IMPACT ASSESSMENT INSTITUTE

Impact Assessment Institute

The Institute for Impact Assessment and Scientific Evaluation of Policy and Legislation

"Impartial Analysis for Policy Making"

Final study scrutinising

the IMPACT ASSESSMENT

accompanying the European Commission's:

"Proposal for a Directive of the European Parliament and of the Council of Amending the Directive 2012/27/EU on Energy Efficiency"

SWD (2016) 405 Final

and on

the coherence between the Impact Assessment and the legislative proposal COM (2016) 761

IAI-EE-170918f

18th September 2017

Main Findings

The Proposal for a Directive of the European Parliament and of the Council amending Directive 2012/27/EU on Energy Efficiency is one of eight proposals of the "Clean Energy for all Europeans" package. This IAI study scrutinises the Impact Assessment on energy efficiency and its coherence with the legislative proposal, taking into account the whole energy package. A significant amount of data and analysis is presented in the Impact Assessment, but there are important weaknesses in the evidence base, which undermine the coherence of the policy provisions in the proposal:

- Most of the results presented in the Impact Assessment are generated by models unavailable for scrutiny. Little or no supporting data is presented that would provide context for the results. The evidence therefore lacks the necessary legitimacy for a policy area of this importance.
- The 30% energy savings scenario was only seriously compared to 27%. No explanation was provided for not fully assessing higher levels of ambition up to 40%. Clear criteria should have been set to measure and compare all scenarios on an equal footing.
- All energy savings scenarios from 27% upwards meet the 40% GHG reduction and 27% renewable energy targets. The 30% target is not clearly shown to have more beneficial impacts than any of the other policy options.
- Four economic assumptions using the E3ME and GEM-E3 models were used to calculate GDP and jobs impacts. These produced a wide range of positive and negative results, with no attempt to select the most feasible model and assumptions, resulting in highly uncertain conclusions.
- In particular three assumptions project high numbers of additional jobs due to energy efficiency investments, with the fourth predicting a significant fall. None of these consider the net employment impact compared to alternative investment destinations for scarce capital.
- Projected investment needs are substantial for all scenarios, for example between €200 and €400 annually per household for 30% energy savings, increasing with higher savings. Little attention is given to the question of how these investments, if accurately modelled, can be realised.
- Scenarios for achieving the energy savings targets based on behavioural changes instead of purely on investment were not assessed. Behavioural measures that require lower investment could be considered, likely requiring more extensive incentives and regulations.
- The Impact Assessment should have additionally assessed the impacts of the alternative option of the energy price increases that would be necessary to achieve the energy savings targets.
- The justification for preferring a 1.5% annual end-use energy savings target for Member States only quotes its proportionality to the presumed overall goal of 30%. More ambitious annual savings options (1.75% and 2.0%) are dismissed without properly assessing their impacts.
- Uncertain accountability and potential double-counting undermine the value of the annual end use energy savings figures, whilst permitted exemptions reduce the net savings from 1.5% to 0.75%. These are key issues but their effects were not addressed in the Impact Assessment.

From these findings, the IAI proposes the following considerations in further policy development:

- Immediately allow stakeholders to have full access to the economic models, enabling additional analysis to underpin further policy making.
- Assess all energy efficiency scenarios on an equal footing using the available evidence, setting clear criteria for assessment and selection of policy options.
- Consider and assess alternatives to the high investment options for meeting energy savings targets, including behavioural change and price increases.
- Consider injecting greater clarity and transparency into annual end use energy savings targets by replacing the current exemptions with a more accountable system.

Visualisation

The following table provides a visual overview of the results of this report for each element of the evidence presented in the Impact Assessment, using an assessment from 1 to 7 to indicate the level of confidence (1 = highest, 7 = lowest confidence level).

Element	**Assessment level & description (1…7)**		**Notes**
Rhetoric	3	Several questions identified on analysis and/or evidence	Language is slanted towards the proposed policy option but in most cases it is concise and neutral.
Assumptions	5	Substantial concerns identified with analysis and/or evidence	Significant flaws are identified in the assumptions underlying the economic modelling.
Background data	6	Serious concerns identified with analysis and/or evidence	The data input to the modelling is not available for scrutiny and its quality cannot be assessed. Data on end use is limited in scope.
Analysis	6	Serious concerns identified with analysis and/or evidence	A balanced assessment of all scenarios was not carried out. The overall assessment of options is not based on coherent criteria. Feasibility of the scenarios is not addressed.
Results	5	Substantial concerns identified with analysis and/or evidence	The results are informative but their legitimacy suffer from assumptions and lack of transparency.
Conclusions	6	Serious concerns identified with analysis and/or evidence	Conclusions are slanted towards favouring specific policy options and do not rely on consistent reasoning with the data. Only two policy options are seriously considered for the main policy issues.

Key to assessment levels

1	2	3	4	5	6	7
Correct analysis, fully evidenced	Minor questions identified on analysis and/or evidence	Several questions identified on analysis and/or evidence	Concerns identified with analysis and/or evidence	Substantial concerns identified with analysis and/or evidence	Serious concerns identified with analysis and/or evidence	Inadequate analysis / evidence absent

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1. Introduction

The "Proposal for a Directive of the European Parliament and of the Council Amending the Directive 2012/27/EU on Energy Efficiency" was published on 30th November 2016 in order to update the energy efficiency targets of the European Union for the 2030 timeframe. In the European Commission's 2014 communication on Energy Efficiency[1], an energy savings target of 30% was proposed compared to 2005 levels. In its subsequent resolution, the Council endorsed 27%, "having in mind a 30% target". This target was set alongside a 40% reduction in greenhouse gas emissions and an EU target of a 27% share of renewables, for 2030. The European Parliament went further by calling for a 40% energy savings target.

The legislative proposal sets a 30% energy savings target in 2030 compared to the 2007 baseline scenario, which is translated into absolute energy use targets both for primary energy and final energy consumption. It also sets an annual end use energy savings target for Member States of 1.5%.

This IAI study scrutinises the evidence presented regarding these two main elements of the directive: the energy efficiency target and the annual end user savings target. This report reviews the methodology, assumptions and conclusions made by the Impact Assessment, drawing on information presented in the Impact Assessment, as well as studies by NGOs and industry.

1.1 Subsidiarity check

A section on subsidiarity is included in both the Impact Assessment and the legislative proposal. They each include an adequately detailed explanation of the need for action at EU level to meet the energy policy objectives set by the institutions. They do not however go far enough in acknowledging that without binding targets at Member State level, the "binding" EU target for energy efficiency has no consistent enforcement mechanism. The proposal, due to the political decision to apply only the EU-wide energy efficiency target, does not therefore address subsidiarity adequately in the context of the overall objective. Member states are allowed to reach the 1.5% end use target, as they best see fit. They can use deductions, and are able to count previous energy saving measures, limiting its effectiveness. No conclusion was made in the Impact Assessment, with regards to the 30% energy efficiency savings target, as to whether it should be indicative or binding. A full acknowledgement of this point would have highlighted the inherent conflicts in the legislation and therefore would have had a fundamental influence on the nature of the assessment, providing transparency for stakeholders on the policy framework.

1.2 Proportionality check

Correctly, proportionality is addressed in the legislative proposal rather than in the introduction to the Impact Assessment, as it is dependent on the assessed impacts. The

[1] Energy Efficiency and its contribution to energy security and the 2030 Framework for climate and energy policy. 2014

justification for proportionality is adequately detailed and explained in regards to the 1.5% end use savings target. These 1.5% yearly savings if achieved will lead to the overall energy efficiency savings objectives. However, the text does not adequately explain how the 30% binding EU target is proportional.

The justification given for the directive and the subsequent percentage chosen raises questions. The justification should refer to the results of the Impact Assessment, stating that they indicate the appropriateness of the selected 30% target against the 27% target or any of the other targets. Instead a circular logic is used to justify the target, stating that the 30% target is selected in order to accomplish the agreed objective of a 27% increase in energy efficiency by 2030, with a target of 30% in mind.

1.3 Transparency

The lack of transparency of analytical modelling in EU energy policy remains a serious fundamental challenge to better regulation in this domain. Specifically, inaccessibility to stakeholders of the modelling algorithms represents a barrier to understanding and scrutiny by those interested in and affected by energy legislation, which ultimately encompasses all citizens. This issue was first highlighted by the Impact Assessment Institute study of December 2015[2] scrutinising the Commission's non-legislative Impact Assessments on Climate & Energy Policy and Energy Efficiency. The Institute further sent a letter to the European Commission[3] highlighting this fundamental issue. Since then, the modelling data in question, in particular the PRIMES model, has been applied in legislative dossiers such as the Emissions Trading System. For the current energy package, including the proposal on the renewable energy directive, the data has been updated with the same lack of transparency. In this directive on energy efficiency, the PRIMES model works in concert with the E3ME and GEM-E3 economic models, whose detailed workings are also unavailable.

In many places in the Impact Assessment, tables of data are presented for which a greater understanding of the background to the figures is essential. The lack of availability of the underlying data and the inability of stakeholders to scrutinise fully the results therefore generates uncertainty and detracts from the credibility of the analysis underlying the policy making. This is a fundamental flaw in EU energy policy making and calls into serious question the provisions of the legislative package on energy.

[2] "Report on transparency, consistency and feasibility in the Impact Assessments accompanying the European Commission Communications SWD (2014) 15 and SWD (2014) 255", the Impact Assessment Institute, 14th December 2015.

[3] Impact Assessment Institute letter to European Commission VP Franz Timmermans 15th February 2016 http://bit.ly/2tlCiG2 and response from cabinet 15th April 2016. http://bit.ly/2vwWnWy.

2. Background and assumptions

An underlying conflict in the Impact Assessment and legislative proposal is the use of the term "Energy Efficiency" in the title and the text. The proposed legislative targets act upon energy use, not energy efficiency. Whilst increased energy efficiency is one way to reduce energy use, they are not the same thing. Whilst the detailed text of the documents describes correctly that energy savings are being targeted, the inconsistent terminology is misleading for policy makers, stakeholders and the public. This has the potential to confuse and therefore to result in sub-optimal policy making. " Energy savings" should be the term consistently used to describe the legislation, with "energy efficiency" being one aspect of the assessment.

Fundamental to understanding the reformulation of the energy efficiency standards are the historical data in primary energy consumption. The following figure shows the primary energy consumption (blue) and GDP (red) from 1995 to 2014. Also shown are the EU28 target and the sum of the national targets for 2020. A downward trajectory in energy consumption continuing the trend between 2006 and 2015 would achieve the EU28 target.

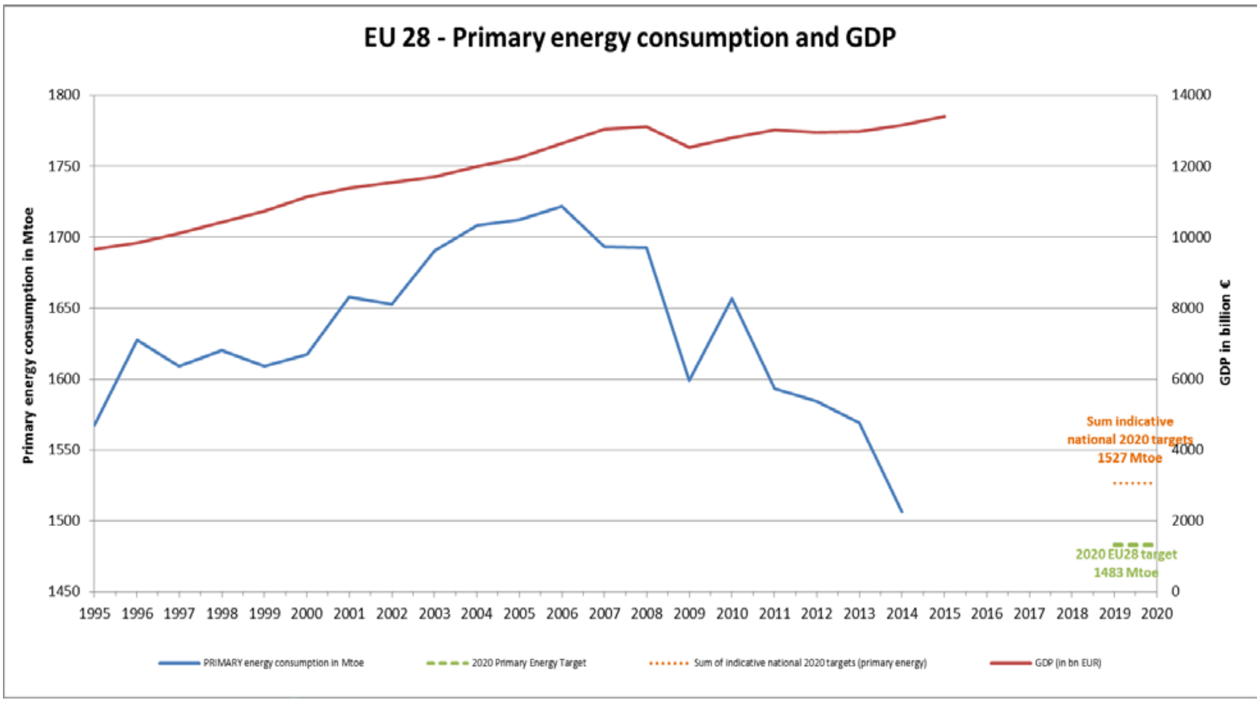

Figure 1: Primary energy consumption in EU28 4

The Impact Assessment projects the successful achievement of the EU2020 target, with funding schemes and incentives implemented to support its achievement.

2.1 Modelling and assumptions for energy efficiency measures

The Impact Assessment relies upon three primary economic modelling engines: E3ME, GEM-E3 and PRIMES. E3ME and GEM-E3 are both macroeconomic models that come from slightly different schools of economic thought. Both of these models are used to assess

[4] EUCO 169/14, CO EUR 13, CONCL 5, Brussels 24 October 2014.

macroeconomic repercussions of each policy option. Each model receives inputs from the PRIMES model, whose lack of transparency has been well documented.

E3ME uses post-Keynesian theory and is adjusted for market imperfections. It assumes two scenarios for business investment on energy efficiency: partial crowding out and no crowding out. The "partial crowding out" imposes a constraint on activity expansion by introducing a rule that would set a maximum rate of 5% by which the economic sectors benefiting from energy efficiency policies would be allowed to grow over three years starting in 2021, without adversely affecting other economic activities.

The “no crowding out” is the standard assumption of the E3ME model and assumes no maximum level on production growth. The Impact Assessment justifies this approach by stating:

> *“In general, the analysis at the economy-wide level showed that energy efficiency policies should be designed in such a way that possible crowding-out of investments in other economic sectors is limited…”*

This appears to express a desire, but since investment capital is by nature limited, the no crowding out assumption is flawed. Evidence has not been presented to indicate that crowding out can be overridden.

The GEM-E3 model is a general equilibrium model of neoclassic economic theory. It assumes markets will clear and agents behave optimally, and as that capital markets behave in an optimal manner. This model assumes two modes of financing for energy efficiency expenditures: loan-based and self-finance. These scenarios are understood as written, the loan-based requires an agent (business or household) to secure a loan covering 90% of the expenditure in 2020. The self-financing version is where the agent pays for the energy efficiency measures through own resources. GEM-E3 intrinsically assumes crowding out effects.

The assumption in this application of GEM-E3 is that the financing options are taken up by a sufficient proportion of actors to meet the respective energy savings targets. However no evidence is presented to demonstrate that this would be the case. Further, the assumption of optimal capital markets and agent behaviour is also questionable since investment in energy efficiency is considered to be subject to market failure.

The text of the Impact Assessment, (Section 5.1.2) indicates the relative viability of the two assumptions for each model, stating “In both cases, the more nuanced assumption is considered more realistic”. It is not clear which options are the “nuanced” ones. For E3ME, nuanced would appear to mean partial crowding out, since this would be expected to correspond more closely to real conditions. For GEM-E3, it is not clear whether loan or self-financing is more “nuanced”.

In all cases the effects of measures necessary to ensure that the investments actually take place, such as incentives or regulations, do not appear to be taken into account in the modelling. This would take address the fact that the scenarios themselves are realistic only if there is a mechanism to generate them (i.e. by investment in and implementation of the energy savings). The effects of such measures could be substantial due to the significant investment requirements they are required to incentivise.

The text of the Impact Assessment further explains the reasoning for including a number of models and assumptions, quoting the need to address uncertainty, to understand better the ranges of macroeconomic effects and to model both loan and self-financing conditions. However, it would have been more coherent to distil these into a single set of realistic modelling parameters and assumptions, which would then have produced a result that could be used to inform policy solutions. On top of this a delta analysis could have been performed to demonstrate the effect of different (reasonable) economic assumptions.

The following table lists the modelled effect on GDP, employment and real disposable income for the EUCO30 and EUCO40 scenarios for each of the four model/assumption combinations.

	EUCO30			**EUCO40**		
% change from EUCO27	**GDP**	**Employment**	**Real Disposable Income**	**GDP**	**Employment**	**Real Disposable Income**
E3ME (no crowding out)	0.39	0.17	0.16	4.08	2.08	2.88
E3ME (partial crowding out)	0.39	0.17	N/A[5]	2.21	1.40	N/A
GEM-E3 (loan-based)	0.26	0.20	0.25	0.06	0.56	0.18
GEM-E3 (self-financing)	-0.22	-0.18	-0.14	-2.12	-1.36	-1.84

Table 1: Differences in economic outputs across parameters for EUCO30 and EUCO40 policy options

The results of the different models and assumptions for each policy option exhibit a wide range of values, demonstrating high sensitivity to the boundary conditions and leading to high uncertainty in the results. If the no crowding out option is discounted (due to the reservations indicated above), the remaining modelling options still exhibit a wide range of positive and negative figures for all three parameters.

Whilst the Impact Assessment devotes a section to each of the economic impacts analysing the models and assumptions (see below), the presence of this wide range of results precludes a firm conclusion on the preferred option. Due to the lack of availability of these models' algorithms, it is not possible to understand how their assumptions are mathematically factored into the model and therefore how they interact in practice to generate the results. At the very least, additional information on the input and output parameters would have been necessary, for example on the penetration of loan take up in the relevant models. This lack of information is especially problematic for the cases, as above, in which the model results exhibit highly variable patterns.

The figures for GDP and employment are discussed in greater detail in Section 3.

[5] Real disposable income results are not reported for the E3ME case of "partial crowding out". This is because of the methodological approach of E3ME in representing potential crowding out effects, which are modelled via forcing higher savings to compensate for what would have been price changes if crowding out effects were to be modelled in a tradition general equilibrium model. In other words, because of the post-Keynesian approach to simulating the possible existence of crowding out effects that are typical to economic equilibrium approaches and not to non-equilibrium models, income effects cannot be adequately captured in the "partial crowding out" version of E3ME.

3. Review of the assessment of EU energy savings policy options for 2030

Five energy savings policy options are assessed, each representing a percentage reduction in both primary and final energy consumption compared to the 2007 baseline:

Scenario	Energy savings	Primary energy target (mtoe)	Final energy target (mtoe)
EUCO27	27%	1,369	1,031
EUCO30	30%	1,321	987
EUCO33	33%	1,260	929
EUCO35	35%	1,220	893
EUCO40	40%	1,129	825

Table 2: Overview of energy savings scenarios

Of these, three have prominently emerged in policy discussions, which are each supported a different set of stakeholders:

- Many industry actors as well as southern and eastern Member States would like to keep the target at 27%.
- The legislative proposal, gaining support from northern and western Member States, sets the target at 30%.
- The 40% target is supported by a number of NGOs and is also called for by the European Parliament.

This study looks at the evidence available for all five policy options.

The impacts on the following parameters are assessed in the Impact Assessment and subsequently used in the selection of the preferred policy option:

- GDP
- System costs
- Investment
- Energy imports
- Emissions Trading System
- Employment
- Health effects

This appears to be a comprehensive list of the relevant parameters for assessment of the policy options. The rationale stated in the Impact Assessment for increasing the target to 30% was based on the favourable impacts projected for these parameters. Each of these is reviewed below for each policy option using data available through the Impact Assessment, and acquired from alternative sources.

At a number of points in the text (page 39, 42 etc) footnotes argue that a comparison of the EUCO scenarios to the reference scenario should not be undertaken in the context of energy efficiency, since the EUCO27 scenario also includes measures that impact GHG and renewable energy. However, the comparison of the scenarios to EUCO27 also does not provide a valid assessment, since a proportion of the impact and investment to reach this scenario is related to energy efficiency. Without full access to the underlying data, this cannot be assessed. In the scrutiny below, this point is highlighted and taken into account where relevant.

3.1 GDP

GDP effects are shown in the table below.

The E3ME model predicts an increase in GDP across the policy options regardless of crowding out effects, with the same GDP effect projected for EUCO30 with and without crowding out. The GDP growth is larger under no crowding out for the higher energy saving scenarios although as stated in Section 2.1 above, the assumption of no crowding out is questionable.

% change from EUCO27	Ref2016[6] (bn €2013)	EUCO27 (bn €2013)	EUCO30	EUCO+33	EUCO+35	EUCO+40
E3ME (no crowding out)	17,928	18,045	0.39	1.45	2.08	4.08
E3ME (partial crowding out)	17,928	18,045	0.39	1.30	1.58	2.21
GEM-E3 (loan-based)	16,955	16,962	0.26	0.21	0.16	0.06
GEM-E3 (self-financing)	16,955	16,907	-0.22	-0.79	-1.35	-2.12

Table 3: GDP change across policy options

The GEM-E3 model projects much lower GDP growth and also shows lower growth for high energy savings, in contrast to E3ME. Additionally it is interesting to note the difference between the loan-based and self-financing outputs, suggesting that loans or other financial mechanisms for households and corporations would need to be available to avoid the significant decline in GDP projected for the self-financing condition.

In the loan-based scenario it is unclear if the behavioural nature of actors is taken into account. There are several barriers to access of these loans including but not limited to: access to the loan information, be able to obtain/be approved for a loan, physically go to the financial institution to receive the loan and have the knowledge to take best advantage of any beneficial systems in place. As indicated in the previous section, policy measures would be required to incentivise or regulate uptake of the investments on energy saving. Such measures themselves would likely have impacts but these do not appear to have been modelled.

In regards to each of the three popular choices, EUCO40 is favoured in both EM3E models as it increases the GDP by the greatest amount while EUCO30 is favoured in the GEM-E3 loan based scenario and EUCO27 in the GEM-E3 self-financing scenario.

The wide range of results of these scenarios creates a high level of uncertainty in the conclusions that can be drawn for policy decisions. The modelling results themselves appear to be consistent with the assumptions, but this can only be verified with full access to the models. The feasibility of the investment scenarios themselves is dealt with in Section 3.3 below.

[6] Whereas the EUCO scenarios achieve the 2030 targets for RES (≥27%), GHG (≥ 40%) and energy efficiency (≥27%), the REF2016 does not achieve these targets. Therefore, a comparison of the results of EUCO scenarios with REF2016 should not be undertaken to identify the impacts of a higher energy efficiency level above 27% in 2030 only because this comparison would include also the impacts of a higher RES and GHG targets and the associated cost.

3.2 System Costs

The total system costs associated with each policy option is laid out below along with the total systems cost as a percentage of GDP. This was done for both the 2021-2030 timeline (shown in the graph below) and a further-reaching 2021-2050 timeline. The cost rises across the policy options in the 2021-2030 timeframe at a rate that increases with higher energy savings.

Energy system costs (2030)	**Ref2016**[7]	**EUCO27**	**EUCO30**	**EUCO+33**	**EUCO+35**	**EUCO+40**
Total System Costs in billion €'13 (average annual 2021-30)	1,928	1,943	1,952	1,977	2,014	2,077
Change in system costs compared to EUCO27 (in bn €'13)			9	34	71	133
Total System Costs as % of GDP (average annual 2021-30)	12.28	12.37	12.42	12.57	12.80	13.18
Total System Costs as % of GDP increase (average annual 2021-30) compared to EUCO27 in % points			0.05	0.20	0.43	0.80

Table 4: Energy system costs 2021-2030[8]

Therefore, considering only the total system costs between 2021 and 2030, the EUCO27 scenario would be the most favourable.

In the longer outlook from 2021-2050 there is a negative change in system costs between EUCO27 and EUCO30 (Figure 2). According to the Impact Assessment "*Taking a longer term perspective (2021-2050), the average annual system costs for the 30% scenario would be € 9 billion lower than in the EUCO27 scenario, as the benefits of investments made between 2021 and 2030 continue to pay off post-2030.*" This result implies that the economic costs and benefits in the 2021-2050 timeframe are near the optimum point in the EUCO30 scenario and that this would be the preferred option on a total cost basis if a longer term view is taken.

However the lack of availability of the model and absence of further data means that the Impact Assessment does not provide an understanding of the factors causing this optimum point to arise. Such information would be necessary in order to provide confidence in the mechanism that causes this optimum to arise and therefore in the results and conclusions of the modelling.

[7] Whereas the EUCO scenarios achieve the 2030 targets for RES (≥27%), GHG (≥ 40%) and energy efficiency ((≥27%), the REF2016 does not achieve these targets. Therefore, a comparison of the results of EUCO scenarios with REF2016 should not be undertaken to identify the impacts of a higher energy efficiency level above 27% in 2030 only because this comparison would include also the impacts of a higher RES and GHG targets and the associated cost.

[8] The small difference between the total system costs and the summation of capital costs, energy purchase costs and direct efficiency investment costs (as shown in Annex 4) is due to the inclusion of the supply side auction payments under energy purchases, embedded in the energy prices (but not included under the reported total system costs which exclude auction payments).

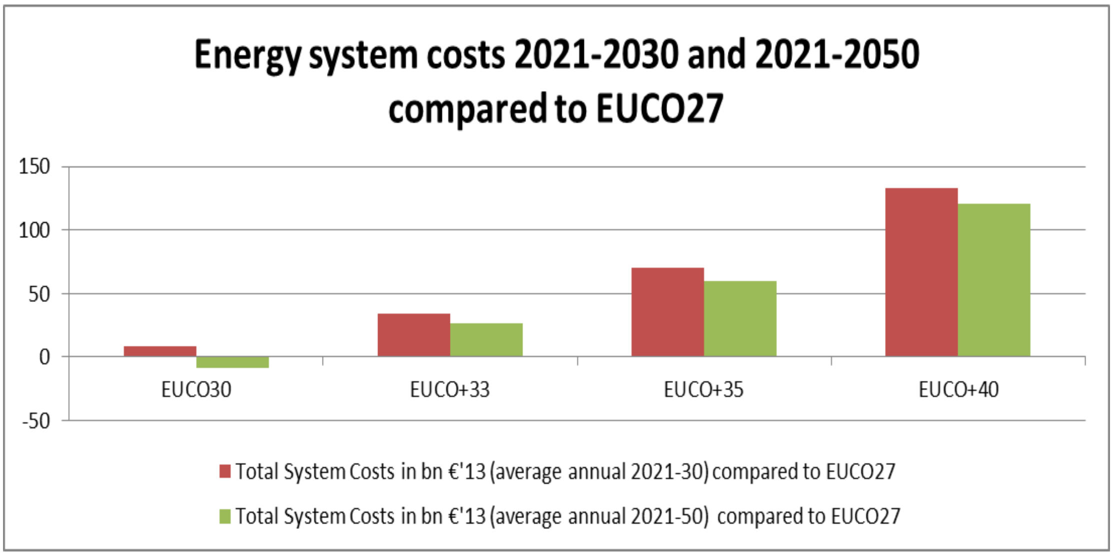

Figure 2: Average annual energy system costs 2021-2030 and 2021-2050

Again, the results depend on the successful uptake of the energy savings measures.

3.3 Investment

Investment will be necessary to meet the Energy Efficiency Targets in the 2030 scenario. The Impact Assessment lays out the total investment expenditures projected to be necessary to meet each scenario, along with a decomposed breakdown of different sectors. These figures indicate the investments required in order to reach the energy efficiency targets. However, the lack of availability for scrutiny of the PRIMES model used to generate the figures means they cannot be verified.

The projected investment figures are shown in the following table and chart.

Investment expenditures: total and sectorial decomposition in billion €'10 (average annual 2021-30)	Ref2016	EUCO27	EUCO30	EUCO+33	EUCO+35	EUCO+40
Total energy related investment expenditures	**938**	**1,036**	**1,115**	**1,232**	**1,324**	**1,565**
Change from EUCO27 in bn €			**78**	**196**	**288**	**529**
Households	127	168	214	286	337	455
Change from EUCO27 in bn €			47	118	169	288
Tertiary	23	40	68	119	157	257
Change from EUCO27 in bn €			28	79	117	217
Industry	15	17	19	24	29	51
Change from EUCO27 in bn €			1	6	12	34
Transport	705	731	736	729	733	740
Change from EUCO27 in bn €			5	-2	2	9
Grid	34	39	36	34	31	26
Change from EUCO27 in bn €			-3	-5	-8	-13
Generation and industrial boilers	33	42	42	40	37	36
Change from EUCO27 in bn €			0	-2	-5	-6

Table 5: Projected total investment expenditures and additional investment vs EUCO27

Further, there is insufficient information provided in the Impact Assessment and its annexes indicating how the figures were generated. This is a serious omission, as these figures are fundamental to the policy area. A fully transparent analysis is necessary in order to provide valid figures and generate the necessary confidence for all stakeholders. At the very least, an explanation of how the figures were generated, the sources of the background data and a description of the algorithms used are necessary.

In the table above, the investment figures are compared to the EUCO27 scenario, not to the Reference scenario. A substantial part of the investment required to meet EUCO27 is due to meeting the GHG and renewable energy targets and cannot be directly attributed to energy efficiency. Information is not provided on the proportion attributable only to energy savings. However, the analysis below considers how the investments will be secured, which is a relevant question regardless of the purpose. In the subsequent analysis, investment figures compared to EUCO27 and to the Reference scenario are both quoted for completeness. The graph below shows the investments in comparison to the Reference scenario, in contrast to the table, in order to reflect the total investments projected to be necessary.

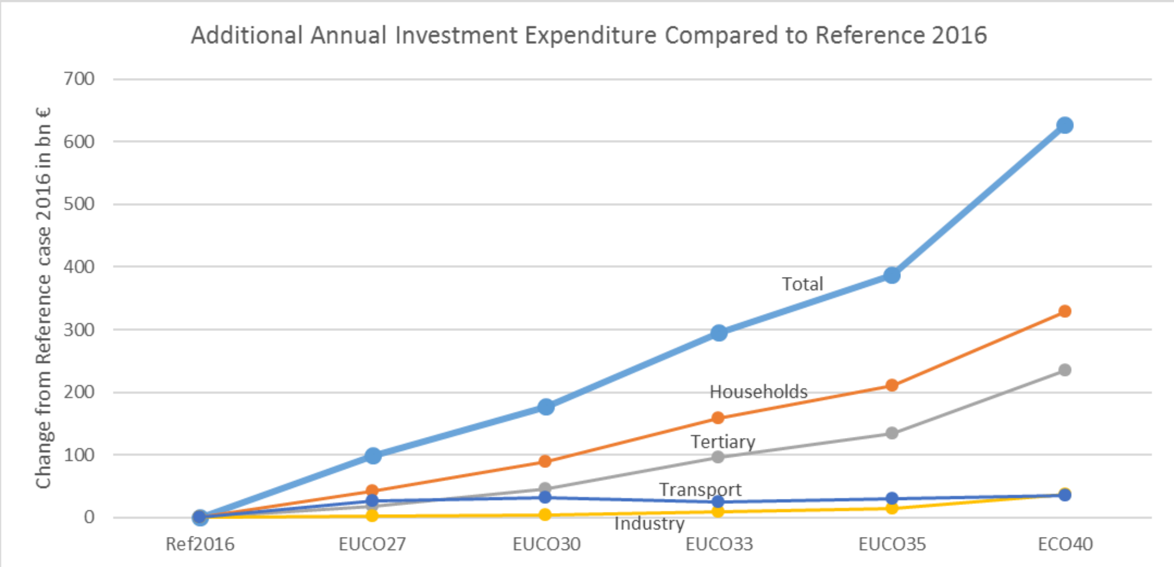

Figure 3: Projected investment expenditures vs reference scenario (excluding grid infrastructure and generation boilers for readability)

In all sectors, greater investments are projected as the 2030 energy savings target increases except in the case of transport, grid infrastructure and generation boilers. This general trend is reasonable, as greater investment in equipment and other measures would be expected in order to save more energy.

In the cases of grid infrastructure and generation boilers, the decreased need for investment with higher energy savings is explained in the Impact Assessment as being due to decrease of energy use and decrease dependence on fossil fuels respectively. This is consistent with reasonable expectation.

A footnote indicates that the investment figures for transport include rolling stock but not infrastructure and also exclude the cost of recharging infrastructure (for electric vehicles). This last point is justified by the recuperation in PRIMES of the costs of infrastructure in electricity prices. However, all relevant transport investments should be shown as investments in this table in order to be consistent. Charging infrastructure will not necessarily only be undertaken by utilities who then pass on the costs through electricity prices. If such investments are recuperated through costs, the table should also have excluded figures for grid investment.

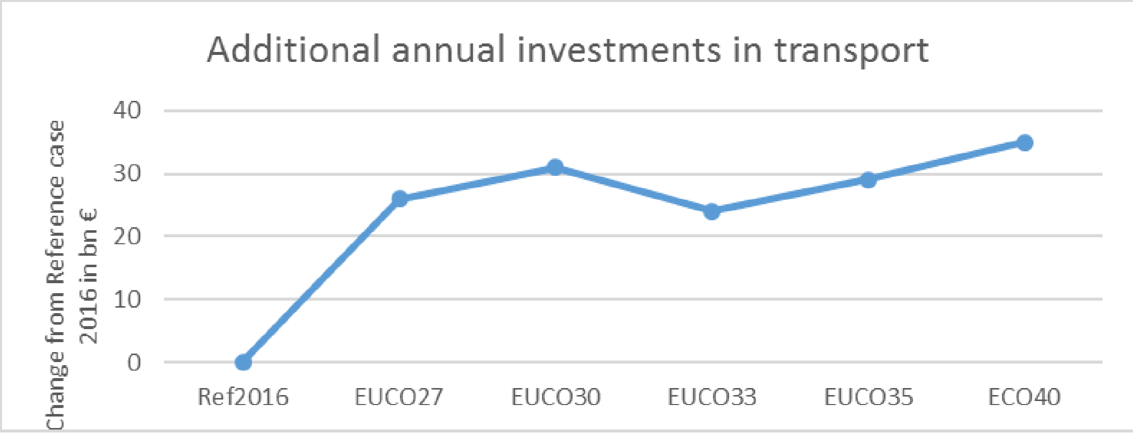

Figure 4: Projected investment expenditures

The relatively large jump in annual transport investment requirements between the Reference Scenario and EUCO27 (€26bn) is presumably due to the cost of reaching the GHG and renewables targets as well as the 27% energy savings. The further increase in investment to EUCO40 is only €9bn, including a fall between EUCO30 and EUCO33. An explanation in the Impact Assessment of the lack of material change in investment need for transport across the scenarios would have been valuable in creating confidence in the viability of the figures. This stability is in stark contrast to the much greater differential for households (€288bn between EUCO30 and EUCO40).

For the EUCO40 scenario, fleet average CO2 standards for cars of 74g/km in 2025 and 64g/km in 2030 are projected (Impact Assessment page 80). Realisation of these figures (reductions of 38% and 46% below the 2016 achievement level) would appear to require a material penetration of electrically chargeable vehicles. In turn this would require private and/or public charging infrastructure, including public charging stations or points as well as an upgrade of the grid and power capacity in homes.

The likelihood of the investments (in all sectors) being made is not directly addressed in the Impact Assessment. Binding targets on Member States for annual energy efficiency improvements are proposed, but in order to be realised, these must translate through policy measures into a sufficient incentive for businesses and households to invest.

The Impact Assessment does include a caveat that each instrument may not work in all circumstances and Member States should create the best financial scheme for their current situation, thereby itself acknowledging that the required investments are not guaranteed.

Finally the Impact Assessment identifies that the largest investment will need to be made for households, reflecting the fact that this sector is projected to have the highest potential for energy savings. The average rate of renovation for buildings across the EU is 1%[9]. This is the case where the assumptions of the investment model appear most likely to break down in practice. For the preferred EUCO30 scenario, the additional annual investment compared to EUCO27 is €79bn per year, of which €47bn for households (about €200 per household[10]). Compared to the reference scenario (therefore including some non energy efficiency

[9] "Impact Assessment on the Proposal amending Directive 2010/31/EU on the energy performance of buildings", SWD(2016)414, European Commission, 30th November 2016

[10] Eurostat data on household composition (2.3 people per household) and population (512m) in the EU

investment) this is €177bn per year, of which €87bn for households (about €400 per household). Split incentives exist for many households. In the case of rental properties the landlord may choose not to install energy efficient technologies because they will not necessarily be able to recoup the investment through higher rents. Further, a clear incentive for individuals to invest in energy savings measures for their own properties would be required.

The figures are commensurately higher for the most ambitious scenarios such as EUCO40. EUCO40 requires annually an additional €627bn over the 2021-2030 period compared to the reference scenario (€529bn vs EUCO27), including €329bn (€288bn vs EUCO27) for households, equalling €1500 per household per year (€1300 vs EUCO27). In order for this to be realised, very strong incentives would need to be in place to encourage the investment by both businesses and households.

3.4 Energy Imports

Energy imports play an important role in the EU economy and are particularly relevant to energy security, whose enhancement is one of the objectives of the Directive. As seen in the table below, higher energy savings are projected to lead to lower energy imports, with the strongest effect on gas imports. This effect appears to be consistent with expectation, as the first energy efficiency measures to become effective (through the projected investments) would be those on households, thereby reducing gas demand. Between EUCO27 and EUCO30 there is actually a small increase in imports of solid fuels, presumably reflecting the effect of the decreasing ETS price. Renewable energy decreases across all scenarios but this is associated with the concurrent drop in overall energy use.

Impacts on energy security (2030)	**Ref2016** [11]	**EUCO27**	**EUCO30**	**EUCO+33**	**EUCO+35**	**EUCO+40**
Net Energy Imports Volume (2005=100)	93	86	82	77	75	69
- Solids	67	57	59	57	57	52
- Oil	88	80	79	77	75	73
- Gas	116	110	97	84	78	64
- Renewable Energy	796	848	804	803	785	762

Table 6: Impacts on Energy Security

The Impact Assessment does not evaluate the benefits from decreased imports (as opposed to decreased energy use). The reduced imports reflect reduced energy use. An assessment of the relative value of reducing imports compared to reducing purchases of domestic energy

[11] Whereas the EUCO scenarios achieve the 2030 targets for RES (≥27%), GHG (≥ 40%) and energy efficiency (≥27%), the REF2016 does not achieve these targets. Therefore, a comparison of the results of EUCO scenarios with REF2016 should not be undertaken to identify the impacts of a higher energy efficiency level above 27% in 2030 only because this comparison would include also the impacts of a higher RES and GHG targets and the associated cost.

sources is required in order to make a comprehensive assessment. This would enable the higher ambition scenarios in particular, to be coherently assessed, as these exhibit the highest reductions in imports. A possible approach for addressing this question was proposed in the Institute's study on the renewable energy directive[12] (page 46).

3.5 Emissions Trading System (ETS) and Price of Electricity

The Emissions Trading System carbon price decreases with increasing energy savings in the presented scenarios. However the trend is not consistent. The price increases of €8 between the Reference Scenario and EUCO27 is explained by the higher annual reduction factor in the ETS cap, which in turn helps to reduce energy use, supporting achievement of the 27% energy savings.

Electricity, carbon prices and ETS emissions (2030)	**Ref2016[13]**	**EUCO27**	**EUCO30**	**EUCO+33**	**EUCO+35**	**EUCO+40**
Average Price of Electricity (€/MWh)	158	161	157	158	157	159
ETS carbon price (€/t of CO2-eq)	34	42	27	27	20	14
ETS emissions (% below 2005)	-37.7	-43.1	-43.1	-44.3	-44.2	-48.3

Table 7: Impacts on price of electricity and ETS carbon price

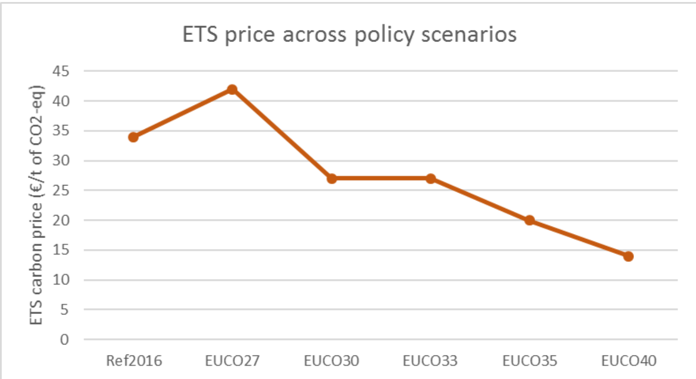

Figure 5: Projected ETS prices

The ETS price decreases between EUCO27 and EUCO30, then identical ETS prices are projected for EUCO30 and EUCO33, with the price again projected to decrease between EUCO33 and EUCO35. No explanation for this discontinuity is available in the Impact Assessment, whereby one would be necessary in order to provide confidence in the apparently anomalous figure and therefore all related results.

[12] Final study on the "IMPACT ASSESSMENT on the Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources" SWD (2016) 418, Impact Assessment Institute, 19th June 2017.

[13] Whereas the EUCO scenarios achieve the 2030 targets for RES (≥27%), GHG (≥ 40%) and energy efficiency (≥27%), the REF2016 does not achieve these targets. Therefore, a comparison of the results of EUCO scenarios with REF2016 should not be undertaken to identify the impacts of a higher energy efficiency level above 27% in 2030 only because this comparison would include also the impacts of a higher RES and GHG targets and the associated cost.

In all cases (except the Reference Scenario), GHG emissions in the covered sectors achieve the 43% target in 2030.

The decrease in the ETS price would be a disincentive to invest in low carbon energy, such as fuel switching or renewables. The overall effect would therefore be a shift in the investment and cost requirements in the energy system from energy suppliers onto users. The lower costs for suppliers should in principle be passed on to users in lower energy prices.

The projected increase in total system cost with higher energy savings (Section 3.2 above) indicates that, using the assumptions, data and algorithms of PRIMES, the cost of the energy savings measures substantially overcompensate the savings in generation.

The above analysis is dependent on the accuracy of the outputs from the PRIMES model, which cannot be verified. The discussion indicates some discrepancies for which no explanation is apparent. The results are therefore beset with uncertainty. A fuller assessment of the interaction between the ETS and the energy savings goals is required.

3.6 Jobs

According to the figures presented in the Impact Assessment, higher energy efficiency would lead to an increase in jobs across all models except for the GEM-E3 self-financing. The change in growth overall is slow at the lower scenarios but ramps up quickly as the more ambitious scenarios are considered.

Similar questions on the assumptions of these models arise as in Section 2.1 above due the wide variations between the results of these modelling scenarios.

The Impact Assessment does not define the quality of the jobs created, in particular the duration. The models used both acknowledge that the employment impact depends on the stock of available suitably skilled labour. If such labour is not available, either wages will increase instead of employment levels or labour would have to be imported. In some high technology sectors, this is already the case in the EU. To ensure EU labour meets the projected demand, sufficient skills would have to be ensured, itself requiring public and/or private investment.

The most important factor is the consideration of alternative destinations for the investment that creates jobs in this sector (budget effect). The figures quote total jobs, but more pertinent would be net jobs, compared to the investment being made in an alternative sector. This net figure could be positive, negative or zero.

It would be positive if the alternative investment destination were a sector with high capital investment, thereby with lower employment intensity. It could be negative if the incentives for energy efficiency divert investment from a theoretically more productive or labour-intensive sector.

If data were available on the efficacy of the assumption made in the models, a more confident prediction of the employment effect (in this sector) could be made. Due to the questions arising on the assumptions (Section 2.1) and the high variability of the quoted figures, confidence in the results is lacking.

	Absolute figures in millions		Change vs EUCO27 in millions			
% change from EUCO27	**REF2016** [14]	**EUCO27**	**EUCO30**	**EUCO+33**	**EUCO+35**	**EUCO+40**
E3ME (no crowding out)	233.1	233.5	+0.405	+1.59	+3.27	+4.8
E3ME (partial crowding out)	233.1	233.5	+0.405	+1.47	+1.98	+3.2
GEM-E3 (loan-based)	216.4	216.6	+0.434	+0.607	+0.780	+1.2
GEM-E3 (self-financing)	216.4	216.0	-0.382	-1.00	-1.81	-2.9

Table 8: Employment impacts in EU28 in 2030 (millions)

Without the consideration of the budget effect, the above figures for jobs impact cannot be considered valid. More sophisticated analysis is necessary to generate a viable projection.

3.7 GHG

GHG emissions decrease across all scenarios, achieving the 40% reduction target for 2030. The reduction in greenhouse gas emissions remains stagnant between the EUCO27 and EUCO30 scenarios and increases with more ambitious scenarios.

Emissions (2030)	**Ref2016** [15]	**EUCO27**	**EUCO30**	**EUCO+33**	**EUCO+35**	**EUCO+40**
Total GHG emissions (% to 1990)	-35.2	-40.7	-40.8	-43.0	-43.9	-47.2

Table 9: GHG emissions and ETS percentage

Notwithstanding the lack of availability of the model used to calculate the figures, the GHG reductions for each scenario appear qualitatively to be consistent with the parameters for the scenarios.

3.8 Health Impacts

The Impact Assessment section on "Air pollution: health impacts and air pollution control cost" contains projections on the costs of impacts on health and life expectancy and of pollution control.

[14] Whereas the EUCO scenarios achieve the 2030 targets for RES (≥27%), GHG (≥ 40%) and energy efficiency (≥27%), the REF2016 does not achieve these targets. Therefore, a comparison of the results of EUCO scenarios with REF2016 should not be undertaken to identify the impacts of a higher energy efficiency level above 27% in 2030 only because this comparison would include also the impacts of a higher RES and GHG targets and the associated cost.

[15] Whereas the EUCO scenarios achieve the 2030 targets for RES (≥27%), GHG (≥ 40%) and energy efficiency (≥27%), the REF2016 does not achieve these targets. Therefore, a comparison of the results of EUCO scenarios with REF2016 should not be undertaken to identify the impacts of a higher energy efficiency level above 27% in 2030 only because this comparison would include also the impacts of a higher RES and GHG targets and the associated cost.

The section quotes "latest research" (from the European Environment Agency) but the reference is to a study from 2010, which therefore does not consider changes and new data in the intervening six years. The introduction appears to tie energy efficiency directly to air pollution abatement, without acknowledging that such a correlation is not automatic and depends on the nature of the changes to the energy system. For example, vehicle emissions will align to emissions standards unless efficiency improvements are brought about by a substantial shift to zero emission vehicles or those with zero emission capability (for example electric).

However, in general less energy consumption would correlate to lower pollutant emissions if consumption of the highest emitting sources is reduced first. The extent of this reduction is assessed by the modelling, whose algorithms, input data and outputs are again not provided, precluding scrutiny of the results. The efficacy of the results (table 18 in the Impact Assessment) cannot therefore be confirmed.

The results are presented in terms of pollution control costs and health damage costs, thereby requiring an economic value being placed on human life, as developed in the EU's Thematic Strategy on Air Pollution. Appropriately a range of values for the cost of a life year lost is used, due to the uncertainty and sensitivity of this type of assessment.

Such figures may be contentious, but where they are quoted, it would be consistent to compare them to the projected cost of each scenario:

Energy system costs & health benefits	EUCO27	EUCO30	EUCO+33	EUCO+35	EUCO+40
Incremental Total System Costs in billion €'13 vs Ref2016 (average annual 2021-30)	0	9	34	71	134
SUM of reduction in pollution control costs & health damage costs in 2030 (€ billion/year)	0	4.5-8.3	15.2-28.4	19.9.-36.6	30.4-55.9

Table 10: Comparison of total system costs and health benefits

This provides a measure (based on the applied assumptions) allowing some comparison of costs and benefits. The projected health benefits partially compensate for the increased total system costs of the energy efficiency scenarios. If a decision were based purely on economic costs and benefits (as in Section 3.2 above), EUCO27 would remain the preferred option for the 2030 timeframe. However, if greater weight were given by policy makers to the health benefits, a more ambitious energy efficiency scenario could be favoured. Figures on health impacts are not provided for 2050 but could be expected to influence the outcome of this decision making method if available.

The two sets of economic figures are not directly comparable since they represent investment and running costs in one case and notional costs avoided in the other, and each apply to different economic actors. However, the direct comparison provides policy makers with a clearer overview of the relevant impacts on which to base decision making.

3.9 Social Impact

The impact on household expenditure is projected, with a "slight" increase in the share of energy related costs expected as energy savings increase in 2030 and a decrease in 2050.

Without access to the modelling it is not possible to confirm the robustness of the projections. Further, the projections are based on achievement of the scenarios, which in turn assume the necessary investments are made. As indicated in Section 3.3, fulfilment of this assumption is not demonstrated.

Real disposable incomes are projected to increase overall and within each income quintile except in the self-financing option presumably do to the use of capital for energy efficiency investments. These projections are made taking into account the projected increase in GDP and in employment.

As in (Section 3.1) and (Section 3.6) there are serious concerns underlying the assumptions for GDP and Employment statistic respectively and the variability between the scenarios. Since these criteria are used in projecting income growth it can be assumed that the same issues apply. Alongside these arguments is the question, as indicated above, of which low-income households have access to loans, and other financial incentives to undertake energy efficiency measures.

3.10 Additional considerations

3.10.1 Investment

The very high projected figures for required investment, especially for households, if substantiated, present a strong disincentive for increased ambition of the energy efficiency scenarios. However, since energy savings targets are achieved by reducing the consumption of energy, in principle this can at least partially be realised through behavioural change. In particular in households, reducing consumption can be achieved by using fewer amenities, switching off lights and accepting lower / higher temperatures. A similar effect may be seen in the tertiary sector.

The impacts of such behavioural change in households would be social and health-related (less comfortable temperatures, fewer energy-consuming conveniences, more attention to controlling energy use) and economic (lower consumption of goods and services). It would be expected that the likelihood of widespread acceptance of such changes would be low or conversely that the regulations / incentives necessary would be onerous. This may be the reason for not including such an option in the Impact Assessment. However, it could also be argued that the likelihood of investment participation to the levels projected is also low, although this option was fully assessed.

For completeness, it would therefore have been appropriate to consider the fully behavioural option (at least for households) in the modelling and analysis. This would have provided valuable information on the social and economic costs and benefits as a platform for a wider discussion on the measures that would be necessary to bring about the behavioural change.

The success of such measures to change behaviour *en masse* would be expected to require far-reaching regulation and/or incentives that well-coordinated at EU, national and local level, combined with strong enforcement. Experience suggests that this would be difficult to achieve. However, the measure of energy price increases is one whose effect could be precisely defined and modelled. For every energy savings target, there must be an energy price level that would bring it about through economic forces, by incentivising investment in energy saving measures or by suppressing energy demand. In the current modelling a very small variation in energy prices between scenarios is projected.

The implementation of policies to apply such price increases could be expected also to be very difficult to achieve (for example through taxes applied at national level) and would be likely to meet some social resistance. They would be expected to have material social and health effects (as indicated above) in addition to economic ones. Significantly higher energy prices would result in higher levels of energy poverty, affecting social well-being due to higher household expenditure and potentially health issues for those choosing to use less energy for heating.

However, the modelling would be an extremely valuable exercise to demonstrate how the economic factors could interact to achieve the policy scenarios. It would indicate the relative efficiency of price increases against the investment driven policy model in meeting the overall energy savings targets.

3.10.2 Geographical and timing effects of the costs and benefits

No analysis was presented in the Impact Assessment of the distribution of the impacts across Member States. To present such data in detail in the Impact Assessment itself would have been unnecessary. However, the outputs from the PRIMES modelling were created down to Member State level[16] and the relevant background data is therefore available to assess the effects. It would have been of value to include for a brief overview of the distribution of all costs and benefits of the total energy savings and the end-use energy savings scenarios.

This would have indicated where any burden (e.g. total system costs) or benefits (e.g. health) might have fallen disproportionately, potentially to inform a more differentiated approach.

The timing of the costs and benefits is also a valuable area of investigation. Average annual total system costs were found to be modest for the EUCO30 scenario between 2021 and 2030, and negative between 2021 and 2050. This single figure does not communicate the "cashflow" effect, which would be expected to indicate that investment expenditure is more prevalent in the early years, with reduced costs in the later years. Again this information would have been generated by the modelling but was not made public nor discussed in the Impact Assessment. It would have been highly informative, to demonstrate how Member States and stakeholders would need to plan financing in order to achieve the objectives.

This is also related to the question of the time value of money, manifested in discount rates. PRIMES uses a decision making discount rate for determining choices that are made by the various energy actors. This rate varies for different actors (Annex 4 of the Impact Assessment, section 4.2.3). It also uses a flat financial discount rate of 10% for all end consumers in all scenarios when calculating total system costs.

The financial discount rate has been selected to be in line with the weighted average cost of capital in the supply sector (again section 4.2.3). The determination of discount rates requires

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[16] "Technical report on Member State results of the EUCO policy scenarios", E3MLab & IIASA, December 2016 https://ec.europa.eu/energy/sites/ener/files/documents/20170125_-_technical_report_on_euco_scenarios_primes_corrected.pdf

decision making based on assumptions, the concept of a "correct" discount rate is difficult to define. Its selection depends on the relative value placed on future benefits or losses. This is likely to vary for different stakeholders. Therefore, this study exercises no scrutiny on the choice of this discount rate. It would be highly informative to carry out a delta analysis on the total systems costs with altered discount rates to demonstrate the effects of different assumptions. If the results are sufficiently detailed, including a breakdown of system costs by investment and operational costs, they can contribute to a more robust assessment of the target scenarios[17].

3.11 Conclusion

The legislative proposal sets a 30% energy savings target for 2030, increasing from the 27% target (having in mind a 30% target) included in its 2014 Climate & Energy Communication. It is also intended for this Directive to work in concert with the targets of 40% reduction in GHG emissions and achievement of the 27% increase in renewable energy share by 2030.

The proposal is therefore consistent with the Impact Assessment, which concludes (Section 6.1) that the 30% savings (EUCO30) scenario is the preferred option by comparing it to the EUCO27 scenario. However, it does not refer to the other (more ambitious) scenarios up to EUCO40 in this concluding assessment (except by presenting all the many data points for each scenario in a single table). It therefore does not appear to evaluate all scenarios equally. Even though a political decision has been made for the 30% scenario, it is the purpose of the Impact Assessment to evaluate all potentially viable policy options. This is especially relevant due to the resolution of the European Parliament for a 40% energy savings target.

This could have been most effectively achieved by setting in advance the assessment an selection criteria for the options, weighting each of the parameters with a clear explanation to justify the determination of their relative importance. This would still require comparison of impacts not directly comparable numerically (e.g. total system costs in €, employment in number of jobs, energy imports, life years saved). It would however provide a clear framework for decision making.

The EU's GHG reduction and proposed renewables targets are achieved in all scenarios, with minimal differentiation between EUCO27 and EUCO30. Therefore the comparison relies on other impacts, including costs, jobs, health, social. The comparison of these impacts is based on modelling not available for scrutiny and therefore any conclusions are reached without generating confidence in their robustness.

Total system costs in the 2030 timeframe are projected to be higher with higher energy savings across all scenarios. In the 2050 timeframe total system costs are lowest for the EUCO30 scenario, then again rise with higher energy savings. If total system costs were the sole criterion, in the timeframe of the legislation (2030), EUCO27 would therefore be preferred. If

[17] Reflecting the conclusion of the study "Clean Energy for All Europeans - Do the Commission's Impact Assessments Assign the Right Role to Energy Efficiency?", by OpenExp, May 2017, as indicated in a response to the peer review (Annex II)

a long-term view is taken, again considering only the total system costs, the EUCO30 scenario would result.

The analysis behind the social and jobs impacts is associated with potentially flawed assumptions and a high variability of results, which are therefore not sufficiently robust to provide justification for any of the scenarios.

The investment requirements, being one element of the total system costs, are substantial and increase with higher energy savings. The preferred scenario EUCO30 is projected to require €400 per household per year in addition to business and public investment. This figure rises to €1500 per household for EUCO40. The section on assessment of impacts includes (pages 108/109) a list of measures that would be needed at EU and Member state/regional/local level to achieve the EUCO30 target. The list is quite comprehensive, but it is not sufficient to address the key question of how to realise in practice the high household and business investments projected in the Impact Assessment to be necessary to meet the energy savings targets.

Since the rate of required investment increase rises at energy savings levels above 30%, achievement of the scenarios becomes more challenging. For those scenarios above EUCO30, measures to ensure the investments would have to be increasingly extensive. As indicated in the previous section, any such measures, whether regulatory, behavioural or economic would have to overcome barriers that increase in size as the energy savings level increases.

Since all the scenarios presented rely on securing the projected investments, their feasibility is in question. For this reason, the alternative options of achieving the energy savings targets through behavioural or price measures need to be fully assessed and considered. These also exhibit issues of feasibility and acceptability but are equally valid options for policy.

4. Review of annual savings targets for Member States (Article 7)

Article 7 of the current Energy Efficiency Directive requires each Member State to deliver new end-use energy savings per year at least equivalent to 1.5% of retail energy sales until 2020. The new proposal extends this requirement to 2030. It leaves the Member States to decide whether to achieve this through an Energy Efficiency Obligation Scheme (EEOS) or alternative policy measures or a combination. It is also in the remit of Member States to determine the sectors in which the measures should primarily take place. This Article is used as a pulling mechanism to attract private investors into contributing to the energy efficiency savings plan. The directive allows member states flexibility on how they would implement and count this 1.5% savings by granting certain exemptions and offering a wide variety of potential financial services.

4.1 Accountability

Individual Member States are allowed to choose how they will gather the information regarding the annual and total energy savings over the time period. Although this does provide flexibility across the EU it also creates difficulties in assessing the accuracy and comparability of each Member State's claims. Member States could be at risk of double counting their energy savings, as certain measures may be counted in two separate policies or by two separate parties. For example, an energy saving technology may be counted in a city's end target number and then that number may be counted again for a nation-state end use savings. In another case a country may have tax rebates and contributions given back to households through EEOS. It needs to be clear how much of the end savings can be accounted for by the EEOS and how much can be attributed to the tax rebate. This risk is acknowledged in Article 7 §7 of the proposal, but the provision requiring member states to ensure no double counting does not guarantee their absence.

Further, the metric used for counting overall savings is important, whether primary or final energy consumption. The metric a Member State chooses as their measure, has impacts on different sectors within that Member State and associated costs with those measures. For example, if a Member State were to focus on final consumption it would need consumers to report energy savings. This may necessitate a new metering system, or other technologies to make sure the accurate amount of savings is being reported.

4.2 Policy Options

In the Impact Assessment, four policy options were assessed for Article 7:

Policy option	Description	Annual end-use savings target
1	No regulatory action at EU level	n/a
2	Extend Article 7 to 2030	1.5%
3	Extend Article 7 to 2030; simplify and update	1.5%
4	Extend Article 7 to 2030; increase the rate of savings	1.75% 2.0%

Table 11: Comparison of policy options for Article 7

The options are each assessed in terms of their projected achievement in reducing energy consumption and their impact on administrative burden, economic effects and costs and benefits. This appears to be an appropriate set of parameters for the assessment.

The evidence presented for these options is reviewed below.

<u>Assessment of option 1</u>

Policy option 1, not extending Article 7, was dismissed as not viable on the grounds that it would cause the Member States to fall short of the overall energy efficiency target. Since the overall target is the only proposed binding measure, this appears to be a reasonable conclusion.

<u>Assessment of options 2 and 3</u>

The assessment of the economic impacts of these policy options are brief and call upon conclusions from previous sections of the Impact Assessment. The Impact Assessment states that the annual savings target will increase GDP and create indirect job growth in the same way as projected for the EU-wide energy efficiency target. These conclusions were already questioned in Section 3.1 above. The projected increase in GDP is dependent on specific economic conditions of users (access and take-up of loans, use of own resources) whose fulfilment is not demonstrated. Further, in one scenario the GDP decreases. It is also stated that the extension of Article 7 will “contribute with extra savings to the macro-economic benefits”, with no evidence presented that supports this assertion.

Article 7 is a policy measure in force only since 2014, resulting in a lack of sufficient data on its costs and benefits. The Impact Assessment claims that the EEOS have been used before Article 7, and because these EEOS are often used as a way to achieve Article 7 that they can be examined as a way to assess the longer term efficacy of the policy. This excludes assessment of alternative measures that a Member State, could, or would, have to undertake to achieve the annual savings.

The Impact Assessment states that the cost of EEOS is often passed onto the consumer resulting in higher energy prices, but that with the energy saved, prices may go down. The net change on energy prices has not been assessed but this information would be necessary to understand the effects.

Energy poverty is not adequately covered in the Impact Assessment. The Impact Assessment claims that some Member States such as Ireland have begun to address this issue. Ireland requires that 5% of the energy savings be made in low income areas. This is low percentage and does not demonstrate that an EEOS is an effective way to combat energy poverty. In fact, the Impact Assessment concedes that high income households are more likely to take up the opportunities afforded by an EEOS because they can afford and contribute to the investment.

The costs and benefits of an EEOS also vary by Member States. It is not described how Member States who do not have sufficient funding to implement an EEOS may achieve the annual savings numbers. Other financing options for all Member States should be analysed to demonstrate the total EU effectiveness of this policy.

<u>Assessment of option 4 and overall comparison</u>

The key element in the assessment is a comparison between the annual percentages in option 2 and 3 (1.5% in both) and option 4 (1.75% and 2.0%). The savings projected for 2030 with each of these options are shown in the graph below.

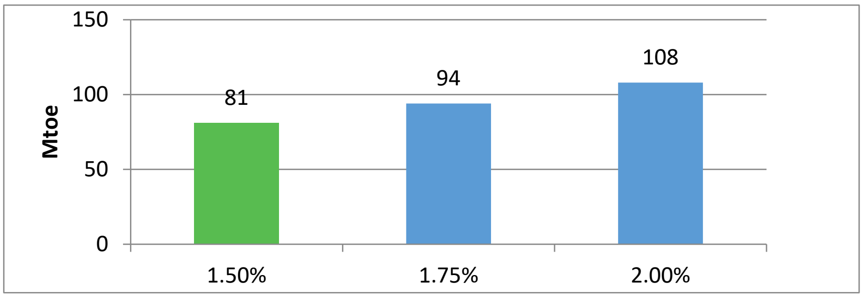

Figure 6: Estimated energy savings in year 2030, maximum reduction applied (Mtoe) 18

Achievement of the 1.5% annual savings target, even with the maximum number of exemptions applied, is projected in the Impact Assessment to contribute savings sufficient to achieve the EUCO30 target. A simple review of the figures confirms this calculation. However it is unclear if the 30% savings target would still be met considering the potential for double counting and the overall lack of accountability (Section 4.1 above) when it comes to member states reporting their savings.

The overall savings in 2030 corresponding to the annual savings targets of 1.75% and 2.0%, making the same assumptions about the exemptions, would be 30.9% and 31.9% respectively. There is no explanation for not assessing annual savings rates that would correspond to the higher ambition scenarios up to 40% (i.e. EUCO40).

This section of the Impact Assessment assess the impacts of the 1.5% savings option in some detail (see review below), but does not provide a comparison to the impacts of the 1.75% and 2.0% options. The text of the assessment of option 4 (page 95 of the IA) states:

> *"It could be assumed that the increase in the level of savings would result in comparable economic benefits and environmental benefits described under the previous options 2 and 3."*

No basis for this assumption is presented. The text further states:

> *"In terms of costs, there is limited evidence of the costs associated with the higher levels of ambition for Article 7 including the degree to which low cost savings would take place before the high cost energy savings."*

This is precisely the analysis that would be expected from the Impact Assessment, in order to inform policymakers of the effects of the options.

Policy option 4 was rejected (page 117) by stating that it goes beyond what is necessary to the achieve the Union's objectives. However, this statement could also apply to the achievement

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[18] Calculation based on the final energy consumption averaged over 2015-2020 (PRIMES ref. scenario).

of the 30% energy savings target, since EUCO27 already enables the EU's GHG and renewable energy targets to be met. The assessment of the energy savings target itself should depend on the assessment of the Member State savings targets assessed in this section of the Impact Assessment. The assessment should have been applied bottom-up, by determining the most effective option at Member State level and then applying those results to determine an EU-wide savings level.

4.3 Exemptions and actual savings

There are a number of exemptions that Member States can use, put forward in Article 7.

Specifically in part 1, "The sales of energy, by volume, used in transport may be partially or fully excluded from these calculations". Further exemptions (to a maximum of 25% of the target) are listed in part 2, including exclusion of volumes transformed on site and used for own-use, and those used for the production of other energy for non-energy use like plastics or other petroleum based products.

Almost all member states have taken full advantage of these exemptions during the life of the Directive so far, which has lowered the actual rate of savings from the headline figure of 1.5% to 0.75%, according to some studies[19, 20]. This indicates that a similar effect may arise in the post 2020 period set by the new Directive.

The lack of standardised delivery, verification and monitoring methods are intended to provide flexibility for Member States in meeting the objectives. However, they also allow for a lack of transparency and accountability in understanding the realised percentage for each member state.

4.4 Conclusion

The extension of Article 7 and the simplification of the code was the policy option chosen by the Impact Assessment and was also the provision selected for the legislative proposal. However the Impact Assessment suggests that only the simplification regarding the building renovations should be considered and not the simplification regarding the renewable energy.

Much of the criticism levelled toward the existing Article 7 is the use of exemptions and the lack of accountability in reporting. Neither of these issues are addressed in the chosen policy option. The exemptions will remain and are projected to result in realised savings of 0.75%. The various ways in which Member States can implement, finance and report the annual savings is a move towards flexibility for compliance. However, with no standardised systems it can be difficult to legitimise the realised saving percentage. If each Member State calculates savings in their own way, each with its own assumptions and caveats, the final number is likely not to represent the realised annual energy efficiency savings for the European Union.

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[19]."Study evaluating progress in the implementation of Article 7 of the Energy Efficiency Directive". Ricardo, 8th February 2016.

[20] " Costs and benefits of the Energy Efficiency Obligation Schemes", Regulatory Assistance Project, Rosenow, J., Bayer, E., 2016.

The 1.5% number works in concert with the EUCO30 option, but no analysis was presented on the correspondence between more ambitious yearly savings and more ambitious EU-wide targets policies such as EUCO35 or EUCO40. No coherent reasoning was given. The corresponding data analysis is necessary, as the yearly savings target is essential for the overall energy efficiency target and to dismiss it may hinder the EU from achieving savings in energy efficiency.

In its overall comparison of policy options, the Impact Assessment states :

> *"By choosing to achieve the 1.5% savings through the EEOS associated costs are placed on end-consumers….and on economic operators….without placing burden on the public finances. Such evidence is not available though for option 4 which proposes higher savings rates than 1.5% per year."*

This evidence is however necessary for a complete analysis.

In the choice of policy option 3 for Article 7 it mentions that the more ambitious targets violated the principle of proportionality. However this same logic is not applied to the choice of the EUCO30 over EUCO27 when the same conditions of meeting required objectives is present.

The choice of Policy Option 3, including simplifications under sub-option a, was chosen on its coherence with the EUCO30 policy, the clarifications it serves for EEOS and other financing mechanisms and its proportionality.

As argued above, this creates a circular argument, since the determination of the EU-wide target should have been made based on the assessments of the impacts of targets at Member State level.

5. Qualitative assessment of policy options on the nature of the targets

There is a number of different ways that the Impact Assessment assesses the validity of the various policy options. After addressing the quantitative measures in earlier sections it then chooses the preferred policy based on qualitative systems. It uses a system of scoring in which certain policy options are given a -1, 0 or 1 depending on their efficacy in the defined criteria of: effectiveness, efficiency, relevance, coherence, subsidiarity and proportionality. This is used to assess policy options for Articles 1 and 3 regarding binding or indicative targets and how the energy savings will be calculated.

The nature of the targets is imperative to the success of the directive, in particular whether the directive is binding or indicative, and whether it has cascading effects for the implementation of the directive. Likewise the decision over how to measure the final amount of energy saved, primary **and** final energy consumption or primary **or** final consumption, effects how the policy is implemented and what sectors need to respond in order to achieve the target.

5.1 Outcomes

For the policy option dealing with the binding nature of a 2030 target no conclusion was apparent as all of the policy options scored a 3 in summation, see table below:

	1.1 Indicative EU and national targets with review/what-if-clause and governance system	1.2 Binding EU target with review clause/what-if-and governance system	1.3 Binding MS targets
Effectiveness	0	0	1
Efficiency	0	0	1
Relevance	1	1	1
Coherence	1	1	0
Subsidiarity and proportionality	1	1	0
SUM	**3**	**3**	**3**

Table 12: Comparison of policy options for the character of the 2030 target

There is a fundamental concern with this form of assessment. In particular, without weighting of the importance of the criteria, the context is not taken into account. There is no assessment demonstrating that each of these criteria have the same importance. If an additional criterion were introduced or an existing one removed, it could significantly change the outcome, but its significance may not merit such an effect.

Related to that point, the lack of differentiation in the scale presents an additional challenge. With just three options (1,0,-1) the magnitude of the number has greater implications than if the scale was from 0-5 or even 0-10. This problem is borne out within the assessment, in which policy option 1.3 was not chosen because it terms of subsidiarity and proportionality it was found that:

> *"… the score of option 1.3 would depend largely on the decision that will set the target. In case the targets are defined at EU level, the score of the subsidiarity and proportionality criteria would be -1. In case the national binding targets would be set at national level, the score would be 1 as well. For that reason, a score of zero is applied."*

There must be a way to assess which of the two proposed scenarios is likely to give the policy option 1.3 a score. With a score of 1 or -1, it would have indicated the best policy option or eliminated it from contention.

The lack of a clear conclusion in the Impact Assessment on potentially the most important and contested piece of the directive is concerning.

Regarding the question of how the energy can be measured, the policy options were very close regarding which would be preferred. See table below:

	2.2. Primary **and** final energy consumption	2.3 **Either** primary **or** final energy consumption	2.4. Primary and final energy intensity
Effectiveness	0	0	1
Efficiency	1	-1	1
Relevance	1	0	0
Coherence	1	1	1
Transparency and monitoring	1	1	0
SUM	**4**	**1**	**3**

Table 13: Comparison of policy options for the character of the 2030 target

In the transparency and monitoring section the 2.4 policy option was given a zero because the contribution of each member state would be difficult to measure on an EU level if energy intensity was used. There is no explanation for this assertion or how the conclusion was reached but with a single sentence and number the Impact Assessment dismisses it as a possibility and policy 2.2 is given the preferred option.

Proportionality and subsidiarity were left off the list of criteria for this policy option. Whilst the reasoning for this may be considered to be apparent, the choice of criteria should be fully justified.

5.2 Conclusions

The qualitative nature of the policy options is problematic for several reasons. An overwhelming amount of quantitative data exists. The policy options could have been assessed using deductive reasoning with the quantitative data as a logical tool. The culmination of the Impact Assessment is the recommendations it gives for policy. These recommendations rely on the aforementioned qualitative systems instead of data. These policy options have wide sweeping impacts across the EU. The difference between a binding EU target and an indicative EU target have cascading impacts across the continent and individual member states.

It is unclear why qualitative measures were taken with regard to these particular policy options and not every policy option. The energy efficiency target for 2030, EUCO27 vs EUCO30 vs EUCO40, was done through deductive reasoning and the use of quantitative data but the policy options were not.

Finally, the lack of coherence across the qualitative scales is an issue. It is impossible to reconcile the above scale with the one used for the policy options for articles 9-11. They measure different policy options using different scales and provide no explanation for the differences in these scales. The scales should be uniform not only within this impact assessment but across EU legislation to increase transparency, efficiency in reading time and the ability to critically examine the argument. If the scales need to be different, this difference should be clearly explained.

Annex I: Accompanying statement

This report has been written according to the guiding principles of the Impact Assessment Institute: transparency, objectivity, legitimacy and credibility. It analyses the subject matter from a purely factual and scientific point of view, without any policy orientation. In respecting these principles it has been compiled following its written Study Procedures[21].

The analysis is open to review and criticism from all parties, including those whose work is scrutinised. Contacts with all relevant parties are recorded to ensure transparency and to guard against "lobbying" of the results.

By its nature the report has a critical characteristic, since it scrutinises the subject document with its main findings entailing the identification of errors, discrepancies and inconsistencies. In performing this work, the intention of the report is to be constructive in assisting the authors of the subject document and its background information as well as all relevant stakeholders in identifying the most robust evidence base for the policy objective in question. It should therefore be seen as a cooperative contribution to the policy making process.

This report is also to be considered as a call for additional data. Peer review is an essential step laid down in the procedures of the Impact Assessment Institute and this is manifested in the openness to further review and to identify new data. Even at publication of the final version, the report explicitly requests additional data where the readily available data was not sufficient to complete the analysis, and is open to newly arising data, information and analysis.

[21] "Procedures for Conduct of Studies", Impact Assessment Institute, December 2015 (http://www.impactassessmentinstitute.org/#!procedures/c1q8c)

Annex II: Input from stakeholders and response to peer review

Input received during drafting

Direct input contributing to the content of this study was received by exchanges with the following organisations:

- A non-governmental organisation
- An energy company

Additional input was received from organisations that were consulted during the compilation of the Institute's study on the Renewable Energy Directive (recast)[22].

Responses to peer review

Direct input contributing to the content of this study was received by exchanges with the following organisations:

Organisation	Nature of feedback	IAI response
An environmental NGO	…the assessment is in line with another one done by OpenExp that was published in May this year. The OpenExp study includes call for investigating discount rate scenarios and publishing a full breakdown of system costs	The IAI study call for discount rate scenarios to be assessed and generally calls for full transparency in publication of modelling results. The text of Section 3.10 has been updated to emphasise the need for a full breakdown of the modelling results.
An association representing industry	1. Energy efficiency definition: The directive gives abusively the impression that the directive is about wise use of energy. The proposed targets are about absolute energy usage and not about energy efficiency. Real energy efficiency should be the target. 2. Double regulation: The EED overlaps with the ETS. The impact of this should have been thoroughly investigated."	1. The text has been amended to highlight the inconsistent use of the term " energy efficiency" in the legislative proposal and Impact Assessment. 2. This ETS is addressed in Section 3.5 of this study. A remark has been added regarding the need for more thorough assessment of the interaction between this legislation and the ETS,

[22] Final study on the "IMPACT ASSESSMENT on the Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources" SWD (2016) 418, Impact Assessment Institute, 19th June 2017

Organisation	Nature of feedback	IAI response
An association representing an industry sector	A detailed response indicating the sector's position on a number of the issues raised in the IAI study, including: • Conflict between energy efficiency and energy savings. • An increase of the efficiency target is not required to achieve the ETS and RED targets. • The study excludes only the manufacturing sector from the behavioural option for energy savings. • Counting electricity used in vehicles as zero CO2 emissions does not reflect the reality of their actual contribution to CO2 emissions across the economy.	• Section 2 amended as indicated above. • This point is acknowledged in the study. • Section 3.10.1 updated to focus on households, avoid inconsistency between other sectors. • This is correct, but the IAI scrutiny only refers to the expected effects of the modelled standards.
	In addition to the above, the following arguments are made: • against applying the target to both primary and final energy. • against double counting of ETS. • transport should maintain its exemption from Article 7. • ETS emissions should be excluded from Article 7.	These are policy choices and the arguments do not come within the scope of the IAI's scrutiny of the evidence.