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Safeguarding essential household energy consumption: the role of the rising block

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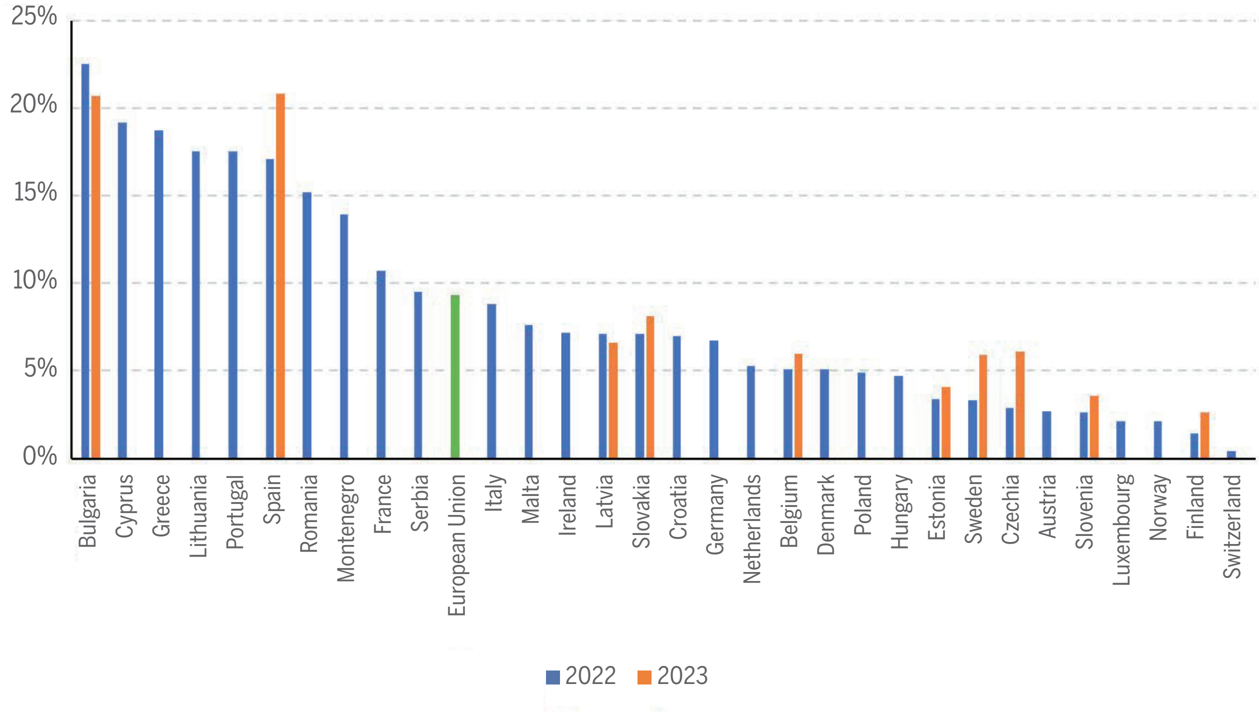
PRICING THE ESSENTIALS

Core services, including energy, food, water, housing and healthcare, are essential for a decent standard of living. The economic dynamics of these services in Europe, however, vary greatly, particularly in the extent of commercialisation. Essential healthcare stands out as a service delivered largely outside of the market; by contrast, food and energy are commercialised in most European countries.

The commercialised status of energy in Europe can have an impact on living standards, particularly when accompanied by inadequate regulation. Eurostat data suggests that even prior to the recent surge in energy prices, around 7% of European Union residents (1 in 14) were unable to keep their home adequately warm.[1] In 2022, this jumped to 9.3% (1 in 11), or over 41 million people, as the energy price spike hit, and preliminary data suggests the rate rose further still in 2023 **(Figure 1)**. Significant variability in energy affordability persists between European countries, for instance with energy proportionately more affordable in Norway, Finland and Switzerland, and unaffordable in Bulgaria, Cyprus and Greece.

Figure 1: Proportion of respondents reporting an 'inability to keep home adequately warm' by European country in 2022 and 2023 (where data is available)



Source: EU-SILC survey

1 Eurostat (2023) Inability to keep home adequately warm – EU-SILC survey.

Across Europe, energy is typically charged based on a simple, single linear tariff. This basic structure offers limited protection to essential energy consumption for lower income households. Policies, usually targeted 'social tariffs' designed to support particularly vulnerable social groups, such as the elderly or disabled, are often used to 'correct' the market for social aims. These corrections proved inadequate when Russia's invasion of Ukraine spiked wholesale energy prices. Governments were forced to intervene, implementing a variety of price control measures.

A tension can be found between initiatives aimed at improving the affordability of energy and the need for rapid decarbonisation. Levies and prices on greenhouse gas emissions have developed as a preferred mechanism for driving emissions reduction across Europe. The EU Emissions Trading Scheme (EU ETS), which already caps and prices emissions in many industrial sectors, is set for an extension to cover domestic heating. This move, scheduled for 2027, will increase the cost of fossil fuel–based domestic heating.

Some argue it represents a threat to the wellbeing of low-income households across Europe.[2] While the final extent of any harm done will depend on the social initiatives sitting alongside the roll-out, there is a tension between the wide array of policies which aim to bring energy prices down, and others which push them up. The 2022-2023 energy crisis saw extraordinary levels of effective subsidy placed on fossil fuel products, climbing from €56 billion in 2021 to well over €100 billion in 2022 and 2023.[3]

Today, with prices remaining high and many emergency support measures coming to an end, questions remain as to whether the energy retail market is fit for purpose or requires longer-term reform. Further consideration is needed on how we guarantee that the rapid transition to renewables is also done fairly, locking in affordable energy for all.

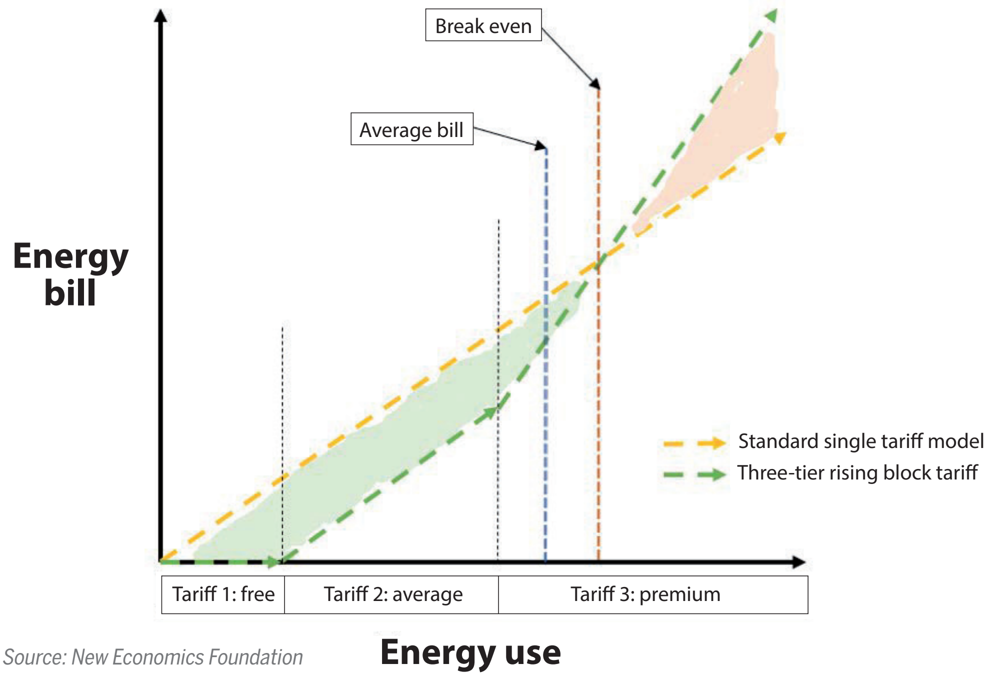
ALTERNATIVE RETAIL MODELS

A strong moral case can be made for energy as a universal basic service, to be provided for free at the point of use. A common critique of this approach, however, is that a proportion of energy use relates to luxury consumption and, particularly given the climate crisis imperative, there is a case for a price signal reflecting the economic and environmental costs of excess consumption. Price signals can also help to manage the strain the energy production and distribution system experiences from factors such as aggregate demand and time-of-use (e.g. peak/off-peak, day/night-time consumption). As Europe transitions to more weather-dependent energy sources and increased use of electric energy, the importance of being able to flex energy demand and provide the right signals to consumers is only growing. At the same time, the rapidly falling average price of wind and solar energy offers potential opportunities to improve the affordability of energy and reduce fuel poverty.

Seeking to balance the tension between energy as an essential service and price signals in the retail market is the 'rising/increasing block tariff model' (also termed 'progressive' or 'variable' tariffs). At its most basic, the **rising block tariff (RBT)** model involves a simple reform to the energy billing system, which sees incrementally higher prices charged as household energy consumption levels increase **(Figure 2)**.

In principle, the RBT design can enable protection of lower energy consumption levels at a cheap, or even free, tariff, while also charging a premium on what might be considered 'excessive' or 'non-essential' consumption. The model is conceptualised in **Figure 2**. A difference between the RBT structure and a 'social tariff' is that the RBT can, in principle, be self-financing. The effective discount offered to lower-consuming households (shown in green) can be fully offset by the additional revenue generated at the higher-consuming end (shown in beige).

Figure 2: Conceptual comparison of a standard (linear) single tariff model versus a rising block tariff model of energy bills



Source: New Economics Foundation

2 Bajomi, A. EU ETS extension could have devastating impact on low-income households, Euractiv, 18 April 2023.

3 European Commission (2023) Study on energy subsidies and other government interventions in the European Union. Enerdata and Trinomics report to the European Commission.

As shown in **Figure 2**, tariffs are usually set such that households with consumption levels near to the national average see either minimal change or a small reduction in their bill versus a linear tariff model. The impact of a shift from a linear tariff to a two-tariff RBT on household bills is illustrated in **Table 1**. In this scenario, using a model of the United Kingdom's domestic economy, a bottom tariff is set at 13% below the market rate, and a top tariff is set 20% above the market rate. The result is that 57% of all households are 'winners' from the policy. However, as energy consumption is lower among lower-income households, 80% of households in the bottom income decile (i.e. bottom 10%) are 'winners' from the policy. NEF (2023) analysis further shows how recycling existing government expenditure on social tariffs can increase the overall win rate in the general population to levels above 70%, and above 90% among low-income households.[4]

Table 1: Illustrative impact of a revenue-neutral switch from a linear tariff to an RBT on household bills based on United Kingdom gas and electricity consumption data spanning 2015-2019, grouped by equivalised household income decile

		Proportion of population		Total average annual energy consumption, kWh (combined gas and electricity)	
Household Income decile	Average bill change (all households)	Policy losers	Policy winners	Policy losers	Policy winners
1	-£103	20%	80%	22,656	15,191
2	-£88	24%	76%	22,700	15,009
3	-£67	29%	71%	21,575	14,485
4	-£29	35%	65%	22,075	13,418
5	-£5	42%	58%	22,201	12,973
6	£22	49%	51%	22,448	12,677
7	£37	51%	49%	23,069	11,970
8	£47	54%	46%	23,032	12,176
9	£63	56%	44%	23,585	11,518
10	£132	66%	34%	27,612	11,304
Average	£1	43%	57%	23,426	13,392

Source: New Economics Foundation analysis of data from the UK Office for National Statistics – Living Costs and Food Survey

The RBT tariff structure is usually enforced through government regulation or offered via state-owned retailers, but in some rare cases, such models might be offered by private businesses without government intervention. The RBT differs from a typical social tariff because it is applied universally to all households as a structural billing system reform. Social tariffs typically only apply to a subset of the population, usually identified as having a particular characteristic of vulnerability. Social tariffs are widespread across Europe,[5] usually sitting alongside a basic single linear tariff, and applied to 'correct' for a failure of the market. Social tariffs can also be used in conjunction with an RBT billing structure.

While not commonly operated in Europe, the RBT model is prevalent across a number of regions and countries. A 2020 World Bank study of 60 countries around the globe identified that 65% were operating some form of block tariff billing model.[6] Indeed, with the structure used in places like India, China, Indonesia, Bangladesh, Japan and Ethiopia, the majority of the world's population live in countries operating RBT models.

ADVANTAGES OF THE RISING BLOCK MODEL

A key reason for the popularity of the RBT model outside Europe is its equity impacts and its role ensuring the affordability of energy for lower-income households. The World Bank (2020) describe the RBT model, as implemented around the world, as having a 'material' positive effect on the affordability of energy.[7] The social and equity impacts of the RBT model are delivered through three routes:

1. **The safety net:** The RBT provides a universal safety net. Every household in the operating region sees the accessibility of energy improve as their consumption falls. This rewards low consumption, but critically, it protects households that experience an income shock against energy poverty. The effectiveness of the RBT in protecting essential energy consumption depends in part on where the tariff levels are set. Delivering free energy at the lower tariff band provides complete protection against energy poverty, as long as the free band provides sufficient energy to meet essential needs.

4 Chapman, A. and Kumar, C. (2023) The National Energy Guarantee: A long term policy to protect essential energy needs, reduce bills and cut carbon. New Economics Foundation.
5 ACER/CEER (2023) Energy Retail and Consumer Protection. 2023 Market Monitoring Report.
6 Foster, V. and Witte, S. (2020) Falling Short: A Global Survey of Electricity Tariff Design. World Bank Group Policy Research Working Paper 9174.
7 Foster, V. and Witte, S. (2020) Falling Short: A Global Survey of Electricity Tariff Design. World Bank Group Policy Research Working Paper 9174.

2. **The progressive distribution:** If energy consumption increases with household incomes (a positive relationship), a shift from a linear tariff to an RBT will deliver progressive outcomes at the aggregate level (as show in **Table 1**). Eurostat data from 2020, analysed by NEF, suggests that household expenditure on electricity, gas and other fuels tends to grow with income in all 23 European countries with complete data. Expenditure is typically around 90% higher in the top income quintile compared with the bottom. This trend weakens when expenditure is viewed on a per-adult basis (i.e. equivalised) because higher-income households have larger numbers of adult residents. On this measure, two-thirds of the European countries in the sample continue to show higher levels of energy expenditure among higher-income households.[8]

3. **Universalism:** A core advantage of the RBT model is its universalism. While social tariffs can be highly effective for households that receive them, it is often difficult to develop a perfect targeting system which captures all households in need. For example, fuel poverty can be experienced by households not eligible, or not aware, of income- or disability-related social security schemes operated by the government and used to target social tariffs.

Further potential benefits of the RBT model relate to its impacts on demand. These span both system management considerations and climate objectives. The existence of a premium tariff, typically set at a level higher than the market average, acts as an effective tool to dampen demand at the higher consumption end.[9] Evidence suggests that the higher the premium tariff, the greater the demand constraint that results.[10]

RBT models can play a role in facilitating the green energy transition by incentivising energy savings, during a period in which electricity demand, in particular, is likely to grow rapidly, as well as incentivising the switch to renewable energy sources. The premium tariff can act to improve the relative household return on investment in energy efficiency measures, stimulating demand reduction and reducing carbon emissions. For example, researchers have documented how home energy efficiency improvements implemented under an RBT energy billing system in Mexico can deliver a 9.9% reduction in energy consumption, but an 11.1% reduction in household expenditure, thereby improving the financial incentive versus a linear tariff structure.[11] The premium tariff similarly increases the return on investment in domestic solar panels. In the context of the urgent need to reach net-zero emissions, this stimulus to demand for energy efficiency and on-site renewable energy might be seen as a strong advantage. By some, however, it is viewed unfavourably as distorting market incentives and encouraging inefficient economic behaviour.

CRITIQUES OF THE RISING BLOCK MODEL

Despite presenting clear evidence of the success of the RBT model in making energy affordable for low-income households, the World Bank, and others such as the International Monetary Fund (IMF), are critical of the RBT model. Critiques typically cover three core issues:

1. **Efficacy improving the wellbeing of the poorest:** The IMF's critique focuses on the targeting of support, and potential for low-income high-consuming households to lose out, while high-income, low-consuming households gain.[12] The IMF discuss this issue in abstract terms and, in reality, it can only be confronted fairly with accurate information on the distribution of local energy consumption and incomes. Across Europe, high-income households consume, on average, considerably more energy. This is true both before and after equivalising households for their size (i.e. the number of occupants).

   In almost all cases, the RBT model would have progressive impacts in Europe. However, it is correct to say that there are some lower-income households that do consume larger amounts of energy and can be hit by higher bills under an RBT model. For this reason, many countries operating the RBT model also operate social tariffs aimed at protecting the low-income high-consuming group. In countries such as the UK, the reason groups exist in this category is usually because of low quality housing stock with poor energy efficiency characteristics. Resolving this issue should be a political priority, irrespective of the chosen energy billing model.

   While RBT models have proven redistributive impacts in most cases,[13] economists have argued that if this is the primary (or only) objective, the model performs redistribution of wealth in an inefficient manner compared with other measures available to the state through other forms of tax and spend.[14] However, the purpose of the RBT model is not only redistribution, but improving the energy security of households and their resilience in the face of income shocks, as well as delivering stronger demand constraint incentives and incentives for energy efficiency investments.

2. **Distortion of economic incentives:** A second criticism relates to the way that the RBT changes the incentives on household investments in things like energy efficiency and rooftop solar. The World Bank suggests that 'the savings that they [households] make from the installation of rooftop solar may be quite large' and the structure 'may over-incentivize the adoption of rooftop solar by large consumers, while under-incentivizing the adoption of electric vehicles'. The IMF go further, saying 'there is a limit to how much can be achieved without generating excessive inefficiencies (e.g., over-investment in more costly own-supply systems)'.

   An important backdrop to this critique is the context in which governments, particularly in Europe, have frequently tweaked incentives in the domestic energy production and efficiency markets for social purposes over the past two decades. Solar power subsidies which artificially increased the return on investment in domestic solar installations were widespread for two decades, and governments across Europe have provided some capital support to energy efficiency measures such as loft insulation, albeit with mixed success.

   Incentives or 'distortions' to the market are in fact commonplace. Indeed, through social tariffs and recent emergency support schemes, governments have distorted market incentives by artificially suppressing the price of energy, with counterproductive impacts on aggregate demand and climate progress. Furthermore, the price paid for energy in most modern economies is already distorted because externalities, particularly the cost of carbon, are not fully captured in the market price (internalised), either through exemptions or under-pricing carbon versus its true social cost. Markets can, and should, be managed to ensure they reflect wider social and environmental goals.

8 NEF analysis of Eurostat, Consumption Expenditure of Private Households: Structure of consumption expenditure by income quintile and COICOP consumption purpose.

9 Prasanna, A., Mahmoodi, J., Brosch, T. and Patel, M. (2018) Recent experiences with tariffs for saving electricity in households. Energy Policy, 115: 514-522.

10 Quan, S. and Kim, K. (2023) Did new electricity progressive tariff system change energy usage pattern in Seoul apartments? Evidence from integrated multisource dataset and combined analytical models. Energy and Buildings, 287: 112979.

11 Hancevic, P. and Lopez-Aguilar, J. (2019) Energy efficiency programs in the context of increasing block tariffs: The case of residential electricity in Mexico. Energy Policy, 131: 320-331.

12 Coady, D., Jahan, S., Machado, F., and Gu, M. (2023) The distributional and fiscal implications of public utility pricing. International Monetary Fund (IMF).

13 Borenstein, S. (2012) The Redistributional Impact of Nonlinear Electricity Pricing. American Economic Journal: Economic Policy, 4:56-90.

14 Levinson, A. and Silva, E. (2022) The Electric Gini: Income Redistribution through Energy Prices. American Economic Journal: Economic Policy, 14: 341-365.

3. **Policy sustainability:** Another concern often raised in relation to RBT models is their development over the long term. If the model is successful in its aim, namely reducing demand and increasing energy efficiency, the proportion of households paying at the premium tariff level could conceivably reduce, impacting the financial sustainability of the model. This can only arise if the tariff levels are not regularly recalibrated to reflect the balance of energy demand in the system. RBT models have run for decades in Japan and South Korea, using regular recalibration to manage system costs and incentives.

   It is also worth considering whether an RBT model might have a built-in end date. Much as the EU ETS has built-in obsolescence when decarbonisation is achieved, the RBT could be time limited to either a point at which energy has reached parity of access across income groups, or a point at which a certain threshold of energy efficiency or affordability has been reached.

A final point advanced by both the World Bank and IMF is that the current models governing energy billing do an inadequate job of pricing available energy capacity, as opposed to volumetric consumption. The demands placed on the energy grid relate in part to consumption at volume, and in part simply to the availability of energy when needed (i.e. keeping some generation capacity on stand-by). A household with its own solar generation capacity still relies on the grid when the sun does not shine, but may reduce its overall contribution to system running costs if a large proportion of those costs are being recouped from volumetric charges. This also relates to a general tendency for under-utilisation of time-of-use tariffs, which are useful tools to smooth energy demand peaks and improve the efficiency (including the carbon impact) of energy system operation. This is not a criticism of the RBT model per se as the model could function alongside time-of-use and other capacity-based charges, as discussed further below.

EMERGENCY SUPPORT MEASURES IN EUROPE AND THEIR TRADE-OFFS

Governments across Europe have implemented a wide range of energy support measures, including universal flat cash payments, targeted payments (to students, the elderly and the disabled), tax cuts and price controls. Here we look at those mechanisms which operated directly through energy bills and the different approaches taken to protecting essential energy consumption while incentivising demand reduction.

The Universal Discount approach (e.g. United Kingdom)

In the UK, the Energy Price Guarantee was the centrepiece of the government's support package. Costing around £20 billion,[15] the scheme capped the price per kilowatt-hour (kWh) paid by households, with the government compensating energy retailers for the difference against the market price. As this discount applied to all energy consumption, and higher-income households consume more than those on a lower income, better-off households are likely to have received a higher share of the government's support. Assuming pre-crisis trends, the top 20% of households (in terms of household income level) would have received 48% more in cash terms on electricity and 74% more on gas than the bottom 20% of households (this declines to 21% and 29%, respectively, if differences in the average number of household occupants are controlled for).

The consumption-contingent universal discount (e.g. Germany)

Much like the UK, Germany implemented a large, universal price cap, which cost an estimated €33 billion for its household component.[16] The package capped energy prices paid by the public, but only on the first 80% of a household's annual consumption (usually estimated on the basis of the previous year's consumption). This design meant that a household which consumed more energy in the previous/baseline year could claim more discounted energy in the crisis year. If consumption trends followed previous years, this would mean households in the top 20% by income receiving 100% more in cash terms than households in the bottom 20% (falling to 19% if household sizes are equivalised). In other words, the German scheme distributed government funds in a regressive manner similar to that seen in the United Kingdom. The difference between the two schemes is that the German model maintained a stronger demand constraint, with any increase in energy consumption beyond 80% of the previous year being priced at the prevailing (very high) market price instead of the discounted price paid in the UK.

The energy block discount (e.g. Austria, Netherlands, Greece and Poland)

While on the face of it, the Austrian support scheme for electricity bills shared many features of the German model, it held one core difference. The cap on price support was not set based on an individual household's previous bill, but instead was set at 80% of the average household's consumption – 2,900 kWh. Reporting at the time suggested that more than half of Austria's population consume less than 2,500 kWh, and therefore would see all of their electricity consumption covered by the scheme. Households' consumption above the threshold would experience a much stronger demand constraint price signal from the market. In essence, the Austrian government had implemented a temporary, two-tariff RBT.[17] With households in Austria's top 20% spending 80% more on energy than households in the bottom 20%, this design of support was likely progressive. Far more households among higher-income groups would have consumed beyond the 2,900 kWh support limit.

The Dutch model followed that of Austria, effectively implementing a two-tier RBT on both electricity and gas. The price tariff increase kicked in at 2,900 kWh of electricity and 1,200 cubic metres of gas. Again, as energy consumption has a positive relationship with household income in the Netherlands, this design was progressive. Other countries implementing support measures with structures similar to an RBT included Greece, where the first 300 kWh consumed per month was subsidised, and Poland, where the first 2,000 kWh of annual consumption was subsidised.

15 OBR (2023) Forecast Evaluation Report – October 2023. Office of Budget Responsibility, United Kingdom.

16 Reuters. German gas price brake to cost 54 bln euros, 15 November 2022.

17 Reuters. Austria plans to partly reimburse household power bills, 7 September 2022.

LINKING THE RISING BLOCK TO RENEWABLE ELECTRICITY ROLL-OUT AND EMERGING TECHNOLOGIES

Modern energy systems are evolving rapidly as smart technologies roll out and expand the range of options available to households, both for spreading and reducing consumption, as well as maximising the potential of new energy storage and generation options. At the same time, with the rise of heat pumps and electric vehicles, the demand for electricity is also rising rapidly. These developments and technologies have important social equity considerations.[18] As energy technologies are usually capital expensive, they are only available to households with the wealth to afford them. Meanwhile, innovative dynamic time-of-use tariffs are often more accessible to certain types of households with better knowledge, time availability and access to technology. Both efficient tariffs and technologies can be more accessible to homeowners than to renters.

In countries such as South Korea, where the RBT model is well established, its interaction with emerging technologies is being explored. Studies have shown the compatibility of the RBT model with the so-called 'prosumer' – households that are, at times during the year, exporting energy to the grid from domestic solar panels.[19] In South Korea, the equity dimension has also been considered; indeed, the RBT model has been shown to be useful as a means of offsetting some of the otherwise socially regressive impacts of time-of-use tariffs.[20]

Ensuring that the emerging technologies and energy system management approaches are to the benefit of all, reducing rather than entrenching energy inequities is a topic of contemporary interest. As the availability of cheap renewable energy has grown, notably secured through the Contracts for Difference (CfD) system, debates have emerged as to whether some of the cheapest energy contracts secured should be directed or hypothecated for certain social groups (or even businesses). One option would be to use cheap CfDs to secure the bottom block of energy in an RBT system. Others have proposed dedicating this energy to social groups with a particular need, while in some economies, there has been a push to protect the energy costs of certain nationally important industries. Authors, such as ENTSO-E[21] and Schittekatte and Batlle,[22] have discussed the merits of different systems for administering renewable energy contracts and securing long-term, low-cost energy on behalf of consumers.

CONCLUSION

While the block tariff approach to energy billing is not typical in Europe, it is widely adopted across the rest of the world, including in higher-income countries such as Japan and South Korea, and US states such as California. In general, when comparing against a single (linear) tariff model, the RBT is pro-poor and redistributive in nature, offers stronger demand constraint incentives, and represents a safety net against energy poverty. Nonetheless, the model is disliked by institutions such as the World Bank and IMF for its claimed 'distortion' of market incentives.

In Europe, inadequate market regulation and social protection, poor tariff design, and dependence on fossil fuels have led to millions of households experiencing energy poverty. Even before the recent energy price spike, energy poverty and insecurity were widespread. Governments regulate and rebalance the energy market in order to adjust and correct for its failures. When the crisis hit, many governments defaulted to emergency measures using the block tariff approach, underscoring why the approach is favoured outside of Europe. Those governments that utilised this approach spent their resources in the most progressive manner. They avoided making large cash transfers to subsidise non-essential energy consumption made by high-income households. They also kept both the demand constraint signal provided by higher prices, and the rationale for the investments required to decarbonise Europe's housing stock.

No system is perfect. The strength of the RBT model is that it dramatically shrinks the pool of households requiring additional state support in the form of social tariffs. It does not, however, eradicate this need. The smaller group of low-income, high-consuming households, often occupying poor quality housing stock, still requires help. This group should be a political priority, irrespective of the preferred energy billing system. This is particularly the case as emerging smart technologies, with significant potential to improve energy efficiency, security and sustainability, are not necessarily pro-poor. The RBT model offers one way of ensuring that the 'green dividend' offered by these technologies, as well as the proliferation of cheap renewable energy, is seen and received by all.

18 Batlle, C., Mastropietro, P., and Rodilla, P. (2020) Redesigning residual cost allocation in electricity tariffs: A proposal to balance efficiency, equity and cost recovery. Renewable Energy, 155: 257-266.

19 Park, L., Yoon, Y., Cho, S. and Choi, S. (2021) Prosumer Energy Management Considering Contract With Consumers Under Progressive Pricing Policy. IEEE.

20 Cho, K-S. and Son, Sung-Yong. (2020) Design and Impact Analysis of Time-Of-Use Pricing based on Progressive Pricing. The Journal of Korea Institute of Information, Electronics, and Communication Technology, 13: 159-168.

21 ENTSO-E (2024) Sustainable Contracts for Difference Design. European Network of Transmission System Operators for Electricity.

22 Schittekatte, T. and Batlle, C. (2023) Power Crisis in the EU 3.0: Proposals to Complete Long-Term Markets. MIT Center for Energy and Environmental Policy Research.