D6-3 • The multiple benefits of energy efficiency

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Abstract

Energy efficiency is a key dimension of the EU energy policy and has become a matter of energy security, resilience, competitiveness and social cohesion. Yet, there are still many challenges to assessing the wider benefits of energy efficiency measures and integrating them into policy design and investment decisions. This policy paper puts forward several policy recommendations to improve data collection, design tailored methodologies for financial institutions and private entities, provide national and local policy makers with technical assistance as well as with the necessary human and financial ressources, as well as to develop and make easy-to-use policy support tools, such as the Referee tool, widely available.

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Executive Summary

Improving energy efficiency is a key solution to reduce energy demand and greenhouse gas emissions. But it also has wider impacts on society, from energy security, to competitiveness, health and wellbeing, and social cohesion to name a few. The current geopolitical, social and economic context strengthens the case to better account for the non-energy impacts of energy efficiency.

Quantifying these wider benefits and integrating them in policy design however comes with several challenges regarding data access, methodologies, availability of human resources and technical expertise, and most of all, lack of awareness.

The Referee project aims to address most of these challenges by offering an easy-to-use online tool to European, national and local policymakers that will allow them to assess the real value – energy and non-energy impacts – of energy efficiency measures they have or plan to implement.

This policy paper thus highlights the importance of a better integration of multiple benefits into the general energy efficiency policy approach. It presents Referee as one of the possible solutions and provides some general policy recommendations, some of them outlined below:

- National and local policymakers should more systematically take into account the multiple benefits of energy efficiency measures when designing policies. This should be reflected in their revised NECPs.

- The EU and Member states should ensure that local governments have the adequate financial, human and technical capacity to collect the relevant data and carry out multiple benefit assessments of energy efficiency policies.

- EU/national funds could be conditioned to data collection and monitoring that would help improve future multiple benefits assessments.

- Some EU resources could be dedicated to supporting local governments conduct such assessments, eg. through the technical support instrument.

- The EU should develop dedicated methodologies to calculate these multiple benefits in order to suit different stakeholders. The EU should in particular encourage financial institutions and private entities to consider these wider benefits when making energy efficiency-related investment decisions.

- **The EU should encourage Member states, across all government levels, to use existing tools like Referee that can assess the energy and non-energy impacts of energy efficiency measures.**

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1. Introduction

The energy efficiency's large potential to help reach carbon neutrality remains largely untapped. According to the latest IEA report, almost one third of current global energy consumption and emissions could be cut by 2030 by doubling the rate of energy efficiency progress this decade.[1] This can be achieved with technologies that already exist, yet policies and commitments still need to be implemented fully and quickly.[2]

Energy efficiency usually refers to the amount of output that can be produced with a given input of energy. According to the EU definition, this output can not only be an energy output, but also an output of performance, service or goods.[3] Improving building insulation, optimising industrial processes thanks to digitalisation, installing smart heating and cooling management systems, switching to more efficient appliances, and very importantly, electrifying the whole economy, are all concrete ways to increase energy efficiency.

Energy efficiency is a key dimension of the EU energy union and of the EU Green Deal towards net zero. EU energy efficiency related policies date back from the 2000s[4], yet policy framing tends to narrowly focus on reduced demand and emissions. Improving energy efficiency has wider benefits (also called "multiple benefits") on health, well-being, available income, competitiveness, security and resilience.

This policy paper highlights the importance of a better integration of multiple benefits into the general energy efficiency policy approach. It will first set the scene of the current geopolitical, social and economic context that strengthens the case to better account for the non-energy impacts of energy efficiency. It will then provide an overview of the EU regulatory framework on energy efficiency including recent development from the Fit for 55 package. The paper will then address the challenges to assessing and integrating the wider benefits of energy efficiency into policy design and investment decisions. The last part will provide some policy recommendations building on the previous findings as well as on the Referee tool.[5]

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[1] International Energy Agency (2023). Energy Efficiency – The Decade for Action: Ministerial Briefing. *IEA 8th Annual Global Conference on Energy Efficiency*, June.

[2] Ibid.

[3] Article 2 EED. Council of the EU (2023). Proposal for a Directive of the European Parliament and of the Council on energy efficiency (recast), Analysis of the final compromise text with a view to agreement, *Interinstitutional File 2021/0203(COD)*, 24 March.

[4] With the Energy performance of buildings directive (EPBD) in 2006, followed by the Energy efficiency directive (EED) in 2012.

[5] Referee is a project funded by the European Union. It involves the development of the Referee tool which aims at quantifying the multiple benefits of energy efficiency policies at different governance levels.

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2. State of play: beyond climate action, energy efficiency is now a matter of energy security, resilience, competitiveness and social cohesion

Energy efficiency has a key role in phasing-out fossil fuels. The decline of energy demand will reduce the need for the maintenance of baseload power generation capacities, often running on fossil fuels. Electrification based on the large-scale deployment of renewables and energy efficiency improvements could allow a complete phase-out of coal and fossil gas consumption in the "hard-to-abate" chemical, iron and steel sub-sectors in the EU by 2040.[6] The deployment of high and low temperature heat pumps and industrial buildings' insulation could further cut fossil gas demand by half in 2030 in the medium (chemical industry) and low temperature segments, which represent 70% of the fossil gas-based process heat needs in the industry.[7] Significant energy efficiency improvements in the building sector (e.g. more energy efficient heating appliances, better insulation) could reduce the energy demand of the residential building stock in the EU by 19.4% in 2030 and by 43% in 2050 compared to 2018 levels.[8]

The economic recovery from covid-19, the supply deficits on the global gas market and the Russian invasion in Ukraine led to skyrocketing energy prices, making demand reduction a top policy priority. The EU's dependence on fossil fuel imports allowed Russia to use energy as a weapon, reducing gas flows to Europe by 80% over the course of 2022, hence exacerbating the energy crisis. EU wholesale gas and electricity prices rose by up to 10 times in 2022 compared to historical averages.[9] This led to sharp increases in retail prices for households and businesses, raising **concerns over the cost of living, the European business competitiveness and deindustrialization**.[10] The rise in energy prices further fueled the inflation of other goods, including food. The risk of energy poverty increasingly started to concern new publics, including the middle class.[11] Central and Eastern European households were at the biggest risk of being negatively affected.[12]

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[6] Graf, A., Gagnebin, M. & Buck, M. (2023). Breaking free from fossil gas. A new path to a climate-neutral Europe. *Agora Energiewende*, May.
[7] Ibid.
[8] Ibid.
[9] Trading Economics (2022). EU natural gas; Ember (2023). European power price tracker.
[10] European Scientific Advisory Board on Climate Change (2023). Aligning policy responses to rising energy prices with the long-term climate neutrality objective, 7 February.
[11] Henger, R. and Stockhausen, M. (2022). Gefahr der Energiearmut wächst, *Institut der deutschen Wirtschaft*, IW-Kurzbericht 55/2022, 3 July; ACER and CEER (2022). Op. Cit.
[12] ESABCC (2023), Op. cit.

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The delays in improving energy efficiency worsened the price impact of the gas shock. In France, achieving the energy renovation objectives set in 2008 for 2020 would have allowed savings equivalent to the total Russian gas imports in France.[13]

Energy efficiency is now more than ever a critical tool to bolster energy security. In the face of the Russian gas supply disruption, there is a need to accelerate the electrification of buildings and industry to enable the full decarbonisation of the European economy. Energy efficiency could save a cumulative amount of up to 365 Mt CO2eq between 2022 and 2030, and save up to 25 bcm of fossil gas by 2025, equivalent to 15% of the required offset for Russian gas supply.[14] The IEA has also recommended speeding up the building renovation rates targeted at the worst-performing buildings in order to save gas. Energy efficiency is also a major feature of REPowerEU, which aims to accelerate the phaseout of fossil fuel imports, the reduction in energy demand and the decarbonisation of the electricity generation by 2027.

Energy efficiency is a key component of business competitiveness. The EU now has the highest energy prices in the world. Retail industrial electricity prices in the EU were about twice as high as in China or the US at the end of 2022 (see Figure 1).[15] The European Commission considers that the era of cheap fossil fuels is behind us,[16] with implications on EU long-term competitiveness with an industry still largely dependent on fossil fuels.

Energy efficiency progresses in the EU but more efforts are needed. In 2020, the EU achieved its 20% energy efficiency target – a 20% reduction of energy consumption compared to baseline projections – by more than 5,5%. However, part of it was due to lockdowns linked to the covid-19 pandemic. Final energy demand was 0,9% above the 2020 target in 2021, showing a strong rebound effect from the recovery and reopening of economic and social activities.

[13] Rüdinger, A. (2022). La rénovation énergétique, levier essentiel pour se prémunir durablement contre la hausse des prix de l'énergie, IDDRI, 23 mars.
[14] European Climate Foundation (2022). Delivering EU energy security through climate action. July.
[15] European Commission (2023a). Quarterly report on European electricity markets, *DG Energy, Market Observatory for Energy* 15(3).
[16] European Commission (2023b). Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: A Green Deal Industrial Plan for the Net-Zero Age, COM(2023) 62 final. 1 February.

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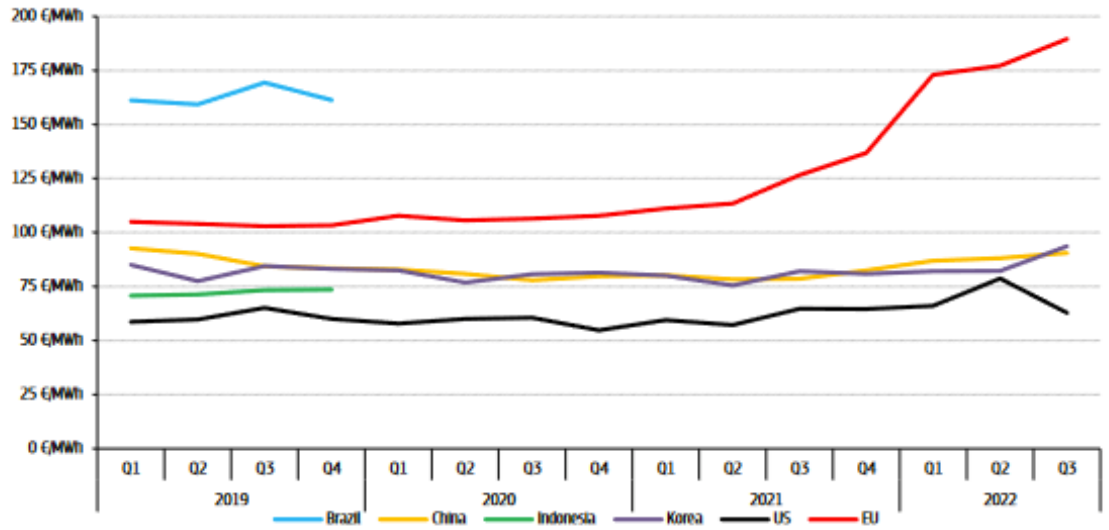
Figure 1: Retail electricity prices in the EU and its main trading partners



Source: Eurostat, IEA, CEIC, DG ENER computations. The latest data for Brazil and Indonesia is not available. Industrial prices in the EU are represented by the ID consumption band for the purposes of international comparison.

Source: European Commission (2023). Quarterly report on EU electricity markets Q3 2022.

The current geopolitical, social and economic context shows how relevant energy efficiency is, not just in terms of energy demand reduction, but to help address a wide range of issues across society, like competitiveness, security and social cohesion. This strongly strengthens the case to better account for the non-energy impacts of energy efficiency in policy making.

3. EU regulatory framework on energy efficiency and its multiple benefits

3.1. A comprehensive EU regulatory framework on energy efficiency

On top of the dedicated energy efficiency directive adopted back in 2012 – with indicative energy efficiency improvement targets – the EU has set rules on energy performance of buildings, ecodesign requirements and energy labelling, CO2 emission standards for vehicles, smart metering systems, carbon price, etc. EU funds are also helping Member states implement their energy efficiency measures. Member states took advantage of the Recovery and Resilience Facility

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as they have collectively dedicated €72.5 billion for energy efficiency improvements, most of which (€65.3 billion) for energy efficiency in buildings.[17]

With the Fit for 55 package and the REPowerEU plan, the EU further strengthened its energy efficiency policy framework, with policymakers agreeing to **collectively reduce final energy consumption by 11.7% in 2030 in the EU**.[18,19] This represents a milestone as the first EU energy efficiency target, but there are still important limitations such as the level of ambition, the lack of a binding primary energy consumption target and the absence of binding national targets. The Energy Performance of Buildings Directive is also being revised and should mandate Member States to introduce energy performance standards for existing buildings to help trigger renovations and give visibility to the sector.

3.2. Integration of the multiple benefits of energy efficiency into the EU legislation

The multiple benefits of energy efficiency are still not systematically assessed by policymakers. Most governmental policy assessment guidelines recommend considering a range of social, economic and environmental issues when evaluating the impact of energy efficiency policies.[20] However, in practice, these wider benefits are either not considered in national policy-making, or when they are, only in a qualitative way.[21]

The Regulation on Governance of the Energy Union and Climate Action from 2018 enshrined the Energy Efficiency First (EE1st) principle as a compass for energy-related decisions in the EU.[22] This principle aims at prioritising energy efficiency measures when they are more cost-efficient rather than investing in other energy sources. Importantly, cost-effectiveness should be assessed through a societal perspective considering the wider impacts of the energy saved, and thus acknowledging the role of energy efficiency to deliver socio-economic improvements.[23] Member states were encouraged to apply this principle, including in regional and local government, as well as to help spread its use in the private sector. However, the lack of proper legal basis and technical support likely

[17] European Commission (2023c). Energy efficiency in buildings, *Recovery and resilience scoreboard, Thematic analysis*, January.
[18] Compared to the projections of the 2020 Reference Scenario. The target is included in the revised EED.
[19] An agreement regarding the revision of the EED was found in March 2023 between the European Parliament and the Council. At the time of writing, the agreement is now pending formal adoption on both sides.
[20] International Energy Agency (2014). Capturing the multiple benefits of energy efficiency.
[21] Ibid.
[22] The Coalition for Energy Savings. Energy Efficiency First principle, Guiding energy policy and investment decisions.
[23] International Energy Agency (2014). Op. cit.

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hindered the full implementation of this principle.[24] In addition, the revision of the Energy efficiency directive (EED) in 2018 meant to contribute to the implementation of EE1st principle but the framework had similar limitations.

The revised EED as part of the Fit for 55 package attempts to bridge this gap and provide a stronger and wider legal basis for the application of the EE1st principle. The new directive mandates that Member states include the assessment of energy efficiency measures and their wider cross-sectoral and long-term impacts in their policy planning and in major investment decisions.[25] The methodologies used by Member states should quantify societal, health, economic and climate benefits (including circular economy and sustainability principles) and address the impact on energy poverty. The directive also asks Member states to designate an entity responsible for monitoring the application of the principle (including by identifying national measures contrary to EE1st) and to report to the EU in this sense. Finally, the Commission will adopt guidelines to help Member states monitor and report on these wider benefits,[26] completing the 2021 Commission recommendation on putting the energy efficiency first principle into practice.[27]

The Energy performance of buildings directive (EPBD) can be seen as a first small attempt to mainstream the EE1st principle beyond the EED. First, it is important to note that the EPBD will help reduce energy consumption in the building sector in several ways. It should include minimum energy performance standards that increase renovation rates, a ban on financial incentives for fossil-fuel boilers – thus supporting the roll out of heat pumps[28] and other renewable-based technologies –, requirements for the installation of smart temperature management devices and of charging infrastructure for electric vehicles.

The proposed directive includes a multiple benefits approach with the introduction of building renovation passports, which are a roadmap to plan energy performance enhancing renovation. According to the EU rules, these passports will need to outline the benefits of the renovation project regarding

[24] Recital 64, Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action (2018). *Official Journal of the European Union*. 21 December.

[25] More than 100 million euro each or 175 million euro for transport infrastructure projects, related to buildings, transport, water, information and communications technology (ICT), agriculture and financial sectors. Source: Council of the EU (2023), Op. cit.

[26] Council of the EU (2023), Op. cit.

[27] European Commission (2021a). Commission Recommendation (EU) 2021/1749 of 28 September 2021 on Energy Efficiency First: from principles to practice — Guidelines and examples for its implementation in decision-making in the energy sector and beyond, *Official Journal of the European Union*. 4 October.

[28] REPowerEU proposed indicative targets regarding heat pumps, which could amount to the installation of 20 million heat pumps in the EU by 2026 and nearly 60 million by 2030. Source: European heat pump association (2023). REPowerEU: heat pump strategy required to help sector deliver. 12 June; The EU could publish a dedicated heat pump strategy by the end of 2023 with additional measures to boost the technology.

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energy savings but also wider non-energy benefits in terms of health, comfort and adaptation to climate change.[29]

4. Rationale and challenges to systematically assess the multiple benefits of energy efficiency measures

4.1. A strong rationale to operationalise this multiple benefit approach

A better assessment of the full range of outcomes of energy efficiency would allow Member states to design policies that maximise specific impacts in line with their own priorities.[30] The multiple benefit approach can also help highlight the "strategic trade-offs among options and across a range of priorities".[31]

Multiple benefit assessments can also shape investment strategies and should thus be integrated in investment and credit decisions, financing procedures, business models, risk management and external reporting.[32] This is crucial as the scale of investment needed to reach our energy efficiency objectives requires significantly scaling up private investment in energy efficiency.[33] There is, however, still a general lack of understanding among stakeholders working in financial institutions about how taking into account multiple benefits can stimulate the uptake of energy efficiency measures and improve their business.[34] For these institutions, it is important to accurately value the positive impact on project performance and risk profile, and to monetise the multiple benefits.[35] Having a reliable way to do so could lead to deploying more capital into energy efficiency and driving energy efficiency markets.[36] The multiple benefit approach could also represent an opportunity to develop public-private partnerships for

[29] "By 31 December 2023, the Commission shall adopt delegated acts [...] by establishing a common European framework for renovation passports." Source: European Commission (2021b). Proposal for a Directive of the European Parliament and of the Council on the energy performance of buildings, *COM(2021) 802 final*, 15 December.

[30] IEA (2014), Op. cit.

[31] United States Environmental Protection Agency (2018). Quantifying the Multiple Benefits of Energy Efficiency and Renewable Energy: A Guide for State and Local Governments.

[32] Energy Efficiency Financial Institutions Group (2021). Multiple Benefits of Energy Efficiency Investments for Financial Institutions, *Final Report*, October.

[33] Canevari, C. (2023). Strengthening energy efficiency for the clean energy transition and energy independence. [Conference presentation]. *European Union Sustainable Energy Week*, Brussels, Belgium, 21 June.

[34] EEFIG (2021), Op. cit.

[35] Ibid.

[36] Ibid.

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unlocking energy efficiency funding streams. Lastly, it could also contribute to financial institutions' own sustainable investment strategies, often defined along the UN's sustainable development goals,[37] that will ultimately help yield reputation gains.

Multiple benefits assessment of energy efficiency can also help shape the general public debate on the energy transition.[38] It can improve the ability to communicate the value that energy efficiency can deliver for the economy and society.[39] Thus, countries, regions and cities can develop a narrative based on the expected positive impacts the energy efficiency measures will have on their level (eg. energy security, job creation, health, poverty reduction, industrial competitiveness, innovation) and ensure transparency and visibility of the expected gains and losses.[40] This can in turn help increase societal acceptance and create a political climate, conducive to more ambitious policies, less backtracking and which contributes to driving the EU's transition towards climate neutrality.[41]

In addition, a multiple benefit assessment of energy efficiency policies can help better understand the rebound effect. Improved energy efficiency can sometimes lead to more demand for energy, especially in dwellings with cost-driven suppressed energy use, rather than to reduce consumption, a phenomenon known as the rebound effect. An analytical approach of the broader outcomes of energy efficiency can thus provide "a clearer appreciation of where this effect either reduces or amplifies the benefits of an energy efficiency intervention".[42]

4.2. Challenges for integrating a multiple benefits approach of energy efficiency into policy design and investment decisions

In practice, there are several barriers to assess these multiple benefits: methods, skills, resources and awareness. First, the methods to quantify and monetise these benefits are either lacking or need to be further developed.[43] Second, such assessments require greater financial and human resources compared to more traditional policy evaluation methods.[44] This issue is all the more problematic for subnational levels of government (regions or cities) that

[37] Ibid.
[38] Energy Efficiency Watch (2022). The missing 'why' - how narratives can improve energy efficiency and security in Europe, June; EEW (2022). Key Policy Recommendations: New Narratives to promote better energy policies and energy security.
[39] IEA (2014), Op. cit.
[40] Energy Efficiency Watch (2022), Op. cit.
[41] Ibid.
[42] IEA (2014), Op. cit.
[43] Ibid.
[44] Ibid.

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already see administrative, technical and budgetary capacity constraints as the main obstacle to enhance energy efficiency in the first place.[45] According to the European Investment Bank, 69% of municipalities across Europe say that a lack of environmental and climate assessment skills is a barrier to green investments.[46] Third, there is a need for greater awareness about the existence of non-energy impacts of energy efficiency measures among policymakers and financial institutions.

Developing robust and comprehensive analytical approaches to assess the real impact of energy efficiency policies is a complex endeavour that comes with challenges and limitations. Some benefits can for instance be indirect, or the product of a chain of effects, making them more difficult to calculate.[47] In addition, impacts can occur at the same time at different levels of the economy (individual, households, sectoral, subsectoral, national, international, etc.), making quantification all the more difficult.[48] There is also a clear overlap between some of the multiple benefits, for instance between air pollution and health/wellbeing,[49] which requires establishing mechanisms to avoid double counting. More generally, due to lack of data (see below) and modelling constraints, the list of multiple benefits calculated cannot be extensive and thus relies on choices by the policy analyst. Uncertain external events (such as the war in Ukraine) can have an impact on energy prices and thus disrupt models' fossil fuel price assumptions that are key to estimating the cost and emission savings related to the implementation of energy efficiency measures..[50] Finally, **data availability is a major issue to assess the broader benefits of energy efficiency and integrate them into decision making procedures.** At the same time, some data may already be available but dispersed across different public entities.[51]

[45] OCDE (2022). Decarbonising Buildings in Cities and Regions, *OECD Urban Studies*, 28 March.
[46] European Investment Bank (2023). Resilience and renewal in Europe, *Investment Report 2022/2023*, 28 February.
[47] IEA (2014), Op. cit.
[48] Ibid.
[49] Shnapp, S., Paci, D. & Bertoldi, P. (2020). Untapping multiple benefits: hidden values in environmental and building policies, *Joint Research Centre technical report*.
[50] Mandel, T. et al. (2023). Investigating pathways to a net-zero emissions building sector in the European Union: what role for the energy efficiency first principle? *Energy Efficiency*, 16(22), 17 March.
[51] Shnapp, S. et al. (2020), Op. cit.

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5. Policy recommendations and how REFEREE can contribute

The revised EED contains provisions to better include multiple benefits in energy planning in the EU, but several challenges still exist to adopt this approach in policy design and investment decisions.

Ideally, instead of a one-size-fits-all model, there is a need to introduce several assessment methodologies to calculate these co-benefits in order to suit different stakeholders (local/regional public authorities, national public authorities, financial institutions, the private sector etc.).

The EU should encourage financial institutions and private entities to incorporate the assessment of multiple benefits when making investment decisions related to energy efficiency. To do so, the EU should for instance make sure these entities can use a dedicated methodology. Some standards could be developed to report about multiple benefits from a financial industry perspective as there are for instance some overlaps with the environmental, social and governance (ESG) criteria used by financial institutions to screen their investments.[52] In addition, more tailored models could calculate the micro impacts of energy efficiency measures at company level – for instance improved product quality, reduced production time, reduced losses, lower risks. On top of macro impacts, these results would be crucial for companies and financing bodies alike and could be more efficient in influencing investment decisions.[53] Lastly, the EU should raise awareness on how applying this method can also help financial institutions and private companies comply with the EU Taxonomy for sustainable finance.[54]

National and local policymakers should more systematically take into account the multiple benefits of energy efficiency measures when designing policies. They should use this approach when revising their National Energy and Climate Plans (since they need to submit the final version by June 2024).

To do so, Member states need to put in place procedures to improve data collection.[55] This includes closely monitoring and evaluating the policy impacts of energy efficiency projects such as renovation programmes in order to make them more widely available[56], and overall, to improve future modelling and decision-making. However, Member states should first and foremost ensure that the

[52] EEFIG (2021), Op. cit.
[53] Ibid.
[54] European Commission (2021a), Op. cit.
[55] Shnapp, S. et al. (2020), Op. cit.
[56] EEFIG (2021), Op. cit.

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subnational government levels – where most of the data collection happens – have the **adequate financial and human capacity** to collect such data, or find an appropriate balance when defining the scope of data collection to limit administrative burdens.[57] One possible solution could be to include wider data collection or the achievement of wider objectives (requiring equivalent data collection) as a condition when receiving EU and national support programmes.[58]

Additionally, Member states should invest resources to centralise all of the relevant existing data or data points to calculate these impacts. This also means enhancing the coordination between public authorities (eg. working on buildings, health, energy and climate, financing, etc.) at national and regional levels.[59]

Nevertheless, because conducting multiple benefit impact assessments is more complex than traditional policy planning, national and local authorities will need to be supported. The EU could thus provide **technical assistance to both national and local policymakers**, for instance through the Technical support instrument[60]. In addition, Member states should make sure that regional and local authorities, which are often already overstretched, have the adequate human and financial resources, as well as the technical expertise to, not only collect the necessary data, but also to conduct such wide range multiple benefits analysis and monitoring.

Developing easy-to-use tools based on robust data and science is also a great opportunity to ensure that everyone can conduct multiple benefits assessments with minimal time and effort. On the EU level, the Horizon2020 programme has financed several projects focusing on the multiple benefits of energy efficiency. In addition to REFEREE, the other projects are: COMBI1, Odyssee-Mure2 and M-Benefits.[61]

The main outcome of the REFEREE project is its **Policy assessment tool,** which presents several particularities. It is built on state-of-the-art stock, technoeconomic and macro-econometric models[62] that allow for a comprehensive and unified modelling of the dynamics of energy efficiency policy impact propagation (see Figure 2), which, in turn, simulates energy efficiency policy packages, either at national or local level, and evaluates the energy and non-energy impacts of these policies.

[57] Ibid.
[58] Ibid.
[59] Ibid.
[60] European Commission (2023). Technical support instrument.
[61] Shnapp, S. et al. (2020), Op. cit.
[62] For more information, see: REFEREE (refereetool.eu)

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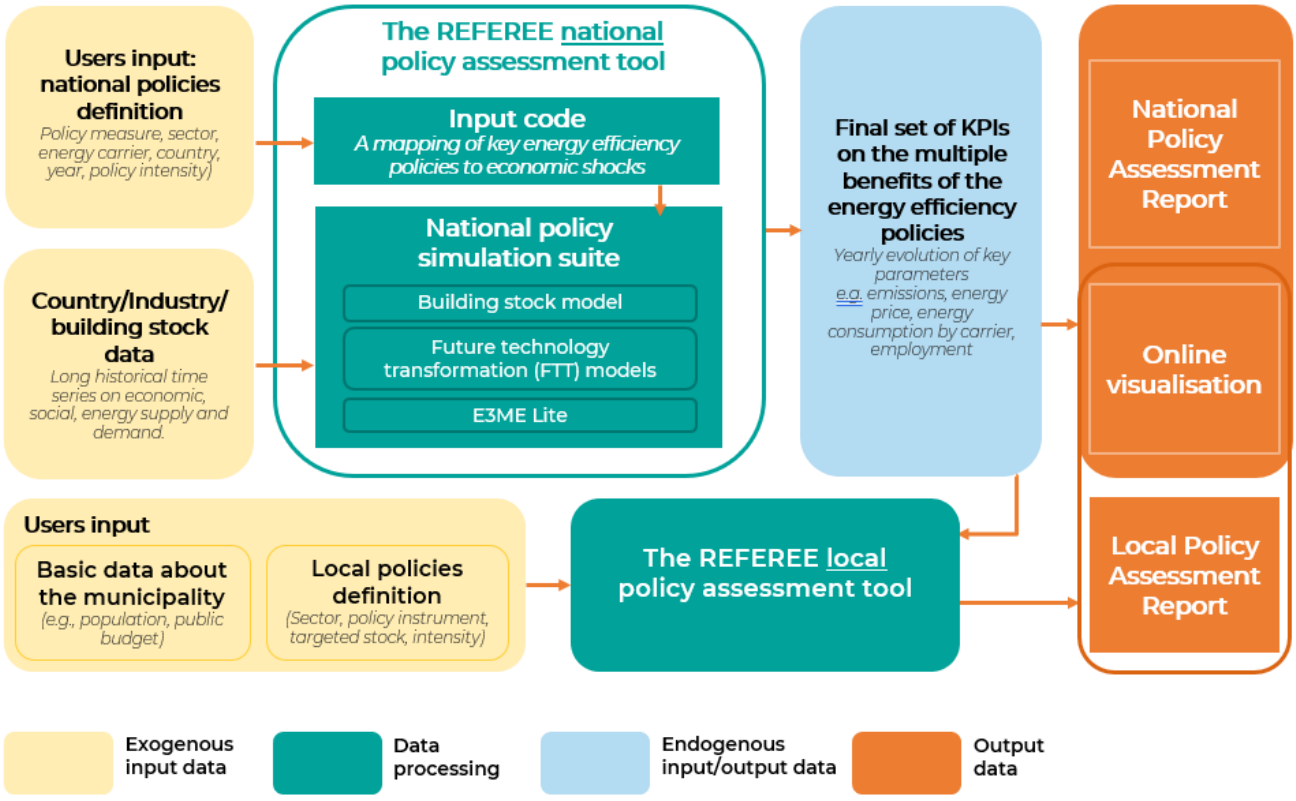
Figure 2: Input/output data flow of the Referee tool



The Referee tool can account for future policy developments at EU level as well as future shock disruptions that affect fossil fuel prices. Users are able to compare the impacts of energy efficiency measures at EU and national levels against four different scenarios with different fossil fuel prices (see Figure 3). This allows the results of the Referee tool to stay relevant overtime. The EU Reference scenario is a baseline scenario – based on the policy framework in place in 2020 – that is used to assess policy scenarios to inform policy initiatives, like the European Green Deal.[63] The Referee tool uses this baseline scenario as well as other scenarios complemented by some policies from the Fit for 55 package, the EPBD and REPowerEU,[64] and the cost of the EU Emissions Trading System for buildings and road transport.

[63] European Commission. EU Reference Scenario 2020. Accessed in July 2023.
[64] Only the policies which can be modelled by the tool. For more details, please refer to the Referee documentation.

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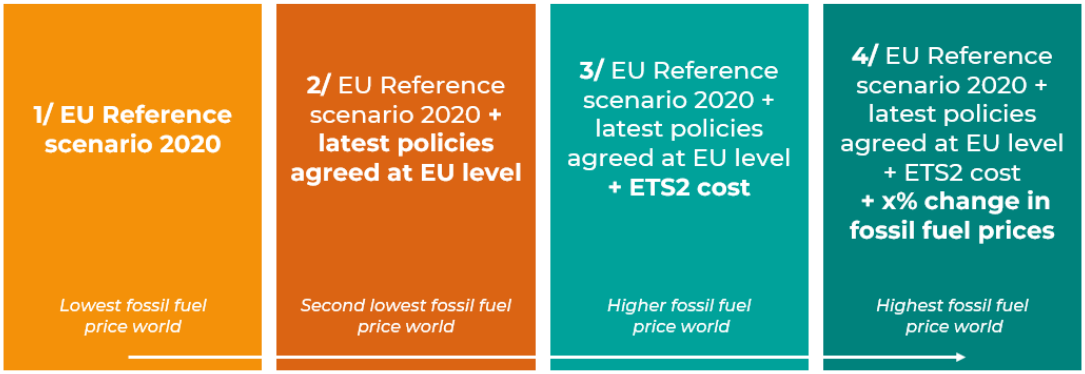
Figure 3: Reference scenarios of the Referee tool



The Referee tool can process different types of policy instruments, such as taxes or subsidies on fuels or vehicles, technology or fuel phase out, mandatory change in the energy mix, increases in the renovation rate, energy efficiency improvements in buildings, the introduction of smart heating/cooling management systems*, renewal of households' appliances* or of buildings' lighting*, the transfer or road users to public transports*, and can also take into account user behaviour* (*only for the local simulation).

Importantly, **the Referee tool quantifies the multiple benefits of energy efficiency, not just in terms of energy savings and other energy impacts, but also in terms of industrial productivity, socio economic development, wellbeing, environment and climate, cost-savings and public finances*, and governance*** (*only for the local simulation). The complete indicators for both the local and national policy simulations can be found below (Annex 1 and Annex 2).

The Referee tool takes into account the different realities at national and local levels by proposing two different simulation approaches:

- The **national tool** calculates energy and non-energy impacts of energy efficiency measures at EU and national level based on a predefined set of reference scenarios to be selected by the users.
- The **local tool** calculates energy and non-energy impacts of energy efficiency measures at municipal level based on users' input data about the municipality: climatic area, income, population, public budget, energy consumption.[65]

[65] The tool provides proxies based on Covenant of Mayors benchmark and Eurostat data.

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6. Conclusion

Accelerating energy efficiency is urgent for Europe' security, competitiveness and social cohesion. However, the wider non-energy benefits that energy efficiency brings to society are difficult to assess. Therefore they are not fully taken into account by policymakers and financial institutions alike when making important political or investment decisions. The EU is strengthening its regulatory framework on energy efficiency and has taken important steps to integrate this multiple benefits approach in its legislation in particular through the Energy efficiency first principle. Yet, a more systematic and mainstream application of this approach is needed in EU policies, and even more importantly in national and local policymaking, since more and more energy action, in particular regarding renovation and sustainable mobility, will continue to be taken at regional and local levels. Policymakers will thus need to be granted additional support and instruments to assess the real value of energy efficiency measures so that they can make more informed policy decisions. The Referee tool is a great example of such policy support tools, especially since it is tailored for both national and local policymakers. Overall however, more research will be needed in the future to finetune these tools and improve multiple benefits calculation methodologies. It will also be essential to raise awareness among public and private stakeholders about these wider benefits and how to assess them in different contexts.

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Annexes

Annex 1: Referee tool - Outputs at national level

Impact areas	Indicators
Industrial productivity	Gross Value Added (GVA)
	Energy intensity
	Energy cost impact
	International competitiveness
	Labour productivity
Socioeconomic development	Gross Domestic Product (GDP)
	Employment
	Demand for skills by type of occupation
	Demand for skills by skill level
	Public budget as a share of GDP
	Share of energy consumption by quintile
	Share of total space heat demand
Air quality & wellbeing	Air pollution damage costs
Environment & Climate	Air pollution and emissions
	Fossil fuel consumption
	Fuel imports as a share of gross output
	Water used in electricity generation
	Material consumption

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Annex 2: Referee tool - Outputs at local level

Impact areas	Indicators
Expected energy consumption and energy savings	Energy consumption and energy savings (total & by sector) •Housing: heating, cooling, water heating, appliances •Tertiary: heating, cooling, water heating, appliances •Mobility: public transport, road transport
Cost savings and public finances (pre-tax)	Costs and cost savings (total & by sector) •Housing: heating, cooling, water heating, appliances •Tertiary: heating, cooling, water heating, appliances •Mobility: public transport, road transport
	Magnitude of savings contrasted to locality aggregated income (Proxy to municipal GDP)
Climate Change	CO2 emission savings (total & by sector) •Housing: heating, cooling, water heating, appliances •Tertiary: heating, cooling, water heating, appliances •Mobility: public transport, road transport
	Contrast with existing policy targets for greenhouse gas emission reduction
Socioeconomic impacts	Increase of available income per capita
	Increase of available local aggregated income
	Municipal public budget impacts
Governance (transformation capacity of public policies)	Impact of public policies derived from citizen behaviour
	Impact of public policies derived from cleaner technology (cleaner energy mix)
	Exogenous gains not deriving from local policies (derived from cleaner electricity mix)

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