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Right here! Right now! New roles for energy efficiency in an electrified energy system

Marion Santini, Louise Sunderland, Samuel Thomas

The role of energy efficiency policy in an electrified European Union – an overview

EU's ambition:

Double the share of electricity in energy consumption by 2040

A modern power system requires:

- Electrifying more end uses with efficient electric equipment
- Making investments in renewable energy and grids
- Enabling end users to produce, consume and store electricity flexibly

Energy efficiency policy:

- Mitigates the growth of electricity demand
- Enables benefits from demand-side flexibility
- Contributes to affordability and inclusion

New!

The timing and location of energy savings is important

What's next?

- Recognise and assess the specific value of energy efficiency in the electrification process
- Explore the role for targeted energy efficiency programmes that focus on specific challenges
- Build synergies between policies promoting distributed energy resources

Introduction

Electrification is a vital tool for meeting EU climate targets and environmental and energy security objectives. As the EU is already making more progress on decarbonising electricity than other energy vectors, increasing its share in the overall energy mix has significant climate benefits.

Electrification typically contributes to meeting policy goals in two key ways: It replaces the use of environmentally harmful fuels with cleaner electricity and it reduces overall energy consumption.[1] For example, electrically powered appliances like heat pumps not only replace traditional technologies like gas boilers, but they also need less energy to provide the same service. Because of this second feature, many EU countries use energy efficiency policies to support the deployment of electric equipment among households. But are existing policies doing enough to realise the synergies between energy efficiency and electrification goals?

This paper aims to identify the contribution of energy efficiency policy in the electrification process and how decision-makers can maximise their policies' impact.

The first section describes the impacts of electrification on the power system. The second section highlights why energy efficiency policy is crucial to enable electrification and describes the increasing importance of where and when electricity savings materialise. The third section provides recommendations on the further role of energy efficiency policy.[2]

While our starting point is the EU context, we acknowledge that many of the arguments in this paper could apply to other jurisdictions.

Electrification in the EU

Electrification is a relatively new focus of EU policies but is at the core of the EU decarbonisation strategy.[3] According to the European Commission, the share of electricity in the EU's final energy consumption must double by 2040 to put the EU on track to meet its climate goals.[4] This will involve massive changes to energy system.

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[1] Rosenow, J. & Eyre, N. (2022). Reinventing energy efficiency for net zero. *Energy Research & Social Science.* Volume 90, 2022, 102602. ISSN 2214-6296. https://doi.org/10.1016/j.erss.2022.102602

[2] The authors would like to acknowledge and express their appreciation to the following people who provided helpful insights into early drafts: Antonin Chapelot and Arianna Vitali Roscini (Coalition for Energy Savings), Femke de Jong (European Climate Foundation), Quentin de Hults (International Copper Association), Susanne Dyrbøl (Rockwool), Alex Howard (UK Power Networks), Jaume Loffredo (formerly from SmartEn), Emma Mooney and Federico Callioni (International Energy Agency), Elisabeth Staudt (Deutsche Umwelthilfe), Richard Cowart, Jaap Burger, Duncan Gibb, Jan Rosenow, and Zsuzsanna Pató (Regulatory Assistance Project). Bram Claeys and RAP's EU power team provided advice over the course of the project. Review does not signal endorsement. Lowercase Editorial Services and Deborah Bynum provided graphic support and editorial assistance. Cover picture by Filip Baotić on Unsplash.

[3] In its 2015 Energy Union Strategy, the European Commission only used the term "electrification" twice, related to transport, while it cited it 13 times in its 2024 climate communication, mentioning the "electrification of the economy." European Commission. (2015). *A framework strategy for a resilient energy union with a forward-looking climate change policy.* https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0080; European Commission. (2024a). *Securing our future: Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society.* https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2024%3A63%3AFIN

[4] European Commission, 2024a, p.13.

Replacement of equipment using fossil fuels

Electrification requires end users to invest in new equipment, replacing combustion technologies with equipment powered by electricity.

Most of this equipment is already on the market today. More than one in five cars sold in Europe in 2023 were electric,[5] and electric cars already represent a significant share of all kilometres travelled in frontrunner countries like Norway.[6] The heat pump market expanded in Europe in the early 2020s, driven by the energy crisis and related policy developments.[7] Even when installations slowed in 2023, heat pumps continued to gain market share over fossil fuel boilers.[8]

Electrification is also a key lever of decarbonisation in many industrial sectors. While electrification solutions for some industrial processes and equipment are already mature, solutions for others are under development or have not yet reached commercial maturity. Industrial heat pumps, for example, are currently a viable option in processes that require temperatures up to 160–200°C,[9] and other electric processes offer solutions for a wider range of industrial operations.[10]

The Commission expects electrification to continue in all major end-use sectors, as shown in Figure 1.[11]

[5] International Energy Agency. (2024). *Global EV Outlook 2024.* https://www.iea.org/reports/global-ev-outlook-2024/trends-in-electric-cars

[6] Andrew, R. (n.d.). *Norway EV sales and related data*. https://robbieandrew.github.io/EV/img/kjørelengder.svg

[7] Rosenow, J. & Gibb, D. (2023). *Guest post: How the energy crisis is boosting heat pumps in Europe.* Carbon Brief. https://www.carbonbrief.org/guest-post-how-the-energy-crisis-is-boosting-heat-pumps-in-europe/

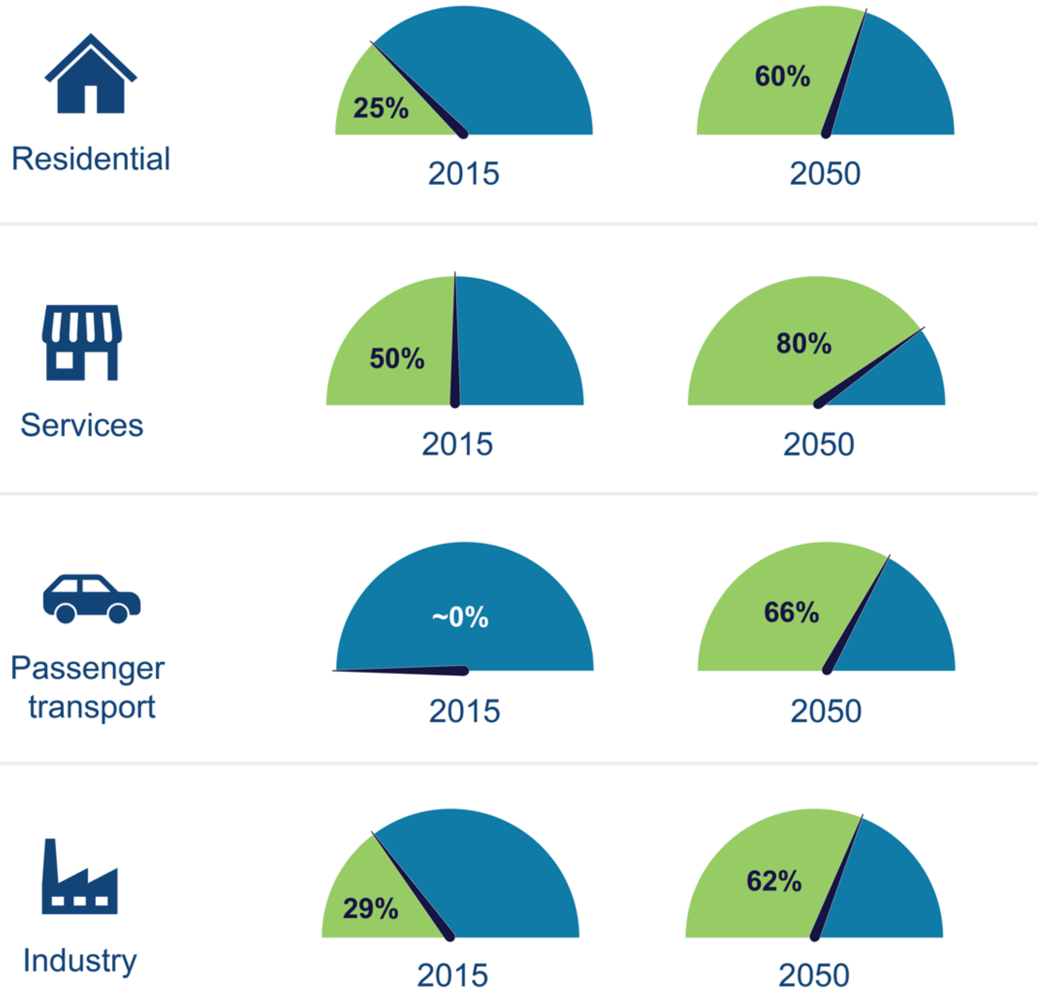
[8] Gibb, D. & Rosenow, J. (2024). *Guest post: Heat pumps gained European market share in 2023 despite falling sales.* Carbon Brief. https://www.carbonbrief.org/guest-post-heat-pumps-gained-european-market-share-in-2023-despite-falling-sales

[9] Arpagaus, C. (2023). *High-temperature heat pumps for industrial applications – new developments and products for supply temperatures above 100 °C.* Eastern Switzerland University of Applied Sciences. https://022fdef7-26ea-4db0-a396-ec438d3c7851.filesusr.com/ugd/c1ceb4_4c566f4ba92f4db4a7ee45a2ec951ff3.pdf

[10] Rosenow, J., Oxenaar, S., & Pusceddu, E. (2024). [Forthcoming]. *Some like it hot: moving industrial electrification from potential to practice.* Regulatory Assistance Project and Elian Pusceddu.

[11] Data from European Commission. (2024b). *Supplementary information: Data for the graphs presented in the impact assessment.* https://climate.ec.europa.eu/eu-action/climate-strategies-targets/2040-climate-target_en - documents. Figures 42 (residential), 43 (services), 68 (passenger cars) and 50 (industry). Note: In the residential sector, by 2050, 60% of end-use energy services are expected to be electrified, with the remaining 40% expected to use biomass, district heating and to a smaller extent other fuels. It should be noted that ambient heat captured for use by heat pumps is not captured in these statistics.

Figure 1. Electricity's growing share in selected end-use energy services, EU



Note: 2050 data is from Scenario 3 in line with the recommended 2040 climate target. Ambient heat is not captured in these statistics.

Data source: European Commission. (2024b). *Supplementary information: Data for the graphs presented in the impact assessment*

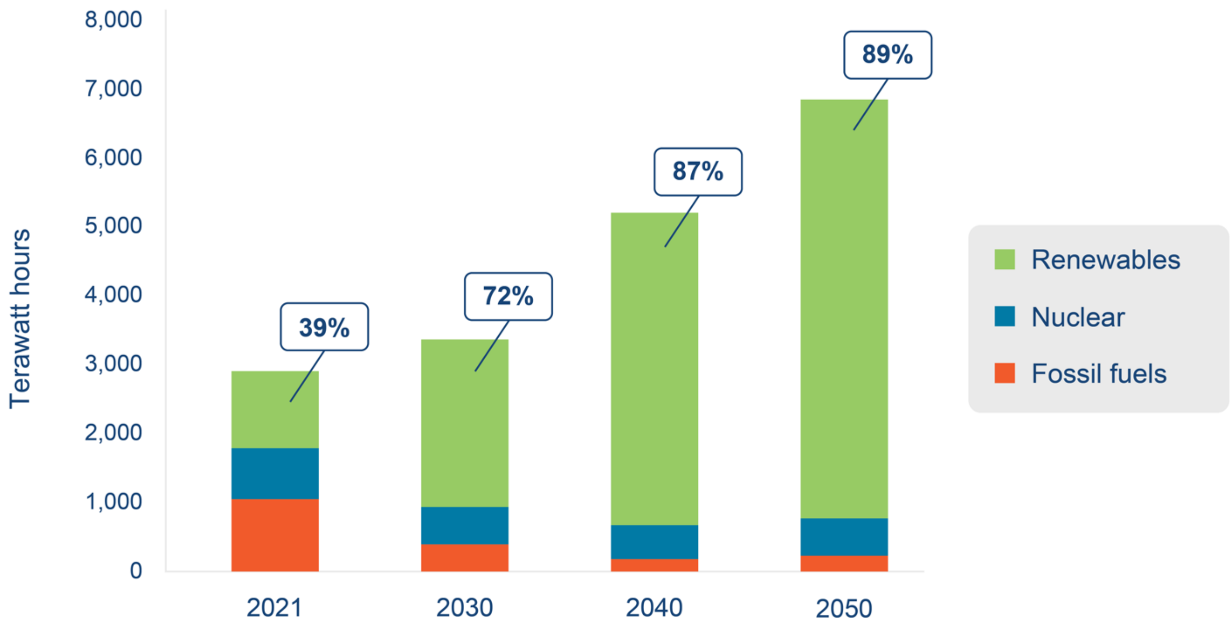
New clean power generation and grid upgrades

Even with strong energy efficiency policies, the Commission estimates that electricity generation will more than double by 2050.[12] The share of renewables in the electricity mix would also increase continuously, from 39% in 2021 to 87% in 2040 and to almost 90% in 2050, as Figure 2 shows.[13]

[12] Data from European Commission, 2024b. Figure 19.

[13] Data from European Commission, 2024b. Figure 19.

Figure 2. Electricity generation by energy carrier, EU



Note: 2040 and 2050 data are from Scenario 3 in line with the recommended 2040 climate target.

Data source: European Commission. (2024b). *Supplementary information: Data for the graphs presented in the impact assessment*

This increase requires investments in renewable electricity generation as well as the expansion and modernisation of grids. Grid congestion is already an issue in some Member States, preventing new users or new equipment from connecting, which slows down the electrification process.[14] Grid modernisation investments are also needed to accommodate two-way flows of electricity, as consumers inject increasing volumes of electricity into the distribution network from solar panels and batteries.

The Commission evaluated that electricity network development requires investment of half a trillion euro by 2030.[15] These investment costs will be borne at least partly by electricity consumers through grid tariffs. Electricity prices are highly likely to be impacted by these investment costs, yet at the same time the EU is under pressure to bring energy costs down to increase industry competitiveness and address the issue of high energy bills for people.[16]

[14] Pató, Z. (2024). *RIP first come, first served. Shifting gear to tackle power grid scarcity.* Regulatory Assistance Project. https://www.raponline.org/knowledge-center/rip-first-come-first-served

[15] European Commission. (2022). *Implementing the REPowerEU action plan: Investment needs, hydrogen accelerator and achieving the bio-methane targets.* https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD%3A2022%3A230%3AFIN

[16] European Commission. (2024, September). *Mission letter. Dan Jørgensen. Commissioner-designate for Energy and Housing.* https://commission.europa.eu/document/1c203799-0137-482e-bd18-4f6813535986_en

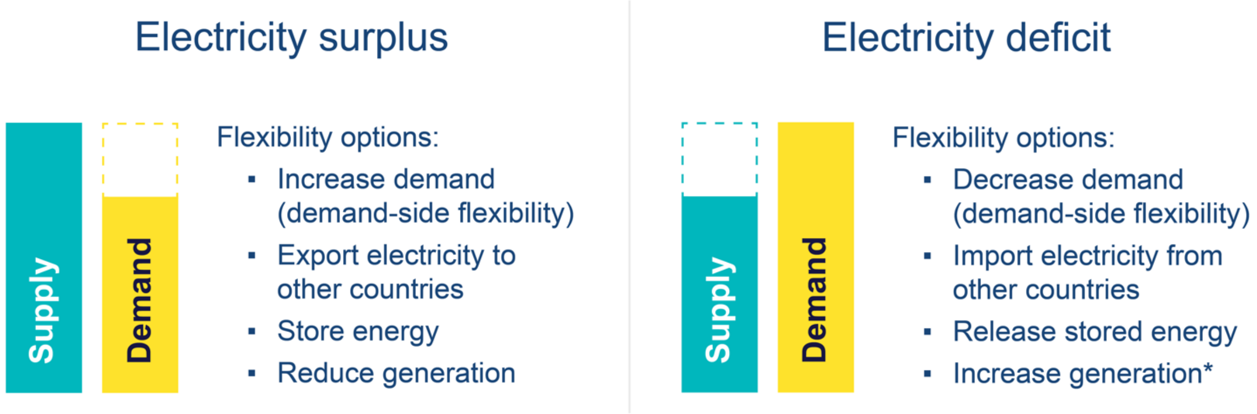
Flexible production, storage and use of electricity

An electricity system dominated by variable renewable energy means that at certain times renewable energy would be abundant, possibly exceeding demand, while at others the electricity supply provided by renewable energy would not meet demand.

Electricity demand varies across seasons, depending on heating and cooling needs, throughout the week, and within a single day, as people use different appliances in their routines. Power system operators both at distribution and transmission levels must manage grid congestion, and transmission system operators must make sure that supply matches demand for electricity every second of a day. Both these tasks are becoming more complex with growing electricity uses and renewable production.

Different strategies, or flexibility options, to ensure a match between supply and demand are illustrated in Figure 3.[17] The traditional and still widely used option is to start back-up power generation when electricity demand increases or supply decreases, but this method is expensive and often relies on polluting fossil fuel plants that can ramp up their production quickly.[18] Alternatively, interconnectors enable surplus electricity to flow between neighbouring countries; and storage solutions, such as pumped hydropower or batteries, provide further flexibility. Another option is to incentivise energy users to consume or produce electricity at different periods of the day. This is called "demand-side flexibility."

Figure 3. Illustration of flexibility options to balance electricity supply and demand



* Generation increases by starting backup power generation

Source: Own illustration, inspired by European Environment Agency and EU Agency for the Cooperation of Energy Regulators. (2023). *Flexibility solutions to support a decarbonised and secure EU electricity system*

With demand-side flexibility, electricity users are playing an increasing role in balancing the supply and demand of electricity by changing consumption, storage and production patterns

[17] Inspired by European Environment Agency and EU Agency for the Cooperation of Energy Regulators. (2023). *Flexibility solutions to support a decarbonised and secure EU electricity system.* https://www.eea.europa.eu/publications/flexibility-solutions-to-support

[18] Today the electricity system meets flexibility needs mainly through fossil-based dispatchable electricity generation. European Environment Agency & EU Agency for the Cooperation of Energy Regulators, 2023.

to respond to system conditions.[19] For example, people can charge an electric vehicle or reschedule other non-time-critical loads like water heating to different times of the day.[20] Energy can be stored in home batteries and electric vehicles batteries for later use or for reinjection into the grid at a later time.[21] Energy can also be stored in the form of heat held by the building fabric or in water for later use in the building.

Demand-side flexibility can bring benefits to end users if technologies, controls and automation can maintain energy service levels and comfort and if the process is easy and stress-free.[22] Demand-side flexibility even benefits end users who cannot shift their energy consumption patterns, as lower overall system costs will positively impact all energy users.

The contribution of energy efficiency to an electrified system

A sustained focus on energy-efficient solutions is important to meet EU climate targets, as outlined by the Commission in its energy modelling.[23] Energy efficiency is also crucial to make electrification more affordable and inclusive. However, it is becoming increasingly important to consider the time and location of energy savings in order to maximise the benefits of electrification.

Energy efficiency enables electrification

Energy efficiency, and policy that supports it, is vital to the process of moving towards electrification. As discussed above, efficient electrically powered equipment like heat pumps need less energy to provide the same service as traditional technologies like boilers. Adoption of these technologies can be promoted by energy efficiency policies. In addition, there are three main arguments for reinforcing energy efficiency policy in the context of electrification: First, energy efficiency policy stems the rise in overall demand for electricity. Second, energy efficiency policy supports demand-side flexibility. Both of these strategies make best use of generation and infrastructure, reduce the need for costly supply-side investment and can alleviate constraints on the speed of transition. And third, energy efficiency policy can also bring targeted benefits of affordable electrification to low-income and vulnerable consumers, making electrification more inclusive.

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[19] Yule-Bennett, S., & Sunderland, L. (2022). *The joy of flex: Embracing household demand-side flexibility as a power system resource for Europe.* Regulatory Assistance Project. https://www.raponline.org/knowledge-center/joy-flex-embracing-household-demand-side-flexibility-power-system-resource-europe

[20] Burger, J. (2024). *Imagine all the people: Strong growth in tariffs and services for demand-side flexibility in Europe.* Regulatory Assistance Project. https://www.raponline.org/toolkit/strong-growth-in-tariffs-and-services-for-demand-side-flexibility-in-europe

[21] Burger, J. (2023). *Enabling two-way communication: Principles for bidirectional charging of electric vehicles.* Regulatory Assistance Project. https://www.raponline.org/knowledge-center/enabling-two-way-communication-principles-for-bidirectional-charging-of-electric-vehicles/

[22] Yule-Bennett, S., & Sunderland, L. (2024). *Flex-ability for all: Pursuing socially inclusive demand-side flexibility in Europe.* Regulatory Assistance Project. https://www.raponline.org/knowledge-center/flex-ability-for-all-pursuing-socially-inclusive-demand-side-flexibility-europe

[23] European Commission. (2024c). *Impact Assessment report. Part 1 Accompanying the document 'Securing our future: Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society.'* https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52024SC0063

Mitigating the growth of electricity demand

Up to now, EU governments have mainly put in place energy efficiency policies to reduce energy consumption overall, regardless of their impact on electrification. However, some energy efficiency interventions contribute to electrification goals, while others do not, as illustrated by Table 1. It is important to recognise the rising or falling value of these interventions. For example:

- In the past, efficient use of fossil fuels was a key goal. But as the electrification destination becomes clearer and electrification progresses, investments in efficient fossil fuel equipment lose value. At the same time, energy efficiency solutions that involve a fuel switch away from fossil fuel equipment are valuable to progress towards the electrification goals.
- Energy efficiency interventions that mitigate the growth of electricity demand are becoming more and more valuable as we make progress towards our electrification goals. They can unlock existing grid capacity, enable best use of existing resources and help accelerate electrification of diverse end-use sectors in the short and medium term while grid and other investments progress. Their value varies depending on when and where electricity is saved, as described in the next section.

Energy efficiency improvements can play a pivotal role in making the unavoidable growth of energy demand manageable. Given the enormous challenge of full decarbonisation by 2050, investments in both energy efficiency and electricity system expansion will be necessary.

Table 1. Energy efficiency solutions and electrification

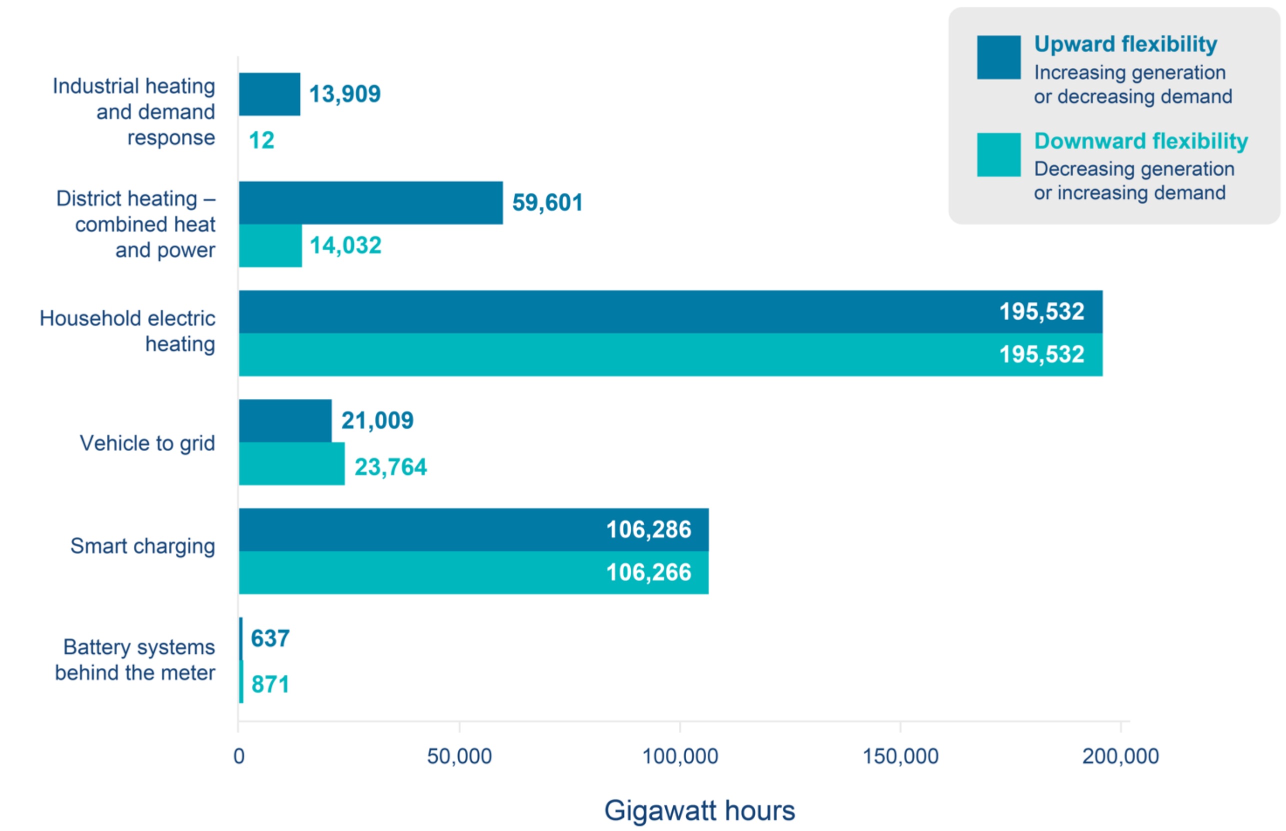
Type of energy efficiency solution	Examples of policies supporting these solutions	Impact on electrification
Activities that **reduce the amount of energy** used without involving a fuel switch.	Subsidy scheme supporting envelope improvements in fossil-fuel–heated buildings.	✓ Can contribute to minimising the increase of electricity demand, if they aim to. For example, a fabric improvement can help prepare for the subsequent installation of an efficient and smaller sized heat pump.
Activities that involve **switching** from fossil fuel equipment to more efficient electric equipment.	Energy efficiency obligation schemes that support heat pump deployment.	✓ Directly contribute to the electrification objective. Increase electricity demand, meaning that energy efficient equipment should be promoted.
Activities that **decrease electricity consumption**.	Building code regulating the envelope performance of electrically heated buildings; Efficiency standard for electric vehicles;	✓ Directly contribute to the electrification objective. Help minimise the increase of electricity demand.

	Policies allowing a more efficient transmission and distribution of electricity.	
Activities that involve the installation of **new, more efficient fossil fuel equipment**.	Subsidy scheme promoting the installation of new condensing gas boilers.	Go against the electrification objective, as these activities lock in users to the use of fossil fuels or leave them with stranded assets.

Enabling benefits from demand-side flexibility

Energy efficiency policy can increase energy users' capacity to use electricity flexibly. The greatest potential source of demand-side flexibility in 2030 is predicted to be household heating, as shown in Figure 4.[24]

Figure 4. Projected sources of activated demand-side flexibility in 2030



Note: In this figure, the category of industrial heating represents both electric and combined heat and power. Calculations are based on a 2030 electricity wholesale market simulation.

Data source: smartEn & DNV. (2022). *2030 demand-side flexibility: Quantification of benefits in the EU*

[24] Yule-Bennett & Sunderland, 2024. Data source: smartEn & DNV. (2022). *2030 demand-side flexibility: Quantification of benefits in the EU*. https://smarten.eu/demand-side-flexibility-quantification-of-benefits-in-the-eu

Improvements to an inefficient building's envelope help to maintain internal temperatures for longer, meaning that occupants can turn down their electricity-based heating (or cooling) equipment to respond to requests from the grid. Adequate levels of insulation ensure that households can confidently change heating schedules or allow automated control of their heating because their comfort is not compromised. Efficient thermal storage in a water tank can also be used by building owners to turn up electricity use at times of abundance – for example, charging domestic hot water or thermal stores overnight.[25]

These flexibility benefits support the acceleration of electrification and reduce costs for end users. Greater demand-side flexibility allows system operators to cope with more of the congestion and balancing issues that can constrain the rate of electrification, and to do so more cost-effectively.

Contributing to affordability and inclusion

Energy efficiency policy can and should have a strong social focus. Energy efficiency has been recognised by the EU as a priority measure to address energy poverty.[26] Saving energy is particularly important and valuable for people who already have very high energy burdens, particularly those who are vulnerable or at risk of energy poverty.

Reducing the energy needed to provide comfort and wellbeing can lower bills and provide a buffer against the impact of energy price fluctuations in the long term.

Increasing the efficiency of the home means it can hold heat and keep occupants comfortable for longer without active heat input. The ability to turn down heat input at times of the day when electricity is scarcer, and possibly more expensive, without compromising comfort, can provide further bill savings. Lowering operational costs and opening flexibility potential are key tools to make electrification affordable and inclusive.[27,28]

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[25] This is an idea being operationalised by EnergyCloud, a social enterprise that works with social housing providers to install smart controls on existing hot water tanks. When there is abundant wind generation that would otherwise be curtailed, the smart controls heat up the water in the tanks to absorb large amounts of electricity. The social housing tenants benefit from free hot water, utilising clean energy that otherwise would go to waste. https://energycloud.org

[26] European Commission. (2023). *Commission Recommendation (EU) 2023/2407 of 20 October 2023 on energy poverty.* https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L_202302407

[27] Sunderland, L., & Gibb, D. (2023). *Taking the burn out of heating for low-income households.* Regulatory Assistance Project. https://www.raponline.org/knowledge-center/taking-burn-out-of-heating-low-income-households

[28] Yule-Bennett & Sunderland, 2024.

The increasing relevance of where and when electricity is saved

When matters

Reducing electricity consumption in times when demand exceeds clean electricity supply can help keep costs in check. As discussed above, this can be achieved by deploying demand-side flexibility, which can itself be facilitated by energy efficiency policies.

Various energy efficiency interventions also have a direct impact on hourly and seasonal electricity consumption.[29] Investments in energy efficient technologies save energy whenever that appliance or use would be "on." For example:

- Replacing an inefficient air conditioner unit with a more efficient one saves energy during the summer, while replacing electric resistive heating with a heat pump saves energy in the winter.
- Increasing the efficiency of residential lighting mainly saves electricity during the evenings, when most people are at home, while a similar intervention in the commercial sector would save electricity when shops are open.

Different technology interventions, in different end-use sectors and electricity system conditions, will therefore be more or less useful depending on when clean electricity supply cannot keep up with electricity demand.[30]

Where matters

Reducing electricity consumption in areas with grid congestion may have particular value as it can alleviate constraints and mitigate the increase in grid costs. The EU would still need to plan for massive investments in grids, but these investments could be targeted to where they are most needed.

In the United States, energy companies have used geographically targeted energy efficiency investments to postpone specific grid investments or prioritise investments where they were most urgently needed.[31] These projects established that energy efficiency investments are in some cases less costly than some specific grid upgrades to maintain appropriate levels of energy service in grid-constrained areas. A number of similar pilot projects have been rolled out in Europe.[32]

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[29] Enterline, S. (2023). *Energy savings, demand savings and time-varying value: Research and recommendations*. Regulatory Assistance Project. https://www.raponline.org/knowledge-center/energy-savings-demand-savings-time-varying-value

[30] Martinez, S., & Sullivan, D. (2014). *Using energy efficiency to meet flexible resource needs and integrate high levels of renewables into the grid.* Natural Resources Defense Council. ACEEE Summer Study on Energy Efficiency in Buildings. https://www.aceee.org/files/proceedings/2014/data/papers/5-1012.pdf

[31] Neme, C., & Sedano, R. (2012). *US experience with efficiency as a transmission and distribution system resource.* Regulatory Assistance Project. https://www.raponline.org/knowledge-center/us-experience-with-efficiency-as-a-transmission-and-distribution-system-resource

[32] See for example: https://ieecp.org/projects/sensei/ and https://smarter.energynetworks.org/projects/10084666

Geographically targeted energy efficiency programmes can have multiple drivers, beyond supporting electrification. For example:

- They could focus on deploying energy efficiency actions to benefit low-income or vulnerable households, which would otherwise not be in a position to benefit from affordable electrification.[33]
- They can be driven by heat planning. If a heat plan identifies that a geographical area will transition to a modern district heating system using low-temperature water to heat homes,[34] it makes sense to prioritise timely building fabric improvements in these areas.

Recommendations

Energy efficiency will be crucial to successfully managing the transition to a decarbonised, electrified energy system. As the EU is figuring out the best strategies to accelerate electrification, we recommend that decision-makers involved in the design of future energy policy take the following steps:

- **Recognise and assess the specific value of energy efficiency in the electrification process.** Decision-makers interested in achieving more progress on energy efficiency can identify – and, when possible, quantify – the role of energy efficiency policy as an enabler of affordable, inclusive electrification. This knowledge and focus can drive more informed and targeted policymaking.

  At the moment, neither energy efficiency policy nor electricity regulations fully recognise the benefits that energy efficiency brings to electrification. For example:

  → Headline energy efficiency targets and policies at EU level do not sufficiently differentiate or target support based on efficiency's contribution to electrification.

  → There are very few projects in Europe where energy efficiency has been used to defer specific investments in transmission and distribution infrastructure.

  → Stakeholders are starting to investigate the role of energy efficiency as an enabler of demand-side flexibility services,[35] but this benefit is not yet reflected in different policy areas.

  → Many policies still provide undifferentiated support to all households, regardless of their income or vulnerability factors,[36] despite the fact that energy efficiency has been recognised a key strategy to mitigate energy poverty and facilitate electrification.

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[33] Sunderland & Gibb, 2023.

[34] Lowes, R., Oxenaar, S., & Rosenow, J. (2023). *Warming up to it: Principles for clean, efficient and smart district heating.* Regulatory Assistance Project. https://www.raponline.org/knowledge-center/warming-up-to-it-principles-clean-efficient-smart-district-heating

[35] See for example: Your home Our future. (2024). *How energy-efficient and flexible buildings can help reduce peak energy demand and benefit the European energy system.* https://www.yourhomeourfuture.eu/app/uploads/5f78f14cd6aac40e469ec004-light-report-your-home-our-future-7.pdf

[36] Sunderland & Gibb, 2023.

- **Explore the role of targeted energy efficiency programmes that focus on specific challenges.** These will likely become more important in the next few years. For example:

  → The deployment of fabric insulation in specific geographical areas could relieve grid stress, enable continued progress on electrification, support the delivery of heat planning objectives or enable households to electrify affordably.

  → Energy efficiency support schemes could focus on specific actions that address problematic peak consumption times. For example, policies could couple building fabric efficiency assessments and upgrades with heat pump rollout and default smart operation.

  Because the many benefits of energy efficiency, including social and health benefits, are often split across multiple parties, the focus on targeted projects might make it easier to bring these parties together. Coordination between energy efficiency policymakers and multiple grid planners will likely be needed, possibly in the context of a better integration of different energy planning exercises.[37]

  In that regard, decision-makers could gather relevant stakeholders, including grid companies, to pilot targeted energy efficiency programmes around specific challenges. This could happen in the context of the development of local heating and cooling plans, for example.

- **Build synergies between policies promoting distributed energy resources.** Energy efficiency is a distributed energy resource, like solar panels, batteries and demand-side flexibility. These resources interact. For example:

  → Both fabric efficiency and an efficient heat pump contribute to improving the overall efficiency of a building.

  → Fabric efficiency increases the ability of building occupiers to use electricity for heating flexibly.

  There might be a need to consider energy efficiency and other distributed energy resources collectively and maximise the contribution of these resources to the transition, rather than thinking in silos. A first step would be for decision-makers to identify successful business models combining different distributed energy resources and investigate policy measures which could further support such synergies.

These points may be of interest for the European Commission as it is designing its Electrification Action Plan and looking into options for a post-2030 climate and energy framework.

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[37] The need for coordinated planning rises up the political agenda. European Commission. (2024d). *The future of European competitiveness: In-depth analysis and recommendations.* https://commission.europa.eu/topics/strengthening-european-competitiveness/eu-competitiveness-looking-ahead_en

Regulatory Assistance Project (RAP)®
Belgium · China · Germany · India · United States

Rue de la Science 23
B – 1040 Brussels
Belgium

+32 2 789 3012
info@raponline.org
raponline.org