Update on energy price assumptions on economic potential savings

Final Report

Written by Yeen Chan

October 2022

EUROPEAN COMMISSION

Directorate-General for Energy
Directorate B — Just Transition, Consumers, Energy Efficiency and Innovation
Unit B.2 — Energy Efficiency

Contact: Nikolaos Kontinakis

E-mail: nikolaos.kontinakis@ec.europa.eu

European Commission
B-1049 Brussels

Update on energy price assumptions on economic potential savings

Final report

Directorate-General for Energy

2023

EN

Manuscript completed in September 2022

1st edition

This document should not be considered as representative of the European Commission's official position.

Luxembourg: Publications Office of the European Union, 2023

PDF ISBN 978-92-76-99021-5 doi: 10.2833/971788 MJ-07-23-045-EN-N

Table of Contents

1 Introduction

ICF supported the Commission to analyse and quantitatively assess in depth the remaining energy saving potential, and energy saving options, across the residential, commercial, industrial, and road transport sectors. The assessment was carried across all 27 EU Member States (plus UK) by applying ICF's Energy Saving Opportunity Assessment Tool at Member State level, a bottom-up modelling assessment of technical and economic energy saving potential across the sectors mentioned, projected from 2020 to 2030, with a perspective to 2050. Results of the assessment was published by the Commission in 2021, hereafter referred to as the '**2021 Assessment**'.

2 Objective of this contract

Since completion of the 2021 Assessment, EU is facing a dual energy crisis: (i) high-energy price inflation and (ii) the need to diversify oil and gas imports away from Russia. Energy prices have increased significantly across EU as demand recovered after the pandemic, further escalated by the conflict in Russia and Ukraine.

In this context, it is expected that the economic energy saving potential quantified in the 2021 Assessment would increase, especially because of the recent energy price trends. This contract aims to obtain an ad-hoc, high-level estimate of the changes in economic energy saving potential projection of the 2021 Assessment. On the other hand, the technical energy saving potential is not anticipated to change as it only depends on technical feasibility factors and does not fluctuate with economic factors. As a result, a short report outlining the changes in the economic energy saving potential considering the current energy prices was prepared and submitted to the Commission.

The 2021 Assessment along with this updated analysis assessed energy saving potential on a long-term basis under nominal conditions as set out in the EU Reference Scenario. It does not account for critical market shifts due to unexpected events. It was also not intended to be carried out for the purpose of addressing market crisis or generating corresponding emergency measures.

3 Approach

This updated analysis was carried out applying all the results and data from the 2021 Assessment, apart from the updated energy tariffs of EU Member States. This analysis was carried out without the aid of ICF's Energy Saving Opportunity Assessment Tool. The Cost of Conserved Energy (CCE) for the various Programmes from the 2021 Assessment were compared against the updated fuel tariff projections across all EU27 Member States through high-level calculations. Then, the updated energy saving potential were compared to the results of the 2021 Assessment.

All energy saving measures are referred to as Energy Saving Opportunities (ESOs). ESOs are grouped into Programmes, which is setup to group up similar ESOs which can be applied to the same subsector, fuel type and end-use category. The Programme energy savings are categorised into technical and economic saving potential.

Technical saving potential. The technical energy saving potential is the level of energy savings (quantified with reference to final energy consumption) that could be achieved if the baseline technology of an energy-using equipment, product or process within the respective sectors were replaced with higher technical efficiency ESOs or additional energy saving measures, by implementing the suite of ESOs within the respective Programme at a pre-defined uptake rate. It essentially quantifies the maximum amount of energy savings which could be realised assuming all technically feasible Programmes would be implemented, without any consideration of cost and other economic factors (e.g. payback, ROI, IRR, etc.), *thus it does not fluctuate with an increase in fuel tariff*. The technical saving potential for these individual ESOs applied are then aggregated to a Programme and presented on a

Programme level to support policy makers in scoping out the relevant areas for energy saving potential.

Economic saving potential. The economic saving potential quantifies the level of energy savings (quantified with reference to final energy consumption) that could be achieved by implementing *only cost-effective* Programmes. Each Programme will be tested for cost-effectiveness using a CCE methodology. CCE represents the lifetime cost of providing an energy service using an efficient technology measure that otherwise would be provided by an inefficient baseline technology. It is the equivalent cost incurred to save 1 kWh of energy (specific to a technology and usage pattern) over the assessment period (2020 – 2050). The lower the CCE, the more economically attractive the Programme is. Programmes are deemed to be cost-effective if their respective CCE is lower than the applicable fuel (e.g., electricity, gas, coal, etc.) tariff for the applicable sector of the given Programme, i.e. it is cheaper to save 1kWh of energy in comparison to paying for the additional 1kWh of energy from the utility supplier.

ICF carried out a simplified analysis to update the economic saving potential for all Programmes within the four sectors. The energy tariff across all EU27 Member States were updated applying an inflation factor to the previous primary fuel tariff applied for the 2021 Assessment, extracted from the modelling analysis that supported the REPowerEU plan[1] as this was provided by the Commission for the following energy carriers: Natural Gas, Electricity, Coal, Refined Petroleum Product (RPP) and Biomass. ICF then carried out a manual comparison of Programme CCE against the inflated energy tariff within each of the EU27 Member States to quantify additional economic saving potential in comparison with the economic saving potential results from the 2021 Assessment.

[1] https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131

4 Results of updated economic saving potential

Table 1 summarises the EU27 technical and economic saving potential between 2020 and 2030 (in ktoe and %), for the results of the 2021 Assessment and this updated analysis, with reference to the projected Business-as-Usual (BAU) final energy consumption, derived from Eurostat and EU Reference Scenario 2016 projections. It should be noted that EU Reference Scenario 2016 was applied in the 2021 Assessment as it was the latest and best available source underpinning the assessment. Consequently, the EU Reference Scenario 2016 was again applied in this report to enable consistency and comparability with the 2021 Assessment results.

Table 1. Summary of EU27 technical and economic saving potential by 2030

Sector	BAU projected consumption by 2030	Technical saving potential by 2030		Economic saving potential by 2030		Updated economic saving potential by 2030	
	[ktoe]	[ktoe]	[%]	[ktoe]	[%]	[ktoe]	[%]
Residential	236,129	77,113	32.7%	36,673	15.5%	58,495	24.8%
Commercial	127,502	29,956	23.5%	20,375	16.0%	23,589	18.5%
Industry	275,038	66,994	24.4%	64,716	23.5%	64,716[2]	23.5%
Road Transport	248,537	26,086	10.5%	16,107	6.5%	20,475	8.2%
Total	**887,206**	**200,149**	**22.6%**	**137,871**	**15.5%**	**167,274**	**18.9%**

The economic saving potential for the residential, commercial and road transport sector has increased as expected after the applying the inflated fuel tariff for the respective energy carriers, which is the sole factor considered under this updated analysis.

4.1 EU Residential Sector

Table 2 presents the technical and economic saving potential for residential sector for the 2021 Assessment, including the updated results of the economic saving potential, broken down by residential end-use categories: space heating, hot water heating, lighting, appliances, cooking, cooling, fans and pumps. Residential sector made a significant economic saving potential gain of ~60%, increasing from 36,673ktoe to 58,495ktoe.

The economic saving potential for space heating increased by ~19% in comparison with the 2021 Assessment, from 26,698ktoe to 31,816ktoe. RPP fuelled space heating Programmes made the highest gain of ~2,798ktoe, followed by natural gas fuelled space heating Programmes making up ~2,216KTOE energy savings for space heating end-use category.

The hot water end-use category made the largest economic saving potential gain in comparison with 2021 Assessment, increasing by ~3.9x, from 5,656ktoe to 22,337ktoe. Natural gas fuelled hot water heating Programmes made the largest economic saving potential gain amounting to ~13,500ktoe. The increase in natural gas fuel tariff was substantive enough to shift some natural gas fuelled hot water heating Programmes (solar heating, improved hot water system heating and insulation) towards economic saving potential. This is followed by RPP fuelled hot water heating Programmes making up ~2,500ktoe energy savings. Electrical hot water heating Programmes made up ~445ktoe of additional economic saving potential, lesser in comparison with natural gas or RPP Programmes as most of the savings were accounted as economic saving potential under the 2021 Assessment.

[2] As most ESOs within the energy intensive sector have a very long lifespan, the Cost of Conserved Energy of energy saving Programmes is thus significantly lower. Correspondingly, many of the energy intensive sector Programmes are deemed to be cost-effective, resulting a much higher portion of technical savings being deemed as economical saving potential.

Programmes related to lighting, cooking and cooling were accounted as economic saving potential under the 2021 Assessment, hence the economic saving potential gained in this updated analysis is nil (or close to nil).

Table 2. EU27 residential sector 2030 final energy saving potential broken down by end-use categories

Residential end-use category	Technical saving potential [KTOE]	Economic saving potential [KTOE]	Updated Economic Saving Potential [KTOE]	Delta in Economic Saving Potential [KTOE]
Space heating	40,187	26,698	31,816	5,118
Hot water heating	32,564	5,656	22,337	16,681
Lighting	2,645	2,645	2,645	0
Appliances	1,557	1,504	1,535	31
Cooking	81	81	81	0
Cooling	78	75	78	3
Fans and pumps	2	0	0.4	0.4

4.2 EU Commercial Sector

Table 3 presents the technical and economic saving potential for commercial sector for the 2021 Assessment, including the updated economic saving potential results, broken down by its end-use categories: space heating, water heating, lighting, refrigeration, space cooling, cooking, IT/Multimedia and other equipment. Commercial sector generated an economic saving potential gain of ~16%, increasing from 20,375ktoe to 23,589ktoe.

The economic saving potential for space heating increased significantly by ~44% in comparison with the 2021 Assessment, from 5,501ktoe to 7,918ktoe. Natural gas fuelled Programmes made the highest additional gain of ~1,550ktoe. The increase in natural gas tariff was substantive enough to shift some space heating Programmes (better building envelope and higher efficiency heat generators) from technical to economic saving potential. RPP fuelled Programmes made up ~198ktoe of energy savings for space heating end-use category. Biomass fuelled Programmes also made a notable gain of ~670ktoe. Programmes related to lighting, refrigeration and other equipment were accounted as economic saving potential under the 2021 Assessment. As such, there were no additional economic saving potential gains from electrical Programmes related to lighting and refrigeration, and very small economic saving potential gain on other equipment.

Hot water Programmes contributed to additional economic saving potential gain of ~625ktoe in comparison with 2021 Assessment, increasing by ~13%, from 4,822ktoe to 5,447ktoe. Biomass fuelled hot water Programmes made up the highest amount of savings in this end-use category, contributing to an additional ~415ktoe economic potential saving. Natural gas fuelled Programmes contributed to additional economic saving potential of ~122ktoe. This is followed by electrical driven hot water Programmes generating an additional economic saving potential of ~79ktoe.

Programmes related to lighting, refrigeration and other equipment were accounted as economic saving potential under the 2021 Assessment, hence the economic saving potential gained in this updated analysis is nil (or close to nil).

Table 3. EU27 commercial sector 2030 final energy saving potential broken down by end-use categories

Commercial end-use category[3]	Technical saving potential [KTOE]	Economic saving potential [KTOE]	Updated Economic Saving Potential [KTOE]	Delta in Economic Saving Potential [KTOE]
Space heating	12,861	5,501	7,918	2,417
Water heating	6,575	4,822	5,447	625
Lighting	6,546	6,546	6,546	0
Refrigeration	2,104	2,104	2,104	0
Space cooling	965	861	965	104
Cooking	516	391	404	13
IT & Multimedia	321	86	137	51
Other Equipment	68	63	66	3

4.3 EU Road Transport Sector

Table 4 presents the technical and economic saving potential for road transport sector for the 2021 Assessment, including the updated economic saving potential results in this updated analysis, broken down by its end-use categories: private cars, heavy goods vehicle, light duty vehicles and public road transport. The road transport sector generated significant additional economic saving potential gain of ~27%, increasing from 16,107ktoe to 20,475ktoe. All additional economic saving potential were solely from Programmes relating to private cars category. All Programmes related to heavy goods vehicles, light duty vehicles and public road transport were already accounted as economic saving potential under the 2021 Assessment, hence the economic saving potential gained in this updated analysis is nil. The projected increase in fuel tariff for Refined Petroleum Products (diesel and gasoline) under this updated analysis were substantive enough for Programmes related to private cars to be shifted from technical to economic saving potential.

Table 4. EU27 road transport sector 2030 final energy saving potential broken down by end-use categories

Commercial end-use category	Technical saving potential [KTOE]	Economic saving potential [KTOE]	Updated Economic Saving Potential [KTOE]	Delta in Economic Saving Potential [KTOE]
Private cars	14,531	5,602	9,766	4,164
Heavy goods vehicles	6,517	6,029	6,029	0
Light Duty Vehicles	4,313	3,750	3,750	0
Public road transport	726	726	726	0

4.4 EU Industrial Sector

The economic saving potential for industrial sector from the 2021 Assessment was very close to its technical saving potential. This is mainly attributed to the long lifespan of industrial Energy Saving Opportunities (ESOs), which resulted in a lower Cost of Conserved

[3] This updated analysis retained the end-use category classification applied in the 2021 Assessment for ease of results comparison, which differs from the classification utilised in the residential sector.

Energy (CCE) across the sector. Industrial primary energy tariffs are also lower in comparison with the other sectors. As such, a high proportion of industrial related Programmes have CCEs which are lower than the respective primary fuel tariff, deeming them to be economic saving potential. As a result, the updated analysis did not account for any additional economic saving potential for the industrial sector.

5 Limitations of this updated analysis

EU Reference Scenario 2016 applied for updated analysis. At the time when the 2021 Assessment was conducted, EU Reference Scenario 2016 was applied as it was the latest and best available source underpinning the assessment. Consequently, EU Reference Scenario 2016 was retained for the updated analysis in this report to enable consistency and comparability with the 2021 Assessment results. As such, all results presented in the updated analysis in this report is with reference to EU Reference Scenario 2016.

Projection does not account for unforeseen circumstances. The 2021 Assessment along with this updated analysis does not account for unexpected events, circumstances or critical market shifts due to unpredicted events. It was aimed at assessing energy saving potential on a long-term basis under nominal conditions as set out in the EU Reference Scenario and supporting long-term policy objectives and measures for addressing energy saving potential within EU27.

Approach to economic saving potential. The economic saving potential approach applies a comparison between CCE and fuel tariff price. It provides a consistent approach in comparing the cost effectiveness. While it accounts for the cost in consideration of the measure lifespan, it does not take other nominal financial metrics which may be more widely applied (e.g. payback, ROI, IRR). As a result, the economic saving potential would appear higher in comparison with other nominal financial metrics. The cost benefit period applied for the CCE assessment is 30 years, considerably longer than typical the investment term acceptable to financial providers.

Analysis conducted without aid of modelling tool. Updates on the economic saving potential were carried out on an ad-hoc basis through high-level calculations without the aid of the modelling tool utilised in the 2021 Assessment. The energy tariff across all EU27 Member States were updated applying an inflation factor to the previous primary fuel tariff applied for the 2021 Assessment, extracted from the modelling analysis that supported the REPowerEU plan as this was provided by the Commission for the following energy carriers: Natural Gas, Electricity, Coal, Refined Petroleum Product (RPP) and Biomass. ICF then carried out a manual comparison of Programme CCE against the inflated energy tariff to account for additional economic saving potential.

Cost inflation. Programme cost inflation were not considered for this analysis, as such Programme CCE values from 2021 Assessment were retained. As such, economic saving potential within this analysis may be over projected. Fuel tariffs across all EU27 Member States were updated applying an inflation factor to the previous primary fuel tariff, extracted from the modelling analysis that supported the REPowerEU plan as this was provided by the Commission for the following energy carriers: Natural Gas, Electricity, Coal, Refined Petroleum Product (RPP) and Biomass.

GETTING IN TOUCH WITH THE EU

In person

All over the European Union there are hundreds of Europe Direct centres. You can find the address of the centre nearest you online (european-union.europa.eu/contact-eu/meet-us_en).

On the phone or in writing

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

— by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),
— at the following standard number: +32 22999696,
— via the following form: european-union.europa.eu/contact-eu/write-us_en.

FINDING INFORMATION ABOUT THE EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website (european-union.europa.eu).

EU publications

You can view or order EU publications at op.europa.eu/en/publications. Multiple copies of free publications can be obtained by contacting Europe Direct or your local documentation centre (european-union.europa.eu/contact-eu/meet-us_en).

EU law and related documents

For access to legal information from the EU, including all EU law since 1951 in all the official language versions, go to EUR-Lex (eur-lex.europa.eu).

EU open data

The portal data.europa.eu provides access to open datasets from the EU institutions, bodies and agencies. These can be downloaded and reused for free, for both commercial and non-commercial purposes. The portal also provides access to a wealth of datasets from European countries.

Publications Office
of the European Union