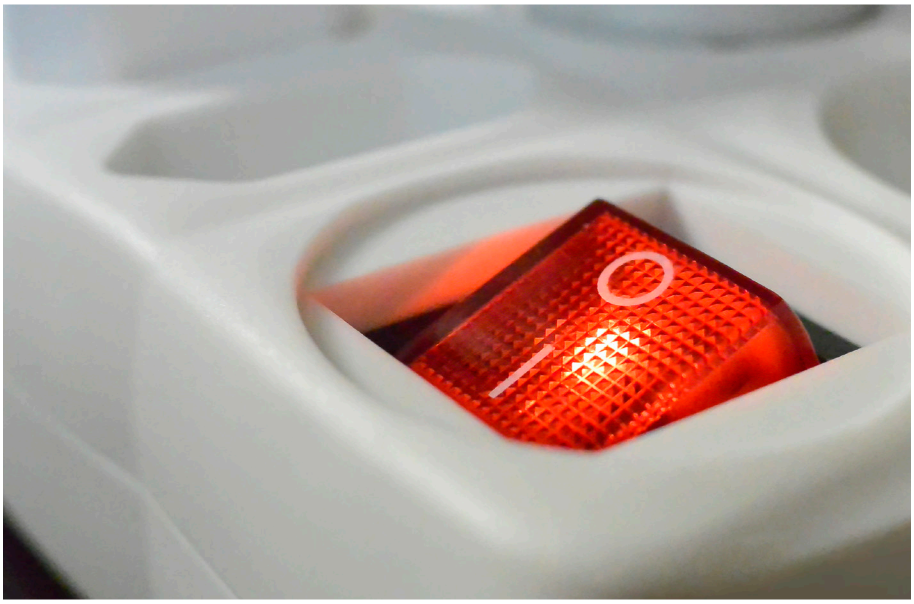
european
council for an
energy efficient
economy

What we will gain from more ambitious energy efficiency goals in the EU

Let's not waste energy – or an opportunity



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About the European Council for an Energy Efficient Economy (eceee)

eceee, the European Council for an Energy Efficient Economy, is the largest non-profit, membership-based energy efficiency NGO in Europe. The goal of eceee is to promote energy efficiency through co-operation and information exchange.

To facilitate this, eceee provides evidence-based knowledge, analysis and information through its website, news service and seminars. eceee arranges conferences and workshops and takes an active part in the key European energy efficiency policy discussions.

One of eceee's principle events is the five-day Summer Study held in June every odd year. It typically attracts more than 450 participants from governments, industry, research institutes and citizen organisations. In 2012 eceee started a specialist, three-day Industrial Summer Study series to be held every even year.

For more information about eceee, see www.eceee.org.

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Preface

On July 23 2014, the European Commission published its new Communication on energy efficiency.[1] In the Communication the Commission proposed a target of a 30 % improvement in energy efficiency, up from the previous mentioned level of 25 % published in early 2014. On October 24, the European Council agreed to a non-binding target for an energy efficiency increase of at least 27 %, to be reviewed by 2020, having in mind an EU level of 30 % for 2030.

Despite the Council's compromise decision, it is still important to have a careful review of the Impact Assessment following the July Communication. This Impact Assessment shows that taking the level of ambition beyond a 30 % energy efficiency improvement could deliver significant benefits in a number of areas that would otherwise be lost. It should also be noted that a high ambition level for energy efficiency will lead to a reduction of primary energy use – i.e., reduction of absolute energy demand – while positive effects on jobs, energy security, GDP and greenhouse gas emission reductions would be achieved.

The Commission's Impact Assessment has been criticised for applying assumptions that are too conservative. In particular the applied discount rates have been criticised for being too high. However, eceee has chosen not to discuss the assumptions in this analysis, concluding that the presented impact analysis as it is justifies much higher ambition levels.

THE PURPOSE OF THE IMPACT ASSESSMENT

One of the purposes of the Communication was to determine what the new EU energy savings target for 2030 should be, putting the target in the context of other proposed targets for greenhouse gas emissions reductions and renewable energy, as well as assessing as many costs and benefits as possible. The Communication states:

> The appropriate contribution of energy efficiency to the 2030 framework must be based upon a thorough consideration of the additional costs and benefits of going beyond the 25 % energy savings previously indicated by the Commission.

In the Communication the European Commission proposed a target of a 30 % improvement in energy efficiency in 2030. It should be noted that the "energy efficiency target" is actually a target for the reduction of energy consumption.[2] This proposed efficiency, or savings, target represents an increased ambition from the previously mentioned level of 25 % published in early 2014. The Communication explained those "additional costs and benefits" this way:

> Additional benefits include those from reduced GHG emissions, reduced air, noise, water and soil pollution, reduced resource use for energy extraction, transformation, transportation and use, together with co-benefits on human health and the state of the ecosystems.

The Communication continued to explain why it went to the 30 % level:

> The Commission's Communication on a 2030 policy framework for climate and energy identified a level of energy savings of 25 % as part of a strategy to deliver the 40 % greenhouse gas emission reduction target in the most cost-effective manner. However, given the increased relevance of bolstering EU energy security and reducing the Union's import dependency, the Commission considers it appropriate to propose a higher target of 30 %. This would increase the costs of the 2030 Framework by €20 billion per annum but would still deliver tangible economic and energy security benefits.

SUMMARY OF ENERGY EFFICIENCY BENEFITS IN THE IMPACT ASSESSMENT

A careful review of the European Commission's Impact Assessment accompanying the Communication shows that taking the level of ambition beyond a 30 % improvement could bring many more benefits that are important to the EU economy and energy sustainability that will be lost otherwise. This paper highlights that the Commission's *own* analysis shows that greater ambition will bring:

- Significantly lower total energy consumption in the EU.
- Significantly lower net energy imports, thus improving overall energy security.
- Important shift in investments to the residential and tertiary sectors.

1. European Commission Communication "Energy Efficiency and its contribution to energy security and the 2030 Framework for climate and energy policy" [COM(2014) 520 final].

2. It is also commonly called an energy savings target, which is more accurate.

- Positive impact on economic growth.
- Important and positive employment impact throughout all of the EU.
- Greater environmental benefits.
- Important benefits to lower fuel poverty together with a range of health benefits.
- Improved competitiveness for Europe's businesses.

Why should Europe go for anything less?

Introduction

This paper analyses the July 23 2014 Commission Communication "Energy Efficiency and its contribution to energy security and the 2030 Framework for climate and energy policy" [COM(2014) 520 final] together with its accompanying Impact Assessment (IA). The Communication proposed a target of a 30 % energy savings by 2030. The Commission's own analysis in the IA shows that a significantly strengthened target can deliver much more than is currently expected from it.

On October 24, the European Council agreed to a non-binding target for an energy efficiency increase of at least 27 %, to be reviewed by 2020, having in mind an EU level of 30 % for 2030. Nevertheless, it is important to review the Commission's analysis, which obviously affected the decision of EU leaders. The energy efficiency target was part of the package of energy and climate targets on greenhouse gas emissions and renewable energy.

The Commission's own analysis shows that many opportunities will be lost if only the 30 % target is adopted. The Commission's IA is very limited in the analysis of several of the important multiple benefits, and in the quantification of these different benefits. The calculated energy system cost is, therefore, not a good indicator for the overall cost.[3]

This paper is designed to help the reader better appreciate the impact that improved energy efficiency can have throughout a range of government policy areas. It shows how energy efficiency can help solve several policy dilemmas that are seldom considered in the domain of "energy" policy. This paper argues for a new look at increasing the level of ambition for improvements of energy efficiency in the EU's overall energy strategy and in the analysis of that strategy.

Despite the fact that the EU is giving energy efficiency policies more consideration than ever before,[4] there is a poor understanding of the range of benefits to our economies and societies that derive from greater energy efficiency investments and more forceful energy efficiency policies. With a better appreciation of the benefits and the overall potential impact, the energy efficiency community believes that even more ambitious objectives could be agreed upon.

The paper reviews the range of benefits that would derive from a more ambitious approach to improving energy efficiency, approaches that the Impact Assessment itself analyses in several scenarios. The review examines the main benefits of pursuing the more ambitious energy efficiency targets outlined in the Impact Assessment (since the IA provided several scenarios above the 30 % proposal). The current eceee analysis complements the eceee discussion paper on setting ambitious energy demand targets, published in May 2014.[5] The May paper on targets laid out the framework for why ambitious energy efficiency targets as such are needed, and why a single GHG reduction target would lead to suboptimal investments. This analysis goes further, showing that going to an even more ambitious target will provide significant benefits that will be lost if only the 30 % scenario is followed as proposed by the Commission.

CURRENT POLICY CONTEXT

Energy policy in the EU is constantly evolving and this has been particularly true in recent years. There is a long-term perspective with the EU agreeing to reduce greenhouse gas (GHG) emissions by 80–95 % in 2050. There are immediate concerns as well. Today, the developments in Ukraine and Russia have shown that the importance of energy security cannot be underestimated and it shows the need for a balanced, comprehensive energy policy. Energy policy is also, importantly, an element of Europe's growth strategy, Europe 2020.[6] The overall objective is for the EU to become a

3. The EU Impact Assessment has been criticised for applying too conservative assumptions, in particular the applied discount rates have been criticised for being too high. However, eceee has chosen not to discuss these assumptions in this analysis, but concludes that the presented impact analysis as it is would justify much higher ambition levels.

4. As evident from the range of energy efficiency directives, policy statements and strategies that have been approved or modified in recent years. The policy framework at the EU and national levels are comprehensive and the level of activity has increased significantly.

5. "A binding target for sustainable energy demand: Why and how? A discussion paper", eceee 16 May 2014. http://www.eceee.org/policy-areas/2030-policy-framework

6. http://ec.europa.eu/europe2020/index_en.htm

smart, sustainable and inclusive economy. These three mutually reinforcing priorities should help the EU and the Member States deliver high levels of employment, productivity and social cohesion. Energy policy must contribute and because energy efficiency is a prime element of energy policy, so must energy efficiency policy also contribute.

The EU climate and energy targets for 2020, known as the "20-20-20" targets, set three key objectives for 2020:

- A binding 20 % reduction in EU greenhouse gas emissions from 1990 levels;
- A binding requirement to raise the share of EU energy consumption produced from renewable resources to 20 %; and
- An indicative 20 % improvement in the EU's energy efficiency compared to a November 2007 PRIMES modelling baseline.

The EU energy efficiency policy framework consists primarily of a series of energy efficiency directives. The most recent is the 2012 Energy Efficiency Directive (Directive 2012/27/EU) that is the first directive to directly address the gap to achieving the 2020 energy savings target and covers a wide range of energy efficiency measures in all sectors (other than transport, that is dealt with separately). A short description on the range of directives is available on the eceee website.[7]

The Council decision on the 2030 targets was, in large part, based on the Commission's 2030 Communication from January 2014 and the new July Communication on energy efficiency. In the July Communication on energy efficiency, the importance of improved energy efficiency was duly expressed. In this Communication the Commission proposed a target of a 30 % improvement in energy efficiency by 2030. This was chosen from a range of options from 25 % to 40 %.

WHY IMPROVED ENERGY EFFICIENCY IS IMPORTANT

Sometimes it is forgotten *why* we are trying to achieve energy efficiency improvements. Energy efficiency is not an end in itself, but a means to an end. It is a government policy area that is essentially integrated into many economic and social areas, including health, jobs and competitiveness, well-being, resource efficiency and waste management, to name just a few.

7. http://www.eceee.org/policy-areas

eceee's most recent publication focused on targets,[8] looking at both why they were necessary and how to set them. The report gave three major objectives why energy efficiency is an important government policy area:

- Affordable energy prices and industrial competitiveness.
- Security of energy supply with regard to disruptions and price volatility.
- Achievement of climate and environmental goals.

It is instructive to take a fresh look at the full range of benefits of improved energy efficiency. This is assuming that energy efficiency can be improved in an ambitious fashion, as is the position of eceee. The track record shows that energy efficiency can deliver – and has delivered, as shown in Figure 1.

The graph shows that the avoided energy through improved energy efficiency is equal to about 65 % of total final consumption in the IEA region. No traditional fuel comes close to matching that. While once dubbed the "fifth fuel" by many, the IEA has now dubbed it the "first fuel".

The next two sections provide more evidence on the impact and benefits derived from improved energy efficiency, but it is useful at this point to consider the role of energy efficiency. As an element of government policy, it should contribute to the broad objectives of policy, which in the context of the EU is *Europe 2020*, described above. Energy efficiency, as any policy area, must contribute to help the EU "become a smart, sustainable and inclusive economy". Within energy policy, energy efficiency is seen in this context on the European Commission website:

> A European Energy Policy will firmly commit the European Union (EU) to a low consumption economy based on more secure, more competitive and more sustainable energy. Priority energy objectives involve ensuring the smooth functioning of the internal market in energy, security of strategic supply, concrete reductions in greenhouse gas emissions caused by the production or consumption of energy and the EU's ability to speak with a single voice on the international stage.[9]

8. "A binding target for sustainable energy demand: Why and how? A discussion paper", eceee 16 May 2014. http://www.eceee.org/policy-areas/2030-policy-framework

9. http://europa.eu/legislation_summaries/energy/european_energy_policy/l27067_en.htm

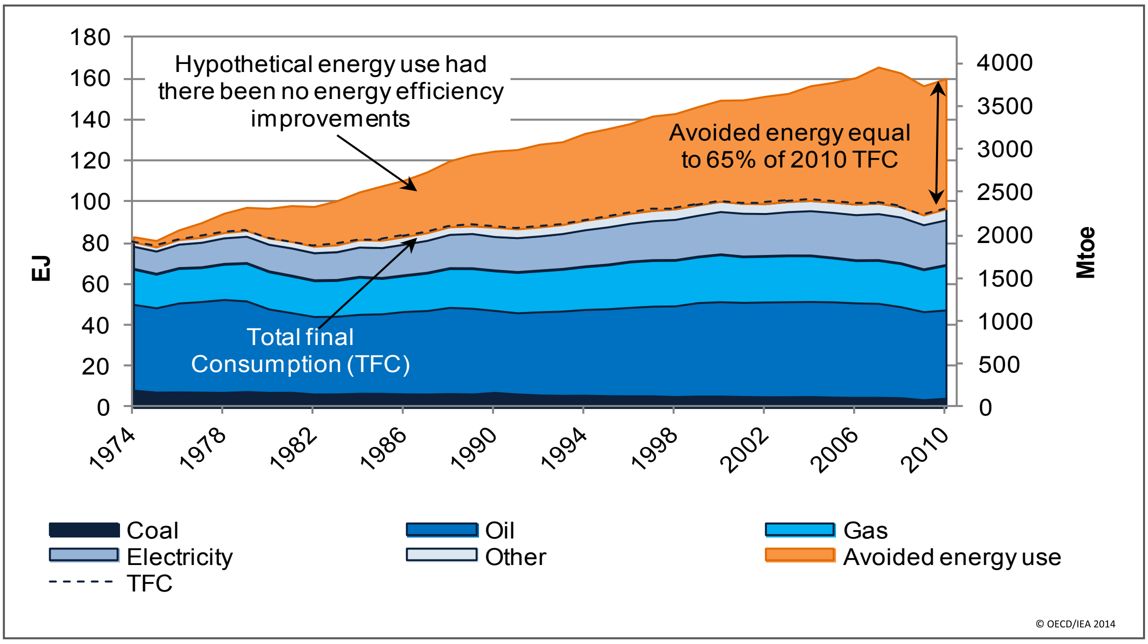

Figure 1. IEA's first fuel. According to the International Energy Agency (IEA), since 1974 energy efficiency alone has contributed more to our total need of energy services than any other form of energy supply. Source: Plenary presentation by Robert Tromop, International Energy Agency, to eceee Industrial Summer Study, 2 June 2014.

UNDERSTANDING THE MULTIPLE BENEFITS OF ENERGY EFFICIENCY

We as individuals in our homes or our businesses, together with our economies and society as a whole, benefit significantly from improved energy efficiency. For years, experts have been analysing the benefits from improved energy efficiency and yet they are still poorly understood.[10] Most recently, the IEA has been working on assessing the range of benefits derived from energy efficiency.

Figure 2 shows the benefits that the IEA identified in 2012. These benefits are both energy-related and non-energy related. In broad terms, these concern energy policy, economic and social policy, environmental policies and macro-economic policy. For illustrative purposes, Figure 2 lays out the general categories of benefits to give the reader an indication of the range of benefits. This is only a generalisation and there are specific benefits for each of the end-use sectors (buildings, transport, industry, etc.). This figure, however, provides an indication of the types of benefits that the Commission's Impact Assessment set out to address.

New IEA report on multiple benefits

The new IEA report "Capturing the Multiple Benefits of Energy Efficiency"[11] is the culmination of a multi-year effort by the IEA and many committed experts to quantify the many benefits from improved energy efficiency. The IEA is trying to re-frame the discussion about the so-called "hidden fuel", by showing how energy efficiency has the potential to support economic growth, enhance social development, advance environmental sustainability, ensure energy-system security and help build wealth.

The report shows that when the value of productivity and operational benefits to energy efficiency may be a hidden fuel, but it is hiding in plain sight.

The term "multiple benefits" aims to capture a reality that is often overlooked: investment in energy efficiency can provide many different benefits to many different stakeholders. Whether by directly reducing energy demand and associated costs (which can enable investment in other goods and services) or facilitating the achievement of other objectives (e.g. making indoor environments healthier or boosting industrial productivity), recent research acknowledges the enormous potential of energy efficiency.

10. The annex includes some of the eceee Summer Study papers that analyse the range of benefits.

11. http://www.iea.org/topics/energyefficiency/energyefficiencyiea/multiple-benefitsofenergyefficiency/

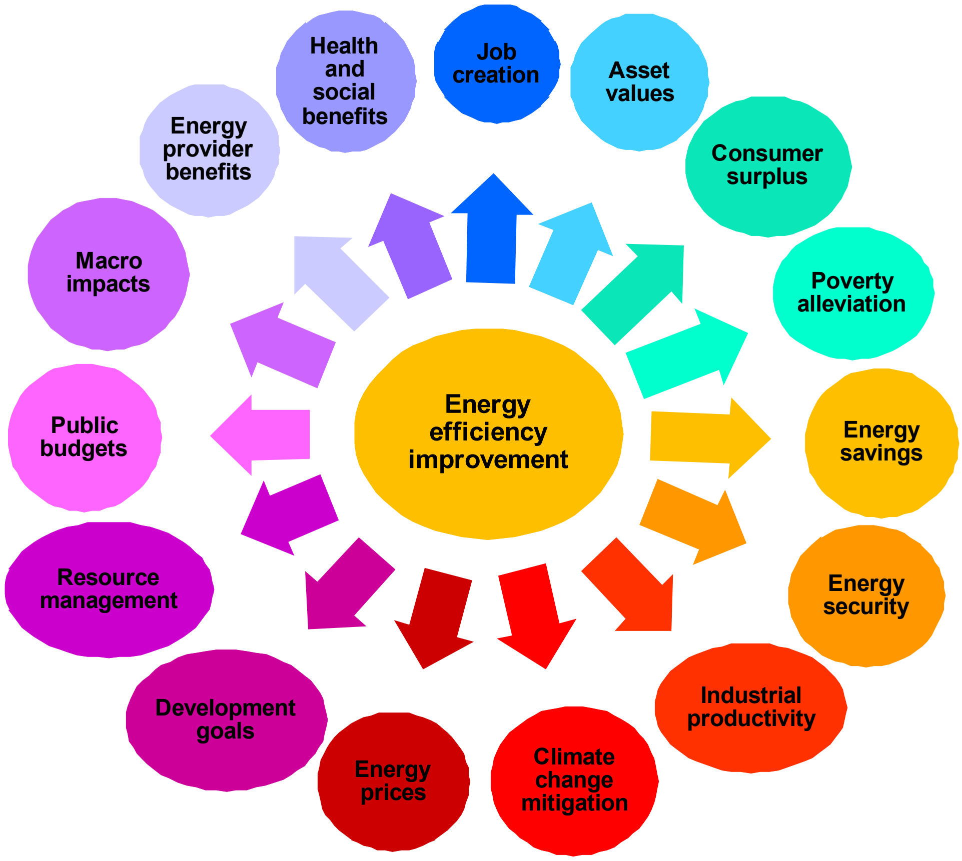

Figure 2. The multiple benefits of energy efficiency. Schematic illustration of the multiple benefits that can be attributed to energy efficiency. Source: IEA, Spreading the Net, The Multiple Benefits of Energy Efficiency Improvements, OECD, 2012.

The potential benefits assessed by EC Impact Assessment

This section will first review the benefits as assessed in the Commission's July Communication and IA, then it will review the costs estimated.

THE BENEFITS

As stated above, recently the Commission published its Communication "Energy Efficiency and its contribution to energy security and the 2030 Framework for climate and energy policy". The accompanying Impact Assessment (IA) analysed several energy efficiency scenarios beyond the reference scenario to support the Communication. These scenarios included the GHG 40 scenario (achieving 40 % reduction in GHG emissions by 2030) and six scenarios for various levels of energy efficiency improvements from 27 % to 40 %. It resulted in the Commission proposing in the Communication a 30 % target following its analysis, partly as a result of the calculated high energy system costs from the partial analysis in the IA, as set out below.

It is useful to review some of the findings in the Impact Assessment relating to the overall impact and the benefits derived from various levels of energy efficiency. The categories follow the IA methodology.

Contested assumptions

The EU Impact Assessment has been criticised for applying assumptions that are too conservative, in particular the applied discount rates used in the analysis have been criticised for being too high. Also, the high costs of renovation rates above 3 % are not in line with many similar studies carried out by Ecofys in 2013–2014. This means that the costs will be exaggerated and the benefits will be underestimated, the argument goes, and that the proposed target will be too low or unambitious. However, eceee has chosen not to discuss the discount rate and related assumptions in this analysis, but concludes that the presented impact analysis – as it is – would justify a much more ambitious energy efficiency target.

> An ambitious energy efficiency target of 40 % would lead to much lower total primary energy consumption than applying the green house gas target alone or any of the less ambitious energy efficiency targets.

Energy system impacts in the Impact Assessment

Consider just three indicators from the Impact Assessment (see legend to the left in Table 1). Primary energy consumption is significantly lower in the EE40 scenario for 2030 for both gross inland energy consumption and primary energy consumption as shown in Table 1.

Primary energy consumption for all the scenarios is described well in Figure 3.

Both Table 1 and Figure 3 are important because the target for 2030 is not to improve energy efficiency per se but to *reduce energy consumption*.

Table 1. Excerpt from "Impacts on gross inland energy consumption in 2030 and 2050".

Indicator *(figures are presented in a 2030/2050 format)*	**Ref**	**GHG40**	**Decarbonisation Scenarios**					
			EE27	**EE28**	**EE29**	**EE30**	**EE35**	**EE40**
Gross Inland Energy Consumption (Mtoe)	1611 / 1630	1534 / 1393	1488 / 1423	1470 / 1380	1450 / 1338	1422 / 1286	1337 / 1196	1243 / 1129
Primary Energy Consumption (Mtoe)	1490 / 1510	1413 / 1294	1369 / 1319	1352 / 1281	1333 / 1239	1307 / 1188	1227 / 1098	1135 / 1031
Energy Savings % in 2030	21.0	25.1	27.4	28.3	29.3	30.7	35.0	39.8

Source: European Commission, Impact Assessment, Table 4, p. 38.

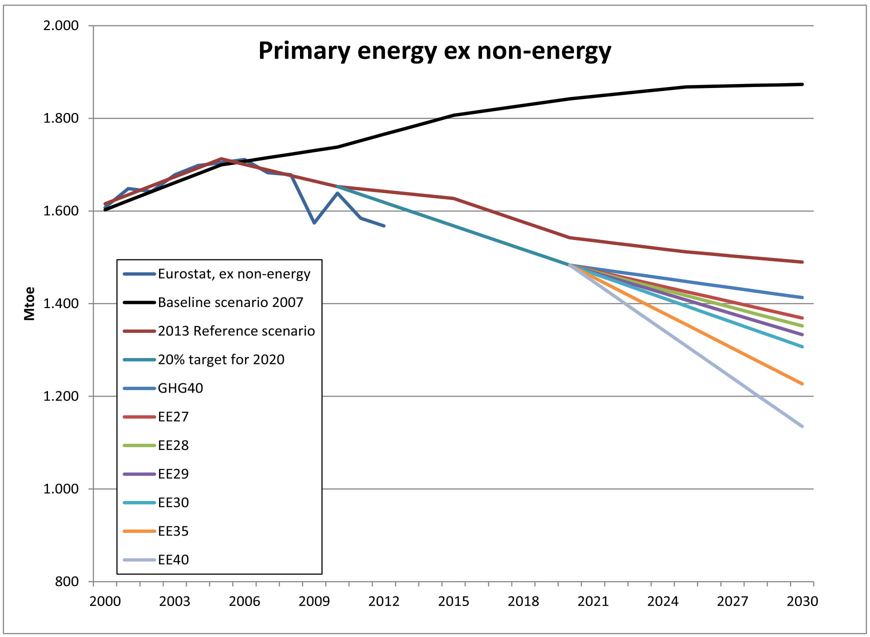

Figure 3. Primary energy to 2030. Going for a 40 % energy efficiency target would deliver most reductions in primary energy use. Source: Eurostat, "Trends to 2030 – Update 2007" and "Trends to 2050, Reference scenario 2013" and European Commission, Impact Assessment, Table 4, page 38.

Positive impacts on energy security

Figure 4 and Table 2 show that all six energy efficiency scenarios in the 2014 Impact Assessment achieve *higher reduction* in net energy imports for 2030 than the GHG40 scenario. The overall import dependency is lowest for EE40. However, if one looks at natural gas, EE40 has a much greater impact. It is natural gas where the greatest energy insecurity is today. These reductions in net energy imports are an important consideration in the energy security concerns that are dominating much of energy policy today. Figure 4 graphically shows the natural gas imports in 2030 according to the scenarios.

Improved energy efficiency is a main contributor to delivering increased energy security by reducing net energy imports. The impact assessment's EE40 scenario delivers the highest reductions in net energy imports to the EU – particularly in gas imports – but even the less ambitious energy efficiency scenarios deliver larger reductions in net energy imports than the GHG40 scenario.

Thus, the IA gives a strong endorsement for an ambitious energy efficiency strategy to meet current energy security objectives.

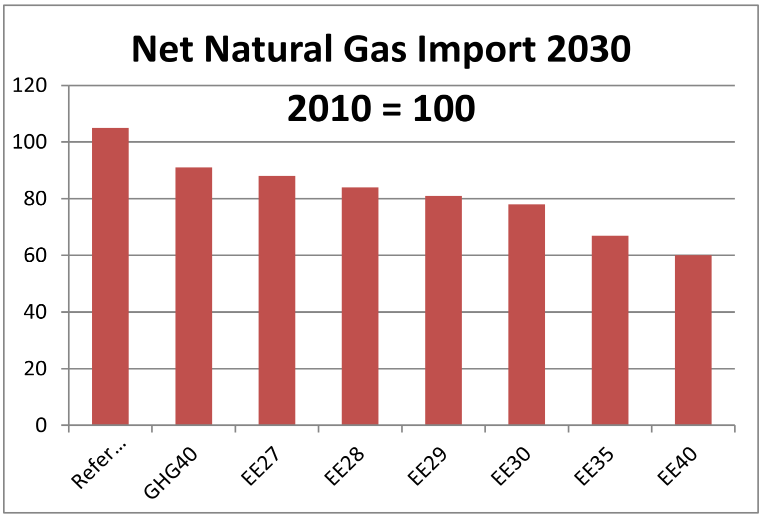

Figure 4. Net natural gas imports in 2030. Reductions in natural gas imports to the EU by 2030 as a consequence of the GHG40 and different EE scenarios in the Impact Assessment. Source: European Commission, Impact Assessment, Table 5, page 41.

Table 2. Excerpt from "Impacts on energy security in 2030 and 2050".

Indicator *(figures are presented in a 2030/2050 format)*	**Ref**	**GHG40**	**Decarbonisation Scenarios**					
			EE27	**EE28**	**EE29**	**EE30**	**EE35**	**EE40**
Net Energy Imports Volume (2010=100)	96 / 101	89 / 56	86 / 59	85 / 57	83 / 56	82 / 54	78 / 51	74 / 49
- Solid	77 / 49	68 / 42	61 / 40	65 / 38	61 / 38	62 / 34	70 / 30	59 / 29
- Oil	93 / 96	90 / 41	86 / 44	85 / 43	85 / 43	84 / 43	82 / 41	81 / 41
- Gas	105 / 122	91 / 74	88 / 82	84 / 78	81 / 74	78 / 69	67 / 65	60 / 59
- Renewable Energy Forms	492 / 601	505 / 1043	509 / 1002	500 / 972	493 / 947	48 / 9202 / 924	458 / 875	433 / 852
Import Dependency (% net imports to total gross inland energy consumption)	55.1 / 56.6	53.6 / 36.8	53 / 38.1	53 / 38	52.6 / 38.2	52.8 / 38.3	53.5 / 38.6	54.4 / 39.1

Source: European Commission, Impact Assessment, Table 5, p. 42.

Table 3. Excerpt from "Electricity and carbon prices, energy related costs for energy intensive industries".

Indicator *(figures are presented in a 2030/2050 format)*	Ref	GHG40	Decarbonisation Scenarios					
			EE27	EE28	EE29	EE30	EE35	EE40
Average Price of Electricity (€/MWh)	176 / 175	179 / 183	180 / 187	179 / 185	178 / 184	178 / 182	177 / 182	182 / 182
ETS carbon price (€/t of CO2-eq)	35 / 100	40 / 264	39 / 243	35 / 220	30 / 205	25 / 180	13 / 160	6 / 165

Source: European Commission, Impact Assessment, Table 9, p. 51–2.

Economic impacts in the energy system

Energy related investment expenditures increase in all scenarios, according to the IA. This is particularly true for the EE35 and EE40 scenarios and most of the expenditure is in the residential and tertiary sectors. The IA provides a powerful statement:

> The magnitude of investments in the entire economy should also be interpreted as a huge potential for driving jobs and growth in the EU, in particular due to the local nature of much energy efficiency investment and the industrial and technological leadership the EU companies still have in terms of energy efficient and low-carbon technology.

While not directly related to the theme of this paper, it is important to look at the effect on the EU Emissions Trading System (ETS) since it is considered quite controversial. The IA states:

> The more the energy savings, the lower becomes the ETS price as EE policies reduce the demand for electricity in the ETS sector. Also EE improvements in industry reduce the demand for ETS allowances. In addition, in the EE40 scenario, which significantly overshoots the GHG target, efficiency policies shift emission reduction efforts from ETS to non-ETS sectors. In 2030, the ETS prices in the EE scenarios with the highest energy savings are lower than in Reference.[12]

More will be discussed on ETS below.

12. European Commission, Impact Assessment, p. 51.

Energy related investment expenditures increase in all EE scenarios (particularly the EE35 and EE40 scenarios), according to the IA. Given the local nature of energy efficiency measures, the magnitude of investments in the entire economy should also be seen as a huge potential for driving jobs and growth in the EU.

Macro-economic impacts

There are three main macro-economic impacts that the Impact Assessment analysed: impact on *economic output (GDP), sectoral impacts* and *employment effects*. The IA used two models for its macro-economic modelling – the E3ME model and the GEM-E3 model. The IA states that there are some similarities between the two models but also many differences. The E3ME is a macro-econometric model based on a post-Keynesian framework. The GEM-E3 model is a general equilibrium model that draws on neoclassical economic theory and optimising behaviour of economic agents.[13] E3ME only projects until 2030 while the GEM-E3 model goes to 2050.

Depending on the model chosen, the accumulated GDP effects differ more than 5 % by 2030. It should be noted that these are changes in *addition* to the reference scenario. In the "pessimistic" case (the GEM-E3 model) the accumulated GDP is slightly lower in 2030, where it is several percentage points higher for the E3ME model. However, it will be shown below that even the model that produces a lower growth

13. Annex VI of the IA provides a detailed description of the methodology of each model.

Two macro-economic models show different impacts of the EE40 and the other efficiency scenarios. Applying a macro-econometric model based on a post-Keynesian framework (E3ME), GDP would grow by almost 4.5 % by 2030 in addition to the reference scenario. With the other model – a general equilibrium model that draws on neoclassical economic theory assuming perfect information and rational actors (GEM-E3) – GDP would be approximately 1.2 % lower in 2030. The difference is about 5.5 % by 2030 or 0.4 %/year. Is this much? Assuming the equilibrium model is correct, the reduction in GDP would be small: less than 0.1 % a year. Assuming the post-Keynesian model is correct, the benefits are almost four times larger. *It is fair to argue that the risks in the most pessimistic assumptions are small, but that the potential benefits of the more optimistic assumptions are large.* It should also be pointed out that the great benefits come with the most ambitious scenarios.

will also create more jobs than the reference scenario. The economic impact of the EE scenarios is shown in Figure 5.

Impacts on GDP – more efficiency stimulates economic growth

It was shown above that the two models provide different results for economic growth (it can be argued whether the differences are "significant"). For the GEM-E3 model for 2030, there is a negative effect of -1.2 % from the reference case. The E3ME model provides significantly different results as shown in Table 4. This table also provides intermediary impacts for 2020 and 2025. The IA stated that the main driver was energy-efficient investment.

Sectoral impacts – shift from energy producers domestic EU Supply chains for efficiency

The modelling in the Impact Assessment shows that greater energy efficiency "drives consumption expenditures towards sectors producing energy efficient equipment (i.e. more efficient electrical appliances for households, retrofits, materials improving thermal integrity of buildings, etc.) and savings towards the fi-

Ambitious energy efficiency policies will generate more jobs in businesses that are involved in the supply chains of energy efficiency. There will be a shift away from the energy-producing sector.

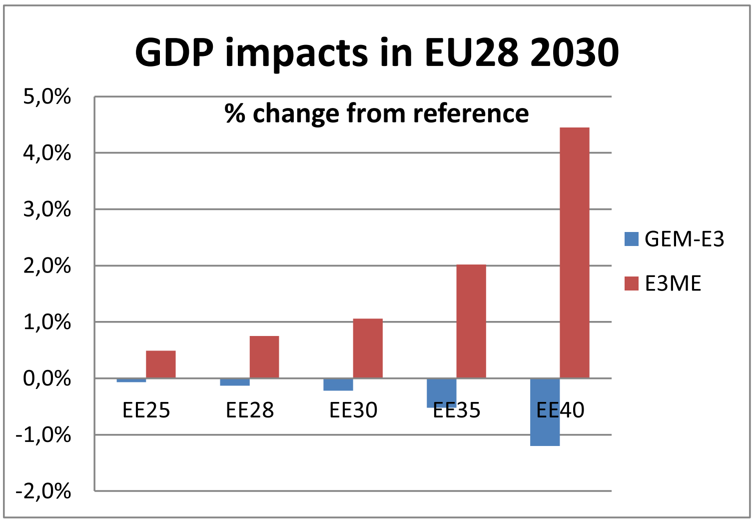

Figure 5. GDP impacts in EU 28 in 2030. Applying a macro-econometric model based on a post-Keynesian framework (E3ME), GDP would grow by almost 4.5 % by 2030 in addition to the reference scenario. With the other model – a general equilibrium model that draws on neoclassical economic theory assuming perfect information and rational actors (GEM-E3) – GDP would be approximately 1.2 % lower in 2030. The difference is about 5.5 % by 2030 or 0.4 %/year. The risks in the most pessimistic assumptions are thus small, but the potential benefits of the more optimistic assumptions are large. Source: European Commission, Impact Assessment, Table 10 and 11, pages 53 and 54.

Table 4. GDP impacts in EU28 (2030) in E3ME model.

% change from the Reference	2020	2025	2030
Reference (in bn 2010 €)	14.479	15.699	16.960
EE25	0,05	0,20	0,49
EE28	0,06	0,27	0,75
EE30	0,08	0,53	1,06
EE35	0,07	0,90	2,02
EE40	0,05	0,82	4,45

Source: Energy Commission, Impact Assessment, Table 11, p. 56.

nancing of energy efficiency projects (i.e. insulation to improve thermal integrity, etc.)". Understandably this means a shift away from energy producing sectors. The IA sees this as positive because the investment in energy efficient equipment is "further strengthened by the multiplier effect, which is the increased intermediate demand for goods and services due to sectoral interconnections and long supply chains". The IA also states that those sectors that have a low exposure to foreign competition also do well.

For the GEM-E3 model, the sectors delivering energy efficiency products and services report increases in their production. This is particularly true for the construction sector. For the E3ME model, the sectors that benefit the most are those that "produce investment goods related to energy efficiency products and services, such as construction and engineering".[14] For this model, the non-energy extraction sector is also expected to benefit because it is a major supplier to the construction industry.

Employment effects – energy efficiency brings people to work

Both models were also used to assess the employment effects. All of the energy efficiency scenarios saw increased employment, with most of the gains before 2030 and fewer after that. The modelling showed that employment was affected by "positive changes in the activity of more labour intensive sectors of energy efficiency products and services as well as building renovation".[15] Gains for the EE scenarios in 2030 in the GEM-E3 model ranged from 0.5 % to 3.0 % compared to the reference scenario. The EE40 scenario had significantly higher employment benefits at 3.0 %. The E3ME model showed employment growth ranging from 0.23 % (for EE25) to 1.5 % (for EE40).

Analysis with both macro-economic models result in a net creation of jobs for all efficiency scenarios, compared to the reference scenario. The model based on a post-Keynesian framework (E3ME) results in more jobs, but both models predict a net positive impact on jobs for all efficiency scenarios. Both models predict that more jobs will be created with the more ambitious scenarios.

Both models show positive employment for almost all sectors including the energy-intensive sectors (steel, cement, pulp and paper, etc.). The employment impact for the two scenarios is shown graphically in Figure 6.

To provide another view of the employment impact that was outside of the Commission's IA, analysis undertaken for the Energy Efficiency Industrial Forum during the negotiations for the 2012 Energy Efficiency Directive, showed that about 19 net jobs would be created in the buildings sector for every €1 million invested.[16] Energy efficiency investments in buildings are much more labour-intensive than many other sectors. Importantly, as recognised by the IA, these jobs are throughout the entire economy and not in specific sites as one would find for traditional power plants.

14. Impact Assessment, p. 58.
15. Impact Assessment, p. 59.
16. Janssen and Staniaszek, "A Survey of the Employment Effects of Investment in Energy Efficiency of Buildings", for the Energy Efficiency Industrial Forum, May 2012.

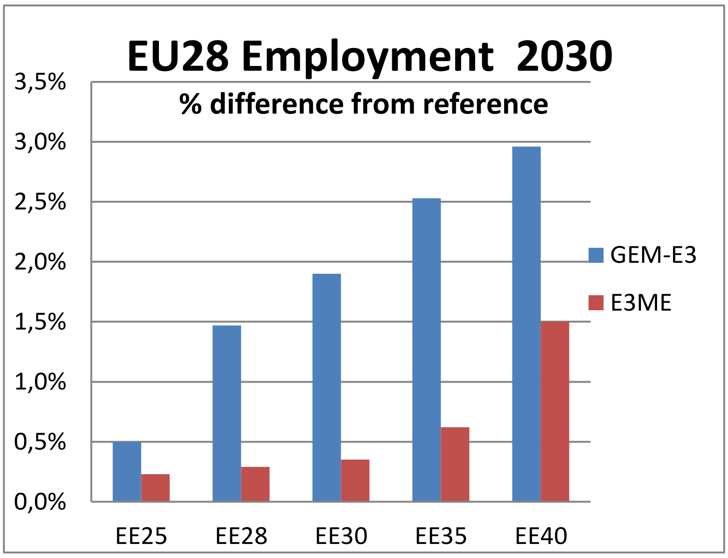

Figure 6. EU employment in 2030. Analysis by both models show that more jobs are created with the Impact Assessment's more ambitious efficiency targets. Source: European Commission, Impact Assessment, Table 14 and 16, pages 58 and 59.

Environmental and health impacts – EE scenarios give most GHG reductions

The Impact Assessment mainly focuses on the reduction of GHG emissions. All of the scenarios achieve at least 40 % reduction. The greatest reductions are in the EE40 scenario that is expected to achieve 43.9 % reduction in 2030. All of the scenarios also achieve between 42 % and 46 % savings for the ETS sector and between 28 % and 35 % for the non-ETS sector.

The IA refers to the health benefits from greater energy efficiency and thus there is reduced pollution from energy extraction, transformation, transportation and use, all of which provide health benefits. Also, the reduction in resources for energy extraction, transformation, transportation and use lead to less use of water and that can be very important for many regions. This is important in the EU's promotion of resource efficiency.

Competitiveness and affordability of energy

The IA shows little difference between the reference scenarios and the EE scenarios in terms of electricity price changes and the share of energy costs in value added created by energy intensive industries. For households, the IA shows that energy-related costs go up slightly in 2030.

Figure 7 shows the average electricity price evolution under the different scenarios. The price is almost the same regardless of the scenario, but there are changes in relation to the reference scenario, where average electricity prices are predicted to remain slightly lower.

> Average electricity prices will be almost the same regardless of the scenario chosen, according to the Impact Assessment. More ambitious efficiency targets are thus not predicted to raise the price of electricity.

Table 5 also provides the IA's results on the share of energy expenditures for both households and energy-intensive industries. As the IA states, the share of energy costs in value added created by energy intensive industries remains stable among the various scenarios in 2030. "For households, the share of energy-related costs (both including and excluding transport) grows slightly already in 2030 …"[17]

The Communication states that energy efficiency "spurs competitiveness by creating markets for efficient, high value-added appliances and decentralised energy management technologies".[18]

A discussion paper published by the eceee in May 2013 entitled "European competitiveness and energy efficiency: Focusing on the real issue" showed the importance of improved energy efficiency to help Europe improve its competitive position.[19]

17. European Commission, Impact Assessment, p. 66.

18. EC Communication, "Energy Efficiency and its contribution to energy security and the 2030 Framework for climate and energy policy", COM (2014) 520 final, 23.7.2014, page 6.

19. "European competitiveness and energy efficiency: Focusing on the real issue", eceee, 21 May 2013. http://www.eceee.org/policy-areas/competitiveness

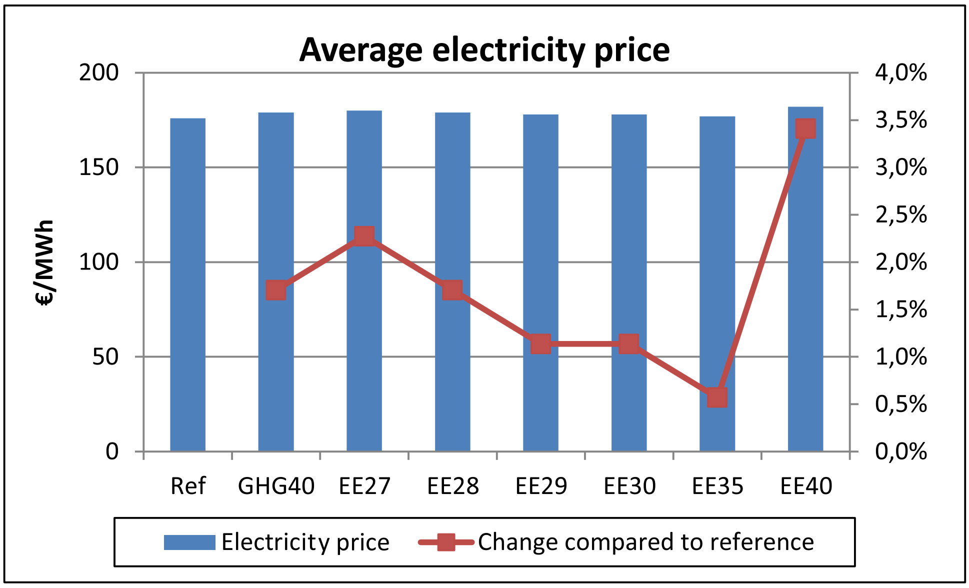

Figure 7. Average electricity price. Regardless of the scenario chosen, the average electricity price remains almost flat. The red line shows the percentage change in relation to the reference case: the EE40 would give only 3.5 % higher average electricity prices than the reference scenario. Source: European Commission, Impact Assessment, Table 9, page 50.

Table 5. Share of energy costs in household expenditure and energy intensive industries value added.

Indicator *(figures are presented in a 2030/2050 format)*	Ref	GHG40	Decarbonisation Scenarios					
			EE27	EE28	EE29	EE30	EE35	EE40
Share of energy costs in energy intensive industries value added	41.8 / 41.0	42.1 / 54.2	43.9 / 50	43.7 / 51.5	43.6 / 51.5	43.5 / 51.2	43.8 / 50.1	44.1 / 49.8
Share of energy related cost (including transport) in household expenditure (In 2010: 12,4)	14.6 / 12.6	14.8 / 14.1	14.8 / 13.6	15 / 13.8	15.2 / 14.3	15.5 / 14.8	16.5 / 16.3	18.6 / 18.5
Share of energy related cost (excluding transport) in household expenditure (In 2010: 7.5)	9.3 / 8.0	9.4 / 8.7	9.5 / 8.3	9.7 / 8.6	9.9 / 9	10.1 / 9.5	11.1 / 11	13.2 / 13.2
Avg. electricity price incr. compared to 2010 price	30.8 / 30.1	33.3 / 36.2	34.1 / 38.9	33.2 / 37.7	32.6 / 36.7	32.4 / 35.12	31.9 / 35.3	35.2 / 35.6
Average electricity price change compared to Ref. (percentage points)	n.a.	1.9 / 4.7	2.5 / 6.8	1.8 / 5.8	1.4 / 5.1	1.2 / 3.9	0.8 / 4	3.3 / 4.2

Source: From PRIMES model in European Commission, Impact Assessment, pp. 66–67, former Table 21.

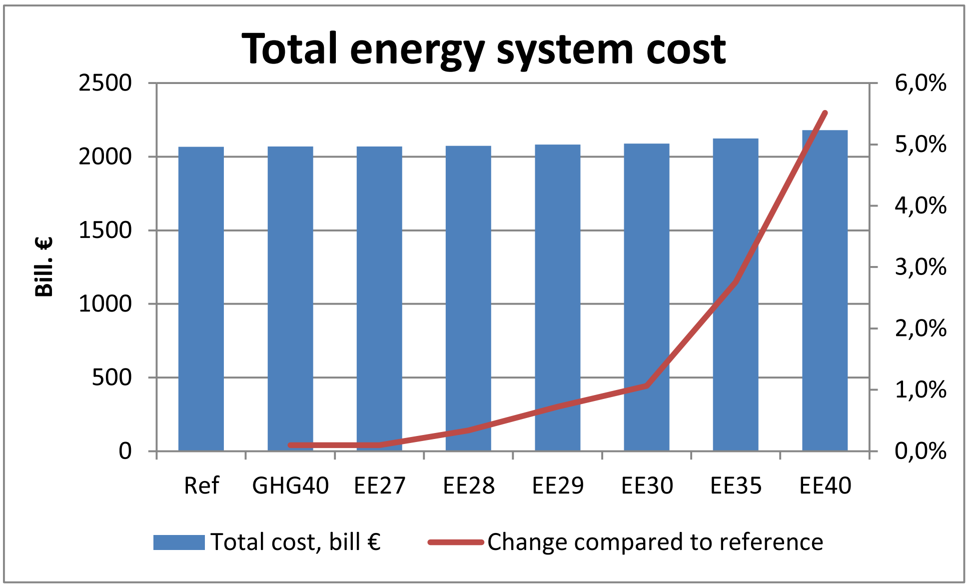

Figure 8. Total energy system costs. The total energy system cost is only marginally affected by the scenario chosen. The red line shows the percentage change in relation to the reference case. Source: European Commission, Impact Assessment, Table 7, page 46.

THE ENERGY SYSTEM COSTS

Total energy system costs from an end user perspective were calculated in the modelling. It is useful to see the results in the following Figure 8. The system costs are only marginally higher in the EE40 scenario but manageable when looking at the full range of benefits as discussed in this paper. The IA did not look into the costs and benefits for specific sectors of final energy demand or specific economic actors (e.g. landlords, tenants, manufacturers, etc.). The IA stated that those calculations would be made for policy or legislative proposals that will follow the agreement on the energy efficiency target.

Table 6 provides what the July Communication describes as some of the key aspects of different options. The table is quite revealing. One of the concerns for the Commission was the total energy system costs without the effect of energy efficiency on non-financial costs (third row). The energy system costs include both capital costs and energy purchases. As the footnote on the table states, the capital costs include the cash cost of investing in energy efficiency, the cost of obtaining financing for that purpose and the non-financial costs attributed to the barriers that consumers face. All of the energy efficiency scenarios are equal or more expensive than the GHG40 scenario and the EE40 is the most expensive of all the scenarios.

The Communication states that "the 2030 framework also indicated that the cost-effective delivery of the greenhouse gas emissions reduction target for 2030 would require increased energy savings in the order of 25 %".[20] The Communication, however, concludes: "[…] given the increased relevance of bolstering EU energy security and reducing the Union's import dependency, the Commission considers it appropriate to propose a higher target of 30 %. This would increase the costs of the 2030 Framework by €20 billion per annum but would still deliver tangible economic and energy security benefits."[21]

Total system costs will be affected very little by more ambitious energy efficiency targets. The most aggressive efficiency scenario – EE40 – will only see about 5 % higher total system costs than the reference scenario.

Considering Table 6, EE40 provides significantly more benefits in reduced natural gas imports, primary energy consumption is significantly lower than any other scenario, fossil fuel import costs are the lowest and there is greater employment. In summary, this is the scenario that has the greatest reduction in natural gas imports and the lowest fossil fuel import costs.

The Communication considers that the EE40 scenario comes at a "hefty" cost. The overall energy system

20. Communication, p. 5.

21. Ibid, p. 17.

Table 6. Costs and benefits of a range of different energy efficiency targets.

	REF2013 Baseline	GHG40 (40% GHG, 27% RES, 25% EE)	More ambitious objective for energy efficiency (%)					
			EE27	EE28	EE29	EE30	EE35	EE40
Energy Savings in 2030 (evaluated against the 2007 Baseline projections for Primary Energy Consumption)	21.0%	25.1%	27.4%	28.3%	29.3%	30.7%	35.0%	39.8%
Primary Energy consumption in 2030 (Mtoe) [Gross Inland Energy Consumption excluding non-energy use]	1490	1413	1369	1352	1333	1307	1227	1135
Energy systems costs without effect of energy efficiency on non-financial costs (average annual 2011-2030 in bn €10)	2067	2069	2069	2074	2082	2089	2124	2181
Investment Expenditures (average annual 2011-2030 in bn €10)	816	854	851	868	886	905	992	1147
Net gas imports in 2030 (in bcm)	320	276	267	256	248	237	204	184
Fossil fuel imports costs (average annual 2011-2030 in bn €'10)	461	452	447	446	444	441	436	434
Employment in 2030 (million Persons)	231.74	n.a.[38]	n.a.	232.39	n.a.	232.53	233.16	235.21
Average Price of Electricity in 2030 (€/MWh)	176	179	180	179	178	178	177	182

Source: EC Communication Table 1.

costs would increase from €2,069 to €2,181 billion per annum or approximately €12 billion a year. But it could surely be argued whether a 5 % higher total system cost in 2030 justifies the description "hefty".

Complementary benefits by sector – some examples

The IA did not address all the benefits, nor could it. There is some material from other studies that broaden the perspective and aid the reader in understanding many of the benefits. At this point it is important to consider some of the sectoral benefits from ambitious but realistic energy efficiency improvements. There is some overlap in the sectors, but this gives a reasonable indication of the benefits available. One should note Figure 2 from the IEA on the range of multiple benefits. Many were discussed in the IA and Communication but many were not. The IEA has just published a major report on this topic (see section on multiple benefits, above).

RESIDENTIAL SECTOR – HEALTH AND SOCIAL IMPACTS

There are many benefits for the residential sector. The following are two of the main ones.

1. Fuel poverty

According to the Buildings Performance Institute Europe, in 2012, 10.8 % of the total European population was unable to keep their home adequately warm, increasing to 24.4 % when referring to low-income people.[22] It is widely known that fuel poverty is a major problem for Europe and some individual Member States are actively trying to address it in a comprehensive manner. BPIE's most recent publication reinforces the arguments that many have tried to make – improved energy efficiency is the main approach to address fuel poverty.

2. Health

It should be noted that there can be serious health effects from buildings that are too cold or too hot. Effects can include such as colds and flu, accidents in the home, food poisoning, hygiene problems, asthma and allergies. Extreme problems lead to excess winter deaths (or even summer). These can result from inappropriate heating or cooling or poor ventilation. Improved energy efficiency can address all those health aspects.

Of 14 Member States surveyed in one study, the coefficient of seasonal variation in mortality was lowest in Finland (0.10), Germany (0.11) and the Netherlands (0.11), while highest in Portugal (0.28), Spain (0.21) and Ireland (0.21). The mean for the 14 MS was 0.16.[23] In another study, countries that have more energy efficient housing have lower Excess Winter Deaths (EWDs).[24]

Improved energy efficiency is undoubtedly an important solution to the negative health effects related to poor buildings.

INDUSTRY

There is increasing analysis of the non-energy benefits in the industrial sector. There were several papers at 2014 eceee Industrial Summer Study related to the topic. There is on-going work to calculate the non-energy benefits so that they can be better integrated into the business strategies of companies. One paper by Nehler et al provides a good summary of the non-energy benefits in industry.

Conclusions

The Commission's Impact Assessment to its recent Communication on energy efficiency provides a wealth of information and analysis of the importance for a more ambitious energy efficiency approach than exists now. While the Communication has admitted that the EU will most likely miss the 2020 energy savings target, the Communication states that the 20 % target can be achieved without the need for additional measures.

The importance of the Commission's documents is that it firmly puts energy efficiency in the forefront of energy policy. The Energy Efficiency Financial Institutions Group, created by DG Energy and the UNEP Financial Initiative, published an interim report[25] in April 2014 that recognised energy efficiency as the first fuel. When one looks at Figure 1, how could one argue that it should not be so considered?

22. http://bpie.eu/fuel_poverty.html#.U9ecvS_fiVw

23. Marmot Review, p. 25. Note: This did not include any new MS.

24. Marmot Review Team, "The Health Impacts of Cold Homes and Fuel Poverty", May 2011, p. 8.

25. http://ec.europa.eu/energy/efficiency/studies/doc/2014_fig_how_drive_finance_for_economy.pdf

Table 7. Summary of the non-energy benefits in industry.

Category	Examples
Production	Increased production Improved product quality Increased production reliability Increased equipment life Shorter process cycle time Reduced raw materials use
Operation and maintenance	Reduced maintenance Lower cooling requirements Reduced labour requirements Reduced need for engineering controls
Working environment	Increased worker safety Reduced noise Improved air quality Improved temperature control Improved lighting
Waste	Reduced waste water Reduced hazardous waste Use of waste fuel, heat, gas Materials reduction
Emissions	Reduced emissions (CO, CO_2, NO_x, SO_x) Reduced dust emissions
Other	Improved public/corporate image Improved worker morale Increased sales levels

Source: Therese Nehler et al., "Including non-energy benefits in investment calculations in industry – empirical findings from Sweden", eceee Industrial Summer Study proceedings, eceee 2014, p. 714.

Modelling, as undertaken by the Commission, is always open to criticism, but the results provided show the significance of improved energy efficiency. Improved energy efficiency is a catalyst for much of the positive impact in energy policy, in environmental policy and throughout the range of other policy areas. The benefits are at the EU-wide and national level but also, as not shown in the Impact Assessment, also significant at the regional and local levels.

The Communication proposed a 30 % target for energy efficiency for 2030 and Council adopted a target of 27 %, although with the understanding this would be revisited by 2020. This current review of the findings from the Impact Assessment confirms that a more ambitious target would bring significantly more benefits throughout the European Union. This paper was designed to show that the Commission's own analysis of its proposal for 2030 revealed that a significantly strengthened target can deliver much more than is currently expected from it. This is a win-win situation and can certainly help Europe shake off the final chapter of the long financial crisis that has gripped the content for too many years.

Annex – selected reading

"Alleviating Fuel Poverty in the EU. Investing in home renovation, a sustainable and inclusive solution", Buildings Performance Institute Europe, Brussels, May 2014.

Foxon, Timothy, & Steinberger, Julia, "The role of energy and efficiency in economic development: policy implications", *eceee Summer Study proceedings*, eceee 2013, pp. 177–183.

Jonsson, Daniel, & Johansson, Bengt, "How can improved energy efficiency affect energy security?", *eceee Summer Study proceedings*, eceee 2013, pp. 13–18.
Nehler, Therese, et al., "Including non-energy benefits in investment calculations in industry – empirical findings from Sweden", *eceee Industrial Summer Study proceedings*, eceee 2014, pp. 711–719.
Rasmussen, Josefine, "Energy-efficiency investments and the concepts of non-energy benefits and investment behaviour", *eceee Industrial Summer Study proceedings*, eceee 2014, pp. 733–744.
Sheer, Jim, "Ensuring efficient government expenditure on alleviating fuel poverty in Ireland", *eceee Summer Study proceedings*, eceee 2013, pp. 1353–1363.
Zhang, Shaohui, et al., "Integrated assessment of co-benefits between energy efficiency improvement and emission mitigation in Chinese iron and steel industry", *eceee Industrial Summer Study proceedings*, eceee 2014, pp. 721–731.