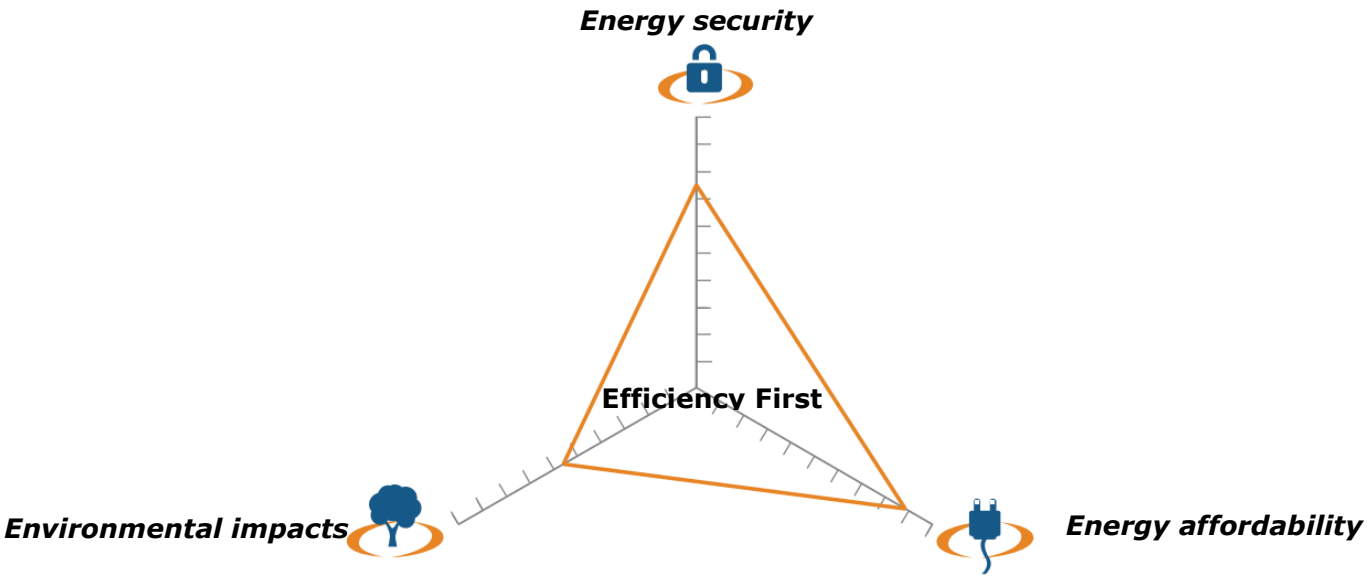
Clean Energy for All Europeans Package

Do the Commission's Impact Assessments Assign the Right Role to Energy Efficiency?

Executive Summary



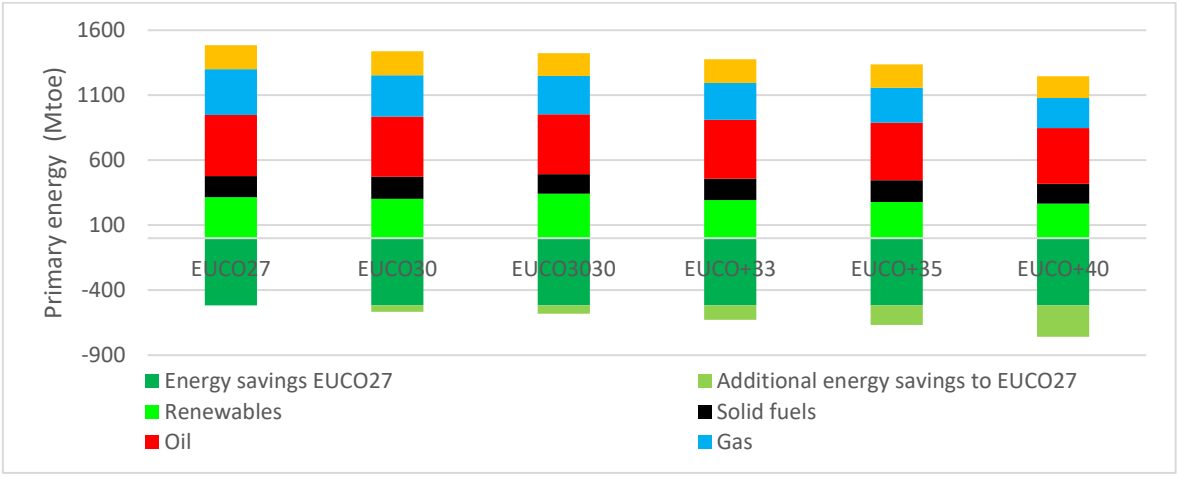
The EU Energy "Trilemma"

The European Commission's Clean Energy for All Europeans Package, published in November 2016, includes the Commission's proposals for energy efficiency to play a meaningful role in the EU's obligations under the Paris Climate Agreement. The Commission's proposals are based on a combination of qualitative analyses and the modelling results of different energy savings scenarios. This report reviews the modelling assumptions and results included in the Commission's impact assessments related to the Energy Efficiency Directive (EED) and to the Energy Performance of Buildings Directive (EPBD). The aim is to provide additional insights to the European Parliament, the European Council and stakeholders. The overall objective is to gain a better understanding of the rationale behind the Commission's policy proposals. The following represents the main findings.

The Commission modelling results[1] show that 40% energy savings by 2030 is viable

Importantly, in line with the Energy Union Strategy Framework and its Efficiency First Principle[2], each of the policy scenarios modelled by the Commission projects energy savings to be the first fuel of Europe in 2030. As shown in Figure ES.1, energy savings are projected to be, in absolute terms, higher than any other fuel in each of the EUCO scenarios. Moreover, in the 40% energy savings scenario (EUCO+40) the sum of renewables and energy savings is projected to overtake the sum of nuclear and fossil fuels. This would reflect the expected acceleration of energy renovation of existing buildings and the increased penetration of renewables in power and heat generation.

Figure ES.1 EU 2030 primary energy mix in the Commission's scenarios



Key point: Energy savings[3] are projected to be the first fuel of Europe in 2030 in each of the Commission's scenarios.

Source: OpenExp based on the 2016 impact assessment related to the Energy Efficiency Directive

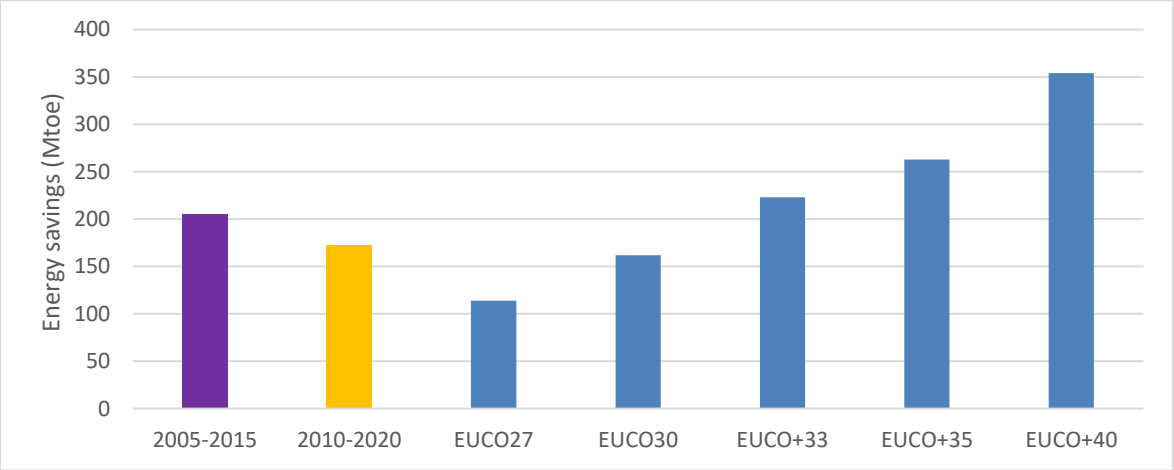
[1] The modelling results related to energy balances and discussed in this report are those considered in the Commission's 2016 impact assessment of the EED and included in The Technical Report on Member State Results of the EUCO policy scenarios

[2] Efficiency First Principle is a guiding principle introduced by the Energy Union Strategy Framework which states that energy efficiency should be considered as an energy source in its own right. It aims to prioritise investments in energy savings (energy efficiency and demand-response). More information on the Efficiency First Principle is available at: https://europeanclimate.org/efficiency-first-a-new-paradigm-for-the-european-energy-system/

[3] Energy savings are calculated as a difference between the 2007 baseline primary energy consumption for 2030 and the projected 2030 primary energy consumption in each of the EUCO scenarios.

The energy savings ambition for the next decade in the scenarios aiming at 27% and 30% energy savings (EUCO27, EUCO30) is lower than the one for the current decade. The projected energy savings in the EUCO27 and EUCO30 scenarios for the period 2020-2030 are, in absolute terms, lower than the savings achieved over the period 2005-2015[4] and the projected savings for the period 2010-2020 (Figure ES.2). This is significantly different in the 40% energy savings scenario where the expected energy savings for the period 2020-2030 would be double those expected for the period 2010-2020. This would reflect the expected doubling of renovation rates from 1.5% in the current period to 3.1% in the EUCO+40 in the next decade while the renovation rates increase only slightly in the scenarios aiming at 27% and 30% energy savings.

Figure ES.2 Energy savings in the period 2021-2030 (EUCO scenarios) and in the periods 2010-2020 and 2005-2015



Key point: Energy savings ambition for the next decade in EUCO27 and EUCO30 is lower than the one for the current decade.

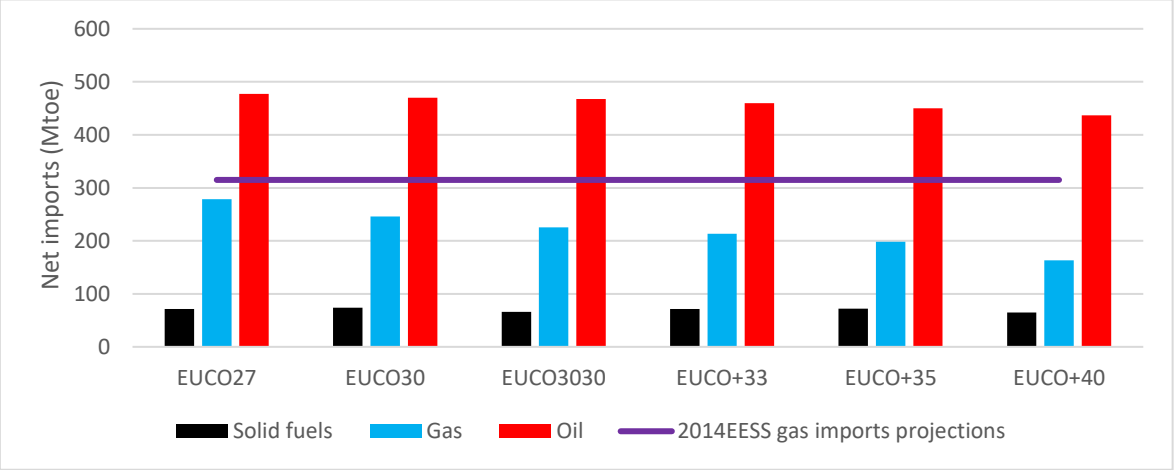
Source: Savings in EUCO scenarios and those in the period 2010-2020 are based on the 2016 impact assessment related to the Energy Efficiency Directive while savings in the period 2005-2015 are based on Eurostat data.

From an energy security perspective, the 40% energy savings scenario projects gas imports to be almost half of gas import projections in the 2014 European Energy Security Strategy (EESS). Each of the Commission's scenarios projects gas import needs to be lower than the 2030 projections for gas considered in the 2014 EESS (Figure ES.3). The more significant difference between the two projections is observed in the scenario aiming at 40% energy savings (EUCO+40). The reduction of gas imports in this scenario would result from the combined effect of the projected doubling of renovation rates and the more than doubling[5] of the number of household using electric heating. Moreover, the scenario aiming at 40% energy savings would bring a cumulative € 160 billion savings in gas import bills, over the period 2021-2030, in comparison with the scenario aiming at 27% energy savings.

[4] Energy savings referred to for the period 2005-2015 include savings due to the implementation of energy efficiency measures but also those savings resulting for reduced economic activity during this period.

[5] The projected number of household using electric heating in the EUCO+40 scenario is 53 million while the projected one in the EUCO27 is 22 million.

Figure ES.3 2030 Net imports projections of solid fuels, oil and gas in EUCO scenarios and 2030 gas projections in the 2014 EESS

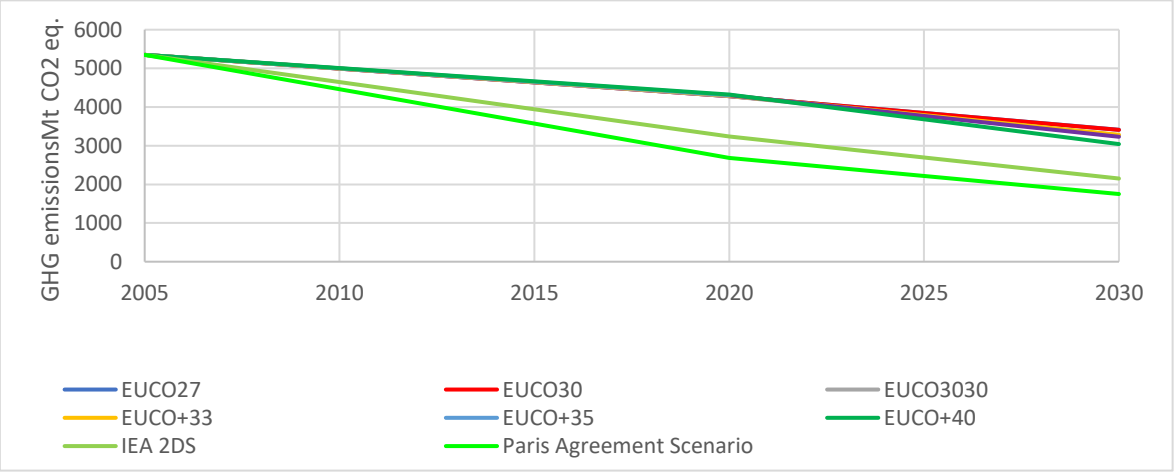


Key point: The Commission's EUCO scenarios project gas import to be lower than those considered in the 2014 European Energy Security Strategy.

Source: 2016 impact assessment related to the Energy Efficiency Directive and the European Energy Security Strategy

From an environmental perspective, none of the Commission's scenarios is aligned with the Paris Climate Agreement. The expected greenhouse gas (GHG) emissions reduction in the 40% energy savings scenario is the closest to the International Energy Agency's two-degrees scenario (IEA 2DS). However, they are still higher than the required ones under the Paris Climate Agreement (Figure ES.4). The highest share of emissions reduction is expected to take place in two sectors: a) power generation, due to increased share of renewables and b) in buildings, due to reduced heating and consequently gas demand, that would result from the renovation of the building envelope and the electrification of heating.

Figure ES.4 EU 2030 GHG emissions in the Commission's scenarios, IEA two-degrees scenario (IEA 2DS) and the Paris Climate Agreement scenario



Key point: EU 2030 GHG emissions in EUCO scenarios are higher than those of the Paris Climate Agreement scenario.

Source: GHG emissions in EUCO scenarios are based on 2016 impact assessment related to the Energy Efficiency Directive, those of the IEA 2DS are based on ETP 2016 and those related to the Paris Climate Agreement scenario are based on OpenExp estimates.

The GHG emissions reduction goes hand in hand with the increased energy savings ambition and the increased share of renewables despite the decrease of Emission Trading Scheme (ETS) carbon prices. Modelling results show that low carbon prices will not negatively impact GHG emissions reduction. This is in line with what the EU experienced in the period 2005-2014. The correlation observed, during the previous period, between GHG emissions reduction and the increased share of renewables and energy savings in the EU primary energy mix and the opposite correlation observed with ETS carbon prices are expected to occur in the period 2020-2030 (Table ES.1).

Table ES.1 2030 GHG emissions reduction, ETS carbon price, share of renewables and energy savings target in the Commission's scenarios

	EUCO27	EUCO30	EUCO+33	EUCO+35	EUCO+40
ETS carbon price (€/t of CO_2 eq.)	42	27	27	20	14
Total GHG emissions reduction compared to 1990	-40,7%	-40,8%	-43,0%	-43,9%	-47,2%
GHG emissions reduction in ETS sectors compared to 2005	-43.1%	-43.1%	-44.3%	-44.2%	-48.3%
GHG emissions reduction in ESD sectors compared to 2005	-30.2%	-30.3%	-33.7%	-35.5%	-38.7%
Share of RE in gross final energy consumption	27%	27%	28%	28%	28%
Energy savings target	27%	30%	33%	35%	40%

Key point: Emissions reduction are expected to continue to be driven by an increased share of renewables and ambitious energy savings and not by the ETS carbon price.

Source: 2016 impact assessment related to the Energy Efficiency Directive

From a societal perspective, improving health of EU citizens and reducing energy poverty is more significant in the most ambitious energy savings scenario. The 40% energy savings scenario increases the number of life years in the population due to lower $PM_{2.5}$ by almost 17 million compared to the 27% energy savings scenario. Combined with reduced premature deaths due to reduced ozone pollution, this could translate to an average annual cost reduction of €43 billion[6]. In parallel, household energy expenditures are expected to increase only slightly as reduced energy bills would compensate, in the long term, for investments in energy efficiency measures. Moreover, real disposable incomes are expected to increase across all household groups including low-income. However, achieving these results requires tailored policy measures to ensure that ambitious energy renovation of existing buildings is undertaken, especially for buildings occupied by low-income families.

From a competitiveness perspective, energy related costs of energy intensive industries are expected to stay almost constant with increased levels of energy savings ambition. This could be explained by the combined decrease of electricity and ETS carbon prices, which would reduce energy purchases costs and auction payments, thereby outweighing the increase of capital costs necessary for investments. Consequently, this would ensure a slight decrease of the overall energy related costs of energy intensive industries (Table ES.2), in all scenarios compared to the EUCO27 scenario, and energy intensity of the industry sector improves considerably.

[6] The cost reduction referred to includes the reduction in monetary damage health due to PM and ozone concentration (estimated between 19.5 €bn/yr and 45 €bn/yr) and the air pollution control cost savings (estimated at 10.9 €bn/yr).

Table ES.2 Impacts of the Commission's scenarios on competitiveness of EU industry

	EUCO27	EUCO30	EUCO+33	EUCO+35	EUCO+40
Ratio of energy related costs (inclusive of auction payments ETS) to value added for energy intensive industries	40.8%	40.1%	40.0%	39.8%	40.6%
ETS carbon price (€/t of CO2 eq.)	42	27	27	20	14
Auction Payments (annual average €bn '13)	6.8	4.5	4.2	3.1	2.1
Average price of electricity (€ '13/MWh)	164	161	162	161	163
Energy purchases costs (annual average €bn '13)	175.7	173.4	169.5	165.6	158.7
Capital costs (annual average €bn '13)	29.8	30.9	34.7	38.4	50.6
Total energy related costs (annual average €bn '13)	212.4	208.8	208.4	207.2	211.4

Key point: Ambitious energy savings scenarios are not expected to adversely impact the competitiveness of EU industry.

Source: 2016 impact assessment related to the Energy Efficiency Directive

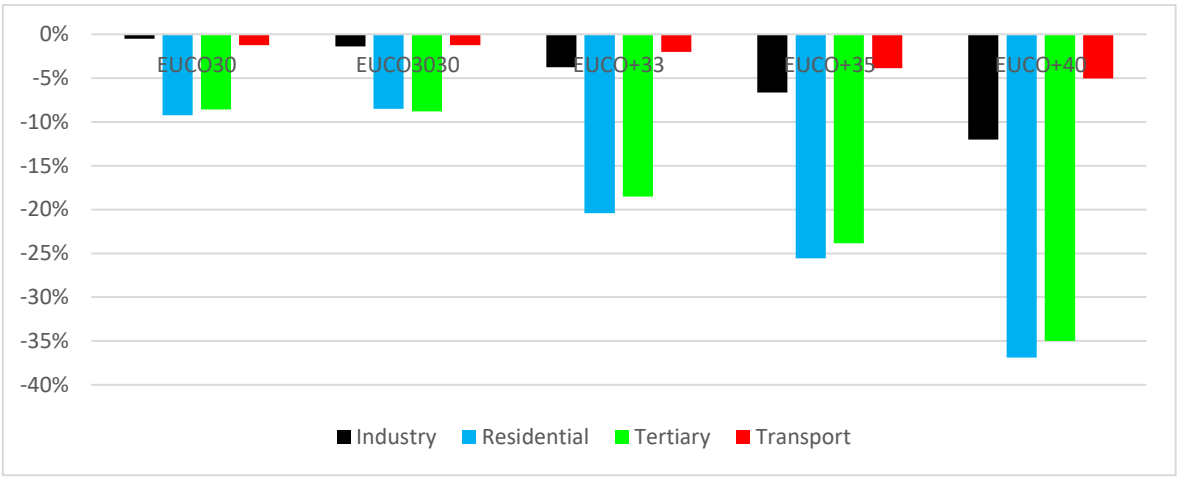
From a macro-economic perspective, energy savings scenarios would contribute to keep the EU trade balance positive[7] which in turn would drive growth and create jobs. In fact, energy savings ambition correlates positively with the EU trade balances: ambitious energy savings scenarios show a greater demand for energy efficient products and lower demand for gas imports[8]. Investments in energy efficient technologies will therefore have a positive impact on the EU GDP except if efficiency investments are self-financed[9] which almost certainly will not be the case. Similarly, employment is expected to increase substantially with the projected increase of energy efficiency investments after 2020. Engineering and construction sectors would be the main beneficiaries of production and employment growth.

Energy renovation of existing buildings is the cornerstone of the Commission's scenarios

Renovation rates in the impact assessment related to the proposed changes to the EED are misaligned with those in the impact assessment related to the proposed changes to the EPBD. The resulting renovation rates from the EED modelling are much higher than the ones used as input for the EPBD modelling[10]. This inconsistency puts the EU at risk of not moderating its energy demand at the agreed level given the projected pivotal role for buildings in the EUCO scenarios (Figure ES.5). In fact, energy savings scenarios show greater changes in final energy demand in residential and tertiary sectors compared to industry and transport sectors in each of the EUCO scenarios. Moreover, the Commission considered in the EPBD modelling the option of obligating building owners to renovate their buildings to a given energy performance standard. The implementation of a such measure would increase over time the renovation rates. However, this option is not included in the Commission's proposed changes to the EPBD. Question remains about how to achieve the renovation rates resulting from the EED modelling and consequently how to achieve the projected savings.

[7] It is worth noting that imports are projected to increase at a more rapid pace than exports.
[8] Currently, the trade balance of many Member States is negative exclusively because of fossil fuel imports.
[9] For the macro-economic modelling, the Commission considered four different options (self-financed, loan-based finance, no crowding out option, partial crowding out option).
[10] The EED modelling is based on a top-down approach using PRIMES model while the EPBD modelling is based on a bottom-up approach using the BEAM² model. The differences in the modelling approaches used for the EED and the EPBD do not justify the inconsistencies between the renovation rates resulting from the EED modelling and those used as input for the EPBD modelling.

Figure ES.5 Percentage change in final energy demand per sector compared to EUCO27 scenario



Key point: The building sector is expected to experience a sharp decrease of its final energy demand in 2030.

Source: OpenExp based on the 2016 impact assessment related to the Energy Efficiency Directive

The Smart Finance for Smart Buildings (SFSB) initiative[11] is a major step forward to mobilise private financing for energy renovation but still not sufficient to renovate Europe. If effectively implemented, this non-legislative initiative would allow for:

i. financial de-risking through national financial platforms which would deploy attractive and accessible energy renovation loans leading to increased private investments in energy renovation;
ii. technical/technological de-risking through the local/regional one-stop-shops and the increase of Project Development Assistance (PDAs) which would facilitate bundling small projects into larger ones making them more attractive for banks and industrialised energy renovation solutions leading to economies of scale; and
iii. behavioral de-risking through the expected changes in the perception of energy efficiency investments which could result from the tailored information on energy renovation provided by various EU/national platforms to different market actors.

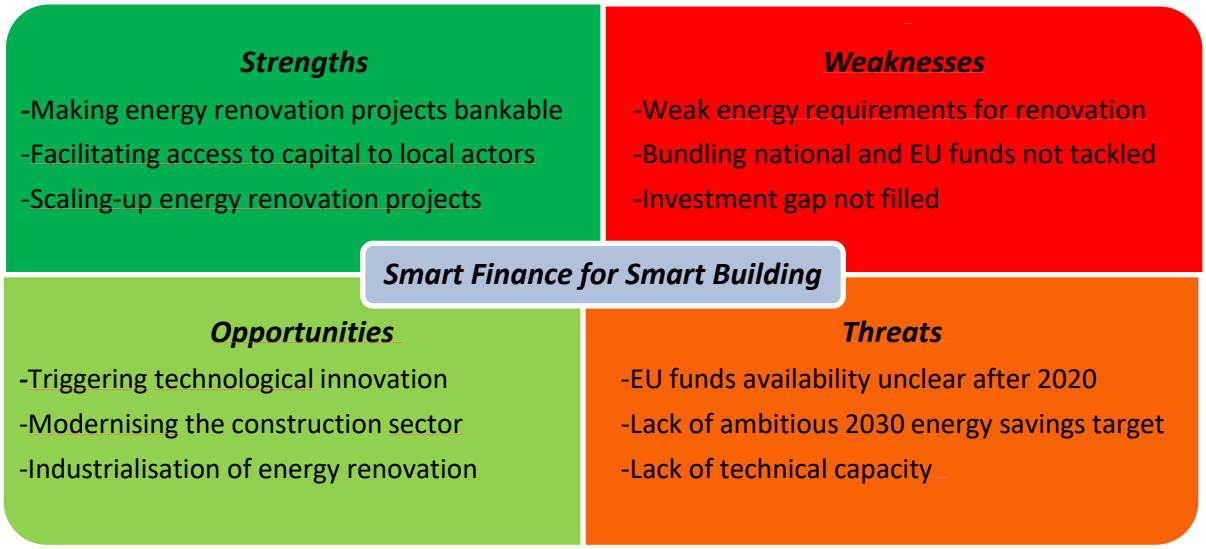
However, experience from the most advanced Member States in the renovation of their building stocks show that providing finance, PDAs and bundling small projects into larger ones is not always sufficient to trigger ambitious energy renovations at the scale needed. For the SFSB initiative to deliver on its expectations and for the EU to deliver on its energy renovation potential, the regulatory framework needs to be strengthened by requiring owners to undertake ambitious energy renovations of their buildings.

Uncertainties about the availability of EU funds in the period 2021-2030, which is the period where efficiency investments are expected to intensify, put the SFSB initiative at risk of failure. The financing platforms in the SFSB initiative are based on bundling public funding, in particular from the European Fund for Strategic Investment (EFSI) the European Regional Development Fund (ERDF) and the Cohesion Fund (CF), in order to mobilise private financing. However, the life-time of these

[11] The SFSB initiative is a non-legislative intervention designed to create an enabling framework to tackle market barriers to building renovation related to financing and to support the shift from current renovation practices based on shallow renovation financed by grants to large scale renovation projects financed by long-term loans paid back by energy savings.

three funds goes, for the time being, until 2020 and the EU public funding available in the period 2021-2030 remains unclear. This may increase the perceived risk of energy efficiency investments by investors (Figure ES.6). The two other funding mechanisms of energy renovation are ETS revenues, especially if carbon prices go up, and energy efficiency obligation schemes (EEOSs) under Article 7 of the EED if the proposed extension by the Commission is approved by the European Parliament and Council. Unfortunately, evidence shows that none of these instruments allow for financing ambitious energy renovations. ETS and EEOs revenues have, so far, mainly been used for financing low-hanging fruit measures. However, the proposed policy changes are unlikely to tackle the misalignment between the energy savings ambition and the policy instruments aiming at financing the implementation of energy efficiency measures.

Figure ES.6 SWOT analysis of the Smart Finance for Smart Buildings initiative



Key point: Effective implementation of the SFSB initiative requires policy intervention.

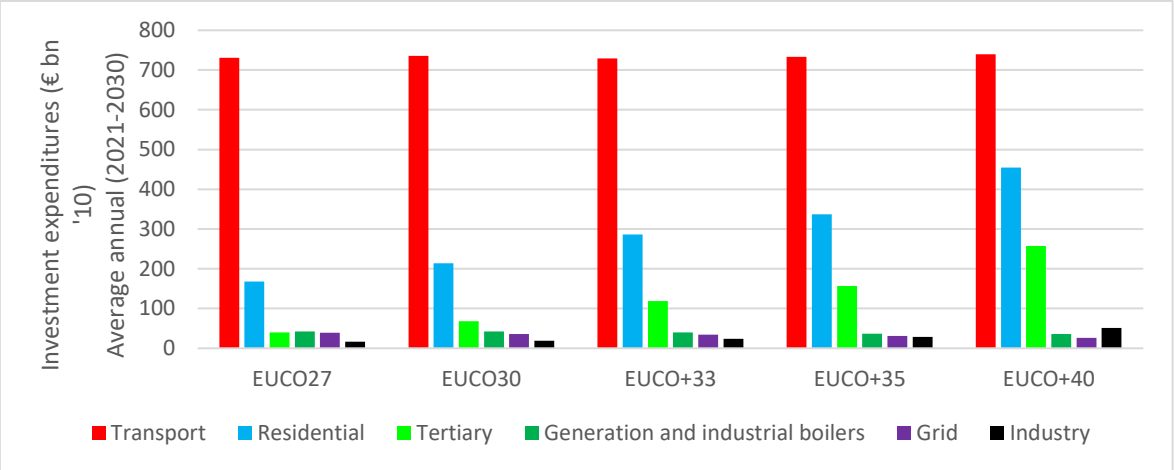
Source: OpenExp based on the Smart Finance for Smart Building initiative

Investment expenditures and costs related only to efficiency measures are unknown

The transport sector has the highest share of total[12] investment expenditures in the Commission's scenarios and the lowest contribution to energy savings. The share of total investment expenditures in the transport sector out of the total investment expenditures is projected to range from 70% in EUCO27 scenario to 47% in EUCO+40 scenario. The shares of total investment expenditures for residential and tertiary sectors are projected to increase in the most ambitious scenarios. The share of total investment expenditures in industry is kept constant, at 2% in EUCO27, EUCO30, EUCO+33 and EUCO+35 scenarios while it is projected to be at 3.3% in EUCO+40 scenario (Figure ES.7). This makes the total financing gap high because of the sector (transport) that contributes least to the energy transition (Figure ES.5) and the inclusion of energy services' investments in EUCO investment expenditures. The lack of information about the direct energy efficiency investment expenditures questions how the decision on the ambition level could be based on the cost-effectiveness of the policy options considered in the EUCO scenarios.

[12]Investments expenditures for transport include those related to mobility purposes (e.g. rolling stock).

Figure ES.7 Investment expenditures per sector in the Commission's scenarios

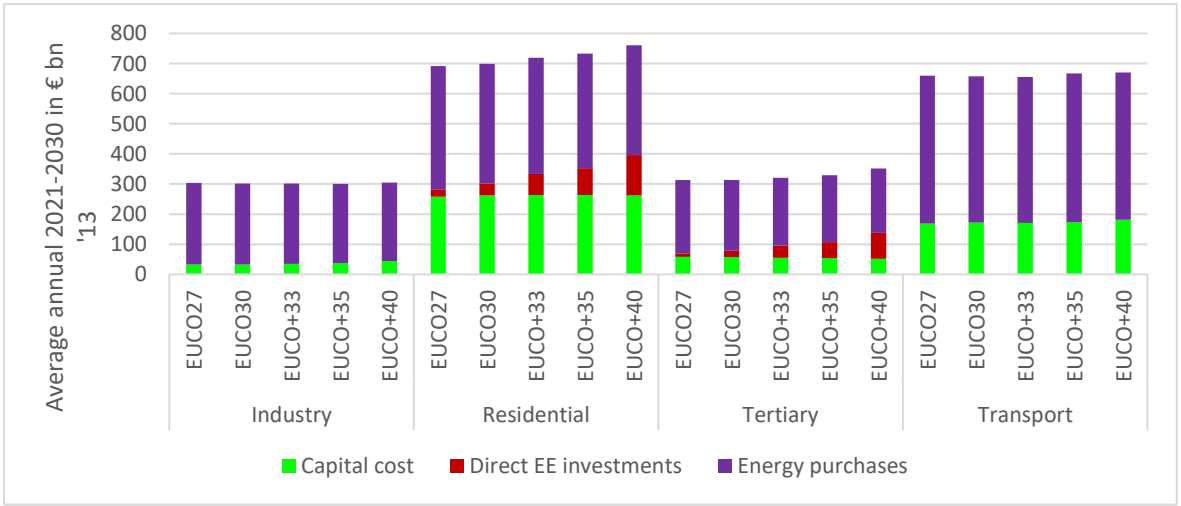


Key point: Transport sector has the highest total investment expenditures while it is the least contributing sector to energy demand reduction.

Source: 2016 impact assessment related to the Energy Efficiency Directive

Total energy system costs per sector do not match with the expected energy savings from the implementation of energy efficiency measures. Total energy system costs of residential and transport sectors are projected to be almost equal (Figure ES.8) while the savings from the residential sector are much higher than those expected from the transport sector (Figure ES.5). Similarly, total energy system costs of tertiary and industry sectors are projected to be almost equal as well, especially in low ambitious scenarios (Figure ES.7) while the expected savings from these two sectors are quite different. The lack of information about the direct energy efficiency investment costs for the industry and the transport sectors do not allow assessing the cost-effectiveness of the planned measures in these two sectors. Furthermore, direct energy efficiency investment costs for residential and tertiary sectors resulting from the EED modelling cannot be compared to those resulting from the EPBD modelling given the differences in the renovation rates.

Figure ES.8 Energy system costs per component and per sector in the Commission's scenarios



Key point: Total energy system costs of the industry sector do not change across scenarios while those of the transport sector change only slightly.

Source: 2016 impact assessment related to the Energy Efficiency Directive

The Commission's estimates of energy transition costs are high due to the private approach considered when estimating energy efficiency investments. The Commission's modelling assumes that individuals will take the decision to renovate their homes, buy efficient cars and efficient products. Thus, a private discount rate of 10%[13] was used when estimating total energy system costs. The guarantee/risk sharing mechanism proposed in the SFSB does not seem to be considered in these calculations since EU/EIB guarantee uses a much lower discount rate of around 4%. It is also unclear about how the effects of economies of scale on reducing technological/technical costs of energy renovation, through the expected industrialisation, which may result from large scale projects, were considered in the modelling.

The analysis of the impact assessments leaves many unanswered questions. As the approval process for the clean energy package continues in both Parliament and Council, it would be good, if a new modelling exercise is undertaken by the Commission and the following recommendations considered to allow for an evidence-based decision about the ambition level of the energy savings target:

Sensitivity analysis of different discount rate levels is needed to better assess the cost of different policy options. The debate about the discount rate to use requires an accurate comparison of energy system costs at various levels of discount rate. Similar sensitivity analysis was included in the Commission's impact assessment related to the Renewable Energy Directive (RED). A well-balanced and citizen-centred energy transition would be better based on cost-benefit analyses of different policy options at different discount rates instead of the least-cost approach considered by the Commission. Policy intervention, such as the guarantee mechanism included in the SFSB initiative will certainly be needed. This policy intervention must be reflected in the Commission's modelling to ensure a smooth transition of the EU energy system to a sustainable one.

Precise information on the direct energy efficiency investments and costs is needed to allow for an accurate assessment of the cost-effectiveness of energy efficiency measures. Imbedding direct energy efficiency investments and costs in the overall investments and costs which include also those related to energy services, as currently provided by the Commission's modelling results, may lead the Parliament and the Council to lower the ambition level for the energy savings target because of a financing gap not necessarily due to efficiency measures. It is, therefore, important to provide a detailed breakdown of energy system costs and investments.

Co-building impact assessments with stakeholders to enhance transparency and increase the robustness of policy proposals. The governance regulation is an opportunity to change mind-sets and move towards a more participatory process in policy design. Impact assessments should be opened for stakeholder input prior to the selection of the preferred option by the Commission. This would require full transparency about the assumptions, the modelling methodology and a breakdown of results into relevant components (e.g. energy efficiency investment per sector). Moreover, the use of open source models instead of privately owned models would help in building trust in the modelling process and in the results produced.

[13] The discount rate used by the Commission is lower than the one used in 2014. However, it is higher compared to the 4% discount rate recommended in the Commission's better regulation tool box.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