GREEN EUROPEAN FOUNDATION

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Electricity tariff design

Marine Cornelis, Next Energy Consumer

Policy Brief
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Introduction

Since the end of 2021, households in many EU countries have been exposed to extreme price hikes from wholesale electricity markets as a result of Europe's dependency on fossil gas (Ramboll, 2023). The summer of 2024, the hottest on record, also reminds us of the toll that high energy prices take on the poorest and most vulnerable populations, who are the first to suffer from climate change. Making renewable electricity accessible and prices affordable for everyone is a social, ecological, security and economic imperative.

The energy price crisis has intensified the cost of living in the EU and highlighted how poorly designed electricity tariffs can deepen inequalities. Meanwhile, solar and wind power have helped lower wholesale prices. This brief focuses on household consumption of renewable electricity and the regulatory and contractual framework for retail electricity supply in the EU. A separate brief deals with citizen energy-sharing schemes to improve access to low-cost renewable electricity.

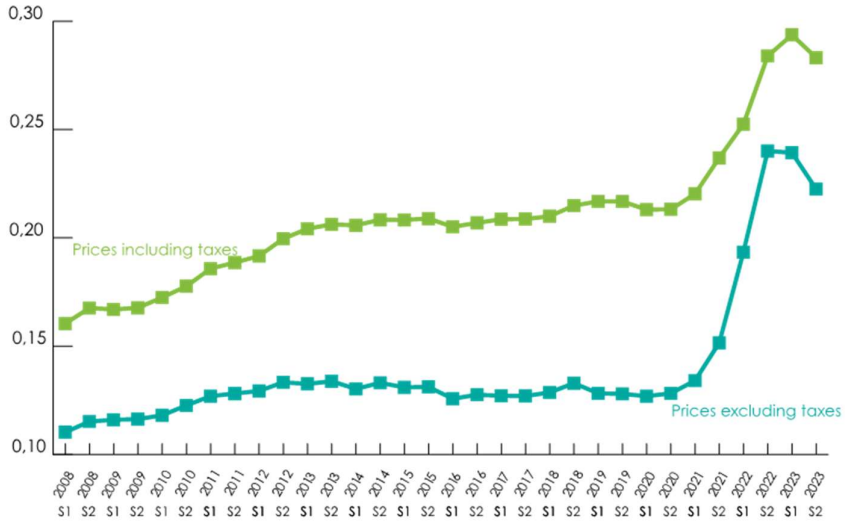


Figure 1 - Development of electricity prices for household consumers, EU, 2008-2023 (€ per kWh).
Source: Eurostat, 2024

What is electricity tariff design?

Electricity tariffs have a number of different components: energy, network, taxes and levies. While the energy component of the price is subject to competition and can vary depending on the specific arrangements between market players and consumers, network tariffs and taxes are determined by law or the regulator.

Protecting citizens against future price hikes and geopolitical uncertainties requires suppliers to wean their portfolios off fossil fuels and increase renewable electricity supply. So far, however, most retail electricity tariffs in the EU have failed to pass on the cost advantages of renewable electricity sources to households. Fair tariffs should make electricity more affordable while ensuring equitable access and participation in the energy market. Such tariffs are essential for **building trust** in the energy transition by **fairly distributing the costs and benefits of renewable energy**. This requires innovative tariff designs that address the needs of all consumers, especially vulnerable and low-income households, which are most impacted by price volatility and least able to invest in renewable self-generation or energy efficiency improvements.

With high shares of cheap but weather-dependent solar and wind power, energy bills will increasingly depend on how and when energy is used. Those who can adapt their consumption patterns will see increasing rewards. Conversely, the relative cost for households unable to respond flexibly will probably become more significant.

The fossil energy supply crisis of 2021-23 demonstrated the importance of **long-term hedging**[1] on the electricity wholesale markets to shield end-consumers, particularly households, from extreme prices. Suppliers that had hedged their customers' electricity consumption on the long-term electricity market well in advance were less affected by the energy supply crisis than those that had not hedged and therefore passed on the extreme prices to their customers or even went bankrupt.

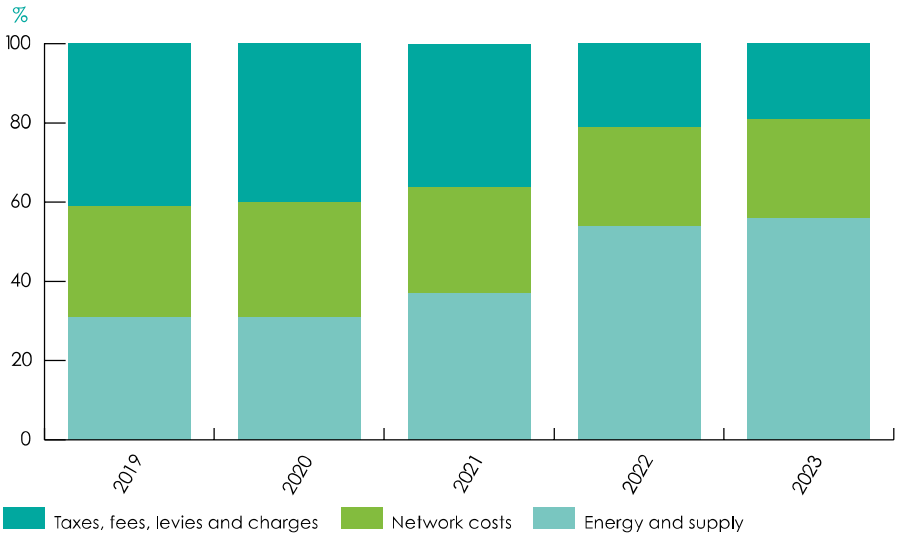


Figure 2 - Breakdown of the average electricity price for households 2019-202 3 (%).
Source: Eurostat electricity price components (nrg_pc_204_c), own calculations

In 2023, EU households paid an average of 29 cents per kilowatt-hour of electricity. Even if citizens change their behaviour to maximise their use of low-cost renewable electricity, they still need to pay additional costs for transporting the electricity and taxes. The way **retail tariffs allocate network costs and taxes significantly affects cost distribution**. Network costs make up 25% of the household retail price (7 cents/kWh), while

[1] 'Hedging' here refers to managing the financial risk associated with fluctuating electricity prices. It involves making agreements or transactions that protect against potential losses due to price volatility.

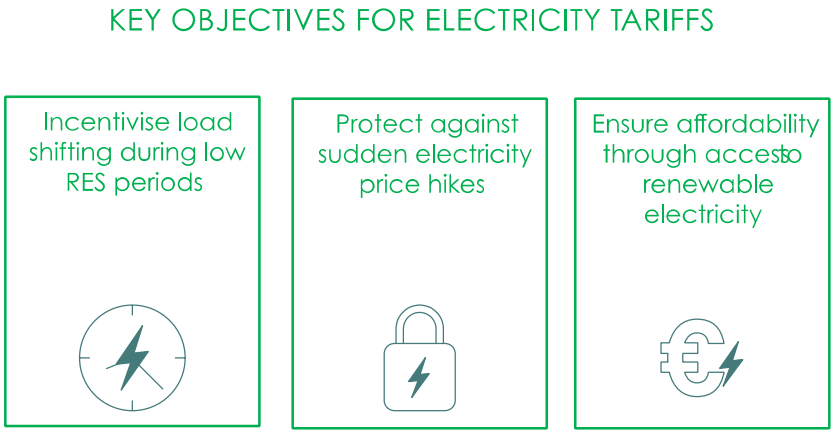
taxes, fees, levies and charges account for around 20% (6 cents/kWh) (Eurostat, 2024), with substantial differences between Member States and over recent years (figure 2).

Key objectives for electricity tariffs

Given this context, it is clear that electricity tariffs should be evaluated for their **incentive effects** and their role in mitigating the impact of electricity price crises. Electricity tariffs should meet three key objectives:

- Create **incentives for load shifting** to enhance flexibility and encourage **energy saving** during longer periods of low (renewable) production
- Offer **protection** against sudden increases in electricity prices
- Ensure **affordability** through access to renewable electricity.

Current retail electricity tariffs in the EU typically either incentivise consumption shifts by means of variable pricing or offer price stability through fixed-rate tariffs, but rarely combine the two.



State of play: How tariffs contribute to fair participation in the EU energy transition

EU legislation gives citizens the right to access a fixed price tariff and obliges retail suppliers to offer dynamic price tariffs[2]. A variety of retail electricity tariffs are available in EU Member States. These include **static, fixed price** and **social or regulated tariffs** with capped prices per kilowatt-hour; highly **dynamic tariffs** with varying prices depending on the time of consumption; and block tariffs that include a basic amount of consumption (explained in detail below) (ACER & CEER, 2023).

Fixed electricity tariffs offer price stability by locking in rates for a set period. They can help consumers manage their budgets and avoid market volatility, but **consumers might pay too much** if wholesale market prices drop after they take out a fixed-price contract (Citizens Advice, 2024), and they might also have to pay an exit fee if leaving it early. Moreover, **fixed-price tariffs might hide wholesale market price signals**, reducing the incentive to use renewable electricity when it is abundant, such as during hours of sunshine or wind.

Dynamic tariffs are available in many Member States, allowing citizens to **benefit from low-cost renewables by adjusting their usage during specific periods** (Enefirst project, 2020). These tariffs, which are based on wholesale market prices, can pass on the cost savings of renewables to consumers. By embracing demand-side flexibility – e.g. by night-charging electric vehicles, using smart appliances and integrating solar panels

[2] Directive (EU) 2024/1711 as regards improving the Union's electricity market design, June 2024, art. 11

with home batteries – EU consumers could save over € 71 billion on electricity bills by 2030 (SmartEn/DNV, 2022).

Table 1 - Examples of dynamic price contracts

Level	Mechanism	Details
Tado	Smart thermostats with dynamic price contracts in several EU Member States	Balances energy use with real-time dynamic pricing to optimise heating costs
1komma5grad	Home energy management system optimising solar self-consumption with a capped dynamic price contract (Germany only)	Integrates solar self-consumption and provides a capped dynamic pricing structure to manage costs effectively
Octopus	Heat pump tariffs (UK only)	Offers variable pricing tailored to heat pump users to promote efficient energy use
EDF	Air source heat pump tariff trial (UK only)	Trial tariff aimed at making air source heat pumps more affordable through dynamic pricing

While beneficial for some, dynamic tariffs are not suitable for everyone and also require smart meters – which are still unavailable for many consumers in the EU. For poor and vulnerable households, dynamic tariffs can pose a serious risk, as these households may not have the **financial flexibility** to manage energy bills that occasionally spike far above the average due to sudden price increases. These households are already financially fragile, so even a short period of elevated prices could push them into (further) energy debt. Moreover, many of them face barriers such as limited **digital literacy, lack of access to technology, and the inability to invest** in flexible assets such as electric vehicles, heat pumps or smart appliances. These **challenges are compounded by factors** such as age, location, working hours and family dynamics, which can limit the advantages of features such as time-of-use pricing. For example, older populations may struggle with new technologies, and low--income families often live in poorly insulated homes with outdated appliances, and may find the upfront costs of smart devices prohibitive. As a result, making dynamic tariffs accessible and effective for all consumers remains a significant challenge (RAP, 2024; Sharma, 2024).

A stable, cost-efficient renewable energy system relies on **dynamic interactions** between the grid and millions of solar panels, batteries, electric vehicles and heat pumps (EEA & ACER, 2023). Effective retail electricity tariffs can encourage households to **adjust their consumption**, reducing grid strain and overall system costs. Time-based and capacity-based network charges can further incentivise households to adapt their usage to grid conditions. Greater demand-side flexibility can decrease the need for grid expansion and reduce reliance on fossil backup capacities.

Households that shift consumption to times when cheap renewable electricity is abundant support the market integration of renewables by effectively prioritising them over other forms of energy; this **reduces the need for public subsidies**. Fair tariffs that promote energy savings and efficiency also lower demand, **enhancing supply security** by decreasing reliance on imported fossil fuels. However, **high electricity taxes and charges can hinder the transition** from fossil fuels by making electric heat pumps and vehicles less competitive than fossil gas boilers and combustion cars, which may face lower taxation (Gore, 2021).

On the supply side, retail electricity suppliers can offer price-stable renewable energy through long-term contracts such as Renewable Power Purchase Agreements (PPAs)[3] or Contracts for Difference (CfDs)[4] (see also Florence School of Regulation, 2024). These mechanisms are intended to supply larger quantities of renewable energy and offer developers **stable revenue** – but need careful design. So far, these offers have been available to retailers and large-scale consumers. Governments can leverage them to promote renewable energy deployment and provide indirect benefits to households through innovative retail electricity contracts and consumer protection measures (RAP, 2023). As policymakers focus on lowering industrial electricity costs via PPAs and CfDs, fairness for households must not be overlooked. For instance, PPAs and CfDs can reduce market liquidity and weaken flexibility incentives if they fail to transmit effective price signals.

What is missing?

Collaboration between players to create fair electricity tariffs

Achieving fair renewable electricity tariffs will require coordinated efforts across multiple levels of governance. European institutions are responsible for establishing clear policy frameworks that promote flexibility while protecting vulnerable consumers. National governments and regulators tailor these frameworks to local contexts, designing tariffs that encourage – or de facto discourage – demand-side flexibility and protect low-income households from price volatility. Local authorities are pivotal in facilitating the deployment of smart grids and community energy projects that empower consumers. Energy utility companies are tasked with effectively integrating renewable energy and managing grid demand. Retail suppliers contribute by offering dynamic pricing models and stable renewable energy options through contracts such as CfDs and PPAs.

However, ensuring inclusivity and fairness requires the active involvement of vulnerable and underrepresented groups in tariff design, for example, through focus groups or citizens' panels. Consumer organisations, ombudsmen and dispute resolution bodies are also uniquely positioned to leverage their frontline experience to shape tariffs that address consumers' needs. Ultimately, collaboration between all stakeholders is essential for the development of tariffs that are equitable and drive broad participation in the energy transition across the EU.

Transparency for building citizen trust

Consumers face significant barriers to engaging with the energy market, including a lack of awareness about the benefits of **switching** tariffs. The **complexity** of energy tariffs increases with time-of-use elements. Even for consumers with high digital literacy, comparing offers and making a well-informed choice can be challenging. During the energy price crisis, many EU households experienced extreme price increases, unilateral contract changes by their retail suppliers or even suppliers going bankrupt. These developments **undermined trust**. Both the delayed roll-out of smart meters and the privacy concerns about them in some Member States further complicate households' engagement. In some countries, environmental NGOs and consumer organisations have also criticised the marketing of renewable electricity tariffs as not always sufficiently substantiated and potentially allowing for greenwashing (Boeck, 2023).

[3] PPAs are long-term contracts between energy buyers and sellers, e.g. with prices for solar or wind power fixed for 10 years.

[4] CfDs are financial instruments backed by a public entity to support investments in assets with high upfront costs by providing stable revenues for power plant operators over a long period, independent of the price volatility of wholesale markets.

Tailored tariffs aligned with targeted support measures

There is **no 'average' energy consumer** – the way we use energy is influenced by factors such as gender, age, ability, income, wealth and access to technologies such as electric vehicles, heat pumps and solar panels. Tariff design must take this into account. Tariffs should be tailored to reflect the energy demands of various consumer groups, particularly those traditionally underserved or marginalised. Not everyone is able or willing to engage with dynamic tariffs and flexible solutions, and this underscores the importance of **clear communication, inclusive design and accessible, user-friendly options** (Heinrich Boell Stiftung Greece et al., 2022). To be truly future-proof, tariffs must focus on justice and affordability and incorporate social tariffs for certain households in order to ensure fair and equitable access to energy for all.

Practical examples

The RenOnBill project in Italy demonstrates how **on-bill financing** schemes can significantly boost residential energy renovation. Allowing homeowners to finance energy efficiency upgrades through their utility bills reduces the upfront costs to zero. The resulting energy savings are used to repay the investment, making renovations accessible and financially viable (EUSEW, 2021).

Under the Greek government's plan to shift lower off-peak electricity tariffs from nighttime to midday – when renewable energy production is at its highest – households can **receive vouchers to upgrade old appliances** to more efficient smart devices. This initiative will align energy use with renewable generation, and includes provisions for households with members who have special needs.

Tariff design that gets the right balance between price protection and exposure

Many countries have introduced rebates, vouchers and social tariffs to help the most vulnerable pay their energy bills (ACER & CEER, 2023). However, the key challenge in designing fair renewable tariffs is finding a way to balance two seemingly conflicting objectives: **nudging behavioural change through effective price signals** while also **protecting households** from extreme price spikes.

Although uncommon in the EU, **rising block tariff models** could help balance social protection with exposure to market price signals. These tariffs offer a basic level of consumption either free or at a reduced rate, with higher, dynamic pricing applied above this essential level. They can benefit low-income households with low energy consumption. However, block tariffs could send inefficient price signals, leading to overconsumption in cheaper blocks and underconsumption in more expensive ones. It would be counterproductive to attempts to reduce demand if, for example, consumers were incentivised to increase their electricity usage in order to stay within lower-cost tiers. Additionally, defining a basic supply per household is challenging, as needs vary significantly. For example, someone reliant on respiratory equipment has different energy needs from someone who works outside the home all day. During the 2021-22 electricity price crisis, some EU Member States introduced block tariffs to protect consumers from price hikes, without adequate differentiation or progressive targeting. As a result, some groups received benefits despite not being in need (Chapman, 2024).

Dynamic tariffs with price protection combine real-time energy pricing with a safety net against price spikes (Hirth et al., 2023; Belgian Energy Ombudsman, 2024). This model allows consumers to benefit from lower rates during off-peak times while shielding them from sudden increases in electricity costs. By integrating smart technology and price caps, this tariff system encourages efficient energy use and savings, providing a balanced approach to energy consumption and financial predictability. Although exposed to hourly changing prices, the price floats within clearly defined limits.

The risk of potential grid bottlenecks could be dealt with by using the network cost component of retail electricity prices as a lever to increase both flexibility and fairness. Replacing static network charges with

more differentiated, cost-reflective pricing could drive better outcomes. Local grid operators could introduce time-of-use elements in network charges, rewarding users for adjusting their consumption. However, it is essential that these local price signals are aligned with those from wholesale markets in order to avoid conflicting incentives that could undermine the intended benefits.

How can the EU facilitate fair renewable electricity tariffs?

In the context of energy price and cost of living crises, better electricity tariff design could help broaden access to affordable renewable energy by helping households to respond flexibly to price signals. Well-designed tariffs should create incentives for load-shifting and encourage energy saving during periods of low renewable production; offer protection against sudden increases in electricity prices; and ensure affordability through access to renewable energy.

To deliver on this potential, the EU can take the following concrete steps.

1. Make electricity tariffs more transparent and user-friendly

Facilitate dynamic tariff adoption

EU institutions should provide clear guidance on renewable tariffs. Key actions include strengthening rules for transparent pre-contractual information, simplifying price comparison tools, and ensuring clear and accessible bill design, particularly for vulnerable and underrepresented consumers. The use of aids such as colour coding and plain language can greatly improve comprehension. Additionally, e-platforms offering real-time data and tools can enhance transparency, enabling consumers to monitor and better manage their electricity costs.

Align network charges with market signals

Local price signals should be aligned with those from wholesale markets to prevent conflicting incentives. EU institutions should offer guidance on fair and cost-reflective network charge allocations to encourage flexibility in energy usage, ensuring that consumers are not overburdened by disproportionate costs.

Promote sub-metering devices for dynamic tariffs

Sub-metering devices should be promoted in order to give consumers more granular control over their electricity use. This would enable households to differentiate between essential and flexible electricity consumption, such as charging electric vehicles during low-price periods, thereby making dynamic tariffs more practical and appealing.

2. Deliver on climate and social goals via renewable electricity tariffs

Amend the Energy Taxation Directive to promote renewable electricity use

The current tax structure often favours fossil fuels: it needs to be reformed to align with environmental objectives. Energy taxation should incentivise the use of renewable electricity, particularly in the heating and transport sectors. For example, reducing excise duties for renewable electricity can encourage its use and accelerate electrification.

Develop renewable-friendly safeguards for households in energy poverty

Protect vulnerable groups through the introduction of safeguards such as universal basic supply rights, either through block tariffs or dynamic tariffs with safety nets, to ensure energy is affordable. Financial instruments

and subsidies should be improved so as to assist low-income households with their bills and encourage the installation of energy-efficient appliances, thereby supporting their participation in the energy transition.

Assess the social impacts of tariffs

Standardised metrics should be developed to measure the social and economic impacts of the various tariff structures and ensure affordability. These assessments could incorporate risk profiles (similar to those used in financial services) to guide consumers based on their consumption patterns. Having an understanding of different consumer groups' financial flexibility and risk tolerance enables tariffs to be better aligned with their needs and protections, ensuring a fairer market.

Promote stakeholder collaboration and shared responsibility

Effective tariff design requires active cooperation between government bodies, regulators, energy companies and civil society. This collective effort can ensure that tariffs are economically viable, socially equitable and environmentally sustainable. Local authorities can play a vital role in disseminating information, organising educational campaigns and supporting vulnerable consumers. They should coordinate closely with initiatives such as the Energy Poverty Advisory Hub, Citizens' Assemblies and the Just Transition Platform. Consumer organisations, ombudsmen and similar bodies can further support these efforts by bridging the gap between policy and public awareness.

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