2030 energy efficiency target ambition

Critical review of the European Commission assessment for the *Clean Energy For All Europeans* package

Towards a cost-benefit analysis

ECOFYS

sustainable energy for everyone

The Coalition for ENERGY SAVINGS

Abstract

The European Commission's assessment of financial impacts of 2030 energy efficiency targets as provided in its 2016 Impact Assessment (IA 2016) for the Energy Efficiency Directive builds on a private and short term perspective. This does not sufficiently take into account the role of public policy making in removing and reducing market barriers and changing energy market designs.

Such an approach as used in IA 2016 is not compatible with appraising energy efficiency ambition levels for 2030 within the context of the *"Clean Energy for All Europeans"* package. The package places energy efficiency at its centre. A societal perspective should instead be used by applying a societal interest rate in assessing and comparing costs and benefits.

Therefore, and as set out in the Commission's internal Better Regulation policy, a cost-benefit analysis that builds on this broader societal perspective is the appropriate way forward.

Our example of a calculation for a cost-benefit analysis, using the Commission's available data, shows that overall energy bill savings resulting from energy efficiency targets of up to 40% could exceed the costs of upfront investment, taking a societal perspective and applying longer (but realistic) lifetimes of measures. This is also confirmed by a study referred to in the IA 2016.

Additionally, considering non-financial impacts like energy security, employment, air quality, health or climate protection, higher targets can be more robustly justified than is done in the IA 2016.

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Abbreviations/acronyms

CBA	Cost benefit analysis
EC	European Commission
EE	Energy efficiency
EED	Energy Efficiency Directive
EPBD	Energy Performance of Buildings Directive
IA	Impact assessment

Background

In March 2016 the Coalition for Energy Savings and Ecofys published the study "*Impact assessment of EU 2030 energy efficiency targets in the context of the Energy Union & Energy Efficiency First*". This study reviewed the European Commission impact assessment from 2014[1] (IA 2014) and showed that by moving from a private to a societal perspective and by applying longer (but realistic) technical lifetimes of measures the financial savings for consumers of 40% energy efficiency (EE) target for 2030 would outweigh the capital and investment costs. The study was presented to the European Commission.

On 30 November 2016 the European Commission published its proposals for "Clean Energy for All Europeans" including a binding 30% EE target and an updated impact assessment of different 2030 target levels[2] (IA 2016).

This study is an update of the previous study using the new data and findings made available by the Commission impact assessment.

1. The imperative to move toward cost-benefit analysis (CBA)

The European Union institutions have set out different visions for 2030 EU EE policies. The European Council[3] called for a target of at least 27% EE improvements compared to the 2007 reference to be reviewed by 2020 having in mind a 30% target, the European Commission[4] proposed a binding target of 30% and the European Parliament[5] called for a binding 40% EE target.

The difference between the various target levels in terms of savings is significant, around 250 Mtoe primary energy per annum. This is roughly the gross annual energy consumption of France.

From least cost to best economic outcome

Both the European Council and Parliament justify their proposals by referring to the optimum from an energy system cost perspective. The Council's justification relies on the IA 2014, which shows that energy system costs are lowest at a 27% EE target. The Parliament's justification relates to research commissioned by DG Energy about cost-effective EE potentials per sector[6] (DG ENER 2014), which shows that an overall level of

[1] IA 2014: European Commission Impact Assessment accompanying the Communication: Energy Efficiency and its contribution to energy security and the 2030 Framework for climate and energy policy; 23/07/2014
[2] IA 2016: European Commission Impact Assessment accompanying the Proposal for amending the 2012 Energy Efficiency Directive; SWD(2016)405final; 30/11/2016
[3] Conclusions by the European Council from 24 October 2014
[4] Proposal for a Directive amending the Energy Efficiency Directive 2012, European Commission COM(2016)761, 30/11/2016
[5] Resolution from the European Parliament from 5 February 2014 and later resolutions (14 October and 15 December 2015)
[6] DG ENER 2014: Study evaluating the current energy efficiency policy framework in the EU and providing orientation on policy options for realising the cost-effective energy efficiency/saving potential until 2020 and beyond; Report on behalf of DG ENER; 19/09/2014

40% EE can be reached by interventions that deliver net financial benefits for the individual investor. Both assessment approaches look at costs and benefits from a private perspective, but make fundamentally different assumptions about whether or not barriers to EE investments, such as split incentives, lack of information and lack of capital, are removed.

The IA 2016 uses a slightly different approach and shows that in the period 2021-2030 up to 27% and in the period 2031-2050 up to 30% are cost-effective 2030 target levels, which means that energy bill savings exceed additional investment and capital costs. The Commission also refers to additional benefits like security, employment and climate protection, to justify its proposal for a 30% target[7].

The problem with the Commission's impact assessments, both in 2014 and 2016, is that they assume that market barriers are not removed beyond what is happening under existing policies. This means that even if EE is increasing, the impact of new policies on costs is not considered. The discount rates (or rather interest rates, as they represent the expected interest or rate of return under which the investments would be made), which are used to estimate costs for overcoming barriers, are also used for reporting and comparing costs and benefits at a high level of 12-17.5% in IA 2014 and 10% in IA 2016[8].

Such an approach would only be suited to identify the least-cost EE level without additional EE policies and measures in place, rather than for searching the optimal target level to drive EE policies and measures to realise investments that make economic sense. The result is a 'worst case' assessment of what the level of EE targets should be without considering the impact of supporting policies. This is at odds with the rationale that policy targets are put in place to trigger new policy actions.

Several studies[9] have criticised the use of high interest rates in assessing the costs of efficiency scenarios. To some extent IA 2016 has reacted to this by reducing the discount rate to 10%, though this is still far off societal rates and by providing the findings from a study for DG Energy, which showed that up to 40% EE (DG ENER 2014) is cost-effective, i.e. delivering net benefits if market barriers are removed[10].

The findings are presented in Table 1 page 17 of part 1/3 of IA 2016 but require some explanation to be understandable:

LPI stands for Low and **HPI** for High Policy Intensity, reflecting to what degree policies are put in place to remove investment barriers. This means that under HPI discount rates drop to a commonly applied societal level of between 2% and 5% depending on the sector. **NE** stands for near economic meaning that measures are at or close to cost-effective level.

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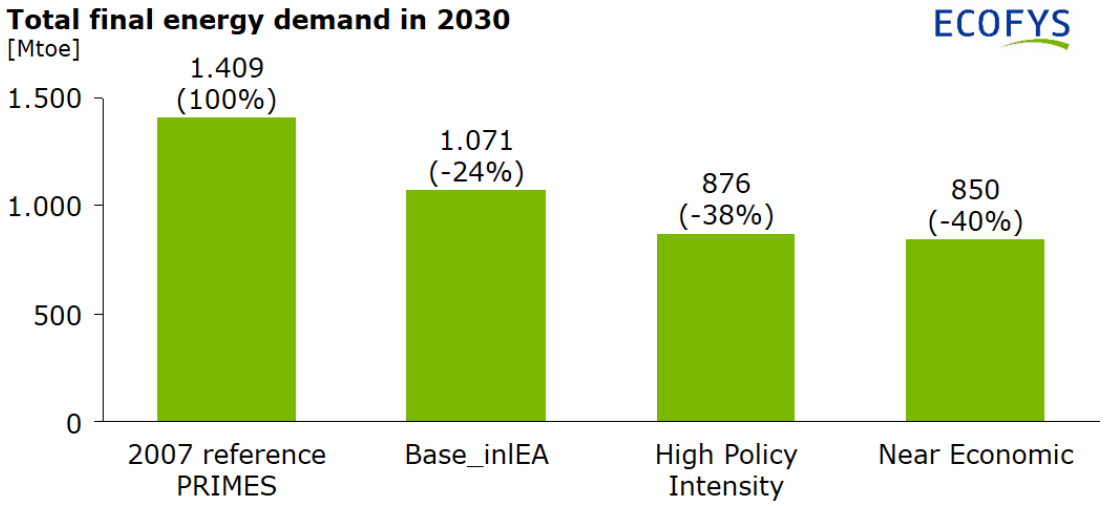
[7] Energy and Climate Action Commissioner Arias Cañete on 30 November 2016: *"The review of our Energy Efficiency legislation will be about unlocking the energy savings that can kick start our economy. Achieving 30%, instead of 27, can create an additional 70 billion euros and 400,000 jobs."*

[8] In practice this means that energy efficiency investments are translated into annual costs, using an interest rate of 10% in the IA 2016.

[9] BPIE 2015; ECEEE 2015; ECOFYS 2015

[10] This means that discount rates used to calculate net present values of energy efficiency investments are lowered and reach levels recommended to be used in cost-benefit analysis, as outlined in the European Commission Better regulation Toolbox – see Tool 54

The reference is the **BASE-inclEA Scenario** which is similar to the new EU reference scenario 2016 where final energy demand in 2030 is around 24% lower than the 2007 reference scenario. HPI reduces final energy demand further to 38% and NE to 40% as can been seen in the chart below, whis is based on that data provided in the IA 2016 (Table 1 page 17 of part 1/3).



In conclusion the IA 2016 has made some improvements in assessing the costs of different energy efficiency scenarios and showing that with additional policies removing market barriers target levels of up to 40% would become cost-effective. But overall the assessment is far from conducting a proper cost-benefit analysis and is dominated by a private perspective in assessing financial impacts, which assumes that no new policies would be introduced to reach a 2030 target.

The wider energy efficiency picture

Beyond the issues with the current assessment of EE targets, there are several additional reasons to move from a least-cost analysis to apply a CBA to assess the impacts of EE targets for the review of the Energy Efficiency Directive in the context of the *"Clean Energy for All Europeans"* package.

1. Application of the Energy Efficiency First principle

With the Energy Union framework strategy, the European Commission has increased the importance of energy efficiency and called for treating it 'as an energy source in its own right' and for giving it 'primary consideration in [MSs] policies', while the European Parliament called for applying the 'energy efficiency first' principle[11]. This should be reflected in the problem definition of the Impact Assessments concerning EE.

This means that the impacts of EE target levels must be assessed in their own right and in the context of strengthening EE policies and measures. EE target levels determine EU and national policies and measures, as set out in the Energy Efficiency Directive. It would be incomprehensible to ignore this relation and reduce the target ambition question to an optimisation issue under the current climate target without looking into the energy savings

[11] Resolution from the European Parliament from 15 December 2015

potential, which can be delivered by additional supportive policies and measures that have a priori been shown to be cost-effective.

2. A tool suited for appraisal stages

A CBA is a powerful tool for comparing policy options and especially recommended for the policy appraisal phase of policy development, rather than a least–cost analysis, which could be justified when refining more specific policy measures under a given target[12]. Given the wide range of EE target levels to be assessed it is difficult to argue that the EU is not in an appraisal phase.

3. A tool justified by the available information

A CBA is the recommended method in particular if[13]:

- Direct costs and benefits can be monetised. This is very much the case regarding energy system costs, but also for several other impacts such as air pollution and health costs;
- The magnitude of impacts justifies the effort and time needed to carry out a full-fledged CBA for the different options. The impacts of increasing energy efficiency have been proven to be large, for example, the investment impacts are in the range of several billion Euro per year;
- Distributional impacts can be substantial, in which case a breakdown per affected sector is required. If it is expected that distributional impacts are substantial, the models available should allow a break down for affected sectors; and
- There are long-term benefits and long lifetimes for many of the investments made.

The consequences of applying a CBA for assessing the impacts of different EE targets within the context of the EED review are manifold. Most notably, it will be necessary to establish a complete list of impacts, including the multiple benefits of EE, and to consider the use of a societal interest rate when comparing overall societal costs and benefits.

In conclusion, a least cost-analysis for 2030 EE target levels, as currently used by the European Commission, is at odds with the priorities of the *"Clean Energy for All Europeans"* package and the Energy Efficiency First principle. Cost-benefit analysis is the appropriate tool and perfectly possible to be applied given data availability for energy system costs. It is also more suited for comparing different policy options at a highly aggregated level and appraisal phase, such as overall energy efficiency targets.

[12] See EC Better Regulation tool 54
[13] Idem and tool 55

2. An example of a CBA of energy system costs

In the following assessment, the information of annual system costs from the Impact Assessment (IA 2016) is translated into a CBA for the different energy efficiency 2030 scenarios that reflect the use of a societal interest rate and also looks into the impact of different assumptions on lifetimes of energy efficiency measures.

In the European Commission impact assessment[14] (IA 2016), five decarbonisation scenarios are assessed, reflecting an energy efficiency target in 2030 of 27%, 30%, 33%, 35%, and 40% compared to baseline. The scenario reflecting a 27% efficiency target was found to represent the lowest system costs.

Approach

The results of the impact assessment on capital costs and direct energy efficiency investments are provided in annuitized figures. Annuitized costs are a product of the Investment costs (I) and the Capital Recovery Factor (CRF):

$$Annuitized costs = I * CRF$$

in which the CRF is calculated from a discount (interest) rate (d) and a lifetime (L):

$$CRF = \frac{d(1+d)^L}{(1+d)^L - 1}$$

In the impact assessment, a discount rate (d) of 10% is used, and the following values are used for L:

Cost category	Lifetime	Source
Capital costs	15 years	Assumption based on interview with PRIMES team
Direct efficiency investment costs	20 years	Assumption based on interview with PRIMES team

With the annuitized costs and the above interest rate and lifetimes the Investment costs I can be determined for the cost categories in the different scenarios. To calculate annuitized costs under different assumptions on interest rate and lifetimes, the *CRF*'s are calculated with the respective new rates and lifetimes and are multiplied by the investment costs.

[14]Commission Staff Working Document Impact Assessment accompanying the document: Proposal for a Directive of the European Parliament and of the Council amending Directive 2012/27/EU on Energy Efficiency; 30/11/2016

Two scenarios are considered for the CBA:

- a scenario using a societal interest rate (i.e. 4%, following the recommendations of the better regulation guideline) and
- a scenario where the lifetime of direct energy efficiency investment costs is changed to 30 years (which reflects a realistic average lifetime of energy efficiency measures), while keeping the lifetime of capital costs at 15 years and applying a societal interest rate to all sectors.

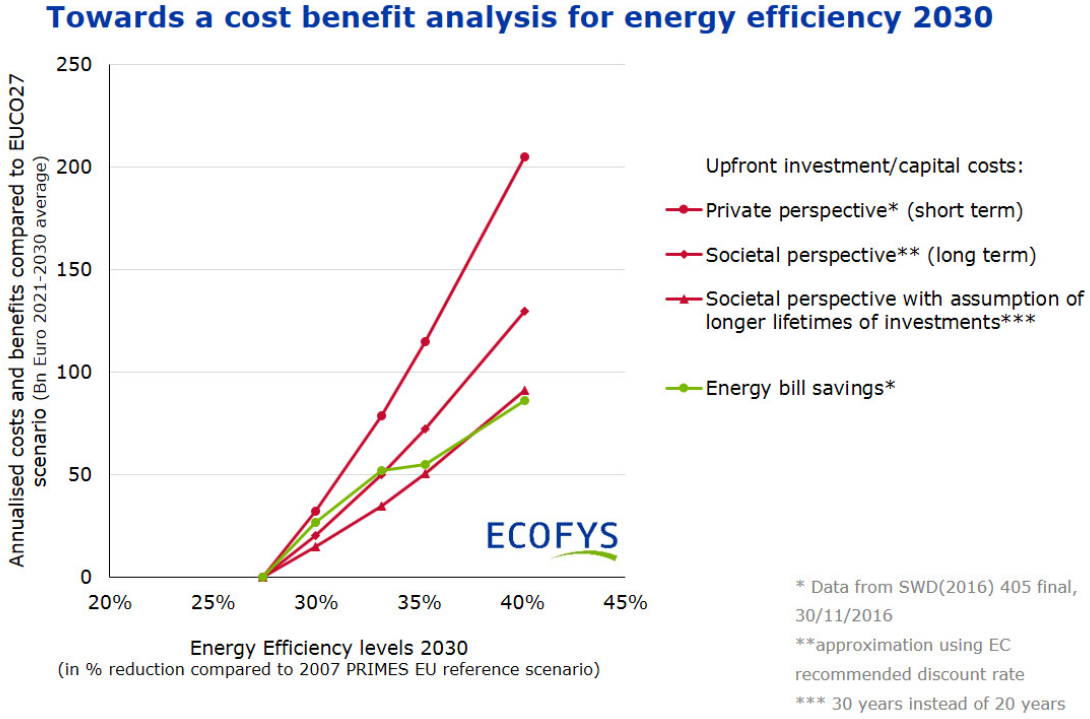
Please note that the use of a societal interest rate represents an approximation of a societal perspective. For a full societal perspective, all taxes need to be subtracted (from investments, as well as from energy purchase costs and related bill savings) and, for example, costs of avoided greenhouse gases need to be taken into account (see also methodology on cost optimal performance levels under the EPBD).

Analogous to our previous report, we display the results as the difference between scenarios. However, whereas we previously displayed the difference compared to the GHG40 scenario we now display the difference compared to the EUCO27 scenario. This is because this report analyses increased ambition from a 27% target.

The outcomes of the cost benefit analysis (i.e. the total costs and total benefits of all sectors) are plotted with the 2030 energy efficiency target (in % primary energy demand savings compared to the PRIMES 2007 EU reference scenario) on the x-axis.

Results

The results of the assessment for the 2021-2030 period are depicted in the chart below.

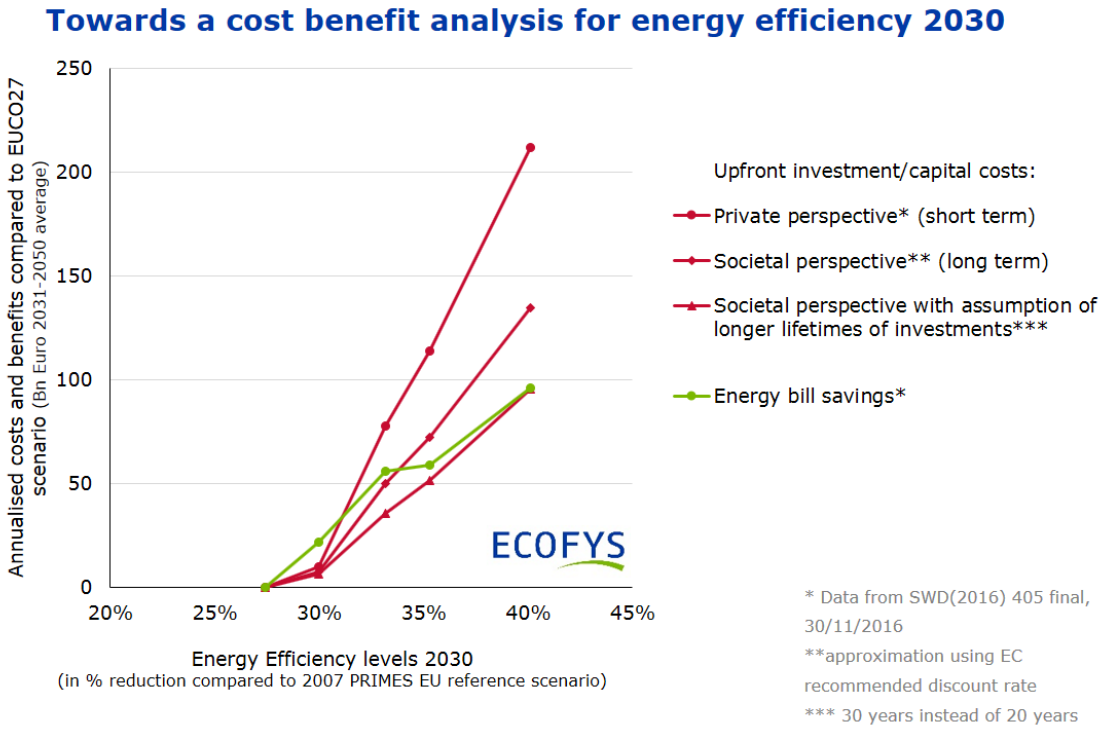


The results show that with the input parameters used in the original Impact Assessment for the time frame 2021-2030, the additional benefits (green line) do not exceed the additional costs for a 2030 target above 27%.

When applying a societal interest rate, the benefits exceed the costs also for the scenarios reflecting energy efficiency targets of 30% and 33%.

When considering in addition lifetimes of energy efficiency measure of 30 years, the benefits exceed the costs also in the 30% and 33% energy efficiency scenario's and the benefits almost meet the costs for the 35% target.

When using the input parameters for the 2031-2050 time frame (see chart below), the benefits exceed the costs also in the 35% and 40% target scenarios when applying the societal discount rate and using a longer lifetime.



4. Going beyond financial impacts

The multiple benefits of energy efficiency and savings should be considered when evaluating different 2030 EE target levels. The IA 2016 has moved in the right direction and provides a broad range of findings, including on energy security, energy bill savings, GHG emissions, employment and health.

These impacts are for example easily illustrated by showing the additional impact of increasing the target beyond 30% by 1% (applying a linear change from the 30 to 33% scenario in IA 2016)[15]. These are the results:

For every 1% extra energy efficiency:

- Gas imports fall by 4%;

- Households get €29 of annual energy bill savings;

- GHG emissions fall by 0.7%;

- Employment increases by 336,000 jobs; and

- Pollution and health costs drop by up to €6bn per year.

[15] Benefits of increasing the EU's 2030 energy efficiency target, Stefan Scheuer Consulting 2016; http://www.stefanscheuer.eu/20161207%20STS%20Benefits%20of%20increasing%20EU%202030%20EE%20target.pdf

5. Conclusions

Moving from a least-cost approach towards a cost-benefit analysis for assessing impacts of 2030 target levels is required to adequately support decision-making in line with the priorities set by the *"Clean Energy for All Europeans"* package: to put energy efficiency first.

This means that the financial analysis of different policy options should take into account the positive investment environment created by additional energy efficiency policies. Further to a private perspective that can help identify barriers and split incentives, the analysis should be done from a societal perspective to ensure that policies are shaped with a view to maximise short- as well as long term benefits at a societal level.

The assessment of impacts using of a societal interest rate and longer (but realistic) lifetimes of measures revealed significant potential to achieve higher energy efficiency targets. Applying a societal interest rate, the financial benefits exceed the costs for scenarios reflecting energy efficiency targets of 30 and 33%. When considering in addition lifetimes of energy efficiency measure of 30 years and the impacts on the 2031-2050 period, benefits exceed costs in the 35% and the 40% energy efficiency scenarios as well.

These substantially higher cost-effective levels for energy efficiency of up to 40% are also confirmed by other study results presented in the IA 2016.

Besides the financial benefits analysed in this study, the IA 2016 quantifies the additional non-financial benefits from more ambitious energy efficiency targets, including on energy security, employment, GHG emissions and health.