-Facts-and-trends.pdf; ECME Consortium 2009. The functioning of electricity retail markets for consumers in the European Union. Final Report; and See for e.g. a survey undertaken by chambers of commerce of 12 Member States in the framework of the IEE project CHANGE, Energy Efficiency in SMEs: Success Factors and Obstacles. 2009. Cited at: www.eurochambres.eu/change

24 Lovings A. 1997. Climate: Making Sense and Making Money

25 Survey results, Commission Progress Report on Implementing the Cogeneration Directive

2.3. Will existing policies do enough to address the problem?

Achievements and shortcomings of the ESD and CHP Directives

The ESD and CHP Directives were the first steps to tackle the barriers and from this perspective were milestones in energy efficiency policy development. They encouraged the introduction of a number of concrete policies at national level. However, their frequently 'soft' and open wording has not been sufficient to overcome the main barriers to energy efficiency.

The **mid-term evaluation[26] of the ESD shows that it has not succeeded in tapping the full energy saving potential of the sectors it covers.** Even if Member States continue their efforts on energy savings beyond the ESD's target year of 2016, primary energy savings from the implementation of the Directive will reach only 50-95 Mtoe in 2020, leaving a significant gap towards the 20% saving target (which requires savings of 368 Mtoe).

The analysis showed that Member States will achieve their 9% target in 2016 but that this does not guarantee the realization of the 20% target in 2020. This is because the present ESD target is based on proving 9% end use energy savings in 9 years against the average of a five year base period. These savings are relative and do not necessarily translate into consumption reduction. Therefore, there is no guarantee that the overall energy savings which would be needed to contribute to the 20% energy efficiency target for 2020 are realized. Furthermore, savings as early as 1991 can be counted and the realm of the ESD varies from one Member State to another[27]. For example, a government may be able to show that its policy in the sectors covered achieved proven savings of 9% whilst at the same time energy consumption is only stabilised or even growing due to high economic growth.

The Directive's main measures and the results of their evaluation are summarised below.

Measure and barrier that it addresses	Summary of the mid-term evaluation
Indicative 9% target (Art. 4): Each MS should demonstrate 9% improvement by 2016 in the quantity of "end use energy"[28] consumed, relative to the five year period preceding the implementation of the Directive Addresses barrier (1) (section 2.1.)	**Most MS are on track to achieve the 9% target, so that it can be expected that the target by 2016 will be met by all Member States[29]**. Assessment of progress uses a complex combination of bottom up and top down calculation methodologies which implies considerable administrative costs for MS. T**he 9% target is considerably less ambitious than the 20% overall objective.** No direct relation between the ESD target and the overall objective can be established.
National energy efficiency plans (NEEAP, Art. 14): measures to reach the 9% target have to be presented in NEEAPs which have to be updated every three years Addresses barrier (1) (section 2.1.)	NEEAPs **proved to be useful tools but the measurement of savings (mentioned above) is complicated**. For many MS the NEEAPs of 2007-2008 were the first time they made a comprehensive overview of EE possibilities and policies. This also helped MS build their institutional capacity[30]. However, the limited focus of the NEEAPs has sometimes led MS to over-focus on certain end-use sectors and overlook other energy saving potentials.

26 See Annex III

27 The realm of the ESD includes end use savings, defined as savings excluding ETS installations ("undertakings") and where deemed necessary military end uses. As Member States define both provisions differently, the basis for the saving calculations is not fully harmonised.

28 Defined as final energy consumption minus the consumption of the installations covered by ETS minus optional deduction of final energy use for military purposes

29 Responses from Member States to the questionnaires on horizontal ESD issues, November 2010

30 Maclagan L, Bruel R, Draft report on Bucharest Forum telephone interviews, March 2011

Measure and barrier that it addresses	Summary of the mid-term evaluation
Exemplary role of the public sector (Art. 5): MS have to select at least two from a list of measures to promote this role. Addresses barriers (1,3,4) (section 2.1.)	**Most MS have taken appropriate measures but the level of ambition varies between MS**. Where MS have set ambitious objectives, it seems that it is not the ESD that has driven this[31]. The provision has been superseded by later EU legislation requiring energy efficiency to be taken into account in the public procurement of vehicles and of office equipment[32]. This has created fragmented requirements.
Role of energy companies (Art. 6): MS have to ensure that energy companies[33] promote EE through provision of energy services, audits, contributing to funds, voluntary agreements or other market-orientated schemes. Addresses barriers (3,4) (section 2.1.)	**The impact has been moderate**. The level of ambition in implementation has been uneven, due to the vagueness of the provision's wording. In no case has implementation led to the energy services market becoming well developed in a Member State where this was not previously the case.
Information provision (Art. 7, 8, 12): MS have to disseminate information on financial and legal frameworks, to ensure the availability of energy audits and the availability of qualification, accreditation or certification schemes for providers of energy services and audits. Address barrier (4) (section 2.1.)	**Progress has been limited.** In most cases MS used non-legislative measures (e.g. awareness raising campaigns) to provide information especially to the general public, schools and industries. SMEs have been less frequently targeted. However, generally, the awareness of consumers on how energy use can be rationalised remains low[34]. There has been only limited progress as regards certification, mainly regarding energy performance of buildings. The availability of audits has improved only in some MS and mainly in relation to energy intensive industries.
Removal of barriers (Art. 9, 10): MS have to remove national regulations that impede energy savings and tariffs that create incentives for energy consumption; MS have to make available model EE contracts for financial instruments. Address barriers (2,6) (section 2.1.)	**Progress has been limited and uneven.** Legal, accounting and budgetary obstacles remain in many MS. For example, the accounting practices of some public authorities prevent them retaining in their budgets savings from reduced energy consumption. The effect of the provision on model contracts is also difficult to assess. By 2010 they were not yet available in half the MS.
Funds and funding mechanisms (Art. 11): MS are invited to establish these to subsidise energy efficiency improvements or promote energy services. Addresses barriers (2, 6) (section 2.1.)	**No direct link was established between developments at MS level regarding the funding of energy efficiency and the introduction of the ESD.** Most Member States applied funding schemes for energy efficiency before the ESD came into force. From 2007 onwards many new schemes were introduced (40% of all current schemes).
Metering and billing (Art. 13): MS have to ensure understandable and accurate information is provided for consumers via individual meters and energy bills on a frequent basis. Addresses barriers (2,4) (section 2.1.)	**Because of the vague wording the provisions did not lead to improvements** and the Commission received numerous complaints from citizens. For example, billing based on actual consumption is considered as "frequent enough" when provided monthly (e.g. Sweden) or every three years (e.g. Austria).

The efficiency and effectiveness of the **CHP Directive has also proved to be limited as revealed in the Directive's progress report[35]**. The share of electricity from high-efficiency CHP increased only from 10.5% in 2004 to 11.0% in 2008. This shows that the lack of concrete obligations regarding the real uptake of the CHP in the Directive and its soft wording have failed to create the investment security needed, to decrease the burden of the numerous

31 Background study "Horizontal Issues concerning energy efficiency", 2011 (Annex XII)

32 Directive 2009/33/EC and Regulation (EC) No 106/2008

33 Energy distributors, distribution system operators and retail energy sales companies.

34 E.g. less than half of EU consumers (47%) know how much electricity they consume - The functioning of the retail electricity markets for consumers in the European Union, SEC(2010) 1409 final

35 See Annex IV

administrative procedures and to create a playing level field for this technology and its operators.

The Directive's main measures and the results of their evaluation are summarised below.

Measure and barrier that it addresses	Summary of the mid-term evaluation
National potential (Art. 6): MS are obliged to evaluate their national potential for the application of high-efficiency cogeneration. Addresses barriers (1, 4) (section 2.1.)	**All MS have made an analysis.** But as the Directive does not define how this analysis of potential should be carried out, each national analysis **has different depth, length and quality**. The information given is not conducive for comparison and does not give the detail needed for a comprehensive evaluation of national potentials. There is no obligation on MS to realise this potential.
Guarantees of origin and support schemes (Art. 5 and 7): MS are required to create a system of guarantees of origin for CHP electricity and base support schemes on useful heat[36]. Addresses barriers (3, 5) (section 2.1.)	All Member States have established a system of guarantees of origin. However, **in close to half the system is still not fully operational.** Member States have established various types of support schemes (see Annex XIII) but there is no evidence that this has been driven by the Directive.
Connection rules (Art. 8): lays down rules to guarantee the connection and access of electricity from cogeneration to the grid. Addresses barriers (5, 6) (section 2.1.)	The wording of Art. 8 **does not provide** regulatory certainty and stability for access to the electricity and heat markets, nor does it guarantee sufficient political commitment by Member States. The requirement has **led to introduction of rules that vary across MS**. These were not sufficient to address the challenges; network connection and access still often constitute a barrier to the expansion of cogeneration.
Evaluation of administrative burden (Art. 9): MS are required to evaluate the case for addressing a range of administrative barriers Addresses barrier (6) (section 2.1.)	The evaluation of administrative procedures has been completed by all Member States. However there is **no evidence of any systematic implementation of the results of this evaluation.**

Experience has shown that better enforcement action is not possible from the Commission side because of the open wording of many of the two Directives' provisions and the lack of clarity concerning the minimum requirements that MS have to meet in order to implement them. This resulted in the fact that even though there were a number of observations and also complaints from citizens and companies for the Directives' poor implementation, the Commission was in most cases not able to launch infringement procedures.

Preliminary information on the forthcoming National Energy Efficiency Action Plans, which are due to be submitted in June 2011, shows that it is unlikely that their level of ambition will be significantly improved so that they make an important contribution towards the 20% target in 2020. These observations come from discussions with Member States and also from a study[37] carried out as a preparation for this IA. The main deficiencies that could be expected are in the Plans' coverage (potential and measures on the supply side will probably not be included) and the scope of the activities on end-use consumption (some further measures are expected but no major step up of effort).

Based on the evaluation of the ESD and CHP Directives, it can be concluded that they will not, in their present form, lead to the implementation of actions sufficient to tackle the problems described in section 2.2 and the new challenges described above.

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36 'Useful heat' is defined as the thermal energy needed to satisfy an economically justifiable demand for heat and cooling.

37 http://ec.europa.eu/energy/efficiency/bucharest/bucharest_forum_telephone_interviews.pdf

Other relevant policies and new challenges

In addition, since the adoption of the two Directives the following new challenges have emerged:

- **A new target for 20% energy efficiency was endorsed by the European Council in 2007:** this made the level of ambition of the ESD inadequate. In addition, the political climate has changed significantly since the two Directives were proposed (ESD: proposed Dec 2003, CHP: proposed July 2002) and adopted (in 2006 and 2004 respectively) and the EU Member States and the European Parliament have called upon the Commission to propose more and binding measures on energy efficiency.

- **The Renewable Energy Directive (Directive 2009/28/EC) was adopted in 2009**: it set a higher priority for technologies using renewable energy relative to CHP. This increases the risk perception for CHP and has further hampered the market uptake of this technology.

- **The third internal energy market package was published in 2009**: it sets obligations for the introduction of smart meters but does not spell out measures that will ensure that these meters are used for the benefit of final consumers and not only of energy utilities.

Relationship between the indicative energy efficiency target and the binding energy and climate targets

The relationship of the EU's energy efficiency policy objectives, in particular the 20% energy efficiency target for 2020, with the two binding targets on renewable energy and greenhouse gas emissions was assessed through a separate run of PRIMES, i.e. the "Reference scenario". This scenario assumes that these two binding targets are met. The result of the modelling shows that this alone would not have a significant effect on progress towards the achievement of the 20% savings objective (only increasing savings by an additional 0.8 percentage points or 14 Mtoe compared to baseline with efficiency policies). This is because there is a range of possible measures for the realization of GHG emissions reduction, in addition to energy efficiency. These, for example, include increased use of renewable energy, particularly favoured by the renewables target, fuel switching, reduction of non-CO_2 emissions and international offsets (CDM/JI). Thus, the objectives of energy efficiency policy would not be met by the achievement of the two other targets and additional measures to fully reap energy efficiency's benefits are required.

2.4. The Union's right to act, subsidiarity and proportionality

The EU's competence in the area of energy, and of energy efficiency in particular, is enshrined in the Treaty on the Functioning of the European Union, Article 194(1). The EU's role needs to respect the principles of subsidiarity and proportionality. Member States are essential for the realization of energy efficiency policy and EU intervention should be well targeted and supportive to their actions. The EU's role is in:

– Establishing a common framework which creates the basis for coherent and mutually reinforcing mechanisms while leaving in being the responsibility of Member States to set, in a transparent and comparable way, the concrete means and modalities to achieve the agreed objectives.

– Creating a platform for exchanging best practice and stimulating capacity building.

– Setting minimum requirements in areas where there is a risk of internal market distortions if Member States take individual measures.

– Using EU instruments to promote energy efficiency, e.g. through financing, and to mainstream it in other policy areas.

The appraisal section includes a measure-by-measure check of respect for the principle of subsidiarity and proportionality.

3. OBJECTIVES

3.1. General and specific policy objectives

Because progress towards the target of 20% is not satisfactory, the **main objective of this IA is to contribute to the closing of the gap by exploring measures in all sectors with potential for cost-effective savings.** To realize this general objective the following specific objectives need to be achieved:

- Stimulate higher political commitment to energy efficiency
- Trigger measures to reap the remaining cost-effective potential on the energy demand side, particularly in buildings and industry
- Support a functioning commercial market for delivering energy efficiency improvements
- Provide equal playing field rules for energy efficiency market actors
- Decrease the administrative burden and simplify the legislative framework
- Ensure that consumers are empowered with correct, understandable and regular information on their energy use
- Trigger measures on the energy supply side so that energy is transformed, transmitted and distributed in the most cost-effective way
- Support the establishment of 'smart grids' that encourage energy efficiency improvements.

3.2. Consistency of the objectives with other EU policies

The above general and specific policy objectives are in line with other EU policies. They:

- Enable the reduction of greenhouse gas (GHG) emissions up to 2020 and thus contribute in a cost-effective way to reaching the EU's climate objectives.
- Make possible further commitments on greenhouse gas emission reduction after 2020.
- Promote economic recovery and enhance the competitiveness of EU industries in line with the Europe 2020 Strategy, contributing to the Resource efficiency flagship initiative and the sustainability layer of Europe 2020.

- Increase security of energy supply as called for in the Energy 2020 Strategy: less energy used in Europe means less reliance on imports and a lower energy import bill.

- Create jobs and reduce energy poverty in support of the EU's social agenda.

- Reduce environmental and land-use impacts resulting from the extraction and treatment of energy resources and waste and from energy transmission and distribution.

The coherence of each individual policy option is assessed in Chapter 5.

4. POLICY OPTIONS

4.1. Overview of policy options

The first level of policy option relates to whether there should be legally binding energy efficiency targets on Member States. A second level of analysis relates to the nature and impact of legal measures - most of the options are based on the current instruments of the two Directives as it has been evaluated that the problems lie not with the instruments themselves but with their inconclusive wording. New policy measures that are added to the analysis are the energy savings obligation, and tools to enhance generation efficiency and grid efficiency. Finally the alternatives legislative approaches are reviewed.

Table 2. Overview of policy options

First-level policy options
A: National targets/objectives
Option A1: Retain the current approach
Option A2: Extend the indicative end use target of ESD to 2020
Option A3: Comprehensive indicative target for each Member State for 2020
Option A4: Binding target for each Member State for 2020
Second-level policy options
B: Energy Savings Obligation
Option B1: Retain the current approach (limited encouragement in the ESD)
Option B2: Repeal the current ESD provisions without replacement
Option B3: Require all Member States to introduce energy saving obligations while leaving their design for determination by Member States
Option B4: As B3 but with harmonisation of key design features
C: Further measures to realise potential at the end-use stage
Option C1: Retain the current approach
Option C2: Energy saving measures for renovation of public buildings
Option C2a: Introduce 3% binding target for renovation of public buildings to cost-optimal levels
Option C2b: Introduce 3% binding target for renovation of public buildings to nearly zero energy levels
Option C2c: Establish a national financing and technical assistance infrastructure for renovation of public buildings.
Option C3: Obligatory use of energy efficiency as a criterion in public procurement
Option C4: Voluntary measures to promote energy efficiency via public procurement
Option C5: Enhanced obligations for smart metering and billing by energy companies

Option C6: Voluntary measures on metering and billing
Option C7: Mandatory energy audits and energy management systems for industry
Option C8: Voluntary systems to promote energy audits and the use of energy management systems in industry
Option C9: Obligations for Member States to promote ESCOs
Option C10: Voluntary measures to promote ESCOs
D**: Measures to realise potential at the stage of energy transformation and distribution**
Option D1: Retain the current approach
Option D2: Removal of existing provisions
Option D3: Mandatory CHP and district heating/cooling requirement for new electricity and high-heat-demand industry installations
Option D4: Mandatory connection and priority access of high-efficiency cogeneration to the electricity grid
Option D5: Voluntary measures to promote CHP and district heating/cooling
Option D6: Minimum performance requirements for energy generation
Option D7: Energy efficiency obligation on energy network regulators
Option D8: Voluntary measures to increase the efficiency of energy transformation, transmission and distribution
E: National reporting
Option E1: Retain the current approach
Option E2: Require light form of reports
Option E3: Require detailed calculation of savings and evaluation of measures across the whole economy
Option E4: Reporting only in National Reform Programmes
Option E5: Combine reporting with other relevant instruments
Third-level policy options
Option 1: Retain the two current Directives (ESD and CHP) as they stand today
Option 2: Abolish the two current Directives without replacement
Option 3: Propose two separate revised Directives and extend their scope
Option 4: Merge the two Directives and extend the scope
Option 5: Use Regulation legal instrument instead of Directive

The options are described in more detail below.

4.2. First-level policy options

4.2.1. National targets and objectives

The targets set in the ESD are not comprehensive – they cover only a part of energy consumption - and are indicative. This approach can be contrasted with that adopted by the EU for renewable energy (where the Renewable Energy Directive[38] sets binding national targets for 2020) and for greenhouse gas emissions (where the EU Emissions Trading Scheme (ETS) creates binding targets for 2020 at firm level for the sectors it covers, and the effort-sharing decision[39] does the same at national level for those it does not). Both systems of

[38] Directive 2009/28/EC

[39] Decision 406/2009/EC

targets are comprehensive. In a step in that direction, the European Council has invited Member States to set indicative national energy efficiency targets for 2020 as part of a new system of National Reform Programmes (NRPs). The method for calculating savings was not specified; the European Council has subsequently asked the Commission to develop one. In this context, the following options are assessed:

Name	What EU obligation?	Flexibility for MS
A1: Retain the current approach	Indicative 9% target for end use savings in 2016, embodied in legislation (energy services Directive); overall indicative target in the framework of the Europe 2020 process (invitation from European Council to set targets for 2020, no common methodology, no set level of ambition).	The method of setting the target in the framework of the energy services Directive is fully harmonised. However, Member States are largely free to choose the measures to comply with the saving target. The request to set a target for overall national energy efficiency in the Europe 2020 process is political. Member States can choose not to set any targets here. The target formulation and the level of ambition for 2020 is fully in the hands of Member States. They can adopt targets that fit their national policies or even decide to set no targets at all.
A2: Extend the indicative end use target of ESD to 2020	In addition to the 9% ESD target for 2016 (see A1), additional target for end use savings in 2020. In addition, maintain the overall indicative target in the Europe 2020 framework.	See A1.
A3: Comprehensive indicative target for each Member State for 2020	Maintain ESD target for 2016 (see A1). Set a legislative requirement for Member States to adopt an overall indicative target for 2020.	See A1 for the ESD target. The 2020 target would still be indicative as in A1. In contrast to A1, all Member States would be legally required to set energy efficiency targets. In addition, they would lose the flexibility to determine how to formulate the target. However, they would retain full flexibility on the level of ambition they choose.
A4: Binding target for each Member State for 2020	As A1 plus binding targets for primary energy consumption in 2020. As for the renewable energy and GHG targets, the targets announced in the Europe 2020 process would be those embodied in legislation.	See A1 for the ESD target. For the 2020 target, Member States have no flexibility in terms of target formulation or level of ambition.

Options not retained for assessment

The option of repealing the current ESD target provisions without replacement was not retained because the purpose of targets in energy policy is to establish a confident climate for investment. A Commission proposal to repeal a provision concerning national targets that the EU had previously, on a Commission proposal, adopted would bring the credibility of targets in the energy sector into question. The option of setting binding targets for end-use efficiency rather than comprehensive targets was not retained because the EU's overall target (established after the ESD's adoption) is expressed in terms of primary energy savings. There would seem no reason to express binding targets – if they are to be set – in any other way.

4.3. Second-level policy options

4.3.1. Energy Savings Obligation

Denmark, France, Italy, the UK and the region of Flanders have introduced energy savings obligations, under which energy suppliers or distributors are required to achieve a given quantity of savings among energy end-users. These obligations vary widely in design features[40]. The ESD contains limited provisions to encourage the use of this tool.

The following options are assessed:

Name	What EU obligation?	Flexibility for MS
B1: Retain the current approach	Obligation to choose from various options to promote energy services given in Article 6 of the ESD.	Large flexibility concerning which provisions to adopt.
B2: Repeal the current ESD provisions without replacement	None	Member States would have full flexibility on how to develop the market for energy services.
B3: Require all MS to introduce energy saving obligations while leaving their design for determination by MS	Oblige energy suppliers/distributors to achieve energy savings among consumers.	Large flexibility as to the design of the scheme (level of ambition, sectors targeted, focus of savings achieved)
B4: As B3 but with harmonisation of key design features	Oblige energy suppliers/distributors to achieve a specified amount of energy savings and use harmonised procedures to prove these savings.	Still significant flexibility as to design of the scheme, however constrained by given level of ambition and accounting rules.

Options not retained for assessment

The option of harmonisation of all design features and introduction of a European system of tradable white certificates is discussed in Annex VII, where it is concluded that setting obligations at national level is preferable.

4.3.2. Further measures to realise potential at the end-use stage

The starting point for these options is:

Name	What EU obligation?	Flexibility for MS
C1: Retain the current approach	Vague obligations on the public sector (but strong for office equipment, i.e. Energy Star) and on metering and billing, energy audits and ESCO from ESD.	Large room for flexibility in implementation (except Energy Star).

This would mean retaining the provisions of the current ESD. For the **public sector**, **industry** and **ESCOs** these are largely non-normative. For **metering and billing** they are normative but have proved difficult to interpret. (For more detail see section 2.2).

Starting from this baseline, three options on increased **public sector** contribution are assessed:

[40] JRC. 2010. Energy Saving obligations and tradable white certificates. Cited at: http://ec.europa.eu/energy/efficiency/studies/efficiency_en.htm

C2: Energy saving measures for renovation of public buildings	EU level obligation on MS to achieve increase of the annual renovation rate to 3% for publicly owned and occupied buildings (excluding social housing). Three possibilities are considered: Option C2b: Introduce 3% binding target for renovation of public buildings to cost-optimal levels; Option C2b: Introduce 3% binding target for renovation of public buildings to nearly zero energy levels; Option C2c: Establishing a national financing and technical assistance infrastructure for renovation of public buildings.	For Options C2a and C2b MS have to ensure that the target is reached and properly monitored. MS have full flexibility on the way they reach it. Option C2c includes an obligation on MS to ensure sufficient financing and technical assistance for the renovation rate of relevant public buildings to be increased.
C3: Obligatory use of EE as a criterion in public procurement	EU level obligation that existing energy labels (the Energy Label or Energy Performance Certificate) and performance requirements (Energy Star) are used as a criteria in public spending for the purchase of energy using products and buildings, and for services as far as the service providers use products or buildings. MS would be obliged to eliminate constraints in legal, accounting and budgeting rules.	MS have to implement the requirements. They may set further measures (including on green public procurement)
C4: Voluntary measures to promote EE via public procurement	EU level encouragement to MS	MS can provide, if they consider it necessary, information and support to procuring authorities and take other steps to eliminate barriers to energy efficiency in procurement.

In order to improve consumers' ability to manage their energy consumption, two options to improve **metering and billing** are assessed:

C5: Enhanced obligations for smart metering and billing by energy companies	EU level harmonised common requirements on the provision of feedback to consumers by metering; common EU requirements for the frequency of billing based on actual consumption; provision of data on individual historical consumption by internet; possible EU harmonisation of guidelines on the clarity of billing	MS must ensure proper implementation and monitoring of the provisions. MS retain flexibility to introduce further requirements on clarity of billing and decide on technical aspects for the deployment of smart meters within the remit of other EU legislation[41].
C6: Voluntary measures on metering and billing	Common EU guidelines for energy companies to encourage use of in-home displays and bi-directional communication for advanced metering; Voluntary EU codes of conduct on clarity and minimum frequency of billing based on actual consumption	No legal obligations on MS.

In order to trigger additional energy savings in **industry**, two options are assessed:

[41] Measurement Instruments Directive (Directive 2004/22/EC)

C7: Mandatory energy audits and energy management systems for industry	A requirement that non-SME companies in industrial sectors implement regular (minimum every 5 years) energy audits relating to all energy aspects of their operations	MS have to ensure proper implementation. They have the flexibility to define quality requirements for the audits within the broad objective of a systemic screening of all energy related aspects of the company.
C8: Voluntary systems to promote energy audits and the use of energy management systems in industry	A requirement for Member States to introduce energy efficiency programmes, such as Voluntary Agreements with industry to commit to implementing regular energy audits or energy management systems. MS could provide incentives for companies to join by e.g. granting tax or financial benefits and support schemes	MS have broad flexibility to design their programmes, to tailor them to specific industry sectors, and to define implementation channels and offer incentives.

ESCOs have an important role to play in facilitating energy efficiency measures. Two options are assessed to promote the development of ESCOs:

C9: Obligations for Member States to promote ESCOs	Requirements for MS to ensure market monitoring, providing lists of energy service offers and standard contracts.	Large room for flexibility in implementation. Government support can be modelled closely on existing national policies.
C10: Voluntary measures to promote ESCOs	Encourage the setting up of voluntary agreements at national level through which large energy consumers commit to engage ESCOs to lower their consumption.	Large room for flexibility regarding level of ambition, content and design of the voluntary agreements.

Options not retained for assessment

The option of improving consumer information solely through methods such as personalised web pages and telephone services was not retained because research shows them to be ineffective if adopted on a freestanding basis rather than in combination with advanced metering/improved billing[42]. The option of promoting energy audits and energy management systems for households and SMEs was not retained because for audits this would overlap with options B3 and B4, while energy management systems are not suitable for these sectors.

4.3.3. Measures to realise potential in energy transformation and distribution

The starting point for these options is:

Name	What EU obligation?	Flexibility for MS
D1: Retain the current approach	Implementation of a guarantee of origin system; calculation of efficiency of CHP and primary energy savings using either a harmonised or an alternative methodology; 4-yearly reporting obligation on progress in raising the share of high efficiency CHP; annual submission of statistical information; guaranteeing of minimum grid access for high efficiency CHP	MS are free to decide whether and how to support high efficiency CHP and whether to take measures to increase its use. They must, however, use a common definition of the type of CHP that merits support.
D2: Removal of existing provisions	No obligation to apply the common definition of high efficiency CHP e.g. for state aid purposes or for guaranteeing access to the grid.	As D1; Member States are, in addition, free to define the type of CHP that merits support, subject to the application of EU state aid rules.

[42] European Smart Metering Guide, 2008, European Smart Metering Alliance (IEE project) http://www.esma-home.eu/downloads/

Option D1 means retaining the provisions of the current CHP Directive. These do not promote energy efficiency across the energy supply sector in general, but only in relation to co-generation. They contain binding measures regarding the gathering of information/reporting to the Commission and the provision of state aid for CHP, but not regarding the promotion of CHP. (For more detail see section 2.2). Option D2 means removing even these provisions. Starting from this baseline, three options to promote **CHP** in particular are assessed:

D3: Mandatory CHP and district heating/cooling requirement for new electricity and high-heat-demand industry installations	New thermal electricity generation capacity must be used for the generation of heat as well as power whenever there is an appropriate demand for heat nearby.	MS would have to ensure coordination of their administrative procedures related to CHP production units and related heat and cooling network connection and development. While the measure would ensure a common high ambition level for CHP, it would still be based on national economic conditions respecting the specificities of each country.
D4: Mandatory connection and priority access of high-efficiency cogeneration to the electricity grid	Requirement to provide priority or guaranteed access to the grid and priority dispatch for high efficiency CHP to ensure level playing field in electricity markets and help distributed CHP.	The requirement would ensure a common EU approach to grid access of high efficiency CHP, within the limits of ensuring the reliable operation of the national electricity network, that MS would have to implement correctly.
D5: Voluntary measures to promote CHP and district heating/cooling	National measures and programmes driven by level of ambition of MS, initiatives by local or regional authorities to include CHP into their programmes to build a sustainable energy system in their communities	MS would have full flexibility to decide whether they want CHP to play a role in building their future sustainable energy systems and what measures to take at what level.

Three options to promote efficiency across the **energy supply sector** in general are assessed:

D6: Minimum performance requirements for energy generation	MS would have to provide information on the energy efficiency parameters of their electricity and heat supply installations and how these relate to BAT	MS would be required to provide information while retaining flexibility as regards setting energy efficiency requirements for power and heat installations.
D7: Energy efficiency obligation on energy network regulators	A requirement for energy regulators to increase the priority given to energy efficiency when they design network tariffs and regulation, and to set the network tariffs a) allowing the provision of energy efficiency related energy services to consumers b) incentivising the reduction of network losses via better grid operation, management, demand response and the connection of distributed generators.	This measure would reduce the discretion of network regulators. It would not significantly limit MS's flexibility, since they already have obligation to ensure the independence of network regulators.
D8: Voluntary measures to increase the efficiency of energy transformation, transmission and distribution	This would leave scope for MS and network operators to implement best practice sharing, voluntary industrial initiatives and regional cooperation to introduce measures reducing network losses and developing network services needed for demand management, demand response and demand aggregation.	MS would have full flexibility to decide whether and how they want to drive network developments, including the development of electricity, gas and district heating/cooling smart grids within the limits of the existing requirement under the EU internal energy market to ensure the independence of network regulators.

Options not retained for assessment

In some Member States, pricing rules are not favourable to developing district heating. The option of regulating this at EU level was not retained because of concerns about subsidiarity.

4.3.4. National reporting

Under the ESD, Member States are required, every three years, to make detailed reports of progress in end-use energy savings, using a complex methodology, and to accompany these with detailed plans for future action. These documents are known as National Energy Efficiency Action Plans (NEEAPs). There is no agreed template for them. The next NEEAPs are due in June 2011. In their NRPs, Member States have typically chosen to include a paragraph or two describing highlights of their action on energy efficiency. Member States will be invited to report every year. There is as yet no set reporting method and again, no agreed template. In this context, the following options are assessed:

Name	What EU obligation?	Flexibility for MS
E1: Retain the current approach	Every three years, MS are obliged to submit national plans including planned and implemented EE measures as well as a calculation of the final energy savings delivered by each single measure; no common rules. Each year, Member States must report on the basic EE indicators on primary energy consumption and the progress with EE policy implementation in a previous year.	MS can use their own national methods to determine final energy savings; free choice of indicators within certain constraints set by ESD; no obligation to report on the achievement of the 9% target for final energy savings in 2016; no formal obligation to report on EE indicators on annual basis; no obligation to use a common template for reporting on national energy efficiency plans
E2: Require light form of reports	As E1 with a simplification of the requirements for three-yearly reports (no impacts of single measures) and common formats for each type of report	Fewer requirements than under E1, but less flexibility in how they are implemented by Member States.
E3: Require detailed calculation of savings and evaluation of measures across the whole economy	Extension of the methodologies for reporting on energy savings in E1 to additional sectors including energy generation and transmission/distribution	Methodology for the detailed calculation of primary energy savings needs to be developed and agreed in the comitology; obligation to set own national systems for the regular collection of statistical information from each energy generating installation
E4: Reporting only in National Reform Programmes	Existing provisions of ESD are repealed without replacement. Basic information on EE provided through NRPs only.	No formal obligation to report on EE indicators on annual basis, no obligation to use a common template for reporting on national energy efficiency plans. No obligation for the MS to continue collection of data on the impacts of EE measures.
E5: Combine reporting with other relevant instruments	As E2 but in the form of a common report also incorporating other existing reporting obligations covering renewable energy and greenhouse gas.	MS can combine reporting required by this Directive with other EU Directives on energy efficiency as well as renewables and reduction of emissions of GHG.

Options not retained for assessment

The option of simplifying the reporting obligations under the ESD (as in E2) while keeping the reporting interval at three years was not retained because this simplified procedure would be likely to end up duplicating much of what would then have to be put in place, in parallel, for the NRPs.

4.4. Third-level policy options

This section describes options concerning the purpose and scope of the legislative proposal and the choice of legal instrument. These can be defined according to four variables:

- **whether there is a need to adopt a new legislative proposal or not**

The answer to this question will come from the analysis of the first-level options.

- **whether the purpose and scope of the two existing Directives (ESD and CHP) should be extended**

As explained in chapter 2, the purpose of the ESD is to enhance the cost-effective improvement of energy end-use efficiency in the Member States. It is therefore focused exclusively on achieving savings in end-use sectors. The Directive does not include measures to promote energy savings directly in the energy supply sectors.

With the setting in 2007 of a 20% target, a qualitative step was made in the level of ambition of EU energy efficiency policy, which from then on has aimed at achieving energy consumption reductions irrespective of whether this is done in the energy supply or end-use sectors. The ESD in its current form is not able to achieve such a target. This raises the issue of whether it should be modified in view of achieving the 20% energy efficiency target, through extension to the supply sectors.

In addition, the ESD excludes some end-use sectors (e.g. undertakings covered by the Emissions Trading Directive[43], and armed forces to the extent that this application causes conflict with their nature or activities). In addition, Member States can exclude from the obligations in Articles 6 (obligations on energy utilities) and 13 (metering and billing) small distributors, small distribution system operators and small retail energy sales companies. This raises the issue of whether these exclusions should be retained.

The mid-term review of the CHP Directive did not identify any major issue concerning its purpose or scope.

- **whether the two Directives should remain as separate legal acts**

The CHP Directive deals with energy supply. If the decision is taken to modify the purpose of the ESD to include the supply side, it could make sense also to incorporate provisions that are currently dealt with in the CHP Directive. The new legislative proposal would in this way become the general EU legal framework for energy efficiency, encompassing energy saving instruments across all sectors.

- **whether in the light of the changes proposed for each Directive the form of the new legal instrument should be a Directive or a Regulation**

Directives and Regulations are both binding legal acts of the Union. Regulations are directly applicable in their entirety. Directives are binding upon each Member State as to the result to be achieved, leaving to the national authorities the choice of form and methods.

[43] Directive 2009/29/EC

The choice of legal instrument should be inspired by the principle of proportionality, according to which the content and form of Union action should not exceed what is necessary to achieve the intended objective[44]. A Directive should be the preferred option if, in the light of the content of the provisions of the new legislative proposal, the intended objectives can be fully achieved while providing some room for manoeuvre to Member States as to the choice of the means to achieve such objectives. The choice of legal instrument therefore depends on the content of the preferred second-level policy options as assessed in Chapters 5 and 6.

The following options have been retained for further analysis and comparison. They are intended to encapsulate the main policy choices.

Option 1: Retain the two current Directives as they stand today

This option implies the maintenance of the purpose and scope of the ESD and the CHP as they currently stand (the ESD would continue being exclusively focused on end-use sectors and the current exemptions to its the scope would continue in being). The Directives would remain as separate legal acts.

Option 2: Abolish the two current Directives without replacement

Do not propose any new legislative act(s) but abolish the two Directives.

Option 2: Propose two separate revised Directives and extend their scope

Under this option the CHP Directive and the ESD would remain as separate acts, but the purpose of the ESD would be extended to achieve the energy efficiency target of 20% and to cover energy efficiency measures in the supply sector. Its scope would also be broadened by removing existing exemptions to its coverage of end-use sectors.

Option 3: Merge the two Directives and extend the scope

As option 2, plus the merger of the ESD and CHP Directives into a single Directive.

Option 4: Use Regulation legal instrument instead of Directive

As option 3, but with a Regulation rather than a Directive as legal instrument.

5. ANALYSIS OF IMPACTS AND COMPARING THE OPTIONS

5.1. Analytical approach and modelling tools

To establish the baseline for each policy area the "PRIMES 2009 energy efficiency scenario" was used. This includes policies adopted up to December 2009.

To analyse the detailed economic, social and environmental impact of the policy options the E3ME model was used[45]. Results from the PRIMES 2009 energy efficiency scenario were used as an input for the energy projections. In cases where there was insufficient information

[44] Article 5(4) of the Treaty on European Union.

[45] See Chewpreecha and Pollitt (2009).

to run the E3ME model, bottom-up assessments and individual studies were used to establish the impact of the options.

To evaluate the impact of the proposed options on the administrative burden for public authorities and businesses, results of various studies were used. Finally, to assess the impacts of the preferred policy options in combination, taking into account their overlaps, a further PRIMES run was performed[46].

5.2. Criteria used for comparison of the options

Based on the description of the impact, qualitative evaluation of how the options contribute to the policy objectives set in Chapter 3 is made using the following evaluation criteria:

- **respect of subsidiarity/proportionality**
- **effectiveness –** the extent to which options achieve the objectives of the proposal
- **efficiency –** the extent to which objectives can be achieved for a given level of resources (cost-effectiveness).
- **coherence –** the extent to which options are coherent with the overarching objectives of EU policy and to which they limit trade-offs.

For the evaluation of subsidiarity/proportionality the following symbols are used: **respected R**, **or not respected NR.**

The following symbols are used to describe the results of the evaluations of efficiency, effectiveness and overall assessment:

'=' **baseline or equivalent to the baseline**

'+' to '+++' **low to high improvement compared to the baseline**

'-' **worsening compared to the baseline**

For the evaluation of coherence with other policies the following symbols are used: **coherent C**, **or not coherent NC.**

5.3. Summary results for the first-level policy options

5.3.1. National targets and objectives

Option A1: Retain the current approach

Retaining the current approach would mean that no further targets are defined. The present ESD target of proving 9% end use energy savings in 9 years against a base period would expire at the end of 2016. The mid term evaluation[47] and feedback from the Member States through the ESD concerted action and evaluation questionnaires[48] have shown that this format

[46] SEC(2011) 277
[47] Annex III
[48] Annex XIII

of target setting is flawed. The achievement of the target cannot easily be monitored through official statistics and does not allow for any conclusion on whether the measures carried out have led to lower consumption. Moreover, due to the taking into account of "early action"[49] , the actual target in some Member States is considerably lower than the indicative 9%. The economic, social and environmental impacts of the present ESD, including the 9% target, are included in the base case.

Options A2-A4: Propose further targets

If the ESD were to be extended at the present saving pace (1% p.a.), **option A2** would imply an end use energy saving target of 13% in 2020. It is assumed that this would be achieved.

Option A3 would imply the setting of voluntary targets in the framework of the Europe 2020 strategy. The level of ambition of these targets would be up to Member States and could vary considerably. This is captured model-wise by assessing the impact of an optimistic hypothesis (80% of the savings necessary to reach the overall 20% target of the EU are achieved) and a pessimistic hypothesis (60% of savings achieved)[50]. Since the targets would not be binding, the level of fulfilment of the ambition could also vary. Two hypotheses are assessed. Under the first, more pessimistic hypothesis, this approach would lead to **energy savings of 15.4%** (283 Mtoe) relative to the projection used for the EU's overall 20% target. Under the second, more optimistic hypothesis it would lead to **energy savings of 19.3%** (355 Mtoe). This corresponds to a scenario in which new binding energy efficiency measures in EU legislation lead Member States to increase their combined ambition to a level equivalent to a 20% saving and in which they come rather close to achieving this.

Option A4 investigates the impact of binding national targets for primary energy consumption. In this case it is assumed that the 20% target is achieved.

- **Impact on energy consumption**

In the baseline, primary energy savings of 8.9% or 167 Mtoe are reached, compared to the saving of 368 Mtoe needed to achieve the 20% target. In the baseline, energy intensity is forecast to improve by 1.4% per year. Option A2, with its target for end-use energy savings of 1% per year, would therefore have no higher an impact than option A1. The overall 20% primary energy saving aim would not be reached. Depending on the hypothesis for the level of ambition, option A3 would lead to energy savings of either 283 or 355 Mtoe. The overall 20% target would not be reached in either case, but under the more optimistic hypothesis the gap would be small. Option A4 would lead to the 20% target being achieved in full.

- **Economic impact**

The economic impacts of options A1 and A2 are included in the baseline. The economic impact of options A3 and A4 were modelled using the E3ME model. As the table below shows, for both cases, the modelled impact on GDP is moderately positive.

[49] Savings since 1991/1995 count towards the target

[50] The span given by these hypotheses matches the level of ambition witnessed so far with the indicative national targets set in the Europe 2020 framework.

Table 3. Overview of economic impacts of different target options, 2020

	Baseline (option A1)		**Additional effects to baseline case**							
			Extension of ESD target **(option A2)**		Indicative target (**option A3**, pessimistic hypothesis)		Indicative target (**option A3**, optimistic hypothesis)		Binding target **(option A4)**	
	2015	2020	2015	2020	2015	2020	2015	2020	2015	2020
GDP (bn € 2000)	11420	12537	0	0	19.5	30.0	21.5	32.4	23.7	33.8
Consumption (bn € 2000)	6627	7155	0	0	-6.5	1.4	-7.8	-5.8	-13.0	-14.7
Investment (bn € 2000)	2699	3177	0	0	23.0	26.6	27.0	35.5	33.8	46.6
Exports (bn € 2000)	4915	6147	0	0	-2.8	-6.6	-5.0	-10.8	-6.5	-16.2
Imports (bn € 2000)	4559	5744	0	0	-5.9	-8.6	-7.3	-13.6	-9.6	-18.2
Consumer prices (2000 = 1.0)	1.42	1.62	0	0	0.01	0.02	0.02	0.03	0.02	0.04

Source(s): E3ME, Cambridge Econometrics

It needs to be underlined that these modelling results in some senses represent a worst-case scenario. The modelling is based on fictive price increases (ranging from 2% to 4%), which reduce energy consumption. Whereas this approach is suitable to draw conclusions on economic, social and environmental impacts, the real world impacts are likely to be more positive. If price were in fact to increase as a consequence of energy efficiency policy, this would only tend to be in the short term. In the medium and longer term, these increases would be compensated by lower energy bills due to lower energy consumption. The modelled price increases lead to a decrease of consumption. The negative impacts displayed in the modelling for exports should in reality be lower or even positive as an increase in energy efficiency will permit the reaping of first mover advantages in selling energy efficiency technology to third countries.

- **Administrative burden**

National targets by themselves cause no administrative burden to private industry. However, as governments need to monitor the targets, this causes administrative costs. In the case of the targets proposed, the administrative costs for the ESD target (A1) or a possible extension thereof are already covered in the baseline. The administrative costs for additional overall targets for 2020 can be estimated to be low or even close to zero as these targets can be monitored through official statistics (primary energy consumption, final energy consumption, energy intensity) which are readily available at national level and from Eurostat.

- **Social impact**

As the table below shows, the effects on employment of options A3 and A4 are forecast to be positive.[51] Because energy efficiency solutions like building insulation or advanced heating systems demand skills, the increase of employment is likely to be in the medium to high quality segment. Efficiency programmes initiated by the public sector are likely to tackle social housing, favouring social inclusion. As discussed above, the modelling of energy

[51] Here again, it should be noted that these impacts represent a "worst case" result due to the modelling of energy saving by means of price increases. A more realistic assessment in the Energy Efficiency Plan estimated the employment potential at up to 2 million jobs based on data from the building sector.

efficiency through iteratively increased energy prices inevitably leads to a result that misleadingly depicts a permanent reduction in real household incomes.

Table 4. Overview of social impacts of different target options, 2020

	Baseline (option A1)		**Additional effects to baseline case**							
			Extension of ESD target **(option A2)**		Indicative target (**option A3**, pessimistic hypothesis)		Indicative target (**option A3**, optimistic hypothesis)		Binding target **(option A4)**	
	2015	2020	2015	2020	2015	2020	2015	2020	2015	2020
Consumer prices (2000 = 1.0)	1.42	1.62	0	0	0.01	0.02	0.02	0.03	0.02	0.04
Employment (000)	226824	226942	0	0	148.0	216.0	210.2	327.5	260	398
Real household incomes (bn € 2000)	7795	8672	0	0	-1.5	-2.0	1.7	-8.7	-1.9	-18.9

Source(s): E3ME, Cambridge Econometrics

As discussed above, the modelling makes the incorrect assumption that it will be energy prices alone, rather than more direct regulatory measures, that will be the trigger for an increased uptake of energy efficiency. In distributional terms, the model results show that these higher energy prices would hurt the more vulnerable income groups more than high income groups. However, as discussed above, the model results cannot be regarded as valid for energy efficiency in this respect. In reality, the energy and cost saving effects would strongly outbalance the direct income losses if indeed energy price increases were to occur. For comprehensiveness of this analysis, however, the distributional effects of the modelled price increases are shown in Annex V.

- **Environmental impact**

As the table below shows options A3 and (especially) A4 deliver a significant contribution to the reduction of greenhouse gas emissions. Reduced energy consumption will translate into further environmental benefits such as the reduction of local air pollutants and subsequent increase in air quality, in particular in densely populated areas. This was not modelled.

Table 5. Overview of environmental impacts of different target options, 2020

	Baseline (option A1)		**Additional effects to baseline case**							
			Extension of ESD target **(option A2)**		Indicative target (**option A3**, pessimistic hypothesis)		Indicative target (**option A3**, optimistic hypothesis)		Binding target **(option A4)**	
	2015	2020	2015	2020	2015	2020	2015	2020	2015	2020
CO_2 emissions (m tonnes carbon)	1096	1064	0	0	-40.5	-79.9	-53.9	-97.7	-69	-123
GHG emissions (m tonnes carbon)	1286	1250	0	0	-49.5	-92.1	-65.9	-113.2	-83	-142

Source(s): E3ME, Cambridge Econometrics

- **Interaction with the Emissions Trading Scheme**

The model projects that in reaching the 20% energy efficiency goal the ETS price will be put under some pressure. In this model the ETS price is set endogenously and is determined by the level of effort needed to meet the emission targets as a whole in the year 2020. The large reductions that occur in energy consumption are enough to meet these targets.

This result, while credible in principle, is liable to be overstated – in the model the specific ETS price becomes zero - because in the model, energy efficiency improvements are achieved by means of energy price increases. In reality, regulatory measures or instruments changing consumer behaviour which primarily target non-ETS sectors may put ETS prices under less strain. These interaction effects are not reflected in E3ME.

In order to test this argumentation, the impact of energy efficiency targets was also modelled using the PRIMES model. Several similar scenarios were modelled. These are known as the 'PRIMES 20% efficiency' scenarios. In these new scenarios, the ETS Directive is assumed to continue until 2050, with allowances continuing to decrease over time. PRIMES assumes foresight of actors over the full investment horizon. While unlimited banking is allowed from Phase 2 of the ETS until 2050, borrowing from the future is not permitted. These scenarios also assume full compliance with the renewable energy targets for 2020 – or even their overachievement, since incentives established for the purposes of the reference scenario are assumed to also remain in being in the 20% efficiency scenarios. The results of this additional modelling suggest that ETS prices will fall to a much lesser extent than predicted with the E3ME model. The ETS price, under these conditions, is forecast to be about 14.2 €/t CO_2 in 2020, compared to a price of about 16.5 €/t in 2020 in the PRIMES 2009 reference scenario which is taken for a comparison because in it the GHG and RES targets are reached[52].

Therefore, while both models project a further decrease in GHG emissions, they project different impacts on the ETS price. The much lower ETS price impact until 2020 in PRIMES is explained among other things by the different baselines used, a higher share of modelled measures with GHG reductions materialising in non-ETS sectors, the full market foresight assumed and an unlimited ETS banking flexibility until 2050 assumed.

Comparing the options on national targets and objectives

The following table summarizes the outcome of the analysis for each policy option.

Evaluation criterion / Policy options	Subsidiarity/ proportionality	Effectiveness	Efficiency	Coherence	OVERALL
Option A1: Retain the current approach	R	=	=	C	**=**
Option A2: Extend the indicative end use target of ESD to 2020	R	-	=/-	C	**-**
Option A3: Comprehensive indicative target for each Member State for 2020	R	+++	++	C	+++
Option A4: Binding target for each Member State for 2020	R	+++	++	C	+++

Options A1 and A2 are weak in terms of **effectiveness** because they do not come close to attaining the policy goal of a 20% energy saving. If the indicative targets in option A3 are accompanied by a strong set of binding measures, and if the introduction of these measures at European level leads Member States to revise upwards the current level of ambition of their indicative targets ("optimistic hypothesis") and to achieve these revised goals, then option A3

[52] E3MLab National Technical University of Athens (2011), Modelling of Energy Efficiency scenarios.

will be effective; if not ("pessimistic hypothesis"), not.[53] Option A4, with binding targets, would certainly be effective.

The criterion of **subsidiarity** aims at the attainment of a goal at the most local institutional level possible. Options A1 and A2 are compatible with this criterion, but fail in terms of effectiveness and efficiency because they do not achieve the goal and imply administrative burdens. Under the optimistic hypothesis for option A3, its voluntary approach will be sufficient for the goal to be achieved. This would then be the appropriate path to follow, while the more interventionist approach of binding targets (option A4) would go too far. However, under the pessimistic hypothesis for option A3, the voluntary approach would fail to attain the goal. Option A4 would then embody the approach that the subsidiarity criterion requires. The Energy Efficiency Plan 2011 states that the Commission will review this at the end of 2013.

Options A1 and A2 both fit **coherently** into the present energy and climate framework. Due to the technical complexity of the task of establishing and verify the target of end use savings, their cost-benefit ratio in terms of **efficiency** is neutral if not negative as many resources are required for verification and reporting on the attainment of the targets. Contrary to this, moving towards the overall primary energy saving targets in options A3 and A4 increases **efficiency** from the point of view of the target being easy to track with available statistics. They also increase **coherence** as they make the link of energy efficiency policies to other policies more understandable.

The result of the **stakeholders' consultation** showed that the majority of stakeholders (53%, 108 submissions) favoured a binding overall target, possibly supported by secondary ones (e.g. for CHP), 25% (50 submissions) were against while 22% (45 submissions) had no opinion in this regard. This call was also repeated by the European Parliament[54]. In strong contrast are, however, the views of the majority of MS who consider that the indicative approach to targets is to be kept, at least until its efficacy can be properly assessed.

Based on the analysis and taking into account the various views of stakeholders, it is proposed that Option A3 is retained. However, progress towards the 20% objective should be reviewed in 2013 (see chapter 7, "Monitoring and Evaluation"). If this review in 2013 shows that this does not deliver the results needed to reach the overall European 20% energy efficiency target, option A4 will then need to be further investigated.

Deciding to pursue this approach towards target setting, based on voluntary and indicative rather than binding national *targets*, would mean that the approach towards achieving the 20% objective would instead be based on binding *measures*. This is in line with the position taken by Member States, notably at the European Council meeting of 4th February 2011. Analysis of the various measures is provided in the text to follow.

5.4. Second-level policy options

5.4.1. Energy Savings Obligation

Details on the current situation and on design considerations are provided in Annex VII.

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53 The new binding measures will not on their own achieve the 20% target because they are designed to be accompanied by activities such as financing and consumer information at national level.

54 European Parliament resolution of 15 December 2010 on Revision of the Energy Efficiency Action Plan (2010/2107(INI))

- **Impact on energy consumption**

The present provisions on this topic in the ESD have had a limited impact on energy savings. Member States have found them difficult to implement[55] due to their broad and generic character. Options B1 and B2 are therefore assumed to have the same impact: that reflected in the baseline.

The impacts on energy savings of saving obligations depends on the level of ambition and the comprehensiveness of the scheme. Under option B3, Member States would be free to set the level of ambition. On average, existing schemes aim at 0.8% annual savings. It is assumed that if all Member States were required to use the instrument, they would on average choose a slightly lower level of ambition: 0.6%. This would save 50-56 Mtoe of primary energy consumption in 2020. For option B4, it is assumed that the requirement would be set at the more ambitious level of 1.5% savings per year, saving 108-118 Mtoe of primary energy consumption in 2020.[56]. It is assumed that the binding character of the obligations to be placed on energy suppliers/distributors will mean that in both cases these obligations are fully translated into energy savings.

- **Economic impact**

The economic impacts of options B1 and B2 are included in the baseline scenario. The introduction of saving obligations for energy suppliers/distributors (options B3 and B4) is estimated to have a positive economic impact. The E3ME model was used to assess the impact of financing the investment cost of energy saving obligations in three ways:

- with **income tax increases** used to compensate energy suppliers/distributors;
- with **energy price increases** to fund the investment costs[57]
- with the costs being met from a **revolving fund** paid for by energy savings (this is equivalent to 100% price recoup by distributors/suppliers).

As shown in the table 6, saving obligations are estimated to lead to additional investment in energy efficiency of €100-198 bn in 2020. The impact on GDP is an increase of €247-1046m compared to the baseline.

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55 Questionnaires for mid-term evaluation of ESD, see Annex III

56 The rate chosen under option B4 represents an ambitious stance which is close to the maximum that is estimated to be achievable. Cf. Annex XIII; Thomas (2010), Success and failures of energy efficiency funds and obligations. What five European systems have achieved and what can be learnt from them – a criteria-based policy analysis, http://iopscience.iop.org/1755-1315/6/20/202010; Eyre, Pavan, Bodineau (2009), Energy company obligations to save energy in Italy, the UK and France: what have we learnt?; EuroWhiteCert (2007) White Certificate Trading Systems in the European Union, Intelligent Energy Europe project, available at www.eurowhitecert.org; Thomas (2007) Politische Rahmenbedingungen für Aktivitäten der Energiewirtschaft zur Förderung der Endenergieeffizienz, Zeitschrift für Energiewirtschaft 31(3).

57 It is assumed that competitive pressures in the market and/or optimal pricing strategies for entities with market power lead to suppliers/distributors only recouping 75% of the cost.

Table 6. Summary of overall economic impacts for EU27 (difference from baseline)

	Baseline (option B1)			Additional effects to baseline case																
				Option B3									Option B4							
				Income tax increase			Energy price increase			Revolving fund			Income tax increase			Energy price increase			Revolving fund		
	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020
GDP (bn € 2000)	10305	11415	12519	n/a	13.7	42.0	n/a	18.4	46.7	n/a	17.0	35.2	n/a	27.0	69.2	n/a	36.6	80.1	n/a	33.7	77.2
Consumption (bn € 2000)	6070	6628	7154	n/a	-1.5	11.9	n/a	3.4	18.2	n/a	2.0	13.6	n/a	-3.7	17.7	n/a	7.0	29.9	n/a	4.5	27.6
Investment (bn € 2000)	2285	2699	3176	n/a	9.7	5.6	n/a	9.3	5.7	n/a	9.3	5.9	n/a	19.1	15.3	n/a	18.0	15.9	n/a	18.2	15.4
Exports (bn € 2000)	3943	4913	6139	n/a	5.0	23.3	n/a	5.7	23.0	n/a	5.0	15.8	n/a	11.3	36.6	n/a	12.4	36.3	n/a	11.0	35.2
Imports (bn € 2000)	3638	4562	5751	n/a	-0.5	-1.0	n/a	0.04	0.2	n/a	-0.5	0.2	n/a	-0.3	0.4	n/a	0.7	2.1	n/a	-0.01	1.0
Consumer prices (2000 = 1.0)	1.24	1.42	1.6	n/a	0.00	0.0	n/a	0.00	0.0	n/a	0.00	0.0	n/a	0.00	0.0	n/a	0.00	0.0	n/a	0.00	0.0

Table 7. Summary of overall social impacts for EU-27 (difference from baseline)

	Baseline (option B1)			Additional effects to baseline case																
				Option B3									Option B4							
				Income tax increase			Energy price increase			Revolving fund			Income tax increase			Energy price increase			Revolving fund		
	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020
Consumption (bn € 2000)	6070	6628	7154	n/a	-1.5	11.9	n/a	3.4	18.2	n/a	2.0	13.6	n/a	-3.7	17.7	n/a	7.0	29.9	n/a	4.5	27.6
Employment (000)	218754	226816	226894	n/a	-37	235	n/a	174	430	n/a	159	386	n/a	-69	438	n/a	303	754	n/a	279	731
Real household incomes (bn € 2000)	6934	7797	8674	n/a	-0.4	14.0	n/a	3.6	19.2	n/a	1.7	12.9	n/a	-1.3	16.7	n/a	8.4	28.7	n/a	5.3	26.0

Table 8. Summary of overall environmental impacts for EU-27

	Baseline (option B1)			Additional effects to baseline case																
				Option B3									Option B4							
				Income tax increase			Energy price increase			Revolving fund			Income tax increase			Energy price increase			Revolving fund		
	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020
CO2 emissions (m tonnes carbon)	1094	1095	1063	n/a	-16	-34	n/a	-19	-37	n/a	-20	-38	n/a	-37	-71	n/a	-43	-76	n/a	-45	-77
GHG emissions (m tonnes carbon)	1286	1285	1249	n/a	-20	-43	n/a	-23	-46	n/a	-25	-47	n/a	-43	-86	n/a	-50	-90	n/a	-52	-92
ETS Price (2008 €/t CO2)	11.1	19.9	28.7	n/a	10.3	10.4	n/a	7.9	7.7	n/a	8.1	8.0	n/a	4.7	12.0	n/a	1.4	5.2	n/a	0.8	4.9

Source(s): E3ME, Cambridge Econometric

- **Administrative burden**

Existing energy saving obligation schemes create almost no extra costs for government. They are financed by energy prices or grid charges, or - if certificate trading is part of the scheme - by a charge per certificate issued[58]. The reported administrative costs are low: about €400,000 per year in the UK[59] and €700,000 in France.[60] Total administrative costs of around 0.002 Eurocent per kWh can be assumed[61]. This negligible effect on consumer prices is affirmed by the modelling results shown in the tables above.

Schemes with tradable certificates cost more to administer. The possibility to certify and trade energy savings (so called "energy savings certificates" or "white certificates") will lead to a larger increase in administrative costs, if the trade is not performed bilaterally between two obliged parties ("over the counter") but on a fully operational market. In this case, the savings need to be clearly certified, registered with a registration and clearance body and the trading in certificates monitored to avoid double counting of energy savings. These administrative costs are – at least in the starting phase of such a certificate scheme – outbalancing the overall economic gains of trading. However, these costs can be regarded as one-off installation costs similar to the set up of the relevant bodies for the European Emissions Trading Scheme. As full tradability is rarely used in the existing saving obligation schemes across Europe, an estimate of the administrative costs is difficult to estimate. However, in Italy, where trading of savings certificate is an essential part of the system, the costs are slightly higher, i.e. in the range of €1m per year[62]. However, it is decided that at this time, under both option B3 and option B4, this would not be required by EU legislation. Harmonisation at European level of standardised values for saving calculations (option B4) would further cut administrative costs.

Harmonising key parts of the saving obligations at European level (option B4) can contribute strongly to reducing the administrative costs for the Member States in comparison to purely national design (option B3). A considerable reduction in administrative costs and administrative burden can be achieved through focussing the saving obligation scheme on standardised actions with deemed ex ante saving calculations. By putting forward default values for the most common saving activities the Commission can contribute strongly to saving administrative costs.

- **Social impact**

The social impacts of options B1 and B2 are included in the base case. Table 7 shows that for all cases the impact on consumption is forecast to be positive compared to the reference case. All options show positive employment effects and in most cases real household income tends to increase due to lower energy bills. As discussed above, the modelling uses energy prices as the trigger for an increased uptake of energy efficiency. In distributional terms, the model results show that higher energy prices would have higher impact on the more vulnerable

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58 Harmelink M., Blok K. Chang M., Graus W. and S. Joosen, Mogelijkheden voor versnelling van energiebesparing in Nederland, Ecofys rapport in opdracht van Ministerie van Economische zaken, 2005.

59 Based on administrative cost for the Energy Efficiency Commitment schemes.

60 See Annex XIII. An average of 10-15 staff work on the administration of the existing EU energy saving obligations schemes.

61 Harmelink et al., 2005

62 JRC. Energy savings obligation and white certificate schemes. 2009

income groups more than high income groups. All the same, as discussed above, the model results cannot be regarded as valid for energy efficiency, as the energy and cost saving effects would strongly outbalance the direct income losses if indeed energy price increases were to occur. For comprehensiveness of this analysis, however, the distributional effects of the modelled price increases is shown in Annex VII.

The majority of the jobs created will be in the higher quality segment. Member States would be able to further improve the social impact by targeting the energy efficiency improvement measures to 'fuel poor' households. In the UK[63], this has proved to be highly successful. Including this as a harmonisation element in the EU requirement could however have countervailing effects, for example if the refurbishment of social housing leads to higher rental prices, crowding out low income households. It is therefore appropriate to leave the correct appreciation of this factor to national circumstances.

- **Environmental impact**

Depending on the level of ambition of the obligation, 42-90 million tonnes of carbon equivalents can be saved (see Table 8). Further environmental benefits can be expected with the mitigation of local air pollutants through decreased energy production from conventional energy sources, especially in densely populated areas.

- **Interactions with the ETS**

The modelling of the options presented does not exclude ETS installations from the saving obligation scheme. This approach was chosen to take into account the impacts of already existing obligation systems that target primary energy (e.g. Flanders, Italy) or CO_2 (UK) and which are likely to serve as models to other Member States when setting up their national saving obligation schemes.

As the savings obligations thus directly and indirectly generate additional CO_2 savings, this has a direct repercussion on the ETS. In terms of the overall climate policy aim, the saving obligation scheme can strongly contribute to reaching the GHG emission targets, in particular in non-ETS sectors. However, there will also be savings in the ETS sectors and, according to the E3ME model, this also lowers ETS carbon prices. The extent of price decreases depends on the level of ambition chosen and the precise market condition (full or only partial rollover of the saving obligation costs to the consumer as depicted in table 7). In this respect, industries covered in ETS will face two cost components. The costs for emission certificates will fall on the one side. On the other side, they face additional costs for meeting the savings obligations, in case these costs cannot be rolled over to the consumers. The net additional burden depends very much on the detailed interaction which will vary from Member State to Member State. However, as the saving obligation scheme implements energy saving options also at these installations, it can be estimated that the total cost for industry will diminish, leading an increased competitiveness in global markets.

Comparing the options on energy savings obligation

[63] The UK's Energy Efficiency Commitment (EEC) schemes stipulated that at least 50% of the energy savings had to be targeted at customers that receive income/related benefits or tax credits. The present Carbon Emission Reduction Target (CERT) scheme has reduced this share to 40%. Bertoldi et al. (2010).

The table summarizes the outcomes of the analysis for each policy option.

Evaluation criteria / Policy options	Subsidiarity/ proportionality	Effectiveness	Efficiency	Coherence	OVERALL
Option B1: Retain the current approach	R	=	=	=	**=**
Option B2: Repeal the current ESD provisions without replacement	R	=	=	C	**=**
Option B3: Require all Member States to introduce energy saving obligations while leaving their design for determination by Member States	R	++	++	C	**++**
Option B4: As B3 but with harmonisation of key design features (targeted sectors, level of ambition and counting methods)	R	+++	+++	C	**+++**

According to the mid-term analysis, **option B1** has limited effectiveness. An overall assessment of efficiency is difficult as the national implementation of Art. 6 of the ESD is too diverse to allow for precise evaluation. However, it can be estimated that with the market for energy services remaining well below its potential, a large numbers of barriers exist which hinder the effective uptake of savings. Due to the mainly passive approach, there are no coherence problems with other EU policy areas. However, the potential for mutually reinforcing policies can be expected to stay well below the possible potential. As **option B2** would in practice not deviate from option B1, the evaluation is the same.

Introducing saving obligations (**options B3 and B4**) will be highly effective in the sense that a clear amount of energy will be saved through energy efficiency measures. This adds reliability to energy efficiency policy. The higher level of ambition (B4, 1.5% annual savings) shows a stronger effectiveness than the lower level of ambition (B3) without negative economic, social or environmental impacts.

The efficiency of option B4 will be higher than B3 if harmonisation is used to reduce the administrative costs of the Member States[64]. Tradable quotas ("white certificates") have the potential to enhance cost effectiveness, but this needs to be balanced against the administrative costs of trading (installation of registers, certification bodies etc.) These costs depend on the national situation. Cases like Italy have shown however, that cost-effective trading systems can be put in place.

In general terms, the instrument is coherent with the overall aims of the Europe 2020 strategy (notably sustainability, employment and social inclusion), supports consumer policies, safeguards competitiveness and contributes to overall climate and environmental objectives.

The **public consultation** focused on the plausibility of the introduction of an EU wide trading scheme for energy efficiency improvements (i.e. of white certificates). There was no strong support for an EU wide scheme with 30% (60 submissions) of stakeholders positive, 32% (65 submissions) negative and 38% (78 submission) having no opinion. However, from the submissions it became clear that it was considered by many stakeholders that **individual**

64 See Annex VII for detailed discussion

national schemes could be a way forward. The proponents of national white certificate schemes believed that these schemes should be market driven and carefully designed in order not to overlap with other schemes and create further administrative burdens for MS.

Based on the analysis and taking into account the various views of the stakeholders, it is proposed that option B4 is retained.

5.4.2. Further measures to realise potential at the end-use stage

The analysis in this section addresses measures that aim to increase the role of the **public sector**, ensure that information on savings is provided for **consumers** and for **industry** and support the development of **energy service companies.** Their impacts are discussed in separate sub-sections. The assessment is mainly qualitative because of the difficulty of modelling these options. The final comparison based on the evaluation criteria is done for all the options together to allow for comparison of their impacts.

Retain the current approach - Option C1

Under this option the policies currently in place on the role of public sector (the ESD, and the green public procurement initiative[65]), metering and billing (the ESD and the internal electricity and gas market Directives[66]), energy audits (the ESD) and ESCOs (the ESD) would be retained and would be expected to continue to have limited impact, for the reasons explained in section 2.2 and in the mid-term analysis of the ESD[67]. These measures are taken into account in the baseline (PRIMES 2009 energy efficiency scenario).

Options related to the role of public spending in promoting energy efficiency (C2 to C4)

It makes sense under option C2 to focus on the refurbishment of public buildings, which represent a small but still considerable part (i.e. 12%) of the total building stock, because they have a high visibility in public life (e.g. schools) and their status and performance have a significant impact as negative or positive examples for the private building sector. Data on their overall number and their renovation is easier to collect than data on energy consumption for other purposes (e.g. for equipment, public transport, heating of buildings).

Options C2a and C2b envisage that a target for each MS is established. As regards the scope of the target, it is suggested that it cover all buildings that are owned by the public sector, excluding social housing. The latter exclusion is because of the different ownership structure of social housing. In many countries a target could lead to significant a burden on social housing associations which do not have direct links with state budgets.

To establish which renovation rate is ambitious enough but realistic it is important to note that the pre-crisis energy-related renovation rate was 1.5% per year and as a baseline an average energy-related renovation rate of 1.7% per year over 2010-2020 is expected under business-as-usual because of the impact of the current policy mix (mainly the recast EPBD and national support schemes)[68].

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65 http://ec.europa.eu/environment/gpp/index_en.htm

66 Directives 2009/72/EC and 2009/73/EC

67 See Annex III

68 Ibid 70

Currently, the general refurbishment cycles are of 30-40 years but those which lead to energy efficiency improvements are at longer intervals (60-80 years). This signifies that approximately 3% of the building stock is renovated per year but in only half of the cases are energy efficiency improvements included (1.5% energy related renovation rate). Energy efficiency improvements are in most cases cost-effective when they are combined with ongoing maintenance and refurbishment work. Therefore, an upper limit of 3% can be identified for the cost-effective rate of energy-efficient renovation. This means that if all refurbishments are combined with a comprehensive package of measures to improve energy performance (which is presently not the case) the energy-related renovation rate would also be 3%.

To go beyond the 3% rate would force investors to carry out energy-related improvements to their buildings outside the refurbishment cycle, preventing the synergies obtainable from coupled renovation and thus leading to significantly lower cost effectiveness[69]. Furthermore, the construction sector would find it difficult to meet the increased demand and suboptimal renovations could be expected. Going below the 3%, by contrast, would not be ambitious enough to put on show the leading role of the public sector.

Energy-related retrofit rates beyond 3% are nevertheless possible in the short or medium term when refurbishments have not taken place for a large part of the stock for some time (e.g. in some eastern EU countries) and could be tackled in a condensed timeframe. However, in the longer term the full coupling of energy-related renovation to average refurbishment cycles sets a ceiling at 3%. This would mean double the pre-crisis energy-related refurbishment activity in Europe, which would already be a challenge (but also present good business and employment opportunities) for the EU building industry.

An alternative method to achieve a significantly accelerated retrofit rate, as opposed to a target where MS have full flexibility, would be to require that certain financial and technical assistance instruments are established by MS in a form that would provide funding and technical assistance to national, regional and local public authorities to implement energy efficiency improvements of the building stock they own. This is examined as Option C2c. The establishment of such financial and technical assistance instruments could either result from a political commitment taken by all Member States or as a binding obligation resulting from EC legislation. There would be a need to achieve a maximum leverage ratio between public grants and final investment volume. These instruments would channel money from various sources to support investments in energy efficiency improvements of buildings. They can be set up at national, regional and local level and their design and objectives will vary according to the specific characteristics and needs. These instruments can provide support to preferential loans, or loans combined with performance linked grants, or guarantee/risk sharing facility.

Option C3 would entail inclusion of energy efficiency criteria in public spending. In order to decrease the administrative burden and facilitate their use, the mandatory energy efficiency criteria to be used when public spending decisions are made (in a very broad sense, e.g. including social housing) should be based on existing labelling schemes (the highest classes of the Energy Label or Energy Performance Certificate) or established best performance requirements (Energy Star). These are relevant for energy using products/equipment, buildings (incl. buying, renting or renovating) and for services as far as the service providers use equipment or buildings. The focus is in principle on the energy use but, in certain cases

[69] Ecofys, Cost-Effective Climate Protection in the EU Building Stock.

(e.g. Energy Labels), other major environmental impacts are also taken into account. Measures also include greater use of energy management systems by public authorities. In addition, MS would be obliged to eliminate the legal, accounting and budgeting rules that hinder the uptake of energy efficiency measures (in particular the role of ESCOs) for public authorities.

Option C4 would imply encouragement for MS to develop guidelines and information portals that provide information and active support to procuring authorities and to eliminate any legal, accounting or budgetary barriers to public procurement.

The impact of the individual options is estimated using the BEAM model of Ecofys[70] (for Options C2a and C2b). The impact of Option C2c depends on the level of ambition set by each Member State but is close to the impact of Options C2a and C2b. The impact of Option C3 was considered on an aggregate level and not as a sum of individual measures; the PROST study was used as a reference source for calculations[71]. Due to its voluntary character only qualification of the impact of Option 4 was possible. The E3ME modelling could not provide results for these options, as their impact was too small to affect model outputs. Details on the model/studies used and the assumptions made are in Annex VIII. Only the direct impacts of the options are estimated. However, all the options could be expected to lead to economies of scale and to develop the market for energy efficient products, buildings and services. This would lead to further energy savings.

Impact on energy consumption Based on the considerations above, the impact of the proposed options on energy consumption is presented in the table below.

Table 9. Impact on energy consumption[72]

	Final energy savings in 2020 (Mtoe)	**Primary energy savings in 2020** (Mtoe)
Option C2a (cost-optimal levels)	3.4	6.4
Option C2b (nearly zero energy levels)	4.6	8.6
Option C2c (financial and technical assistance instruments)	4.0	7.5
Option C3 (EE criteria in public spending)	4.8 – 9.6	8.9-17.9
Option C4 (voluntary provisions)	Higher than BAU but smaller than C2a	Higher than BAU but smaller than C2a

Due to its wider coverage, the impact on energy savings of Option C3 is the highest. The range presented depicts the range of possible measures to be covered and the different levels of ambition of the highest performance classes of labels and certificates. The potential is estimated to be 5% to 10% reduction in 2020 compared to the baseline (PRIMES 2009 EE scenario). Much of the savings will come from energy efficiency improvements in buildings.

The requirement that ambitious renovation levels are achieved upon renovation (Option C2b) would lead to higher savings than if only cost-optimal levels are required (C2a) and would limit the possibility of a 'lock-in' effect. This refers to the fact that, if sub-optimal renovation is been undertaken, subsequent, more comprehensive measures become less cost effective until the next major renovation (in 30-40 years). Regarding Option C2c it is assumed that if sufficient funding is provided this would encourage the public bodies to implement

[70] Ecorys, Ecofys and BioIntelligence (2010): Study to Support the Impact Assessment for the EU Energy Saving Action Plan.

[71] PROST SAVE supported study. 2003. Harnessing the Power of the Public Purse. Final report.

[72] Based on Ibid 70, 71, see Annex VIII for more details

renovation projects and thus increase the energy related renovation rate to the optimal levels (as demonstrated above this would be approximately a 3% annual renovation rate). These renovations would be carried out to at least cost-optimal levels (as this is required by Directive 2010/31/EU) and for some countries to nearly zero energy levels. Therefore, it is considered that the impact of this option is the average of the impact of C2a and C2b.

The impact of Option C4 is expected to be a little higher than the business as usual option, as it can be expected that more Member States will take measures if there is a reminder in a legal text to do so. However, no significant improvements compared with BAU are to be expected.

- **Economic impact**

Energy efficiency improvements (e.g. adding of insulation during façade renovation) only account for part of the investment needed when renovation is carried out (alongside painting, scaffolding, renewal of roof tiles, renewal of bathrooms etc.). Energy related investments are usually 1.5 times lower than total investment needs. That is why energy efficiency measures should be carried out when general renovation is done.

Costs estimates for both types of investment are presented in the table below for Options C2a and C2b. Even the total investment needs are still a small fraction (0.03% for Option C2a and 0.01% for option C2b) of current EU GDP. The expected annual energy cost savings by 2020 exceed the total energy related investments for Option C2a, but are about 2.7 times lower for Option C2b (but would be equal for Option C2b over the whole lifetime of the measures).

Table 10. Investment needs and energy cost savings[73]

	Option C2a (cost-optimal levels)		**Option C2b** (nearly zero energy levels)	
	2020	Average 2010-2020	2020	Average 2010-2020
Additional energy related investment (bn €)	1.2	1.56	5.28	5.04
Total energy related investment (bn €)	2.64	3.48	10.56	10.2
Total investment (energy and non-energy) (bn €)	4.08	5.16	13.68	13.2
Annuities additional energy related investment (bn €)	0.96	0.48	3.24	1.56
Annuities total energy related investment (bn €)	2.16	1.2	6.48	3.12
Annuities total investment (bn €)	3.36	1.68	8.4	4.08
Energy cost savings (bn €)	4.32	1.92	8.16	3.72

With a requirement for very high performance (Option C2b), CO_2 savings would be one-third higher than with the current cost-optimal level (Option C2a), while investments would be 50% higher. The step from cost-optimum to nearly zero would therefore come with a higher lifecycle cost. However, it can be assumed that the cost optimum and nearly zero energy levels will converge up to 2020, due to better market penetration, higher energy prices, etc.

The financial requirements for Option C2c are estimated to be in the range of €2 to 4 bn per year which would cover the average annual total investment needs for the period 2010-2020. The funding could come from any source determined by the MS, such as Cohesion policy funds, national/regional/local sources, obligations related to energy savings obligations, revenues from trading with GHG emission reductions (e.g. the new PoAs under the Kyoto

[73] Based on Ibid 70, see Annex VIII for more details

Protocol[74]) and others. The burden on state budgets can be much lower than the total cost estimates because if properly designed the instruments can leverage private interments.

No detailed evaluation of the investment needs for Option C3 is available, but, as the design of the options provides that cost-effective equipment is purchased and that renovations are made to cost-optimal and not nearly zero energy levels, it can be expected that they would not be especially high compared with Option C2a. Conditionality on public spending would lead to higher investment needs, but would decrease overall costs for public organisations[75]. This is because the higher purchase prices of efficient goods and buildings are compensated by lower operating costs. Studies[76] show that the cost reduction is on average around 1% and CO_2 emissions are on average decreased by 25% when using green public procurement.

Energy performance contracting is also an important tool that could decrease the burden on public authorities. Under this performance-based form of purchasing, monetary savings from lower utility bills and maintenance costs that result from energy efficiency measures are used to cover part or all of the measures' investment costs. This model has been tried and proved cost-effective in a number of Member States[77]. Energy performance contracting is relevant for triggering renovation in public buildings and for upgrading the energy efficiency level of public infrastructure such as street lighting[78]. It is necessary for its uptake to be encouraged because in many Member States it is hampered by ambiguities in the legal framework and the lack of reliable energy consumption data to establish the baselines against which performance is measured[79].

Option C4 would not lead to significant changes in current practices and thus is expected to have a limited impact on public budgets.

- **Administrative costs**

The administrative costs – as opposed to the investment costs - of all options are not considered significant. Among the options analyzed, Option C2c would entail the highest administrative costs for the setting up of the financial and technical assistance instruments and for managing their operation. This cost would vary considerably in each MS depending on experience so far and the structure of the instruments chosen. Options C2a and C2b would require that MS collect data on publicly owned buildings and monitor the progress of their refurbishment. Such data are readily available to the public administration and will not be a burden for them to collect and monitor. MS will have to report their progress once a year to the Commission which can be as part of their NRP thus not adding an additional burden. Option C3 uses current labelling schemes and thus neither public authorities nor bidding companies would need to carry out additional calculations. The monitoring that the

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74 From 2007 new Programmes of Activities (PoAs) can be registered as CDM or JI projects. A PoA is a programme that can comprise multiple and combined emission reduction activities or projects. By aggregating the combined emission reductions of the different participants in the programme, it gives small and dispersed activities and projects that would be too small for the traditional stand-alone approach a chance to participate and profit from Certified Emission Reduction or Emission Reduction Unit revenues.

75 PWC, Significant and Ecofys (2009) Collection of statistical information on Green Public Procurement in the EU

76 Ibid 75

77 Including Denmark, France and Germany

78 In 2005, street lighting consumed 36 TWh of electricity. See http://ec.europa.eu/governance/impact/ia_carried_out/docs/ia_2009/sec_2009_0324_en.pdf

79 COM(2011) 109 final

requirements are followed in the public tenders will be carried out by the market players themselves. Option C4 is voluntary in nature and would not lead to significant administrative burden.

- **Social impact**

Increased activity in the construction sector would have an impact on job creation and retention. The direct employment effects of options C2a and C2b are summarised in the table below. The impact of Option C2c would be in the range of those of Options C2a and C2b. For Option C3 the employment impacts would be higher but of the same order of magnitude, because the main driver for more jobs would be measures applied for increased energy performance of public buildings. The impact of option C4 on employment would be insignificant.

Table 11. Job creation[80]

	Option C2a (cost-optimal levels)	**Option C2b** (nearly zero energy levels)
Jobs created and maintained due to additional energy-related investment, average 2010-2020	6 840	10 200
Jobs created and maintained due to total investment, average 2010-2020	15 720	23 640
Jobs created and maintained due to total investments (energy and non-energy), average 2010-2020	23 520	35 400

Because of the need for dramatic reductions of emissions from the buildings sector if the 2050 greenhouse gas objective is to be met, and the consequent need for sustained high renovation rates, it can be expected that the employment impacts will be sustained over the long term.

Option C3 would also have a positive impact for people living in publicly owned social housing, because new investments would mean lower energy costs in the long run.

- **Environmental impact**

The CO_2 emission reductions forecast in 2020 are presented in the table below[81]. Like the impacts on energy consumption, the highest reductions will come from option C3, followed by C2(b, c and a), while the lowest would be C4.

Table 12. Impact on CO_2 emission reductions in 2020 (Mt)[82]

	CO_2 emission reductions in 2020 (Mt)
Option C2a (cost-optimal levels)	9.2
Option C2b (nearly zero energy levels)	20.0
Option C2c (financial and technical assistance instruments)	14.7
Option C3 (EE criteria in public spending)	12.8-25.7
Option C4 (voluntary provisions)	Higher than BAU but smaller than C2a

Options related to metering and billing (Options C5 and C6)

Metering and billing can enable consumers to rationalise their energy use. In the short term, the more clearly people can link consumption to specific appliances and activities, the more obvious it is to them how behaviour patterns affect the size of the energy bill. In the longer

80 Based on Ibid 70, 71, see Annex VIII for more details

81 The conversion factor used for the residential and commercial sector is 1.35 Mt per 1 Mtoe

82 Based on Ibid 70, 71, see Annex VIII for more details

term, such feedback can demonstrate the benefits of better insulation and more careful use of timers and thermostats, or the energy cost of new equipment or increased living space[83].

The impact of the options is based on analysis of a number of literature sources.

- **Impact on energy consumption**

The measures in options C5 and C6 are expected to generate significant energy savings in generation, in transmission/distribution and in end-use consumption. The majority of the savings can be expected in end-use consumption of electricity, gas and centralised heat. However, the options will also enable savings in generation due to shifting peak demand to the base loads where more energy-efficient generation capacity can be used[84]. The peak shaving and better grid management enabled by bi-directional meters and better response from consumers will allow the reduction of distribution and transmission losses[85].

Summary of the estimated impacts on energy savings of options C5/C6

	Option C5			**Option C6**		
	Total	*Electricity and gas*	*Heat*	Total	*Electricity and gas*	*Heat*
Primary energy savings in generation (Mtoe)	1.5	0.5	1	0	0	0
Primary energy savings in transmission/distribution (Mtoe)	1-1.5	0.5-1	0.5	0	0	0
Primary energy savings in end-use consumption (Mtoe)	78-89	69	9-20	8-9	7	1 – 2
TOTAL (rounded)	**80-92**	**70**	**10-20**	**8-9**	**7**	**1 – 2**

Studies show that at EU level, improved **metering and billing of centralised heat** could lead to up to ca. **9-20 Mtoe** of primary energy savings[86]. Advanced electricity and/or gas meters could lead to a reduction of energy use of up to 10%[87], which would translate into ca. **69 Mtoe.** Some pilot projects suggest that the number could be even higher[88]. Further, in-home displays (IHD) have been reported (Darby 2010) to result in 5-15% final energy savings in pilot experiments. IHDs provide direct feedback to customers, who can directly observe the consequences of their behaviour. However, trials with smart meters equipped with in-home

83 Fischer, C (2008) Feedback on household electricity consumption: a tool for saving energy. Energy Efficiency 1(1), 79-104

84 E.g. combined heat and power with overall efficiency over 80-90% rather than simple open gas turbines with efficiency ca. 35%

85 In the USA it has been estimated that this could reach 1-2% (M.Jung, P.Yeung, Connecting Smart Grid and Climate Change, Silver Springs Networks http://www.silverspringnet.com/pdfs/SSN_WP_ConnectingSmartGrid-1109.pdf)

86 Eurostat data and Euroheat&Power statistics 2007 (http://www.euroheat.org/Statistics-69.aspx): (final heat delivered by district heating to residential buildings in 2007 was around 30 Mtoe, average efficiency ca. 70-80%; projection of PRIMES 2009 business-as-usual is that in 2020 the demand for heat from DHP/CHP might increase to 75 Mtoe final)

87 Vincenzo Cannatelli, ENEL Telegestore Project is on Track, page 4. Available at: http://www.greey.ca/RelatedFiles/1/ENEL%20Telegestore%20Project%20IS%20ON%20TRACK.pdf

88 In the UK, the AlertMe project allows customers to turn off appliances by web interface or mobile, and in 8 months residents have saved roughly 40% of their electricity; in Spain, the forecasts developed by the GAD project show that a usual consumer could save 15% of his total energy consumption; in the US Smart Grid City, a pilot project to understand the potential impacts of a range of 'smart grid' technologies including OpenGrid software which allowed two- way communications on the grid and led to a 90% reduction in voltage problems which in turn reduced overall power requirements by 3-5% in a city of 100,000 people.

displays in the Netherlands show that consumers who returned their in-home displays after a few months tended to return to their original consumption levels[89]. It is therefore important that introduction of smart meters is supported by improved billing synchronised with the information provided by the meter. Experiments with monthly or bimonthly billing report savings in the range of 0-10%[90].

It is thus estimated that the introduction of stricter obligations on metering and billing would have the potential to lead to primary energy savings of the order of **80-92 Mtoe**. In the absence of widespread roll-out it is however difficult to make a firm prediction concerning the proportion of this potential that would in fact be realised. In Option C6, by contrast, the voluntary approach is likely to have a limited added value compared to the business-as-usual.

- **Economic impacts**

The roll-out of intelligent meters for electricity is already assumed by Directive 2009/72/EC. Where roll-out of smart meters is assessed positively by the Member States, at least 80 % of consumers are supposed to be equipped with intelligent metering systems by 2020, possibly reaching 100% in 2022. The roll-out of gas meters is assumed by Directive 2009/73/EC, according to which MS must ensure the implementation of intelligent metering systems that assist the active participation of consumers in the gas supply market. However, the time horizon for the roll-out of intelligent meters for natural gas has not been set by the EU legislation. As regards improved metering of individual consumption of heat and hot water, so far there has been no EU legislation that would set a time horizon.

In general, according to the existing EU legislation, the tempo of deployment of intelligent meters is up to MS. In principle, accelerated deployment of meters over a short period of time would increase the need for skilled installers and lead to a general increase of costs related to training installers. However, experience of some MS shows that deployment can be done in a short period of time if combined with a requirement for frequent billing for actual energy consumption[91]. The optimal speed of the roll-out will depend on the specific situation of a given MS (e.g. capability of energy companies to put in place upfront investments in the smart metering system). However, it is important that the critical conditions for empowering consumers to rationalise energy consumption using advanced metering and billing are introduced as soon as possible in order to ensure that the roll-out of intelligent meters does not lead to stranded investments.

As regards the requirement for frequent individual billing based on actual consumption, this needs replacement of individual meters. In a short term, the purpose of collecting accurate data on individual consumption could be solved through self-reading, provided that the meter is equipped with a suitable display.

In many countries, the individual consumption of centralised heat in multi-apartment buildings is often not accurately measured at all. Instead forecasts often with flat rates per m^2 of heated space are used. In such cases, setting early deadlines for the introduction of frequent

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89 van Dam, SS, Bakker, CA and van Hal, JDM: Home energy monitors: impact over the medium-term. Building Research and Information 38 (5), 458-469

90 Darby S, 2010, Literature review for the Energy Demand Research Project Environmental Change Institute, University of Oxford

91 E.g. in Sweden almost all meters have been replaced within 2 years when the requirement for monthly billing based on actual consumption was introduced

billing based on actual consumption will require quick deployment of individual heat meters and electronic heat cost allocators. Since local district heating companies have limited own resources for new investments and local residents may not always be financially capable of paying for such upfront investments, such a roll-out may require additional public support. In such a case, it would be reasonable that the deadline for the introduction of frequent (e.g. monthly) billing of individual consumption of centralised heat is 2-3 years longer than in case of billing of individual consumption of electricity or natural gas.

Under Option C5, ensuring that the new advanced **electricity/gas** meter is bi-directional electricity/gas rather than one-way black-box type (as the current legal provisions could be interpreted) would increase the cost of the meter on average by ca. €50-100. The introduction of an obligation to provide an in-home display integrated in an advanced meter would result in an increase of capital cost by ca. €15-20 per meter. It can be assumed that installation costs would be the same as in the case of smart meters not equipped with an in-home display. Electronic **heat** allocators cost €10-25 for each radiator. More expensive models allow more accurate readings. The cost for heat allocators with evaporation agent is lower. Most accurate are individual heat meters (€120-300) with more expensive models ready for remote reading.

In option C6, the costs of the preparation of common guidelines and facilitation of dissemination of good practice with advanced metering and billing would be small. Assuming that the voluntary measures would lead to ca. 10% uptake of advanced metering, the total cost of this option would be more or less 9 times lower than that of option C5.

With systems fully integrated with advanced metering, switching to more frequent billing would not increase costs except for printing and postage. Introduction of electronic billing even with relatively small uptake of such services could even result in reduced costs that could be shared between the supplier and the consumer.

Direct financial benefits to consumers would come from a reduction in overall energy consumption.[92] The scale of saving would depend on the share of final energy consumption compared to fixed components of the energy bill. Other benefits would come from avoided costs of home visits for manual meter reading[93] and reduced costs related to handling complaints and requests from customers for the clarification of billing[94]. An important benefit will come from enabling the consumer to more easily participate in the local generation of energy (introduction of micro-CHP, integration of photovoltaic power, etc).

Suppliers would benefit from lower costs for remote switching and disconnection, debt management, and theft of energy and it is also likely that they would sell new energy products and services as a result of smart meters [95]. Furthermore, the introduction of metering would result in cost savings due to reduced losses in transmission and distribution[96]. Electricity generators would benefit from reduced demand for peak generation. As a simple example,

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92 Impact assessment of a GB-wide smart meter roll out for the domestic sector (final), DECC, 2009

93 Ibid 92. In the UK, it was assumed that on average reducing home visits would bring GBP 6 of saving annually per meter.

94 Ibid 92. In the UK annual savings due to reduced need for call centres were estimated to be ca. GBP 3 per meter.

95 Ibid 92. The benefit to suppliers in the UK was estimated to be ca. £100 million annually

96 Ibid 92. In the UK, this has been calculated as £0,5 per electricity meter and £0,1 per gas meter.

assuming that 7 GW working 9 peak hours per year at $10 000/MWh are replaced by power at $1 000/MWh, the annual savings for the system are €410 million[97].

Due to expected lower uptake of advanced meters and improved billing, the economic benefits of the measures in option C6 would be lower than in the case of option C5.

- **Administrative burden**

In general, introduction of advanced metering and improved billing of individual energy consumption will significantly reduce administrative burdens (substantial decrease of complaints related to inaccurate metering and billing, significant decrease of costs of billing due to electronic remote recording of consumption, decrease of postage costs due to introduction of electronic billing, etc). Also the administrative burden will be reduced for the public institutions dealing with complaints from citizens (national courts, ombudsman offices, consumers associations, European Commission, etc).

- **Environmental impact**

Reduction of final consumption of electricity/gas by 10% and heat by 20% would result in a significant reduction of emissions of greenhouses gases. Additional environmental benefits would come from enabling peak shaving in generation of electricity and heat as well as improved management and reduction of losses in transmission and distribution of electricity, gas and centralised heat. Elimination of the use of imprecise evaporating heat allocators would reduce the chemical waste and environmental pollution from the production of chemical agents used in such devices[98]. Increased frequency of billing would have no major environmental impact as the probably-resulting wider introduction of electronic billing of energy consumption would result in lower use of paper (for printing and posting the billing).

- **Social impacts**

A key social impact of improved metering and billing is that individual consumers will be effectively empowered to control their own energy consumption. Greater consumer awareness of the links between their behaviour, their energy consumption and the amount they pay will eventually strengthen consumers' position vis a vis energy suppliers.

The roll-out of advanced meters is already required by Directive 2009/72/EC and therefore installing better advanced meters would not lead to additional job effects. It can also be assumed that due to improved clarity of billing, the number of people employed by suppliers in call centres dealing with requests for information and complaints would be reduced. However, the need for telephone helplines to assist in the introduction of smart meters and the activation of services related to energy advice to consumers would probably compensate the reduction of employment in call centres dealing with complaints.

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97 Empowering electricity customers: Customers choice and demand response in competitive markets, IEA report (draft), 2011. Generation costs of an OCGT operating for only 9 hours per year, corresponding to a 0.1% capacity factor, is approximately $/MWh 10 000 (IEA, 2007). If it was possible to expand the prospects for demand response to 5% of peak load in a price range between $/MWh 1 000 and 10 000, the prospects for savings and making the electricity system more robust would improve considerably.

98 E.g. many evaporating heat allocators used especially in Eastern Europe use methyl p-hydroxybenzoate, which can cause allergies and may produce a lasting bad smell in case of accidental damage of such heat allocator

As regards metering and billing of centralised heating, it is estimated that 800 to 2600 people might be needed to read HCAs for every million flats. Billing service companies deal with this seasonal peak by employing temporary personnel and cooperating with external companies.[99]

Other impacts on consumers

Access to heat metering and controls and consumption-based billing is important for poorer consumers, since it gives them the opportunity to control the amount of money they spend for heating. Another important social impact is related to reduced intrusiveness of metering and billing. In particular metering of heat consumption can be troublesome as it requires readers to enter apartments and visit all rooms with radiators. From this point of view, advanced remote reading meters for heat consumption would pose no problems. The impact of introducing consumer-friendly metering will be positive as regards improving thermal comfort in housing.

Options related to energy audits and management in industry

Possibilities to save energy are difficult to assess for energy users. Assessment often requires specialized expertise. **Energy audits** provide an evaluation in the form of a study that identifies cost-effective saving potentials and measures to realise them. Audits raise awareness of savings potential and reduce the information gap that is one of the barriers to efficiency. Access to energy audits is thus the basis for realising cost-effective energy saving potentials. Audits are also the basis for the development of a market for energy services. Audits show saving possibilities without the proposed saving measures automatically being executed. **Energy management systems** (EMS) incorporate regular energy audits, the preparation and implementation of action plans and monitoring of impacts.

The impacts of options C7 and C8 were modelled using the E3ME model. It was assumed that energy audits were combined with energy management systems.

- **Impact on energy consumption**

Option C7 would introduce a policy driver for companies larger then SMEs, in the industrial and services sectors to use audits and energy management. Option C8 would be voluntary in nature.

Experience shows that all sizes of organisation require some form of focussed professional support with energy efficiency. Energy Audits programmes implemented in European countries [100] have shown that energy audits result in important energy saving possibilities being identified even in the energy intensive businesses which have the most experience and knowledge about energy. This particularly the case for businesses where energy is not a cost driver and energy efficiency is not considered core business.

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99 Heat Metering and Billing, Technical Options, Policies and Regulations, World Bank, 2002 (www.worldbank.org.cn/english/content/heat.pdf)

100 Energy audit program implemented under an EBRD performed industrial energy audits in, inter alia, Bulgaria, Romania. Audits resulted in financially viable measures, such the utilization of surplus heat from a nearby factory; switching from heavy fuel oil to natural gas, installation of cogeneration facility, utilization of geothermal energy, heat recovery from fluid gases and other measures. Audits identified energy efficiency improvement possibilities at such energy savvy companies as Stora Enso, a leading paper and pulp company in Sweden.

Audits generally identify the main uses of energy. It reviews energy bills and supply arrangements. It assesses the adequacy of monitoring and measurement of energy consumption and the supply of energy, including their accuracy. It includes an energy balance of the relevant aspects of the company's operations. It evaluates the extent to which the implementation of new energy sources (such as on-site co-generation) is appropriate. It also assesses performance in relation to current best practice in comparable businesses, followed by specific recommendations, where necessary, on how best practice can be achieved. Energy audits are a first step toward a sound energy management system and ensure that energy awareness occupies a prominent position among company managements and employees. If implemented properly, the returns from energy efficiency audits can be very high.

57% of the final energy consumption of the industrial sector will be attributable to energy-intensive industry in 2020, while the share of medium energy users will be 34%; SMEs will consume only 9% of the total. It is assumed that 95%, 90% and 80% of energy-intensive, medium energy user and SME companies, respectively, are suitable for applying energy audits. The scope for new savings from energy audits is further reduced by already implemented audits due to national policies that make audits a requirement as part of Voluntary Agreements, benchmarking and subsidy schemes.[101]

Given the deployment of audits or EMS and given amounts of saving potentials, the crucial factor for realizing savings is the follow-up of the audit, whether stand alone or part of EMS. Here it is assumed that there is either no supporting policy at all (min-case, 10-20% follow-up) or full support (max case, 80-90% follow-up). In the minimum case the audit has shown the possibilities for savings but all other factors and barriers, such as lack of capital or perceived risks, remain present. Therefore, it is assumed that only a small fraction of the audit suggestions is followed up. In case of support for the follow-up actions many more suggestions from the audit are assumed to be followed (as reported in the monitoring of the Finnish audit schemes, where subsidy is given for follow-up investments). For EMS the follow-up rate of the audit is assumed to be somewhat higher than for audits alone due to its structural character and organizational embedding.

Resulting savings

Under the assumptions set out above, extra savings in the range between about 0.4% and 5.0% of total industrial energy consumption are realised in 2020. The minimum and maximum turn out to be almost the same for both audits and EMS. The maximum applies in cases with a low present level of audits and full support for implementation of audit proposals. The minimum describes a situation with many audits already being done due to current policy and no support for implementation. A more balanced set of assumptions would result in about 3% savings in 2020; in the longer run the figures would be 50% higher. As shown in the tables below, option C7 would lead to from 8.8 to 19.4 Mtoe (if EMS is

[101] Many companies have already done audits due to policies such as Voluntary Agreements, benchmarking and subsidy schemes. An audit is mandatory for enterprises with bills (UK) or use above a threshold (Bulgaria, Czech Republic), or for candidates applying for financing schemes (Austria, Germany, Czech Republic). In Finland and the Netherlands energy audits are part of VA. In the Swedish PFE program for electricity savings all industrial companies must have a certified EMS in 2 years after joining the program [Programme for improving energy efficiency in industry (PFE), SEA, 2007] It is assumed that they do not have to do an audit again or, if they have to do it anyway, it will not provide new information leading to extra saving measures. The fraction with already executed audits is uncertain but highly important, therefore it is varied. E-intensive companies will have the largest fraction (40-70%) and SME the smallest (10-20%).

implemented) final energy use reduction or 13.2 to 29.1 Mtoe primary energy reduction compared to BAU while Option C8 would have a lower impact on energy consumption.

Table 13. Energy savings of Option C7

Final energy consumption by categories of industry (ktoe)*	2015		2020		2025		2030	
E-intensive	185237		186414		184557		183575	
Medium	106589		110625		113832		116458	
SME	29812		31136		32253		33207	
Total	321638		328175		330641		333239	
Potential scope audits/EMS (ktoe)	2015		2020		2025		2030	
Audits**	max	min	max	min	max	min	max	min
E-intensive	175976	52793	177094	53128	175329	52599	174396	52319
Medium	95930	57558	99563	59738	102449	61469	104812	62887
SME	23850	19080	24909	19927	25802	20642	26566	21252
Total	295755	129430	301565	132793	303580	134710	305773	136458
Fraction total energy	92%	44%	92%	44%	92%	44%	92%	45%
EMS (incl. audits)***	max	min	max	min	max	min	max	min
E-intensive	185237	55571	186414	55924	184557	55367	183575	55072
Medium	53294	31977	55313	33188	56916	34150	58229	34937
SME	0	0	0	0	0	0	0	0
Total	238532	87548	241727	89112	241473	89517	241803	90010
Fraction total energy	74%	37%	74%	37%	73%	37%	73%	37%

Notes:
*For 2020, E-intensive industry is 57%, Medium industry is 34% and SME is 9%. (Based on Primes EE)
**Eligible fraction audits: E-intensive industry 0.95, Medium 0.9, SMEs 0.8. E-intensive industry Already audited 70%, Medium VA, BM, ETS, subsidy schemes, etc. 40%, SMEs VA, subsidy schemes, etc. 20%; E-intensive industry Minimum case 40%, Medium VA, BM, ETS, subsidy schemes, etc. 20%, SMEs VA, subsidy schemes, etc. 10%.
***Eligible fraction EMS: E-intensive industry 1.0, Medium 0.5, SMEs 0.0; E-intensive industry Already audited 70%, Medium VA, BM, ETS, subsidy schemes, etc. 40%, SMEs VA, subsidy schemes, etc. 20%; E-intensive industry Minimum case 40%, Medium VA, BM, ETS, subsidy schemes, etc. 20%, SMEs VA, subsidy schemes, etc. 10%.**

Source: E3ME, Cambridge Econometrics.

Table 14. Energy savings of Option C7

Savings mandatory audits/EMS for given follow-up (ktoe)	2015	2020	2025	2030
Audits (incl. part good housekeeping)*				
E-intensive	2534	3825	5049	6278
Medium	3108	5018	7008	9056
SME	1272	1860	2477	2550
Total	6914	10703	14534	17884
Fraction total energy use	2.1%	3.26%	4.4%	5.4%
EMS (incl. good housekeeping)**				
E-intensive	3834	5201	6478	7765
Medium	2398	3485	4610	5765
Total	6233	8686	11088	13530
Fraction total energy use	1.9%	2.65%	3.4%	4.1%

Note: *Audits follow-up E-intensive 80%, Medium 80%, SMEs 80%; % (No support: E-intensive 10%, Medium 10%, SMEs 10%).**EMS follow-up E-intensive 90%, Medium 90%, SMEs 90% (No support: E-intensive 20%, Medium 20%, SMEs 20%);

Source: E3ME, Cambridge Econometrics.

- **Economic impact**

The cost of audits depends on the scale of energy use and the type of audits. The audits generally consist of an on-site visit by an energy auditor and the writing of a report identifying where energy can be saved. This type can be implemented regularly (survey and analysis) and as part of EMS.

For a mid-sized company (260 employees, annual turnover of 50 million EUR), e.g. a meat factory or a tool maker, this would mean a 4 days visit costing 500 EUR/day and preparing a report for an additional 2000 EUR for a total cost of 4000 EUR. An average company spends around 2-4% of its turnover on energy. A typical audit results in saving 20% of the energy bill. 10% of this savings can be achieved with good housekeeping without any real investment (changing lighting or behaviour), while 10% can be realised with an investment of 2-3 year pay-back time. If the company invests in energy efficiency measures with 5 year pay-back time, the saving achievable is generally 30%. As a result of this, a company that spends 2 million EUR on its energy bill could save 400000 EUR on energy bills for a cost of 4000 EUR for energy audit. The energy saving achieves an additional 10% in profits (sales would normally need to increase by around 40% to achieve this).This demonstrates that energy audits not only pay for themselves, but produce profits.

If the audits are of such quality that investment decisions can be based on them, the cost will be much larger for large complex projects (e.g. a chemical plant) then for a SME with a set of standard saving options (ventilation, compressed air, etc.). For investment grade audits the costs can run into hundreds of thousands of euro but the potential savings are also large. Therefore the costs should be related to total investments or total savings. Audit costs will increase in absolute terms with the scale of energy use in question, but will decrease in terms of cost per saved unit.

The costs of acting on the information can vary a great deal depending on the changes in behaviour which arise. These can vary from fairly costless actions, e.g. turning lights off, to expensive actions such as investment in buildings. Here we make the assumption that in the case of saving options that are not profitable enough to be done automatically, financial support is available. Therefore, the pay-back time is always acceptable and the extra costs of follow-up measures are zero.

The total costs for society for medium sized industry could be rather low (for example about 0.2 Euro/GJ (yearly saved) in case of the Finnish audit system)[102]. With usual gas prices a GJ saved delivers 5 Euro and the audit costs decrease the profits by about 4%. In energy intensive industries, the audit costs per GJ saved can be assumed to be a factor of 10 lower than for medium-sized companies. For a company using 20PJ this results, using the same reasoning, in audit costs of 60000 Euro. In this sector cost however will be very specific and project based.

A best practice case from a large scale energy efficiency programme in Sweden indicates savings achieved per EUR in the range of 86-195 kWh/EUR in industrial companies and 8-15 kWh/EUR for service sector companies.[103].

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102 Based on results of the Finnish audit system evaluation (2006).

103 P. Thollander, P. Rohdin Cost-Effectiveness of Energy Programs involving Energy Audits – Results from Sweden, IEPEC 2010, Paris

Regular energy audits can point to larger saving measures that need specific technical solutions and specific investment (process improvements, replacement of energy systems. The cots of these project specific audits are often defined as percentage (around 1-1.5%) of the total project cost[104]. This type of audits (investment grade audit) would be freely implemented based on the decision by the management, in line of the business strategy of the company.

Given the high audit costs for SME and there is a need for financial support in this sector, the option of mandatory audit for SME was not retained.

- **Administrative cost**

They would be the same in both C7 and C8 for companies implementing the measure. Companies already implementing the European Energy Management standard (EN 16001) would not incur additional administrative cost. Companies implementing other European or international standards on Environmental Management (ISO 14001), Quality Management (ISO 9001) or other systems would have a small adaption cost. There would be some additional costs for those companies that at present do not have a comparable system in place. The size of this human resource would depend on the size and complexity of the company. It can range from a part time post to several persons. The implementation of the measures recommended by audits would require investment, the scale of which would again depend on the size and complexity of the organisation's systems. Since the aim of energy audit and management systems is to identify *cost-effective* saving measures, the administrative cost would be expected to be covered by the benefits from the energy savings.

- **Environmental and social impact**

The reductions in energy consumption achieved with option C7 are estimated to translate into 32-58 Mt of CO_2 emission reductions. Under option C8, only a fraction of this would be realised. It can be expected that Option C7 would have a positive, but small, impact on employment.

Options related to support for the ESCO market

Recent studies[105] suggest that even in well established ESCO markets, transaction costs are too high for potential customers to easily assess the available service offer[106]. A governmental body could act as market facilitator, increasing market transparency by listing available energy service offers, displaying quality labels, performing quality checks and providing model contracts and advice.

The analysis is based on a number of literature sources.

- **Economic impact, impact on energy consumption**

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104 An example is a 765,000 EUR investment project with an audit could cost of 9,562 EUR (meat processing factory). The annual energy saving identified was 207,000 EUR resulting in a pay-back time of 3.7 year.

105 JRC (2010), Prognos (2010), European Parliament's report "EU Energy Efficiency Policy – Achievements and Outlook, IP/A/ITRE/ST/2010-02 & 03, December 2010

106 IEE project: ChangeBest, Fresh, ClearSupport

Feedback from the mid-term evaluation questionnaires[107], the summary documents for the Bucharest Forum's working group on the role of energy companies[108], projects on the markets for energy services undertaken in the framework of the Intelligent Energy Europe Programme[109] and relevant workshops[110] conclude that the high transaction costs of implementing energy services need to be lowered. Option C9 can cut transaction costs through government action to increase market transparency, increase credibility through quality checks and address legal barriers.

The full economic potential of the energy services market by 2020 is estimated at €25 billion [111]. Lowering transaction costs would increase the proportion of this potential that is reaped. It would give householders and firms the confidence to undertake investments with longer payback times. For the purposes of analysis it is assumed that the payback times judged acceptable would increase, under option C9, by two years. According to preliminary findings of the ChangeBest project[112], the potential yearly energy service volume in EU households could represent 194 M€/year when implementing contracts of 3 year payback times. With 8 year contracts, the market could increase to 1600 M€ per year. It follows that a two year increase in payback times would increase investment in energy efficiency by 500-600 M€ per year in the household sector. A similar calculation for the tertiary sector gives an increase in investment of 150-200 M€ per year.

Option C10 could be expected to have a significantly lower impact, because it does not address the main cause of low take-up of energy services: high transaction costs.

Both options can be expected to have a positive effect on SMEs. This effect under option C10 stays very general (overall demand pull for energy services, regardless who provides this). On the contrary, the visibility of often local small and medium sized energy providers will be increased. By this, they will have a level playing field and in some cases even a competitive advantage against big service providers or established utilities working on the energy services market. Currently, it is often the case that only the energy service offers from the utilities are known to the customers as these are marketed together with the electricity or gas bill. Increasing the visibility, increasing the trust in independent offers and highlighting the competitive advantages of other service providers will consequently strongly support smaller service providers. Experience gathered in Denmark, Germany and Italy, where initiatives were undertaken to increase small energy service providers' visibility support this argument.

- **Administrative costs**

For both options, additional administrative costs in comparison to the base scenario C1 will emerge. In order to turn voluntary agreements (D10) into a credible instrument, several rounds of coordination and independent monitoring needs to be foreseen. Turning to C9, the tasks attributed to the government body imply administrative burdens in terms of staff

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107 See Annex XIII

108 eceee (2011) Briefing for DG Energy, EU Experience of Energy Efficiency Obligations/White Certificates & their Importance in Meeting Climate Change Challenges.

109 The IEE projects PROMETHEUS, http://www.prometheus-iee.eu; FRESH, http://www.fresh-project.eu; PERMANENT, http://www.permanent-project.eu; EESI, http://www.european-energy-service-initiative.net; CHANGEBEST, http://www.changebest.eu; MINUS 3%, http://www.minus3.org.

110 IEE contractors' meeting "Boosting the energy services market in Europe" 23 February 2011 Brussels

111 Bertoldi (2007)

112 http://www.changebest.eu

resources and additional costs. However, the additional costs can be minimised by using existing bodies to perform these tasks, for example the responsible authorities created at the demand of the present energy services Directive. The costs for creating and maintaining lists or registries of service providers can be minimised by choosing web based databases and random quality checks. In conclusion, it can be estimated that the additional administrative costs will be of a subordinate nature.

- **Social impact**

Energy services have tangible social impacts. Growing national markets will facilitate job creation. Some sources estimate that €100.000 of investment in third party finance of energy services translates into 1 man-year of employment[113]. This would imply that option C9 would create 6500-8000 jobs. As the provision of energy services demands comparatively high skills, the additional jobs are likely to be of high quality and create a demand for further training. In principle, both C9 and C10 should be able to trigger these impacts. However, as D10 will only be able to cover bigger actors, it can be estimated that its impact will be less.

- **Environmental impact**

The reduction of energy consumption has positive repercussions on CO_2 emissions. However, as with the overall energy saving impacts, no consolidated data exists. On project level, reduction achievements tend to be significant[114].

Comparing the options on further measures to realize the potential at the end-use stage

The following table summarizes the outcome of the analysis for each policy option.

Evaluation criteria / **Policy options**	**Subsidiarity/ proportionality**	**Effectiveness**	**Efficiency**	**Coherence**	**OVERALL**
Option C1: Retain the current approach	R	=	=	=	**=**
Option C2: Energy saving measures for renovation of public buildings					
C2a Introduce 3% binding target for renovation of public buildings to cost-optimal levels	R	+	++	C	**++**
C2b Introduce 3% binding target for renovation of public buildings to nearly zero energy levels	R	++	+	C	**+**
C2c: Establish a national financing and technical assistance infrastructure for renovation of public buildings	NR	++	++	C	**++**
Option C3: Obligatory use of energy efficiency as a criterion in public procurement	R	+++	++	C	**++**

[113] Vethman, Kroon (ECN) (2010), Lokaal energie- en klimaatbeleid, Aandachtspunten, valkuilen en oplossingsrichtingen uit lokale projecten in binnen- en buitenland.

[114] The Berlin Energy Saving Partnership lead to a reduction of CO_2 emissions by 25% per annum (corresponding to 16200 t CO_2). eu.bac (2011) Energy Performance Contracting in the European Union

Option C4: Voluntary measures to promote energy efficiency via public procurement	R	+/=	++	C	**++**
Option C5: Enhanced obligations for smart metering and billing by energy companies	R	++	++	C	**++**
Option C6: Voluntary measures on metering and billing	R	+/=	+	C	**+**
C7. Mandatory energy audits and energy management systems for industry	R	++	++	C	**++**
C8. Voluntary systems to promote energy audits and the use of energy management systems in industry	R	+	++	C	**+**
Option C9: Obligations for promoting ESCOs	R	+++	+++	C	**+++**
Option C10: Voluntary measures to promote ESCOs	R	+	++	C	**++**

As regards consistency with the **principles of subsidiarity and proportionality,** Options C2a, C2b and C5 impose strong obligations on Member States in an area of national competence (C2a and C2b) or are strongly prescriptive (C5) and could be considered too interventionist. However, Options C2a and C2b will contribute to the realization of the climate and energy policy objectives and, in particular, to the objective of development of energy efficiency markets that cannot be sufficiently tackled at national level. Therefore, the EU intervention can be justified. As regards Option C5, the number of complaints from citizens[115] on transparency and accuracy of metering and billing indicates that the problem has not been solved in many countries. Given this failure for a less interventionist approach to achieve the objective aimed at, a more interventionist approach is therefore compatible with the principle of subsidiarity, as is the less interventionist approach of in option C6.

The option on energy efficiency conditionality on the spending of public funds (Option C3) is in line with the principles of subsidiarity and proportionality, as it would counter the proliferation of national and local approaches that could present a barrier to competition.

At present, energy services markets across Europe work on the regional and local level. Concluding voluntary agreements (C10) or introducing lists of energy service providers and installing a governmental body to supervise ESCO markets at national level (C9) would therefore be consistent with the criterion of subsidiarity which asks for addressing a problem at the closest institutional level possible. Concerning option C9, in order to allow for cross border provision of energy service offers, national lists could be published on European level to be in line with the single market and allow for cross border exchanges of energy services.

Options C4, C8 and C10 are in line with the two principles as they are not prescriptive and give full flexibility to Member States.

Option C2c is considered not consistent with the two principles as it imposes direct spending requirement on national budgets. Therefore, even though beneficial in terms of its efficiency, effectiveness, and coherent with the current policy framework, the option is excluded from the preferred policy package.

[115] Stajnarova M, Consumers experience with billing and switching, workshop on guidelines for good practices in billing and switching, Brussels 10 February 2011: in Italy between June 2009 and May 2010 over 12,000 complaints were registered by the Italian Consumers Association on electricity billing

As regards **effectiveness,** most of the options, with the notable exception of C1 (BAU), would help reach the objective of support of the development of energy efficiency markets and would emphasize the leading role of the public sector. Options C3 and C9 would have considerable direct (i.e. higher uptake of efficient goods and buildings) and indirect (i.e. market transformation) impact and that is why their effectiveness is evaluated as high (+++). Option C2a would lead to lower savings than C3 and C9 and that is why its effectiveness is evaluated as medium (++). Options C5 and C7 would make important contributions to energy savings; however, as they function through provision of information and the implementation of savings possibilities is not mandatory their effectiveness is evaluated as medium (++). Because of the voluntary nature of Options C4, C8 and C10 and experience so far with current policies, it can be expected that they would lead to insignificant savings.

As regards **efficiency**, the highest scoring option is C9 as it would not require substantial investments but would lead to considerable savings. Options C2a and C3 are marked as medium efficient (++), as they would require increased purchase costs and a higher administrative burden, compensated by lower operating costs. Options C5 and C7 would impose costs on energy consumers and industries. These costs would be evenly distributed and low compared to the benefits and therefore the options are considered to have medium efficiency. C2b has low efficiency, as it is above the cost-effective level in the short and medium term. C4, C6 and C10 would not lead to significant costs or energy savings.

As regards **coherence with the current policy mix**, all options discussed will support the uptake of energy efficiency measures and thus the implementation of the existing legislation. Options C2 and C3 on the role of public authorities are not in line with the existing voluntary approach adopted in two Public Procurement Directives[116], the Commission's green public procurement initiative and the recast Energy Labelling Directive. However, there are already precedents of mandatory efficiency criteria in public procurement at EU level such as the Clean Vehicles Directive[117] and the Energy Star Agreement. Option C5 would supplement the current requirements on 'intelligent metering' in the internal energy market Directives.

The result of the **stakeholders' consultation** showed that regarding:

- **Obligations on the public sector:** there were many calls for an increased role of the public sector in awareness raising and promoting energy efficiency market development (i.e. 68% or 137 submissions were confirmative; 15% or 31 submissions were negative; and 15% or 31 submissions expressed no opinion). Some of the suggested mechanisms were increased renovation of public buildings, purchasing of efficient or green products and improved rules for public procurement. Some of the stakeholders wanted to make green public procurement mandatory but other raised concerns that when it is applied it seems to favour larger companies and not SMEs.

- **Awareness raising, metering, billing and audits:** the majority of stakeholders were in favour (70% or 141 submissions) of additional measures at the EU level for **raising awareness** particularly for consumers and SMEs while only 12% were against (24 submissions) and 19% (38 submissions) had no opinion in this regard. Concerning consumers and SMEs and their energy bills, **ICT solutions** were considered to be efficient.

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116 Directive 2004/18/EC and Directive 2004/17/EC permit certain environmental and social considerations to be taken into account in the procurement process but do not make them a mandatory element.

117 Directive 2009/33/EC

There were suggestions that consumers should be able to access a website or digital indicator to be aware at any time of their energy consumption allowing them to take conscious decisions on energy saving. This information needed to be accompanied by advice on how to save energy. As regards **audits**, in the stakeholder consultation for the Low-carbon economy Roadmap 2050, 44% of stakeholders expressed readiness to do an energy audit for their house or company, 21% have already done this and 36% were reluctant about the idea.

- **Energy services companies (ESCOs):** there was no specific question on **ESCOs** but ESCOs were nevertheless mentioned in a number of replies as important market players. They were often mentioned as a way to encourage the uptake of energy efficiency by SMEs. It was also mentioned that EIB lending should be made available for ESCOs.

Based on the analysis and taking into account that various views of the stakeholders, it is suggested that Options C2b, C3, C5, C7 and C9 be retained.

5.4.3. Measures to realise potential at the stage of energy transformation and distribution

Option D1: Retain the current approach

As far as **CHP** is concerned, this would mean keeping the CHP Directive without remedying the shortcomings identified in section 2.2. The lack of clear policy drive and weak harmonisation would continue to lead to different levels of ambition in implementation and deployment among Member States. The CHP Directive has proved to be ineffective in stepping up the promotion of CHP and did not prevent the erosion of the existing installed base in the most vulnerable Member States. Overall, it has not provided a clear policy framework to achieve progress in realising the national potentials. Under these conditions, although according to the PRIMES model the share of CHP is expected to improve from 11% in 2010 to 19% in 2020, in reality a much lower level of improvement seems likely. As far as the **energy efficiency of energy transformation in general** is concerned, retaining the current approach is expected to mean that average efficiency would improve from 39.1% in 2010 to 41.2% in 2020[118]. Overall, energy consumption in energy transformation and distribution is expected, under this BAU scenario, to fall – at best - from 494 Mtoe in 2010 to 464 Mtoe in 2020. This improvement depends on the unlikely rate of progress in CHP use projected by PRIMES.

[118] Primes efficient scenario; under Primes reference scenario, which better reflects the current situation, the improvement would be from 39.1% in 2010 to 39.9% in 2020, see EU Energy Trends to 2030, DG ENER 2009, http://ec.europa.eu/energy/observatory/trends_2030/doc/trends_to_2030_update_2009.pdf.

Table 15. Summary of overall economic impacts for EU27 (difference from baseline); Note: the numbers are in million €

	Baseline (option D1)			Additional effects to baseline case											
				Option D3						Option D4					
				CHP Potential			25% CHP			DHC doubled			Grid rules		
	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020
GDP (m € 2000)	10305	11415	12519	n/a	1161	1296	n/a	1717	2255	n/a	671	4150	n/a	940	64
Consumption (m € 2000)	6070	6628	7154	n/a	589	998	n/a	1034	1817	n/a	344	2774	n/a	428	114
Investment (m € 2000)	2285	2699	3176	n/a	50	-33	n/a	42	40	n/a	-91	94	n/a	26	-48
Exports (m € 2000)	3943	4913	6139	n/a	134	891	n/a	527	1813	n/a	370	2022	n/a	-31	-26
Imports (m € 2000)	3638	4562	5751	n/a	-388	560	n/a	-115	1414	n/a	-49	740	n/a	-517	-23
Consumer prices (2000 = 1.0)	1.24	1.42	1.6	n/a	0.0	0.0	n/a	0.0	0.0	n/a	0.00	0.0	n/a	0.0	0.0

Source: E3ME, Cambridge Econometrics.

Table 16. Summary of overall social impacts for EU-27 (difference from baseline)

	Baseline (option D1)			Additional effects to baseline case											
				Option D3						Option D4					
				CHP Potential			25% CHP			DHC doubled			Grid rules		
	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020	2010	2015	2020
Consumption (m € 2000)	6070	6628	7154	n/a	589	998	n/a	1034	1817	n/a	344	2774	n/a	428	114
Employment (000)	218754	226816	226894	n/a	2	6	n/a	4	13	n/a	9	45	n/a	0	1
Real household incomes (m € 2000)	6934569	7797120	8674601	n/a	985	1363	n/a	1622	2549	n/a	351	3150	n/a	739	118

Source: E3ME, Cambridge Econometrics.

Option D2: Repealing the current CHP Directive without replacement

- **Energy, economic, environmental and social impact**

The Commission's assessment is that the CHP Directive has had a small impact on CHP growth. It is anticipated that this would continue to be the case under option B1. The impact of removing the current provisions on CHP production and capacity would be – under an optimistic hypothesis - the continuation of the current low growth rate or – under a pessimistic hypothesis - a decrease (see Annex XIII). The E3ME model was used to assess the impact of these two scenarios. The results are shown in tables above. To summarise the pessimistic scenario: by 2020 there is a fall in CHP heat consumption of 1.3% compared to baseline. This causes a 1% fall in total energy consumption, due to price effects, and a 1% increase in CO_2 emissions, due to switching to gas. The macroeconomic impacts would be small.

Under the pessimistic scenario primary energy consumption would be expected to grow by about 35 Mtoe. There would be no significant economic and social impact.

Option D3: Mandatory CHP and district heating/cooling requirement for new electricity and high-heat-demand industry installations in authorisation, permitting and planning

Cogeneration makes it possible to reach 85-90% efficiency of energy production compared to the 35-45% average efficiency of the EU power plant and industrial boiler fleet. Under option D3, the authorisation of new generation capacities and the permitting of existing capacities would be made conditional on equipping new and existing plants with cogeneration units and connection to district heating and cooling networks – in both cases, provided the conditions were appropriate. The measure would ensure that the economic potential for high efficiency cogeneration (see Annex XIII) is realised in the EU. It would overcome the market barriers present on the energy market and not overcome by the EU Emissions Trading Scheme[119]. It would provide mechanisms to match heat demand with supply from waste heat produced in electricity generation, other industrial processes and waste incineration.

- **Energy and environmental impact**

It is estimated that this option would lead to the realisation of the untapped economic potential for high-efficiency CHP, yielding an additional 15-25 Mtoe[120] of primary energy savings per year in 2020 and 35-55 Mt of avoided CO_2 emissions.

Option D4: Mandatory connection and priority access of high efficiency cogeneration to the electricity grid

Under the CHP Directive, Member States must ensure that transmission and distribution of electricity from high-efficiency CHP is guaranteed. They may also give it priority access to the grid. In addition, they must ensure that TSOs give priority dispatch to electricity from

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119 The lack of effectiveness of ETS in overcoming CHP barriers stems from low and volatile price signals and the complexity of CHP requiring a competitive presence on both heat and electricity markets. It has been estimated that CO_2 prices of around €74 per tonne would be needed to trigger investment in new large CHP generation. The cost of carbon would need to be even higher for small distributed CHP. An analysis of this issue is provided in Annex X.

120 Some of this potential is already included in PRIMES 2009 energy efficiency scenario. The mid-term evaluation of the CHP Directive showed, however, that this scenario would not in reality be fully realized as regards CHP under existing policies and measures, and thus it is included in the analysis.

high-efficiency CHP. These rights are all conditional on the reliability and safety of the grid being maintained. Member States are also required to put in place transparent, objective and non-discriminatory rules for the sharing and bearing of various grid investment costs as well as to ensure that the charging of transmission and distribution fees does not discriminate against electricity from high-efficiency CHP. The evidence[121] is that even with these provisions, substantial problems remain. Network connection rules, procedures and charging cause delays and have a constraining effect on the deployment of cogeneration. These administrative procedures and charges have been identified by stakeholders and studies as hampering the growth of cogeneration. Option D4 aims to address these problems by strengthening network connection and access rules, providing for mandatory connection to the network and priority access for high-efficiency CHP.

- **Energy, economic, environmental and social impact**

The measure would remove barriers and limitations to CHP expansion. The E3ME model was used to translate this into an increase in the supply of heat from CHP. The overall increase at EU level is small, reflecting the share of the sector in the EU economy (see Annex XIII). In the light of this, it is not surprising that the expected macroeconomic impacts are too small to discern (see table 20). CO_2 emissions are expected to fall – though again, only by a small amount. The measure would contribute to the realisation of the economic potential of CHP, and most of the savings are therefore already accounted for under option E3.

Option D5: Voluntary measures to promote CHP and district heating and cooling

Dedicated forums to exchange best practice could be a useful tool for promoting CHP and District Heating and Cooling (DHC). Both CHP and DHC are complex solutions that require specialised expertise in technology, energy and environmental regulations, project management and financial planning, spatial planning and building regulations, trading and industrial processes. These aspects could be addressed in dedicated forums, taking into account the different economics and requirements of the different CHP and DHC sectors, such as industrial CHP, micro-CHP, District Heating and District Cooling , etc.

- **Energy, economic, environmental and social impact**

An EU forum would raise the profile of CHP and DHC, raise awareness of the benefits, send signals and attract investors to the sectors. It would therefore positively affect the development of CHP and DHC. However, given that the Covenant of Mayor already organises those actors, i.e. cities, that can do the most for DHC, the niche an EU forum could cover is already partially occupied. In addition, the persistent and complex barriers to CHP and DHC make a voluntary approach less effective in ensuring that the significant energy saving and efficiency improvement potentials of DHC and CHP are developed. Therefore the positive impact of this option appears to be limited in comparison with Option D3.

Option D6: Minimum performance requirements for energy generation

Under option D6 it is assumed that the efficiency of all new plants and the majority of existing plants would be raised, through the setting of authorisation and permit conditions, to

[121] JRC, progress report, 2011; ECN-CN background study, 2011

BAT levels, and that as a result, average generation efficiency would reach 51.5% in 2020[122]. For more details refer to Annex XI.

- **Energy, economic, environmental and social impact**

Compared to BAU, option D6 would reduce EU energy consumption by 77 Mtoe (if upper values for BAT were achieved – an optimistic hypothesis) or 62 Mtoe (if lower values were achieved – a pessimistic hypothesis). This would lead to a reduction in annual consumption of 15 billion m^3 of natural gas and 25 Mt of coal in 2020. There would be positive environmental impacts: under the pessimistic hypothesis, an emissions reduction of 124 Mt CO_2[123].

The use of the energy efficiency BAT by operators would result in compliance costs which can be, in certain cases, large. However, BAT is defined at a level that provides economically viable solutions with a balance between costs and benefits. Cost would be one-off investment costs offset by productivity gains and cost savings. For national authorities there would be an additional administrative cost from developing expertise, measurement and monitoring and enforcement mechanisms for the application of energy efficiency criteria beyond current authorisation practices. Operators would also have small additional administrative costs due to the need to complement the current authorisation and permit applications with energy efficiency information. Therefore, this would not pose a significant administrative burden in addition to that of the ETS.

Option D6 would lead over time to lower consumer prices for electricity and heat and to lower price volatility and higher security of supply.

Option D7: Energy efficiency obligation on energy network regulators

Energy network operators play a decisive role in defining what type of energy efficiency improvement measures energy suppliers and energy services companies can offer, and what actions consumers can take to rationalise their energy consumption. They have a decisive role in integrating distributed energy resources[124] to the grid, such as distributed generation[125], demand bidding and energy storage[126] and in allowing demand response[127]. Demand response requires that DSOs offer network system services to energy suppliers and energy service providers (such as ESCOs) to allow consumers to regulate their consumption. The tools for demand response are direct and indirect load control, via intelligence appliances with control functions. An essential element of demand response is dynamic pricing, where the energy price charged to the customers can vary significantly according to the time (e.g. time of use

122 Assuming a fossil fuel generation mix of 49% coal/lignite, 45% natural gas and 6% other fossil fuel.

123 Assuming a 0.385 conversion factor per MWh for coal/lignite and 0.231 for natural gas.

124 Distributed energy resources (DER) is a common term for distributed generation, energy storage and flexible loads connected to the distribution or transmission network.

125 Distributed generation (below 50 MW) is low capacity generation connected to the distribution or transmission network, including renewable sources and combined heat and power.

126 Electricity storage is used to decouple the timing of generation and consumption of electrical energy. A typical application is load levelling, which involves the charging of storage when energy cost is low and use as needed. This would also enable consumers to be grid independent for many hours. Heat storage can be used to decouple electricity generation from a CHP unit and its associated heat consumptions.

127 Demand response (DR) is a programme or activity designed to encourage customers to change their electricity usage patterns, including timing and level of electricity demand. DR includes time-of-use and dynamic rates or pricing, reliability programs such as direct load control of devices and interruptible load and other market options for demand changes (like demand side bidding).

tariffs, peak pricing, real-time pricing) and location of the electricity consumed[128]. For more details refer to Annex XI.

- **Energy, economic, environmental and social impact**

Network regulation better reflecting energy efficiency performance criteria would allow three categories of network service to be put in place:

(1) savings from demand response: enabling consumers to actively manage energy use and price signals rewarding the shifting of load from peak to off-peak times when cheap and clean energy is available, better management of generation assets and displacing investment in peak load network and generation capacities

(2) savings from integration of distributed generation: reducing network losses by reducing transport and voltage levels, enabling and utilising flexible generation and energy storage and the more optimal dispatching of generation sources

(3) savings from reduced network losses. incentives for reducing malfunctioning and the improved use of the network assets

Pilot projects report up to 40% savings in energy generation capacity from demand response and demand management. If a 7% reduction in generation capacity is assumed, the savings would amount to 22 Mtoe and 45 Mt of CO_2 reduction from category (1).

Savings from category (2) cannot be estimated with current modelling tools. Since this type of network regulation would transform the structure of the market (from centralised to mainly decentralised), the impact would be proportionally transformational.

Savings from category (3) would be less than the large savings potentials of categories 1 and 2 but could still be significant. Improving energy efficiency and reducing losses by one third, for example, would lead to 7.5 Mtoe primary energy savings and 15 Mt of CO2 reduction.

Option D8: Voluntary measures to increase energy efficiency of energy transformation, transmission and distribution

Energy efficiency could be promoted through exchange of best practices in dedicated Energy Efficiency Forums or through Voluntary Agreements coordinated at EU level. The EU could also encourage Member States to set up Voluntary Agreements with energy companies to address energy efficiency improvement possibilities in operational practices.

- **Economic, Environmental and Social Impact**

The impact would be indirect and stem from the better dissemination of energy efficiency related expertise and solutions, as well as from peer pressure. In terms of energy savings and CO_2 emissions the impact would be likely to be small compared to Options D6 and D7. The setting up of an Energy Efficiency Forum on Energy Generation could however still be useful, especially if the implementation of option D6 is deferred while the need for it is assessed through monitoring. For more information on the EU value added of the options see Annex XI.

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[128] IEA, Integration of demand side management, distributed generation, renewable energy sources and energy storages, state of the art report, vol. 1: main report

Table 17. Summary: estimated energy savings and CO_2 reductions from supply side options D1-D8

Options		Primary energy savings compared to BAU	CO_2 reduction compared to BAU
D1	Retain the current approach	-	-
D2	Repeal the CHP Directive	+35 Mtoe	+70 Mt
D3	Mandatory CHP and DHC requirements for new electricity and high-heat demand industry installations	-15-25 Mtoe	-35-55 Mt
D4	Mandatory connection and priority access of high-efficiency CHP to the electricity grid	Same as D3	Same as D3
D5	Voluntary measures to promote CHP and DHC	-	-
D6	Minimum performance requirements for energy generation	-62 Mtoe	-124 Mt
D7	Energy efficiency obligations for network regulators	-30 Mtoe	-60 Mt
D8	Voluntary measures to increase the efficiency of energy transformation, transmission and distribution	-	-

COMPARING THE OPTIONS

The following table summarizes the outcomes of the analysis for each policy option.

Evaluation criteria / Policy options	Subsidiarity/ proportionality	Effectiveness	Efficiency	Coherence	OVERALL
Option D1: Retain the current approach	R	=	=	C	**=**
Option D2: Removal of existing provisions	R	=	=	C	**=**
Option D3: Mandatory CHP and district heating/cooling requirements for new electricity and high heat demand industry installations	R	+++	++	C	**+++**
Option D4: Mandatory connection and priority access of high efficiency cogeneration	R	+++	+++	C	**+++**
Option D5: Voluntary measures to promote CHP and district heating/cooling	R	+	+++	C	**+**
Option D6: Minimum performance requirements for energy generation	R	++	+	NC	**+**
Option D6a: Monitoring to assess need for performance requirements for energy generation[129]	R	+++	+	C	**++**
Option D7: Energy efficiency obligation on energy network regulators	R	+++	+++	C	**+++**
Option D8: Voluntary measures to increase energy efficiency of energy transformation	R	+	+	C	**+**

As regards **subsidiarity,** Option D1 would not alter the current situation. D2 would transfer competence back to Member States. Neither would therefore raise subsidiarity concerns. The

[129] This alternative option reflects the uncertainties identified by the impact assessment concerning the value added by option 6, in the light of uncertainties about the extent to which other legislative measures already in place but not yet implemented will achieve the same efficient.

same is true for Options D5 and D8, since these would not impose any obligation on Member States. Options D3, D4, D6 and D7 would build on existing EU competences. A common feature of these options is that they would significantly contribute to creating a level playing field for generators and network operators. Option D3 would require that local authorities take a more active role in energy policies to contribute to achieving the objectives set at EU-level, in particular the 20% energy saving target. Options D4 and D7 would not alter the balance of shared competences between the Union and the Member States. Options D5 and D8 would leave it to Member States to decide their level of involvement.

As regards **effectiveness,** Options D1 and D2 would not achieve the general, specific and operational objectives. Options D3, D4, D6 and D7 would be effective tools to stimulate political commitment for energy efficiency and trigger energy efficiencies on the supply side. In the case of D6 it is as yet difficult to ascertain whether the imposition of stringent obligations on the energy performance of generators is the best way to achieve the objective. A softer measure, putting energy generation efficiency in focus and thus exercising peer pressure and public scrutiny may be more effective to ensure realisable results. A less stringent variant, D6a has therefore been developed and is considered conducive to ensure the greatest possible effectiveness at this stage. Option D3 would provide appropriate tools to overcome persisting barriers that the CHP Directive and other EU instruments have proved ineffective in tackling. Option D4 would be effective in tackling administrative barriers and achieve transparency, streamlining and swiftness of treatment in network connection and access procedures that are necessary to ensure the market take-up of CHP in line with the existing economic potential. In the case of medium and small scale CHP operators, option D4 would bring the simplification needed to ensure a level playing field with big, established market players. Option D7 would concern a regulated sector and takes into account the need for regulators and regulated businesses to operate on a clearly defined legal basis.

Option D1 would not be **efficient**, since the current level of ambition would not be implemented. Option D2 would abandon current EU policies and leave attainment entirely to Member States. This would be the least efficient solution since the nature of the objective, namely a common saving target, requires EU level mobilisation and coordination of efforts. D6 would bring results but at a relatively high cost; its softer variant D6a would be more appropriate at this stage to establish a balance between the desired objective and the cost to achieve it. D3 would unlock significant untapped saving potentials. At the same time it would offer a systemic and innovative solution to harness the benefits of integrated and coordinated approaches. Given the potential benefits, the level of effort is justified. D4 would be an efficient solution to support distributed CHP generation in particular. It would provide an essential building block for a more efficient, locally anchored and sustainable energy system. The attainment of objectives would be ensured by building and improving on existing national systems. Option D7 would put focus on energy efficiency and provide the necessary competences for energy regulators and competent authorities to reorientate priorities towards energy efficiency in all aspects of network operation. The costs would be in line with the achievable results. Options D5 and D8 would be less demanding in terms of effort and costs. They would lead to results in proportion to the level of adhesion of market actors.

Option D1 is **coherent** with existing EU legislation, but falls short of helping to achieve the EU strategic objectives, notably on energy efficiency and climate change. Option D2 would not be coherent with a number of EU legislative instruments that depend on the application of a harmonised definition of high-efficiency cogeneration. Option D6 would be difficult to achieve given the current level of resources and since other EU policies are already partially addressing the objective. This option therefore should preferably be modified from direct

obligations partially overlapping with other EU policies towards capacity building awareness and monitoring that would fill current information gaps hindering the effectiveness of EU energy efficiency policies. The lighter version of D6 (D6a) would require at a first stage limited additional resources, would build on existing measures and would the more efficient use of national and EU resources. It would thus contribute achieving the objective at least cost. D6a is coherent with existing EU policies and legislation. Options D3, D4, D5, D7 and D8 would be coherent with energy and climate change objectives and EU legislation.

The majority of the **stakeholders** were in favour of further measures for energy utilities. 55% (111 submissions) answered confirmatively, 17% (34 submissions) responded negatively and 29% (58 submissions) had no opinion in this regard. It was proposed that these measures take the form of stricter requirements or encouragements for energy utilities to provide energy efficiency services or use Best Available Techniques (BAT). Some stakeholders also stated that there was a particular need for enhanced investments in **CHP and district heating**. Furthermore, investment in smart grids and smart metering was also emphasised.

Based on the analysis and taking into account the various views of stakeholders, it is proposed that Options D3, D4 and D7 be retained and D6 be retained as modified (i.e. Option D6a).

5.4.4. **National reporting**

Depending on the legislative context, the purposes of planning and reporting requirements can be some or all of the following:

(1) To encourage the setting of a clear comprehensive plan and the monitoring of progress at national level;

(2) To present information on progress in Member States in a form that allows Member States with good performance to be identified and recognised for this, and Member States with poor performance to be identified and put under pressure to improve;

(3) To permit the Commission to provide feedback, enabling weaknesses in planning to be identified and corrected in a timely way;

(4) To serve as the basis for remedial action when progress towards binding targets is insufficient.

The **direct** impact of each option depends on the extent to which they permit these purposes to be fulfilled. That will be assessed in this sub-section, as will

(5) The administrative burden imposed by each option.

The **indirect** impact – that is, the extent to which fulfilment of the above purposes contributes to the overall object of a 20% energy saving - will be assessed in the sub-section “comparing the options”.

- **Encouragement of MS to set clear and comprehensive plans**

The available evidence suggests that the NEEAPs have been reasonably successful in playing this role. In the light of this, Options E2 and E5 would be the most effective because they would extend these benefits to the whole energy sector. Option E1 would be less effective because it would continue to limit the scope to non-ETS end-use sectors. Option E4 would be

less effective still because it would remove the formal framework for planning and reporting that exists at present. Option E3 would be the worst option. Theoretically it could cover all sectors in a comprehensive way but in practice it would focus the monitoring on verification of savings generated by single policy measures.

- **Comparability of presented information**

The best options to fulfil this aim would again be E2 and E5. The use of complicated verification methods under ESD (option E1) has been observed to create difficulties in comparability of information[130], as has the voluntary reporting that has so far taken place under NRPs (option E4). Option E3 would be sub-optimal as it would require arbitrary expert judgements[131], leading to incomparability of results.

- **Allowing the Commission to provide useful feedback to the Member States**

The best options in this respect are E2 and E5. With simpler indicators than E3 and a focus on impacts on sectors rather than impacts of single measures, these options would make it easier to identify strengths and weaknesses of the sets of policy measures, which, in combination with annual reporting under NRPs, would enable the Commission to react more quickly than in any other option. Option E4 with little information from Member States would make it difficult to draw reliable conclusions.

Ensuring the basis for remedial action if progress towards binding targets is insufficient This would best be realized through options are E2, E3 and E5, which would all allow the Commission to get clarity about strategic planning as well as progress with the implementation of measures. Option E1 covers only part of the 2020 target and as such is less effective. Option E4 with basic indicators would provide too little information.

- **Administrative burden**

The continuation of the current ESD approach (option E1) has been identified by a number of Member States as burdensome in administrative terms. According to the data available to the Commission, the first NEEAP required between 0,3-5 person-years to prepare[132]. More time was usually required in countries that were preparing a comprehensive energy efficiency plan for the first time. More time was also required in federal countries (Germany, Spain, Austria) where regional authorities had to be involved. In financial terms, Member States reported costs varying from €10,000 (Estonia) to €1,000,000 (Germany). A number of Member States complained about the complexity of methodologies to be used for reporting (e.g. lack of clarity about what should be excluded from the scope of ESD reporting, requirement for ex-ante reporting on impacts of individual measures covering at least 20-30% of inland energy consumption, etc.). In the second NEEAPs due by 30 June 2011, Member States will also need to report on achieved savings. This will make them more expensive. The full cost for the preparation has been forecast by several Member States to be in the range of €50,000-€2,000,000.

130 SEC(2009)889

131 Other ways of determining the impact of certain measures (e.g. related to energy audits) which normally work in synergy with others would be too costly

132 See Annex III

Option E2 would significantly reduce this administrative burden by eliminating the most expensive tasks: ex-ante and ex-post evaluation of the impact of single policy measures. It is estimated that it would reduce costs to about half their present level. Option E3 would significantly increase the burden by extending ex-ante and ex-post evaluation to sectors not presently covered by the ESD (especially energy supply). It is estimated that it would lead to an approximate doubling of the present level of administrative costs. Option E4 would reduce administrative costs virtually to zero. Option E5 would have a burden a little heavier than that of option E2 because it would require some effort to be devoted to formal aligning of the reporting required for energy efficiency, renewable energy and greenhouse gas emissions.

Comparing the options on national reporting

It can be assumed that the stronger and the more comprehensive national plans and their implementation are, the greater the energy savings. The following table summarizes the outcomes of the analysis for each policy option.

Evaluation criteria / Policy options	Subsidiarity/ proportionality	Effectiveness	Efficiency	Coherence	OVERALL
Option E1: Retain the current approach	R	=	=	=	=
Option E2: Require light form of reports	R	++	+++	C	+++
Option E3: Require detailed calculation of savings and evaluation of measures across the whole economy	R	+	-	C	-
Option E4: Reporting only in National Reform Programmes	R	-	-	C	-
Option E5: Combine reporting with other relevant instruments	R	+	+	C	+

All options respect the **principles of subsidiarity and proportionality.** Reporting is necessary to ensure that comparable information is available to check progress towards achieving the overall EU energy efficiency objective. Strategic planning of measures and monitoring of the main energy efficiency indicators is important for Member States to properly manage implementation. None of the options prescribes how national strategies and plans for energy efficiency should be designed.

As regards **effectiveness,** in relation to an overarching need to check progress towards EU 2020 targets it is important that Member States, possibly on an annual basis, should report on basic indicators (e.g. primary and final energy consumption and energy intensities in the main sectors) and inform about important changes in their national portfolios of policy measures. As the overall EU target is linked to primary energy consumption, the reporting should cover all sectors. As such, from the effectiveness point of view, only options E2, E3 and E5 qualify.

As regards **efficiency,** option E2 would impose the optimal administrative burden. Option E4 would be the cheapest but has to be disqualified as it would not ensure a stimulus for Member States to further strengthen their overall energy efficiency policies.

As regards **coherence**, the obligation for regular reporting may encourage energy efficiency measures to be designed to contribute to broader objectives (environmental, job creation, etc).

The result of the **stakeholders' consultation** showed that there is a general consensus on the need for enhanced **reporting obligations** and ways **to monitor and verify** the progress of individual MS (and also sectors). 70% (143 submissions) of the stakeholders responded confirmatively, 11% (22 submissions) answered negatively, while 19% (38 submissions) had no opinion in this regard.

Based on the analysis and taking into account the various views of the stakeholders, it is proposed that Option E2 be retained.

5.5. Results for the third-level policy options

The **effectiveness** of the options can be assessed by looking at how well they contribute to meeting the general objective of achieving the 20% target and realising further energy savings beyond 2020. Options 2, 3 and 4 have in common the widening of the purpose of the ESD (extending it to energy supply) and its scope (removal of exceptions). This can be justified on the grounds of effectiveness as the increase of the level of ambition of the EU energy efficiency objective has made more acute the need to look at all sectors to reap energy saving potential.

ETS is expected to have a positive impact on energy efficiency but will not in itself guarantee a decrease in energy consumption in 2020.

The Commission is not aware of any case where there has been conflict between the ESD and the nature and activities of the armed forces. The likelihood of such a case is so small that it might not be necessary to maintain an explicit exclusion in the new legislative proposal.

It would also make sense to withdraw the exemption of small energy utilities, at least in part. While there might be reasons to introduce a "*de minimis*" exception as regards energy savings obligations, it is more difficult to argue that small energy utilities should be exempt from the obligation to provide accurate information and billing to their customers.

Setting aside option 1 and 2, all the retained options would introduce comparable requirements delivering additional savings and would thus have comparable effectiveness.

In order to assess the **coherence** of each policy option it is appropriate to look in particular at their consistency with EU energy and climate policies. Options 1 and 2 are not coherent with the 20% energy efficiency objective for 2020 nor with the post-2020 objective of limiting climate change to 2°C. The remaining options contribute to those objectives. This is particularly true of options 4 and 5 as they involve merging the ESD and the CHP Directives in a single legal act. Such an approach is more coherent with EU energy efficiency policy objectives and the Energy Efficiency Plan.

The policy options implying a broadening of the scope of the ESD to currently excluded final users subject to ETS do not raise any problem of coherence with the ETS or the EU Climate policy. The legislative proposal and the ETS Directive are complementary measures that reinforce each other in the realisation of their respective objectives.

The **efficiency** of the policy options can be measured in terms of the administrative costs associated with them. Option 5 would have the most positive effects in this regard since the direct applicability of the legislative proposal would avoid the need for national transposition measures and facilitate the monitoring of implementation. In this sense, recourse to a

Regulation would be a form of legislative simplification. It might in addition result in a lightening of reporting obligations.

Simplification of reporting needs would also result to some extent from Option 4, as a result of the merger of the two Directives (each presently with its own reporting requirements). Member States would still have to transpose the new Directive, but this would probably be less time consuming and burdensome that transposing two Directives in parallel.

Options 1, 2 and 3 would not trigger the streamlining effects of options 4 and 5 as the Directives would remain separate legal acts. Efficiency under options 1 and 2 would be the lowest lower since this option does not properly address the problems.

In terms of **respect of subsidiarity/proportionality**, most retained options do not fundamentally deviate from the current situation even when they imply a modification of the purpose and scope of the ESD. Such modification is justified in subsidiarity terms by the need to ensure that the 20% energy efficiency target is achieved and by the assessment that the current legal framework will not achieve this.

The table below summarises the evaluation of the first-level options:

Evaluation criteria **Policy options**	**Subsidiarity/ proportionality**	**Effectiveness**	**Efficiency**	**Coherence**	**OVERALL**
Option 1: Retain the two current Directives as they stand today	R	=	=	=	**=**
Option 2: Abolish the two current Directives without replacement	R	-	-	-	**-**
Option 3: Propose two separate revised Directives and extend their scope	R	++	+	+	**+**
Option 4: Merge the two Directives and extend the scope	R	++	++	++	**++**
Option 5: Use Regulation legal instrument instead of Directive	**NR**	++	+++	++	**++**

6. PREFERRED OPTIONS AND THEIR INTERACTIONS

6.1. Preferred Options

Three levels of policy options were considered in the analysis in chapter 5.

The **first-level policy options** analyse various ways to improve the current policy framework.

The analysis concluded that there is **no need to propose binding national targets at the present moment**. Even though such targets could signify the importance of energy efficiency and raise it high on political agendas, individual measures like those analysed in the sections of chapter 5 that follow are in any case needed to make a real difference. The current policy framework and the measures to be proposed on the basis of this IA should be sufficient to reach the EU's 20% target in 2020. Therefore, only **indicative targets**, set by Member States, are recommended (Option A3). However, progress needs to be monitored and evaluated. If an evaluation in 2013 shows that this approach endangers reaching the overall European 20% energy efficiency target, a move towards binding national targets needs to be made.

To replace the need for a binding target but ensure the same results, the MS have asked the Commission to propose a package of binding measures. These were discussed as a **second-level policy options** and included measures to tackle the remaining economic potential on the demand and supply side.

The **energy savings obligation (Option B4)** is a key part of this package. To increase the uptake of energy efficiency measures and support the development of energy services market, it is suggested that **national energy saving obligation schemes are introduced which will aim at an annual final energy reduction of 1.5%** (Option B4). It is appropriate for the obligation to be placed by MS on their energy utilities (suppliers or distributors), since these are the entities best placed todispose of appropriate information about the energy consumption of their clients. Certain key features of the obligation schemes should be harmonized at EU level (targeted sectors, level of ambition and counting methods), but MS should have the possibility to adjust them to their national circumstances. This will, *inter alia*, permit the schemes already in being in several Member States to continue with their main design features unchanged. This requirement will put a financial value on energy savings and link the profits of utilities to energy efficiency rather than solely to the volume of energy delivered. The expected savings are considerable (108-118 Mtoe of primary energy consumption in 2020) while the costs per individual are negligible and evenly distributed amongst final energy consumers.

The **public sector could be an important actor** in stimulating market transformation towards more efficient products, buildings and services. Due to the high volume of public spending it could be a strong driver for higher market uptake and the development of the skills that are required to implement energy efficiency measures, notably in the building sector. To this end, two measures are proposed. First, 3% of the buildings owned by public bodies should be renovated annually to cost-optimal levels (Option C2a). This would not lead to especially high energy savings (approx. 9 Mtoe) but is taken forward as they have high visibility in public life and because an acceleration of the renovation rate of this type will play an even more important role in achieving energy savings after 2020. Even in cash terms, the benefits of this option will outweigh the costs: additional energy related investments of €1.6 bn per year between 2010 and 2020 will be offset by savings on energy bills of €1.92 bn. Second, public bodies purchasing high energy performance products and buildings based on the available energy labels and certificates (Option C3) will drive the market forward. This would lead to a direct impact of 9-18 Mtoe saved in 2020. It would require an initial investment increase but would decrease the overall costs for public organizations.

Information on actual energy consumption provided to households and companies on a frequent basis through their energy bills (Option C5) and **on the savings possibilities** for large companies through energy audits (Option C7) are both important for reducing the information gap that is one of the barriers to efficiency. The analysis has shown that in both options the burden for final consumers would be relatively low compared to the benefits they will gain. The introduction of bi-directional smart meters with in-home displays and electronic billing may decrease the administrative burden of the energy utilities even with a high frequency of billing. The possible savings of the two options are also considerable and could reach up to some 80 Mtoe for Option C5 and up to 30 Mtoe for Option C7. However, the scale of savings would depend on individual reactions of consumers and the interaction between these measures and other national measures that would incentivise the consumers to make use of the information that will be made available to them.

ESCOs are an important player that could take some of the burden of the initial required investments in energy efficiency measures. However, even in well established ESCO markets, transaction costs are too high for potential customers to easily assess the available service offer. Therefore, it is suggested that MS establish structures to carry out market monitoring, providing lists of energy service offers and standard contracts (Option C9). This would not pose a significant administrative burden - as Member States could use the agencies already established to follow energy efficiency policies - but would present an important support for the ESCOs market.

To support **more efficient energy generation, transmission and distribution** it is proposed that a number of regulatory measures be brought forward. These include measures to ensure that surplus heat from power generation and industrial processes and other waste-to-energy sources are used first to satisfy heat demand in buildings and businesses and that primary energy fuel is used more efficiently. This would be achieved by requirements to equip new generation capacity and high-heat-demand industry installations with heat recovery (CHP) units and to ensure their connection to consumers via district heating/cooling networks (Option D3). This would bring an estimated 62-79 Mtoe of savings depending on the level of potential realised by 2020. Second, to reduce the administrative burden and create a level playing field, it is essential to establish clear connection rules and priority access to the electricity grid for high efficiency cogeneration (Option D4). This would put CHP on equal footing with renewable energy technologies.

In addition, energy network regulators should be required to design tariffs and network regulations that would enable energy efficient solutions and technologies to be offered to consumers (Option D7). Since this would not bring additional tasks for regulators, but would instead put a clear mandate to prioritise energy efficiency *among* their tasks, the additional administrative burden would not be significant. Finally, it is also proposed that the Commission monitor progress as regards energy efficiency of electricity and heat generation. If current measures are not sufficient, further measures should be proposed, based on further analysis (Option D6 bis). Since this measure would build on already existing information provision requirements, no additional administrative burden would appear. This approach would allow substantiation of whether existing EU market mechanisms, in particular the ETS and the new Industrial Emissions Directive, deliver the necessary investment in BAT.

To limit the administrative burden whilst ensuring that proper monitoring of progress is carried out, **a light form of reporting is suggested** (Option E2). This would include brief statements of plans and progress, simple quantitative reporting with a common format, and a report annually feeding into NRPs. This approach would reduce the administrative burden by eliminating the most expensive tasks: ex-ante and ex-post evaluation of the impact of single policy measures. It is estimated that it would reduce costs to about half their present level.

In the analysis of the more general **third-level policy options** the conclusion has been drawn that in order to reach the level of ambition of the EU 20% energy efficiency objective as set in 2007, EU policies need to look at every sector to reap energy saving potential, including potential in sectors excluded from the scope of application of the ESD. That is why **extending the scope of the two existing Directives – ESD and CHP Directive - would be beneficial**. **Merging them into one legislative text would provide for simplification and better coherenc**e. The analysis was not so conclusive as regards the legal form.

6.2. Interactions between the options

All the options proposed are interlinked and mutually reinforcing. Only if combined in one package can they bring the energy consumption reductions required at a socially acceptable cost.

The energy service obligation (Option C9) will bring forward financing for the realization of energy savings and also create favourable market conditions for the uptake of energy services and, in general, energy efficiency improvements. It could, together with ESCOs (Option C9), ease the burden on public bodies of the financing of energy efficiency improvements (Options C2a and C3). It would be the most important tool for MS to reach their indicative targets (Option A3).

Improved awareness about of actual energy consumption through metering and billing (Option C5) and the audits for large companies (Option B7) will support the uptake of ESCOs (Option C9), ease the implementation of the energy saving obligations (Option B4), and to some extent the uptake of cogeneration (Option D3). While audits will provide the basic information on the possibilities for energy savings, ESCOs take over the financial risk of the investments needed to realise these possibilities. In this sense energy audits support the establishment of ESCOs (as they create demand for the services they offer). Furthermore, audits can be offered by ESCOs and thus the requirement for audits further supports the uptake of ESCOs.

In principle, energy saving obligations (Options B4) and ESCOs (Options C9) both address the market for energy services. However, ESCO projects usually relate to larger projects in the industry sector whereas the main target of the saving obligations is the small consumers segment, which is not directly tackled by ESCO services. In this respect, both instruments are complementary and lead to the provision of energy services to all consumer segments. Additionally, some saving obligation schemes (e.g. Italy) actively involve ESCOs to implement savings, which makes both instruments mutually reinforcing.

Options D3 and D4 on the promotion of district heating and cogeneration will be enhanced by the real-time and historic data on consumption that will be available from better heat metering (heat/hot water suppliers will be able to better optimise their energy generation and distribution) (Option C5).

6.3. Overall impact

The instrument mix put forward will contain a number of overlaps and interactions.

In terms of overlaps with existing policies, especially in the frameworks of the ESD and CHP Directive, the instrument mix takes up instruments already in place in some Member States (e.g. the saving obligation schemes which are in place in France, Denmark, Italy, Flanders and the UK, CHP priority access rules practices in Germany), brings them to all Member States and sharpens their stringency. It can be estimated that the instrument mix will enlarge and reinforce the impact of the existing national energy efficiency instruments.

In terms of interactions within the proposed package of measures, the largest overlap exists between overall energy saving targets (option A3) and all the other measures put forward. The net impacts need to be verified to come to valid conclusions on the viability of this policy mix. In order to evaluate this net impact and have a consistency check with the results of the

E3ME model, an additional set of model runs were performed with the PRIMES energy model (called the 'PRIMES 20% efficiency scenarios', see Annex XIV for the output data). These model runs include the preferred policy options outlined in the analysis. It is important to note that in the scenarios the underlying assumption is that sufficient financing is available to cover the energy efficiency investments. Therefore, it is essential that sufficient financing is triggered. Furthermore, one of the PRIMES 20% efficiency scenarios assumes that the measures are successful in changing consumer behaviour with respect to the uptake of energy efficient solutions[133]. The model results show that for the EU27 the net effect of the proposed measures, in combination and including the impact of assumed changed consumer behaviour, reaches the 20% objective.

Primary energy demand in 2020 falls, in fact, by between 19.7% and 20.9% in the new package scenarios compared to the PRIMES 2007 baseline projection. Compared to the PRIMES 2009 energy efficiency scenario, the reductions in 2020 are between 12% and 13.1%. Final demand also decreases by 15.6% to 19.5% in 2020 in the 20% efficiency scenarios compared to the PRIMES 2007 baseline projection. Compared to the 2009 energy efficiency scenario, the reductions in 2020 are between 6.4% and 10.7%.

The majority of the measures target the end-use sectors. This is confirmed by the fact that 55-58% of the energy consumption reductions in 2020 are projected to come from these sectors. The sectors reducing demand the most are the residential and tertiary sectors. Increased realization of energy efficiency measures throughout the whole economy also stimulates significant savings in the transport sector. Lower final energy demand leads to lower electricity production. There are also significant improvements of efficiency in the energy generation sector which projected to account for 42-45% of the energy consumption reductions in 2020 (including reductions due to lower electricity consumption by end-use consumers). However, this number has to be treated with care as the PRIMES model is rather sensitive to changes in CHP and thus the decrease is possibly overestimated. Also as the incentives for renewables are kept at the same level their relative share increases.

To reveal the geographical spread of the impact of the proposed package of measures, the PRIMES model was used for energy use and CO_2 emissions and the E3ME model for costs and benefits (as embodied, in combination, in changes in GDP). As the detailed modelling results for Member States may include effects particular to the special country, they are clustered according to regional impacts, as these are likely to be closer to reality and more reliable than a disaggregated split up per Member State.

In the table below the forecast reduction of primary energy (minus non-energy use) and CO_2 emissions per group of MS are presented. The results show that economic convergence, e.g. higher rates of GDP increase, among the former Communist economies still has significant relevance for their energy consumption which is projected to decline at a slower pace than in the Nordic, Western European and Mediterranean countries.

[133] This is modelled through setting the subjective discount rate for consumers at the same level as for capital budgeting decisions, that is around 9-10%.

Table 18. Energy savings (gross inland consumption minus non-energy use) and CO_2 emission reductions of the proposed package per group of countries compared to the baseline

	GIC-NEU			CO_2 emissions		
	Baseline	Change (new PRIMES - baseline 2009)		Baseline	Change (new PRIMES - baseline 2009)	
	2010	2015	2020	2010	2015	2020
Baltics (Latvia, Lithuania and Estonia)	1%	-2%	-8%	3%	-2%	-10%
Central and Eastern Europe (Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovak Republic and Slovenia)	0%	-2%	-8%	0%	-3%	-14%
Mediterranean (Cyprus, Greece, Italy, Malta, Portugal and Spain)	0%	-5%	-13%	-1%	-8%	-21%
Nordic (Denmark, Finland and Sweden)	0%	-7%	-19%	0%	-6%	-18%
Western Europe (Austria, Belgium, France, Germany, Ireland, Luxembourg, Netherlands, and United Kingdom)	0%	-3%	-14%	0%	-6%	-18%

Source(s): PRIMES

Data on the GDP impacts is available from the E3ME model and can be displayed for the same groups of MS (see the table below) [134].

Table 19. Costs and benefits of the proposed package per groups of countries compared to the baseline

	GDP (m euro 2000)		
	Baseline	Change	
	2010	2015	2020
Baltic states	37714	377	123
Central and Eastern Europe	551169	2319	4568
Mediterranean	2309051	5376	4206
Nordic	646374	975	2039
Western Europe	6762677	14738	22904

Source(s): E3ME, Cambridge Econometrics

The impact per economic sector is presented in the table below. For most sectors there are only positive impacts with the notable exception of the sectors that are related to fuel extraction and electricity and heat generation and distribution (see the table below). As expected, the proposed instrument mix will strongly affect the energy supply sectors, lowering output from coal, mining, manufacturing fuels and gas supply considerably. Increasing efficiency leads to lower input fuel needs for the other sectors which explain why employment rates and wages are not affected negatively.

[134] Here only the benefits in terms of GDP are highlighted. Non-monetarised secondary benefits such as improved living conditions etc. will occur in addition. For the clarity of the analysis, these have been left out.

Table 20. Impact of the proposed package on different economic sectors for EU 27 in 2020 in percentage difference from base)

SECTOR	Output			Employment			Wages		
	2010	2015	2020	2010	2015	2020	2010	2015	2020
1 Agriculture etc	0	0.15	0.41	0	0.05	0.46	0	0.77	0.85
2 Coal	0	-0.93	-1.39	0	0	0	0	0	0
3 Oil & Gas etc	0	-0.15	0	0	0	0	0	0	0
4 Other Mining	0	-0.23	-0.36	0	-0.49	-1.4	0	0.88	1.7
5 Food, Drink & Tob.	0	0.71	1.74	0	0.06	0.39	0	0.6	1.22
6 Text., Cloth. & Leath	0	0.29	0.82	0	-0.02	0.07	0	0.85	1.19
7 Wood & Paper	0	0.07	0.31	0	0.63	1.12	0	0.33	0.81
8 Printing & Publishing	0	0.46	0.7	0	0.14	0.61	0	0.66	0.58
9 Manuf. Fuels	0	-2.49	-4.06	0	-0.84	-1	0	0.88	1.75
10 Pharmaceuticals	0	0.44	0.14	0	-0.22	0.49	0	0.32	0.45
11 Chemicals nes	0	0.31	0.58	0	0.73	1.34	0	0.03	0.23
12 Rubber & Plastics	0	0.75	1.18	0	0.93	1.52	0	0.42	0.52
13 Non-Met. Min. Prods.	0	0.06	-0.28	0	0.54	1.28	0	0.46	0.31
14 Basic Metals	0	0.24	0.15	0	0.56	1.32	0	0.33	0.61
15 Metal Goods	0	0.71	0.93	0	0.29	0.58	0	0.53	0.8
16 Mech. Engineering	0	0.76	0.95	0	0.2	0.44	0	0.19	0.52
17 Electronics	0	2.27	3.14	0	1.06	0.93	0	0.73	1.07
18 Elec. Eng. & Instrum.	0	-0.01	-0.15	0	0.16	0.21	0	0.22	0.8
19 Motor Vehicles	0	0.25	0.11	0	0.25	0.46	0	0.41	0.76
20 Oth. Transp. Equip.	0	-0.08	-0.19	0	0.05	0.05	0	0.78	1.63
21 Manuf. nes	0	0.43	0.58	0	0.17	0.45	0	0.24	0.83
22 Electricity	0	0.75	0.5	0	0	0	0	1.49	2.89
23 Gas Supply	0	-4.29	-6.05	0	0	0	0	1.55	2.86
24 Water Supply	0	0.07	0.28	0	0	0	0	1.67	3.08
25 Construction	0	1.42	1.81	0	0.58	0.2	0	1.64	3.08
26 Distribution	0	-0.03	-0.08	0	-0.1	-0.08	0	0.37	0.73
27 Retailing	0	0.5	0.98	0	0.05	0.34	0	0.26	0.79
28 Hotels & Catering	0	0.58	0.75	0	-0.02	0.04	0	0.95	2.03
29 Land Transport etc	0	-0.11	-0.27	0	0.42	0.55	0	1.17	1.85
30 Water Transport	0	-0.01	0.33	0	0.32	1.6	0	1.18	2.12
31 Air Transport	0	-0.73	-1.42	0	0.74	0.04	0	0.76	0.69
32 Communications	0	0.25	0.5	0	2.28	2.69	0	-1.23	-0.98
33 Banking & Finance	0	0.45	0.7	0	-0.01	0.06	0	0.24	0.49
34 Insurance	0	0.66	1.52	0	0.06	0.29	0	0.18	1.15
35 Computing Services	0	0.58	0.84	0	0.39	0.28	0	0.28	1.12
36 Prof. Services	0	0.2	0.3	0	-0.03	0.1	0	0.25	1.2
37 Other Bus. Services	0	0.31	0.43	0	0.09	0.17	0	-0.03	0.63
38 Public Admin. & Def.	0	0.02	0.01	0	0	0	0	1.47	2.83
39 Education	0	-0.03	-0.06	0	0	0	0	1.51	2.86
40 Health & Social Work	0	0.07	0.08	0	0	0	0	1.34	2.64
41 Misc. Services	0	0.4	0.57	0	-0.42	-0.79	0	1.16	2.34
Total	**0**	**0.29**	**0.42**	**0**	**0.11**	**0.18**	**0**	**n/a**	**n/a**

Source(s): E3ME, Cambridge Econometrics

The impact on household income is insignificant. Nevertheless, in distributional terms, the model results show that higher energy prices would affect vulnerable income groups more than high income groups. This is partially due to a shortcoming in the E3ME model which

presents energy efficiency improvements through increase of energy prices but does not take full account of the decrease of energy bills due to the saving measures. It is expected that the energy and cost saving effects would strongly outbalance the direct income losses if indeed energy price increases were to occur. Also the measures proposed (energy savings obligation, promotion of ESCOs) could be implemented in ways that enable them to serve as tools to decrease the burden for the socially disadvantaged group of population. Member States could also use other tools (e.g. financing mechanisms) that particularly support this group.

Relation with the GHG emission reduction and renewables targets for 2020 and the ETS

Measures to achieve the 20% energy saving target in 2020 will support the greenhouse gas reduction target, in particular in non-ETS sectors. According to the Low Carbon Economy Roadmap 2050 the achievement of the 20% EE and RES targets enables a 25% greenhouse gas emission reduction. (As stated in the Roadmap, "If the EU delivers on its current policies, including its commitment to reach 20% renewables, and achieve 20% energy efficiency by 2020, this would enable the EU to outperform the current 20% emission reduction target and achieve a 25% reduction by 2020.'’). In this context, the Commission has said that it will monitor the impact of new measures to implement the 20% energy efficiency target on the ETS[135]. The following lessons can be drawn from this impact assessment in this respect.

The preferred package includes a number of measures that only impact non-ETS sectors. It also includes a number of measures that primarily target ETS sectors (for example, CHP requirements). The initial costs of these proposed measures are recovered during the operation period and (over)compensated over the lifetime. In this respect, there is in the middle and long run no additional burden. The preferred package further includes a number of measures that primarily target non-ETS sectors but of which effects materialise in ETS sectors, as a result of measures that lead to electricity savings and hence affect power demand in ETS sectors (e.g. end-use energy efficiency improvements including the Energy Savings Obligation). Taken together, it is expected that part of the GHG reductions induced by the additional energy saving measures proposed materialises in installations covered by the ETS. An exact quantification at this point is difficult due to overlaps between measures and the flexibility provided for implementation and would need further study.

Impacts on the ETS are presented in the overall 20% efficiency model runs, albeit results differ substantially depending on the model used, as explained in section 5.3.1. While both models project a further decrease in GHG emissions, they show different results regarding the impact on the ETS price. In this respect, the E3ME model run projects a drop to zero of the ETS price in 2020 whereas the PRIMES scenarios project a much lower impact (a reduction from €16.5/t in the PRIMES 2009 reference scenario to €14.2/t in 2020). This lower ETS price impact until 2020 in PRIMES is explained among other things by different baselines used, a higher share of modelled measures with GHG reductions materialising in non-ETS sectors, the full market foresight assumed and an unlimited ETS banking flexibility until 2050 assumed. It is appropriate to monitor impacts of the proposed measures on the ETS.

The share of renewable energy in the generation mix increases while the share of nuclear decreases. This will make it easier and cheaper for MS to reach their renewable energy targets. Additional costs to the total energy system rise by between 2.6% and 4.7% compared

[135] COM(2011)112

to the reference scenario[136]. The increase in energy efficiency will tend to increase electricity prices in the short term from 141€/MWh to 146€/MWh due to the need to finance the fixed costs of energy efficiency measures[137]. However, in the long run, this increase pays off by stabilising electricity prices through a lower demand.

It can therefore be confirmed that the package of policy measures put forward is capable of reaching the 20% objective and reaping additional benefits that remain tangible beyond 2020. The additional costs of achieving the overall 20% target through the set of measures proposed are proportionately small. It can be concluded that the overall economic, social and environmental impacts of the options presented above will make a strong positive contribution to EU policies and serve as a pillar for the success of the Europe 2020 strategy.

7. MONITORING AND EVALUATION

To monitor and evaluate progress several aspects will regularly be assessed:

- **Overall progress on energy savings and expected progress**

Progress on the energy saving targets will be monitored using the well-established energy consumption statistics (gross inland consumption minus non energy uses). As energy consumption figure is influenced by the development of economic activity (GDP), the indicator of energy intensity, depicting the energy consumption against the level of GDP can be drawn upon as an additional indicator. Furthermore, Member States would be required to report on progress towards their national targets on energy efficiency, using in their National Reform Programmes if appropriate.

- **Legal transposition and implementation of the new Directive/Regulation**

The Commission will adopt a pro-active role in organising measures to assist Member States with the implementation of the legislative proposal. The legislative proposal is accompanied by an Implementation Plan that identifies the main risks to the timely and correct implementation of the legislation and the actions and instruments that are appropriate to be used to counter those risks. Concerted Actions (regular meetings with national energy agencies and bodies in charge of implementing the legislation) and permanent dialogue with Member States (e.g. via committees and bilateral meetings) will be key tools to ensure effective implementation. Transposition verification and a full conformity check will be undertaken. Recourse to EU pilot requests will also be made in the pre-litigation phase.

- **Progress with individual measures**

Some of the measures proposed would leave Member States with substantial flexibility for determining the concrete design features (e.g. energy saving obligations), others would require Member States to collect statistical data (public sector buildings' renovation target, efficiency of power generation), or analyse barriers and develop appropriate policy response (e.g. barriers to ESCOs and to inclusion of energy efficiency considerations in public spending). However, the administrative costs for these monitoring bodies can be restricted by

136 PRIMES 20% reference scenario
137 Ibid 136

assigning this task to existing bodies like the government authorities already set up under Article 4(4) ESD.

To collect the necessary information for monitoring of the progress with individual measures it may be appropriate to require that the Member States report on these in the framework of the simplified reports (Option B2). This would allow for best practice exchange.

The Commission will analyse the information coming from Member States on the implementation of these reports and propose further measures or binding targets, if needed.

- **Review of overall energy efficiency progress in 2013**

The procedure retained for setting energy efficiency targets includes a review of the effectiveness of the present approach in 2013. This review will coincide with the overall review of the national targets supporting the various Europe 2020 headline targets. By mid-2013, three consecutive sets of National Reform Programmes will be available which give an overview of the (development of) national target formulations as well as the key measures to support these targets. In addition, the 2011 National Energy Efficiency Action Plans will be fully analysed. Taken together, these reports will deliver a sound basis for an evaluation of whether the indicative targets and measures undertaken and adopted (including in the framework of the legislative proposal assessed in this IA) will be ambitious enough to reach the overall EU 20% energy efficiency target. In addition, these data will be used in an additional round of modelling with one or more macroeconomic models to verify and complement the results.