



A EURELECTRIC report - June 2016

RETAIL PRICING FOR A COST-EFFECTIVE TRANSITION TO A LOW-CARBON POWER SYSTEM

EURELECTRIC in brief

EURELECTRIC represents the common interests of the electricity industry at pan-European level. Our current members represent the electricity industry in over 30 European countries. We also have affiliates and associates on several other continents.

Our well-defined structure of expertise ensures that input to our policy positions, statements and in-depth reports comes from several hundred active experts working for power generators, supply companies or distribution network operators (DSOs).

We have a permanent secretariat based in Brussels, which is responsible for the overall organisation and coordination of EURELECTRIC's activities.

EURELECTRIC pursues in all its activities the application of the following sustainable development values:

ECONOMIC DEVELOPMENT

- ▶ GROWTH, ADDED-VALUE, EFFICIENCY

ENVIRONMENTAL LEADERSHIP

- ▶ COMMITMENT, INNOVATION, PRO-ACTIVENESS

SOCIAL RESPONSIBILITY

- ▶ TRANSPARENCY, ETHICS, ACCOUNTABILITY

RETAIL PRICING FOR A COST-EFFECTIVE TRANSITION TO A LOW-CARBON POWER SYSTEM

EURELECTRIC RETAIL CUSTOMERS COMMITTEE AND WG RETAIL MARKET DESIGN WITH
CONTRIBUTIONS OF ALL OTHER COMMITTEES

CONTACT:

Pavla **MANDATOVA** - pmandatova@eurelectric.org
Marion **LABATUT** - mlabatut@eurelectric.org

EXECUTIVE SUMMARY

Empowered consumers are expected to have a crucial role in the transition towards a decarbonised power system and in addressing the related challenges, including the increasing need for flexibility. Efficient retail electricity pricing is crucial to incentivise consumers to invest in electric appliances and is a key enabler of demand response.

Today, a couple of regulatory inefficiencies hinder those and also have important consequences for the evolution of the system:

The first problem, namely the rising levies and taxes or the so-called “wedge”, is known but far from being solved.

The second issue – the “mismatch” between the structures of regulated charges in customers’ bills and their underlying costs – remains however overlooked:

- In most Member States, a customer-centric market model is in place whereby the suppliers are the main points of contact for customers and they are responsible for the billing of all elements of the final retail price. Suppliers are to a certain extent able to “package” the energy element of the final bill (comprising wholesale prices and supply costs), as they want when designing their offers. This is however different for regulated charges, i.e. network tariffs and policy support costs, which are decided upon by regulators or policymakers and are passed on to suppliers who then convey them to customers. Today, in the majority of Member States, both of these items are charged to customers essentially in a volumetric way (€ per kWh), i.e. proportionately to their consumption.

- However, the underlying costs of the system and the nature of the services recovered through these regulated charges are in practice largely independent from the volume of electricity consumed by customers. Network tariffs, meant to recover the costs stemming from the development, refurbishment and operation of transmission and distribution networks, largely depend on the capacity subscribed (€/kW). Policy support costs are the result of governments' decisions to introduce certain policy measures in order to reach a set of policy targets (e.g. support to a certain amount of renewables to reach a set target). These costs are of a quasi-fiscal nature and are usually broken down into €/kWh for suppliers to charge them based on the customers' consumption.
- The kWh charging structure was compatible with the workings of the traditional power system. Back then, there was usually no alternative to the supply of electricity from the grid. The efficiency of the charging structure and the level of charges was therefore not a critical issue. Nowadays, as alternatives such as self-generation develop and the electrification of demand becomes a major element of the decarbonisation process, efficient pricing of electricity supply becomes critical. **Efficient new retail price offerings could reflect the scarcity of firm capacity and flexibility or incentivise the use of electricity at times of abundant decarbonised production.**
- However, suppliers usually do not have the incentive (and most of the time not the possibility) to adapt the way these costs are currently charged to customers to trigger efficient consumption and investments. If suppliers unilaterally restructured price offerings to reflect underlying costs stemming from regulated charges, then prices for some customers would increase (prompting them to leave) and for others would fall (promoting them to stay). Suppliers would be exposed to risks that they cannot manage.

The paper explains how both “the wedge” and “the mismatch” have negative impacts on electrification and on the flexibility potential of demand on the one hand, while they create distorted investment signals that result in social welfare losses on the other hand.

If these issues are not adequately addressed, retail unit prices will keep on rising as the growing costs of the electricity system will be charged over a progressively shrinking demand base. Such a vicious circle would fuel further distortions, resulting in a diminishing potential for active retail customers to participate in the market.

EURELECTRIC believes that addressing these regulatory inefficiencies is a prerequisite for creating the basis for the cost-efficient decarbonisation of the power sector and should become a priority of the EU energy policy reform.

This reform should incorporate the following objectives:

1. Bringing down the share of policy support costs in the electricity bill and financing decarbonisation in a less distortive way. This should include competitive mechanisms to finance decarbonisation and mechanisms to ensure that all energy users contribute to finance decarbonisation in a fair way. Remaining energy-related policy support costs should be mostly financed by national budgets.

2. Charging regulated costs in an efficient way, progressively removing cross-subsidisation. Determining detailed charging structures for both network tariffs and policy support costs that may still remain in the bill is a matter of subsidiarity. However, **the EU legislation should allow suppliers to make alternative offerings to consumers** that will provide flexibility to adapt to the changing uses of electricity, following these principles:

a. A “tiered approach” to regulated charges: customers within different categories (e.g. by size of connection) would be provided a tariff based on different mixes of €/kW and €/kWh. The ratio of those would depend on their consumption patterns, corresponding to low, medium or high-consumption “tiers”.

b. Different levels of granularity for regulated charges: in order to package different innovative offerings within their portfolio, retailers should be able to choose whether to charge regulated tariffs in a flat or more dynamic way (such as time of use or peak pricing).

3. Prosumers should be integrated in the market on equal terms with other power production facilities. Electricity, when injected in the grid, should always be valued at the market price rather than implicitly at the retail price through non-market-based schemes such as net metering schemes.

Electricity – as an efficient and decarbonised energy carrier – is expected to be a major contributor in the cost-efficient transition to a low-carbon economy¹. Spurred by the ambitious 2020 EU energy and climate policy, the last decade has seen the output of renewable energy sources (RES) in the EU almost double. In 2014, 56% of electricity generated in the EU came from low-carbon sources and 28% from RES. Variable RES (solar and wind) made up 22% of the total EU installed generating capacity in the same year, covering about 11% of all generated electricity². The advent of new generation technology options available to the mass market – in particular solar PV and wind – have brought about a significant and lasting change to the traditional electricity system. With its 2030 targets and the December 2015 commitment of the Paris agreement, the EU set a clear direction towards the decarbonisation of its economy. **One can expect that the share of renewable electricity will rise from 28% in 2014 to 49-51% in 2030, based on current projections³.**

Empowered consumers are expected to have a crucial role to play in addressing the challenges of the power system's transition. In a power system that is increasingly relying on the electricity generated from renewables, the need for flexibility will further increase. By voluntarily changing their usual electricity consumption in reaction to price signals or to specific requests, consumers could contribute to a more stable power system and could economically benefit from this positive contribution. At the same time, as the share of low-carbon generation in the system keeps on growing, retail customers could contribute to decarbonisation through further electrification of their appliances. Nevertheless, so far, **retail customers' potential to provide flexibility to the electricity system and the electrification of heating, cooling and transport remain to be tapped.** While new technologies are available and products and services are being developed at the downstream end, their uptake has until now been rather sporadic.

Communication with customers and the learning about their individual needs is key to create new attractive offerings⁴. In addition, the so-called no-regret options listed in EURELECTRIC's recent paper on the electricity market design⁵ must be implemented to enhance the operation of retail markets in general and to boost demand response: adopting rules that enable customers' participation in the markets; phasing out regulated retail prices and timely rolling-out smart grids and smart meters⁶ together with appropriate settlement rules that enable retail pricing to be closely aligned to the true generation marginal cost, such as contracts based on critical peak pricing or spot prices.

However, those per se will not be sufficient. Consumers need relevant incentives to contribute to firm capacity and to the flexibility needs of the system. Price is still the bottom line when it comes to energy. **Efficient retail electricity pricing is crucial to incentivise consumers to invest in electric appliances and is a key enabler for demand response⁷.** Efficient retail pricing is however not a reality today. On the one hand, the link between wholesale and retail markets is weak, holding customers back from actively participating in the market. On the other hand, new technology provides customers with the unprecedented option to react to retail prices and to at least partly avoid paying by investing in e.g. self-generation while investment in other electrical appliances is effectively discouraged. This paper analyses a couple of key phenomena that have a crucial influence in this respect.

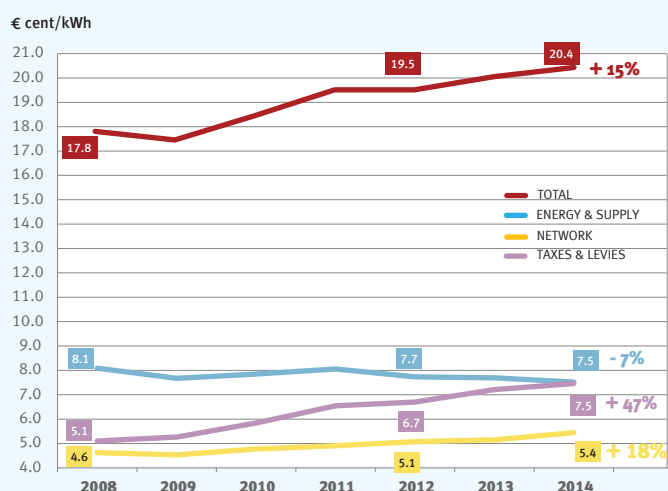
CHAPTER 1

THE TWO KEY ISSUES: THE “WEDGE” AND THE “MISMATCH”

Final retail prices in consumer bills are made of three main elements (*Figure 1*):

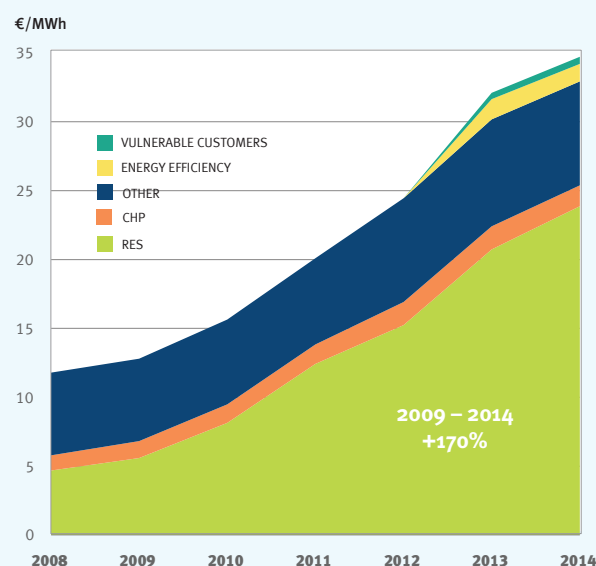
- **Energy and supply** includes the costs of energy, sourced on the wholesale market, and the commercialisation costs. As wholesale market prices fall, this market-based supply element represents only one third of customers' bills today. Since 2008, it reduced in nominal terms by 7%.
- **Policy support charges (levies) and taxes** now represent 36% of the average EU household bill and are the main driver for the end-consumer price increase. Policy support costs and taxes have increased by 47% between 2008 and 2014. This is because the electricity bill is increasingly used to recover the cost of energy and climate policies, including the financing of decarbonisation (*Figure 2*)⁸. A growing share of generation assets is supported outside of the market and financed through levies on customers' electricity bills.
- **Network charges** represent 27% of the average EU household bill. They have grown by 18% since 2008.

FIGURE 1: EVOLUTION OF HOUSEHOLD PRICE COMPONENTS



SOURCE: EURELECTRIC

FIGURE 2: EVOLUTION OF POLICY SUPPORT COSTS ELEMENTS



SOURCE: EURELECTRIC

While views have started to converge on the existence of **a problem related to rising levies and taxes, the so-called “wedge”**, there is neither full awareness of its consequences for the system nor a uniform view as to the remedies to put in place. Worse, another key factor is almost completely overlooked: **the “mismatch” between the charging structures of the regulated charges in customers' bills and their underlying costs**. As will be explained further on in the report, this mismatch does not only contribute to rising levies and further weakening of the link between wholesale and retail markets but also causes further inefficiencies in the system.

CHAPTER 2

THE “MISMATCH”: ARE SUPPLIERS MERE MIDDLEMEN?

At the dawn of the electricity industry in the 19th century the end-user pricing mechanism looked very different from today. The first modern power system – Thomas Edison’s Edison Illuminating Company in Manhattan, New York – could have been described, in today’s words, as electricity-as-a-service: customers paid for the number of light bulbs they used in their factory or offices and not for the electricity necessary to light them up.

As electrification progressed and modern power systems developed, the way electricity was priced – and, critically, the way the underlying costs were recovered through the bill – changed towards the model that we know today. Consumers in the 21st century think of electricity as prices in terms of kWh (or MWh). This simply means that the majority of their final bill (comprising all the three elements) is calculated by multiplying their consumption – measured in kWh – by the kWh unit rate.

In a customer centric market model, as applied in most Member States and supported by EURELECTRIC, **the supplier is the main point of contact for the customer and is responsible for billing consumers for all elements of the final retail prices:**

- **Suppliers are to a certain extent able to “package” the energy element of the final retail price (comprising wholesale prices and supply costs), as they want when designing their offers.** They source the electricity they need to serve their customers either on the wholesale market or via bilateral, over-the-counter, transactions with generators. They buy electricity on a €/MWh basis and pass on the cost to customers as €/kWh. A much smaller fraction of the supplier’s cost is made up of commercial processes and customer care; such costs are not subject to wholesale market price fluctuation and are passed on to customers either on a €/kWh basis or via a fixed charge in e.g. €/month.

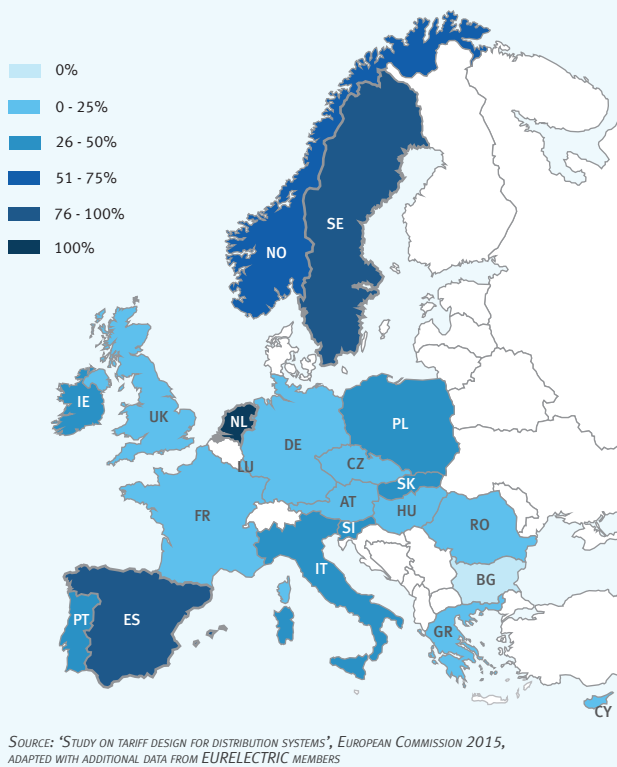
- The situation is however different with respect to **regulated charges, i.e. network charges and policy support charges, which are decided upon by regulators or policymakers and are passed on to suppliers who then convey them to customers.** Today, in the majority of Member States, both of these items are charged to customers essentially in a volumetric way (€ per kWh), i.e. proportionately to their consumption.

However, **the underlying costs of the system and the nature of the services recovered through these regulated charges are largely independent from the volume of electricity consumed by customers:**

- Most of these **network costs** correspond to the investment and operation costs resulting from the operation, development and refurbishing of transmission and distribution networks, which largely depend on the (subscribed) capacity of the infrastructure (€/kW), except for losses. These costs are mostly driven by the peak demand (kW) rather than by the overall energy consumption (kWh). Based on these costs, the national regulators determine the allowed revenues for network operators which are currently collected via network tariffs charged to consumers. In some countries, distribution system operators (DSOs) decide on the network tariff structure they apply to customers, while regulators only control their revenues. In some other countries, the regulators decide also on the network tariff structures.

Figure 3 shows how European DSOs recover their costs. Today, only Dutch customers are entirely charged by DSOs on the basis of their connection capacity and not on the basis of the kWh they consume. Besides the Dutch, only the Spanish and the Swedish DSOs charge a significant share – over three quarters – of their charges primarily via a fixed component. Conversely, in 17 Member States and in Norway, the volumetric component accounts for about half of the overall network charges or more.

FIGURE 3: SHARE OF CAPACITY/FIXED ELEMENT IN GRID TARIFFS ACROSS THE EU AND IN NORWAY



- **Policy support costs** are the result of governments' decisions to introduce certain measures to reach a set of policy targets which lead to some specific costs (e.g. support to a certain amount of renewables to reach a target). In general, these costs are neither directly related to energy demand (€/kWh) nor to peak consumption (€/kW). They are instead of a quasi-fiscal nature. The overall cost of these measures is known and is usually broken down into €/kWh for suppliers to charge it based on their customers' consumption (i.e. kWh consumed multiplied by set €/kWh price).

The kWh charging structure was compatible with the workings of the traditional power system. In that time, usually there was no alternative to electricity supply from the grid. But the old system based on centralised power plants with high variable costs is evolving to a new system dominated by smaller generation, including renewables solar and wind generation, with zero or low variable costs and high fixed costs to recover the relatively higher investment and financing costs.

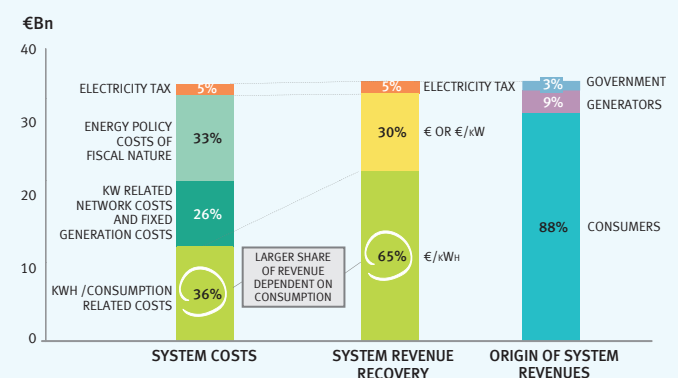
Provided that the wholesale signals resulting from fair competition are strong enough, retail offers may reflect scarcity in firm capacity and flexibility through critical peak pricing or spot based offers maintaining the current charging structure.

However, electricity could be also priced differently in order to cope with the emerging new type of power system. For instance, as the decarbonisation of the system continues, retail offers could incentivise the use of electricity at times of abundant decarbonised production, e.g. when the sun shines and the wind blows, matching flexible demand with non-flexible generation and flexible generation with non-flexible demand⁹.

In theory, suppliers could offer some other pricing structures than the ones they receive through regulated charges (both for networks and policy support). However, they most commonly decide not to use this possibility. If suppliers unilaterally restructured their price offerings to reflect the underlying costs stemming from regulated charges, prices for some customers would increase (prompting them to leave to competitors that still use the volumetric charging model) while they would fall for others (encouraging them to stay with their current supplier), and the suppliers would be exposed to risks they cannot manage. Therefore, suppliers have limited incentive to unilaterally offer prices that better reflect the overall system cost structure, including regulated access charges. This leaves as a result only very little room for innovative product differentiation at the retail end.

By way of example, Figure 4 shows the recovery of the overall system cost for the Spanish power system (excluding VAT). These costs are mostly recovered through a volumetric, kWh-based system even though they are largely (and increasingly so) independent from the volume of consumed electricity.

FIGURE 4: SYSTEM COSTS AND REVENUE RECOVERY STRUCTURE ESTIMATION, SPAIN 2015



CHAPTER 3

UNWANTED CONSEQUENCES

In the past, as the ability of customers to respond to prices was limited, the inefficiency of a price structure departing from costs and the nature of the provided services was limited. This has now changed. Customers compare retail prices against investment in alternative technologies, including the possibility to generate their own electricity. As such alternatives develop, and the electrification of demand becomes a major element of the decarbonisation process, efficient pricing of electricity supply becomes critical. **Both the growing share of levies and taxes and the charging structure used for the recovery of regulated charges through consumers' bills create inefficiencies in the system. Those in turn have negative impacts on electrification and on flexibility at the retail level. They also lead to social welfare losses due to distorted investment signals.**

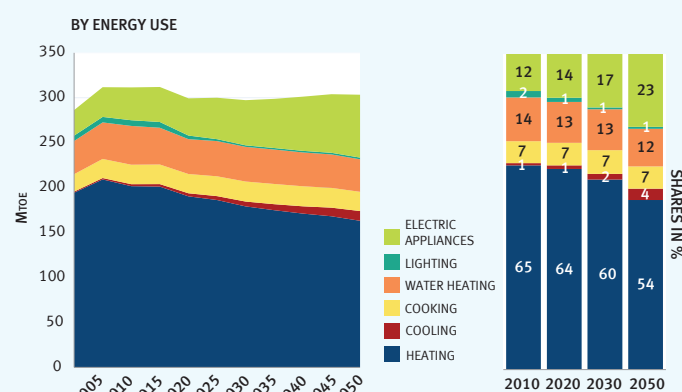
1. ELECTRIFICATION

When the volumetric price of electricity paid by end-users is higher than the variable price of fossil fuels, investing in electricity appliances does not make economic sense for consumers. In particular, high policy support costs and high taxes in consumers' bills hamper electricity's competitiveness against other energy carriers. This puts at risk the most promising opportunity for the EU to decarbonise its economy via the electrification of various sectors.

Electricity – as an efficient and progressively decarbonised energy carrier – is expected to be a major contributor to decarbonising the EU economy, in particular those sectors such as heating and transportation that are more costly and/or technically difficult to decarbonise.

Figure 5 below shows final energy demand in the residential sector broken down per type of use. In 2010, heating, cooling and water heating represented 80% of the residential consumption of energy, a number which is expected to remain broadly stable until 2020.

FIGURE 5: FINAL ENERGY DEMAND IN THE RESIDENTIAL SECTOR



SOURCE: EU ENERGY, TRANSPORT AND GHG EMISSIONS TRENDS TO 2050 REFERENCE SCENARIO 2013

Existing technologies can allow decarbonised electricity to provide heating, cooling and hot water while reducing the overall primary energy demand. For example, the deployment of a high-efficient electric heat pump allows for a drop down to a third or even to a fourth in primary energy demand while maintaining the same comfort level of an equivalent system based on fossil fuels such as gas, coal or oil. This is a very significant increase in energy efficiency. It could also contribute to increasing system flexibility (see below) and, consequently, renewables' integration, as heat pumps can be used in combination with thermal storage at times of low electricity prices. By reducing the consumption of fossil fuels, heat pumps can also help to reduce carbon emissions, eliminate local pollution at the point of consumption, and increase security of supply through the reduction of fossil fuel imports.

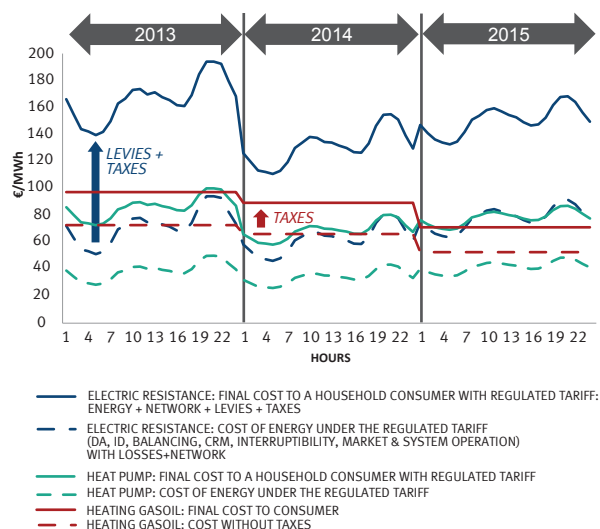
COMPETITIVENESS OF ELECTRICITY VIS-À-VIS OTHER FUELS FOR HEATING - THREE EXAMPLES:

EXAMPLE

1

The following **Spanish example** shows how removing policy costs from electricity bills can be both economically efficient and a prerequisite for electrification. Electricity versus heating gasoil prices are shown for the winter months of the years 2013, 2014 and 2015. The final electricity price paid by consumers (solid blue lines) is always far more expensive than the final heating gasoil price (solid red line). However, **when policy costs and taxes are discounted for both electricity and gasoil (dotted lines), electricity is frequently more competitive**. Moreover, by installing a heat pump with a coefficient performance (COP) of 2 (rather low value, some systems can reach 3.5 – 4) heating with electricity becomes economically sensible throughout the year.

FIGURE 6: INCREMENTAL COST¹⁰ OF HEATING WITH A CONVENTIONAL ELECTRICAL HEATER VERSUS HEAT PUMPS AND GASOIL

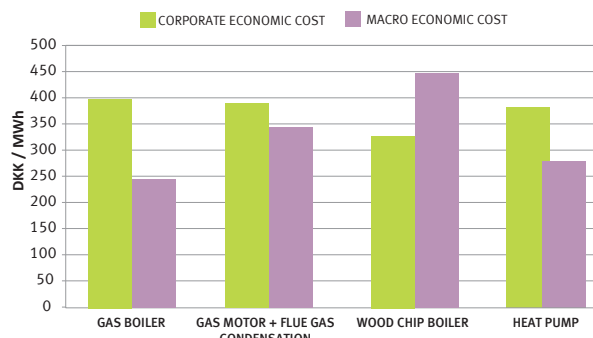


EXAMPLE

2

The **Danish example** shows how, **due to taxes and levies on the electricity bill (and the lack of these on wood chips), it is cheaper for a small district heating company, to use a wood boiler than a heat pump**. However, when factoring in the macroeconomic societal cost, the situation is reversed. The graph compares the corporate and the societal costs of producing district heating using various technologies by 2020. The corporate costs include the externalities from emissions and the avoided deadweight losses of securing comparable tax revenue elsewhere. The calculations are valid for a plant that already has a gas engine and a gas boiler and therefore the capital cost of these two are not included.

FIGURE 7: HEAT PRICE FOR VARIOUS DISTRICT HEATING TECHNOLOGIES IN 2020



EXAMPLE

3

A recent paper of the Hamburg-based Institute of International Economics¹¹ investigated the **economic potential of hybrid heating systems in Germany**. A hybrid heating system can run on either oil or gas and electricity. It also comprises a thermal storage, in order to heat water in times of low electricity prices, even if they do not coincide with the times of heat demand. The costs of hybrid systems were compared with the costs of heating with purely fossil fuel driven heating systems. The analysis carried out with simulated 2020 EPEX day-ahead prices showed that economic incentives at household level will continue to be small, even though electricity wholesale prices on average are expected to be lower than today. This is due to the high amount of levies added onto final consumers' electricity bills.

If regulated charges were significantly lowered, consumers would be inclined to switch to hybrid (thus less carbon-emitting) heating systems as they translate to actual cost savings. In case of levies reduced to 0€/ct/kWh, heating with electricity becomes economically advantageous in over 90% of situations for both types of hybrid systems. This would leave very few hours in times of electricity price spikes when the use of the fossil source remains preferable. If the burden of levies, charges and taxes exceeds an amount of about 5–6€/ct/kWh, annual savings become negligible. The current sum of this regulated fixed component in Germany (2014) amounts to about 16€/ct/kWh.

2. FLEXIBILITY

Retail customers' flexibility potential will to a large extent depend on their investments in "dispatchable" electric appliances such as heating, cooling and electric vehicles. This will not materialise if electricity is not competitive against other fuel carriers. In addition, price signals are important for the development of flexibility. Today, dynamic energy prices resulting from the passing of market prices through to end customers may not provide sufficient incentives for retail customers to consume in a flexible way.

The evolution towards a more fixed costs system based on generators with no emissions and zero or very low fuel costs, e.g. solar or wind, is having a dramatic impact on the concept of scarcity. Scarcity in the traditional energy system essentially meant the ability to produce enough energy to cover demand. In the new paradigm, firm capacity is an ever more scarce resource, which should be priced in a way that incentivises its use or the existence of flexibility for when the system needs it. To make an efficient use of this energy, demand side flexibility is increasingly needed to ensure that consumption takes place when "the sun is shining and the wind is blowing".

Accordingly, incentives are needed to shift "dispatchable" consumption. Accurate, close to real-time consumption data generated by smart metering provide a basis for in-home and mobile technologies that will give customers unprecedented insight into how they consume electricity and allow them to have more control over it without sacrificing their comfort level. New technology is currently developing for this purpose, including distributed generation, storage, electric vehicle charging and smart customer-side usage technologies (e.g. controllable communicating thermostats).

Retail consumers' flexibility will mainly come from "dispatchable" appliances such as heating and cooling appliances or electric vehicles. If electricity is not competitive against other fuel carriers, consumers will not invest in such electric devices.

In addition, the strength of the price signal matters. In order to encourage demand response, price signals which value accurately flexible demand are needed.

These however are too weak today. Therefore, shifting consumption from peak times to off-peak times using demand response technologies such as home automation and storage is not adequately encouraged. Price signals stemming from the wholesale market are currently not strong enough to trigger customers who might be interested in actively shifting their consumption and investing in demand response equipment (e.g. energy management systems and dispatchable equipment like heat-pumps).

Flexibility has a positive impact not only on generation, but also on networks and security of supply. Price signals from those three components, including the positive impact of flexibility on network and security of supply costs, could thus be also taken into account in the tariff design. This would be more suitable than artificially increasing the price signal, e.g. via the taxes and levies component.

3. SOCIAL WELFARE LOSSES & 'CONSUMER DIVIDE'

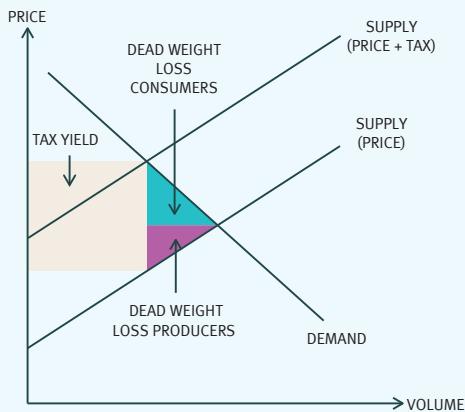
The current charging structure incentivises customers with high consumption levels to invest in self-generation and decide for energy efficiency solutions based on incentives that are in a way artificial. They also increase the overall system costs and create social welfare losses.

New technology makes it easier than ever for customers to respond to prices and to choose between paying the retail price or lowering their consumption. Technological advancements make it possible for final consumers to invest in energy efficiency and self-generation, which result in an overall reduction of electricity demand from the grid. At the same time, these technologies are unlikely to lead to more than a small fraction of the customer base being able to fully cut the cord and disconnect entirely from the grid. High retail prices inflated by a high share of taxes and levies encourage this development.

Policy interventions in the form of energy taxes, including taxes and levies on electricity, have been a stable source of government revenue and were used to influence consumer behaviour. The so-called 'Pigouvian tax' can be used to internalise negative externalities of any commercial activity. But unlike a 'Pigouvian tax' that can be applied to restore the macroeconomic balance, charging electricity with policy support costs which do not directly address its carbon emissions (i.e. do not internalise negative externalities) creates deadweight societal losses (*Figure 8*). This is especially problematic as the share of low-carbon electricity has been rising over the last years and those levies disadvantage electricity vis-à-vis other energy sources, as explained earlier.

DISTORTED INVESTMENT SIGNALS - TWO EXAMPLES:

FIGURE 8: WELFARE LOSSES DUE TO HIGH LEVIES AND TAXES



SOURCE: DANSK ENERGI

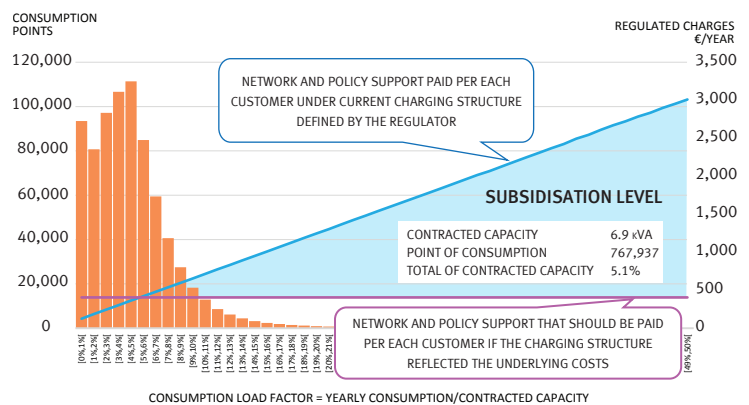
On the one hand, the power system is left with stranded network and generation assets while investments in assets with a possible low efficiency are triggered. It also contributes to a dispatch distortion as self-generation might have an incentive to produce even when wholesale prices are negative.

On the other hand, system costs are shifted towards the customers who are not able to invest in these technologies, creating a 'consumer divide', while the customers who invested in self-generation still benefit from some of the services rendered (current quality and availability). If no measures are adopted to tackle this issue, the system costs that customers who invest in these technologies manage to avoid will need to be charged to the less affluent consumers.

EXAMPLE 1

The first example, based on the data of a leading European supplier, shows how customers with a high consumption level cross-subsidise customers with lower consumption for regulated charges, which then incentivises them to invest in decentralised resources. Figure 9 shows the distribution of consumption points with 6.9kVA of contracted power through the usage level of a leading European supplier. The blue line shows the regulated charges as defined by the regulator, i.e. including network costs and (a majority of) the policy support costs. Given that these tariffs are mostly volumetric, the electricity bill increases as consumption goes up (higher usage of the contracted capacity). The red line shows the bill that each customer would have to pay to stay connected at 6.9kVA if the regulated charges were cost-reflective, i.e. denominated in €/kVA. The difference between the blue and red lines shows the amount of cross-subsidisation from high consumption customers towards low-consumption customers.

FIGURE 9: CROSS-SUBSIDISATION EXAMPLE

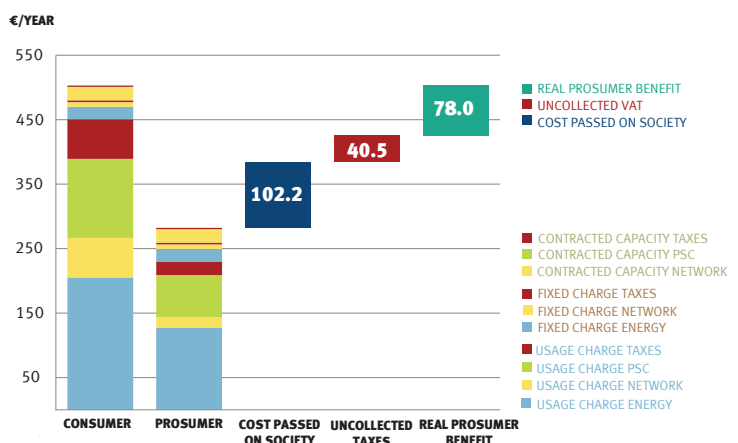


SOURCE: BASED ON REAL FIGURES OF A LEADING EUROPEAN SUPPLIER

EXAMPLE 2

The second example shows the situation from the perspective of a typical residential connection in Italy. A typical household consumes 2,700 kWh from the grid. A typical prosumer consumes 1,700 kWh from the grid, while he self-generates and auto-consumes the remaining 1,000 kWh. With regard to the self-produced and auto-consumed energy, the prosumer does not pay a large part of network costs, policy support costs and taxes. However, the avoided policy support costs and network costs – which represent almost half of the savings of such a prosumer per year – remain in the system and need to be charged to remaining consumers.

FIGURE 10: ILLUSTRATIVE EXAMPLE OF SITUATION IN ITALY, 3kW RESIDENTIAL CONNECTION



SOURCE: EURELECTRIC BASED ON PUBLIC DATA

CHAPTER 4

A VICIOUS CIRCLE!

If the “wedge” issue is not addressed and the cost and charging structure for the remaining regulated charges are not better aligned, **unit prices will be rising as the growing costs of the electricity system will be charged over a progressively shrinking demand base, thus creating an unsustainable vicious circle** (Figure 11).

As a result of the overall system costs increase (poised to continue with the 2030 EU targets)¹², of the way regulated charges are charged to consumers and of the decoupling between growing costs and stagnating – if not reducing – demand, the overall system costs have started to be charged over a smaller sales volume. **The recent retail prices increases (Figure 1) already reflect the fact that electricity demand from the grid does not rise at the same pace as the total system costs** (including new renewable generation, flexible back-up generation and demand response, and the new network infrastructure required to support these policy-driven developments). Final electricity consumption in the EU has decreased in recent years. The annual power consumption peaked in 2008 (2,866TWh), decreasing since then on average by 0.9% per year until 2013 (2,711TWh). Key contributing factors to this phenomenon included increased energy efficiency, the economic recession and the rise of self-generation. Even though demand will increase as electrification of the economy progresses, these increases will to some extent be offset by energy efficiency¹³.

If this trend continues, customers’ financial vulnerability is likely to be further exacerbated. Energy costs as a part of a household’s budget have risen from 6% in 2000 to 9% in 2014 for the most vulnerable households¹⁴. If the cost of the policies addressing the vulnerability of energy consumers keep being charged via electricity bills rather than through measures taken directly by national governments, this will further add to the policy costs that are driving up consumers bills (Figure 2), contributing to the vicious circle.

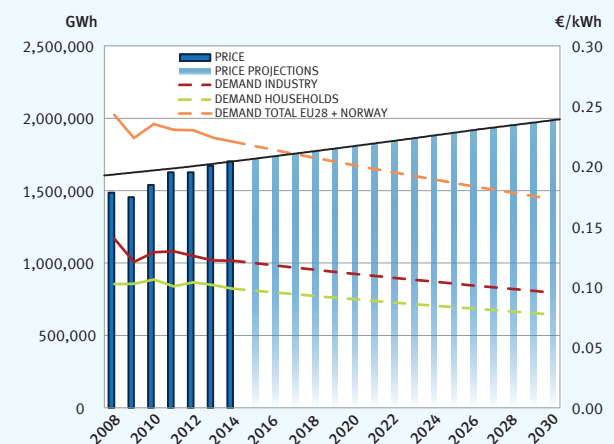
The following example (Figure 12) provides a quantitative illustration of a continuing retail unit price increase under the current situation when the “wedge” and the “mismatch” remain unaddressed: the current tariff structure is kept and electricity demand goes down. It assumes that every year there is an annual reduction in electricity demand of 1.5% in line with the Energy Efficiency Directive¹⁵ extended to 2030 and the same price structure as in the Spanish example in Figure 4, i.e. 65 (kW related network costs, fiscal energy policy cost and fixed generation costs) to 35 (consumption related costs) ratio in the overall system cost structure and the reverse 35 (€, € per kVA or kW) to 65 (€ per kWh) ratio in the overall price structure. An alternative scenario supposing that the two issues of the “wedge” and the “mismatch” were tackled would have the opposite outcome: rising electricity demand and declining prices.

FIGURE 11: VICIOUS CIRCLE OF VOLUME BASED RETAIL PRICING



SOURCE: EURELECTRIC

FIGURE 12: ILLUSTRATIVE EXAMPLE OF RETAIL PRICE EVOLUTION UNTIL 2030 UNDER STATUS QUO



SOURCE: PROJECTION BASED ON EURELECTRIC POWER STATISTICS DATA

CHAPTER

5

IMPROVING REGULATED CHARGES

Customers should be able to choose from more dynamic prices as well as new service based offerings, moving back to Edison's intuitions. Suppliers need to have more flexibility to meet consumers' demand for simplicity and to be able to offer them new attractive pricing options and services. Freeing up the bill from the "wedge", as further explained in the policy prerequisites, is the first step towards this. In addition, the structure of the regulated charges needs to better reflect the underlying cost structure than it is the case today.

For grid tariffs, EURELECTRIC has already proposed¹⁶ that they should evolve towards a higher weight of charges per kW, taking into account that more capacity-based network tariffs reflect the higher network costs associated with peak demand and provide customers with incentives to reduce their peak load, thereby resulting in a more efficient use of the network. However, it may be neither feasible nor acceptable to change charging at once as it will impact customers in different ways: some might end up paying much more than they pay now, while others would save a lot of money. In addition, the charging policy costs that may be left in the bill also needs to be addressed.

Therefore, EURELECTRIC proposes a gradual evolution towards regulated charges that will address the cross-subsidisation issue causing investment signals distortions and that will provide flexibility to adapt to the changing uses of electricity.

In all cases, the national regulatory authorities should put in place appropriate mechanisms to guarantee timely recovery of the allowed revenue for DSOs as well as the remaining system costs.

For customers within different categories (e.g. by size of connection), this should comprise:

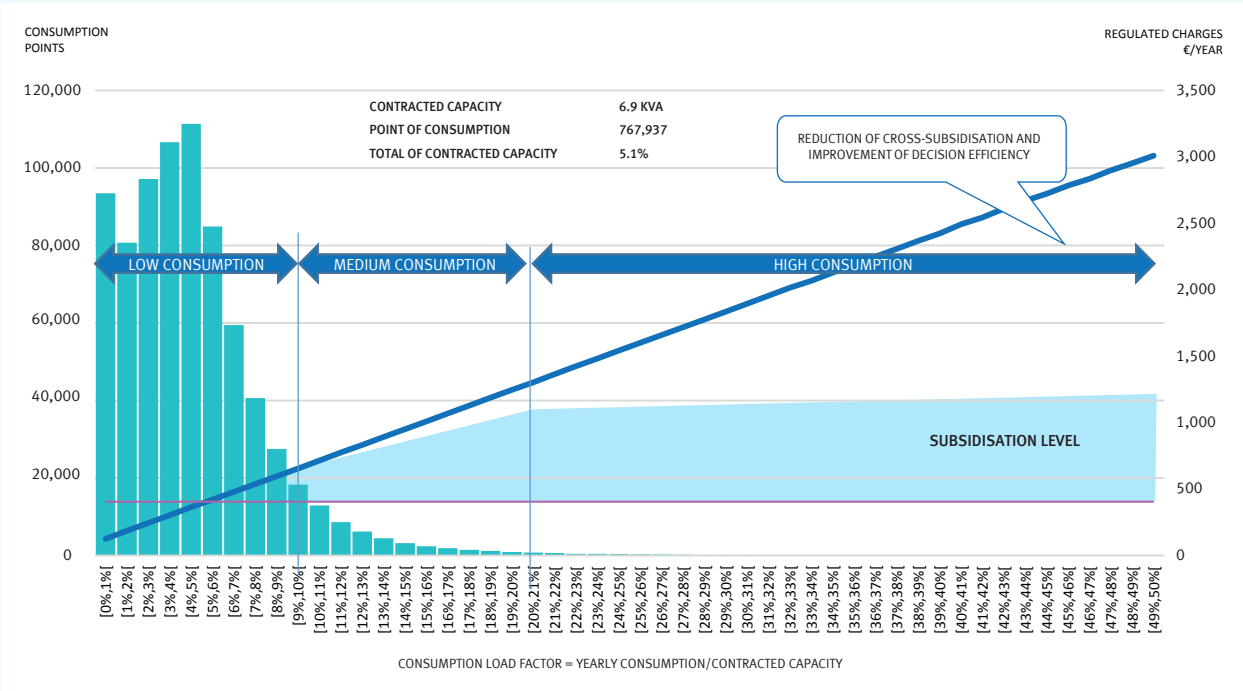
1. A "tiered approach" to regulated charges: the responsible bodies¹⁷ could publish tariff structures with different mixes of €/kW and €/kWh based on the use of the connection and their consumption pattern. Customers would be offered a binominal tariff ($A \cdot kW + B \cdot kWh$) corresponding to low, medium and high consumption that the retailer would take up in their offer. *Figure 13* illustrates this: low-consumption customers could take the current blue line; mid-consumption customers could take a blue line with a lower angle; high-consumption customers could get an almost flat line.

This would help reduce the current cross-subsidisation effects, incentivise a smart use of the network and reduce the incentives for inefficient investments. Lower volumetric prices for customers with a high consumption would further incentivise them to invest in electric heating and cooling devices in particular. In the future, smart home technologies would allow customers with these appliances to distribute their consumption and thus the reduction in volumetric charges would not be offset by an increase in the price for increased contracted capacity. The system cost recovery would mean that low-consumption customers would see some temporary price increase. However, those would probably occur to a larger extent anyway if the current approach leading to welfare losses is maintained.

2. Different levels of granularity for regulated charges: the responsible bodies would allow the retailer to choose whether to pass through regulated charges in a flat (i.e. fixed price per unit of energy/kWh or per kW) or a more dynamic way (i.e. price per kW or kWh depends on time of consumption). This could include time of use (ToU) or peak pricing. This diversity would allow for innovation and would strengthen the price signal towards customers who, for the sake of simplicity, should not be left to choose between different price signals. Suppliers would package those as different offerings within their portfolio. It would also consider that one type of pricing may not fit all applications. For example, exploring the use of dynamic grid pricing among these options could be particularly relevant for electric vehicles: the grid charges with higher rates per kWh in the hours where the grid is under significant stress could be more efficient in this case.

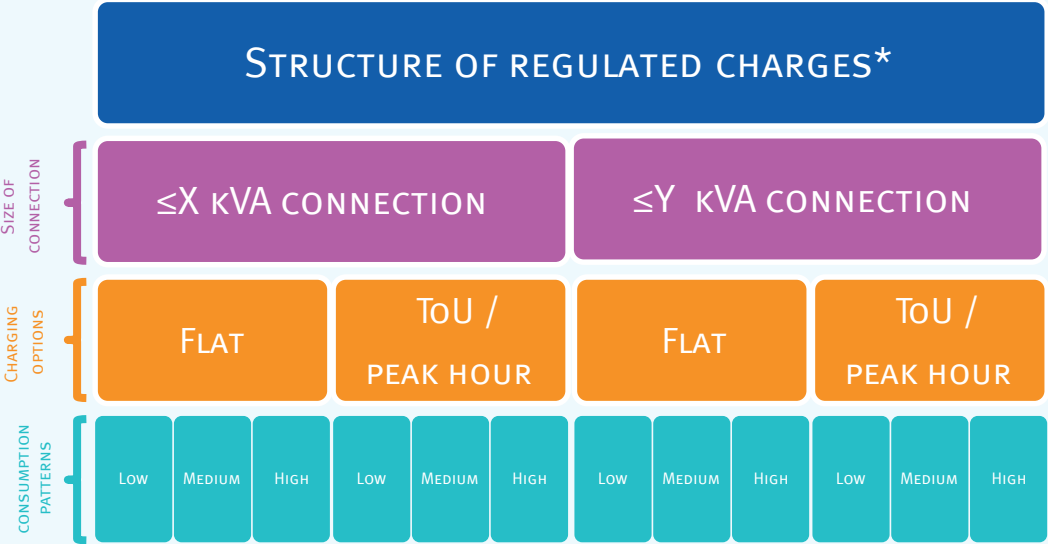
Figure 14 captures such a scheme: the tiered approach is illustrated in the fourth line, the different levels of granularity in the third line.

FIGURE 13: TIERED APPROACH FOR REGULATED CHARGES, ILLUSTRATIVE EXAMPLE FOR CUSTOMERS ON ONE CONNECTION



SOURCE: BASED ON REAL FIGURES OF THE LEADING EUROPEAN SUPPLIER

FIGURE 14: DIFFERENTIATED APPROACH TO REGULATED CHARGES TO REMOVE CROSS-SUBSIDISATION



*including network charges and policy support costs

SOURCE: EURELECTRIC

Addressing these regulatory inefficiencies is a prerequisite for creating a basis for the cost-efficient decarbonisation of the power sector and for further electrification. The future system should provide the right incentives to consumers who want to use energy in a smart way and to invest in new technologies while benefitting from providing the flexibility that these new technologies enable. EURELECTRIC believes that resolving today's regulatory inefficiencies should become a priority to allow for kick-starting new retail developments that will allow for a closer interaction between supply and demand for those customers who are interested. The upcoming EU energy policy reform should tackle this.

The following policy actions are necessary:

1. Bringing down policy support costs in the electricity bill. Financing of decarbonisation in a less distortive way following these principles:

- a.** Market-based mechanisms such as the emissions trading scheme (EU ETS), and, in general, competitive mechanisms allow financing decarbonisation in a less distortive way.
- b.** All energy users should contribute to finance decarbonisation in a fair way. Measures should be addressed to sectors outside the EU ETS, such as buildings and transport, as well as to all energy carriers in a balanced way. Such measures should include carbon pricing.
- c.** If implemented, renewable support schemes should be cost-efficient and technology-neutral and their impacts on the power market, security of supply and competitiveness should be evaluated and potential distortions minimised.
- d.** Remaining energy-related policy support costs should be mostly financed by national budgets, i.e. through general taxation or tax credits, instead of the electricity bill.

2. Charging regulated costs in an efficient way, progressively removing cross-subsidisation. Determining detailed charging structures for both network tariffs and policy support costs that may still remain in the bill is a matter of subsidiarity. However, **the EU legislation should allow suppliers to make alternative offerings to consumers** that will provide flexibility to adapt to the changing uses of electricity, following these principles:

- a. A “tiered approach” to regulated charges:** customers within different categories (e.g. by size of connection) would be provided a tariff based on different mixes of €/kW and €/kWh. The ratio of those would depend on their consumption patterns, corresponding to low, medium or high-consumption “tiers”.
- b. Different levels of granularity for regulated charges:** in order to package different innovative offerings within their portfolio, retailers should be able to choose whether to charge regulated tariffs in a flat or more dynamic way (such as time of use or peak pricing).

3. Valuing the electricity injected in the grid by prosumers at its real value. To ensure a level playing field between the different technologies, prosumers sell the electricity at a price that reflects its value in the market. Indirect subsidies, such as non-market based net-metering schemes and socialising of prosumers balancing costs, should be avoided¹⁸ and possible renewable support schemes should be cost-efficient, transparent and should minimise distortions. This will remove distortions against storage as well as demand response technologies, present in cases where the injected electricity is valued at or above retail price, and further incentivise efficient investment and operational decisions (improve self-consumption ratio).

REFERENCES:

- ¹ Energy Roadmap 2050, European Commission 2012.
- ² Power Statistics and Trends, EURELECTRIC 2015.
- ³ European Commission SWD(2014) 15 final.
- ⁴ As demonstrated e.g. by results of Linear project, www.linear-smartgrid.be/en.
- ⁵ Electricity Market Design: Fit for the Low-Carbon Transition, EURELECTRIC 2016.
- ⁶ 14 out of 28 EU countries still applied price regulation of end user tariffs in 2014 and around 72% of customers in 17 EU Member States will be equipped with smart meters by 2020.
- ⁷ Accenture consumer research & Delivering a New Deal for Energy Consumers, COM(2015)339 final.
- ⁸ Making sense of your electricity bill, EURELECTRIC 2016.
- ⁹ Keay, M.: Electricity markets are broken – can they be fixed? The Oxford Institute of Energy Studies, 2016.
- ¹⁰ Incremental cost of using one additional unit of energy for heating, assuming that the customer does not need to increase their contracted capacity.
- ¹¹ Ehrlich, L.G., J. Klamka and A. Wolf, “The potential of decentralized power-to-heat as a flexibility option for the German electricity system: A microeconomic perspective”, Energy Policy 87 (2015) 417–428.
- ¹² IHS CERA estimates that total system costs – including generation, networks and policy costs – recovered annually from end consumers will rise by 24% from today by 2030, reaching €340 billion per year for the EU28 as a whole. See Squaring the Circle, Europe’s misaligned retail pricing policy. IHS Energy Market Briefing, 2015.
- ¹³ For example, electricity consumption decreases from shift to LED lighting so far seem to more than offset the demand increase from e-mobility. See Power Storage - Shaking Up the Utility Model. European Utilities Equity Research. RBC Capital Markets, 2015.
- ¹⁴ EC Working group on energy poverty presentation, Citizen’s energy forum, 2016.
- ¹⁵ Directive 2012/27/EU.
- ¹⁶ Network tariffs, EURELECTRIC 2016.
- ¹⁷ The national regulatory authorities and DSOs for network tariffs in countries where they have the power to do so.
- ¹⁸ Prosumers – an integral part of the power system and the market, EURELECTRIC 2015.



Union of the Electricity Industry - EURELECTRIC

Boulevard de l'Impératrice, 66 boîte 2
1000 Brussels
Belgium

T.: + 32 (0)2 515 10 00 - F.: + 32 (0)2 515 10 10
website: www.eurelectric.org
 twitter.com/EURELECTRIC