

# Equity in the energy transition

Who pays and who benefits?

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# Acronyms, abbreviations and units of measure

ACER	Agency for the Cooperation of Energy Regulators
ANAH	Agence nationale de l'habitat
BEUC	Bureau Européen des Unions de Consommateurs
CaT	Cap-and-trade
CCE	Contribution Climat Énergie
CCIR	Carbon Competitiveness Incentive Regulation
CEER	Council of European Energy Regulators
CHP	combined heat and power
CRM	capacity remuneration mechanisms
DG ENER	Directorate-General for Energy (European Commission)
EEO	energy efficiency obligation
EPBD	Energy Performance of Buildings Directive
EPOV	EU Energy Poverty Observatory
ETS	emissions trading system (EU)
EU	European Union
GB	Great Britain
GWh	gigawatt-hour
kWh	kilowatt-hour
NRA	national regulatory authority
RAP	Regulatory Assistance Project
RGGI	Regional Greenhouse Gas Initiative
t	tonne
TWh	terrawatt-hour
UK	United Kingdom
U.S.	United States
VAT	value-added tax



# Executive summary

**T**he European Green Deal aims to make Europe the first climate-neutral region by 2050. If directed effectively, the transition to a clean energy system will not only limit the worst impacts of the climate crisis but will deliver Europe's energy services at least cost in the long term, bringing significant social, health and well-being benefits to all European citizens and communities. In the short term, however, it will demand policies that carry significant costs. A successful clean energy transition will rest on the ability of the European Union (EU) to share these costs, and the benefits, fairly.

Experience in a number of countries, not least the *gilets jaunes* (the yellow vests) movement in France, clearly shows that delivering socially just climate policies is essential to maintain public — and therefore political — support for the energy transition. Who is paying and who is benefiting needs to be clearly and transparently communicated and understood. Ensuring that the energy transition does not increase the cost burden of energy consumers who are experiencing — or are at risk of — energy poverty is key to preventing greater social divisions throughout Europe.

Worldwide experience with the coronavirus crisis has amplified the importance of a commitment to social justice. It is shining a light on the precariousness of everyday life for low-income and vulnerable households, including the impact of increased energy bills on already stretched household budgets. Europe's economic recovery must focus on delivering a just and inclusive economic and environmental transition.

This paper contributes to the discussion on how to ensure that the clean energy transition is equitable by proposing recommendations on the design of clean energy policies and regulation that will ultimately be paid for through household consumer energy bills. The overarching aim is to ensure that everyone shares equitably in the costs and benefits of these policies and that the most vulnerable in society are not unfairly financially burdened.

## Unpacking recent changes in charges on energy bills

Prices consumers pay for energy for gas and electricity have risen over the last decade. For the most part, these price increases reflect changes in the non-energy components of the bill more than rises in the retail prices of gas and electricity. On average across the EU, the non-energy components, or regulated elements, make up 50% of gas bills and 63% of electricity bills. They comprise three elements that cover costs of energy infrastructure (network fees), costs of clean energy programmes (levies) and taxes. Therefore, the regulatory and policy decisions that influence these elements of the bills are increasingly important.

This paper examines the market, regulatory and policy decisions being made in the context of the clean energy transition that will affect how costs are passed on through consumer bills. For each of these elements, the paper examines both costs and benefits. In relation to the costs, how much is charged, to whom and how, are important. In relation to the benefits, which individuals or groups benefit, how benefits are directed to low-income consumers, and ensuring that the value of the system benefits is captured, are all important.

## Ensuring the clean energy transition contributes to ending energy poverty

A key priority in ensuring a fair distribution of costs and benefits is to prevent the costs of clean energy policies deepening energy poverty and to direct the benefits of the transition to alleviate it.

Although there is no official definition for energy poverty at European level, the EU Energy Poverty Observatory (EPOV) defines it as when “*individuals or households are not able to adequately heat, cool or provide other required energy services in their homes at affordable cost.*” The data available at a European level reveal that energy poverty is driven by low household income and low-quality homes in poor states of repair. Compared with

middle-income or higher-income households, low-income households tend to be lower consumers of energy with low energy expenditure. However, as they spend a high proportion of income on energy, the expenditure can represent a large part of the overall household budget. Based on this evidence, this paper focuses its analysis of the distributional impacts of policies on low-income and low-energy-use households.

As low-income households spend a high share of income on energy, they are particularly sensitive to changes in the final price of energy. Therefore, the policy and regulatory decisions that dictate the network fee, levy and tax structures have a greater bearing on the energy bill burden of low-income households.

## Designing network tariffs to cover infrastructure costs in a fair manner

Networks play an important role in the energy transition. Modern electricity networks and smart operation are key to the cost-efficient integration of renewable generation and new market entrants, like prosumers. They will enable the realisation of the benefits of smart meters, demand-side flexibility and storage. Gas networks will also need to be modernised and adapted to decarbonise. A significant proportion of domestic heating and cooking will need to be electrified, which implies the phase out of the majority of gas networks and adaptation to clean fuels for those left intact.

Consumers connected to energy distribution systems pay for this infrastructure through network fees. At present in the EU, contributions to the cost of the network account for on average one-quarter of household electricity and gas bills, but can be as much as 40% in some Member States. Individual distribution areas in Member States charge consumers for infrastructure in different ways; the varying approaches to network tariff design result in the costs being split differently among network users. The distribution of costs amongst users is, in large part, dictated by the design of the network tariff. Broadly, network tariffs comprise two elements: fixed and usage-based fees. When fixed fees dominate in a tariff, low-use consumers are disadvantaged as, proportionally, they pay more for their use of the grid than high-use consumers do. Usage-based fees charge consumers based more closely on their use of the grid and are therefore fairer.

### 'Keeping the lights on:' Electricity resource adequacy, but at what cost to consumers?

A growing number of Member States are adding new costs to consumer energy bills through an often-invisible special charge that purports to cover the costs of electricity resources needed to 'keep the lights on'. The instrument used to procure these resources, 'capacity remuneration mechanisms' (CRMs), secures 'resource adequacy' — i.e., that electricity supply resources are adequate, with a given level of confidence, to serve demand at all times and in all places. However, CRMs place unnecessary costs on consumers (creating a greater cost burden to low-income consumers), lock in fossil generation and fail to take advantage of demand-side solutions that are often least-cost options. Greenpeace estimated the cost of CRMs across Europe in 2018 to be €32.6 billion, with governments committed to an additional €25.7 billion to 2040.

In Germany, compared to high-use consumers, low-energy users can pay up to 2.5 times more for network costs per unit of energy delivered.

Network tariffs dominated by high fixed fees result in a larger proportion of the bill that consumers cannot influence through energy efficiency or demand response. In effect, high fixed fees promote uneconomic consumption of electricity. In turn, this higher level of demand at times of high stress on the grid requires greater investment than is necessary to ensure a robust network. The higher investment drives up total costs of system infrastructure, ultimately pushing up the total cost of the energy transition — which will eventually lead to higher costs for all.

## Ensuring the costs and benefits of levy-funded programmes are distributed fairly

Many EU Member States use levies (surcharges) on energy bills to fund clean energy, primarily the development of renewable energy, combined heat and power (CHP) and energy efficiency programmes. On average in Europe, levies account for 13% of household consumer electricity bills. In some countries, levies account for more than 20% (Great Britain, Denmark and Portugal) whilst other countries apply

no levies to support these programmes.

The way in which costs of levy-funded programmes are passed to energy consumers can increase or decrease the cost burden on low-income households. Which consumer groups either pay or receive exemptions, which fuels carry the costs and how costs apply to individual consumers within a group are all factors that affect the cost burden on low-income consumers. The most common exemption from levies, for energy-intensive industries, for example, can increase the share of costs — and hence the financial burden — to non-exempted consumers.

In supporting renewable energy or energy efficiency initiatives, levy-funded programmes produce significant benefits — including both gains for private participants and system and societal benefits that accrue to all. The often-overlooked system benefits can be significant. Evaluation of a levy-funded efficiency scheme in Vermont, USA, found that the value of system benefits delivered to all consumers exceeded the cost by \$8/MWh. The system benefits include lower reserve margins, avoided transmission and distribution upgrades, avoided line losses and avoided environmental costs. In addition, there are significant non-energy benefits that this assessment did not capture.

Levy-funded programmes can deliver a greater proportion of private benefits to specific target groups, such as low-income or energy-poor households. A number of energy efficiency obligations (EEOs) ringfence a proportion of the energy savings, and therefore energy efficiency measures, for low-income households (e.g., UK, France, Ireland) or incentivise obligated parties to deliver measures to low-income households (Austria). Benefits enjoyed by participants in a programme can eclipse the impact of the levy on bills.

## Using carbon pricing and taxes to deliver carbon savings to all

Carbon pricing (carbon taxation and cap-and-trade schemes like the EU Emissions Trading System) can be a key component of a comprehensive climate strategy, based on implementing the ‘polluter pays’ principle. It aims to increase the cost of producing or using fossil energy sources, thereby discouraging such activity. The increased price creates a greater cost burden for low-income consumers, for whom energy expenditures already constitute a larger part of the household income and budget. As climate policies increase in

### Lessons from les gilets jaunes in France

In October 2018, les gilets jaunes (the yellow vests) protesters took to the streets in France, demonstrating against high fuel prices. An analysis of the causes and dynamics of the protests, carried out by Agora Energiewende soon after the initial protests, found that although the French population generally supports climate protection, several flaws in the design of the carbon taxation regime (as well as broader governmental reforms) prompted the protests. The analysis offered five main conclusions:

- Ringfencing revenues for redistributive and carbon-saving purposes (thereby making the mechanism revenue-neutral) is central to gaining public acceptance of carbon pricing as a climate protection measure.
- Effective and transparent communication regarding how revenues will be invested is essential.
- Exemptions and compensation must not privilege businesses over households.
- Part of the revenues should be redistributed to low-income households to offset regressive impacts and ensure that the energy transition does not come into conflict with social justice concerns.
- Revenues should enable those affected to protect themselves from rising costs, for example by providing extended support for access to lower carbon options for home heating and transport.

ambition, carbon prices and carbon taxes can be expected to increase in cost and expand in scope. Focus on how carbon pricing policies will affect low-income and energy-poor consumers is therefore of vital importance now.

How revenues from a price on carbon are used is key to the final impact on low-income households. Earmarking carbon revenues for investment in targeted renewable energy and energy efficiency investments can effectively offset the cost to low-income consumers and reduce energy bills long term. Together with targeted cashback or bill support for low-income households to address the short-term impact of the tax, recycling of revenues in this way can eclipse the negative financial impacts.

As reducing emissions is the central purpose of carbon pricing, the design of the pricing mechanism and the surrounding policy framework should stimulate the lowest-cost way(s) of achieving this goal. Investing the revenues generated into effective carbon reduction programmes can significantly boost actual carbon savings while also reducing system costs — and clean energy transition costs — for all. An analysis of the impact, in carbon saving terms, of a 3% rise in household electricity prices, compared to the impact when the revenue from the price increase was invested into an effective energy efficiency programme, found that investment of the revenues created up to nine times more carbon savings than the price alone.

## Boosting consumer engagement in the energy transition

Consumer engagement in the energy system has the potential to produce significant benefits to the system and to private consumers. Consumers can engage through reducing energy demand, shifting demand and reducing peaks, fuel switching and decentralised electricity production and storage.

The ability and inclination to engage, however, is unevenly spread across populations. Low-income households face greater barriers to engaging in the energy market and the energy transition; as a result, they risk paying higher costs for energy. The act of switching energy tariff or supplier is a key indicator of consumer engagement in the energy market and of whether a given market is functioning. Consumers who do not switch often end up paying more than those who do. Evidence suggests that low-income consumers are less likely to switch suppliers than are higher-income consumers. Therefore, it is essential to provide customer protections, uphold rights to transparent information and ensure ease of switching energy tariff or supplier. Aggregation of customers, for example by municipal energy suppliers, can make it easier for low-income and vulnerable households to navigate the market. District heating customers should not be overlooked, as district heat will play an important role in the decarbonisation of heat. Currently, this sector lacks competition, regulation and consumer protection.

The contribution of consumers to reduce and shift demand has significant value in the energy system. Increasingly, dynamic energy pricing is used to value and

signal when demand-side services are needed. Although dynamic price tariffs can deliver significant benefits to households that provide demand-side response services (through reduced energy prices), the energy use profile of low-income and energy-poor households — coupled with investment barriers they face — may exclude them from realising such benefits. Therefore, policymakers and regulators must carefully consider whether dynamic tariffs are well-suited to low-income households. Clear communication of the projected costs of a dynamic tariff, as compared with a flat-rate tariff, is essential. Providing a shadow bill across a full year, for example, allows consumers to easily compare costs.

## Avoiding lock-in to gas and high costs

Domestic heat must be decarbonised to achieve Europe's climate neutrality goals, therefore the future of gas is a key question. Gas boilers are the most common heating technology in the EU building stock; approximately 42% of residential heating and cooling demand is provided by gas. Decarbonising domestic heat will require significant electrification, primarily through switching from gas heating to heat pumps.

In many Member States, gas is currently a lower-cost heating fuel than electricity. The cost difference between electricity and gas is exacerbated by the fact that levy-funded programmes and carbon prices have been attached to electricity bills more than gas bills. As heat is decarbonised, the cost of using gas can be expected to rise, potentially trapping low-income households that have relied on gas as a low-cost fuel with higher costs. These households often face significant barriers to moving to decarbonised heating such as: lack of space in smaller homes or apartments for an individual heat pump; the high upfront cost of renovation and/or purchasing a new individual heating system; and lack of access to an efficient district heating system. As the number of households using the gas grid shrinks, a smaller pool of customers will be left paying for the gas distribution infrastructure and therefore making higher individual contributions. These consumers may also face higher fuel costs as decarbonised replacements for fossil gas, like hydrogen, are delivered through the gas infrastructure.



## Summary of recommendations

A socially fair energy transition will require complementary policy action on many levels. Individual recommendations on each policy area are included in the relevant chapters; below is a summary of overarching principles and recommendations.

### Overarching principles for a fair energy transition

**The European Green Deal must regard climate ambition and social justice as interdependent.** Social justice relies on ambitious climate action, as the worst impacts of climate change will be felt most by the poorest. Ambitious climate action is reliant on delivering social justice, as fairness is critical to maintaining public and political support.

**The clean energy transition must be delivered at least cost to society as a whole.** Efficiency First principles must underpin decision making. This implies prioritising low-cost resources, particularly on the demand side, to ensure adequate resources to ‘keep the lights on’ in the electricity system; to reduce energy demand and energy system costs through energy efficiency; and, when extended to carbon pricing policy, to maximise emissions reductions at the same carbon price to consumers by reinvesting the revenues into energy efficiency.

**The impact of the energy transition on all consumers must be evaluated, be fair and be clearly communicated.** The impacts of individual policies must be assessed, as well as the interaction of costs and benefits across entire clean energy policy frameworks. The combinations of costs and benefits must be communicated in a transparent and accessible way, monitored and reported on.

**Distributional tests and standards should be applied to all investments, whether for climate policies or for other infrastructure, including for fossil fuels.** The costs of all energy supply infrastructure, including generation, transmission and distribution, are socialised. However, newly introduced clean energy policies are often subject to greater critique than carbon-intensive investments. Robust critique should be applied to both newly introduced clean energy policies and to carbon-intensive investments.

**Mechanisms to ensure low-income households are not trapped with rising costs of gas must be established now.** Low-income households face higher barriers to electrification and are particularly vulnerable to becoming trapped with rising costs of gas infrastructure and fuel. Gas network regulation must plan for the expected reduction in system use, ensure future costs of infrastructure are distributed fairly between current and future consumers and cost shocks are avoided.

**Low-income and vulnerable energy consumers must be enabled to engage safely and effectively in energy markets to secure affordable energy.** Consumer protections, rights to transparent information and ease of switching energy tariff or supplier are essential, both for customers to engage and for the proper functioning of the market. Protections for consumers that rely on district heating systems should be improved to mirror those available in gas and electricity markets. As dynamic energy tariffs become more commonly available, clear communication of the projected costs of a dynamic tariff, as compared with a flat-rate tariff, is essential.

### Summarised policy recommendations

**Distribute costs equitably between consumer groups.** Network fees, levies to fund clean energy programmes and carbon taxes must be designed to ensure fair distribution of costs between different types of energy consumers. Exemptions from contributing to these costs are most often granted to energy-intensive industries to address competition concerns, but less frequently focus on the social impacts. These exemptions increase the financial burden for non-exempted consumers — including low-income households. Exemptions from carbon taxation undermine the ‘polluter pays’ principle and disincentivise efficiency.

**Distribute costs equitably within consumer groups.** The method used to pass on costs of infrastructure and clean energy programmes to consumers can shift costs between subsets of, or even individuals within, the household consumer group. The distribution of costs on a fixed, or per-customer basis, rather than on the basis of energy use places a greater burden of costs on low-use energy consumers, disincentivises energy efficiency and demand response, and impedes the energy transition. As such, their use should be limited.

**Fully capture and communicate system and societal benefits, which accrue to all.** Energy efficiency and renewable energy programmes, paid for by all through levies on energy bills, produce significant system benefits (e.g., avoided generation, transmission and distribution costs or avoided carbon emissions) that are delivered to all. These system benefits can more than offset the costs of programmes to all system users and should be properly accounted for in impact assessments and communicated.

**Target and ringfence private benefits for low-income consumers.** Private benefits of levy-funded energy efficiency and renewable energy programmes should be increasingly targeted for low-income households or communities. Private benefits are those enjoyed by individuals, usually those who participate in a programme, that include subsidised renewable energy generation, energy bill savings and health and well-being benefits. Ringfencing or targeting benefits to

low-income households or communities can alleviate energy poverty long term and create benefits that more than offset the costs of the policies.

**Mitigate temporal mismatches between when costs are incurred and when benefits are felt.** Priority targeting of short-term to medium-term assistance can help low-income households weather the time between incurring costs and receiving the benefits of clean energy programmes. Short-term methods such as social support or bill support can be used to insulate low-income households from short-term increases in costs. Long-term bill reduction, through efficiency and renewable energy measures, must also be delivered as a priority to low-income households and pre-seeded to create benefits sooner. Policy designers need to carefully consider the balance of effort and investment between price support and energy efficiency support, not compromising the long-term solution.



# Introduction

The European Commission has set out plans for a Green Deal that aims to make Europe the first climate-neutral region by 2050,<sup>1</sup> effectively launching the greatest energy system transition since the Industrial Revolution. As with any societal change, the clean energy transition is beset with risks but also holds great opportunities for increased prosperity and well-being. If directed effectively, this transition will limit the worst impacts of the climate crisis. It will also deliver significant social, health and well-being benefits to all European citizens, communities and regions.

The European Green Deal commits to being just (fair) and inclusive, and to putting people first. Worldwide experience with the coronavirus crisis has amplified the importance of this commitment to social justice. It is shining a light on the precariousness of everyday life for low-income and vulnerable households, including the impact of increased energy bills on already stretched household budgets. Europe's economic recovery must focus on delivering a just and inclusive economic and environmental transition.

How the European Green Deal will achieve social justice remains a huge and complex question. This paper contributes to answering this question by proposing principles for, and concrete recommendations on, the design of clean energy policies and regulations that pass costs to household consumers through energy bills (gas, electricity and district heating<sup>2</sup>). The energy bill structure is a useful lens through which to look at the costs and benefits of energy transition policies, but the recommendations proposed have broader relevance to all clean energy transition policies, whether paid

for through national budgets (taxation) or bills. The aim is to ensure the equitable distribution of costs and sharing of benefits such that the poorest and most vulnerable in society are not unfairly burdened and energy poverty is not exacerbated.<sup>3</sup>

The European Green Deal package outlines concrete measures to support the most affected geographic regions — those with coal and carbon-intensive economies — to transition to clean energy. The Just Transition Mechanism will support the economic transformation in these regions via reskilling, jobs development and energy efficient housing, and is supported by the Just Transition Fund.<sup>4</sup> However, Europe must stimulate the just transition everywhere, not only in transition regions. How the European Green Deal will deliver a socially fair transition for all citizens, and how it will embed principles of social justice throughout all policy areas, is arguably less-well developed.

Achieving the clean energy transition is ultimately the most likely least-cost option in the long term in the short term. Achieving climate neutrality in just 30 years will require significant disruption to all sectors of the economy, not least to energy systems and the connected infrastructure to which energy is delivered. Far-reaching new policies will be required to drive this change and in the short term these policies will require significant investment.

The full cost of the European Green Deal has not yet been evaluated. Reaching Europe's existing 2030 climate and energy targets is estimated to require additional investment of €260 billion annually over the next decade;<sup>5</sup> achieving the higher greenhouse gas emissions target of at least

1 European Commission. (2019a). *The European Green Deal*. Brussels, Belgium: Author. Retrieved from [https://ec.europa.eu/info/sites/info/files/european-green-deal-communication\\_en.pdf](https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf)

2 Although the cost of transport fuel is increasingly being considered in the European energy poverty debate, this paper restricts its focus to household heat and power. District heating is considered where appropriate, as the localised nature of system design and cost regulation often makes broad generalisation unproductive.

3 It is recognised that the policies under study also impact the wider economy and workers, through both jobs and wages, but this broader analysis is outside of the scope of this paper.

4 The term Just Transition has its origins in regional transition. It was coined in the U.S. by labour unions and environmental justice groups to

refer to an equitable transition for low-income communities from reliance on industries that were damaging the environment and health. Powell, D., Balata, F., van Lerven, F., and Welsh, M. (2019). *Trust in Transition*. London, England: New Economics Foundation. Retrieved from [https://neweconomics.org/uploads/files/NEF\\_trust-in-transition.pdf](https://neweconomics.org/uploads/files/NEF_trust-in-transition.pdf). The term was also used in the Paris Agreement in relation to the transition of workforces and creation of quality jobs. United Nations. (2015). *The Paris Agreement*. New York, NY: Author. Retrieved from [https://unfccc.int/files/essential\\_background/convention/application/pdf/english\\_paris\\_agreement.pdf](https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf)

5 European Commission. (2019b). *United in delivering the energy union and climate action—setting the foundations for a successful clean energy transition*. Brussels, Belgium: Author. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019DC0285&from=EN>

50% reduction by 2030 (increased from the existing target of 40% by 2030), as set out in the European Green Deal, will drive up investment needs.

The ways in which these costs are distributed among different groups in society — low-income and higher-income, rural and urban, older and younger — is critical to the success of the energy transition. An unfair distribution of costs — and the benefits — will lead to disenfranchisement and social unrest.

This paper examines the near-term market, regulatory and policy decisions that affect how costs are passed on to consumer bills and aims to shed light on the distributional impacts of these decisions. The intention is to ensure that ambitious climate policies can be implemented without the short-term costs and cost burdens<sup>6</sup> falling disproportionately on the poorest, exacerbating energy poverty. The paper also considers methods to ensure that the near-term benefits are directed to low-income households in order to offset the cost burden of the short-term transitional costs and ensure the benefits of the transition are fairly distributed.

Energy poverty<sup>7</sup> in Europe negatively affects the living conditions, health and educational attainment opportunities for an estimated 50-100 million Europeans. Therefore, ensuring that the energy transition does not increase the cost burden of energy consumers experiencing, or at risk

of, energy poverty is key to prevent exacerbating energy poverty and social divisions throughout Europe. Despite this focus on the cost burden of energy services, this paper is set firmly within the understanding that the most cost-effective, long-term method for alleviating energy poverty is energy efficiency and renovation to reduce the amount of energy needed to deliver adequate energy services.

Ultimately, the paper aims to equip stakeholders with information, argumentation and recommendations that enable them to engage positively in the design of clean energy policies at European and Member State levels. Input from these key stakeholders — through roundtable discussion, telephone meetings and one-to-one consultations — has supplemented the desk-based research and been integral to the findings.

This report comprises five chapters. The first chapter briefly covers the breakdown of the household gas and electricity bills<sup>8</sup> and relevant trends over the last decade. This chapter also explores the energy use profile of energy-poor and low-income households to provide focus for the subsequent analysis. The following chapters (two to four), examine the non-energy elements — network fees, levies and carbon taxes<sup>9</sup> — of household energy bills. Chapter Five explores consumers' interaction with the energy market. Each chapter contains recommendations specific to the policies examined.

6 Cost burden refers to the higher budgetary impact imposed by a price or price rise for a low-income household compared to the burden felt by a higher-income household. Even if costs are shared equally among households, the burden felt will be greater for the low-income household.

7 Energy Poverty does not currently have a formal definition at European level but is broadly understood as the inability of households to maintain adequate levels of energy services at an affordable cost. A discussion of the issue of energy poverty and Member State approaches to defining it can be found in: SocialWatt. (2019). *Report on the status quo of energy poverty and its mitigation in the EU*. Athens, Greece: Author. Retrieved from <https://socialwatt.eu/library/publications>

8 The section of this report that looks at bill trends focuses on electricity and gas but not on district heating, as the cost structures and prices differ too significantly and at a too-granular level (to the system level) to make assessment of trends useful.

9 Of all of the tax elements added to household bills, this paper only covers carbon taxes. It does not cover VAT and excise duty, although these make the most significant contribution to the tax element of both gas and electricity bills.

# Chapter 1: Energy bills and energy use in low-income and energy-poor households

This chapter looks first at the elements that make up household gas and electricity bills. It reveals how the breakdown of the bill has changed over the last decade and briefly touches on the differences in energy bills amongst European Member States. The second part of the chapter provides an overview of energy poverty in Europe and focuses on the energy use of low-income and energy-poor households to provide context for the analysis of impacts in the rest of the report.

## Recent trends on household energy bills in the EU

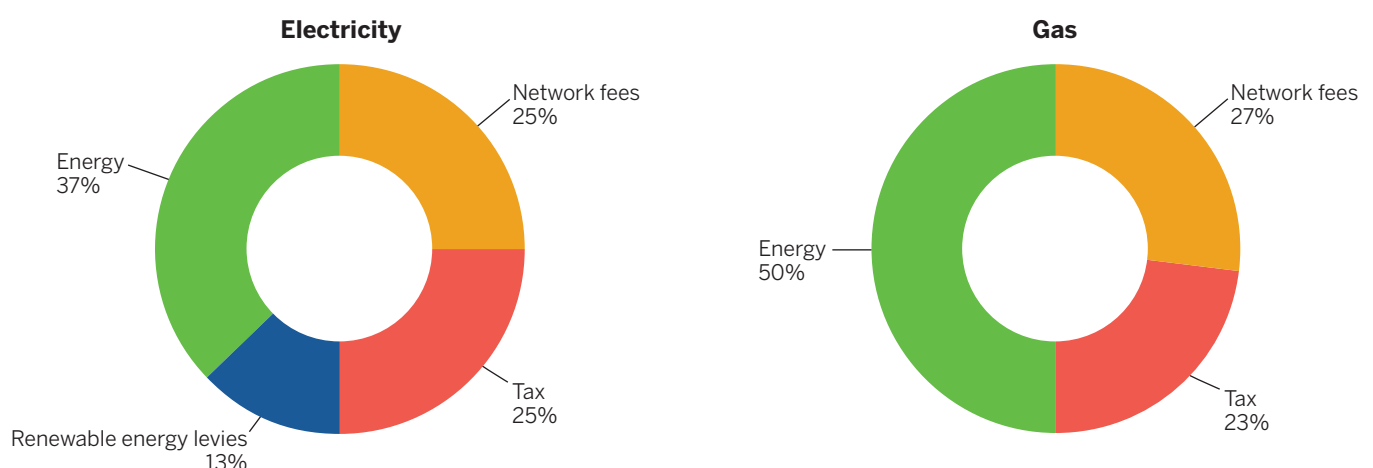
Several elements determine the final cost of energy to a household. Aside from the cost of energy actually consumed, the bill includes a combination of non-energy components in the form of network fees, levies to fund clean energy programmes and taxes. While the price of energy consumed reflects energy markets, the latter elements are regulated

or directed by energy policy. As shown in the breakdown of average European household bills, the regulated elements make up, on average, 63% of the final electricity bill and 50% of the final gas bill (Figure 1).<sup>10</sup>

There are significant differences between the composition of electricity and gas bills. The energy component accounts for about one-half of gas bills; for electricity, it accounts for only around one-third. The application of levies and taxes also varies. A range of policy support costs are added to electricity bills — including levies to support clean energy programmes and carbon taxation through the EU Emissions Trading System — whereas the application of these costs to gas prices is much more limited. For example, levies to pay for renewable energy support make up, on average, 13% of electricity prices but account for less than 1% of household gas prices (and therefore do not figure in Figure 1 or Figure 3).<sup>11</sup>

Over the last decade (2008-2018), final household prices

Figure 1. Breakdown of average European household electricity and gas bills, 2018

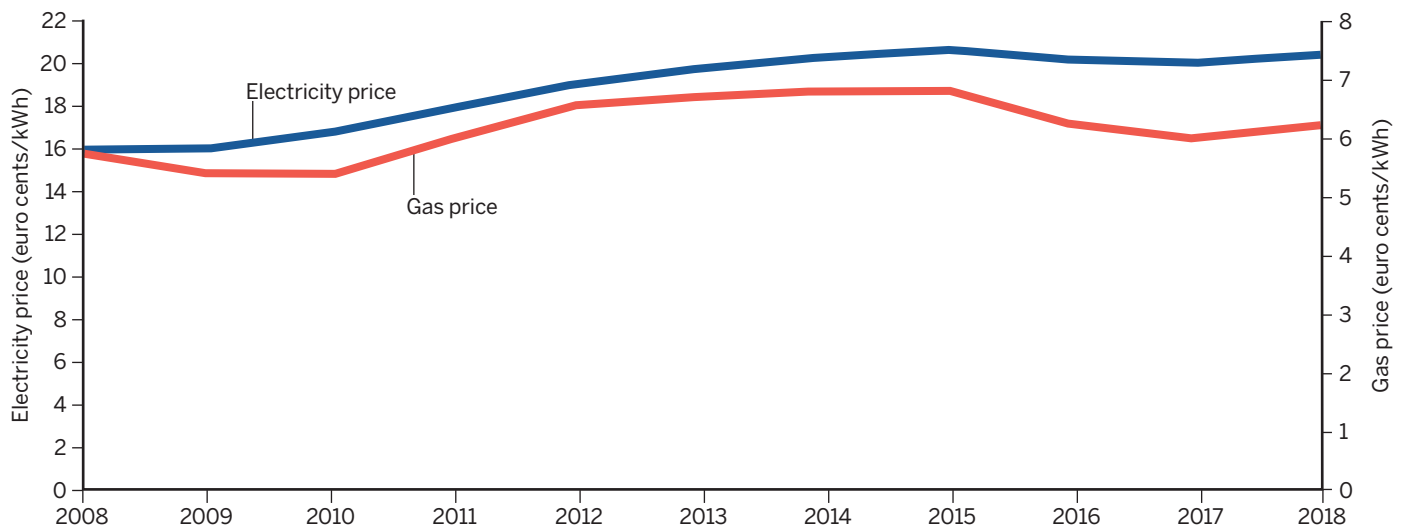


Source: Based on data from Agency for the Cooperation of Energy Regulators / Council of European Energy Regulators. (2019). *Annual report on the results of monitoring the internal electricity and natural gas markets in 2018: Electricity and gas retail markets volume*.

10 Agency for the Cooperation of Energy Regulators/Council of European Energy Regulators. (2019a). *Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2018: Electricity and Gas Retail Markets Volume*. Ljubljana, Slovenia; Author. Retrieved from [www.acer.europa.eu/Official\\_documents/Acts\\_of\\_the\\_Agency/Publication/ACER%20Market%20Monitoring%20Report%202018%20-%20](http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20Market%20Monitoring%20Report%202018%20-%20)

[Electricity%20and%20Gas%20Retail%20Markets%20Volume.pdf](http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20Market%20Monitoring%20Report%202018%20-%20Electricity%20and%20Gas%20Retail%20Markets%20Volume.pdf)

11 European Commission. (2019c). *Energy prices and costs in Europe*. [Staff working document]. Brussels, Belgium: Author. Retrieved from [https://ec.europa.eu/energy/sites/ener/files/documents/swd\\_-\\_v5\\_text\\_6\\_-\\_part\\_1\\_of\\_4.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/swd_-_v5_text_6_-_part_1_of_4.pdf)

**Figure 2. Trends in final electricity and gas prices for EU households, 2008-2018**

Source: Based on data from the Agency for the Cooperation of Energy Regulators / Council of European Energy Regulators. (2019). *Annual report on the results of monitoring the internal electricity and natural gas markets in 2018: Electricity and gas retail markets volume*.

(total costs) have risen for both gas and electricity. Average final electricity prices for households have risen by 28.4% (much of this increase occurred between 2008-2015, after which prices became more stable) (Figure 2).<sup>12</sup> As electricity prices rose faster than inflation, the rate of increase on the bill has outstripped the ability of low-income households to pay it.<sup>13</sup> Average household gas prices also rose, but at a much lower rate of 9.1%, and were subject to fluctuations.

The increase in the final price of electricity and gas is due, in the main, to increases in the non-energy components (network fees, levies and taxes), not to the energy component, both absolutely and, as shown in Figure 3,<sup>14</sup> proportionally. This means that the energy components have declined (from 41% to 37% of electricity bills and 56% to 50% of gas bills) while regulated elements have increased. The most significant proportional increases were rising network fees in gas bills (from 22% to 27%)

and increasing levies to support new renewable energy generation in electricity bills (from 6% to 13%).

For low-income households, energy bills represent a high share of total expenditures (frequently above 5% and as high as 23%, see Figure 9); as such, they are affected most by changes in the final price paid for energy.<sup>15</sup> Therefore, the ways in which policymakers and regulators structure network fees, levies and taxes has a greater bearing on the energy bill burden on low-income households.

The average energy price and bill breakdown trends at a European level obscure significant variation amongst countries, for both gas and electricity (Appendix I contains a full breakdown). The analysis<sup>16</sup> is based on the breakdown of the standard offer from the incumbent supplier of both gas and electricity in each EU capital city, as a proxy for the national market. On average, network fees account for around one-quarter of electricity bills, but they range

12 ACER calculations based on Eurostat, Band DC: 2,500–5,000 kWh (household electricity consumption) and Band D2: 20–200 GJ (household gas consumption). Prices in nominal terms.

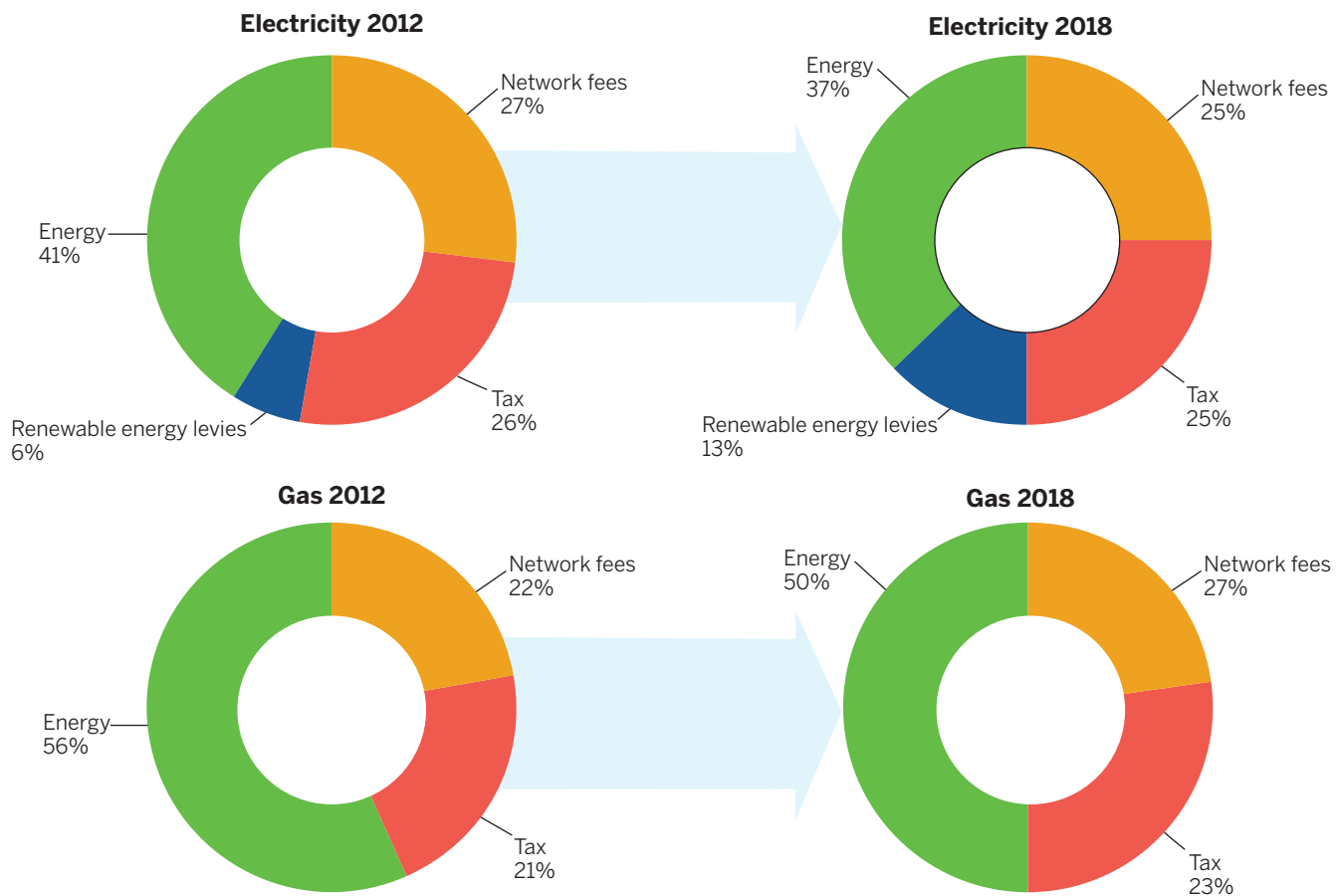
13 ACER/CEER, 2019a; and European Commission, 2019c.

14 ACER calculations based on data from price comparison tools, incumbent supplier websites and national regulatory authorities (NRAs), collected via ACER Retail Database (2019). Bulgaria is not included in the average calculations due to unreported data by the NRA. For the purpose of this analysis, the average price for household consumers in the EU is based

on the standard incumbent offers for an annual pan-European average consumption of 3,500 kilowatt-hours per year (kWh/year) for electricity and 11,000 kWh/year for gas, weighted by total household consumption in each MS, which is provided by CEER.

15 Grave, K., Breitschopf, B., Ordonez, J., Wachsmuth, J., Boeve, S., Smith, M., et al. (2016). *Prices and costs of EU energy*. Utrecht, Netherlands: Ecofys. Retrieved from [https://ec.europa.eu/energy/sites/ener/files/documents/report\\_ecofys2016.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/report_ecofys2016.pdf)

16 ACER/CEER, 2019a.

**Figure 3. Breakdown of electricity and gas offers for households in capital cities, 2012-2018\***

\*Weighted average breakdown of standard electricity and gas offers from incumbent suppliers.

Source: Based on data from the Agency for the Cooperation of Energy Regulators / Council of European Energy Regulators. (2019). *Annual report on the results of monitoring the internal electricity and natural gas markets in 2018: Electricity and gas retail markets volume*.

from just 12% in Greece to 44% in Luxemburg. For gas, on average network fees are 27% of the bill but this obscures a wide range of between just 11% in Estonia to 43% in Spain. Levies for renewable energy account for more than 20% of electricity bills in Germany, Portugal and the UK, but Malta, Poland, Hungary, France and Latvia do not pass any costs for renewable energy on to households.

These brief examples show how market, regulatory and policy decisions that influence how network fees, levies and taxes are applied to bills (as described in the following chapters) will have greater or lesser impact, depending on the breakdown of the gas and electricity bills in each Member State.

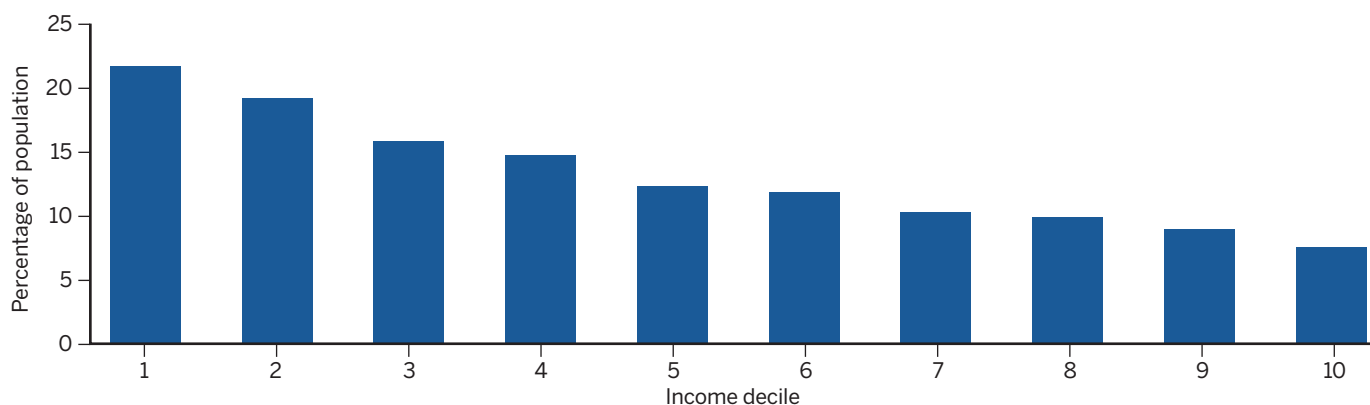
## Energy poverty and energy use in low-income households

This section assesses data on energy poverty to provide an understanding of — and a proxy for — energy poverty for use in the subsequent analysis.

Energy poverty has not been formally defined at a European level or by the majority of Member States. The de-facto definition of energy poverty used by the Energy Poverty Observatory (EPOV)<sup>17</sup> is when “*individuals or households are not able to adequately heat, cool or provide other required energy services in their homes at affordable cost.*”<sup>18</sup> The causes and experience of energy poverty vary significantly among countries, regions and communities. Whilst the

17 The EU Energy Poverty Observatory (EPOV) is a European Commission funded project charged with improving the measuring, monitoring, sharing of knowledge and best practice on energy poverty. [www.energypoverty.eu](http://www.energypoverty.eu)

18 Thomson, H. and Bouzarovski, S. (2018). *Addressing energy poverty in the European Union: State of play and action*. Brussels, Belgium: EU Energy Poverty Observatory. Retrieved from <https://www.energypoverty.eu/publication/addressing-energy-poverty-european-union-state-play-and-action>

**Figure 4. Presence of leak, damp or rot in EU dwellings, by income decile, 2017**

Source: European Commission, Directorate General for Energy and EU Energy Poverty Observatory. (2017). *Total population living in a dwelling with a leaking roof, damp walls, floors or foundation, or rot in window frames or floor.*

EPOV definition points to the affordability of adequate energy services, for some households lack of access to a safe and/or secure fuel supply is the most pressing issue, leading to burning coal or waste and exposure to the associated pollution and health impacts. Others may live in homes of such poor quality that it is impossible to keep warm or cool enough at any cost.

Ensuring universal access to affordable, reliable, sustainable and modern energy is one of the UN Sustainable Development Goals.<sup>19</sup> Access to good-quality essential services, including energy, is part of the European Pillar of Social Rights.<sup>20</sup> The European Green Deal aims to uphold both. Awareness of energy poverty is slowly rising in many Member States and it is now recognised within several European policies.<sup>21</sup> Initial

action to address it, however, has been slow.<sup>22</sup>

Stakeholders are missing a clear understanding of which households need particular focus in each country. From data available at a European level we can conclude that energy poverty is strongly correlated with low household income and with low-quality homes in a poorer state of repair.<sup>23</sup> The EU Survey on Income and Living Standards finds that households in the lowest income decile are three times more likely to report the presence of leaks, damp or rot as an indicator of poor-quality homes (Figure 4).<sup>24</sup> A recent study of the French residential sector specifically linked income to efficiency rating of the home and found that low-income households are more likely to live in homes of lower energy efficiency and thus require higher energy consumption per square-metre<sup>25</sup> (Appendix 2). This reveals how the limited

19 United Nations. *Sustainable Development Goals*. [Website]. Retrieved from <https://sustainabledevelopment.un.org/?menu=1300>

20 European Commission. (2017). *European Pillar of Social Rights – booklet*. Brussels, Belgium: Author. Retrieved from [https://ec.europa.eu/commission/publications/european-pillar-social-rights-booklet\\_en](https://ec.europa.eu/commission/publications/european-pillar-social-rights-booklet_en)

21 The 2019 Clean Energy for All Europeans package introduced new requirements for Member States to assess the number of households in energy poverty and, where relevant, to introduce an indicative objective, policies and measures to reduce the number. Member States are also required to report these actions in their National Energy and Climate Plans (NECPs). Energy poverty is also recognised in the two key EU energy efficiency directives. The Energy Performance of Buildings Directive (EPBD) requires that actions to alleviate energy poverty be outlined in national renovation strategies. The Energy Efficiency Directive, under Article 7, requires, to the extent appropriate, a share of measures (energy efficiency obligations or alternative measures) to be implemented to support vulnerable households, including those affected by energy poverty. Finally, the revised Renewable Energy Directive recognises the role of renewable energy communities to help fight energy poverty through reduced consumption and lower supply tariffs.

22 Reviews of the December 2018 draft National Energy and Climate Plans by the European Commission and by the Right to Energy Coalition found

that although a small number of Member States included good analyses, recognition of energy poverty was absent in the majority of draft plans. European Commission, 2019b; and Right to Energy Coalition. (2019). *Keeping the lights on*. Author. Retrieved from [https://righttoenergy.files.wordpress.com/2019/05/keeping-the-lights-on\\_-\\_energy-poverty-in-necps-1.pdf](https://righttoenergy.files.wordpress.com/2019/05/keeping-the-lights-on_-_energy-poverty-in-necps-1.pdf)

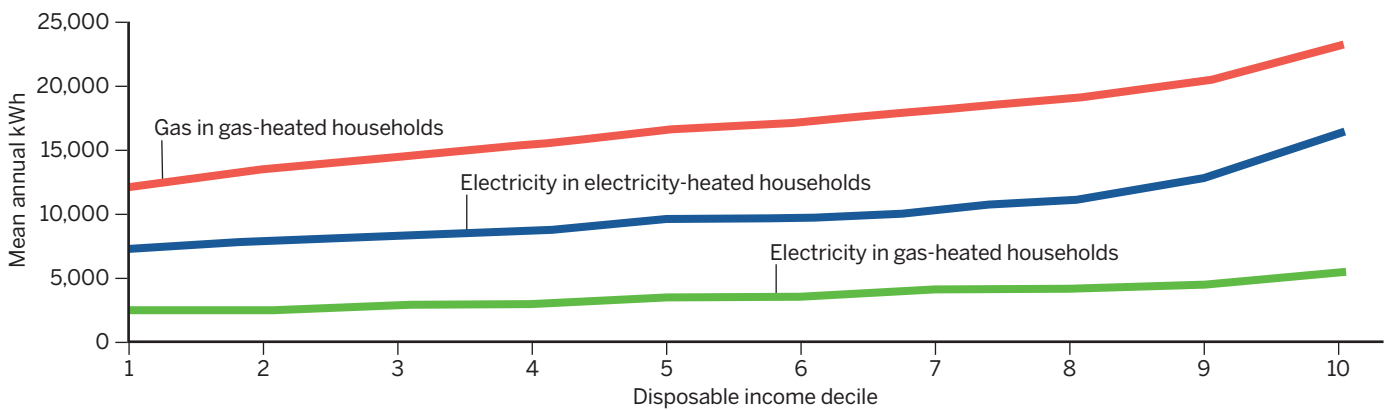
23 This is illustrated by the results of all four primary indicators of energy poverty chosen by the Energy Poverty Observatory and one secondary indicator that specifically identified dwelling quality. Retrieved from [www.energypoverty.eu/indicators-data](http://www.energypoverty.eu/indicators-data)

24 European Commission, Directorate General for Energy and EU Energy Poverty Observatory. *Total population living in a dwelling with a leaking roof, damp walls, floors or foundation, or rot in window frames or floor*. [Website]. Retrieved from [https://ec.europa.eu/eurostat/web/products-datasets/product?code=sdg\\_01\\_60](https://ec.europa.eu/eurostat/web/products-datasets/product?code=sdg_01_60). Data disaggregated by income provided by EPOV from EU SILC databases.

25 Bakaloglou, S. and Charlier, D. (2018). *Energy consumption in the French residential sector: How much do individual preferences matter?* [Working paper]. Paris, France: French Association of Environmental and Resource Economists. Retrieved from [http://faere.fr/pub/WorkingPapers/Bakaloglou\\_Charlier\\_FAERE\\_WP2018.05.pdf](http://faere.fr/pub/WorkingPapers/Bakaloglou_Charlier_FAERE_WP2018.05.pdf)



**Figure 5. Mean annual UK electricity and gas use by income decile, 2007-2009**



Source: Centre for Sustainable Energy. (2012). *Beyond average consumption*.

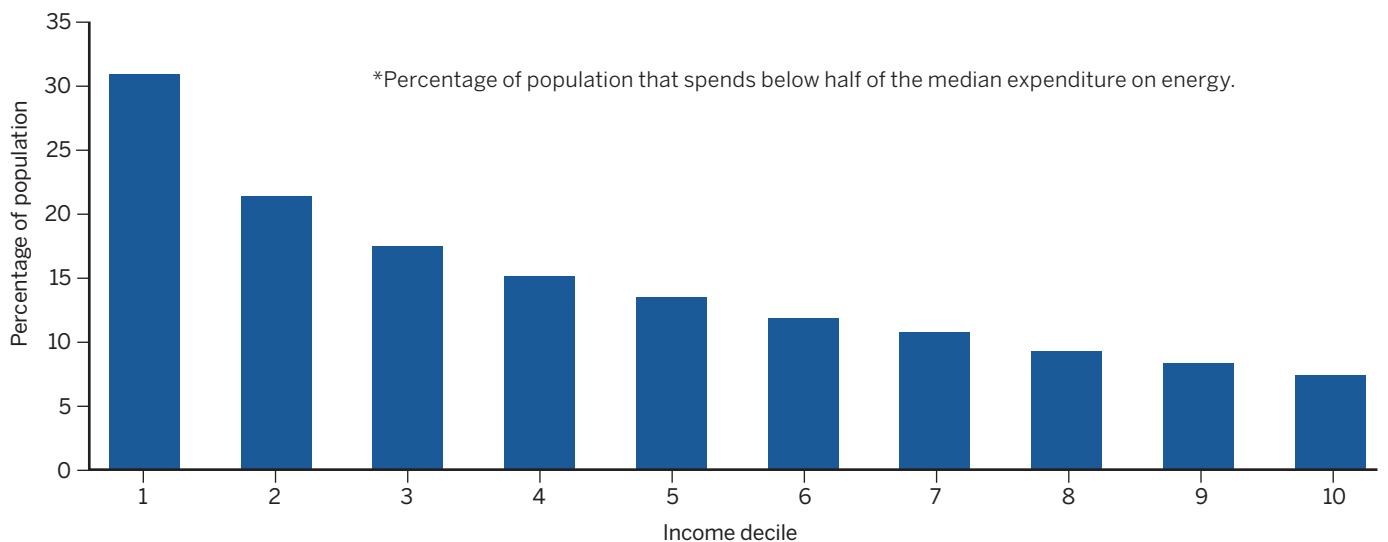
financial resources of low-income households, when in poor housing, are stretched further in an attempt to secure adequate levels of energy services. Poor-quality housing limits the ability of very low-income and energy-poor households to reduce energy use, even in response to price signals.

Despite living in inefficient homes, low-income households tend to be low consumers of energy for household heat and electricity, although significant clusters of

energy-poor households show high energy use.<sup>26</sup> Examining average gas and electricity use by income decile in the UK shows that consumption, particularly for heating, is lower for lower-income households (Figure 5).<sup>27</sup> European-level data on energy consumption are not available, but similar consumption patterns are also evident across all U.S. regions.<sup>28</sup>

As can perhaps be expected given the low energy use of low-income households, lower-income households also spend, on average, less on energy than higher-income

**Figure 6. Low absolute energy expenditure by income decile, 2010\***



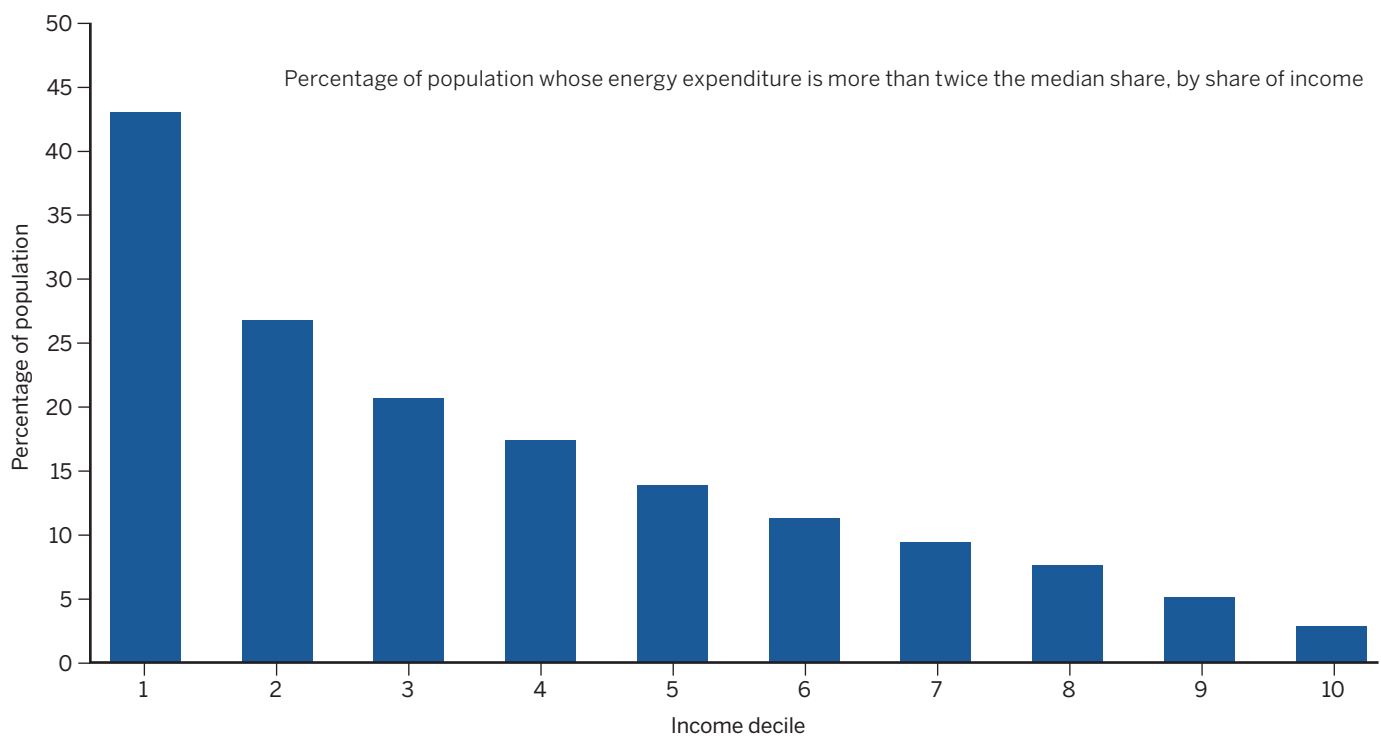
Source: European Commission, Directorate General for Energy and EU Energy Poverty Observatory. (2010). *Low absolute energy expenditure*.

26 Fawcett, T. (2016). *Policy and extreme energy consumption*. DEMAND Centre Conference, Lancaster, England. Retrieved from [www.demand.ac.uk/wp-content/uploads/2016/03/DEMAND2016\\_Full\\_paper\\_59-Fawcett.pdf](http://www.demand.ac.uk/wp-content/uploads/2016/03/DEMAND2016_Full_paper_59-Fawcett.pdf)

27 White, V., Roberts, S., and Preston, I. *Beyond average consumption - Development of a framework for assessing impacts of policy proposals on different consumer groups*. Final report to Ofgem. Bristol, England: Centre for Sustainable Energy. Retrieved from [www.ofgem.gov.uk/ofgem-](http://www.ofgem.gov.uk/ofgem-publications/75556/beyond-average-consumption-pdf)

[publications/75556/beyond-average-consumption-pdf](http://www.ofgem.gov.uk/ofgem-publications/75556/beyond-average-consumption-pdf)

28 Howat, J., Colgan, J., Gerlitz, W., Santiago-Moser, M., and Rábago, K. *Reversing energy system inequity: Urgency and opportunity during the clean energy transition*. Medium. Retrieved from <https://medium.com/getting-it-right-on-electricity-rate-design/reversing-energy-system-inequity-urgency-and-opportunity-during-the-clean-energy-transition-4986fb186655>

**Figure 7. High share of income on energy in Europe, 2010**

Source: European Commission, Directorate General for Energy and EU Energy Poverty Observatory. (2010). *High share of energy expenditure in income.*

households. Across the European population, higher percentages of low-income households spend significantly below the average on energy (Figure 6).<sup>29</sup> While energy-poor households tend to be low-energy consumers and have comparatively low absolute energy expenditure, their low-income status means what they do spend on energy represents a high proportion of income (Figure 7)<sup>30</sup> and a large part of the overall household budget.

These European average data mask a much more complex story when individual Member States are compared (as in Figure 8).<sup>31</sup> While average absolute energy expenditure by the poorest households across Europe is around €870 per annum, expenditure varies widely amongst Member States, from well below €500 in Bulgaria and Romania to around €2,300 in Denmark. When looking at energy expenditure

as a share of total household expenditure, wide variation between Member States also exists, with energy accounting for just 3% of expenditure in Sweden but 23% in Slovakia.<sup>32</sup> However, in the countries where the poorest households face the highest energy costs (right hand side of Figure 8), these costs represent a much smaller share of total household expenditure (below 10%). Conversely, in countries where the lowest income households spend comparatively less in absolute terms on energy (largely Eastern European countries to left-hand side of Figure 8), this expenditure represents a much greater percentage of overall household expenditure (around 13%-16%).

Based on the evidence in this high-level overview of the income, energy use and expenditure of energy-poor households, this paper focuses in the subsequent analysis on

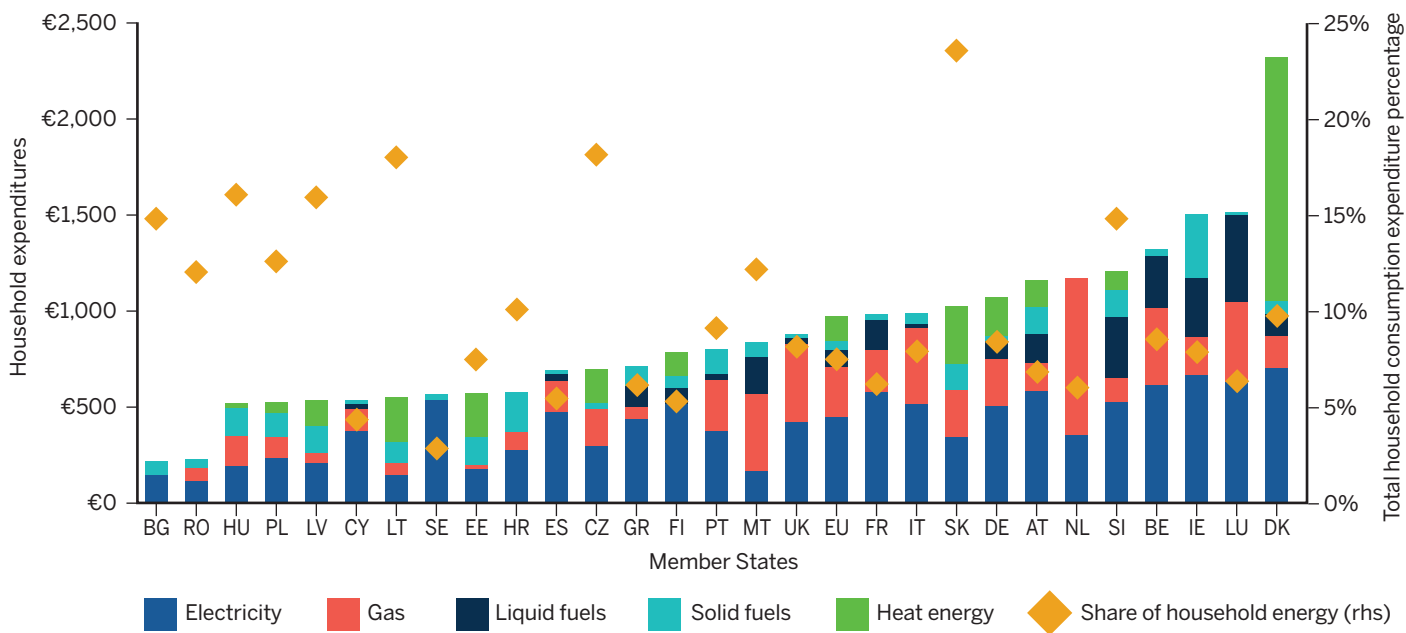
29 European Commission, Directorate General for Energy and EU Energy Poverty Observatory. (2010). *Low absolute energy expenditure (M/2)* [database]. Retrieved from [www.energy-poverty.eu/indicator?primaryId=1463](http://www.energy-poverty.eu/indicator?primaryId=1463)

30 European Commission, Directorate General for Energy and EU Energy Poverty Observatory. (2010). *High share of energy expenditure in income (2M)* [database]. Retrieved from [www.energy-poverty.eu/indicator?primaryId=1463](http://www.energy-poverty.eu/indicator?primaryId=1463)

31 European Commission, 2019c.

32 European Commission, 2019c.

Figure 8. Expenditures on home energy for EU households in the lowest income decile



Source: European Commission (2019). *Energy prices and costs in Europe*.

low-income and low-energy-use households, as a proxy for energy poverty.

The following chapters consider, one by one, the

non-energy, or regulated, components of gas and electricity bills: network fees, levies for clean energy programmes and carbon taxes.

# Chapter 2: The cost of energy infrastructure paid for through network fees

Consumers connected to gas and electricity distribution systems pay for this infrastructure through network fees applied to their bills. Network fees make up on average around one-quarter of household electricity and gas bills (Figure 1), but can be as much as 40% in some Member States (see Appendix 1), and have been rising as a proportion of the bill. Therefore, how the costs of the infrastructure are passed on to consumers has a significant bearing in the final bill. Network tariff design directly affects the final cost of the network to consumers in three ways: It affects the share of costs borne by different consumers, the incentive and ability for consumers to reduce their energy use and expenditure, and the long-term system investment costs.

## Energy distribution systems and their role in the energy transition

Energy distribution systems are investment-intensive infrastructures, gas pipelines more so than electricity grids (per metre). In line with EU guidelines, electricity and gas networks are unbundled from competitive supply businesses;<sup>33</sup> they are regulated infrastructures, with access to the networks, associated tariffs and revenues of network operators regulated by national regulatory agencies.

Networks play an important role in the energy transition. Modern electricity networks and smart operation are key to

the cost-efficient integration of renewable generation and of new market entrants, like prosumers.<sup>34</sup> They will enable the benefits of smart meters, demand-side flexibility and storage.<sup>35</sup> As such, electricity network costs can be expected to continue to rise.<sup>36</sup> The cumulative investment costs for the electricity network of the future are estimated at between €1.2 trillion and €1.4 trillion for transmission and distribution.<sup>37</sup>

Gas networks will also need to be modernised and adapted to decarbonise. A significant amount of domestic heating will need to be electrified, primarily by households switching from gas heating to heat pumps.<sup>38</sup> Policies to prevent new homes from being built with gas connections already exist in several European countries (e.g., UK and Ireland) and are likely to be replicated elsewhere. Going further, the Netherlands will start disconnecting homes from the gas grid as part of its commitment to phase out the use of fossil gas in homes by 2050.<sup>39</sup> Decarbonisation therefore implies the phase out of entire gas networks and adaptation to clean fuels for those that remain. As such, continued investment in gas infrastructure risks redundancy and stranded costs. Furthermore, as consumers move away from gas, the costs of the existing network will be shared amongst a shrinking pool of users. For the reasons outlined in Chapter 5, there is a risk that low-income and energy-poor households, which previously used gas as a low-cost heating fuel, will be trapped with increasing infrastructure and fuel costs.

33 European Commission, Directorate General for Energy. (2009). *Third energy package*. Brussels, Belgium: Author. Retrieved from <https://ec.europa.eu/energy/en/topics/markets-and-consumers/market-legislation/third-energy-package>

34 A prosumer is someone who both produces and consumes energy.

35 Council of European Energy Regulators. (2017). *Electricity distribution network tariffs: CEER guidelines of good practice*. Brussels, Belgium: Author. Retrieved from [www.ceer.eu/documents/104400/-/-/1bdc6307-7f9a-c6de-6950-f19873959413](http://www.ceer.eu/documents/104400/-/-/1bdc6307-7f9a-c6de-6950-f19873959413); and Client Earth. (2019). *Distribution network tariff design under the clean energy package*. Brussels, Belgium: Author. Retrieved from [www.documents.clientearth.org/wp-content/uploads/library/2019-12-04-distribution-network-tariff-design-under-the-clean-energy-package-legal-requirements-and-policy-impacts-ce-en.pdf](http://www.documents.clientearth.org/wp-content/uploads/library/2019-12-04-distribution-network-tariff-design-under-the-clean-energy-package-legal-requirements-and-policy-impacts-ce-en.pdf)

36 Kolokathis, C., Hogan, M., and Jahn, A. (2018). *Cleaner, smarter, sheaper: Network tariff design for a smart future*. Brussels, Belgium: Regulatory

Assistance Project. Retrieved from [www.raonline.org/knowledge-center/cleaner-smarter-cheaper-network-tariff-design-for-a-smart-future/](http://www.raonline.org/knowledge-center/cleaner-smarter-cheaper-network-tariff-design-for-a-smart-future/)

37 European Parliament Directorate General for Internal Policies. (2017). *European energy industry investments*. Brussels, Belgium: Author. Retrieved from [https://www.eesc.europa.eu/sites/default/files/files/energy\\_investment.pdf](https://www.eesc.europa.eu/sites/default/files/files/energy_investment.pdf)

38 Rosenow, J. and Lowes, R. (2020). *Heating without the hot air: Principles for smart heat electrification*. Brussels, Belgium: Regulatory Assistance Project. Retrieved from [www.raonline.org/knowledge-center/heating-without-hot-air-principles-smart-heat-electrification/](http://www.raonline.org/knowledge-center/heating-without-hot-air-principles-smart-heat-electrification/)

39 Government of the Netherlands. (2019). *Climate Agreement*. The Hague, Netherlands: Author. Retrieved from [www.government.nl/binaries/government/documents/reports/2019/06/28/climate-agreement/Climate+Agreement.pdf](http://www.government.nl/binaries/government/documents/reports/2019/06/28/climate-agreement/Climate+Agreement.pdf)

## Distribution of costs among groups of network users

Network users are made up of energy consumers and energy generators. Energy consumers connected to energy distribution systems pay most of the costs for the infrastructure. In some Member States, generators also pay a small share for the use of the infrastructure.

The tariff structures for passing on the costs of the distribution grid and the share of costs paid by different consumer groups vary greatly among Member States. A European Commission study on tariff design reports that the share of distribution network cost paid by residential consumers ranges from 33% to 69% for electricity and from 32% to 86% for gas.<sup>40</sup> The range is clearly significant but, as the consumption of power and gas by each consumer group (e.g., residential and industrial) also differs considerably among countries. The share of costs by consumer group alone is a weak indicator of fairness of cost allocation policies.

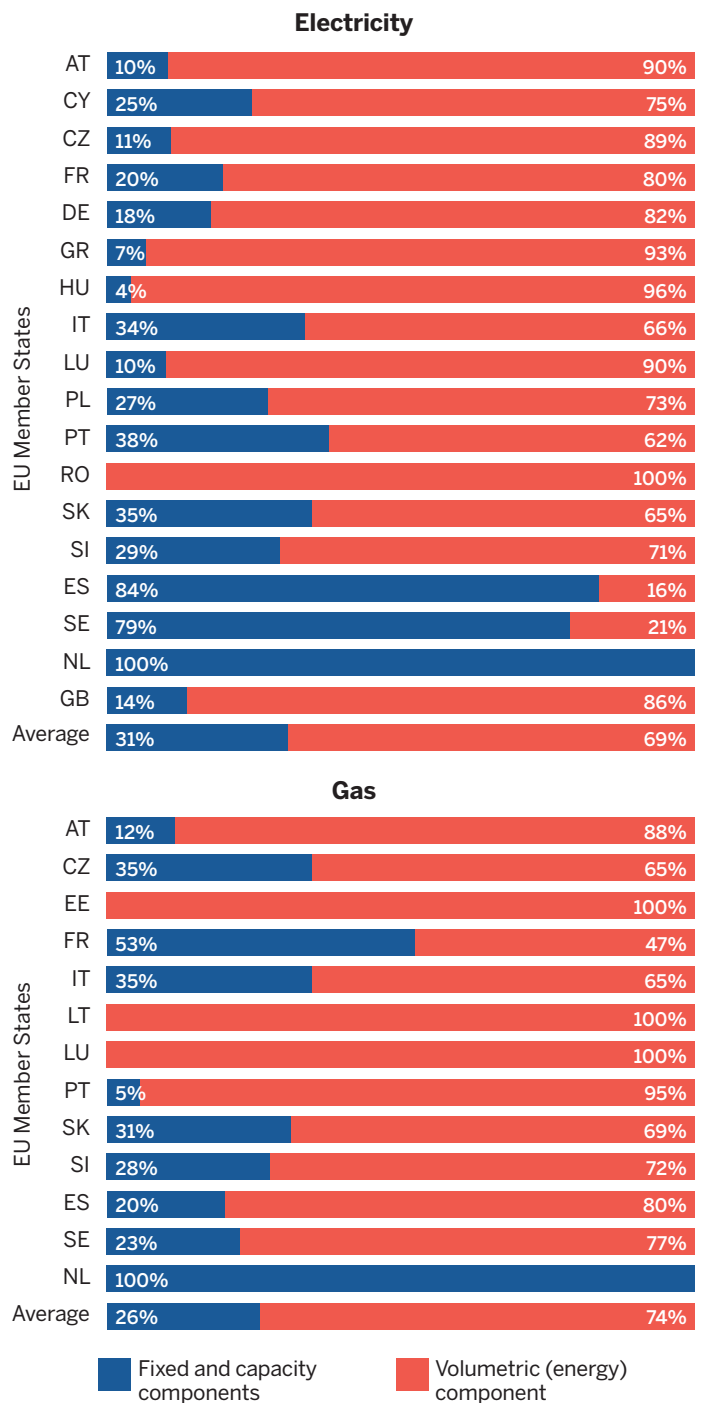
Comparing the share of network costs among consumer groups with the share of energy consumption of each group reveals a wide range of approaches. In some Member States, the share paid by industry is comparable to the energy share (e.g., Czech Republic); in others, the network costs borne by industry are much smaller (e.g., Romania), leaving a bigger share to be paid by other consumer groups.<sup>41</sup> The allocation of network costs among different consumer groups is the first lens through which to examine fairness of network cost pass-back. The second is the network tariff design that allocates costs among consumers within each group. The focus here is on the household consumer group.

## Network tariff design to distribute costs amongst household users

Network tariff design, for both gas and electricity, is the combination of a number of possible components into one tariff. These components can be described as:

- **Fixed or customer component:** Fees charged per customer every billing period that generally do not vary regardless of actual use.
- **Capacity or demand component:** Fees based on kW power draw during the billing period, usually a fixed

Figure 9. Ratio of components in network tariffs paid by EU households



Source: European Commission. (2015). Study on tariff design for distribution systems.

- charge based on the maximum peak energy demand by the consumer.
- **Volumetric energy component:** Fees based on kWh usage during the billing period.

40 European Commission. (2015). Study on tariff design for distribution systems. Brussels, Belgium: Author. Retrieved from <https://ec.europa.eu/energy/sites/ener/files/documents/20150313%20Tariff%20report%20>

fina\_revREF-E.PDF

41 European Commission, 2015.

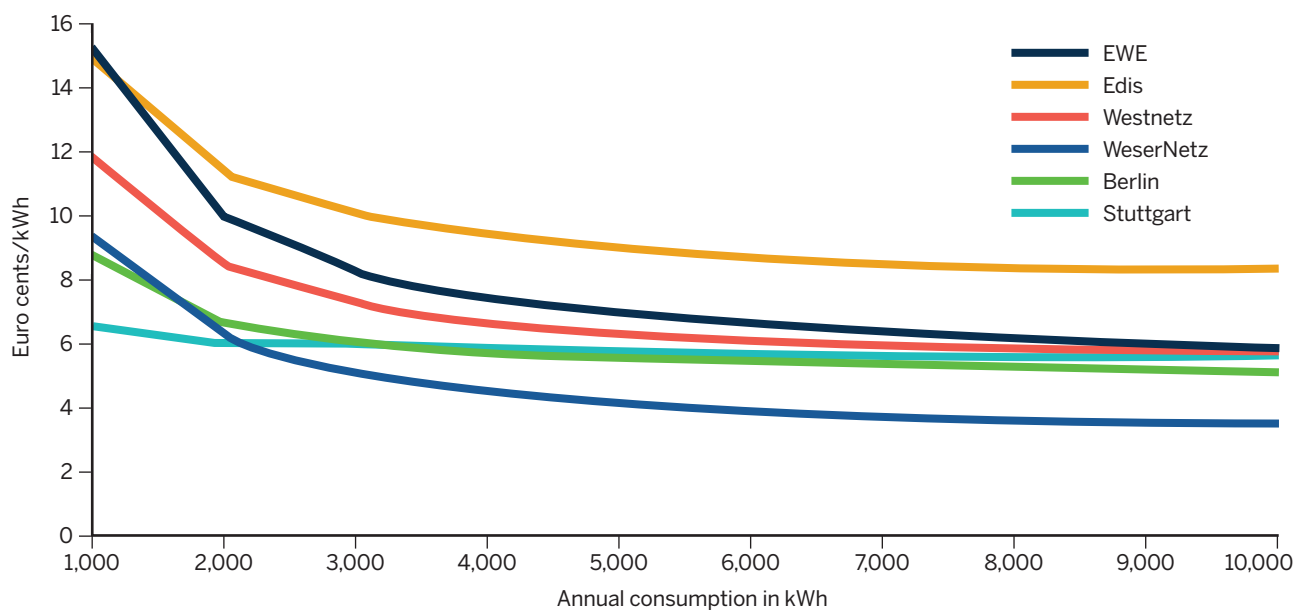
## The distributional effect of fixed fees

A uniform fixed tariff tends to shift costs from high-use consumers in a consumer group to low-use ones in proportion to their use of the infrastructure. In Germany, per unit of energy delivered, low-use consumers can pay up to 2.5 times more for network costs compared with high-use consumers.

Figure 10 shows the network costs paid per kWh of electricity for low-energy to high-energy consumers in six

German power distribution territories. The graph isolates the effect of fixed fees through inclusion of the Stuttgart, which is the only distribution territory of the six that does not apply any fixed fees.<sup>45</sup> The cost of the network in Stuttgart is relatively equal for energy consumers across all consumption levels. In the other five distribution territories, the lowest-energy consumers pay significantly more per kWh for infrastructure than high-energy consumers.

Figure 10. Network costs per kWh as a function of annual electricity consumption



Source: Regulatory Assistance Project and Agora Energiewende. (2018). *Netzentgelte 2018: Problematische Umverteilung zulasten von Geringverbrauchern*.

Network tariff design is based on the combination of these components.<sup>42</sup> The proportional weight given to each component has a crucial bearing on the costs for different consumers, the incentive for using energy efficiently and the overall efficiency of grid operations.<sup>43</sup>

The ways in which household consumers are charged for the use of the infrastructure varies as much as the share of costs among the consumer groups (Figure 9).<sup>44</sup> Figure 9

illustrates the breakdown of network fee only, not the entire energy bill. It illustrates the balance between fixed/capacity components and volumetric components in the network tariff design for each country. The make-up of network tariffs in Member States varies between high fixed fees to fees based solely on use (volumetric) for both electricity and gas. Some Member States charge household consumers for the networks through the use of fixed-capacity-only components

42 In addition, there are fees for metering, measuring and billing, but as these components are costs that are caused and paid individually, they are, in general, not considered as network costs, so not covered in this chapter.

43 Kolokathis, C., et al, 2018.

44 European Commission, 2015.

45 Jahn, A. and Graichen, P. (2018). *Netzentgelte 2018: Problematische Umverteilung zulasten von Geringverbrauchern*. Berlin, Germany: Regulatory Assistance Project and Agora Energiewende. Retrieved from [www.raponline.org/knowledge-center/netzentgelte-2018-problematische-umverteilung-zulasten-von-geringverbrauchern/](http://www.raponline.org/knowledge-center/netzentgelte-2018-problematische-umverteilung-zulasten-von-geringverbrauchern/)



**Table 1. Network fees for gas consumers without demand metering in Berlin, 2020**

For use up to (kWh/year)	Fixed fee (Euros/year)	Energy component (Euro cents/kWh)
<b>1,000</b>	13	1.68
<b>6,000</b>	18.71	1.11
<b>25,000</b>	21.71	1.07
<b>100,000</b>	50.27	0.95
<b>300,000</b>	69.08	0.93
<b>1,000,000</b>	367.20	0.83

Source: NBB Netzgesellschaft. (2020). *Network charges for the network area of NBB Netzgesellschaft Berlin-Brandenburg.*

(the Netherlands for both gas and electricity) and others charge by volumetric network fees only (Romania for power and Estonia, Lithuania and Luxembourg for gas).

Network fees in the gas sector are more differentiated among consumers than in the power sector. For electricity, network fees are usually the same for all households in a certain power distribution network. Within the gas system, network fees and the make-up of network tariffs are often based on more granular levels of use. This results in different types of fees for different households; for example households that use gas only for cooking may pay different types of fees than households that use gas for both heating and cooking. By way of illustration, the Berlin gas distribution network operator distinguishes the fixed fee and energy component on the basis of gas use per year, with higher use afforded lower kWh charges but higher fixed charges (Table 1).<sup>46</sup> Residential gas consumers would largely consume within the first three bands: 1,000-25,000 kWh/year in Table 1.

The design of network tariffs for both electricity and gas directly influences how network costs are distributed and provides very different incentives for consumers to minimise

the network element of their bills by changing their consumption. As is illustrated by the example on page 24, the distribution of total network costs between the fixed and volumetric components has a significant impact, with fixed fees resulting in low-energy users paying more in proportion to their use of the grid.

As the revenues of network operators are regulated, an increase of one component must be balanced by reducing another component (as shown in Table 1). When fixed fees are increased, consumers with higher consumption benefit most from reduced volumetric fees. In turn, the decrease of the volumetric fee disincentivises the efficient use of energy. When fixed (or capacity) fees dominate, different types of consumers who impose very different costs on the system, e.g., via different time of use, different amount of energy consumption or by different (time of) peak demand, all pay the same price for the network.

Under the volumetric fee structure, energy prosumers — i.e., those who produce some of the energy they consume, from rooftop photovoltaics for example — may be able to substantially reduce the number of kilowatt-hours delivered by the network and thus significantly reduce their network costs. In this situation, the remaining network users are left to pay the network costs avoided by the self-generator.<sup>47</sup> An argument is often made for fixed or capacity fees to protect remaining network users from additional costs as a result of self-generating consumers (usually higher-income consumers) avoiding the costs of the network.<sup>48</sup> However, although a fixed/capacity fee structure could be effective to protect the average consumer, below-average or low-energy consumers on balance are still worse off as a result of a switch to network tariffs dominated by fixed or capacity components.<sup>49</sup>

Recent studies carried out by from the Regulatory

46 NBB Netzgesellschaft. (2020). *Network charges for the network area of NBB Netzgesellschaft Berlin-Brandenburg including cost sharing.* [Website]. Retrieved from [www.nbb-netzgesellschaft.de/fileadmin/public/2\\_NBB\\_DownloadCenter/1\\_Kunden/Transportkunden/Netznutzungsentgelte\\_NNE/NNE\\_NBB\\_01012020.pdf](http://www.nbb-netzgesellschaft.de/fileadmin/public/2_NBB_DownloadCenter/1_Kunden/Transportkunden/Netznutzungsentgelte_NNE/NNE_NBB_01012020.pdf)

47 The National Energy Association in the UK estimated the impact on non-FIT users in the UK to be around £20 per annum or 1.5% of the bill. Frerk, M. and MacLean, K. (2017). *Heat decarbonisation: potential impacts on social equity and fuel poverty.* Newcastle upon Tyne, England: National Energy Association. Retrieved from [www.nea.org.uk/wp-content/uploads/2017/09/Heat-Decarbonisation-Report-2017.pdf](http://www.nea.org.uk/wp-content/uploads/2017/09/Heat-Decarbonisation-Report-2017.pdf)

48 Bardt, H., Flues, F., Gawel, E., Heindl, P., Korte, K., Löschel, A., et al. (2012). *Verteilungswirkungen des Erneuerbare-Energien-Gesetzes* [Distributional effects of the Renewable Energy Sources Act]. Hamburg, Germany: Wirtschaftsdienst. Retrieved from [www.wirtschaftsdienst.eu/inhalt/jahr/2012/heft/8/beitrag/verteilungswirkungen-des-erneuerbare-energien-gesetzes.html](http://www.wirtschaftsdienst.eu/inhalt/jahr/2012/heft/8/beitrag/verteilungswirkungen-des-erneuerbare-energien-gesetzes.html)

49 Jahn, A. (2014). *Netzentgelte in Deutschland: Herausforderungen und Handlungsoptionen.* Berlin, Germany: Agora Energiewende and Regulatory Assistance Project. Retrieved from [www.raponline.org/knowledge-center/netzentgelte-in-deutschland-herausforderungen-und-handlungsoptionen/](http://www.raponline.org/knowledge-center/netzentgelte-in-deutschland-herausforderungen-und-handlungsoptionen/)

Assistance Project (RAP)<sup>50</sup> and ClientEarth<sup>51</sup> found that several Member States are shifting network tariff design to favour fixed or capacity fees over volumetric fees. In Germany, fixed fees for residential consumers increased by around 50% from 2013 to 2016; in some network areas, they now account for more than 50% of the total network component of the bill for low-use households.<sup>52</sup> In Spain, the main fixed component increased from 32% to 60% of the network charges for households between 2013 and 2014.<sup>53</sup> A similar trend is observed in Italy, where the fixed charge increased threefold between 2016 and 2018.

## Key findings

**When fixed fees dominate, they disadvantage low-energy-use consumers.** Fixed fees result in low-use consumers paying more in proportion to their use of the network, thereby placing on them a greater burden of system costs. Conversely, a flat volumetric (€/kWh) network fee distributes network costs based on energy use, which is more equitable.

**High fixed or capacity fees for electricity can lead to higher total infrastructure system costs for all.** A shift to fixed or capacity-based fees undermines consumer engagement in energy efficiency and leaves a larger proportion of the bill that consumers cannot influence through energy efficiency or demand response. Fixed or capacity-based fees therefore promote uneconomic consumption of electricity. The higher level of demand at times of high stress on the grid requires greater excess capacity in the network, and thus greater investment than is necessary. Ultimately, high levels of fixed fees can

lead to excessive investment in infrastructure that is then underutilised. Higher investments lead to higher costs for all.

**The decarbonisation of heat will require significant changes to the gas infrastructure and the costs of the gas network will be shared among a smaller pool of users.**

Gas network tariff regulation needs to prepare for three significant changes: a reduced length of time over which to recoup investments;<sup>54</sup> a smaller volume of gas through which to recoup costs, and a smaller pool of consumers across which costs can be distributed.

## Recommendations

- Network tariffs should be designed to ensure that consumers' contribution to network costs reflects their use of the network, both in the amount of energy they use and the time of use.
- Use of fixed fees in network tariffs should be limited. Fixed fees disincentivise energy efficiency and demand response, and place a greater burden on low-use (low-income) energy consumers, ultimately impeding the energy transition.
- No new investments in gas infrastructure should take place without an analysis that takes into account Efficiency First principles,<sup>55</sup> and a route map for the decarbonisation of heat by 2050.
- Gas network regulation must plan for the expected reduction in system use and the cost to remaining consumers — particularly low-income and vulnerable consumers — and ensure future costs of infrastructure are distributed fairly between current and future consumers and cost shocks are avoided.

50 Kolokathis, C., et al, 2018.

51 Client Earth, 2019.

52 Jahn, A. (2017). *Are fixed charges an answer to tariff design challenges?* Delegation from Minnesota/Illinois. [Presentation]. Retrieved from [www.raonline.org/wp-content/uploads/2017/07/rap-jahn-tariff-design-MN-IL-2017-july-12.pdf](http://www.raonline.org/wp-content/uploads/2017/07/rap-jahn-tariff-design-MN-IL-2017-july-12.pdf)

53 This refers to the capacity component of the tariffs for Spanish residential consumers.

54 RIIO GD1 is the UK gas and electricity regulator ofgem's performance-based regulation scheme for gas distribution price control, covering the period 2013-2021. GD1 contains measures to front load the depreciation profile and to limit gas investments to those with a relatively shorter payback. Frerk, M, et al, 2017.

55 Bayer, E. (2018). *Energy efficiency first: A key principle for energy union governance*. Brussels, Belgium: Regulatory Assistance Project. Retrieved from [www.raonline.org/knowledge-center/energy-efficiency-first-key-principle-for-energy-union-governance/](http://www.raonline.org/knowledge-center/energy-efficiency-first-key-principle-for-energy-union-governance/)

## ‘Keeping the lights on:’ Electricity resource adequacy at least cost to consumers

In a growing number of Member States, new costs are being added to consumer bills through an often-invisible special charge intended to cover the costs of electricity resources needed to ‘keep the lights on’.

‘Capacity remuneration mechanisms’ (CRMs) are intended to secure ‘resource adequacy’ — i.e., that electricity supply resources are adequate, with a given level of confidence, to serve demand at all times and in all places. The most popular type of CRM is a market-wide capacity market. This is an administrative mechanism that determines a quantity of capacity needed at some point in the future, based on the available mix of resources, projected peak demand and a given level of confidence. It then allows existing and proposed new capacity that meets a set of qualifications to compete for financial commitments of varying lengths of time to provide the capacity. Four Member States (France, Ireland, Italy and Poland) and the UK have capacity markets in place; more are planning to implement them (e.g., Belgium and Lithuania).

However, evidence is building that CRMs place unnecessary costs on consumers (and create greater cost burdens for low-income consumers), lock in fossil generation and fail to take advantage of demand-side solutions, which are often least cost options.

Greenpeace estimated the cost of CRMs across Europe in 2018 to be €32.6 billion (Figure 11), with governments having committed to a further €25.7 billion to 2040,<sup>56</sup> an amount that has further increased since this analysis was undertaken. For example, Poland implemented a CRM as of 2018, in which the total costs for capacity payments are approximately €8 billion.<sup>57</sup> Italy implemented a CRM (auctions took place in late 2019), with the costs of around

€2.8 billion to secure supplies in two years (2022, 2023).<sup>58</sup>

Maintaining resource adequacy has been a major flashpoint in deliberations regarding the energy transition because it implies the need to retire and replace — in a relatively short time — the high-carbon generation on which the system has relied. Historically, the challenge of resource adequacy was met principally by maintaining a margin of generating capacity above the highest expected load. As the mix of resources becomes ever more variable, producing electricity only when the wind blows and the sun shines, the resource adequacy challenge becomes more multifaceted. It now requires not just a quantity of resource capacity but also a mix of resource capabilities that can — under a wide range of supply and demand conditions — meet demand efficiently and cost-effectively with a certain level of confidence. Rather than simply calculating kilowatts of capacity, the challenge is becoming one of flexible energy and system services.

The CRM approach is essentially designed to solve yesterday’s resource adequacy problem — i.e., to secure a given margin of capacity above peak demand, regardless of whether the resulting mix of resource capabilities provides a cost-effective means of meeting demand in every hour of the year or meets decarbonisation objectives. As a result, CRMs tend to:

- Lock in far more legacy fossil generation than needed. Greenpeace estimates that over 90% of resources that have or will receive CRM-based payments are fossil-fuelled, and nearly all pre-exist CRM implementation.
- Procure more generation than consumers value and obscure the cost. Responsible for delivering electricity resources to ‘keep the lights on,’ CRM administrators

56 Greenpeace. (2018). Exposed: €58bn in hidden subsidies for coal, gas and nuclear. [Press Release]. Retrieved from [www.greenpeace.org/eu-unit/issues/climate-energy/1519/exposed-e58-billion-in-hidden-subsidies-for-coal-gas-and-nuclear/](http://www.greenpeace.org/eu-unit/issues/climate-energy/1519/exposed-e58-billion-in-hidden-subsidies-for-coal-gas-and-nuclear/)

57 Around half of these costs are for capacity contracted in 2021-2023, but extend out to 2037. The costs of the CRM will further increase as Poland runs more auctions to secure capacity. Gawlikowska-Fyk, A. (2019). *Capacity market for review: Analysis of the results of three auctions.*

Warsaw, Poland: Forum Energii. Retrieved from <https://forum-energii.eu/en/analizy/rynek-mocy-do-przegladu>

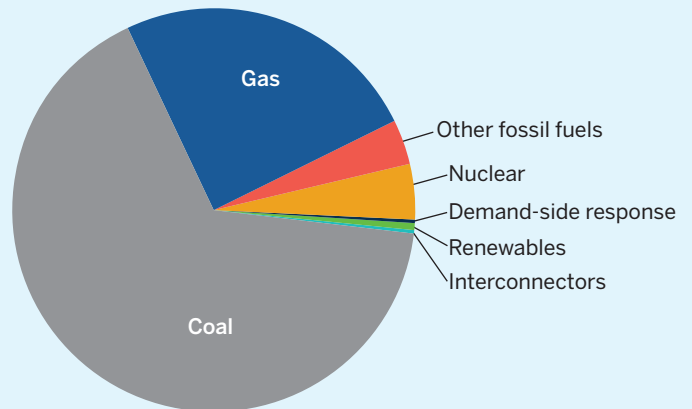
58 The first auction (delivery 2022) has a total cost of around €1.3 billion (results available at [https://download.terna.it/terna/News%20esiti%20capacity\\_8d764417c2f7a39\\_8d764519d9502c7.pdf](https://download.terna.it/terna/News%20esiti%20capacity_8d764417c2f7a39_8d764519d9502c7.pdf)) and the second auction (delivery 2023) has a total cost of around €1.45 billion (results retrieved from [https://download.terna.it/terna/Esiti%20asta%202023\\_8d775015d3860f3.pdf](https://download.terna.it/terna/Esiti%20asta%202023_8d775015d3860f3.pdf))

have an incentive to overbuy resources, and then socialise the cost of doing so, and face few institutional restraints. In the UK market alone, excess capacity has recently been estimated to add £276 million in costs to consumers every year.<sup>59</sup>

- Exclude many emerging solutions, particularly on the demand side. The technical requirements for participating in CRMs — and the energy price suppression resulting from the oversupply they encourage — block the entry of a multitude of innovative, low-cost solutions.
- Buy the cheapest capacity rather than the most valuable reliability solutions. CRMs have little or no potential for differentiating resources based on their ability to deliver the wide range of operational capabilities needed at a reasonable cost to consumers (e.g., the ability to turn on and off or to vary production quickly).

To date, the results of CRMs are persistent surplus generating capacity, mismatches between the operational limitations of legacy generation and the changing needs of the system, limited participation by demand-response solutions, and high costs for consumers.

**Figure 11. Available data on fuel sources receiving capacity payments**



Source: Greenpeace. (2018). *Exposed: €58 billion in hidden subsidies for coal, gas and nuclear.*

### Recommendation

Member States should promote market reforms that enable reliability in the electricity system at least cost<sup>60</sup> — following Efficiency First principles. Reforms can include establishing appropriate price signals and enabling and promoting demand-side flexibility. Where CRMs are in place, market design must permit all resources, particularly demand-side solutions, to participate on an equal footing.

59 Baker, P. and Hogan, M. (2019). UK capacity market deja vu: A solution that's still in search of a problem. [Blog post]. Regulatory Assistance Project. Retrieved from [www.raonline.org/blog/uk-capacity-market-deja-vu-solution-still-search-of-problem/](http://www.raonline.org/blog/uk-capacity-market-deja-vu-solution-still-search-of-problem/)

60 Hogan, M. (2016). *Hitting the mark on missing money: How to ensure reliability at least cost to consumers.* Brussels, Belgium: Regulatory Assistance Project. Retrieved from [www.raonline.org/wp-content/uploads/2016/09/rap-hogan-hitting-mark-missing-money-2016-september.pdf](http://www.raonline.org/wp-content/uploads/2016/09/rap-hogan-hitting-mark-missing-money-2016-september.pdf)

# Chapter 3: Levies for clean energy programmes

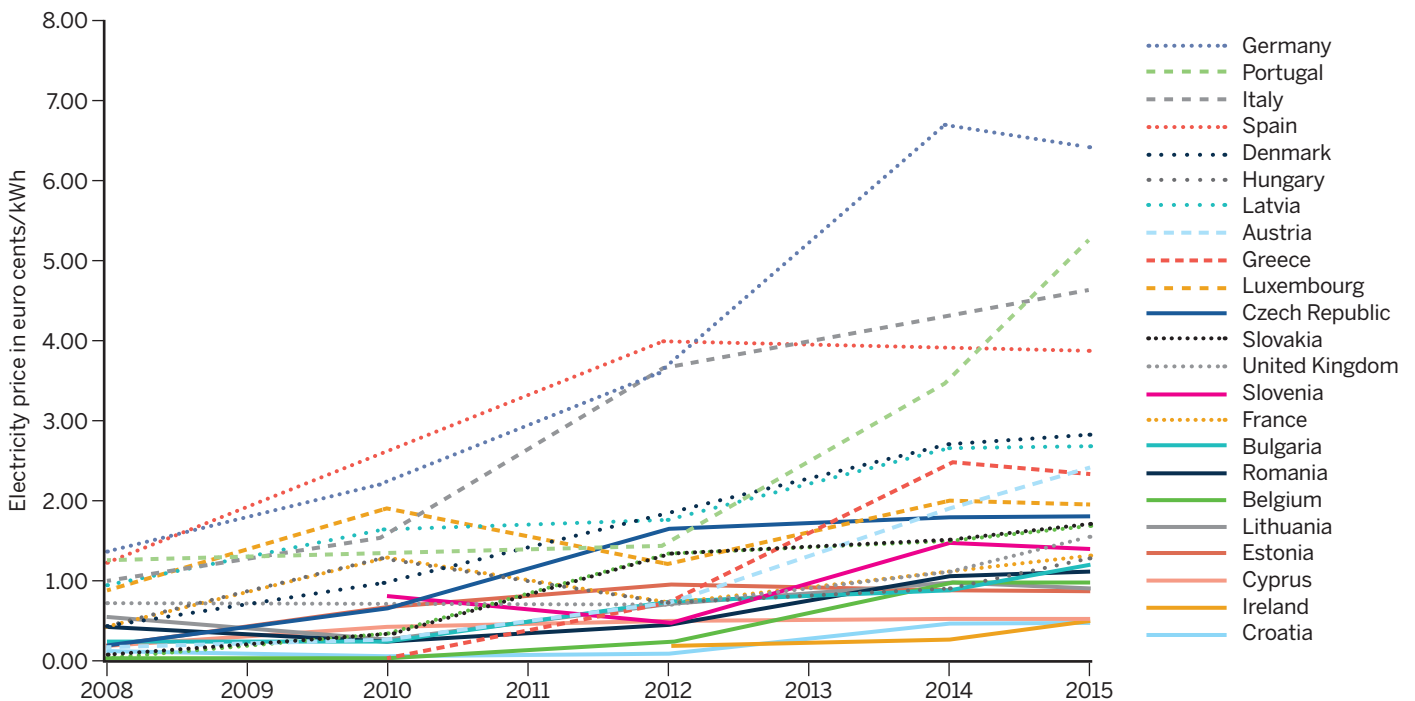
**M**any Member States pay for clean energy programmes through a surcharge levied on energy bills. Levies are usually independent from national budgets and fiscal cycles and thereby provide a separate revenue stream for funding investments in low-carbon technologies and energy efficiency. Depending on whether levies are regulated (for example, as part of network tariffs), governments may or may not have direct control over the amount of the levy in a given year. That said, as governments design policies funded by levies, they have an indirect impact on the amount of the levy because it reflects the costs of the policies.

On average, levies account for 13% of European household consumer electricity bills (Figure 1); in some countries (e.g., UK, Denmark and Portugal), they account for more than 20%.

## Types of clean energy programmes paid for through levies on energy bills

Levies are used, in the main, to support renewable energy, combined heat and power (CHP) and energy efficiency programmes. Renewable energy support is the most common policy to be financed by levies, usually in the form of feed-in tariffs, feed-in premiums, green certificates and investment grants. The primary aim of renewable energy levies is to increase renewable energy penetration in the electricity mix and reduce future purchase costs of technologies. In 2016, the cost of supporting renewable electricity across Europe was €57 billion.<sup>61</sup> While this total annual cost increased between 2008 and 2014 (in some countries quite significantly), it has largely levelled off (Figure

Figure 12. Renewable energy and CHP cost components in electricity retail prices for EU households, 2008-2015



Source: Directorate-General for Energy, referenced in Ecofys. (2016). *Prices and costs of EU energy*.

61 European Commission, 2019c.

62 Grave, K., et al (Ecofys), 2016.

12).<sup>62</sup> A 2018 study by the Council of European Energy Regulators (CEER) found that 19 Member States, UK and Norway<sup>63</sup> use levies to fund their renewable energy support mechanisms.

Energy efficiency obligations (EEOs) require energy companies to fund the installation of energy efficiency measures in homes and businesses and, to some extent, in the transport sector. Fourteen Member States and the UK have implemented EEOs.<sup>64</sup> In almost all cases, the costs of delivery are passed on to final consumers through energy bills, either through a regulated cost-recovery mechanism or priced in as an additional cost to the energy company.

## Levy design and cost recovery

Levies are determined using a variety of mechanisms. According to an EU survey conducted by CEER, in seven countries, the regulator determines the value of the renewables levy; in five, it is the government; in Denmark, Germany and Hungary, it is the transmission system operators; and, in Sweden, the electricity supplier.<sup>65</sup>

There is limited information on how the costs of levy-funded programmes (for both renewables and energy efficiency) are charged through to final consumers and to what extent the amount is determined per customer (a fixed fee) or per kWh (volumetric charges) — or as a combination of the two. In principle, in the pass-on of levies, the same arguments against using a fixed charge, as outlined in relation to network tariffs, apply. Evidence from the UK suggests that energy companies, due to the commercial reality of cost-recovery practices, may disproportionately pass costs on to consumers who do not have a history of frequently switching energy tariffs or supplier.<sup>66</sup> Because less affluent, more vulnerable groups are over-represented in non-switching

groups in the UK, there is increased potential for the cost burden to be greater for low-income consumers.<sup>67</sup>

The share of such levies in relation to the overall energy price — and therefore the impact on bills — varies significantly among countries and, importantly, fuels:<sup>68</sup>

- Levies are more commonly applied to electricity bills as opposed to other fuels, although Italy, the Netherlands and Slovenia additionally raise financing for renewable energy and CHP policies via gas bills.
- In Germany, Italy, Portugal and Spain, support payments for renewable energy and CHP add more to households' electricity bills than value-added tax (VAT).
- Finland, Malta and Poland do not use levies on household electricity bills for renewable energy and CHP support schemes.
- Very few EU Member States report adding levies for clean energy programmes to heating oil, petrol and diesel.

As the policy costs of levy-funded energy programmes are more often attached to electricity bills, the current practice disproportionately increases electricity prices while keeping prices of fossil fuels — such as gas and heating oil — comparably lower. The disparity is problematic as it disincentivises fuel switching through the adoption of cleaner, electricity-based technologies such as heat pumps.

## Which energy consumers contribute to the cost of levy-funded programmes

Most Member States apply exemptions (full or partial) that excuse particular consumer groups from contributing to the cost of renewable energy support schemes, which can increase the financial burden for non-exempted consumers.

63 Council of European Energy Regulators. (2018). *Status Review of Renewable Support Schemes in Europe for 2016 and 2017*. Brussels, Belgium: Author. Retrieved from [www.ceer.eu/documents/104400/-/80ff3127-8328-52c3-4d01-0acb2d3bed](http://www.ceer.eu/documents/104400/-/80ff3127-8328-52c3-4d01-0acb2d3bed). Slovakia, Slovenia not surveyed

64 Many EEOs came as a result of the introduction of the Energy Efficiency Directive, Article 7 of which requires EU Member States to either put in place EEOs or alternative policy measures delivering equivalent savings. Only five EU countries had an EEO in place before its introduction.

65 CEER, 2018.

66 Preston, I., White, V., and Guertler, P. (2010). *Distributional impacts of UK climate change policies: Final report to eaga Charitable Trust*. Bristol and London, England: Centre for Sustainable Energy and Association for the

Conservation of Energy. Retrieved from [www.cse.org.uk/downloads/reports-and-publications/policy/energy-justice/distributional\\_impacts\\_of\\_uk\\_climate\\_change\\_policies\\_june\\_2010.pdf](http://www.cse.org.uk/downloads/reports-and-publications/policy/energy-justice/distributional_impacts_of_uk_climate_change_policies_june_2010.pdf); referenced in broader discussion in Rosenow, J., Platt, R., and Flanagan, B. (2013). Fuel poverty and energy efficiency obligations. The case of the Supplier Obligation in the UK. *Energy Policy* 62, pp. 1194–1203. Retrieved from [http://eng.janrosenow.com/uploads/4/7/1/2/4712328/fuel\\_poverty\\_and\\_energy\\_efficiency\\_oblig.pdf](http://eng.janrosenow.com/uploads/4/7/1/2/4712328/fuel_poverty_and_energy_efficiency_oblig.pdf)

67 Corfe, S. and Keohane, N. (2018). *Eliminating the poverty premium in energy: A report for the Joseph Rountree Foundation*. London, England: Social Marketing Foundation. Retrieved from [www.smf.co.uk/wp-content/uploads/2018/04/Eliminating-the-poverty-premium-in-energy.pdf](http://www.smf.co.uk/wp-content/uploads/2018/04/Eliminating-the-poverty-premium-in-energy.pdf)

68 Grave, K., et al (Ecofys), 2016.



Most commonly (12 of 27 Member States), exemptions are applied to energy-intensive industries as a means of preserving their international competitiveness.<sup>69</sup> State Aid Rules allow renewables levies or costs on bills to be discounted by up to 85% for a large number of industries,<sup>70</sup> a ruling that consumer groups criticise for placing a greater cost burden on other consumers and for being insufficiently attuned to supporting competitiveness.<sup>71</sup>

Three examples of arguably more socially fair exemptions include the partial or full exemption of low-income households (Austria), of households and small enterprises (Hungary), and of high-energy consumers that commit to certain energy efficiency improvements (the Netherlands).<sup>72</sup>

## How the benefits of levy-funded programmes are shared

Two types of benefits are created by schemes that promote energy efficiency or renewable energy. The first are the, often overlooked, system or societal benefits and second are the private benefits delivered to a participant.

### System and societal benefits

Investments in energy efficiency and renewable energy programmes can deliver significant benefits to the energy system, technologies and markets, and environmental quality and public health.

Investments in energy efficiency are a cost-effective means of reducing overall demand and therefore total system costs. Reduced system costs mean reduced costs passed on

through energy bills. Over time, those avoided costs will indirectly benefit everyone, including low-income and fuel-poor households.<sup>73</sup> A 2010 study of a Vermont levy-funded efficiency programme illustrates this point. A calculation of the costs of energy savings, benefits to all system users and to participants in the programme, shows that even for non-participating households, the value in savings exceeded what they paid (example on page 32). Evaluation of the EEO in the UK estimated the cost to be approximately 3% of the household energy bill in 2013 but showed it would have the effect of reducing consumer bills by 9% in 2020.<sup>74</sup>

Renewable energy investment also produces system benefits — reduced technology costs, reduced wholesale energy prices, other system benefits such as avoided line losses from well-located decentralised energy and various non-energy benefits — that should be balanced against the costs.

Policies to incentivise renewables installations have been credited with dramatically reducing the levelised cost of installed renewable technologies, particularly solar photovoltaic.<sup>75</sup> To understand the full system or societal benefit, it is necessary to not only capture the value of installations directly supported by the levy-funded programme but also the benefit of future renewables that will be introduced as an indirect result of it. These are investments that will become financially viable as a result of technology costs reductions triggered.

Investment in renewable energy also reduces the wholesale energy price for all consumers. Data from across

69 CEER, 2018.

70 European Commission. (2014). *Guidelines on State aid for Environmental protection and Energy 2014-2020, section 3.7.2*. Brussels, Belgium: Author. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52014XC0628%2801%29>

71 Goyens, M. (2019). Letter from Bureau européen des unions de consommateurs (BEUC) to Johannes Laitenberger, Director General, Directorate General Competition. Future State aid decisions related to energy must better protect the interest of consumers. Retrieved from [www.beuc.eu/publications/beuc-x-2019-044\\_letter\\_to\\_mr\\_laitenberger\\_guidelines\\_on\\_state\\_aid.pdf](http://www.beuc.eu/publications/beuc-x-2019-044_letter_to_mr_laitenberger_guidelines_on_state_aid.pdf)

72 CEER, 2018.

73 International Energy Agency (2014). *Capturing the multiple benefits of energy efficiency*. Paris, France: Author. Retrieved from <https://webstore.iea.org/capturing-the-multiple-benefits-of-energy-efficiency>

74 Rosenow, J. and Cowart, R. (2017). *Benefits to consumers and climate of Article 7 of the Energy Efficiency Directive*. Brussels, Belgium: Regulatory Assistance Project. Retrieved from [www.raponline.org/wp-content/uploads/2017/03/rap-rosenow-cowart-article7-benefits-2017-march.pdf](http://www.raponline.org/wp-content/uploads/2017/03/rap-rosenow-cowart-article7-benefits-2017-march.pdf); or Department of Environment and Climate Change. (2013). *Estimated impacts of energy and climate change policies on energy prices and bills: 2013*. London, England: Author. Retrieved from [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/172923/130326\\_-\\_Price\\_and\\_Bill\\_Impacts\\_Report\\_Final.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/172923/130326_-_Price_and_Bill_Impacts_Report_Final.pdf)

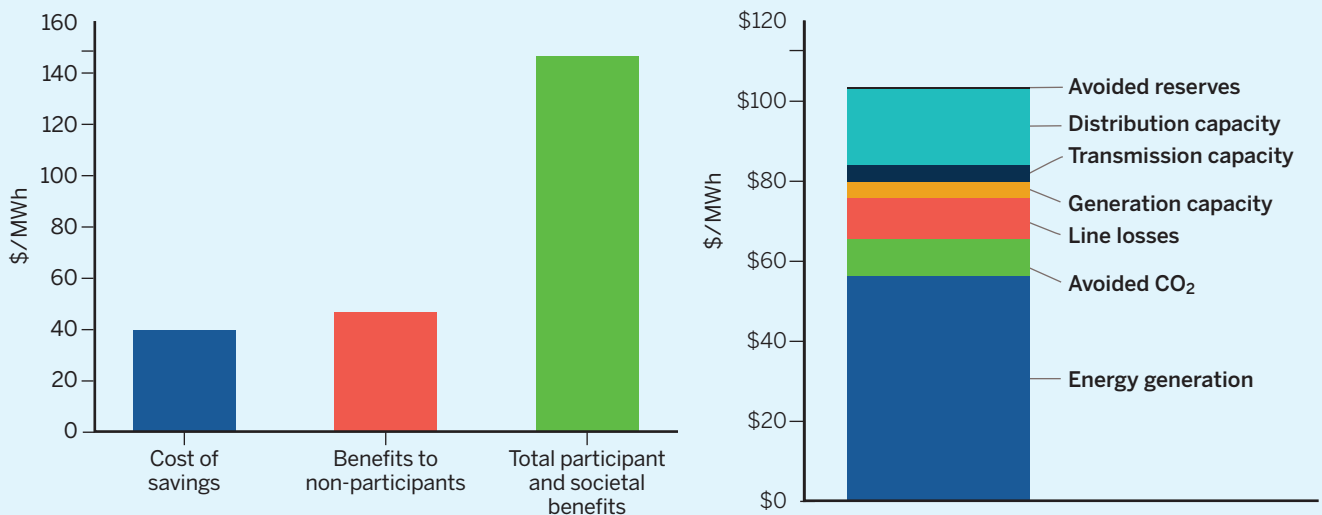
75 The JRC found that photovoltaic costs for residential installations in Germany had fallen by a factor of 10 since 2000, SolarPower Europe reports that in 2019 solar power could be generated at a cost energy of between €0.05-€0.03/MWh in Europe and that this price is expected to continue to fall to just 0.02-0.01/MWh by 2050. Jaeger-Waldau, A. (2019). *PV status report 2019*. Luxembourg: Joint Research Council. Retrieved from <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/pv-status-report-2019>; and SolarPower Europe. (2019). *EU market outlook for solar power 2019-2023*. Brussels, Belgium: Author. Retrieved from <https://www.solarpowereurope.org/eu-market-outlook-for-solar-power-2019-2023/>

### Efficiency Vermont programme delivers benefits to all consumers that outstrip costs

The state of Vermont applies a volumetric charge (levy) to consumer electricity bills and uses this revenue to form the budget of the energy efficiency utility, Efficiency Vermont. The Vermont Public Service Board determines both the energy efficiency charge and the energy efficiency budgets, pursuant to law that requires that all cost-effective end-use energy efficiency in the sector be acquired. Efficiency Vermont is then contracted to deliver on energy efficiency targets (based on a study of efficiency potential). Measures implemented include: energy efficient technologies, appliances, lighting, fuel substitution and whole building retrofits.<sup>76</sup>

In 2010, the cost of saved energy incurred by the obligation was \$39/MWh. The total participant/private and system/societal benefits were significantly higher, just over \$147/MWh saved (Figure 13). Of those benefits, \$47/MWh accrued to all power market customers, participants and non-participants alike, through system savings including lower reserve margins, avoided transmission and distribution upgrades, avoided line losses and avoided environmental costs.<sup>77</sup> Therefore, benefits outweighed the costs by \$8/MWh. This study did not capture the significant social, economic, environmental quality, health and amenity (i.e., non-energy system) benefits that the efficiency investments provide.

**Figure 13. Illustrative source and allocation of benefits of a cost-effective energy efficiency obligation, Efficiency Vermont**



Source: Regulatory Assistance Project. (2016). *Toolkit for energy efficiency obligations*.

all EU Member States indicate that each 1% increase in the share of renewables leads to a €0.50/MWh reduction in the wholesale electricity price. Taking the example of Spain, the feed-in tariff is calculated to have increased the share

of renewables by 11% over the period 2008-2016. In turn, this reduced the wholesale electricity price by €5.00/MWh, partially offsetting the cost — €34.60/MWh — of renewable energy support to end-use electricity consumers.<sup>78</sup>

76 Regulatory Assistance Project for the International Energy Agency. (2012). *Best Practices in Designing and Implementing Energy Efficiency Obligation Schemes*. Montpelier, VT: Author. Retrieved from [www.ieadsm.org/wp/files/Tasks/Task%2022%20-%20Energy%20Efficiency%20Portfolio%20Standards/Publications/RAP\\_IEADSM\\_Best%20Practices%20in%20Designing%20and%20Implementing%20Energy%20Efficiency%20Obligation%20Schemes%202012%20June.pdf](http://www.ieadsm.org/wp/files/Tasks/Task%2022%20-%20Energy%20Efficiency%20Portfolio%20Standards/Publications/RAP_IEADSM_Best%20Practices%20in%20Designing%20and%20Implementing%20Energy%20Efficiency%20Obligation%20Schemes%202012%20June.pdf)

77 Bayer, E. and Lees, E. (2016). *Toolkit for energy efficiency obligations*. Brussels, Belgium: Regulatory Assistance Project. Retrieved from [www.](http://www.)

[raponline.org/wp-content/uploads/2016/05/rap-leesbayer-ee toolkit-2016-feb.pdf](http://raponline.org/wp-content/uploads/2016/05/rap-leesbayer-ee toolkit-2016-feb.pdf)

78 Heald, S., Debrosses, N., Rademaekers, K., Morenhout, J., Altman, M., Yearwood, J., et al. (2018). *Study on energy prices, costs and subsidies and their impact on industry and households – Final report*. Rotterdam, Netherlands: Triconomics B.V. Retrieved from <https://op.europa.eu/en/publication-detail/-/publication/d7c9d93b-1879-11e9-8d04-01aa75ed71a1/language-en>

## French White Certificates Programme ringfences 25% for low-income households

The French EEO (Certificat d'économie d'énergie), introduced in June 2006, is used to deliver on the target set by Article 7 of the EU Energy Efficiency Directive. The scheme is redesigned each three-year period, with targets for lifetime energy savings having increased significantly from 54 TWh in the first period to the current 1,600 TWh. In 2015, the scheme introduced a new requirement that a portion of savings must be delivered in low-income households, which has been increased from 18% in the third period (2015-2017) to 25% in the fourth period, 2018-2020.<sup>79</sup> Eligibility is defined using income thresholds at two levels (low-income and very-low income) that are linked to household size and location. A bonus factor or uplift in the value of the savings has been introduced to incentivise obligated parties to support the very low-income group.

Over the 2011-2014 period, the French EEO has been evaluated to deliver energy savings at a cost of around 0.4 euro cents/kWh (lifetime) saved, against the retail price of energy supply at 9 euro cents/kWh. Aligning the EEO with other national policies has been credited for keeping the cost down.<sup>80</sup> For low-income households, EEO support can be blended with support through the National Housing Agency's (Agence nationale de l'habitat [ANAH]) Habiter mieux programme, a tax credit for low-income households and soft loans. This coordinated approach allows low-income households to benefit from well-subsidised retrofits.<sup>81</sup> The costs of the EEO are recovered through energy bills. Although the cost recovery is unregulated, during the 2011-2014 period, costs were estimated to add €6 per capita to energy bills (this figure will have risen in line with the higher obligation target in later periods).<sup>82</sup>

**Table 2. Development overview of the French White Certificate Programme**

Period	Years	Obligation (TWh)		Savings delivered (TWh)	
		Standard	Low-income	Standard	Low-income
<b>1st</b>	2006-2009	54	-	65	-
<b>Intermediate</b>	2010	-	-	99	-
<b>2nd</b>	2011-2013	345	-	298	-
<b>Extension</b>	2014	120	-	172	-
<b>3rd</b>	2015-2017	700	150	646	174
<b>4th</b>	2018-2020	1,200	400	ongoing	

Source: Osso, D. et al. (2019). *Evolutions of the French EEO scheme through the ages according to emblematic measures: A testimony from within of a continuous work in progress.*

## Private benefits

Private benefits are those enjoyed by individuals, usually those who participate in a programme, that include subsidised renewable energy generation and efficiency measures, energy bill savings and health and well-being

benefits.

Energy efficiency obligations can be designed such that a portion of the energy savings, and therefore energy efficiency measures, is dedicated to consumers on low-incomes and/or in energy poverty. This practice is common in several

79 Osso, D., Laurent, M. and Nosperger, S. (2019). *Evolutions of the French EEO scheme through the ages according to emblematic measures: A testimony from within of a continuous work in progress.* [Presentation from ECEEE 2019 Summer Study, Jun 2019, Presqu'île de Giens, France. Pp.467-476.] HAL. Retrieved from <https://hal-edf.archives-ouvertes.fr/hal-02153753/document>

80 Rosenow, J. and Bayer, E. (2017). *Costs and benefits of energy efficiency obligations: A review of European programs.* Brussels, Belgium: Regulatory

Assistance Project. Retrieved from [www.raponline.org/wp-content/uploads/2017/04/rap-rosenow-bayer-costs-benefits-energy-efficiency-obligations-2017-may.pdf](http://www.raponline.org/wp-content/uploads/2017/04/rap-rosenow-bayer-costs-benefits-energy-efficiency-obligations-2017-may.pdf)

81 SocialWatt, 2019. Since publication, the ANAH and EEO subsidy level has been reduced to 90% for very low-income households and 75% for low-income households.

82 Rosenow, J., et al, 2017.

European countries, with varying shares being ringfenced. The UK EEO is 100% dedicated energy savings in low-income and vulnerable households,<sup>83</sup> France's EEO dedicates 25% to low-income households,<sup>84</sup> and Ireland dedicates 5% of savings to low-income households.<sup>85</sup> Austria provides additional credit to obligated parties to incentivise them to deliver energy saving measures in energy-poor homes.<sup>86</sup>

Targeted energy efficiency programmes, funded through levies, can reduce energy bills for low-income or energy-poor consumers over the long term. The benefits to participants, in absolute energy bill savings, can be much more significant than their contribution to the cost of the levy. Programme design including progressive allocation of benefits (i.e., benefiting proportionally more households on low incomes) therefore has a huge impact on how levy-funded programmes affect households.

## Key findings

### **The cost of programmes should be shared equitably.**

Which consumer groups pay for levy-funded programmes and which are exempted, which fuels carry the costs and how the costs are passed back to individual consumers within a group can all affect the cost burden felt by low-income consumers. How the costs of levy-funded programmes are passed on to consumers is not always transparent. Exemptions from levy costs for industrial energy consumers place a greater burden on households, including low-income households. Furthermore, the method of cost allocation among different consumers should be based on usage rather than a fixed or per-customer charge. As with network tariffs, using fixed charges for levies ultimately shifts greater costs to low-use consumers.

**Benefits of levy-funded programmes should target low-income households.** Home energy efficiency and renewable energy are key measures through which

low-income households can benefit from the energy transition. Levy-funded programmes are a significant source of support that could be directed to these households. This has been recognised in the Energy Efficiency Directive which, under Article 7, requires, to the extent appropriate, a share of measures to be implemented to support vulnerable households, including those affected by energy poverty.

**Significant system benefits from levy-funded programmes are often overlooked.** The benefits of levy-funded programmes are not limited to those benefits directly enjoyed by participants. If fully accounted for, the system benefits can more than outweigh the costs to energy consumers of the programme. Therefore, impact assessments of programmes must balance the costs against the sum of both private and system or societal benefits.

## Recommendations

- The methods used to pass the costs of levy-funded programmes on to energy bills must be transparent.
- Policymakers designing cost-recovery mechanisms must consider the impact on low-income households in the allocation of costs to different fuels and consumer groups.
  - Justifications for exemptions must be robust and fully consider distributional impacts.
  - Costs should be allocated on an energy-use basis rather than on a fixed or per customer basis.
- Member States should design their EEOs and levy-funded renewables programmes to ensure that an appropriate proportion of the benefits are targeted to low-income households.
- Full system or societal benefits delivered by a levy-funded programme should be included in cost-benefits analyses and analyses of distributional impact. The full system benefits should be clearly communicated.

83 UK Department for Business, Energy and Industrial Strategy. (2018). *Energy company obligation 2018-2020: Final stage impact assessment*. Retrieved from [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/749638/ECO\\_3\\_Final\\_Stage\\_IA\\_\\_Final.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/749638/ECO_3_Final_Stage_IA__Final.pdf)

84 Osso, D. et al, 2019.

85 European Bank for Reconstruction and Development. (2019). *Energy efficiency obligation schemes: Policy guidelines*. Brussels, Belgium: Author. Retrieved from [www.energy-community.org/dam/jcr:7907f720-0904-48a0-9773-2bd948ff2799/EBRD\\_EnCS\\_PG\\_EE\\_112018.pdf](http://www.energy-community.org/dam/jcr:7907f720-0904-48a0-9773-2bd948ff2799/EBRD_EnCS_PG_EE_112018.pdf)

86 Austrian Energy Agency. (2020). *Monitoringstelle Energieeffizienz*. [Website] Retrieved from [www.monitoringstelle.at/index.php?id=676](http://www.monitoringstelle.at/index.php?id=676)

# Chapter 4: Carbon pricing

**T**his chapter considers the impact of pollution taxes on consumer bills. It focusses on carbon pricing and taxation as clean energy transition policies but does not cover non-pollution taxes, specifically VAT and excise duty, although these make the most significant contribution to the tax element of both gas and electricity bills.<sup>87</sup> It should be noted that a range of tax relief policies are used by Member States to insulate households from the burden of VAT and excise duty.<sup>88</sup>

Carbon pricing as a mechanism to implement the ‘polluter pays’ principle can be a key component of a comprehensive climate strategy. There are two main forms of carbon pricing: cap-and-trade systems and carbon taxes.

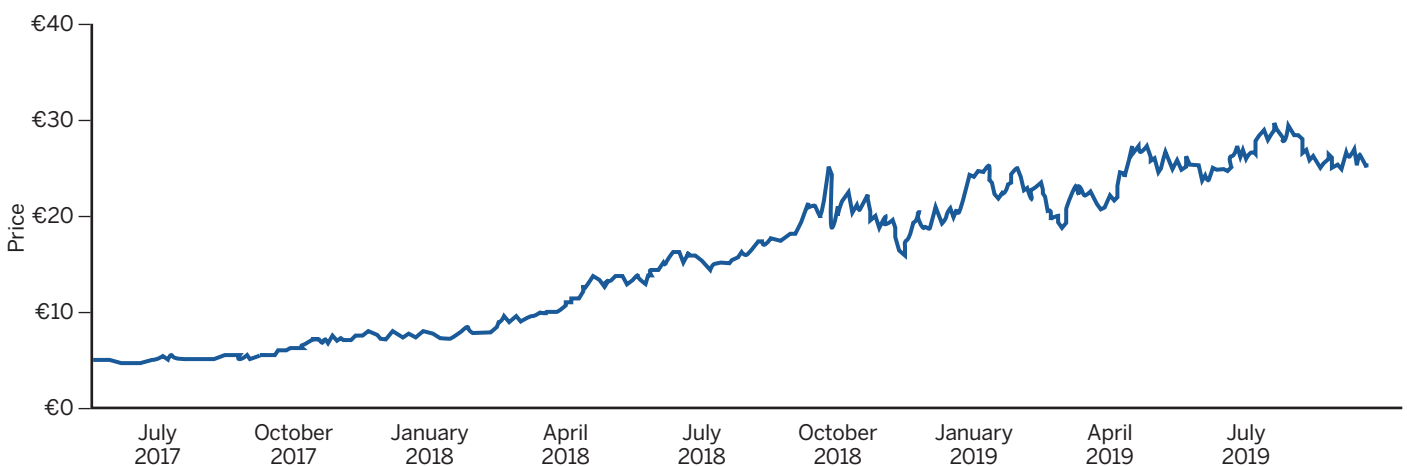
## Cap-and-trade systems

In cap-and-trade systems, the government sets allowable levels of pollution, but the price of polluting is set by markets. Emitters can decide whether to reduce their emissions or to purchase allowances from other entities that can reduce

emissions at a lower cost. As the price of carbon allowances is set in the market, it can rise or fall with demand for allowances from companies that operate within its scope and with the supply of allowances made available by law.

The EU Emission Trading System (ETS) is one of the world’s largest cap-and-trade systems. The ETS covers about 45% of EU emissions and covers the electricity generation, heavy industry and aviation sectors. The price of ETS allowances has historically been low but due to reforms in the ETS and a tighter supply of allowances, the price has been rising. In early 2019, the price was around five times higher than it was just two years ago (Figure 14).<sup>89</sup> Measures to halt the spread of the coronavirus in spring of 2020 caused the price to drop but, after the initial fall, prices have recovered more than half the lost value at the time of writing. Longer-term predictions, made before the virus impacted the economy, expected the price to remain at 2019 levels in coming years.<sup>90</sup> As a result of the price rise, the cost impact on consumers has increased.

Figure 14. Price progression of allowances in the EU Emissions Trading System, 2017-2019



Source: Sandbag/Ember. (2020). *EUA Price*.

87 Grave, K., et al (Ecofys), 2016.

88 For a review of broader tax policies, see Triconomics study: Heald, S. et al (Triconomics), 2018.

89 Sandbag/Ember. (2020). *EUA Price*. [Website]. Retrieved from <https://sandbag.org.uk/carbon-price-viewer/>

90 University of Oxford. (2018). *Oxford Energy Insight: The EU ETS phase IV reform: Implications for system functioning and for the carbon price signal*. Oxford, England: Author. Retrieved from [www.oxfordenergy.org/wpcms/wp-content/uploads/2018/09/The-EU-ETS-phase-IV-reform-implications-for-system-functioning-and-for-the-carbon-price-signal-Insight-38.pdf](http://www.oxfordenergy.org/wpcms/wp-content/uploads/2018/09/The-EU-ETS-phase-IV-reform-implications-for-system-functioning-and-for-the-carbon-price-signal-Insight-38.pdf)



## Carbon taxes

Carbon taxes are imposed by national governments on specific fossil fuels in proportion to their carbon content. Governments set the price per unit of pollution, but the quantity of emissions that results is determined by market conditions. These taxes can cover transportation fuels (diesel and petrol), heating fuels (oil, propane, coal and gas) and, in some cases, process fuels used in industry. The taxes are usually collected at the wholesale level from major energy importers, refiners and sales operators.

Across Europe, at least 15 countries have put in place carbon taxes, which vary in scale and price (see Appendix 3). By revenue, the largest carbon tax programmes are those in France, Sweden, Finland and the UK; by price, the highest taxes are Sweden, Switzerland, Finland and France. At the other end of the spectrum, the Polish carbon price is effectively zero.

The use of carbon taxation has increased in recent years. Spain and France introduced taxes on carbon in 2014. In 2018, Finland raised the carbon charge on coal and fuel oil to €62 per tonne (/t) and the Netherlands announced a new carbon floor price<sup>91</sup> for power generators, starting at €18/t in 2020 and rising to €43/t in 2030.<sup>92</sup> In 2019, Germany announced new carbon taxes on heating and transport fuels, Luxembourg announced its intention to introduce a carbon price from 2021,<sup>93</sup> and Ireland announced an escalator for its carbon tax to reach €80/t by 2030.<sup>94</sup>

## Impact of carbon pricing on household energy use and carbon emissions

While carbon taxes are often credited with reducing emissions, there is considerable debate about the likely long-term relationship between the rate of tax and the rate of emission reduction across different fuels, end uses and types of consumers. A key feature of many energy markets is their low price-elasticity of demand — that is, a relatively low response among consumers to changes in the prices that they pay. Aside from electricity, the main energy costs facing households are for heating fuels and transportation, all of which exhibit low demand elasticities. This is, in large part, due to the significant barriers to adopting energy efficiency and renewable energy technologies. These barriers are higher for low-income households, as they have severely limited financial resources to invest and limited access to finance. Low-income households are also more likely to rent their home and are therefore affected by split incentives between landlord and tenant.<sup>95</sup>

In the absence of other supporting programmes, fuel costs would have to be raised to unrealistic levels to drive the pace of change needed to meet 2030 and 2050 carbon goals.<sup>96</sup> Clearly, very high carbon prices would raise bills disproportionately to incomes and severely impact low-income households.

91 A carbon floor price is a measure used at national level to support the carbon price in the EU ETS. It established a minimum price of carbon that power generators must pay even if the ETS allowance price falls below this level.

92 World Bank Group and Ecofys. (2018). *State and Trends of Carbon Pricing 2018*. World Bank, Washington, D.C.: Author. Retrieved from <https://openknowledge.worldbank.org/bitstream/handle/10986/29687/9781464812927.pdf> Doi: 10.1596/978-1-4648-1292-7. License: CC BY 3.0 IGO.

93 Morgan, S. (2019, December 10). Luxembourg to deploy carbon tax from 2021. *Euractiv*. Retrieved from [www.euractiv.com/section/climate-environment/news/luxembourg-to-deploy-carbon-tax-from-2021/](http://www.euractiv.com/section/climate-environment/news/luxembourg-to-deploy-carbon-tax-from-2021/)

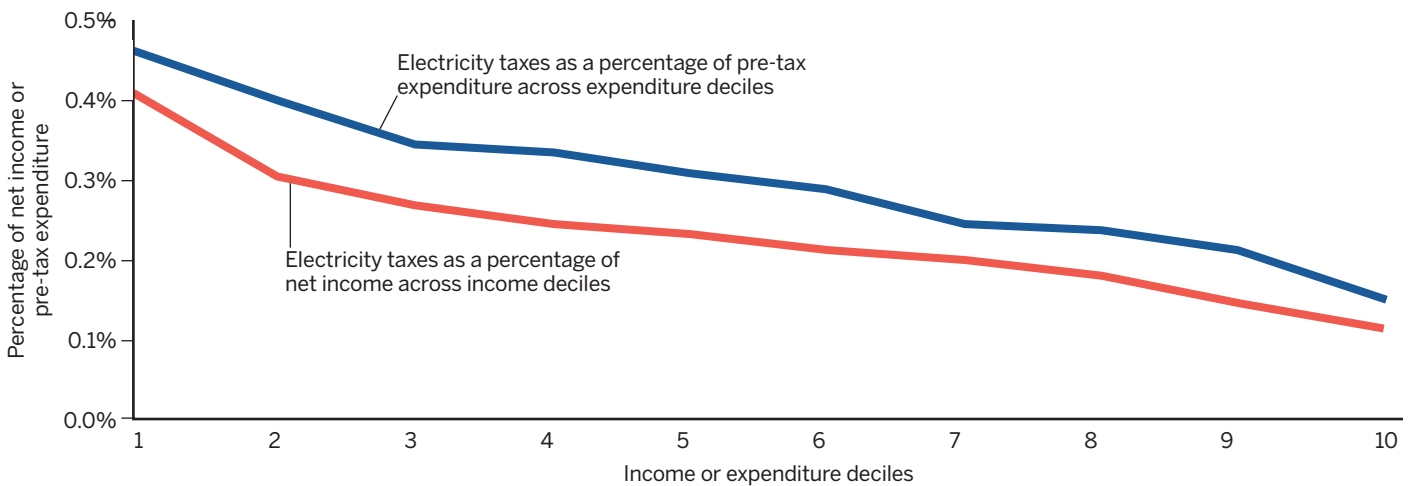
94 Press Association (2019, September 23). Ireland to raise carbon tax to €80 per tonne, Taoiseach tells UN. *Breaking News*. Retrieved from [www.breakingnews.ie/ireland/ireland-to-raise-carbon-tax-to-80-per-](http://www.breakingnews.ie/ireland/ireland-to-raise-carbon-tax-to-80-per-)

[tonne-taoiseach-tells-un-952610.html](http://tonne-taoiseach-tells-un-952610.html)

95 A split incentive refers to a situation in which the benefits to not accrue to the person who pays for the transaction. So, in the case of rented housing, the investment in energy efficiency is made by the landlord but the energy bill savings accrue to the tenant.

96 For example, the price-elasticity of demand for transportation fuels is estimated at about -0.15 in the short run but could be -0.44 in the long run. (Source: Labandeira, X., Labeaga, J.M., and López-Otero, X. [2017]. A meta-analysis on the price elasticity of energy demand. *Energy Policy*, 102, pp. 549–568). These numbers show the expected percentage decrease in consumption for a 100% increase in price, over both the short-term future, and over a longer term (which allows for a greater range of consumer responses and new investments). If we apply this to the German carbon tax proposal for petrol and diesel, first announced in 2019, at the starting level of €10 per tonne of carbon, the new carbon price would raise the cost of transport fuel by just two or three euro cents per litre, which is only 2% of current price. This would yield a negligible decrease in fuel usage. If it were raised to €100 per tonne, the carbon charge would raise fuel costs by around 20%, but reduce usage by less than 3% in the near term and less than 9% even in the long run.



**Figure 15. Average electricity taxes as a percentage of net income and pre-tax expenditure in the 21 OECD countries**

Source: Zachmann, G., Fredriksson, G. and Claeys, G. (2018). *The distributional effects of climate policies. The Bruegel Blueprint Series 28.*

## The impact of carbon pricing on low-income households

Where carbon prices are high enough and expected to continue for a period of years, the price can affect both short-term consumption and long-term investment decisions by both businesses and households.<sup>97</sup>

The additional cost burden created by the carbon price is greater for lower-income consumers. The degree of the cost burden on low-income consumers compared with higher-income consumers varies with the energy sector and type of tax or measure. For example, since wealthier people fly more often than lower-income people, a carbon tax on aviation is likely to be neutral or slightly progressive (burdening higher-income groups more). Electricity, by contrast, is an essential service with very few substitutes. Because electricity costs constitute a greater part of both income and expenditure for low-income households, carbon taxes on electricity place a greater cost burden on low-income consumers. The impact of a tax on electricity (as a proxy for any tax or price increase) across income deciles is illustrated in Figure 15.

There is little difference in the distributional impacts of carbon taxes and cap-and-trade systems. To the extent that there are differences, they lie in numerous design details, such as which sectors are covered, who bears the payment obligation, who is exempted from paying and how are the carbon revenues spent.

Carbon taxes are often applied to fuels commonly used by households; thus, they are highly visible and raise the costs of essential services (e.g., electricity) and uses with few realistic substitutes (e.g., rural transportation). Moreover, they are seen to be unfair as they apply to all citizens, regardless of income. In some well-publicised cases, energy prices, increased through taxation have become the focus of stiff political opposition, as in *les gilets jaunes* (the yellow vests) protests in France in 2018-2020. To shift the narrative around carbon taxation from ‘burden to benefit,’ as the example on the following pages illustrates, the design of carbon pricing policies and the use of resulting revenues need to be carefully considered.<sup>98</sup>

97 Cramton, P.C., MacKay, D.J.C., Ockenfels, A. and S. Stoff (eds). (2017). *Global Carbon Pricing: The Path to Climate Cooperation*. Cambridge, Massachusetts: The MIT Press.

98 Vaidyula, M. and Alberola, E. (2016). *Recycling carbon revenues: Translating costs into opportunities*. Paris, France: Institute for Climate Economics (I4CE). Retrieved from [www.i4ce.org/wp-core/wp-content/uploads/2016/06/16-06-20-I4CE-Note-on-recycling-of-carbon-revenues.pdf](http://www.i4ce.org/wp-core/wp-content/uploads/2016/06/16-06-20-I4CE-Note-on-recycling-of-carbon-revenues.pdf)

## Lessons on carbon pricing and social equity from les gilets jaunes movement, France

In October 2018, les gilets jaunes (the yellow vests) first took to the streets to protest — initially — against high fuel prices. By November, the first day of national protests, they were attracting national and international media attention.

The protests came to focus on a carbon price. Specifically, the escalation of the *Contribution climat énergie* (CCE), a surcharge to existing energy taxes on fossil fuels that households and companies pay on the purchase of diesel, petrol, heating oil, gas or coal, based on their carbon content. The CCE was first introduced in 2014 at €7/t of CO<sub>2</sub> with an escalator that increased the price to €44.60/t in 2018 and included plans to increase at a rate of around €10 per year to €100 by 2030. A concurrent tax reform would phase out (between 2015 and 2021) a tax privilege on diesel to bring it in line with the taxation level of petrol. The combined tax reforms made the tax on diesel rise more sharply than that of petrol. The reforms also coincided with high diesel prices on global markets. The sharp rise in the price of diesel and the rise in the price of high-carbon heating fuels was seen to deliver the hardest hit to low-income, rural populations without access to adequate public transport or heating fuel alternatives.

The rise in the carbon prices of heating and transport fuels were rolled out alongside a raft of other reforms by the government. A distributional analysis of the sum of these reforms by the *Institut des politiques publiques* (Institute

of Public Policy)<sup>99</sup> found that the majority of households (in middle income) benefitted but households in the two lowest income deciles were disadvantaged. Broadly, the reforms favoured working populations, with pensioners being comparatively disadvantaged. Ultimately, the yellow vest movement became about distributional fairness across income deciles, rural and urban populations, and generations, as well as a mistrust of governing institutions.

Soon after the initial protests, an analysis of the causes and dynamics of the protests was carried out by Agora Energiewende.<sup>100</sup> It found that, although the French population generally supports climate protection, a number of flaws in the design of the carbon taxation regime, broader governmental reforms, and the lack of overall transparency and communication of the reforms were at the root of the protests. The assessment concluded:

- **Ringfencing revenues for redistributive and carbon saving purposes, thereby making the mechanism revenue neutral, is central to the acceptance of carbon pricing as a climate protection measure.** French tax legislation follows a principle of non-earmarking, such that revenues flow into the state budget rather than being ringfenced for specific purposes, although significant exemptions to this principle exist.
- **Effective and transparent communication regarding how revenues will be invested is essential.** The lack

## Making carbon pricing more carbon efficient through the investment of revenues

Government revenues generated by the carbon tax or from the auction of ETS allowances can be used to reduce carbon more cost effectively. If invested in effective end-use efficiency programmes, revenue can generate significant

carbon savings, even at a moderate carbon price. A study based on UK household electricity prices compared the carbon-saving impact of a price increase with the carbon-saving impact of investing the revenues generated into an effective efficiency programme. It found that that reinvestment of the revenues generated up to nine times more carbon savings than the price alone.<sup>101</sup>

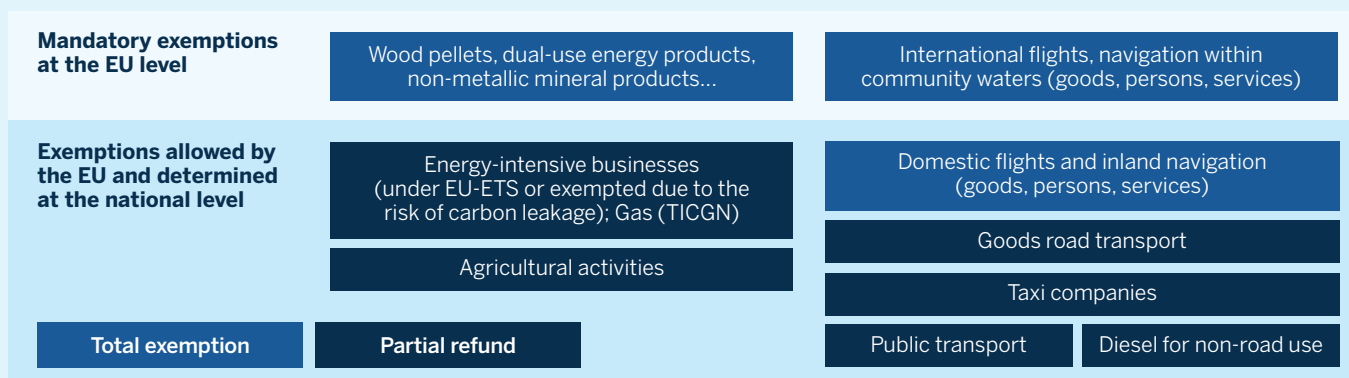
99 Jelloul, M., Bozio, A., Douenne, T., Fabre, B. and Leroy, C. (2018). *Budget 2019: L'impact sur les ménages*. [Presentation at Conférence Evaluations du budget 2019] Institut des Politiques Publiques. Retrieved from [www.ipp.eu/wp-content/uploads/2018/10/ipp-menages-budget2019.pdf](http://www.ipp.eu/wp-content/uploads/2018/10/ipp-menages-budget2019.pdf)

100 Gagnebin, M., Graichen, P., and Lenck, T. (2019). *The French CO<sub>2</sub> pricing policy: Learning from the yellow vests protests*. Berlin, Germany: Agora Energiewende. Retrieved from [www.agora-energiewende.de/fileadmin2/Projekte/2018/CO2-Steuer\\_FR-DE\\_Paper/Agora-Energiewende\\_Paper\\_CO2\\_Steuer\\_EN.pdf](http://www.agora-energiewende.de/fileadmin2/Projekte/2018/CO2-Steuer_FR-DE_Paper/Agora-Energiewende_Paper_CO2_Steuer_EN.pdf)

de/fileadmin2/Projekte/2018/CO2-Steuer\_FR-DE\_Paper/Agora-Energiewende\_Paper\_CO2\_Steuer\_EN.pdf

101 Cowart, R., Bayer, E., Keay-Bright, S., and Lees, E. (2015). *Carbon caps and efficiency resources: Launching a "virtuous circle" for Europe*. Brussels, Belgium: Regulatory Assistance Project. Retrieved from [www.raponline.org/knowledge-center/carbon-caps-and-efficiency-resources-launching-a-virtuous-circle-for-europe/](http://www.raponline.org/knowledge-center/carbon-caps-and-efficiency-resources-launching-a-virtuous-circle-for-europe/)

Figure 16. Energy tax exemptions in France



Source: I4CE. (2018). The carbon component in France: operation, revenues and exemptions. Reproduced in Agora Energiewende. (2019). *The French CO<sub>2</sub> pricing policy: Learning from the yellow vests protests.*

of clear, transparent and well-communicated information on the use of the revenues led the yellow vest protesters to question whether the surcharge was really a climate protection measure or a (regressive) method to restructure the state budget.

- **Exemptions and compensation must not privilege businesses over households.** The climate surcharge was introduced as an extension to an existing energy tax; as a result, companies already exempted from the energy tax also benefited from exemption from the climate surcharge. This included sectors already covered by the EU ETS, public transport, agriculture and inland navigation (Figure 16). Companies in these sectors received a direct refund of the energy tax including the climate surcharge whereas households were subject to the cost of the climate surcharge.

- **Part of the revenues should be redistributed to low-income households to combat regressive impacts** and to ensure that the energy transition does not come into conflict with social justice.
- **Revenues should enable those affected to protect themselves from rising costs, for example by providing support for access to lower-carbon options for home heating and transport.** In comparison to many other Member States, France has a relatively well-developed support framework for home renovation and low-carbon mobility, with specific targeting on low-income households. In the recent reforms, this support and its link to the pricing mechanism needed to be made more explicit as part of the climate protection framework. It should also have been increased in scope and ambition.

Several Member States already dedicate significant carbon revenues, or equivalent investment, to clean energy initiatives, as prompted by the Emissions Trading System Directive. Leading examples include Germany's Energy and Climate Fund<sup>102</sup> and the Czech Republic's New Green Savings Programme,<sup>103</sup> both of which incentivise home renovation. Many of these programmes overcome the issue

of revenues changing year to year by combining carbon revenues with other sources (e.g., *Habiter Mieux*)<sup>104</sup> or committing the first part of revenues to a long-running programme (e.g., Czech Republic's New Green Savings Programme). Any revenues over and above this level are then allocated on a project basis.

102 Die Bundesregierung. (2019). *The climate and energy fund: More money for the energy shift.* [Website]. Retrieved from [www.bundesregierung.de/breg-en/service/more-money-for-the-energy-shift-1589036](http://www.bundesregierung.de/breg-en/service/more-money-for-the-energy-shift-1589036)

103 New Green Savings Programme. (2019). Retrieved from [www.novazelenausporam.cz/en/](http://www.novazelenausporam.cz/en/) [Website].; and Sunderland, L. (2019). *Learning from the Czech Republic on using EU ETS revenues for residential renovations.* Brussels, Belgium: Regulatory Assistance

Project. Retrieved from [www.raponline.org/knowledge-center/learning-from-the-czech-republic-on-using-eu-ets-revenues-for-residential-renovations/](http://www.raponline.org/knowledge-center/learning-from-the-czech-republic-on-using-eu-ets-revenues-for-residential-renovations/)

104 See write up of French experience with variable revenues for the *Habiter Mieux* programme in: Vaidyula, M. and Alberola, E. (2015). *The EU ETS and low-carbon funding mechanisms (Chapter 5)*. Paris, France: Institute for Climate Economics (I4CE). Retrieved from [www.i4ce.org/wp-content/uploads/2016/06/rapport-I4CE-chapitre-5.pdf](http://www.i4ce.org/wp-content/uploads/2016/06/rapport-I4CE-chapitre-5.pdf)

## Reducing the impact of carbon pricing on low-income households and alleviating energy poverty

If targeted effectively, earmarked revenues can deliver significant benefits to specific communities or demographics. Revenues can be used, for example, to directly compensate for the cost of the tax or to support programmes that reduce energy costs for low-income households, expand public infrastructure (e.g., transport), create economic stimulus in transition regions, or reduce local pollution in disadvantaged communities.

Among mechanisms to offset the impact of the carbon price on consumers, the most frequently used are those that directly compensate for the costs of the tax. Consumers are compensated through the return of carbon revenue through a variety of means such as a lump-sum cashback or the reduction of income, employment or capital taxes. Depending on design, these approaches have been more or less effective at levelling the negative distributional effects. Cashback to all consumers is generally evaluated to be more progressive (benefiting proportionally more households on low incomes) whereas redistribution through taxation is less so.<sup>105</sup> Returning revenues to energy-poor households and vulnerable communities is an important and equitable means to offset the cost burden imposed by the tax in the short term. However, returning the majority of revenues back to all consumers is an ineffective strategy to meet overall carbon goals. Returning all revenues to consumers relies solely on the price impact to drive down emissions; as has been illustrated, carbon prices would have to be unrealistically high to drive deep change.

Together with targeted cashback or bill support for low-income households, recycling of revenues into efficiency

and renewable energy programmes targeted to low-income households or communities reduces bills significantly in the long term. This investment can tackle the significant challenges of reducing energy poverty and accelerating decarbonisation in hard-to-change sectors such as housing and transport. For example, France reports that it invests part of the revenue from its ETS auctioned allowances into the *Habiter Mieux*<sup>106</sup> programme that funds renovation for low-income and energy-poor households. There is evidence that this rationale may be gaining ground with new taxes recently announced, coupled with ringfenced support for low-income and energy-poor households and earmarking for clean energy transition programmes (e.g., in 2019 in Ireland<sup>107</sup> and Luxembourg<sup>108</sup>).

## Key findings

**Carbon prices and carbon taxes can be expected to rise in cost and grow in scope over time.** As the climate crisis deepens, it is expected that more emissions and sources will be brought into carbon pricing regimes. The World Bank's 2018 global review of carbon pricing<sup>109</sup> reports on 57 different regional, national and subnational carbon pricing initiatives. In 2018, the total global value of emissions trading schemes and carbon taxes was US\$82 billion, a 56% increase over 2017. The European Green Deal proposes further carbon pricing measures, including the extension of the EU ETS to other sectors and the introduction of a carbon border tax.<sup>110</sup> The impact of carbon costs on low-income households can therefore be expected to continue to grow.

**Carbon revenue recycling can lower the cost of the clean energy transition to all.** The central purpose of a carbon price is to reduce carbon emissions, so policy design should seek the lowest cost way to do so rapidly. Key to this is recycling of carbon revenues into further carbon

105 Cunha Montenegro, R., Lekavičius, V., Brajković, J., Fahl, U., and Hufendiek, K. (2019). Long-Term Distributional Impacts of European Cap-and-Trade Climate Policies: A CGE Multi-Regional Analysis. *Sustainability* 2019, 11(23), 6868. Retrieved from [www.mdpi.com/2071-1050/11/23/6868](http://www.mdpi.com/2071-1050/11/23/6868); and Zachmann, G., Fredriksson, G. and Claeyes, G. (2018). The distributional effects of climate policies. *The Bruegel Blueprint Series* 28. Retrieved from <https://bruegel.org/2018/11/distributional-effects-of-climate-policies/>

106 Agence nationale de l'habitat (ANAH). (2020). [Website]. Retrieved from [www.anah.fr/proprietaires/proprietaires-occupants/etre-mieux-chauffe-avec-habiter-mieux/](http://www.anah.fr/proprietaires/proprietaires-occupants/etre-mieux-chauffe-avec-habiter-mieux/)

107 Press Association, 2019. Ireland to raise carbon tax to €80 per tonne, Taoiseach tells UN. *Breaking News*. Retrieved from [www.breakingnews.ie/ireland/ireland-to-raise-carbon-tax-to-80-per-tonne-taoiseach-tells-un-952610.html](http://www.breakingnews.ie/ireland/ireland-to-raise-carbon-tax-to-80-per-tonne-taoiseach-tells-un-952610.html)

108 Morgan, S. (Euractiv), 2019.

109 World Bank Group and Ecofys, 2018.

110 European Commission, 2019a. Retrieved from [https://ec.europa.eu/info/sites/info/files/european-green-deal-communication\\_en.pdf](https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf)

abatement. Similar to levy-funded energy efficiency programmes discussed in Chapter 3, using carbon revenues to invest in well-managed energy efficiency programmes can also reduce system costs for all and reduce the cost of the clean energy transition.

**Ringfencing carbon revenues can effectively offset regressive impacts on low-income consumers and reduce energy bills over the long term.** Costs for low-income consumers can be offset, and even eclipsed, through targeted energy efficiency or renewable energy investments. In designing policies to offset the regressive impacts of carbon pricing, it is essential to consider the issue of timing. The costs of a tax impact a household immediately while benefits of a programme funded through tax revenues will be received in the future. Direct compensation for the cost of the tax can be used to address short-term impacts. Well-designed programmes have also addressed this timing issue through issuance of a bond, raised on the future revenue, to pre-seed funding for efficiency and infrastructure programmes.<sup>111</sup>

## Recommendations

- Carbon pricing mechanisms must be fair. Designers of carbon pricing mechanisms, at both EU and national levels, must assess the distributional impacts of carbon pricing mechanisms and surrounding policy frameworks, including the use of the carbon revenues.
- The distributional impacts of pricing policies and measures to offset the cost impact must be clearly and transparently communicated to consumers.
- Justifications for exemptions from carbon taxes must be robust and fully consider distributional impacts. EU guidelines for, and national implementation of, exemptions from carbon taxation measures and free allocations of EU ETS allowances for energy-intensive industries must not undermine the polluter-pays principle, disincentivise energy efficiency in large industry or be distributionally inequitable.
- Efficiency First principles must be extended to carbon pricing mechanisms to ensure the greatest carbon abatement at least cost to consumers. Member States and the European Commission must reinvest revenues from carbon pricing into effective efficiency and carbon abatement programmes to deliver more carbon saving for the same consumer cost.
- Member States and the European Commission must ringfence carbon revenues to reduce the cost burden on low-income households. This can be achieved through a combination of targeted social support to reduce short-term impacts and targeted energy efficiency measures to reduce energy costs over the long term.

111 For example, the future revenue from the London congestion charge has been used by Transport for London to securitise a bond to bring forward funds to invest in transport projects.



# Chapter 5: Consumer tariffs and consumer engagement in the energy transition

The elements that make up the final cost of electricity and gas (the energy component, network fees, levies and tax) are packaged and presented to consumers through the final or consumer energy tariff for each fuel. Consumers manage this final cost of energy through controlling their energy use and through engaging in the energy market. Consumer engagement in the energy system has potential to produce significant benefits to both the system and to private consumers through demand reduction, shifting demand and peak reduction, fuel switching, and decentralised electricity production and storage. At present, however, the ability and inclination to engage is not evenly spread among all consumers.

The overarching trends in Europe over the last decade have been toward energy market liberalisation and increasing consumer engagement in the market and in the energy system more broadly. Following the third energy market liberalisation package, which came into force in 2009, an increasing number of Member States have phased out (fully or partially) regulated prices for household electricity and gas (see Appendix 4 for an overview of price regulation in Member States). The Electricity Directive (2019/944), as part of the Clean Energy for all Europeans Package, further emphasises the active role of consumers in the electricity market.<sup>112</sup> Consumers are increasingly encouraged to actively engage by switching

energy tariffs, becoming prosumers, collective engagement in energy communities and providing demand-response services. Increased demand-side engagement in energy systems is key to enabling the incorporation of significant variable renewable energy sources and to delivering future clean energy services at least cost (see sidebar on page 27).

The ways in which consumers engage in the market, and the business models of energy suppliers, both have significant influence on the final cost of energy paid by the consumer. Studies from the UK<sup>113</sup> on the ‘poverty premium’ — the idea that the poor pay more for essential goods and services — show that the extra costs associated with household electricity and gas bills make up, by far, the greatest contribution to the overall premium.<sup>114</sup> Factors assessed in these studies that contribute to the energy poverty premium are: not switching energy supplier or tariff, using a prepayment meter, and not using the cheapest payment or billing options.

## Switching tariff or energy supplier

Switching energy tariff or supplier is a key indicator of consumer engagement in the energy market and of its functioning.<sup>115</sup> Not switching energy tariff was calculated in the UK studies to have the largest impact on the energy

112 Agency for the Cooperation of Energy Regulators / Council of European Energy Regulators (2019b). *Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2018: Consumer Empowerment Volume*. Retrieved from [www.acer.europa.eu/Official\\_documents/Acts\\_of\\_the\\_Agency/Publication/ACER%20Market%20Monitoring%20Report%202018%20-%20Consumer%20Protection%20and%20Empowerment%20Volume.pdf](http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20Market%20Monitoring%20Report%202018%20-%20Consumer%20Protection%20and%20Empowerment%20Volume.pdf).

113 Davies, S., Finney, A., and Hartfree, Y. (2016). *The poverty premium – When low-income households pay more for essential goods and services*. Bristol, England: University of Bristol School of Geographic Studies. Retrieved from [www.bristol.ac.uk/geography/research/pfrc/themes/finexc/poverty-premium/](http://www.bristol.ac.uk/geography/research/pfrc/themes/finexc/poverty-premium/); Westlake, A. (2010). *The UK poverty rip off: The poverty premium 2010*. London, England: Save The Children

UK. Retrieved from <https://resourcecentre.savethechildren.net/node/13400/pdf/uk-poverty-rip-off-poverty-premium.pdf>; and Corfe, S., et al (Social Marketing Foundation), 2018.

114 Other areas of household expenditure that are the main contributors to the premium are telecommunications, insurance, food and grocery shopping, and access to money and credit.

115 Bureau Européen des Unions de Consommateurs. (2017). *Energy markets of the future: How the EU's energy transition should work for consumers*. Brussels, Belgium: Author. Retrieved from [www.beuc.eu/publications/beuc-x-2017-062\\_mst\\_energy\\_markets\\_of\\_the\\_future\\_-\\_how\\_the\\_eus\\_energy\\_transition\\_should\\_work\\_for\\_consumers.pdf](http://www.beuc.eu/publications/beuc-x-2017-062_mst_energy_markets_of_the_future_-_how_the_eus_energy_transition_should_work_for_consumers.pdf); and ACER/CEER, 2019b.



poverty premium, costing £317 (€373) per year. This is broadly in line with the €300 difference between the highest and lowest price offers for electricity and gas in Europe in 2018, found by ACER/CEER in its *Market Monitoring Report*.<sup>116</sup>

Switching rates for both gas and electricity are still low across Europe: At best, between 10% and 20% of all household meter points switch per year, but many markets have almost no switching activity. As can be expected, switching rates are substantially higher in markets without regulated prices or markets in which a low share of consumers are on regulated prices than in markets with the majority of consumers on regulated prices.<sup>117</sup> Many consumers have not switched since liberalisation; for example, Greek consumer organisation EKPIZO found that only 17% of respondents have ever changed their provider.<sup>118</sup> The annual switching rates at different stages of price deregulation vary by country. An overview of price regulation in Europe and a breakdown of switching rates can be found in Appendix 4.

Evidence suggests that low-income consumers are less likely to switch suppliers than higher-income consumers. A survey by the UK Competition and Markets Authority found that 20% of households on low incomes (below £18,000) had switched in the period 2013-2015 compared with 36% of households on a higher income (above £36,000). Additionally, 39% of low-income households had never switched, compared with 29% of those on higher incomes.<sup>119</sup> A range of factors influence a consumer's ability or inclination to switch, from behavioural aspects (such as loyalty, risk aversion and trust) to energy market and regulation issues (including issues around ease or perceived ease of switching

### German consumers with low credit scores locked in to high-cost default supply

In Germany, not all energy suppliers are obliged to supply consumers who have poor credit ratings. Instead, to ensure access to energy, regional or local 'default' suppliers are required to supply electricity and gas to these customers. The default supplier, however, is not subject to price regulation and faces no competition for these customers — and customers who have a poor credit score are unable to switch away.

A recent study assessed the impact of this 'capture' of households with poor credit rating. Comparing the average prices of non-default and default suppliers, it found that the latter were charging these customers (across electricity and gas) a premium valued at €1.15 billion in 2017.<sup>121</sup>

and a large fixed element of the price).<sup>120</sup>

The European Electricity Market Regulation sets out a range of measures to protect consumers and enable them to engage in the energy market, including minimum levels of consumer information, price comparison, and ease, speed and costs of switching. At a local level, where the need to help consumers navigate the energy market has been identified, aggregators (usually local authorities), have established energy companies with simplified tariffs to serve their population on an 'opt-in' or 'opt-out' basis (see examples on the following page).

116 ACER/CEER, 2019a.

117 European Commission, 2019c.

118 EKPIZO survey referenced in: Bureau européen des unions de consommateurs. (2019). *The future of energy consumers: Bright or burdensome?* Brussels, Belgium: Author. Retrieved from [www.beuc.eu/publications/beuc-x-2019-055\\_the\\_future\\_of\\_energy\\_consumers.pdf](http://www.beuc.eu/publications/beuc-x-2019-055_the_future_of_energy_consumers.pdf)

119 UK Competition and Markets Authority survey data summarised in: Corfe, S., et al (Social Marketing Foundation), 2018.

120 Davies, S. et al (University of Bristol), 2016. Heald, S. et al (Triconomics), 2018. CEER, 2018.

121 Jahn, A. and Ecke, J. *Die Grundversorgung mit strom und gas in Deutschland: Potenziale zur verbraucherentlastung und handlungsoptionen*. Berlin, Germany: Frederich Ebert Stiftung (FES). Retrieved from <http://library.fes.de/pdf-files/wiso/15021-20190121.pdf> (in German)

## Municipal energy suppliers and customer aggregation

In response to high rates of energy poverty, high energy prices and a range of other local factors, including ambitious local climate targets, local and regional governments are developing methods to provide residents with affordable, clean energy.

### Municipally owned energy suppliers

Bristol Energy is a gas and electricity company owned and controlled by Bristol City Council. Established in 2016, it aims to provide fairly priced energy to customers through simple, transparent tariffs. Its system is based on 100% renewable electricity and 50% (or more) gas carbon offsets, thereby contributing to the city's social and environmental goals. Bristol Energy is designed to reinvest profits into the founding city; since its inception, it calculates that it has delivered £12m of social value back into the community.<sup>122</sup>

### Governmental aggregation of customers

A number of states in America (including California,<sup>123</sup> New York<sup>124</sup> and Ohio) have introduced laws that enable the aggregation of energy customers. Many aggregation programmes are designed to offer percent discounts off of

the incumbent rate over the term of the agreement.

As part of legislation that liberalised its electricity market in 2001, the state of Ohio passed a law that enabled 'communities' (local government structures such as townships, cities or counties) to aggregate electricity and gas customers to combine their purchasing power to achieve better prices. The aggregators choose a supplier of electricity or gas (or both) to serve their community. Aggregators providing electricity must be authorised and are regulated by the Public Utilities Commission of Ohio.<sup>125</sup> The law allows two types of offers to customers: opt-in and opt-out. Opt-in offers require customers to take up the energy contract offered. Under opt-out programmes, all eligible residents and small businesses are automatically enrolled, unless they respond to a notification allowing them to opt-out at no cost. Municipalities must ask citizens to vote to authorise the opt-out programme (this is not necessary for opt-in). Following introduction of aggregation programmes, in some areas Ohio has had switching rates of 50% to 80% of the customer base.

## Dynamic tariffs

As energy systems evolve and decarbonise, energy consumers are increasingly needed to provide demand-side services that help to balance supply and demand, and reduce future system costs. Energy price is used more and more to place a value on these services and to signal when they are needed. Currently, the most common type of pricing for

household energy is a fixed price tariff that fixes the unit price of energy for the duration of the plan — usually one or more years.<sup>126</sup>

With the need for consumers to provide demand-side services as part of the energy transition, the variety of energy tariffs available can be expected to grow. Dynamic pricing<sup>127</sup> contracts, which enable signals on either the wholesale

122 Bristol Energy. (2020). *Our Social Impact 2018-19*. [Website]. Retrieved from [www.bristol-energy.co.uk/our-social-impact-2018-2019](http://www.bristol-energy.co.uk/our-social-impact-2018-2019)

123 California Community Choice Association. (2020). *CALCCA advocates for community choice in California*. [Website]. Retrieved from <https://cal-cca.org>

124 New York State Energy Research and Development Authority. (2020). *Community choice aggregation*. [Website]. Retrieved from [www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Communities/Clean-Energy-Communities-Program-High-Impact-Action-Toolkits/Community-Choice-Aggregation](http://www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Communities/Clean-Energy-Communities-Program-High-Impact-Action-Toolkits/Community-Choice-Aggregation)

125 Public Utilities Commission of Ohio. (2020). *Government energy aggregation*. [Website]. Retrieved from [www.puco.ohio.gov/be-informed/consumer-topics/governmental-energy-aggregation-local-](http://www.puco.ohio.gov/be-informed/consumer-topics/governmental-energy-aggregation-local-community-buying-power/)

[community-buying-power/](http://www.puco.ohio.gov/be-informed/consumer-topics/governmental-energy-aggregation-local-community-buying-power/)

126 CEER, 2018.

127 Article 2 of the Electricity Directive (2019/944) defines a dynamic electricity price contract as 'an electricity supply contract between a supplier and a final customer that reflects the price variation at the spot markets including day-ahead and intraday markets, at intervals at least equal to the market settlement frequency.' This means that the price paid for electricity varies dependent on the time of use. This can be beneficial for customers who can shift their demand to times of lower prices and consumers can also benefit from lower margins applied to these contracts as the price risk is taken by the household and not the energy provider.

energy price or the value of demand-side services, are being offered to consumers more often. Dynamic pricing can play a key role in shifting load away from peak times, thereby avoiding expensive capacity and system costs. In turn, the provision of demand-side services can produce aggregated system benefits to all and private benefits to those energy consumers who take part.

Some emerging evidence suggests that dynamic tariffs can benefit low-income households. A 2010 U.S. study specifically considered the impact of dynamic pricing on low-income households through an evaluation of five pilot programmes spanning four U.S. states.<sup>128</sup> The paper concludes that dynamic tariffs can be designed so that a large percentage (65% to 80%) of low-income households are immediately better off (largely due to their flatter load profiles). Further benefits are also available if households change their energy use in response to the price signals. The paper's findings on the likelihood that low-income households would engage in demand response varied, from 'equally responsive' as higher-income households to 'only half as responsive.'

Although the U.S. study found that 65% to 80% of low-income households would benefit from dynamic pricing, this leaves a considerable percentage (20% to 35%) that could be worse off.

In light of the risks, the Electricity Directive (2019/944, Article 11) requires Member States to put in place protections including requirements that: suppliers fully inform final customers of opportunities, costs and risks; suppliers obtain each customer's consent before switching onto a dynamic price contract; and regulators monitor market developments, assess risks of new products and deal with abusive

products.<sup>129</sup> From a broader energy market point of view, the Council of European Energy Regulators cautions against an excessively high number of offers and a lack of transparency that can add complexity to the market and reduce consumer engagement.<sup>130</sup>

Clear communication of the projected costs of a dynamic tariff, compared with a fixed rate tariff, is essential. This can be achieved, for example, by providing a shadow bill across one year to illustrate costs comparisons (as is currently required in California's roll out of default time-of-use tariffs).<sup>131</sup> Ensuring that the year-one findings have continued relevance relies on high levels of consumer engagement and education. It also assumes a relatively stable use profile over time, which is not a given for many vulnerable households in insecure housing. In light of all of these issues, BEUC, the European consumer organisation (*Bureau européen des unions de consommateurs*) recommends that consumers should always have the option to choose a tariff that does not change based on time.<sup>132</sup> Not all energy consumers are required to provide demand response or flexibility services to balance energy systems — significant balancing benefits can be achieved with about 20% of load shifted.<sup>133</sup> Therefore, careful consideration must be given to the suitability of dynamic tariffs for low-income households.

## The balance of support between social tariffs and energy efficiency

To reduce the energy cost burden for low-income and vulnerable households, many Member States use social tariffs,<sup>134</sup> exemptions from some components of the

128 Faruqui, A., Sergici, S. and Palmer, J. (2010). *The Impact of Dynamic Pricing on Low-income Customers. An Institute for Electric Efficiency White Paper*. Washington, D.C: The Brattle Group. Retrieved from [www.edisonfoundation.net/IEE/Documents/IEE\\_LowIncomeDynamicPricing\\_0910.pdf](http://www.edisonfoundation.net/IEE/Documents/IEE_LowIncomeDynamicPricing_0910.pdf)

129 European Parliament and Council of the European Union. Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019L0944>

130 CEER, 2018.

131 California Public Utilities Commission (CPUC) ruled in 2018 that two customer protections be included in the system-wide roll out of default time-of-use (TOU) tariffs. First is a 'shadow bill' that shows customers whether they are better off with the TOU rate or their old rate. The other is a guarantee that, for the first year of the transition, customers who would have saved more on the old rate will be credited the difference. The

CPUC ruling is retrieved from <http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M238/K286/238286413.PDF>

132 Bureau européen des unions de consommateurs. (2019). *Consumers and the future of electricity grids*. Paris, France: Author. Retrieved from [www.beuc.eu/publications/beuc-x-2019-059\\_consumers\\_and\\_future\\_electricity\\_grids.pdf](http://www.beuc.eu/publications/beuc-x-2019-059_consumers_and_future_electricity_grids.pdf)

133 European Climate Foundation. (2010). *Roadmap 2050*. The Hague, Netherlands: Author. Retrieved from [www.roadmap2050.eu/project/roadmap-2050](http://www.roadmap2050.eu/project/roadmap-2050)

134 Broadly speaking a social tariff is a reduced tariff targeted to certain categories of vulnerable or low-income consumers. For summaries of bill support policies in the majority of Member States see: SocialWatt, 2019. Retrieved from <https://socialwatt.eu/sites/default/files/2020-01/D1.1%20Status%20Quo%20of%20Energy%20Poverty.pdf>; and STEP, 2019. *Solutions to Tackle Energy Poverty (STEP)*. (2019). [Website]. Retrieved from <https://www.stepenergy.eu/en/>

final energy price, and earmarked social benefits attached to household electricity and gas costs.<sup>135</sup> Social tariffs, in particular, have been widely used to provide ongoing protection to low-income and vulnerable consumers during the phase out of price regulation.<sup>136</sup> Social supports for energy bills can be paid for by socialising the costs across all energy consumers or through public expenditure and taxation.

Although social tariffs and price support can play a vital role in the short term, energy efficiency is the most cost-effective route to reducing energy bills over the long term, and alleviating energy poverty. Efficiency measures also improve thermal comfort and occupant health and well-being. Policy designers, therefore, need to carefully consider the balance between effort and expenditure between price and income support versus renovation support. In the UK's fuel poverty support package, of an annual budget of almost £3 billion, only just over 20% is dedicated to energy efficiency measures. The remaining almost 80% is dedicated to income and price support and must be committed year-on-year to sustain the same level of benefit. This investment is, in effect, akin to running the tap in the bath without putting the plug in.

## Households connected to district heating

A significant exception to the need for consumers to engage in the energy market through switching is found in the provision of heat through district heating systems. Such systems deliver a significant proportion of heat for space heating and domestic hot water in some Member States (approximately 50% in Sweden and Denmark; around 40% in Finland, Estonia and Lithuania). District heating is generally more developed in central, eastern and northern Europe.<sup>137</sup>

Converting existing heat networks to use renewable

energy sources and waste heat, and extending heat networks are among the key routes (alongside electrification) to decarbonise heat.<sup>138</sup> District systems can increase the share of renewable energy in heating and cooling. They can also provide significant, valuable heat storage and demand response services.

At present, district heating is not regulated at EU level in the same way as other energy supply. Most district heating networks are run by an integrated utility and rates are usually regulated ex-post only, by competition regulators. Therefore, the way in which the costs of district heating are passed on to consumers is not as visible (not reported) as for other regulated energy carriers. Approaches to the allocation of costs to customers vary by Member State and even by individual installation. Customers who buy heat through a district system are connected to physical infrastructure that is run by one utility; as a result, they do not have the opportunity to switch supplier or compare prices on a like-for-like basis. Additionally, as district heating systems rely on guaranteed levels of connected demand, consumers are often unable, or face high costs, to disconnect. Finally, consumers have little to no control over the system efficiency or fuel used; in some systems, heat is not metered or controllable at the level of individual dwellings, so households have little ability to ration energy to reduce costs. Consumer associations have identified that this sector lacks competition, regulation and consumer protection.<sup>139</sup>

## What future for gas as a low-cost heating fuel for low-income households?

The future of gas is a key question as heat is decarbonised. Gas boilers are the most commonly used technology for heating in the EU building stock, and around

135 ACER/CEER, 2019b.

136 European Commission, 2019c.

137 Mathiesen, B., Bertelsen, N., Schneider, N.C.A., Garcia, L.S., Paardekooper, S., Thellufsen, J.Z., et al. (2019). *Towards a decarbonised heating and cooling sector in Europe: Unlocking the potential of energy efficiency and district energy*. Copenhagen, Denmark: Aalborg University. Retrieved from [www.euroheat.org/wp-content/uploads/2019/12/Towards\\_a\\_decabonised\\_H\\_C\\_sector\\_in\\_EU\\_Final\\_Report.pdf](http://www.euroheat.org/wp-content/uploads/2019/12/Towards_a_decabonised_H_C_sector_in_EU_Final_Report.pdf)

138 Rosenow, J. et al (RAP), 2020.

139 Austrian Federal Chamber of Labour. (2019). *District heating and cooling: Demands from a consumer perspective*. Brussels, Belgium: Author. Retrieved from [www.akeuropa.eu/sites/default/files/2019-12/8\\_Policy%20Brief%20District%20Heating%20and%20Cooling.pdf](http://www.akeuropa.eu/sites/default/files/2019-12/8_Policy%20Brief%20District%20Heating%20and%20Cooling.pdf)

### The current and future cost of district heating in Poland

District heating is a significant provider of heat in Poland; the country has the largest number of district heating customers in Europe at just over 16 million. Poland is second only to Germany in the amount of consumed heat that is produced nationally by district heating systems. In total, 24% of heat consumed in Poland is delivered by district systems, 17% of which is for households.<sup>140</sup>

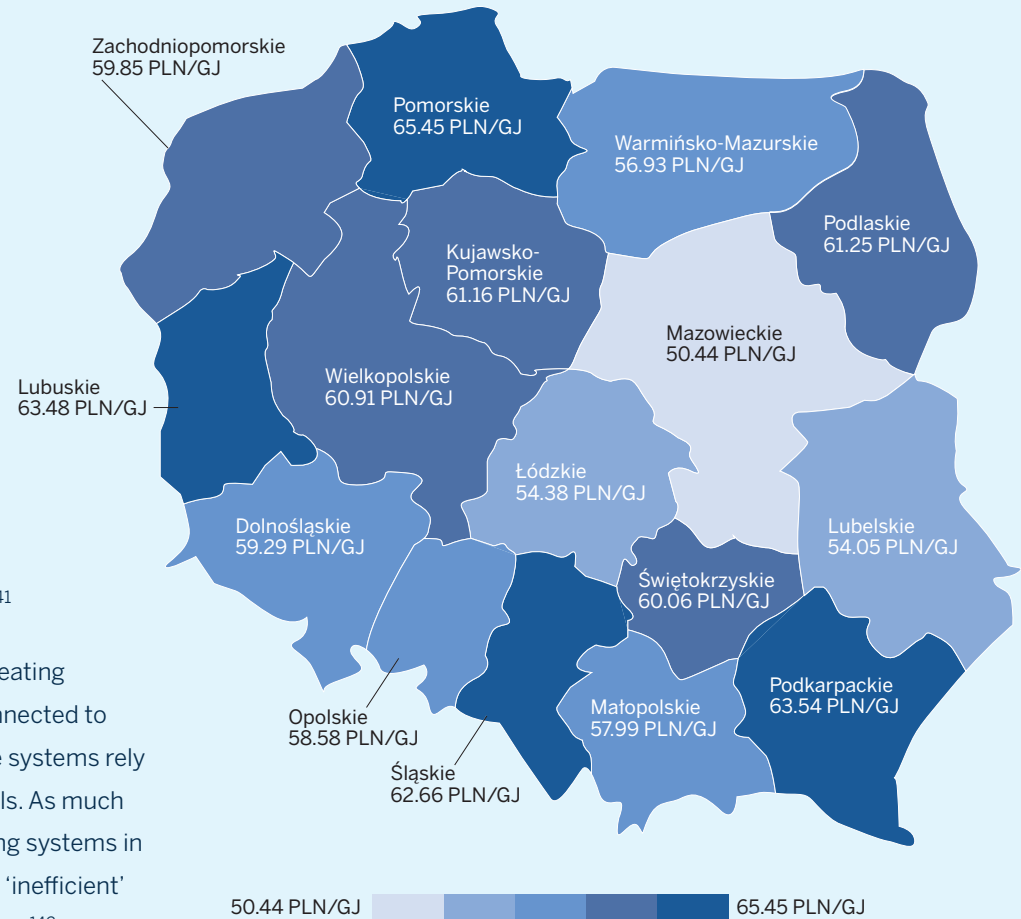
The existence of this extensive infrastructure is a significant benefit to the country on its path to decarbonising heat. When fuelled by low-carbon and renewable sources, and coupled with cogeneration where relevant, district heating provides an efficient route to decarbonising heat supply. District systems and their connected infrastructure also provide significant amounts of thermal storage, an important resource for reducing daily peaks in demand of electrically produced heat.<sup>141</sup>

However, Poland’s district heating systems and the homes connected to them are inefficient, and the systems rely on highly polluting fossil fuels. As much as 80% of the district heating systems in Poland are considered to be ‘inefficient’ under the State Aid Guidelines<sup>142</sup> and over 70% of the district heat is

fuelled by coal, with a further 5% from oils and 8.6% from gas.<sup>143</sup>

The price of heat delivered by district heating systems varies significantly, by 30%, across the country, and heat is more expensive in lower-income towns and cities (Figure 17). One reason for this price disparity is the less-efficient nature of smaller systems in less-populated areas. In 2017, Forum Energii found that, in larger cities, heat costs

**Figure 17. Average price of heat sold from from district heating networks by province (voivodship), 2018**



Source: ERO data presented in Macuk, R. (2019). *Heating in Poland 2019 edition*. Forum Energii.

140 Macuk, R. (2019). *Heating in Poland 2019 edition*. Warsaw, Poland: Forum Energii. Retrieved from <https://forum-energii.eu/en/analizy/cieplownictwo-2019>

141 Rosenow, J. et al (RAP), 2020.

142 State Aid Guidelines require that aid be provided only to district heating systems that incorporate 50% renewable energy, 50% waste heat, 75% cogenerated heat, or a combination of such energy and heat.

143 Macuk, R. (Forum Energii), 2019.



consumed 4.33% of average disposable income; in smaller cities, this rose to 5.76%.<sup>144</sup> These averages would be significantly higher for low-income groups. Given that heat accounts for 66% of household energy bills in Poland, high costs of district heat for poorer households is a risk to increasing energy poverty, which is estimated to affect 12% of the population.<sup>145</sup>

The pressure to keep heating costs down for households

has rendered district heating companies permanently unprofitable. The lack of profitability has also hindered modernisation and fuel switching. Poland faces a significant challenge to modernise its district heating systems and the connected homes, whilst keeping heat affordable to consumers. Householders switching to individual heating systems is a key risk and may present greater barriers to decarbonisation in the long term.

42% of residential heating and cooling demand in the EU is delivered by gas.<sup>146</sup> At a household level, when gas is used for heating it makes up a significant part of the bill because space and water heating make up the larger part of the energy bill than other energy uses (particularly in colder climates).

Gas is a lower price heating fuel in many Member States than other fossil options (e.g., oil) and electricity. In 2018, average household electricity prices across Europe were around three times higher than prices for gas;<sup>147</sup> in some Member States electricity prices are as much as five times higher than for gas. Contributing to the disparity between gas and electricity prices is the fact that both levies for clean energy programmes and carbon prices (through the EU ETS) are placed more frequently on electricity bills than on gas bills. The result is that, comparatively, gas is currently underpriced.

Due, in large part, to the lower cost of gas, programmes in several Member States continue to support switching household heating systems from fossil-fuel sources (e.g., oil) or direct electric heating to gas as a measure to alleviate energy poverty (particularly when coupled with energy

efficiency renovation). However, achieving Europe's net-zero target by 2050 will require the phaseout of fossil fuels, including fossil gas, in the next decades. This leaves significant questions around how this transition will be managed, who will pay for the redundant gas infrastructure (see Chapter 2), what the future price projection will be for gas or gas replacement fuels, and what electrification options will be open to low-income households.

The risk is that low-income households, for whom gas has historically been a low-cost heating fuel, will be left paying higher contributions to the gas distribution infrastructure as part of a smaller pool of infrastructure users and higher fuel costs. Fuel costs are likely to increase as replacement fuels like hydrogen substitute or are mixed with fossil gas to reduce the carbon intensity of the gas mix. The price of hydrogen is projected to be higher than that for the direct use of electricity.<sup>148</sup> Low-income households face significant barriers to moving to decarbonised heating such as: lack of space in smaller homes or apartments for an individual heat pump; high upfront cost of renovation and/or purchasing a new individual heating system; and lack of access to an efficient district heating system.

144 Rączka, J. and Rubczyński, A. (2017). *The last bell for district heat in Poland*. Warsaw, Poland: Forum Energii. Retrieved from <https://forum-energii.eu/en/analizy/ostatni-dzwonek-dla-cieplownictwa>

145 Macuk, R. (Forum Energii), 2019.

146 Fleiter, T., Elsland, R., Rehfeldt, M., Steinbach, J., Reiter, U., Catenazzi, G., et al. (2017). *Profile of heating and cooling demand in 2015*. Copenhagen, Denmark: Heat Roadmap Europe. Retrieved from [https://heatroadmap.eu/wp-content/uploads/2018/11/HRE4\\_D3.1.pdf](https://heatroadmap.eu/wp-content/uploads/2018/11/HRE4_D3.1.pdf)

147 ACER/CEER, 2019a.

148 Agora Verkehrswende, Agora Energiewende and Frontier Economics. (2018). *The future cost of electricity-based synthetic fuels*. Berlin, Germany: Author. Retrieved from [www.agora-energiewende.de/fileadmin2/Projekte/2017/SynKost\\_2050/Agora\\_SynKost\\_Study\\_EN\\_WEB.pdf](http://www.agora-energiewende.de/fileadmin2/Projekte/2017/SynKost_2050/Agora_SynKost_Study_EN_WEB.pdf)



## Key findings

**Low-income households face greater barriers to engaging in the energy market and the energy transition; they risk paying higher costs as a result.** Consumer protections and rights to transparent information and ease of switching energy tariff or supplier are essential. Customer aggregation by municipal energy suppliers can make navigation of the market easier for low-income and vulnerable households. Although dynamic price tariffs can offer significant benefits to households that can provide demand-side response services, the energy use profile of low-income and energy-poor households, as well as investment barriers, may prevent them from benefiting privately.

**Social tariffs can provide important immediate relief but energy efficiency is the most cost-effective, long-term solution to energy poverty.** Policy designers therefore need to carefully consider the balance of effort and investment between price support and energy efficiency support, not compromising the long-term solution in favour of the short term.

**District heat plays a key role in decarbonisation but consumer protection and regulation must be improved.** Increasing numbers of consumers can be expected to be connected to extended and new systems as one solution to decarbonise heat. However, the sector is characterised by a lack of competition and regulation. While district heat systems are different from gas and electric systems with respect to technology, governance, ownership and regulatory traditions, they do present similar challenges with respect to consumer protections, environmental standards and the need for appropriate regulatory oversight. Consumers who rely on district heating should have access to basic consumer protections and, where possible, energy service choices, similar to those in the gas and electricity sectors. District heat systems and their customers must not be left behind in the modernisation of energy systems.

**Gas could be an increasingly expensive heating fuel for low-income households.** As heat is decarbonised, the cost of using gas as a heating and cooking fuel can be expected to rise, creating a risk that low-income households that have relied on gas as a low-cost fuel will be trapped with rising prices. These households face significant barriers to switching to decarbonised heating. The future of gas for low-income households needs to be carefully considered, and a clear timetable established for when new residential gas connections and replacement of existing gas boilers can no longer be supported, particularly by public investment.

## Recommendations

- Municipalities or other entities can set up customer aggregation schemes, under which they can negotiate a discounted rate for citizens. This approach offers a route for consumers to benefit in a liberalised market.
- Regulators should ensure that suppliers fully communicate the costs, risks and benefits of dynamic pricing contracts and that low-income and vulnerable households have access to fixed tariffs (i.e., that do not change based on time).
- Within national energy poverty policy frameworks, actors must strike an effective and cost-effective balance between providing short-term assistance (e.g., through social tariffs) and long-term solutions (through energy efficiency and home renovation).
- European and national policymakers and regulators must ensure that consumers connected to district heating systems have access to a similar protections and choices as in the gas and electricity sectors.
- Policymakers, regulators and renovation programme designers must ensure that low-income households do not get left behind relying on high-cost, high-carbon gas as heat is decarbonised.

# Conclusions

**T**his report has started from the conviction that social justice and ambitious climate action must be fully integrated if Europe is to successfully deliver the clean energy transition. This requires careful assessment of the distributional impacts of climate policies, including the costs and benefits of specific measures. Additionally, such costs and benefits must clearly communicated to affected groups and continually monitored.

Citizens and advocates have rightly placed significant focus on the distributional impact of clean energy policies. However, caution needs to be taken that clean energy policies are not subject to greater critique than carbon-intensive investments, simply because the former are new and the latter are legacy. Whilst it is far from the intention of this paper to advocate a ‘race to the bottom’ in fairness standards, investments in the clean energy transition should not be held to higher standards than other essential investment, including that associated with ongoing fossil fuel infrastructure. Investments in all infrastructure should be subject to the same distributional tests (as outlined in

preceding chapters).

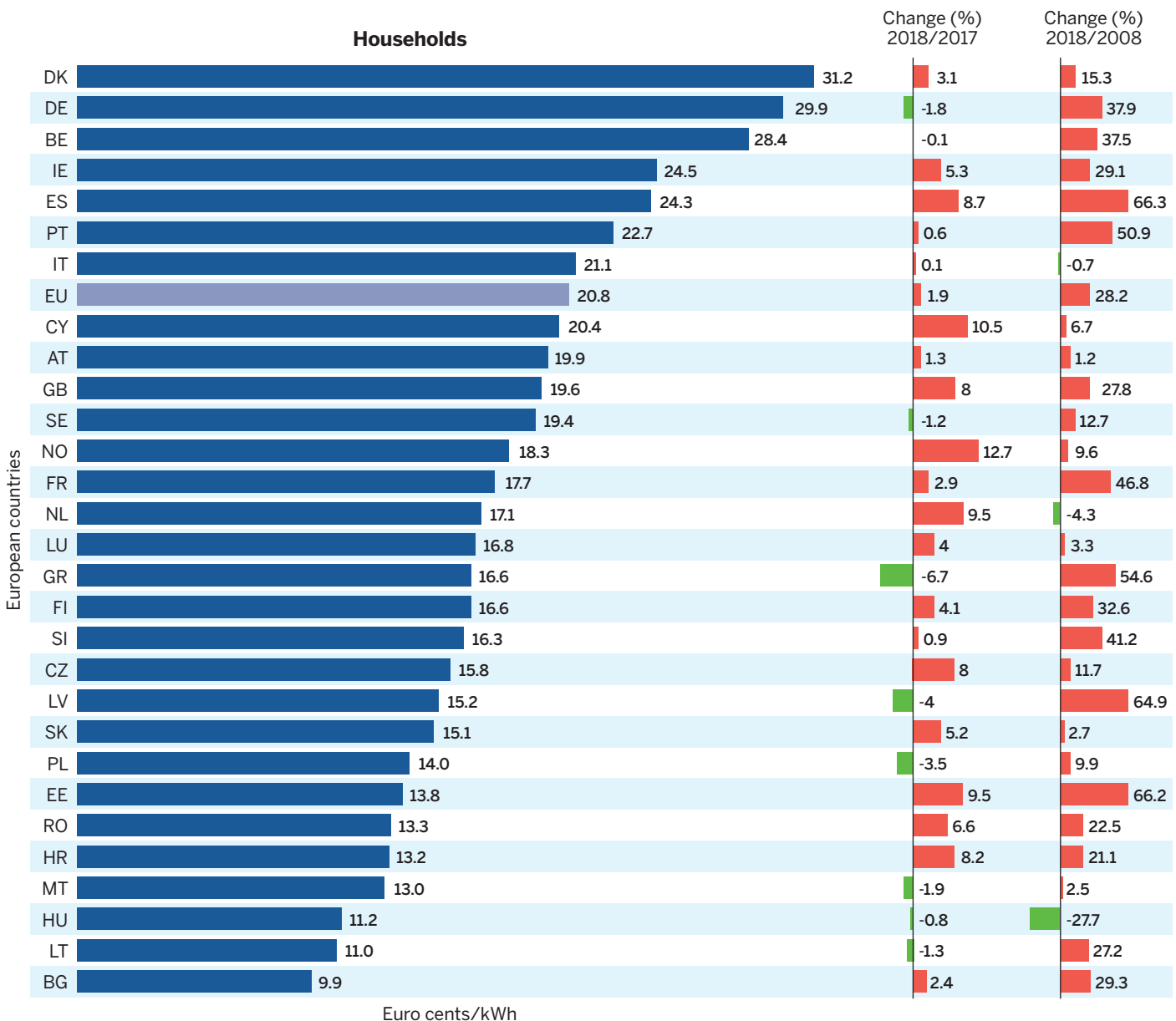
Across chapters, this report has considered separately a range of climate policies that are paid for (at least in part) through energy bills, specifically investigating the potential distributional impact of each. The report has not attempted to assess the aggregated effect of these policies — that is, how design decisions that shape various policies collectively influence household energy bills, particularly the bills of low-income households, and the overarching impacts this has on energy poverty. It is clear, however, that reducing energy demand through energy efficiency is the most cost effective long-term solution to energy poverty.

An important conclusion arises from this work: distributional issues and energy poverty cannot be considered only in social policy and ignored in climate policy. If existing inequalities are allowed to persist in energy policy, they will place a greater cost burden on the lowest-income households, exacerbating energy poverty and social inequity — and thereby placing greater burden on social policies.

# Appendix 1: Development of gas and electricity prices in EU Member States

Final electricity (Figure 18)<sup>149</sup> and gas (Figure 19)<sup>150</sup> prices for EU Member States plus Norway in 2018, and the changes in price compared with 2017 and 2008.<sup>151</sup>

Figure 18. Final electricity prices for households in the EU Member States and Norway, 2018



Source: Agency for the Cooperation of Energy Regulators / Council of European Energy Regulators. (2019). *Annual report on the results of monitoring the internal electricity and natural gas markets in 2018: Electricity and gas retail markets volume.*

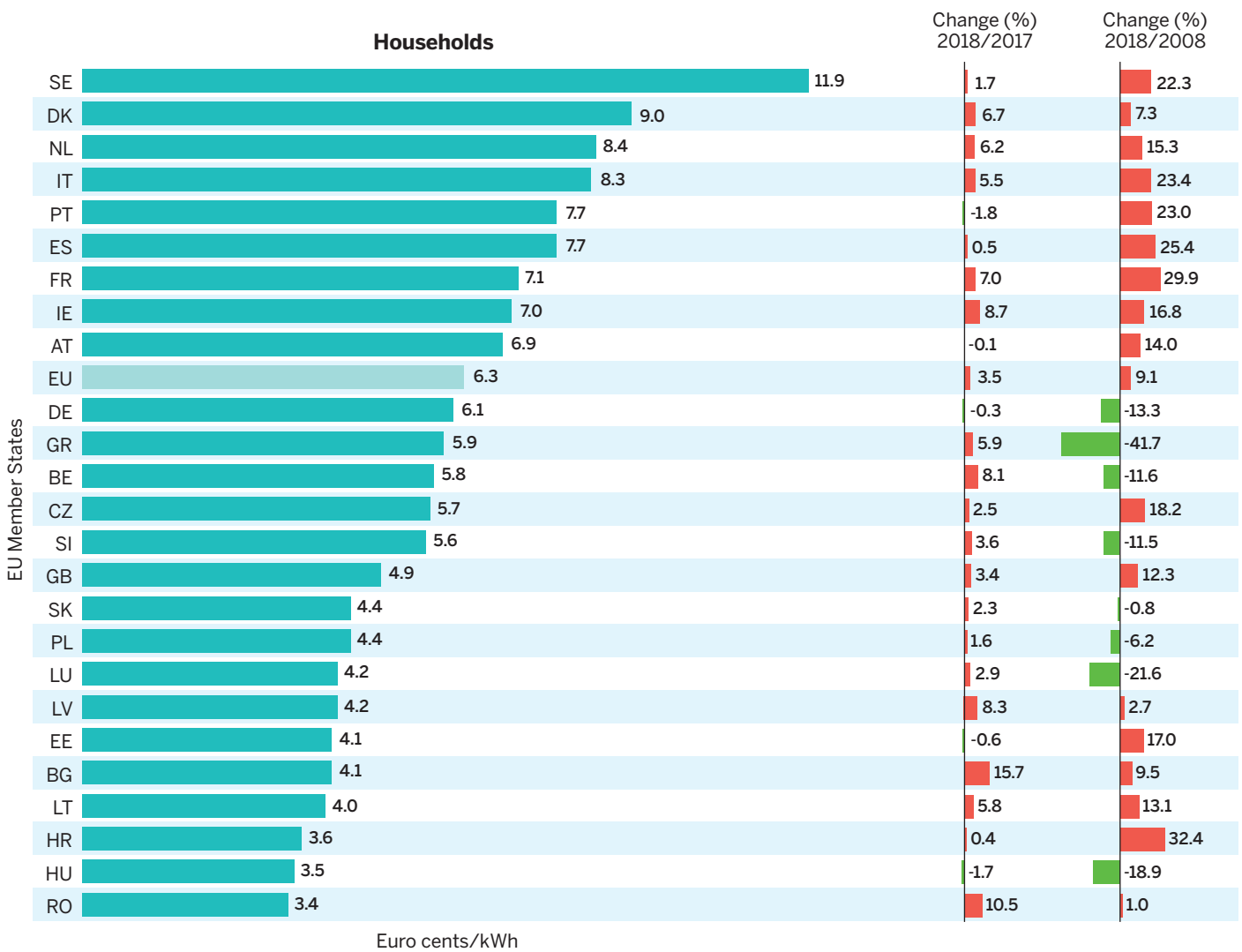
149 ACER calculations based on Eurostat, Band DC: 2,500–5,000 kWh (household electricity consumption) (May 2019). Note: Prices in nominal terms. For GB, Eurostat data only available for the UK as a whole.

(households) the 'change 2018/08' is with respect to 2012 as the data for earlier years are not available. For GB, Eurostat data available only for the UK as a whole. Prices for Finland are not available.

150 ACER calculations based on Eurostat, Band D2: 20–200 GJ (household gas consumption) (June 2019). Note: Prices in nominal terms. For Greece

151 ACER/CEER, 2019a.

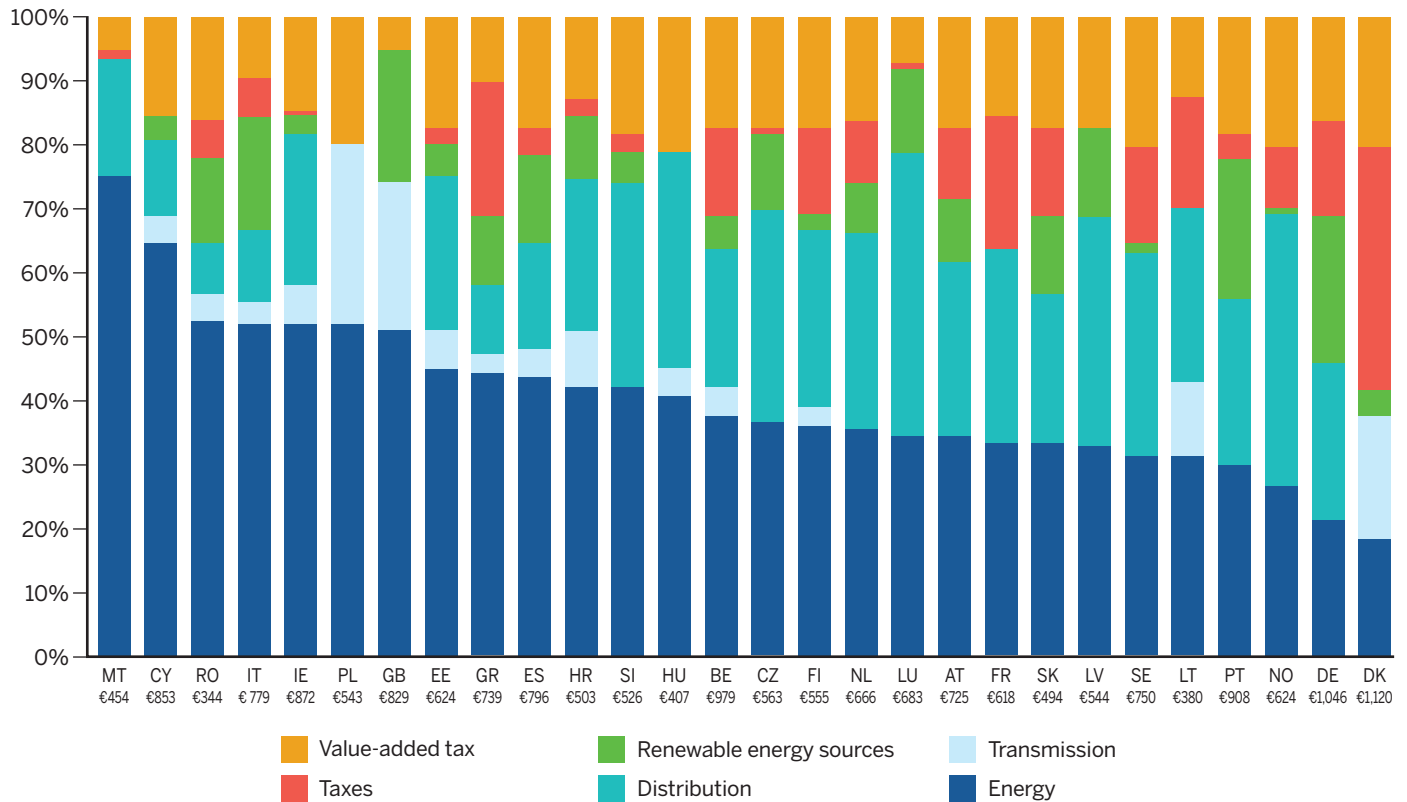
Figure 19. Final gas price for households consumers in the EU Member States, 2018



Source: Agency for the Cooperation of Energy Regulators / Council of European Energy Regulators. (2019). Annual report on the results of monitoring the internal electricity and natural gas markets in 2018: Electricity and gas retail markets volume.

Breakdown of incumbent suppliers' standard offers for electricity (Figure 20)<sup>152</sup> and gas (Figure 21)<sup>153</sup> in EU capital cities for November-December 2018.

**Figure 20. Breakdown of incumbent suppliers' standard electricity offers for households in capital cities, Nov./Dec. 2018**

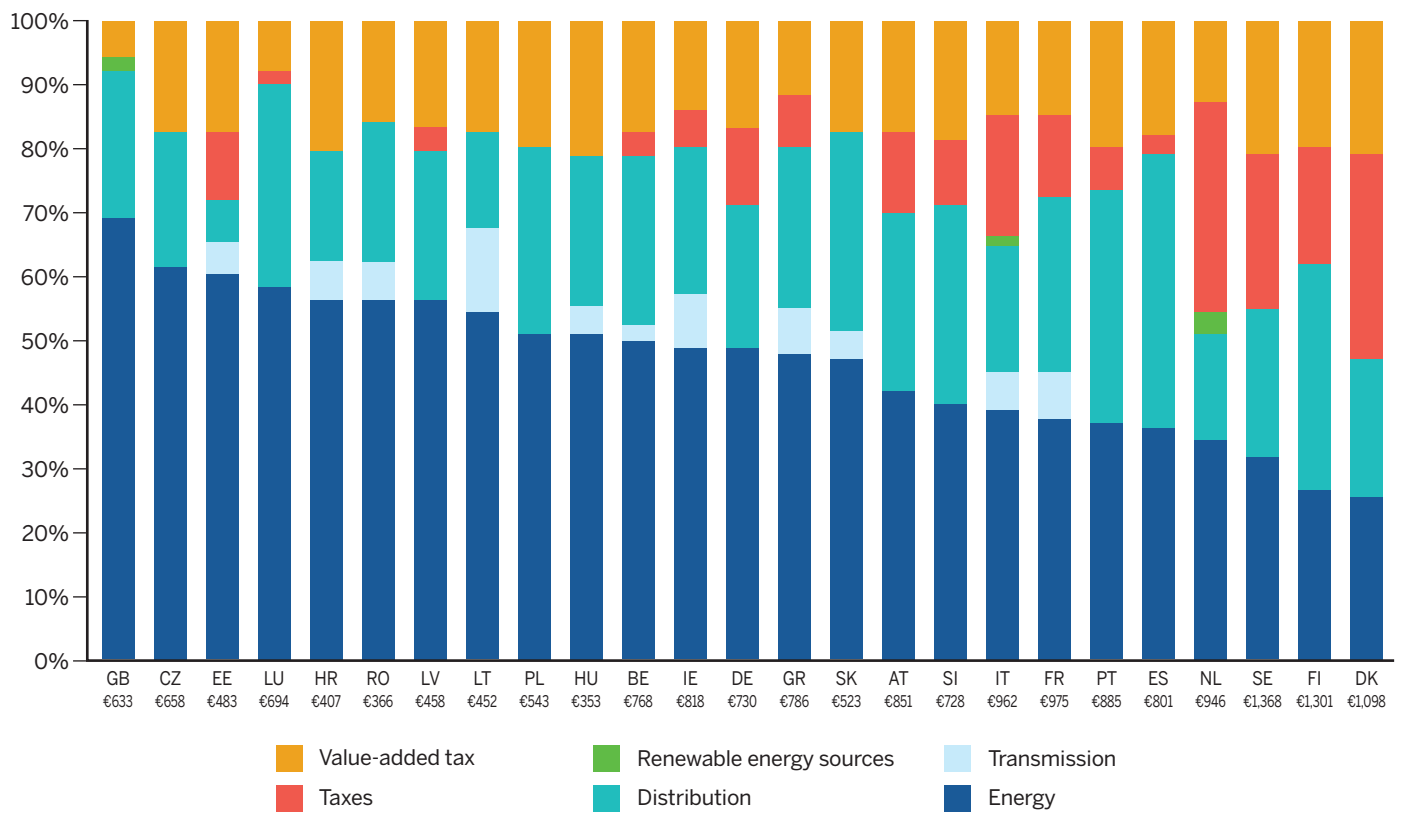


Source: Agency for the Cooperation of Energy Regulators / Council of European Energy Regulators. (2019). *Annual report on the results of monitoring the internal electricity and natural gas markets in 2018: Electricity and gas retail markets volume.*

152 ACER calculations based on data collected via ACER Retail Database (2019). Note: Where the breakdown of grid costs in transmission and distribution is not available, all costs are included in distribution. The breakdown for Germany refers to the national average, instead of the standard incumbent offer, which is collected by the German NRA. The Bulgarian NRA did not provide input for 2018 and is not included.

153 ACER calculations based on data from price comparison tools, incumbent suppliers' websites and NRAs, collected via ACER Retail Database (2019). Note: Where the breakdown of grid costs in transmission and distribution is not available, all costs are included in distribution. Cyprus, Malta and Norway are not included in this Figure, due to small or non-existent gas markets for household consumers. Bulgaria is not included due to lack of data and input by the NRA. Natural gas prices for Sweden refer to Gothenburg. The breakdown for Germany refers to the national average, instead of the standard incumbent offer, which is collected by the German NRA.

Figure 21. Breakdown of incumbent suppliers' standard gas offers for households in capital cities, Nov./Dec. 2018



Source: Agency for the Cooperation of Energy Regulators / Council of European Energy Regulators. (2019). Annual report on the results of monitoring the internal electricity and natural gas markets in 2018: Electricity and gas retail markets volume.



## Appendix 2: Housing quality and energy efficiency by income decile

**T**able 3 provides detailed data on the distribution of households in the three lowest and highest three income deciles across homes of different energy efficiency classifications in the French stock.<sup>154</sup> There is a clear overall trend for the three lowest income deciles (D1-3) to live more often in lower efficiency homes (E, F, G) and the

highest income deciles to live in the best performing homes (A, B, C). Of the dwellings belonging to energy class B, 42% are occupied by households in the three highest income deciles. In energy class G, 50% of the dwellings are occupied by dwellings of the three lowest income deciles.

**Table 3. Distribution of income deciles for each home energy efficiency classification percentage, France**

	A	B	C	D	E	F	G
<b>D1</b>	0	12	4	7	8	14	21
<b>D2</b>	0	5	7	6	11	15	16
<b>D3</b>	0	2	9	10	10	9	13
<b>D8</b>	20	14	14	10	11	6	6
<b>D9</b>	20	16	14	13	7	10	5
<b>D10</b>	20	12	14	13	8	9	5

Source: French association of environmental and resource economists. (2018). *Energy consumption in the French residential sector: How much do individual preferences matter?*

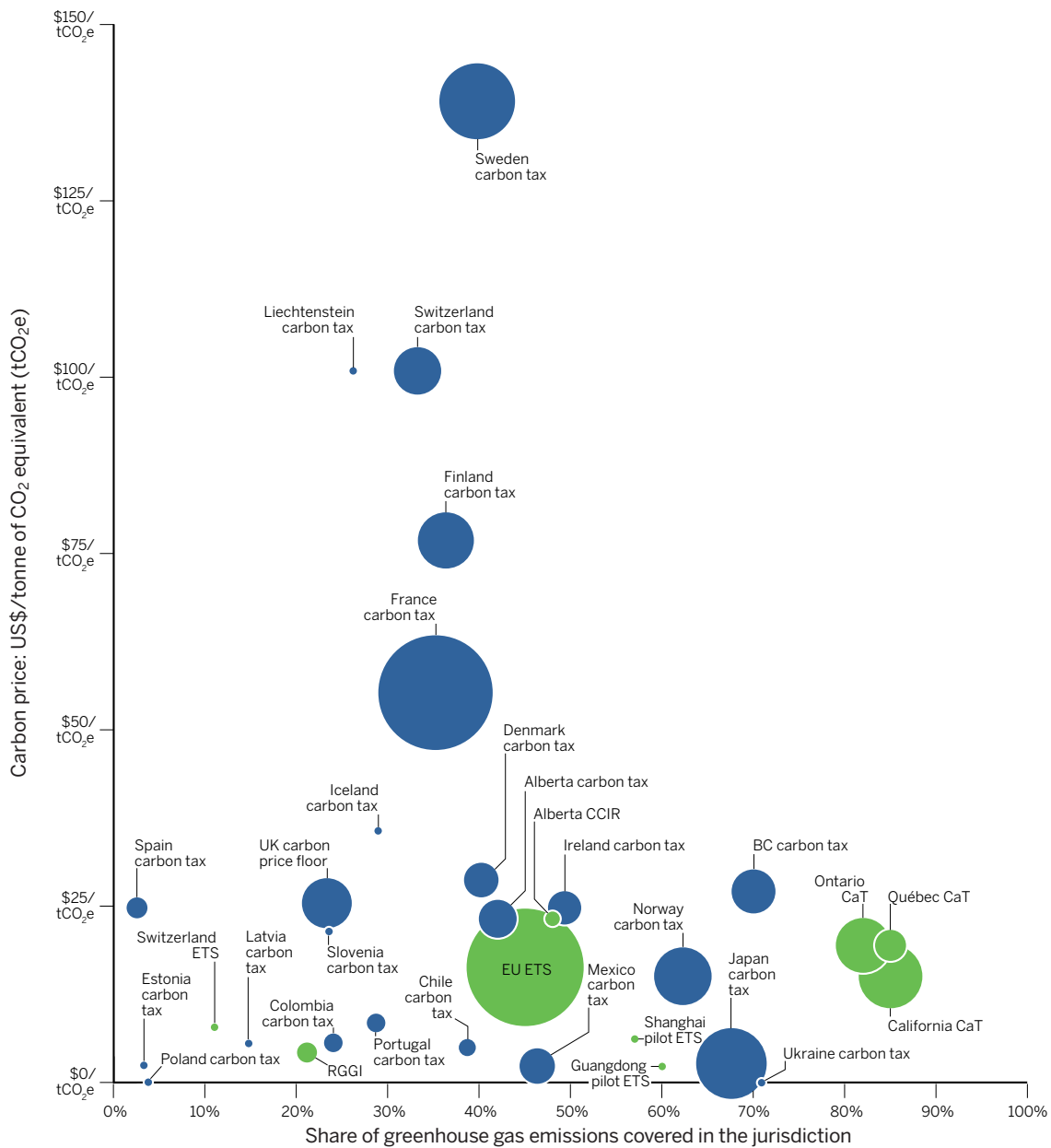
154 Bakaloglou, S. et al (FAERE), 2018.

# Appendix 3: Worldwide carbon pricing initiatives

Figure 23 illustrates the use of carbon pricing initiatives (both taxes and cap-and-trade schemes) worldwide.<sup>155</sup> It illustrates the carbon price, share

of emissions covered by carbon pricing and the revenues of implemented carbon pricing initiatives.

Figure 22. Carbon price, share of emissions covered by carbon pricing, revenues of implemented carbon pricing initiatives



Source: World Bank. (2018). State and trends of carbon pricing 2018.

155 World Bank Group and Ecofys, 2018. The size of the circles is proportional to the amount of government revenues except for initiatives with government revenues below US\$100 million in 2017; the circles of these initiatives have an equal size. For illustrative purposes only, the nominal prices on April 1, 2018 and the coverages in 2018 are shown. The carbon tax rate applied in Mexico and Norway varies with the fossil

fuel type and use. The carbon tax rate applied in Denmark varies with the GHG type. The graph shows the average carbon tax rate weighted by the amount of emissions covered at the different tax rates in those jurisdictions. The middle point of each circle corresponds to the price and coverage of that initiative.

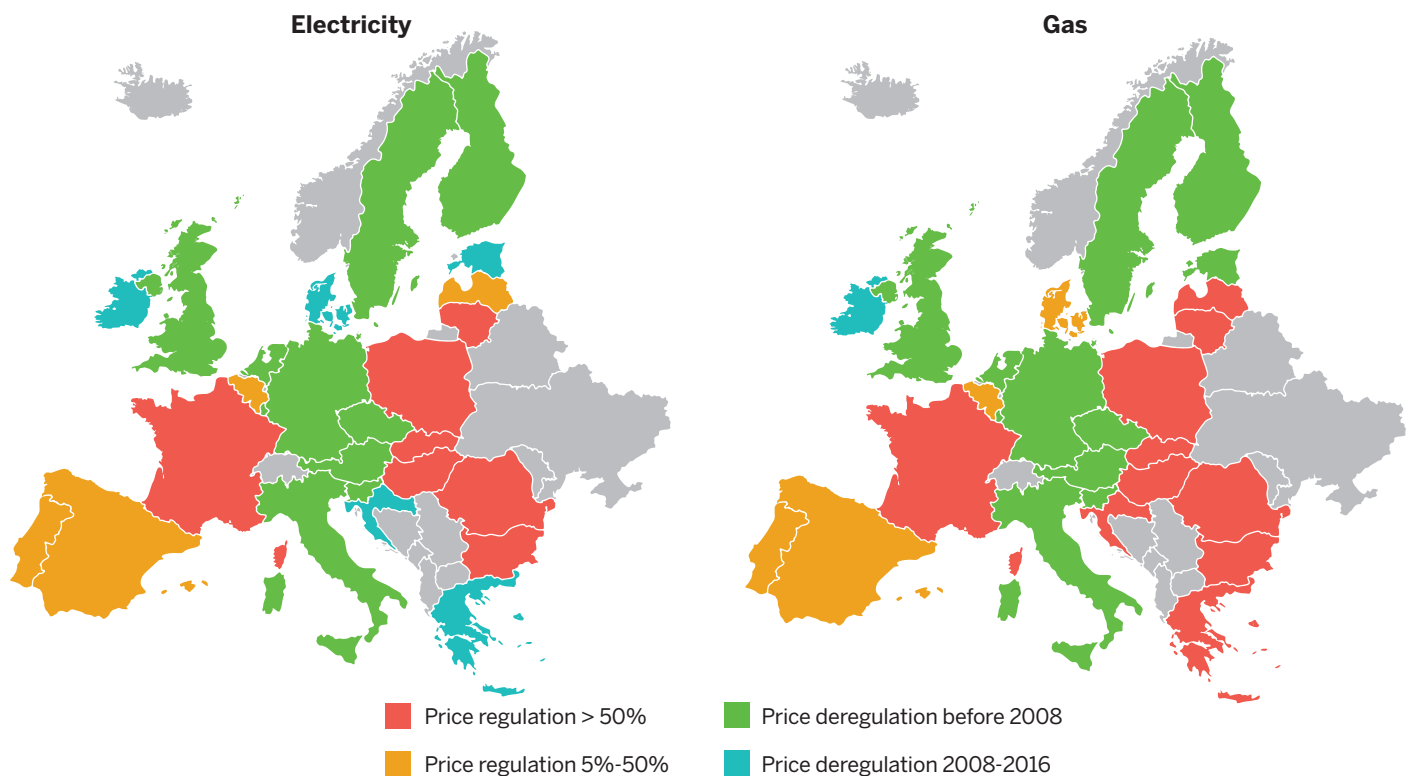
## Appendix 4: Price regulation and switching rates

Figure 23 shows levels of household price regulation in EU Member States.<sup>156</sup> It divides Member States into four groups based on the prevalence of regulated prices: Markets in which more than 50% of consumers have regulated prices (red); markets in which 5% to 50% of consumers have regulated prices (dark yellow); markets that fully phased out regulated prices before 2008 (i.e., a maximum of 5% of consumers have regulated prices since

2008) (green); and markets that phased out regulated prices between 2008 and 2016 (i.e., a maximum of 5% of consumers have regulated prices in 2016) (turquoise).

A summary of approaches to price regulation can also be found in the annexes of the 2018 Triconomics report on energy prices, costs and subsidies.<sup>157</sup> Figure 24 shows the annual switching rates for Member States at different levels of deregulation.<sup>158</sup>

Figure 23. Household price regulation in EU Member States, 2016



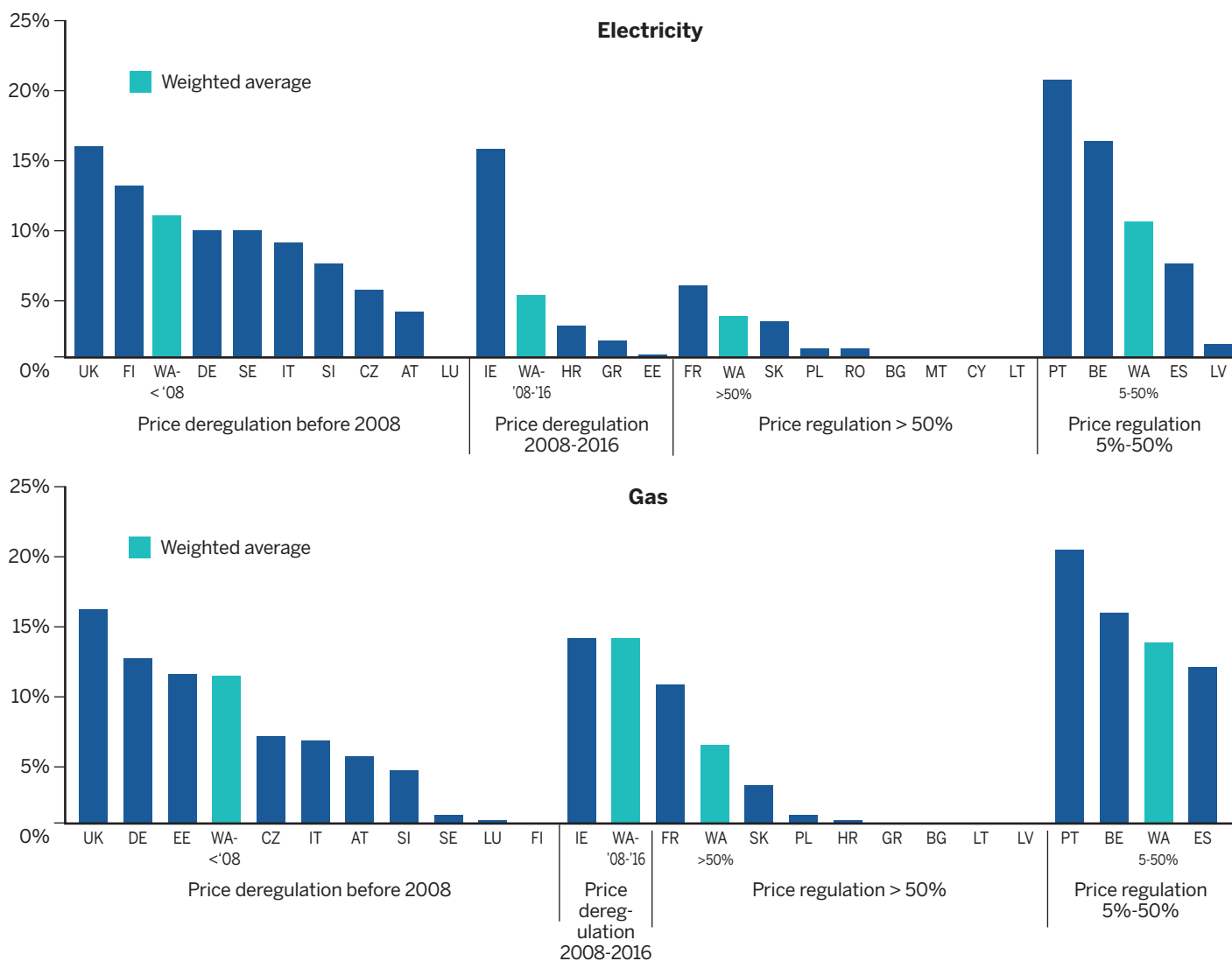
Source: European Commission. (2019). *Staff working document on energy prices and costs in Europe: Part IV Impact of price regulation.*

156 European Commission, 2019c.

157 Heald, S. et al (Triconomics), 2018.

158 European Commission, 2019c. Source data: CEER data and VAASAETT. Switching rates for households in relation to the total number of metering points. Note: data is missing for NL and HU for electricity and for NL, HU and RO for gas. Used weights are the total households consumers per country and per energy market. WA is weighted average.

**Figure 24. Annual switching rates for electricity and gas for countries at different stages of price deregulation, 2016**



Source: European Commission. (2019). Staff working document on energy prices and costs in Europe: Part IV Impact of price regulation.

# Glossary

## **Fair**

An outcome in which people are treated equally without favouritism or discrimination.

## **Just transition**

The term 'just transition' has its origins in regional transition. It was coined in the U.S. by labour unions and environmental justice groups to refer to an equitable transition for low-income communities from industries that were damaging the environment and health. The term was also used in the Paris Agreement in relation to the transition of workforces and creation of quality jobs. The term is taking on a wider definition to relate to broader social equity in the clean energy transition.

## **Equity**

Equity relates to how fairly income and opportunity are distributed between different groups in society.

## **Distributional equity**

Distributional equity referred to in this paper relates to how fairly income and opportunity are distributed between higher- and lower-income consumer groups

## **Vulnerable consumers/vulnerable groups**

Vulnerable energy consumers are defined nationally. The most common ways to define vulnerability are low-income and social vulnerability criteria including old age, presence of very young children in the household, disability and long-term illness.

## **Energy poverty**

Although energy poverty has no official definition at European level, the de-facto definition used by the Energy Poverty Observatory is when 'individuals or households are not able to adequately heat, cool or provide other required energy services in their homes at affordable cost.' A number of Member States have national-level definitions.

## **Dynamic pricing**

A dynamic electricity price contract is an electricity supply contract between a supplier and a final customer that reflects the price variation at the spot markets including day-ahead and intraday markets, at intervals at least equal to the market settlement frequency.

## **Prosumer**

A prosumer is someone who both produces and consumes energy.

## **Fixed fees**

Network tariffs are made up of a number of components. Fixed fees generally do not vary with respect to energy use or usage characteristics. For example, a fixed fee might take the form of a per-customer charge that is the same for each customer in the same group (e.g., household customers).

## **Regressive**

An economic or tax system in which there are advantages for higher-income people and disadvantages for lower-income people.

## **Progressive**

An economic system in which more advantages, especially tax advantages, are given to people with less money than those with more money.









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