

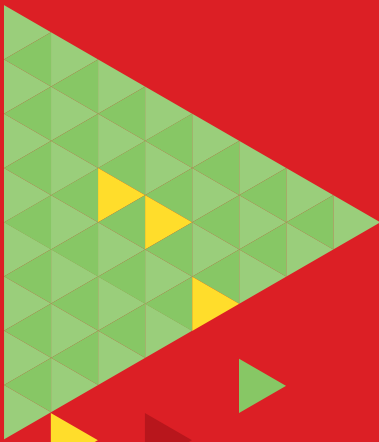
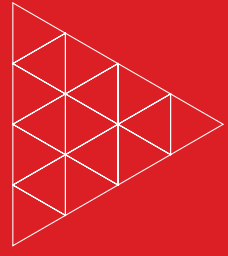
Going Public:

A Decarbonised, Affordable and Democratic Energy System for Europe

The failure of energy liberalisation

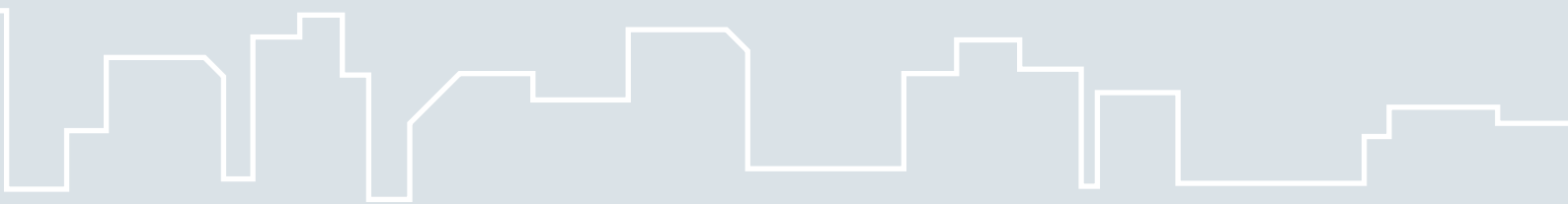
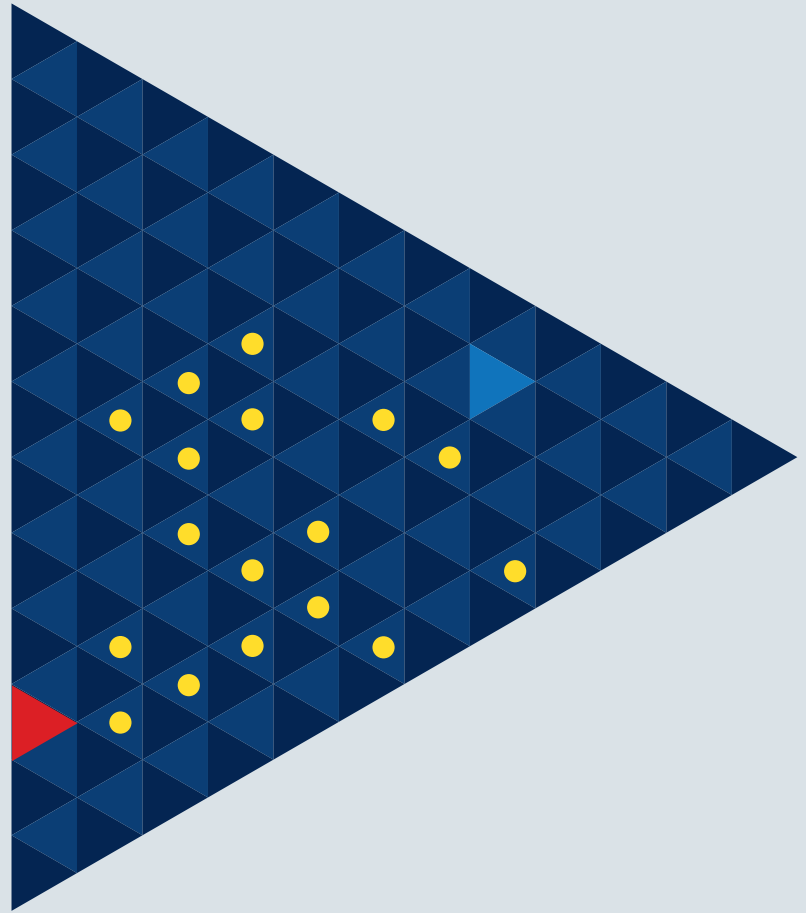


Vera Wegmann
PSIRU, University of Greenwich
July 2019



Contents

Executive Summary	5
1. Introduction	9
2. Energy liberalisation	11
2.1. Two decades of energy liberalisation in the EU	11
2.2. Wholesale markets	12
2.3. Issues for the wholesale market	14
2.4. Retail	16
2.5. The network	18
3. Outcomes of energy liberalisation	21
3.1. Ownership	21
3.2. Prices	22
3.3. Energy liberalisation and the environment	26
3.4. The impact of energy liberalisation on jobs	29
4. A roadmap to an alternative energy policy	39
4.1. A Just Transition	39
4.2. The importance of regulation	41
4.3. Public ownership key to decarbonisation of the energy system	42
4.4. Decentralised versus centralised public ownership	47
4.5. Re-nationalisation and re-municipalisation	48
5. Conclusions	52
References	55



Executive Summary

The urgent need for alternative energy policies

- Decarbonising Europe's energy system is key to urgently addressing the climate emergency, but current energy policies are failing. Radical transformations are required to keep the global temperature rise below the two degrees Celsius above pre-industrial levels set out in the 2015 Paris Agreement. We need to rethink how to solve the energy 'trilemma' and provide a continuous supply of secure and decarbonised energy that is accessible and affordable for all. Energy must be democratically controlled and offer quality employment for workers.

Energy liberalisation has failed

- The aim of energy liberalisation was to introduce competition and to get rid of market monopolies. The European Commission predicted that opening up the energy market would have a significant impact on national productivity and lead to price reductions. However, academic research based on empirical data shows that energy liberalisation has failed to achieve its aims.
- Even where the limited success of energy liberalisation is acknowledged, the blame is attributed to regulation and market distortion, in particular subsidies for renewable energy. Interference in free markets, rather than the intrinsic problems of liberalisation, are blamed.
- Instead of getting rid of the monopolies of previously public companies, energy liberalisation has led to a further concentration of ownership. By the mid-2000s many smaller European generators and retailers had been taken over by major pan-European companies. By the end of the 2000s, the so-called Big Five energy companies dominated the market.
- It is often claimed that the European Union's (EU's) success in deploying renewables is a product of privatisation and liberalisation policies, with liberalisation creating the regulatory landscape in which new actors, wind and solar companies, could thrive. Yet the opposite is the case. Renewable deployment was only possible because the EU allowed renewables to be exempt from state-aid rules and deployed through commercial arrangements outside the market. Subsidies have facilitated an increase in renewable electricity, yet this protection of renewables contradicts the EU's energy liberalisation policies. Renewables do not fit with the existing market structure, which has led to a price collapse in the electricity wholesale market. The European Commission is now moving to reduce protection for renewables.
- Instead of the predicted decreases in electricity and gas prices as a result of energy liberalisation and privatisation, the opposite has occurred and prices for the consumer have increased. Energy poverty across Europe doubled over a 10-year period. By 2014, the lowest-income households in the EU spent close to nine per cent of their total expenditure on energy. Energy poverty is a particular problem in Eastern Europe, where incomes are lower, and in Southern Europe, especially in countries hit hard by austerity policies.

Energy liberalisation is not leading to the creation of quality jobs

- Energy liberalisation is associated with job losses. In relative terms, between a third and a quarter of jobs were lost in the electricity sector between 1995 and 2004 in the EU-15.¹ In the UK, the pioneer in energy liberalisation and privatisation, around 60 per cent of the jobs were lost between the early 1990s and 2001.² Energy liberalisation not only led to job losses, it also shifted the nature of work, with a general decline in technical and maintenance jobs often facilitated and exacerbated by outsourcing.³ Meanwhile, the number of legal, marketing and sales staff increased, with the companies prioritising winning customers in a liberalised market.
- The fragmentation of energy production along with outsourcing has undermined trade union bargaining power and workers' rights. The Just Transition promoted by trade unions puts workers and employment at the heart of climate policies. It acknowledges that the transition towards a low-carbon economy has wide-reaching and industry transforming implications that will affect workers and communities. A Just Transition means communities that currently rely on fossil fuels developing alternative economic activities and workers provided with training to develop skills for new forms of employment.
- The European Commission's recently adopted *Clean Energy for all Europeans* package includes claims that it will lead to the creation of 900,000 new jobs. However, these claims are mostly based on statistical modelling where the creation of jobs stands in direct correlation to investment levels. Under these models, jobs will be created however and wherever the money is invested. This leaves important questions about whether the investment is the best use of the limited capital available and about the type of jobs and where they are located unanswered.

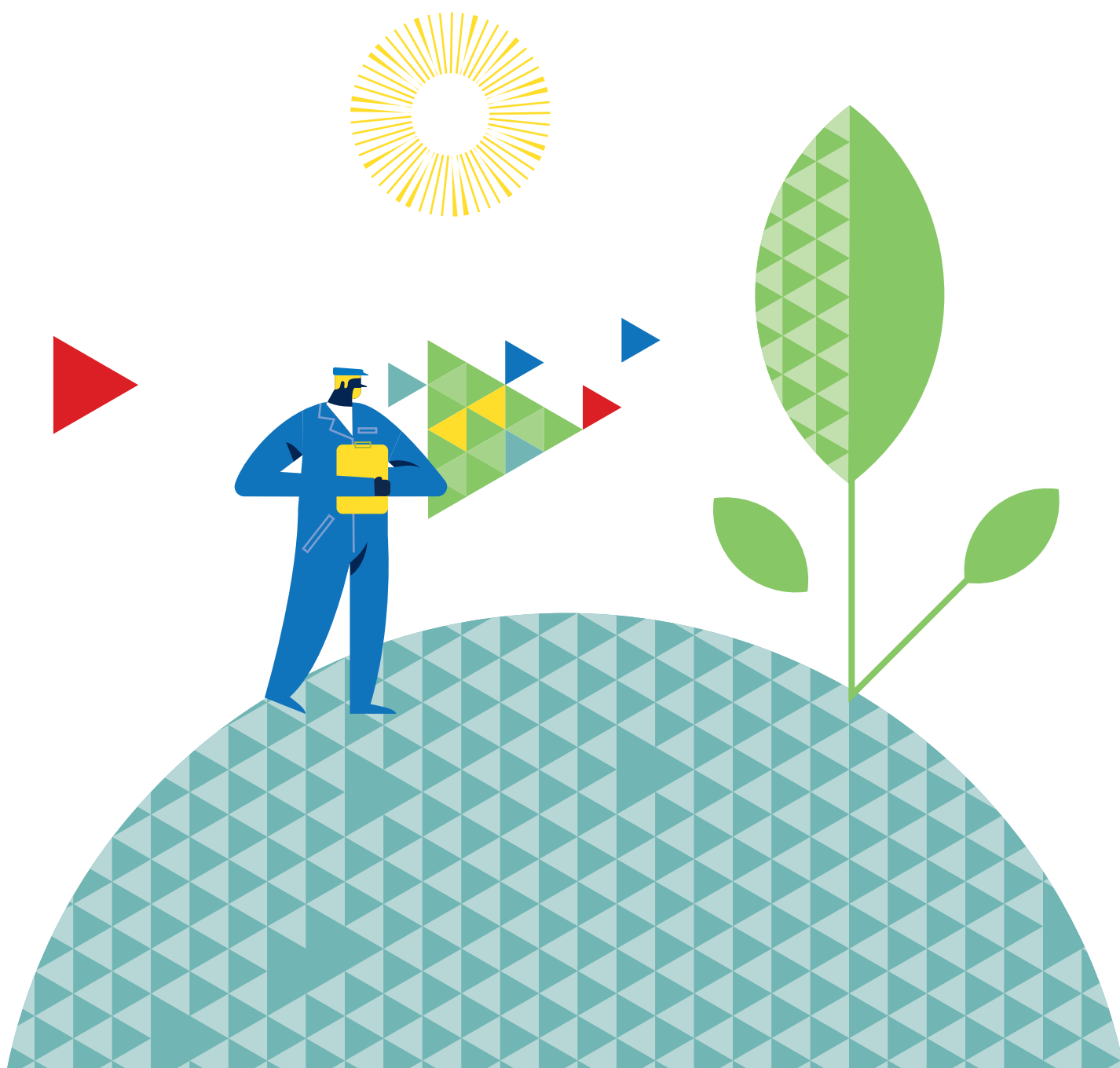
Energy liberalisation is at odds with decarbonisation

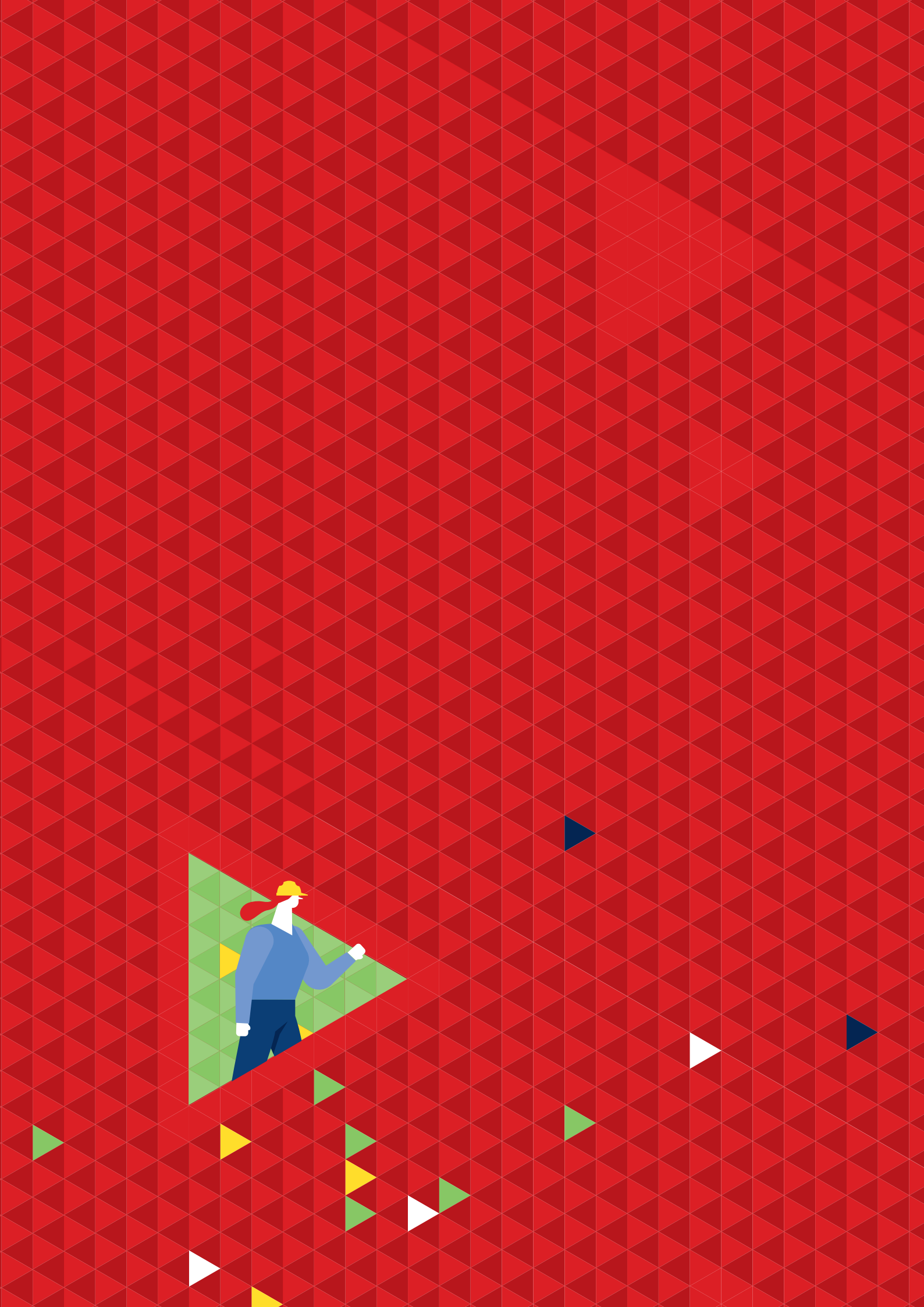
- The Big Five energy companies have performed badly in terms of renewable energy production, which is alarming in view of the climate emergency. Research suggests that energy liberalisation represents a substantial constraint on the transition to a low-carbon system. A wave of re-municipalisation, primarily in Germany, raises key questions about the extent to which private ownership is compatible with the transition to a low-carbon economy. It also highlights the increasing relevance of the public ownership of energy, ownership models and the democratic control of energy resources.
- Energy liberalisation is incompatible with policies that promote and subsidise renewable energy and decarbonisation of the energy sector. Without subsidies, renewables cannot survive in the competitive electricity markets. In other words, the rise of renewable energy was only possible because it was protected from market liberalisation and not because of market liberalisation. However, as a result of subsidies for renewable energy, energy wholesale prices have been falling and have essentially led to a market failure. This shows the market logic cannot successfully accommodate renewables.

The importance of public ownership for a just and sustainable energy system

- The private sector can be incentivised and subsidised to encourage investment in renewable energy and a Just Transition. However, public institutions are much better positioned to address the urgency of climate change while also protecting workers.

- A publicly owned energy system restores and expands the capacity for democratic control and public planning within a sector that provides a vital 'public good'.
- There are different forms of public ownership. It does not necessarily mean going back to the model of large, centralised, nationally owned companies. Public ownership can be decentralised to a municipal and local level which brings opportunities for increased democratic control over key sectors.
- Across the EU there is a drive towards local participation in energy systems through municipal and community ownership. While decentralisation can create initial space for community and/or worker run co-operatives, it also bears the risk of expanded private sector involvement. There is also a danger that cooperatives turn into gated energy communities, where more affluent citizens generate and supply their own electricity for their neighbourhood, leaving poorer communities excluded.
- Regardless of the form that public ownership takes, the principle of universal access must be enshrined. Decentralisation should reinforce rather than undermine the public regional and national infrastructure.





1. Introduction

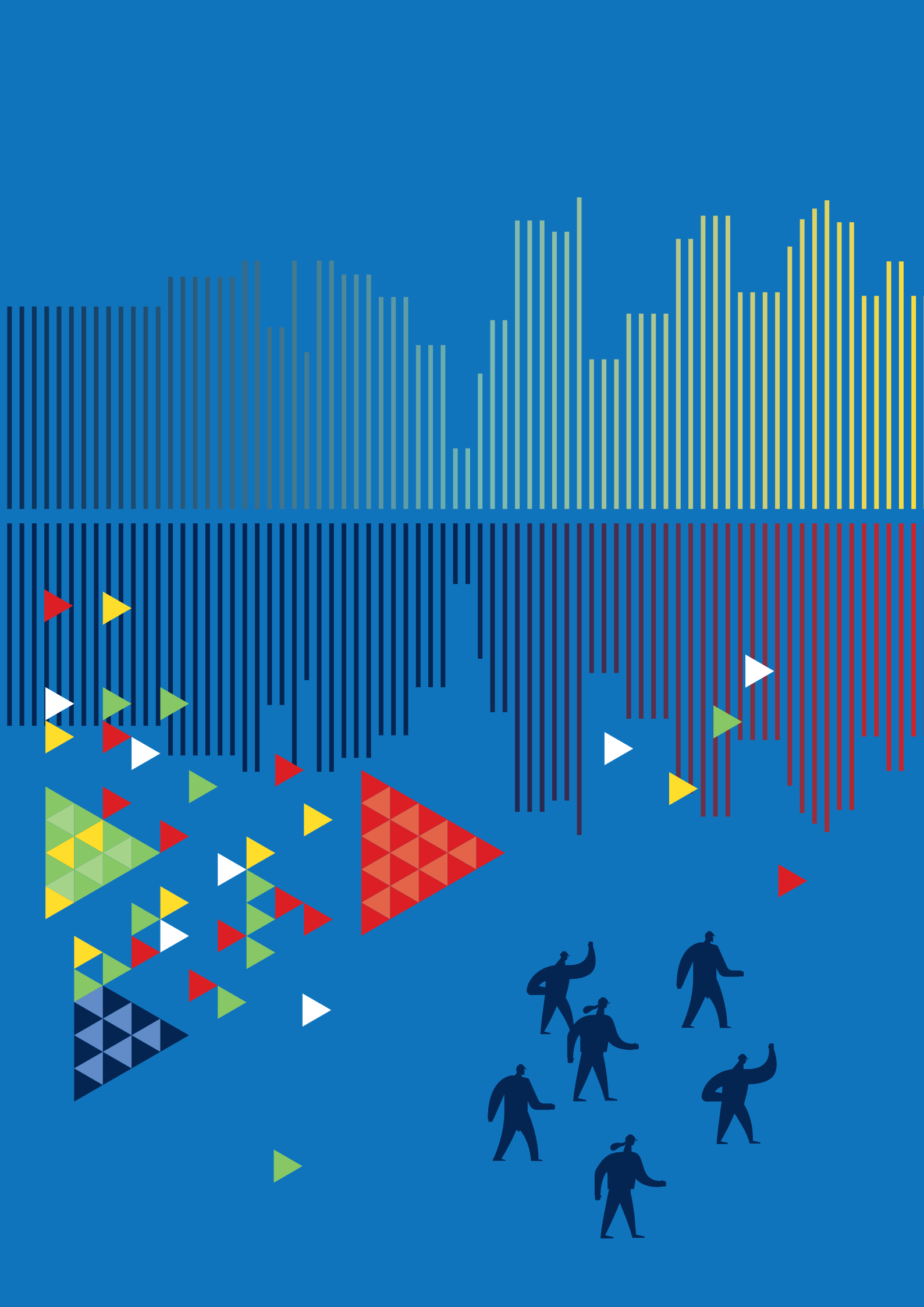
The European Federation of Public Service Unions (EPSU) commissioned this report to evaluate 20 years of energy liberalisation in the European Union (EU). It provides:

- an overview over energy liberalisation policies in the EU;
- an evaluation of the literature on energy liberalisation;
- an assessment of the outcomes of energy liberalisation in the EU; and
- alternative policy proposals to energy liberalisation.

It focuses mainly on electricity, although a parallel process of liberalisation has taken place for gas with a common goal of creating a competitive cross-Europe market. Most of the issues raised in relation to electricity also apply to gas, although the network requirements for gas are not as stringent.

The report critically evaluates the process of energy liberalisation and assesses the outcomes of over 20 years of energy liberalisation. This is especially relevant now as the European Commission has recently renewed its push for further liberalisation. This is an implicit acknowledgement that liberalisation has yet to achieve many of the objectives set for it and that addressing climate change is not easily achieved in a liberalised market structure.

It provides a critical overview of the literature on energy liberalisation and its predicted outcomes. It then outlines the developments in the wholesale market, the retail markets and the distribution networks. The third section outlines the impact of energy liberalisation in the EU on prices for consumers and industries, on the ownership and market share of energy companies, and on the environment and renewable energy. This section shows the predicted positive outcomes of energy liberalisation have not been achieved and in fact energy liberalisation has failed. It has led to higher prices for consumers and pushed many Europeans into energy poverty. It has resulted in further market concentration and monopolisation as a handful of private companies now dominate Europe's energy market. It also stands in stark contradiction to the support for renewable energy. In other words, energy liberalisation is at odds with decarbonisation. In the fourth section, the report outlines a road map of alternative policy proposals, including the concept of Just Transition and why this is an important issue for trade unions. It argues that only through public ownership can rapid progress be made to provide energy that is low carbon, affordable and secure.



2. Energy liberalisation

Energy policies have been at the centre of the EU since it was founded. In fact, they set the foundations for the EU. After World War II cooperation on coal, which was the main source of energy at the time, was seen as beneficial for economic development as well as for establishing peace between France, Germany, Italy and the Benelux countries. In 1952 the European Coal and Steel Community (ECSC) became the first treaty of European integration.

Before liberalisation, electricity systems were organised on a national scale. In some EU member states, e.g., France, UK, Italy, Portugal, Ireland and Greece, these were dominated by state-owned enterprises that controlled generation, transmission, distribution and retail. In some cases; these were fully vertically-integrated, covering all activities. In others; the industry was divided into two, with a generation/transmission company and regional distribution/retail companies.⁴ In some countries, e.g., the Nordic countries and Eastern Europe, there was a large national generation/transmission company and a large number of local companies, often locally and publicly-owned and covering distribution and retail. In others, e.g., Spain and Belgium, the markets were dominated by a small number of privately-owned, vertically-integrated companies. The German market lay somewhere in between, with significant local public ownership but overall domination by a small number of effectively privately-owned companies. The impact of liberalisation has been to reduce public ownership and vertical integration and to begin to undermine the dominance of the largest companies.

The UK has been a pioneer in the liberalisation of energy since the mid-1980s.⁵ The liberalisation of electricity involves unbundling – or breaking up – the different elements of the energy system in order to separate the potentially competitive activities, namely generation and supply, from the natural monopolies, the transmission and distribution systems.⁶ As such, the participants in the wholesale market are generators, electricity suppliers, large industrial consumers and commodities traders. Generators sell to the wholesale market and retailers buy from the wholesale market and sell to final consumers.

2.1. Two decades of energy liberalisation in the EU

In the EU, a liberalised internal electricity market was subsequently established through a legislative package adopted in 1996, and in 1998 for gas, and made mandatory in 1998 for electricity and in 2000 for gas. Both directives were revised in 2003 and again in 2009. Common rules for the internal electricity market were first set out in the 1990s (Directive 96/92/EC). Since 1998 all EU countries have been required to unbundle and liberalise their wholesale and retail markets.⁷ In 2003 the market was opened up to new electricity suppliers (Directive 2003/54/EC). In 2009, with the coming into force of the Lisbon Treaty, the market was further liberalised (Directive 2009/72/EC). The principles of the market liberalisation of energy in the EU can be summarised as ensuring competition in wholesale and retail markets.

Liberalisation of the energy sector was driven by the neoliberal ideology that puts its faith in market competition between privately-owned companies. The assumption was that the liberalisation and privatisation of energy would lead to greater efficiency resulting in lower consumer prices. The establishment of a single, completely open European energy market was supposed to enable all consumers to benefit from the cheapest available sources of energy, by driving down company costs and improving the competitiveness of European companies in world markets.⁸ While ownership of companies, public or private,

is not under the jurisdiction of the European Commission, and liberalisation does not necessarily require privatisation, it is a likely consequence as private companies are free to enter wholesale markets, undermining public ownership.⁹ In this sense, liberalisation has fundamentally changed the ethos of the energy sector from one of public service to one of short-term profit-maximisation.¹⁰

The studies on which the European Commission bases its evaluation of energy liberalisation, notably Copenhagen Economics 2005¹¹ and Booz & Company 2013, rely on econometric simulation of future impacts rather than actual data. They portray a modest success story. They find a small improvement in productivity, some wholesale price reductions, but limited or no retail price reductions.¹²

When considering actual data, however, even advocates of liberalisation must admit that the outcomes of energy liberalisation in the EU remain wanting. Pollitt, who has a longstanding track record of analysis of the EU's process of energy liberalisation, concluded in 2018:

*'However, while the level of structural and institutional change is impressive, the quantification of the costs and benefits of the single market is extremely hard and the evidence we do have suggests that the overall gains in terms of price, cost and quality of service impacts are modest, especially if we consider the 25-year time frame.'*¹³

An EU-wide analysis shows that instead of delivering positive outcomes, both privatisation and liberalisation have had a damaging effect: 'public ownership tends to decrease prices [and] vertical disintegration tends to increase prices.'¹⁴ Energy poverty has become an increasing concern. The European Parliament comments, with respect to energy poverty in post-socialist countries, that 'price increases [are] associated with the liberalisation of national energy markets.'¹⁵ Moreover, a study from 2011 has found that in Europe, private ownership of electricity assets was associated with increased public dissatisfaction with the industry.¹⁶

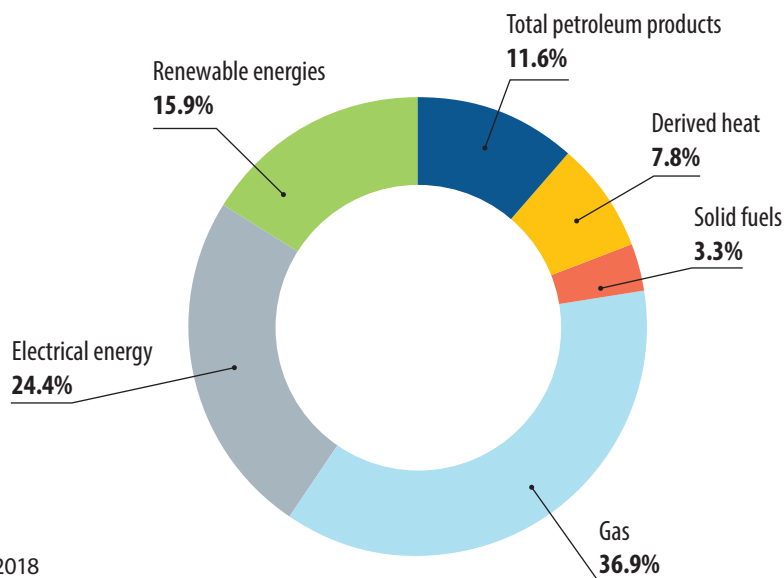
However, rather than blaming these failures on liberalisation, the European Commission blames protection for renewable energy for a price collapse in wholesale markets and the failure to establish credible wholesale regional markets.¹⁷ This is in line with much of the literature published by market economists who have an optimistic view about energy liberalisation in general, and in Europe in particular, and see any problems as the result of interference in free markets rather than intrinsic problems of liberalisation.

2.2. Wholesale markets

The participants in the wholesale market are generators, electricity suppliers, large industrial consumers and commodities traders.

Trends in the wholesale market can only be understood alongside changes in electricity demand. Between 2008 and 2015, energy demand in the EU28 fell. However, from 2015 electricity consumption rose again. This can be explained in part by the recovery of the economy and a rise in the population. Currently, electricity accounts for a slowly growing proportion of energy demand in Europe. In 2016, electricity accounted for only around 24 per cent of total household energy demand in the EU (see Figure 1), while gas, with around 37 per cent, was the largest source of energy, and renewable energies accounted for around 15 per cent.¹⁸ In 2017, electricity consumption increased by 0.7 per cent (23 Terawatt Hours). This was the third year in a row that, overall, European electricity consumption increased.¹⁹ This trend is expected to continue, especially as electricity will be increasingly used in the transport sector for electric vehicles and in heating as part of a low-carbon transformation.

Figure 1:
Final energy consumption of households by energy product in the EU, 2016



Source: Eurostat 2018

Electricity is very different from other traded commodities as it cannot be easily stored and therefore must be produced when needed. This means that electricity supply must precisely equal electricity demand at all times, otherwise the system will collapse with serious economic and social consequences. This makes electricity more difficult to trade than oil, coal and to a lesser extent gas. Globally, only around three per cent of gross electricity produced was traded across national borders in 2015 and most of this trade occurred in Europe, with a significant share of the rest being between the US and Canada.²⁰ Electricity can be traded privately on the 'over-the-counter' market or through an energy exchange, which brings together more buyers and sellers and offers transparent pricing.²¹

Before reaching the final consumer, the electricity traded in the open markets (energy exchanges) is frequently bought and sold a number of times, although a large proportion of electricity is sold through confidential long-term contracts or by internal transaction within integrated generator retailers. Gas is traded in a similar manner. Currently, several hundred companies are involved in wholesale electricity and gas trading in Europe and more than 10,000 transactions take place every day. As mentioned above, electricity cannot easily be stored and the real liquidity of markets, the proportion of power bought and sold in open trades, is low and therefore wholesale prices are very sensitive. The high cost and serious social and economic consequences of a supply shortage mean that system operators must be prepared to pay very high prices to avoid any power imbalance.

European wholesale electricity markets are divided into around 30 bidding zones, defined as the largest geographical area within which market participants can exchange energy. Trade between bidding zones is limited by the technicalities of cross-border capacity. Most electricity bidding zones are national, e.g., France and the Netherlands; some are international, e.g., Austria, Germany and Luxembourg; and some are sub-national, e.g., Italy and Sweden.²²

The wholesale market price has also been influenced by national policies to promote renewable energy, with a distinction made between flexible and non-flexible generation. Non-flexible generators are those that either cannot easily vary their level of output, e.g., nuclear power, or that are not always available,

e.g., solar and wind power. Flexible generators, those which can produce additional power in a matter of minutes or even seconds, that are available on demand are needed to meet peaks in demand or to substitute for the low availability of non-flexible sources. The European Commission has, in the past, allowed renewable sources to be paid at a premium unrelated to the market price and have priority over sources bidding into the market. This has led to the situation where, when the availability of renewables is high, there is little space in the market for sources that bid into the wholesale market. Renewables are given guaranteed prices that means they do not bid into the market and have priority. This has caused wholesale prices to collapse or even become negative at certain times (see section 2.3.2).

Due in part to the impact of renewables, wholesale electricity prices have been falling and are at their lowest for 12 years. In 2014 the European Commission found that wholesale electricity prices fell by 35 per cent between 2008 and 2012. Wholesale prices also remain subject to commodity price fluctuations for both gas and coal. The rationale for liberalisation was that it would reduce wholesale prices through competitive pressures and these reductions would be passed on to consumers in the form of cheaper bills. This has turned out not to be the case and the opposite has occurred (see section 3.2).

2.3. Issues for the wholesale market

2.3.1. Accommodating renewables

Until now, despite remarkable reductions in costs, renewables are only being produced where they are protected from the market by fixed-price, take-or-pay contracts – under take-or-pay the producer is paid for all the output they could have produced even if, for system reasons, it is not always possible to use that output – that is feed-in-tariffs (FiTs) or contracts for differences.²³ This gives developers confidence that their costs will be covered, and incentivises investment, but clearly reduces the space for competition. The European Commission is trying to phase out fixed-price contracts, requiring that FiTs have some indexation to wholesale market prices. This will choke off investment in renewables and lead to a decrease in renewable energy (see section 3.3). Inevitably, we are at a crossroads of policy choice. Either priority is given to climate change policies, which demands public support for renewables and the space in the market for competition will effectively disappear, or we prioritise competition policies. In other words, energy liberalisation is clearly at odds with decarbonising energy policies (see section 3.3).

2.3.2. Capacity payments and security of supply

An issue that has always existed since liberalisation was introduced, but has only recently come to the fore, is security of supply – ensuring there is sufficient generating capacity to meet demand at all times. The simple free-market model relies on sufficient plant being profitable – unprofitable plants will be closed even if they are needed to ensure security of supply. There is a particular issue for peaking plants, plants required for only a few hours a year, as utilisation of these is particularly weather dependent. In a warm winter they might not be needed at all, but in a cold winter they will be crucial to maintaining supplies. Peaking plants, such as open cycle gas turbines or diesel engines, are usually cheap to build. They are expensive to operate, but if they only operate for a few hours a year they will significantly enhance system reliability while having a negligible impact on consumer prices.

A number of countries are introducing capacity payments. These give plant operators money to cover their fixed costs in exchange for guaranteeing to be available when the system operator requires them. In practice, capacity payments must be given to all plants that are dispatchable – always available. These capacity payments should lead to a reduction in wholesale prices as some of the income that generators require to cover their costs will be met by the capacity payments. If the market is inefficient and the



wholesale market price does not fall to reflect the income the generators receive as capacity payments, generators might be able to capture these payments. Where capacity payments are given to new plants, this will be a market distortion as, in a free market, new capacity should be built only in response to price signals from the market. Capacity payments are relatively new and their impact and effectiveness has yet to be determined. However, as low-carbon sources that are not dispatchable and, therefore, not eligible for capacity payments take a larger proportion of demand, it will be harder to determine how much generating capacity should be given capacity payments in order to ensure there is enough capacity to meet peak demands.

The European Commission has never openly opposed capacity payments, although it is clearly uncomfortable with the distortion of markets they create. In February 2019, it opened an investigation into whether the UK's capacity payments scheme breached state-aid rules.²⁴

2.3.3. The European Union Emissions Trading Scheme (EUETS)

In 2005, the EU introduced a cap-and-trade carbon pricing system under which generators using a plant that emitted greenhouse gases would require a permit. These permits could be bought and sold, but the number of permits fell every year so that the cost of generating using fossil fuels went up and the amount that could be generated was capped. In theory, the market in permits should mean the carbon price will be high enough that the cost of generating using low-carbon sources will be no higher than using fossil fuels, and fossil fuels will naturally disappear from the market. In practice, there have been serious design issues and carbon prices have remained far too low to influence investment decisions. While the European Commission claims the EUETS can be made to work, few share its confidence. Without an effective carbon market, renewables will continue to require protection from the market until their costs are as low as the alternatives and generators are willing to invest in them without market protection.

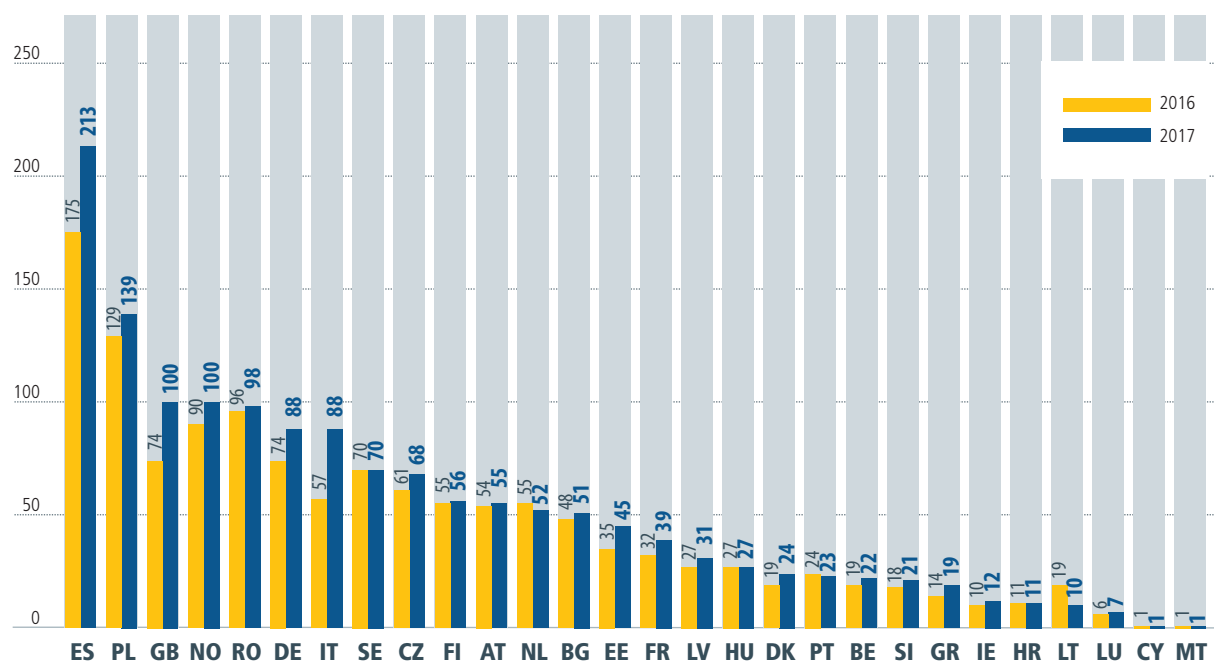
2.4. Retail

A cornerstone of energy liberalisation is that consumers can choose their suppliers. The European Commission claims retail competition is not only desirable, but a right of EU citizens. Whether consumers want choice or can exercise choice to their advantage are not questions the European Commission ever asks. Suppliers buy electricity from their generation division for integrated generator/retailers, or directly from generators via confidential contracts or from the energy exchanges and sell it to consumers. The national regulator licenses suppliers to operate, but there are questions about the adequacy of scrutiny. In the UK, in the 12 months to January 2019, ten small suppliers collapsed, requiring the regulator to find companies to take over supply to more than 800,000 consumers.²⁵ This suggests regulators may place a higher priority on encouraging new entrants than on carrying out rigorous checks on existing companies to ensure they are fit to operate.

Since 2008, retail prices have risen by three per cent a year and gas prices by two per cent a year. In Europe, energy costs have risen to an average of six per cent of household expenditure.²⁶ Switching rates remain very low, with most people never changing their supplier. In 2016, after around two decades of liberalisation, switching rates in Europe were only at around six per cent.²⁷ Suppliers often produce a large number of tariffs, which they claim allow consumers to choose a price best suited to their needs. However, there is a view that this makes choice more complicated and leaves consumers on obsolete, expensive tariffs.

Experience from the UK, where switching rates have consistently been the highest in Europe, is that switching is expensive, with fees paid to price comparison websites and administrative charges, and benefits consumers with the time and skills to exploit the opportunities at the expense of those without. As a

Figure 2:
Number of nationwide electricity suppliers per country in 2016 and 2017 in Europe

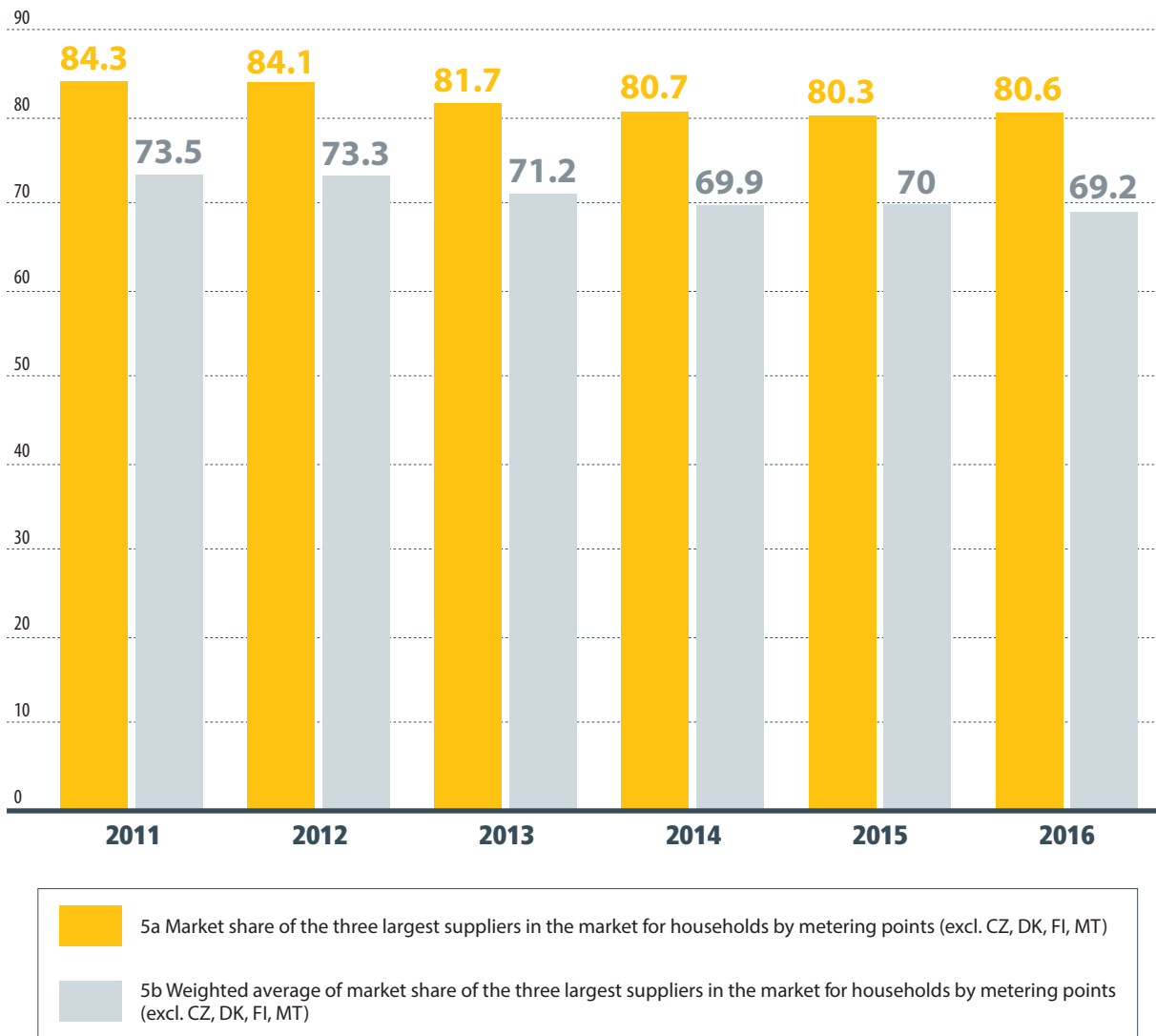


Source: Council of European Energy Regulators (2017) Performance of European Retail Markets in 2017²⁸

result of this experience, the energy companies are deeply unpopular, and the UK government has introduced a price cap which effectively re-regulates the standard tariffs from the largest companies.

In a number of European countries, consumers have around a hundred electricity suppliers to choose from. Poland has 139 and Spain, with 213, has the highest number (see Figure 2). While it is questionable as to whether so much choice is necessarily good for consumers, it is also notable that despite the rapid increase in electricity suppliers over recent years, there is stark market concentration in the electricity sector. Between 2011 and 2016, on average, the market concentration of the three largest suppliers in the retail electricity household segment was over 80 per cent (see Figure 3).

Figure 3:
Average market share of the three largest suppliers in the market for households in Europe-Electricity

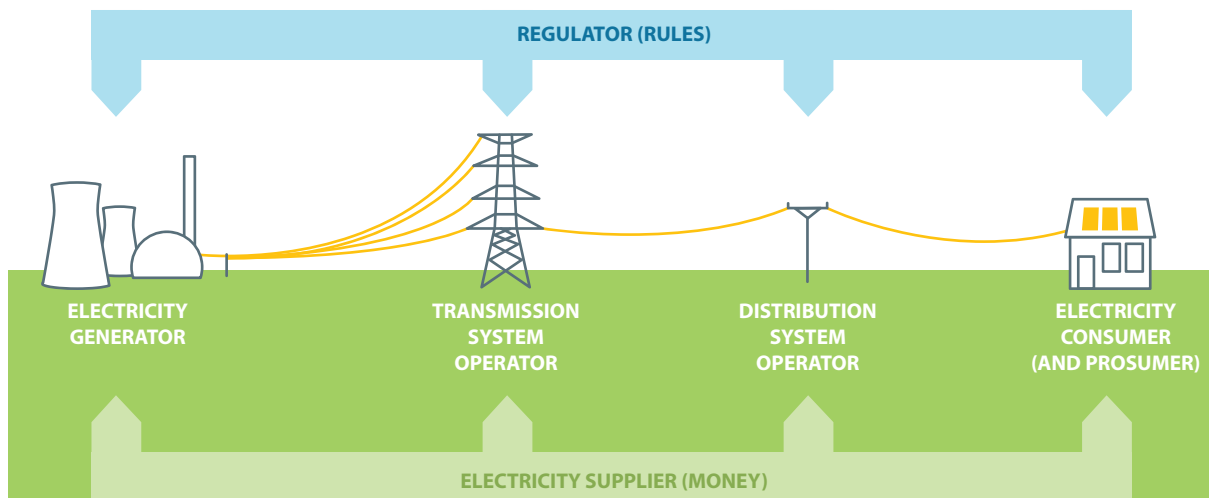


Source: Council of European Energy Regulators (2017) Retail Markets Monitoring Report²⁹

2.5. The network

The electricity network comprises the high voltage transmission systems that take power from power stations to centres of demand, and to a few very large users, and the low-voltage distribution system that takes power from the transmission system to household, commercial and industrial customers.³⁰

Figure 4:
Schematic overview of the electricity system



Source: European Parliamentary Research Service

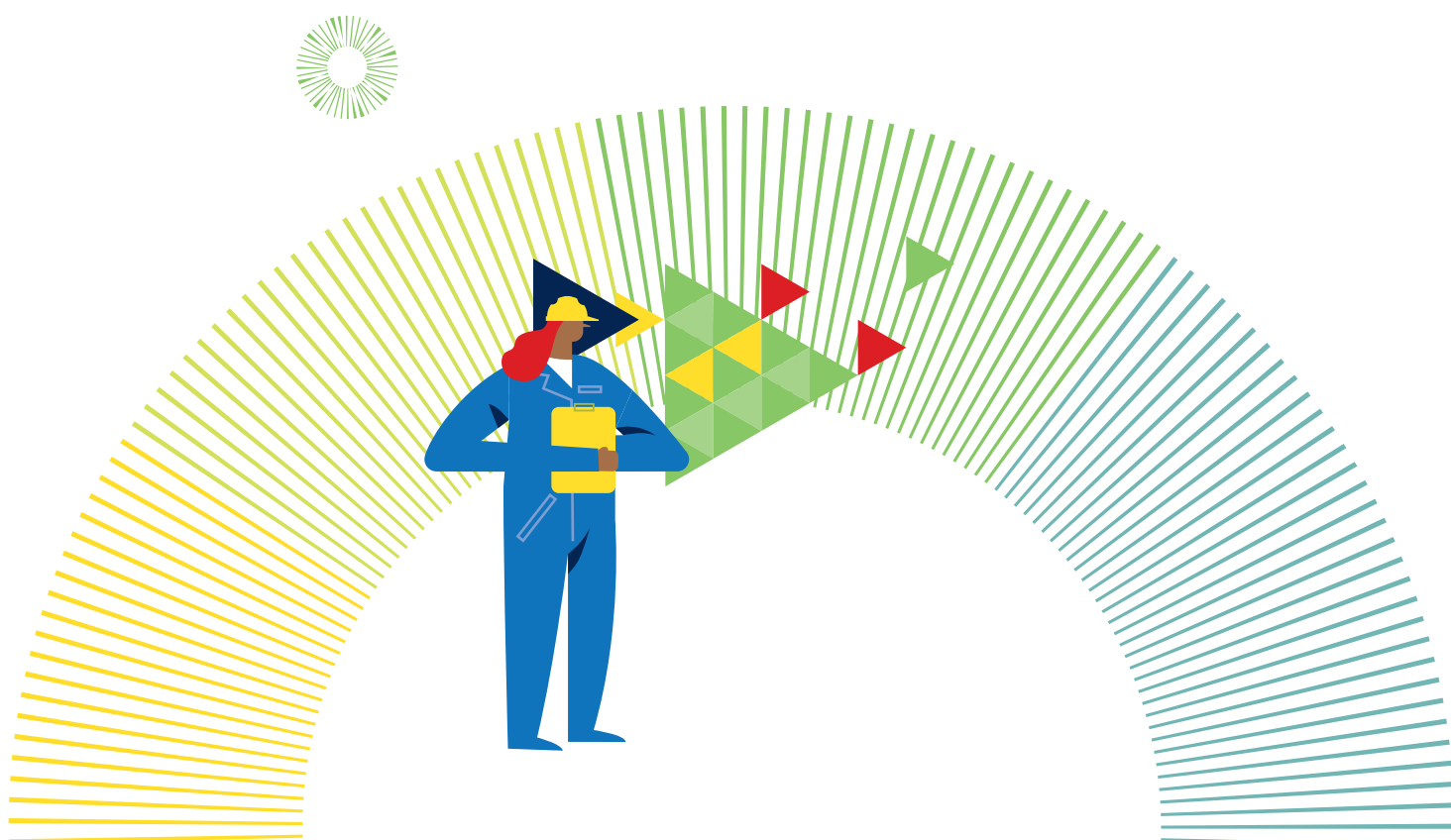
As outlined above, a key element of the liberalisation of electricity is to break up the different elements of the energy system. Unbundling can take different forms:

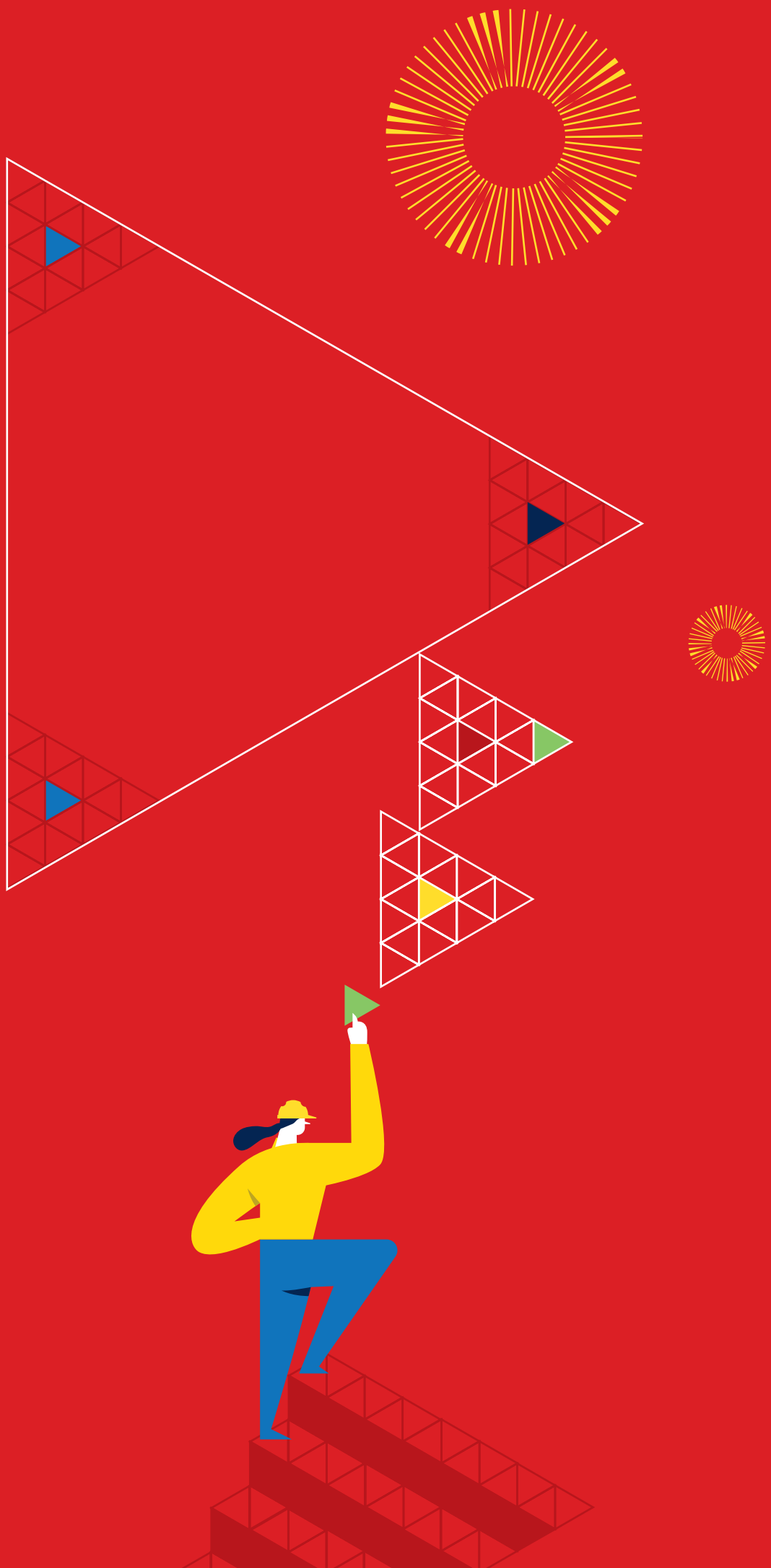
- functional – the networks are in separate departments of the same company;
- accounting – there are separate accounts within a single company for the network activities;
- legal – the network activities are held in legally-separate companies albeit under the same ownership as competitive activities; or
- ownership separation – network activities are in separate companies and not owned by any company competing in generation or retail.

Jamasb and Pollitt argue that ownership separation is the most effective in ensuring fair access to the networks, but this degree of separation may have downsides.³¹ A more fragmented industry is likely to result in smaller companies with less financial and technical strength and access to cheap capital than an integrated company. It should also be noted that if legal unbundling is enforced and is effective in providing non-discriminatory access to networks, it will tend to lead to ownership unbundling. Owners of legally-unbundled networks will find there are no commercial, or technological, advantages to owning the network and will sell their networks. They can use the proceeds to buy businesses that provide synergies with their core businesses of generation and retail, expanding into new markets or taking over competitors for example.

While it has been frequently stated that the unbundling of the grid would lead to a more efficient and cheaper system, and would therefore be better for consumers, so far there is no solid evidence that this is actually the case. There is also little evidence that unbundling has improved the productivity of network investment.³² Network prices are determined by the regulatory bodies so any efficiency improvements will only be apparent and passed on to consumers if the regulator requires the companies to do so. Higher investment is not in itself a good thing. What is required is investment that is cost-effective in improving the service to consumers, either in terms of price, reliability or sustainability. Given that under most regulatory regimes, profits are related to investment – the higher the investment, the higher the permitted level of profit – high levels of investment may be driven by the profit motive rather than service improvement. In regulatory negotiations, companies always ask to be allowed to make more investments than the regulator believes is warranted. Nardi (2010) found higher grid investments through unbundling, but he also showed that the lack of coordination due to the separate ownership and control of different parts of the company affects the quality of service.³³ Gugler et al. (2012) found that forced access or break-up of companies, despite the non-discriminatory access to the grid, come at the 'costs of coordination failures and other diseconomies of vertical disintegration'.³⁴

A few studies have evaluated the impact of unbundling on consumer prices. For example, Bolle and Britmoser (2006) have shown that ownership unbundling increases prices in the long run. However, instead of challenging unbundling as a whole, they suggest legal unbundling is the preferred option.³⁵ This is echoed by Cremer et al. (2006) who proposed that ownership unbundling is more detrimental to social welfare than legal unbundling and, therefore, argue for the latter.³⁶ Höffler and Kranz (2011) confirmed these studies arguing that legal unbundling is better with regard to general social welfare and investment incentives.³⁷ Gugler (2012) showed that ownership unbundling of the generation from the grid reduces the aggregate investment rate in the sector by about 10 per cent.³⁸ According to these studies, legal unbundling is advisable as it allows other parts of the company to benefit from investments made by the formerly vertically-integrated company, which is not the case under ownership unbundling. However, none of these studies present evidence that unbundling is beneficial in itself.





3. Outcomes of energy liberalisation

3.1 Ownership

While energy liberalisation was supposed to increase competition and lead to a break-up of the dominant companies through new market entry, it had the opposite effect. It facilitated a wave of mergers of electricity and gas companies across the EU and the creation of multinational companies. By the mid-2000s many of the smaller European generators and retailers had been taken over by major pan-European companies.³⁹ In 2003, seven large companies engaged in international activities had emerged, taking an increasing share of the market – three large companies, EDF, E.ON and RWE and four smaller ones, ENEL, Suez, Endesa and Vattenfall. By 2009 there were only five big energy companies of comparable size dominating the market: EDF, RWE and E.ON remained, while ENEL had taken over Endesa and Suez had merged with Gaz de France to form GDF Suez, subsequently renamed ENGIE (the Big Five, see Table 1). Vattenfall is much smaller than these five and seems to be increasingly focused solely on the integrated Nordic market.⁴⁰

However, since 2009, the position of the Big Five has deteriorated significantly. Sales are falling and minimal profits and high levels of debt have led to the downgrading of their credit ratings.⁴¹ For example, in 2018 RWE’s net income fell by a staggering 83 per cent, EDF’s by 65 per cent and E.ON’s by 22 per cent.⁴² In response, RWE and E.ON have split themselves into separate companies with old, “sunset” activities like nuclear and fossil fuel generation in one part and continuing activities such as renewables, retail and networks in the other.⁴³ Also EDF, which has a strong focus on nuclear power, is expected to divide its nuclear and renewable businesses. The financial pressure EDF is under has also led its board to discuss partial renationalisation, whereby its nuclear operations would be renationalised.⁴⁴ EDF is already 84 per cent owned by the French government. The government is now considering buying out minority shareholders of Electricite de France SA as a first step towards corporate restructuring that addresses the challenge of

TABLE 1: The Big Five: Europe’s largest energy multinationals, figures from 2018

COMPANY	TURNOVER (\$)	NET INCOME (\$)	NUMBER OF EMPLOYEES
EDF	87 billion	1.35 billion	162,208
RWE	56.4 billion	384 million	58,441
E. ON	35.5 billion	3.69 billion	43,302
ENGIE	75.1 billion	1.18 billion	160,301
ENEL	86.2 billion	5.48 billion	69,900

Source: PSIRU based on Orbis data from 2018.

replacing the country's nuclear-power backbone. ENGIE and ENEL have yet to announce such changes, but it would not be surprising if they did. Whether the Big Five have the agility to transform themselves into companies with the capabilities needed for the future and to compete against more dynamic new entrants must be in doubt.

3.2. Prices

The impact of liberalisation on prices is a key indicator of success, but the question is not whether prices have gone up or down, but whether they are higher or lower than they would have been under alternative policies. Producing reliable counterfactuals to assess what would have happened under alternative policies is, however, almost impossible except in the very short term. A common error is to assume no improvements would have taken place if the old regime had been maintained. Any improvements under liberalisation are therefore claimed as the result of liberalisation, not as the result of forces that would have had an effect whatever the regime.

Nevertheless, the primary claim for liberalisation was lower prices so the impact on electricity prices is an important indicator of the outcome of energy liberalisation. By allowing competition and therefore increasing the number of players in the market, it was argued that energy liberalisation would achieve a lower average EU price and a degree of price convergence through wholesale and retail competition.⁴⁵

Conducting research for the European Commission, Copenhagen Economics (2005) provided an early assessment of the possible effects of opening up the electricity market using a general equilibrium model



based on data from 1990-2003. It came to positive conclusions, predicting that this would have a significant impact on national productivity and forecasting the long-run impact in electricity could be large price reductions.⁴⁶

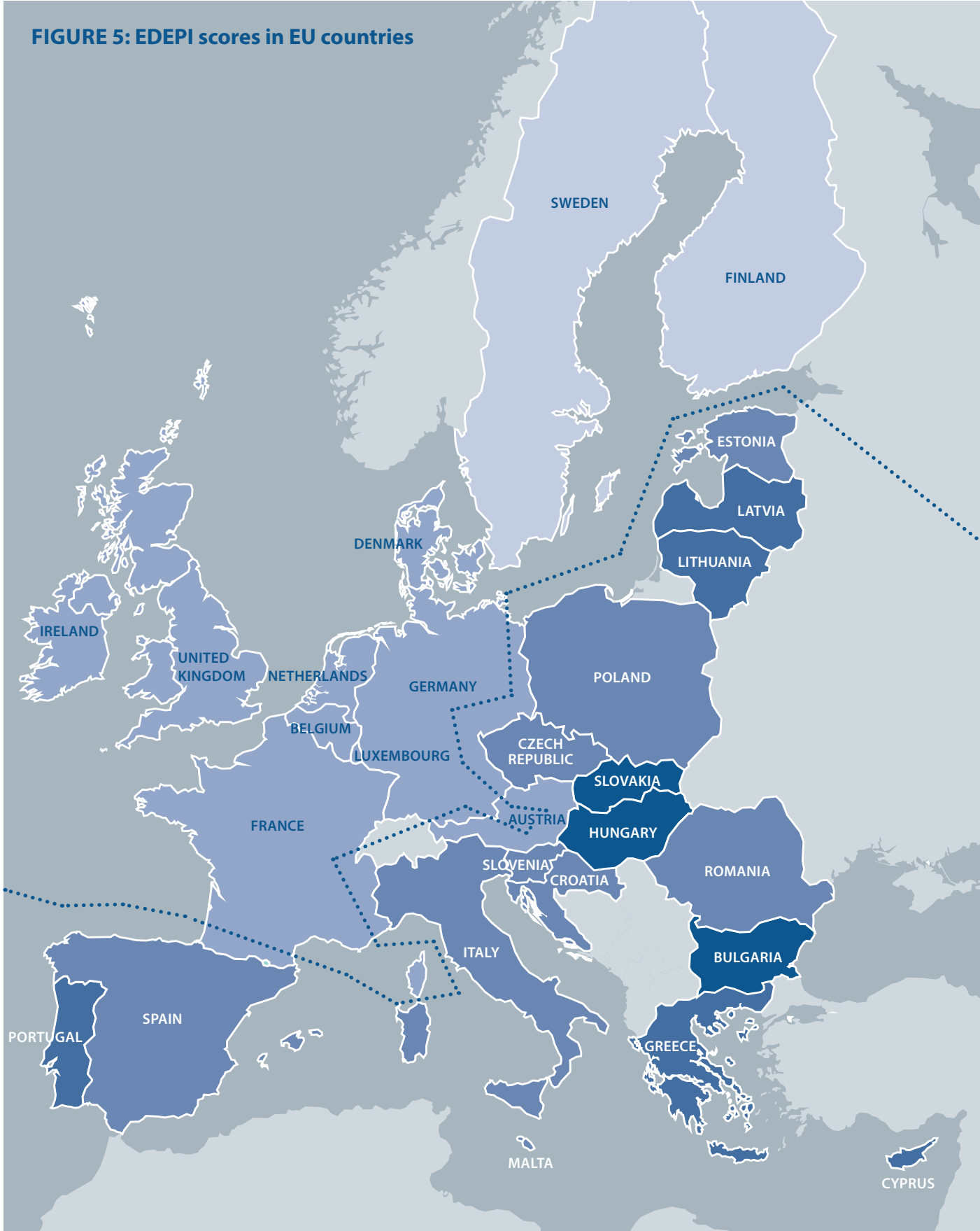
Steiner (2001), in one of the first articles to deal with the effects of liberalisation on consumer prices, analysed data from 19 Organisation for Economic Co-operation and Development (OECD) studies in the period between 1986 and 1996. She found that liberalisation can lead to more efficiency, but that increased efficiency does not necessarily lead to lower prices for consumers.⁴⁷ Hattori and Tsutsui (2004) found that unbundling appears to increase not decrease prices.⁴⁸ However, given these studies only used data up to 2003 or earlier, their validity must be considered with caution. By 2003, most countries did not have wholesale markets and retail competition for small consumers and had not unbundled the networks, so the results of these analyses seem premature.

Thomas (2006) argued that it is more expensive to try to create competition than to maintain the traditional monopoly system because of the higher cost of capital, the cost of marketing and the cost of customer switching.⁴⁹ This was confirmed by Kwoka and Pollitt (2010) who also showed that unbundling appears to raise electricity distribution costs, relative to firms that do not unbundle.⁵⁰ Fiorio and Florio (2009) showed that electricity consumers pay the price of liberalisation through higher final consumer prices.⁵¹ Furthermore, Brau et al. (2010) looked at the impact of EU gas industry reforms on household prices over the period 1991–2007, based on data from 15 EU countries, and found that liberalisation and privatisation did not lower consumer prices.⁵² In fact, higher public ownership in gas production lowers gas prices. If anything, this suggests that public ownership, and not liberalisation, is a vehicle for lowering household prices.⁵³

The general failure of liberalisation to demonstrably reduce prices is reinforced by the fact that electricity prices have been rising across the world, through much of the liberalisation period.⁵⁴ Energy poverty has been the consequence, exacerbated by the fact that it is generally higher income households that have the time and skills to exploit the market, generally at the expense of those that do not switch, often low-income or vulnerable consumers. The European Commission itself points out that in 2014, the lowest-income households in the EU spent close to nine per cent of their total expenditure on energy,⁵⁵ a 50 per cent increase compared to 10 years earlier. However, the exact scale of energy poverty is hard to predict as there is no accepted EU-wide definition and it is therefore hard to measure trends. What is clear is that energy poverty is widespread across the EU and is unevenly distributed across social groups and regions.⁵⁶ Studies suggest a three-way division, with the Mediterranean region particularly affected due to falling incomes in the wake of austerity,⁵⁷ central and eastern European countries structurally affected due to poor housing stock,⁵⁸ and north-western Europe less affected, with a concentration of energy poverty among the lower-income layers of the population.⁵⁹ The European Domestic Energy Poverty Index (EDEPI) also demonstrates the regional inequality of energy poverty in the EU (see Figure 5).⁶⁰ For example, the poorest households in Sweden spent only three per cent of their total expenditure on energy, while in Slovakia this share was more than 23 per cent.⁶¹

Energy poverty can kill. In the UK, the latest figures reveal that excess winter deaths are at their highest levels since the 1970s. The winter of 2018 was particularly cold. Over 15,000 people died because they could not heat their homes.⁶² Excessive heat problems in homes affects an even higher number of people in Europe as they cannot sufficiently cool their homes, with negative and even fatal consequences for health and well-being. In Spain, between 2006 and 2012, a quarter of all households reported that they could not afford to cool their homes in the summer. More people died prematurely due to energy poverty in Spain than from car accidents.⁶³

FIGURE 5: EDEPI scores in EU countries



EDEPI scores show a divide reflecting GDP per capita levels in the EU

LEVEL OF POVERTY	#	COUNTRY	EDEPI Score
Low	1	Sweden	95,4
	2	Finland	85,6
Moderate	3	Denmark	81,9
	4	Austria	81,1
	5	Luxembourg	80,9
	6	United Kingdom	80,5
	7	Ireland	79,3
	8	Netherlands	78,1
	9	Germany	75,8
	10	France	73,3
	11	Belgium	67,6
Moderately high	12	Spain	64,7
	13	Romania	64,2
	14	Poland	61,0
	15	Czech Republic	60,2
	16	Croatia	58,8
	17	Malta	58,6
	18	Estonia	58,0
	19	Italy	52,1
	20	Slovenia	51,3
Very high	21	Cyprus	46,2
	22	Greece	43,7
	23	Lithuania	42,4
	24	Latvia	40,0
	25	Portugal	36,7
Extreme	26	Slovakia	8,4
	27	Hungary	6,2
	28	Bulgaria	0,7

Source: OpenExp, 2019.

3.3. Energy liberalisation and the environment

'A quarter of all emissions result from the burning of coal, natural gas and oil for electricity and heat. Electricity and heat production is the largest single source of global greenhouse gas emissions.' (ILO 2018)⁶⁴

The renewables and decarbonisation agendas are having a significant influence on the electricity industry. Most importantly, the 2001 renewable electricity directive (2001/77/EC) and the 2009 renewable energy directive (2009/28/EC) have led to an increase in renewable electricity, for example wind and solar power.

It is often falsely claimed that the EU's success in deploying renewables is a product of privatisation and liberalisation policies. It is argued that liberalisation created the regulatory landscape within which new actors, wind and solar companies, could thrive.⁶⁵ The opposite is the case. As shown opposite, renewable deployment was only possible because the EU allowed renewables to be subject to state aid (see Figure 6)⁶⁶ and to be deployed with commercial arrangements outside the market (see also section 2.3). Renewable electricity has been subsidised by public money, allowing it to increase significantly in recent years.⁶⁷ As the global campaigning organisation Trade Unions for Energy Democracy has rightly pointed out:

*'The EU's success in deploying renewables has little or nothing to do with the so-called "competitive" electricity markets, or with the "unbundling" of key parts of the energy system described above. The EU's success is really a story of public money being used to develop a privately owned renewables sector.'*⁶⁸

In other words, without subsidies, renewables cannot survive in the competitive electricity markets. As such, the rise of renewable energy was only possible because it was protected from market liberalisation and not because of market liberalisation.

A recent paper by Blazquez et al. (2018) has demonstrated that the policy of energy liberalisation is incompatible with policies that promote and subsidise renewable energy and decarbonisation of the energy sector.⁶⁹ As a result of subsidies for renewable energy, energy wholesale prices have been falling and have essentially led to a market failure (see section 2.3). This in turn has made investment in renewable energy less attractive for investors due to reduced profit rates. The falling levels of subsidy have also made renewables a less profitable business. Many European countries intend to remove the subsidies for renewables, and consequently in the EU investment levels in renewable energy have already fallen dramatically from \$132 billion in 2011 to \$41 billion in 2017. In Germany, the drop in investment levels between 2014 and 2016 was over 60 per cent. The UK reported a 66 per cent fall in investment levels between 2016 and 2017.⁷⁰ The European Commission's attempt to phase out subsidies will only exacerbate this trend.

Assessing the paradox that decarbonisation is at odds with market liberalisation, Blazquez et al. (2018) conclude by pointing to the

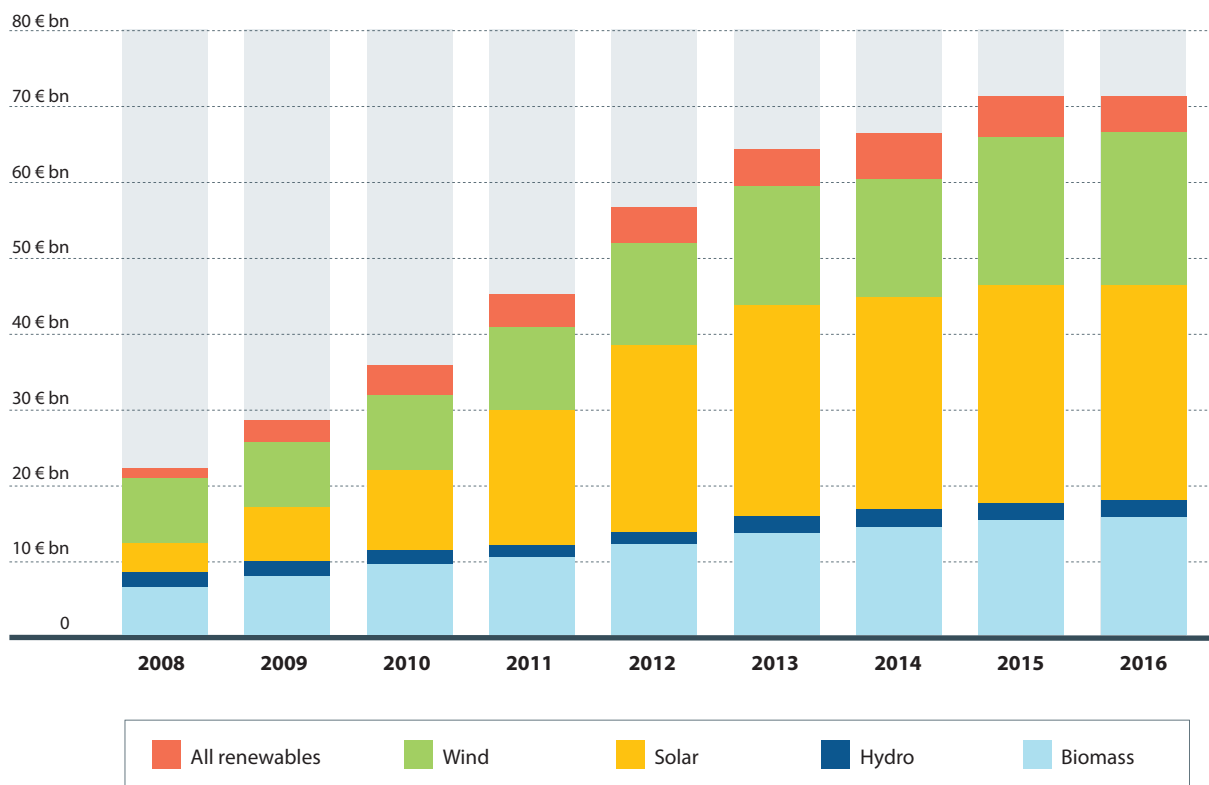
'need for a rethink of the foundations of market liberalisation, given that current power market designs cannot satisfactorily accommodate renewable policy mandates without distorting electricity prices.'

One suggested option to deal with this paradox is to reverse the trend of liberalisation and go back to a centralised market.⁷¹ Sweeney suggests that the green energy revolution needs to 'break completely with the "make it profitable" logic' and instead replace it with a 'public goods approach' of financing renewable energy.⁷² Such an approach would require a) a reclaiming of public control over the power sector and b) public sector planning that puts emphasis on the public good rather than profit maximisation

and risk aversion, by, for example modernising and investing in the transmission grid to make it fit for the integration of renewable energy (see section 4.3.1). In Europe we have already seen that the demand for renewable energy has led to stronger roles for governments, less respect for the markets and in some countries, notably Germany, to re-municipalisation under which the privatised energy system has been brought back into local public ownership (see section 4.4).⁷³

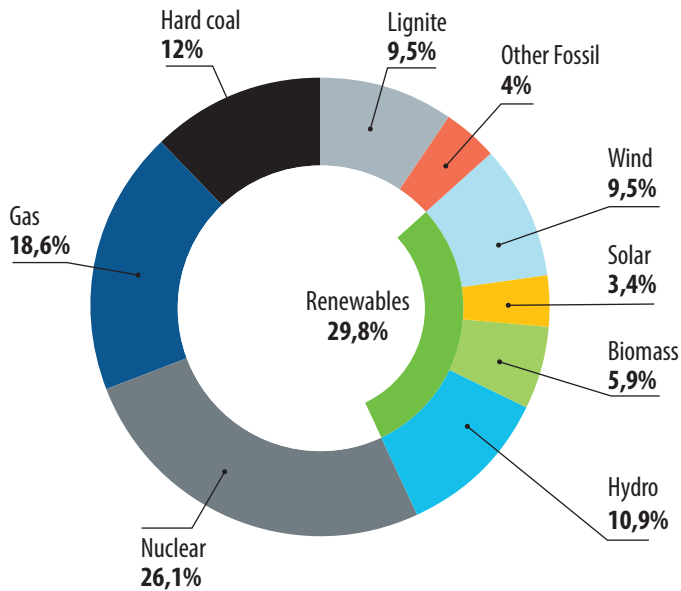
It is clear that the rise in renewable energy would not have happened without subsidies. By promoting competition between renewable energy and fossil fuels, the increase in renewable energy over the last decade could have been seriously undermined.⁷⁴ It is therefore worrying that the subsidies for renewables have been portrayed as a distortion of the market that have mitigated the beneficial outcomes of energy liberalisation and that, in line with this pro-market approach, the European Commission has advocated a time limit on support schemes for renewable energy.⁷⁵ In fact the exact opposite conclusion should be made. As support for renewables and the aim of decarbonisation is clearly at odds with market liberalisation, it is the dogma of competition that has to be abandoned not the support for renewables.

Figure 6:
Support for renewable energy sources in the EU Member States

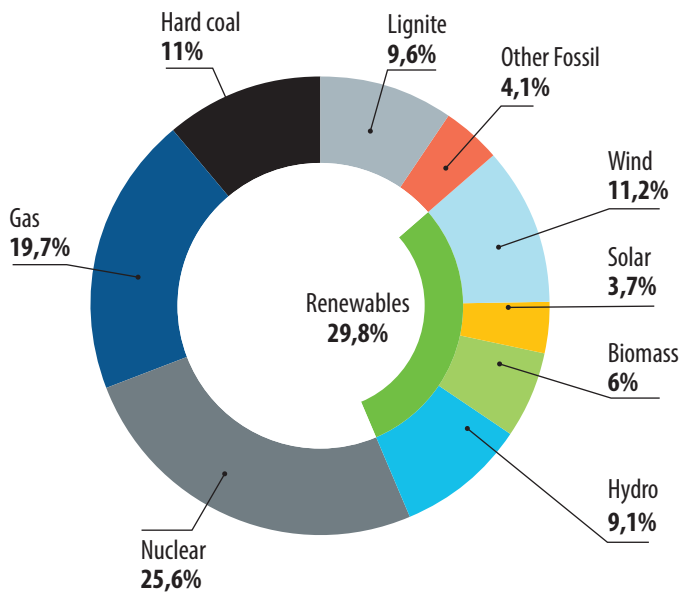


Source: European Commission 2019⁷⁶

Figure 7:
Electricity generation in 2016 and 2017



2016



2017

Source: Agora and Sandberg (2017) The European Power Sector in 2017

3.4. The impact of energy liberalisation on jobs

3.4.1 General employment trends in the energy sector

Currently around two million people work in the EU energy sector. The lion's share of these jobs is in the electricity, gas, steam and air conditioning supply sector, also called the network energy supply sector, which contributes to over 70 per cent of employment. Within the network energy supply sector, most jobs are in the production, transmission, distribution and trade of electricity subsector, also referred to as the electricity supply subsector.⁷⁷ Employment in mining and extraction has generally declined over the past decade with the exception of petroleum and natural gas extraction. Employment in the network energy supply sector has been stable over the past decade. Table 2 provides an overview of employment in the electricity and gas sector in Europe over the last decade.

TABLE 2: Employment in the electricity, gas, steam and air conditioning supply/the network energy supply sector (NACE⁷⁸ Rev 2 Section D 35) in 2009-2018 in selected countries, in thousands

REGION	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
EU-28	1,612.2	1,615.5	1,647.5	1,689.0	1,633.1	1,593	1,539.3	1,534.3	1,573.6	1,570.2
Belgium	30.6	31.7	31.0*	31.2	26.5	31.3	21.3	24.4	30.8*	39.3
Bulgaria	40.5	42.9*	45.4*	40.8	40.9	38.7	38.7	34.6	42.5	42.7
Czech Republic	60.0	50.5	61.4*	49.5	51.7	56.9	51.6	51.6	50.6	53.5
Denmark	17.9	20.4	16.6	19.9	17.2	11.8	15.1	16.2*	11.4*	12.9
Germany	314.0	311.7*	336.4*	364.2	343.3	329.2	331.5	329.8	336.1	330.0
Ireland	11.7	13.6	9.5	10.6	8.9	10.4	9.2	12.2	13.6	12.4
Greece	31.0*	27.0	24.1	25.1	28.7	28.7	26.4	27.8	29.9	30.8
Spain	82.8	80.4	80.8	84.5	81.9	89.8	100.1	84.6	87.1	73.2
France	165.6	217.1	204.5	191.0	243.7	219.4*	188.9	172.1	173.7	187.1
Italy	111.7	116.7	137.8	161.1	139.1	111.0	102.5	109.4	126.9	111.5
Hungary	35.4	36.6	34.0	36.2	31.2	37.0	33.7	32.0	32.6	38.9
Netherlands	31.9	32.6	33.9	37.5	33.5*	30.5	24.3	34.1	27.8	28.1
Austria	25.4	21.9	31.3	26.3	26.4	30.1	29.4	29.9	28.8	29.3
Poland	194.1	166.5*	176.5	168.8	153.2	169.0	179.3	165.8	159.6	158.5
Portugal	24.3	15.6	18.7*	21.8	19.1	16.2	16.5	17.4	16.4	15.4
Romania	142.0	122.4*	105.4	106.7	92.5	93.7	75.1	81.6	84.6	85.9
Slovakia	29.7*	27.5	27.6*	25.1	22.7	22.8	26.0	27.0	30.5	31.3
Finland	15.6	15.3	13.7	15.2	14.8	14.4	13.3	15.5	16.2	14.4
Sweden	22.0	23.3	20.1	24.2	25.6	23.8	28.6	27.8	26.2	25.8
United Kingdom	156.5	175.2	173.8	181.8	176.9	171.4	172.1	184.0	190.9	194.3
Norway	17.3	17.0	16.7	16.9	13.9	15.2	13.8	15.7	19.9	17.0

Source: Eurostat

There is limited available data on the impact of energy liberalisation on employment. Energy liberalisation is only one factor that influences quantitative employment trends. The sector has been through some significant changes over the past two decades, not just because of liberalisation but also because of technological change and climate change policies (see section 3.4.2 and the sections below).⁷⁹ It is however clear that in the first decade of energy liberalisation, from around the mid-1990s to the mid-2000s, the electricity sector in the EU experienced significant job losses. Between 1995 and 2004 around 246,000 jobs were lost in the sector in the EU15.⁸⁰ Hermann and Flecker (2009) point out that in relative terms this means that between a third and a quarter of jobs in electricity were lost between 1995 and 2004.⁸¹ Employment fell even more markedly in several countries. For example in the UK, where the electricity sector was privatised in the early 1990s, around 60 per cent of jobs had been lost by 2001.⁸² In Sweden, the liberalisation of the electricity sector led to significant job losses, particularly affecting technical workers and maintenance staff, middle management and administration.⁸³

In general, the recent literature suggests the privatisation of public utilities leads to employment reductions rather than employment creation. Privatisation may also involve employment creation by new market entrants, but these new jobs are more likely to be on flexible terms and are characterised by an increase in part-time and temporary work and self-employment.⁸⁴ A 2007 study for the European Commission also found that liberalisation has not only led to job losses in the EU, but also to a shift in the kind of work. A general decline in technical and maintenance jobs was often facilitated and exacerbated by outsourcing.⁸⁵ For example in the UK, energy and utility companies outsourced £268 million worth of contracts in the first half of 2017. This is 15 per cent of the UK's outsourcing market as a whole.⁸⁶ Meanwhile, as companies prioritised winning customers in a liberalised market there has been an increase in legal, marketing and sales staff.⁸⁷ In part this explains the increase in the proportion of women working in the industry in some countries, from 24 per cent to 27 per cent in the UK and from 24 per cent to 28 per cent in Sweden for example.⁸⁸ However, overall there is a clear gender gap in the sector. More than 76 per cent of those working in the network energy supply sector are men (see Table 3). Staff reductions in the energy sector have not always come in the form of job cuts and redundancies. Across the EU, many older energy sector workers have sought early retirement in response to a corporate strategy to reduce staff numbers. Often these retired older workers have not been replaced by young workers.⁸⁹

TABLE 3: Employment in the electricity, gas, steam and air conditioning supply (NACE Rev 2 Section D 35) in 2009-2018, in the EU-28 by gender

Gender	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Men	1,250.5	1,261.9	1,284.3	1,286.1	1,237.6	1,203.5	1,155.4	1,188.6	1,209.9	1,200.8
Women	361.7	353.7	363.2	402.9	395.5	390.4	383.8	345.7	363.7	369.4

Source: Eurostat

The negative impact of liberalisation and privatisation on employment is usually side-lined in the European Commission's discourse on energy liberalisation. Highlighting the opposite, in its *Clean Energy for all Europeans package* it argues that by 'mobilising up to an additional 177 billion euro of public and private investment per year from 2021, this package can generate up to 1 per cent increase in GDP over the next decade and create 900,000 new jobs'.⁹⁰ Most of these jobs are expected to be in the construction sector, which is assumed to increase by five per cent due to the policies proposed by the Commission, translating into 700,000 additional jobs. It is also envisaged that the Commission's proposals could lead to an addi-

tional 230,000 jobs in engineering and 27,000 in the iron and steel sectors. The Commission estimates that 400,000 of these jobs will be created by energy efficiency targets and that the EU should set an EU-level binding target of 30 per cent by 2030.⁹¹ In other words, the job creation the European Commission is foreseeing is mostly based on quantitative modelling, where the creation of jobs stands in direct correlation to investment levels. Under these models, jobs will be created however and wherever the money is invested. However, important questions remain unanswered: Is this investment the best use of the limited capital available? Are the jobs long-term or short-term? Are they distributed widely or concentrated in a few large projects? Do the jobs require skills expected to be of significant value in the future?

3.4.2 Employment in the renewable energy sector

The impact of a transition to a low-carbon and resource-efficient economy on workers and society in general has been emphasised in many studies. For example, Bowen et al (2016) declare that ‘the green growth transition will be large, system-wide and structural. In other words, a new industrial revolution’.⁹²

Research also highlights the job creation potential of renewable economy. For example, Wei et al. (2010) compare evidence from 15 studies and conclude that all non-fossil fuel technologies, including renewables, create more jobs per unit of energy than coal and natural gas. Based on this evidence the International Labour Organization (ILO) concludes in a recent report that renewable energy sources create more jobs per GWh than non-renewable energy sources.⁹³ Markandya et al (2016) show, by calculating the total employment effects generated by the changes in the electricity and gas supply sector in the EU between 1995 and 2009, that the shift towards a green economy in Europe had a net impact of 530,000 jobs over that period.⁹⁴ However, their analysis is based on the question of what would have been the case had the structure of electricity and gas supply in the EU remained the same as in 1995. The impact of the energy liberalisation process on employment was not considered in this study.



Generally, a positive correlation between the increase in renewable energy and an increase in jobs is assumed. However, a study conducted by Cameron and Van der Zwaan (2015) reviewed around 70 studies and data sources analysing the employment impact of renewable energy growth. They showed that while the literature suggests that renewable technology can result in significant job creation, there is still limited evidence available to make a robust argument its the job creation potential. As well as methodological concerns, including the recycling of data, the lack of primary research and country specific analysis that cannot be generalised and applied to other countries, they point out that there are only a limited number of studies that compare the employment impact of renewables to those of traditional methods of power production. They conclude that net job creation is not certain.⁹⁵

In 2017, according to EurObserv'ER, a database for the European Commission that measures the progress made by renewable energies, 1.45 million people were employed in the renewable energy sector in Europe.⁹⁶ This is roughly the same as for 2016 and 2015. Employment only deviated by one per cent in each year, with a one per cent decrease in employment from 2015 to 2016 and a one per cent increase from 2016 to 2017. These figures include direct and indirect employment. Direct employment refers to equipment manufacturing, plant construction, engineering and management, operation and maintenance and biomass supply. Indirect employment includes secondary activities, such as transport and other services.⁹⁷ Most of the direct jobs in the renewable sector are in the manufacture and construction of facilities rather than in their operation. The indirect jobs refer to all kinds of jobs and services, including hairdressers and café workers who service people working in the energy sector. The data is therefore not directly comparable with figures on the general employment trends outlined in the previous section (see section 3.4.1). It should also be pointed out that a new methodology has been adopted by EurObserv'ER to measure employment in the renewable energy sector and therefore figures from 2017, 2016 and 2015 cannot be compared to previous years.⁹⁸ Employment levels in the renewable energy sector also need to be considered with caution as the global fall of investment in renewable energy has resulted in a decline in renewable energy that may also result in falling employment in the sector. For example, a 30 per cent drop in renewable energy jobs was reported in the UK between 2014 and 2017.⁹⁹

In its *Clean Energy For All Europeans* package, the European Commission reports that wind, solar photovoltaic (PV) and solid biomass industries are the renewable energy sectors with the highest employment numbers. The majority of jobs in the renewable energy sector are in wind, where employment has increased significantly. Between 2005 and 2013 employment increased fivefold and by 2014, 320,000 people were employed in the sector.¹⁰⁰ Data collected by EurObserv'Er shows that 356,700 people worked in the wind energy sector in 2017 (see Table 4). The export of wind turbines and offshore foundations remains strong, with a positive impact on employment in the countries that manufacture wind turbines, such as Denmark, Germany and Spain. The biggest companies involved in exporting wind turbines are Vestas in Denmark, Siemens Gamesa in Germany and Spain, and Enercon in Germany.¹⁰¹ The PV industry, however, has suffered from significant job losses as Europe has lost its global market position to China. Employment in the photovoltaic sector decreased by almost two thirds between 2011 and 2014.¹⁰² EurObserv'Er reports a further decrease in employment in the PV sector between 2015 and 2017. While 113,400 jobs were recorded in the PV sector in 2015, this decreased to 90,800 in 2017,¹⁰³ a 20 per cent fall (see Table 5).

Most renewable jobs in Europe are in Germany. In 2017, of the 290,700 jobs in the renewable energy sector in Germany, up to 140,800 were in the wind industry (see Table 4). The other renewable energy technologies accounted for a smaller number of jobs. For example, solar PV employment amounted to 35,800 jobs in 2016, a slight decrease from 2015 when 38,100 jobs in the solar PV industry were recorded.¹⁰⁴ Spain scores second in Europe in terms of the number of jobs in the renewable energy sector, with 168,800 jobs recorded in 2017. This and an almost 20 per cent increase on the previous year is largely due to more employment in the wind sector (see Table 4). France is the third largest employer in renewable energy with 140,700 employees, mostly working in the heat pump sector. This is followed by the UK, where 131,000 people work in the renewable energy sector – the wind power sector being the largest employer.¹⁰⁵

Table 4: Employment in the wind power sector in Europe

	Employment (direct and indirect jobs)		Turnover (in € m)	
	2016	2017	2016	2017
Germany	121700	140800	16060	20040
United Kingdom	42900	69900	4490	7360
Denmark	26600	34200	4600	6310
Spain	23500	37200	2820	4340
Netherlands	21500	5800	2680	830
France	18800	18500	2790	2860
Poland	11400	8000	790	660
Portugal	6400	3100	500	320
Italy	6300	7500	950	1120
Sweden	4900	2700	1010	620
Ireland	4200	6500	440	700
Greece	3700	3100	300	230
Finland	3500	4100	520	630
Romania	2500	2100	150	160
Belgium	2300	5500	450	1100
Austria	1700	2000	280	350
Estonia	1600	1200	90	80
Lithuania	1600	500	60	30
Czechia	900	900	60	70
Croatia	900	1100	50	70
Hungary	800	800	50	50
Bulgaria	600	500	30	30
Luxembourg	200	100	30	20
Cyprus	<100	200	<10	20
Latvia	<100	<100	<10	<10
Malta	<100	<100	<10	<10
Slovenia	<100	<100	<10	<10
Slovakia	<100	<100	<10	<10
Total EU 28	309000	356700	39250	48040

Source: EurObserv'ER 2018

Table 5: Employment in the photovoltaic sector in Europe

	Employment (direct and indirect jobs)		Turnover (in € m)	
	2016	2017	2016	2017
Germany	27100	29300	3400	4010
United Kingdom	29000	12900	2810	1310
Italy	10700	11200	1400	1450
France	5200	9300	710	1310
Netherlands	4700	6000	560	730
Spain	2200	5500	220	500
Belgium	2400	3000	440	570
Austria	1300	1600	190	260
Portugal	700	1500	40	90
Hungary	2000	1300	90	60
Czechia	1700	1300	110	100
Greece	1100	1300	90	90
Poland	1500	1100	90	80
Denmark	1200	1100	200	190
Romania	1800	900	90	60
Finland	400	700	80	120
Bulgaria	800	600	30	30
Sweden	300	500	60	90
Cyprus	<100	500	<10	30
Malta	100	300	<10	20
Slovakia	400	200	20	20
Lithuania	300	100	10	<10
Slovenia	300	100	20	10
Estonia	200	100	10	<10
Croatia	<100	100	<10	<10
Luxembourg	<100	100	10	10
Ireland	<100	<100	<10	10
Latvia	<100	<100	<10	<10
Total EU 28	95900	90800	10730	11190

Source: EurObserv'ER 2018

3.4.3 Phasing out coal and its impact on workers

Energy liberalisation is incompatible with decarbonisation (see section 3.3). As shown above, renewables have been artificially kept out of the market to protect them from competing with cheaper means of generating power, such as coal and gas. This, however, has created a collapse of wholesale market prices (see section 2.3) and companies relying on coal, gas and nuclear have struggled financially. The EU responded in two ways. It reduced the subsidies for renewables and it also extended subsidies in the form of capacity payments to coal, gas and nuclear companies, whereby governments reward companies for the capacity to produce power even though the power may not be actually sold or used (see section 2.3.2). As Sweeney points out ‘this created a “subsidies for all” situation.’¹⁰⁶

With the European Commission’s *Clean Energy* package, the EU is now advancing energy liberalisation by phasing out subsidies. It proposes a new electricity market design that introduces a new limit for power plants eligible to receive subsidies as capacity mechanisms. Subsidies to generation capacity emitting 550gr CO₂/kWh or more will be phased out.¹⁰⁷ This will have a significant impact on the coal industry and its workers, as it means that 91 per cent of Polish and 72 per cent of German coal-fired plants will no longer be eligible for subsidies.¹⁰⁸ There could be a serious impact on the viability of these power plants and jobs. While the phasing out of coal is an important part of the transition towards clean energy, the transition needs to be managed in a way that includes the workers. In other words, the coal sector needs employment transitions and regional development.

In order to transition away from coal while taking the needs of workers and communities into consideration, it is crucial to understand employment trends in the sector. In the early 1960s coal mining provided jobs for millions of people. For example, at its peak the UK and West Germany both had about 600,000 people working in the coal mining sector.¹⁰⁹ Since then, and especially since the 1990s, the production of hard coal has been declining in Europe, which along with productivity improvements has led to sharp reductions in employment. Most of the coal used in Europe is now imported from countries such as Russia, Colombia, Australia and the United States. In 2016 only 36 per cent of the EU’s hard coal consumption came from domestic production.¹¹⁰

Table 6: Employment in coal and lignite mining in the EU27

	2007	2017
European Union 27 countries	271800	129748
Bulgaria	14289	10300
Czechia	24265	15145
Germany	42440	14465
Spain	8515	923
Poland	135905	82036
Romania	20908	953
United Kingdom	5944	1420

Source: Galgozi, B. (2019) Phasing out coal – a just transition approach. European Trade Union Institute.
 Based on Eurostat data

In 2017, fewer than 130,000 people worked in coal and lignite mining. This was less than half the number from a decade previously, when just over 270,000 people worked in the industry. In some countries the decline in jobs was even sharper. For example, in Spain and Romania more than 90 per cent, and in Germany more than 65 per cent, of coal mining jobs were lost (see Table 6).¹¹¹ A recent study has therefore argued that the phasing out of coal would not have substantial implications in terms of job losses.¹¹² However, recent research has shown that most coal-related jobs are concentrated in a few countries, and within these countries a few regions are heavily coal dependent and provide the main source of income for the people living there.¹¹³

In 2017, almost two-thirds of all coal mining jobs in Europe were in Poland. This was followed by the Czech Republic and Germany (see Table 6). Almost 75 per cent of coal mining jobs were concentrated in 10 regions in Europe.¹¹⁴ Four are in Poland, two in the Czech Republic and two in Germany. These regions would be particularly affected as many direct jobs depend on coal. It is estimated that there are a further 215,000 jobs in Europe that depend on coal. In Poland almost 88,000 jobs indirectly depend on the coal mining sector, in Germany 34,000 and in the Czech Republic 19,000.¹¹⁵ While many European countries plan to phase out coal by 2030, Germany has only committed to phase it out by 2038 and Poland is committed to coal for as long as possible.¹¹⁶

3.4.4 Employment in the nuclear power sector

Nuclear is claimed to be the largest source of low-carbon electricity in the Global North and the second largest, after hydro, in the world as a whole.¹¹⁷ Europe depends on nuclear energy. It is well-suited for producing a stable amount of electricity over longer periods and can therefore provide consistent energy when the sun is not shining, and the wind is not blowing. Some academics have disputed whether or not nuclear is really low carbon¹¹⁸ and several countries including Germany, Italy and Austria have introduced policies that rule out building new plants because of growing public concern over the safety of nuclear energy, particularly after the accidents at Chernobyl and Fukushima.¹¹⁹ In addition, it cannot be switched on and off easily and is therefore the least flexible form of energy generation. Investment in nuclear energy is risky, as nuclear power stations take a long time to build and require large investments upfront. Private investors are often not interested in taking this risk and therefore in Europe state subsidies are given to reduce investor uncertainty.¹²⁰ In other words, nuclear energy generation cannot be left to market forces alone and demands public money and public control.

From the 1990s to the mid-2000s, the amount of electricity produced from nuclear power has been rising. In 2004 it reached a peak of 1,008.4 TWh, which was a 27 per cent increase when compared to its level in 1990. Since then, however, the production of nuclear electricity has been declining. Between 2004 and 2017 the total production of nuclear power decreased by around 17 per cent.¹²¹ This drop was largely caused by Germany's phasing out of nuclear energy. From 1990 to 2017, Germany decreased its production of nuclear electricity by nearly 50 per cent.¹²² It aims to conclude its nuclear phase-out in 2022, with 10 out of 17 reactors operating in 2004 closed down by 2019.¹²³

France is now by far the largest producer of nuclear electricity in Europe. In 2017 it produced nearly 50 per cent of total nuclear power within the EU28. The second biggest producer is Germany (with nine per cent), followed by the UK (8.5 per cent), Sweden (eight per cent) and Spain (seven per cent). Together these five countries account for more than 80 per cent of the total amount of electricity generated through nuclear power in the EU28.¹²⁴ There are currently 126 nuclear power stations in operation in 14 countries across the EU. There are five reactors under construction: two in Slovakia and one each in France, Finland and the UK.¹²⁵

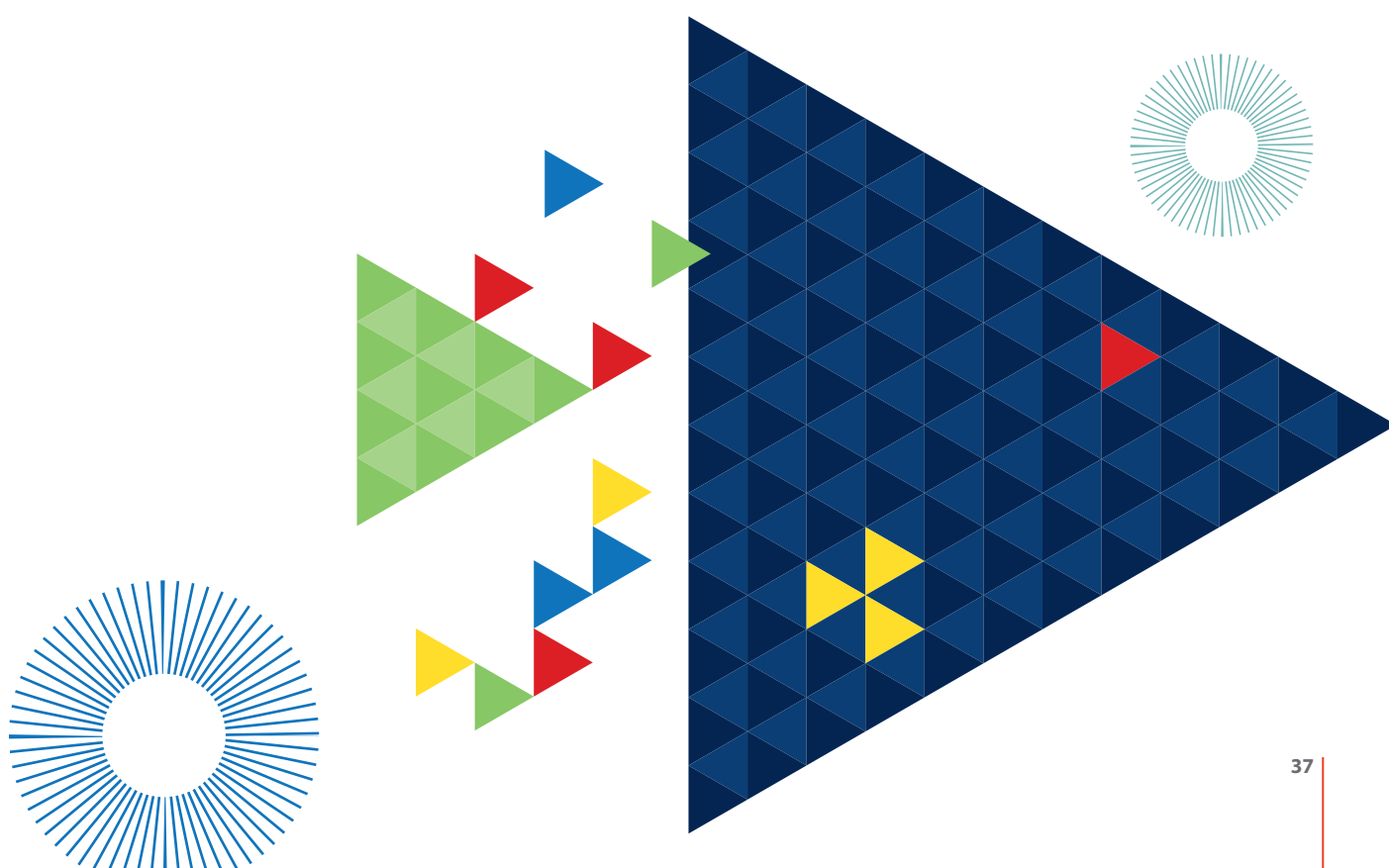
There is only limited available data on how many people work in the nuclear industry. In 2017 the European Commission proudly claimed that 'the EU nuclear industry has developed into a global technology leader in all nuclear industry segments and directly employed between 400,000 and 500,000 people,

while creating around 400,000 additional jobs.’ A 2019 report published by Deloitte, commissioned by the European nuclear trade association Foratom, claimed there were 351,900 direct jobs in the nuclear industry, which indirectly led to 777,900 jobs.¹²⁶ However, these figures were produced through a quantitative modelling exercise based on the nuclear capacity of 118 GW with a share in electricity production of 25 per cent in 2019. When calculating figures on jobs by such a broad brush the error margin is naturally very high and therefore the figure on indirect jobs particularly should be considered with caution.

In the UK, the construction of the Hinkley Point C nuclear station, expected to comprise two large reactors, illustrates that in reality the nuclear industry might not create as many sustainable jobs as is often forecast through economic modelling. In a recent report, the Trade Union Congress (TUC) argued that Hinkley Point C will provide 25,000 jobs.¹²⁷ However, the number of direct jobs is expected to be only around 5,000 over the construction period. It is likely that many of these jobs will not be filled from within the local area and many may need to be filled by workers from outside the UK. This large number of workers in a relatively sparsely populated area is likely to be disruptive. The number of long-term jobs created to operate and maintain the plant will be much fewer, probably less than 1,000, and these may also require skills not available from within the local population.¹²⁸

The example of Germany shows that a nuclear phase-out does not necessarily need to have a significantly adverse impact on employment – at least in the immediate term. Three quarters of the people working in the nuclear power industry in Germany remain employed even after the plant closures as they are involved in the decommissioning of nuclear power stations. This takes a very long time, with jobs remaining for up to 20-30 years after the plant closure.¹²⁹

There are stark differences in the positions of European trade unions on nuclear energy and its potential phasing out. In Germany, for example, the unions IG Metal and Verdi have actively mobilised for the nuclear phase out.¹³⁰ In contrast however, in France the announced closure of nuclear and coal power stations led to industrial action.¹³¹ It is therefore important that workers and their trade unions are part of the discussion on how to achieve an energy transition that is not at the expense of them and their communities (see section 4.1).





4. A roadmap to an alternative energy policy

4.1. A Just Transition

Transitioning towards a low-carbon economy has wide reaching and industry transforming implications that will affect workers and communities. Climate change and low-carbon energy supply are trade union issues, not only because they impact on jobs and working conditions but also because they have consequences for society as a whole. Any energy system depends on the workers who run it. Trade unions are therefore crucial players in the transition towards a low-carbon energy system that is also affordable for all, ensures security over supply and is democratically controlled.

Increasingly, trade unions and global trade union federations have been involved in promoting climate-related policies (see Figure 8). In particular, trade unions have been at the forefront of advocating policies for a Just Transition that include worker participation. A Just Transition ‘secures the future and livelihoods of workers and their communities in the transition to a low-carbon economy’. It is based on social dialogue between workers and their unions, employers, government and communities. A plan for a Just Transition, “provides and guarantees better and decent jobs, social protection, more training opportunities and greater job security for all workers affected by global warming and climate change policies”.¹³²

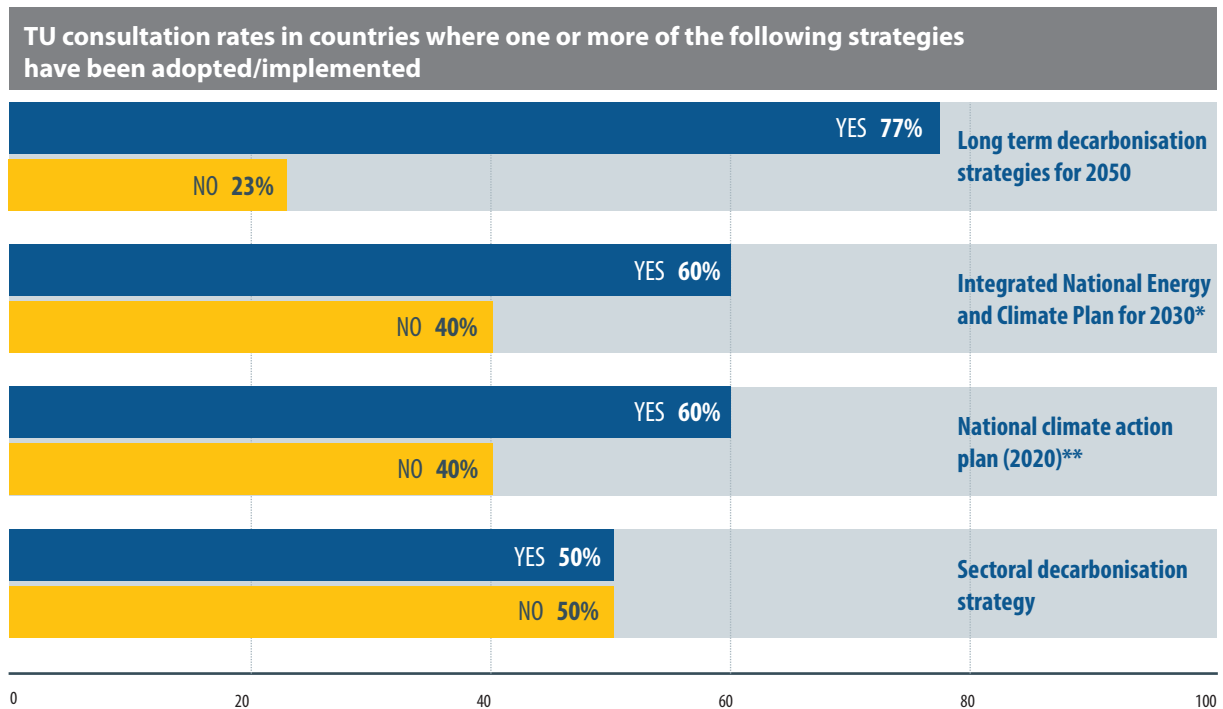
It is thanks to the efforts of trade unions that the concept of a Just Transition for workers towards a low carbon economy has been included in the Preamble to the 2015 Paris climate agreement. Also, the UN Sustainable Development Goals (SDGs) include a commitment towards a Just Transition. In 2016, the International Trade Union Confederation (ITUC) and its partners established the Just Transition Centre, which brings together trade unions, communities, businesses and governments in social dialogue to ensure that workers have a say in the planning for a Just Transition to a low-carbon economy. At European level, the European Trade Union Confederation (ETUC) has advocated the incorporation of a commitment to Just Transition in national energy and climate change plans.¹³³ The social partners – EURELECTRIC, the sector association representing the common interests of the electricity industry at pan-European level, IndustriAll, the voice of industrial workers all over Europe, and EPSU, representing public service workers from over 250 trade unions across Europe – work together to promote a just energy transition.¹³⁴

The involvement of trade unions in climate policies varies across European countries. In France, Germany and the Netherlands, trade unions influence policies through large-scale forums that include social partners as well as non-governmental organisations, parliamentarians and regional authorities. In other countries, for example in Belgium, social dialogue takes place at a sectoral level. In Poland, the trade unions were consulted by the government on climate policies by allowing them to send in written proposals, and in Denmark, Ireland, Sweden and Belgium trade unions participated in advisory groups on Just Transition. However, in some countries, such as the UK, Malta and Greece, trade unions have still not been involved in discussions related to national long-term decarbonisation strategies.¹³⁵

Trade unions are also involved in collective bargaining agreements to facilitate a Just Transition. For example, in Spain the ETUC-member trade unions, Comisiones Obreras (CC.OO), Unión Sindical Obrera (USO) and Unión General de Trabajadores (UGT), struck a deal with the Spanish government and the national federation of coal mining companies (Carbunion) on the transition of Spain’s privately-owned coal mines

by 2027.¹³⁶ The deal offers early retirement for miners over the age of 48 and retraining opportunities for green jobs and environmental restoration for the rest of the workforce. Public funding will also support business and clean energy initiatives in mining regions over the next five years (2019-2023).¹³⁷ The government provided €250 million in funding for the deal as part of a €2.1 billion state aid plan that aims to alleviate the social and economic impact of closing 26 coal mines. The European Commission has found that such a funding initiative is in line with EU state aid rules and is not unduly distorting competition.¹³⁸

Figure 8:
Trade union consultation rates



Note:

* The term "Integrated National Energy and Climate Plans" refer to plans designated at national level and aiming at defining how each country will fulfill its obligations linked to EU's 2030 climate and energy targets.

** National climate actions plans for 2020 are strategies setup by each Member State to realize the objectives set by the Climate and Energy package (3x20).

Box 1: A social power approach to achieving a Just Transition

Trade Unions for Energy Democracy (TUED) is a global, multi-sector initiative which is supported by the European Federation of Public Service Unions (EPSU) and many of its affiliates. It advances democratic direction and control of energy in a way that promotes solutions to the climate crisis and energy poverty. It points out that while consultation is to be welcomed, the social-dialogue approach towards a Just Transition does not challenge the neoliberal, pro-growth and pro-profit narrative.¹³⁹ On the contrary, it is a concept often used by business as well as trade unions to stress the need for capitalist expansion. A case in point is the *Investing in a Just Transition* initiative developed by Principles for Responsible Investment and the International Trade Union Confederation (ITUC) to identify investor strategies to tackle climate change.¹⁴⁰ The Just Transition Centre is another ITUC initiative through which trade unions establish close relationships with businesses and financial institutions.¹⁴¹

TUED warns that while approaching Just Transition through a non-confrontational social dialogue approach might increase political support for the concept, it will not automatically translate into concrete action. Investment decisions continue to be made on the basis of profit rather than the long-term collective interests of workers and society.

It also identifies emergent trade union activism that moves beyond social dialogue and social bargaining towards what it calls a 'social power approach'. This approach is shaped by the recognition that unions must seek to rebuild their social power while at the same time basing their actions on an understanding of the economic issues at stake and the extent of the socio-ecological crisis. Such an approach emphasises that while Just Transition is possible, it is not inevitable. A serious Just Transition is unlikely to happen unless it is fought for.¹⁴²

4.2. The importance of regulation

To protect vulnerable customers, it is vital that EU countries retain the option to intervene in prices. Across the EU, 13 countries still regulate electricity prices, mostly to protect consumers from high energy bills and energy poverty.¹⁴³ However, in its push for further liberalisation and as part of the 2016 Clean Energy legislation, the European Commission is committed 'to encourage member states to establish a roadmap for the phasing-out of all regulated prices'. It argues this is necessary as price regulations limit competition, distort the market and slow down the transition to clean energy. It argues for supply prices that are free of any public intervention, with only duly justified exceptions.¹⁴⁴ This renewed drive for energy liberalisation could exacerbate Europe's rising energy poverty (see section 3.2).

In 2016, the European Commission initially proposed phasing out regulated prices over a five-year period. It argued that "price regulation can limit the development of effective competition, discourage investments and the emergence of new market players" and therefore increase electricity bills. The EU parliament voted in favour of the five-year time limit with a 10-year deadline for vulnerable consumers. However, the proposal was rejected by member states in December 2017.¹⁴⁵ In December 2018 the European Parliament and the European Council reached a compromised agreement on the Electricity Market Design Directive. This acknowledges that price regulation is a political tool to protect households from market failure and to tackle energy poverty. Consequently, there is no deadline for phasing out price regulation and instead

a 2025 review clause.¹⁴⁶ It is crucial that governments retain the right to regulate prices to ensure people can afford their electricity bills. The European Commission's move away from the proposed phase out of price regulation is a positive step in the right direction as it would have exacerbated energy poverty. It is crucial that governments maintain control of energy pricing in order to ensure universal energy access.

4.3 Public ownership key to decarbonisation of the energy system

While the private sector can be incentivised and subsidised to encourage a Just Transition, public institutions are much better positioned to address the rapid pace of climate change while also protecting workers. Only an energy system that is owned and controlled by the public will be able to prioritise decarbonisation, energy poverty and security of supply.¹⁴⁷ Instead of inflating energy bills by paying out excessive dividends to shareholders, a publicly-owned and controlled energy system would ensure any surplus is either reinvested to improve the energy system or paid back to consumers. Governments can also usually borrow at lower interest rates than investor owned companies.¹⁴⁸ Serving the public interest and not shareholders, through a public system, can prioritise the development of renewables, universal coverage and affordability.

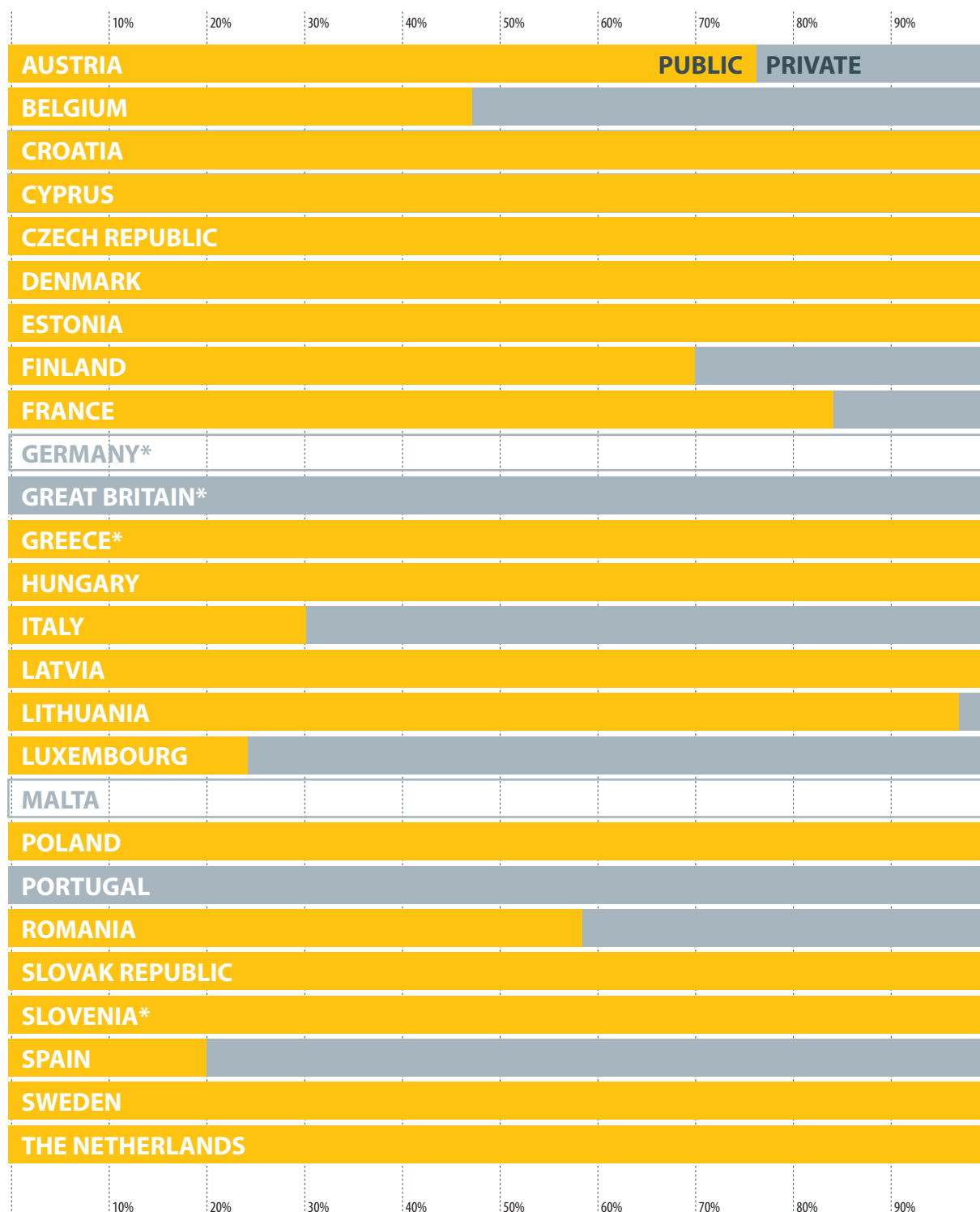
4.3.1. Public ownership and the energy grid

A publicly-owned grid is key to the facilitation of a decarbonised energy system. The grid is a natural monopoly – there is only one set of pipes, pylons and cables that bring electricity to the end users. Renewable energy requires a modern and expansive grid. In other words, it would be pointless to increase renewable energy if it cannot be fed into the energy grid. Yet private providers have been slow to make the necessary investments to make the grid fit for renewables.¹⁴⁹

There is a public/private split in the ownership of transmission grids in Europe. In more than half of European countries, the transmission grids are 100 per cent publicly owned. In the rest, the grids are partially public and partially privately owned and in only two countries, the UK and Portugal, the transmission grid is 100 per cent privately owned (see Figure 9).¹⁵⁰ Portugal was forced to privatise its grid by the International Monetary Fund (IMF) and the European Commission as part of the 2011 bailout programme.¹⁵¹ The UK privatised its national electricity transmission grid in the 1990s and the gas transmission grid even earlier, in 1986. The UK's experience of transmission privatisation exemplifies the problems with the privatisation of a natural monopoly. National Grid – one of the world's largest investor-owned utility companies controlling the electricity transmission system in England and Wales – reaps profit margins of an average of 19 per cent, according to a 2107 study by Citizens Advice.¹⁵² In other words, consumers paid for excessive profits while National Grid underperformed on investment and inflated the costs of investments to the regulator.¹⁵³ The UK Labour Party has announced it will renationalise National Grid if elected to government.¹⁵⁴

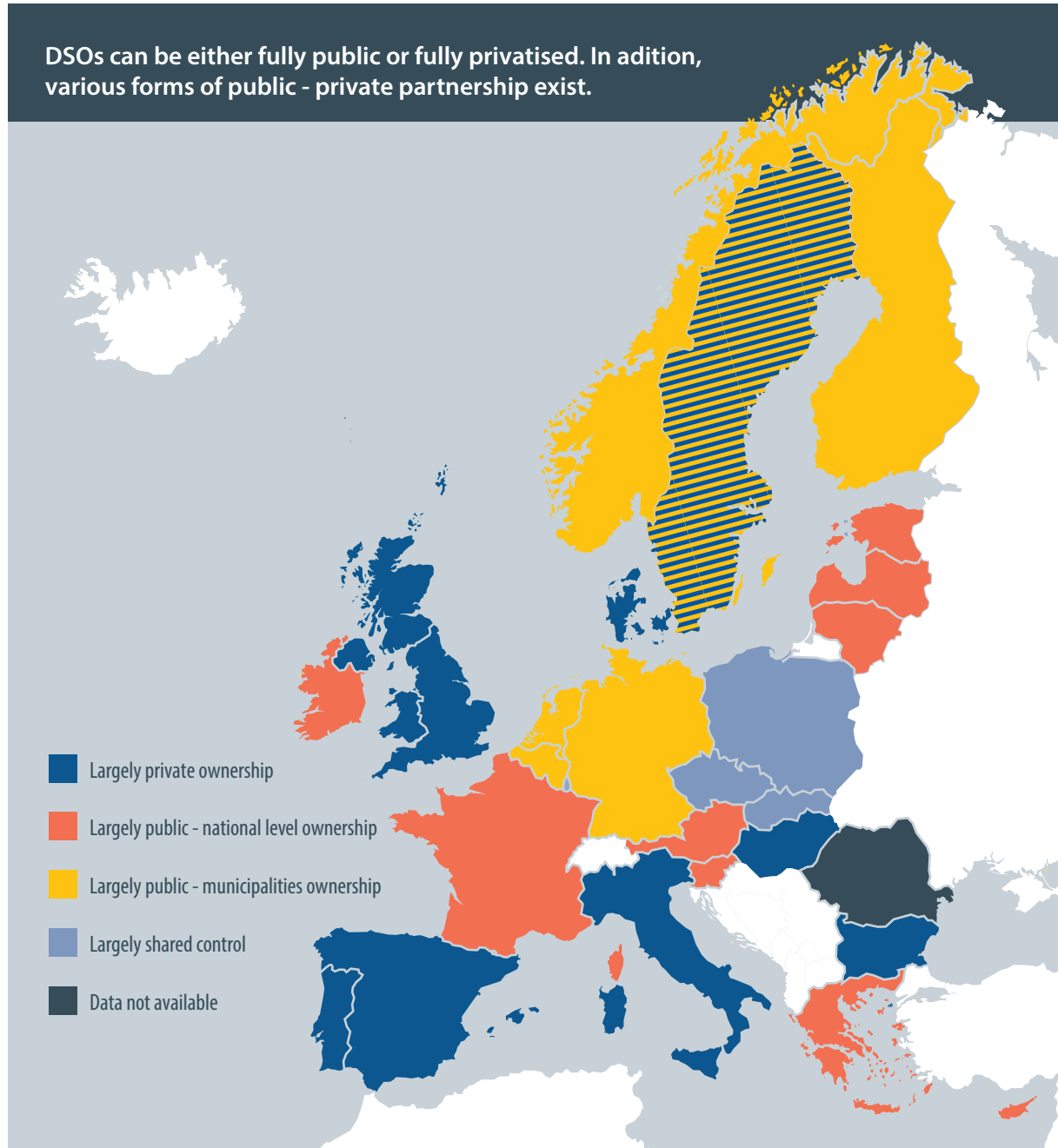
The distribution system in Europe is also mostly in public hands. In 16 out of 27 countries the distribution network is mainly public, in three it is mixed and in seven it is mainly private (see Figure 10). Again, the example of the UK demonstrates that a private distribution system benefits shareholder rather than consumers. The parent companies of the six distribution system network operators (DSOs) posted an average profit margin of over 30 percent between 2011 and 2017,¹⁵⁵ half of which was paid out to shareholders. This equates to an average of almost £1bn per year.¹⁵⁶

Figure 9:
Transmission grid ownership structure in Europe



Source: Council of European Energy Regulators (2016) Review on the Implementation of Transmission System Operators' Unbundling Provisions of the 3rd Energy Package.

Figure 10:
European distribution system operators (DSOs)



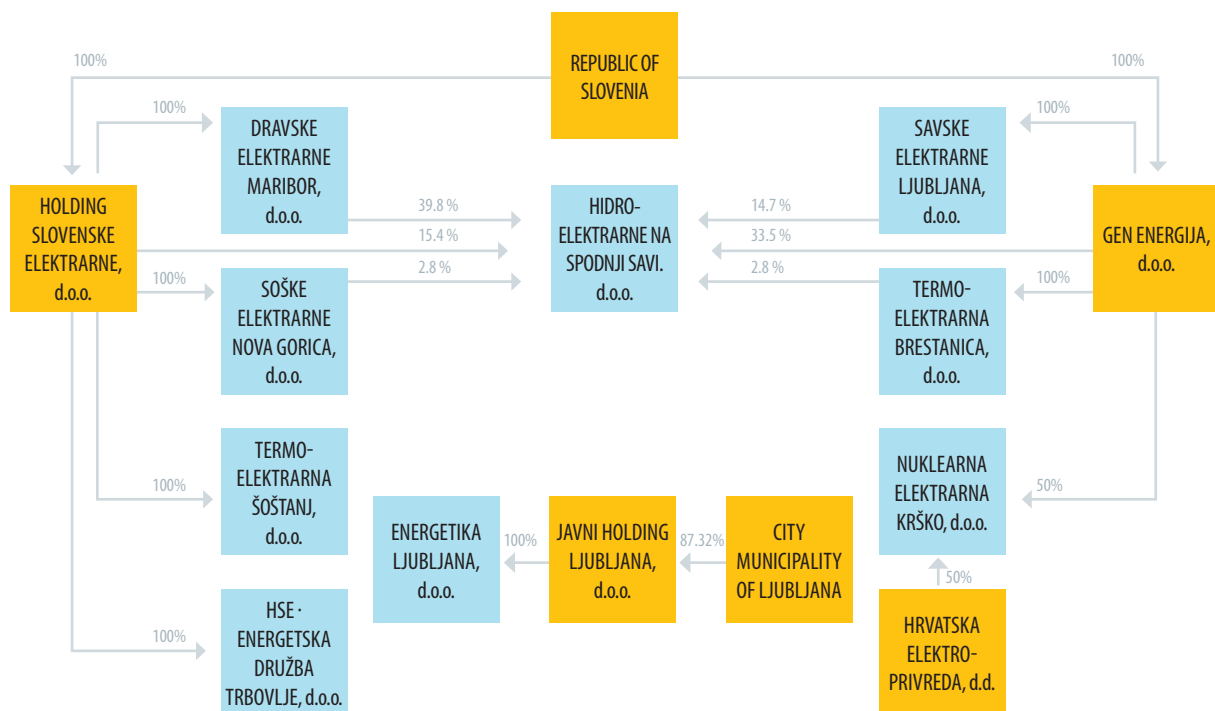
Source: Euelectric (2014) Power Distribution in Europe. Facts and Figures.

4.3.2 Public ownership and energy supply

While the debate around a public energy system has centred on the grid, it is worth paying closer attention to ownership on the energy supply side. In several EU countries, including Finland, Sweden, Slovenia and Hungary, energy supply is mainly in public hands. However, due to energy liberalisation, many of the publicly-owned companies have faced marketisation and some, like the Swedish company Vattenfall,

behave like private entities. For example, since entering the EU, Slovenia has increasingly introduced competition into the retail electricity sector to follow EU policy guidelines and encouraged switching by increased the number of energy supply companies. However these are all owned by the Slovenian Republic (see Figure 11), showing that despite increasing marketisation, energy liberalisation does not necessarily lead to privatisation. Slovenia has faced pressure to privatise its electricity supply, but so far this has been resisted by the Slovenian energy worker unions, SDE Slovenia.¹⁵⁷

Figure 11:
Ownership structure of electricity and natural gas suppliers in Slovenia – May 2018



Source: Agencija za energija (2018)¹⁵⁸

In the UK, energy trade unions, GMB, Prospect, Unite and UNISON, have called for a review of ownership of the sector in a joint position on Just Transition. UNISON has called specifically for public ownership of the six big energy retail and companies that dominate the market and currently serve 75 per cent of customers in the UK. The union wants it to then set up a single, or possibly regional, public retailer that purchases energy on the wholesale market. UNISON argues that now is a good time for renationalisation as the Big Six are in crises and barely making a profit (see section 3.1).¹⁵⁹ Reduced profits usually lead to companies trying to make cost savings on the back of their workers. The nationalisation of the energy supply companies can therefore benefit workers by protecting jobs and benefit customers as electricity prices in these companies are currently the highest for the poorest in society. Renationalisation will address this inequality.

Box 2: Municipally owned energy suppliers in the UK

In 2015, Nottingham City Council launched the Robin Hood Energy company, the first not-for-profit energy company run by a local authority.¹⁶⁰

Its priority is to tackle fuel poverty. In the UK this means the household's income would fall below the official poverty line if it spent the actual amount needed to heat the home and its energy costs are higher than typical for its household type.¹⁶¹ The latest figures from 2015 show that in England alone 11 per cent of the population (2.5 million people) were living in fuel poverty.¹⁶² This figure has been rising constantly over the last few years.¹⁶³ Nottingham was one of the areas with the highest levels of fuel poverty at 15 per cent of the population.¹⁶⁴

Robin Hood Energy has succeeded in making energy cheaper for the Nottingham residents who switch to the company and save on average £315 a year. It buys the energy in bulk from National Grid.¹⁶⁵ Investment to start the public company came in form of a commercial interest rate loan from Nottingham City Council. By April 2018, it had broken even.¹⁶⁶ Between April 2016 and April 2017 almost 30 per cent of Robin Hood energy came from renewable sources, higher than the UK average, which is below 25 per cent.¹⁶⁷

In 2016, Bristol followed suit by setting up Bristol Energy,¹⁶⁸ with the local authority also aiming to increase local renewable energy production in the future.¹⁶⁹ Over 40 per cent of its supply currently comes from renewable energy.¹⁷⁰ Other cities are taking similar initiatives, mostly aided through a "white label" partnership from Robin Hood Energy that allows other councils to launch their own energy suppliers. The partnership means that the tariffs and customer service will be provided by Robin Hood Energy and that each council does not need to get its own license. In this way Leeds set up its own public not-for-profit energy company, White Rose Energy, in 2016. In 2017, Liverpool followed with Liverpool Energy and Community Company (LECCY) and Derby and other parts of the Midlands with RAM. The London Borough of Islington set up Angelic Energy, Sussex established "Your Sussex Energy" and Doncaster created Great Northern Energy.¹⁷¹

By the beginning of 2018, 118,000 people had signed up to Robin Hood Energy and its partner companies.¹⁷² It currently employs 180 people and is an accredited Living Wage employer which means that all employees are earning at least the real Living Wage (£8.75 in 2018). Most of Robin Hood Energy employees are on permanent contracts and all are directly employed.¹⁷³

Following the success of Robin Hood Energy, Scotland is now planning to set up a public energy company by 2021.¹⁷⁴ As with the other municipal energy providers its aim is to reduce fuel poverty.¹⁷⁵

It should be noted that delegates at public services union UNISON's 2018 Energy Service Group conference expressed some concern about municipal energy companies being promoted as a cheaper alternative to the big six retail energy companies, which employ thousands of UNISON members and recognise trade unions. The conference also noted concern that the companies were losing many millions of pounds in trading losses and that as the companies grow, it is likely they will have a negative impact on the job prospects of members.¹⁷⁶

4.3.3 Public ownership and energy generation

Public ownership of renewable energies presents a real opportunity to decarbonise the energy system while enabling a Just Transition. For example, public ownership of renewable energy, particularly wind, presents an opportunity for strategic choices to situate wind farms not only where there is wind, but also in cities and regions that are, or will be particularly affected by, de-industrialisation through the phasing out of coal or nuclear energy.¹⁷⁷

Publicly-owned and controlled energy generation can also achieve significant cost savings because the public sector can raise long-term finance and often borrow money at cheaper interest rates. The public sector outperforms the private sector in terms of flexibility and comparative efficiency, facilitates reduced transaction costs and more certainty, in contrast to the contract uncertainty of the private sector, that makes long term investment possible.¹⁷⁸ Research on offshore wind parks has also shown that full public ownership during construction as well as operation would be significantly cheaper than where it is privately built and operated, and would therefore reduce the price of energy for consumers.¹⁷⁹ As shown above, large nuclear programmes are not feasible due to the costs and the high risk involved (see section 3.4.3). Many countries in the EU already rely on nuclear energy and research has shown that public ownership of nuclear projects could bring substantial savings.¹⁸⁰

Germany's experience with the nuclear phase-out shows the importance of public ownership even when the plants are due to be shut down. To ensure the responsible handling of nuclear waste so that workers, surrounding communities and society as a whole are not at risk of being exposed to toxic waste, Germany nationalised the decommissioning of nuclear plants. Under this nationalisation, the companies paid the state to take on the risk and responsibility for the safe disposal of nuclear waste. In June 2017, RWE, EnBW and Vattenfall paid 24 billion Euros to a public foundation in exchange for passing on the risk and responsibility of nuclear waste management.¹⁸¹

4.4 Decentralised versus centralised public ownership

There are different forms of public ownership. It does not necessarily mean going back to a model of large, centralised, nationally owned companies. Instead public ownership can be decentralised to municipal and local level, which brings opportunities for increased democratic control over key sectors (see section 3.3.2). These different types of public ownership are, however, not mutually exclusive and can also be combined with cooperative and community ownership. This is especially evident in Denmark, which is one of Europe's leaders in terms of renewable energy. In 2015, over 40 per cent of its energy came from wind power and by 2020 this is likely to be more than 50 per cent.¹⁸² Most of the wind energy production is based on local ownership. By 2013, 70-80 per cent of existing wind turbines were owned by communities.¹⁸³ The strong community involvement was only possible because the grid is publicly owned and controlled (see Figure 9). The grid needs to be extended to include new turbines and the expansion of renewable energy is therefore dependent on political will and government finances. In Denmark, the Energinet public enterprise is owned by the Danish Ministry of Climate and Energy.¹⁸⁴ The strong community engagement in wind energy is facilitated by an arrangement where the turbine owners are only required to pay for the connection to the closest technically-feasible point in the grid and the rest of the network expansion is covered by the utilities. This is especially relevant as since the late 1990s and early 2000s the Danish government has begun to liberalise the electricity market to increase competition. However, it is the public ownership and control of the grid that has made the transition towards renewable energy possible.

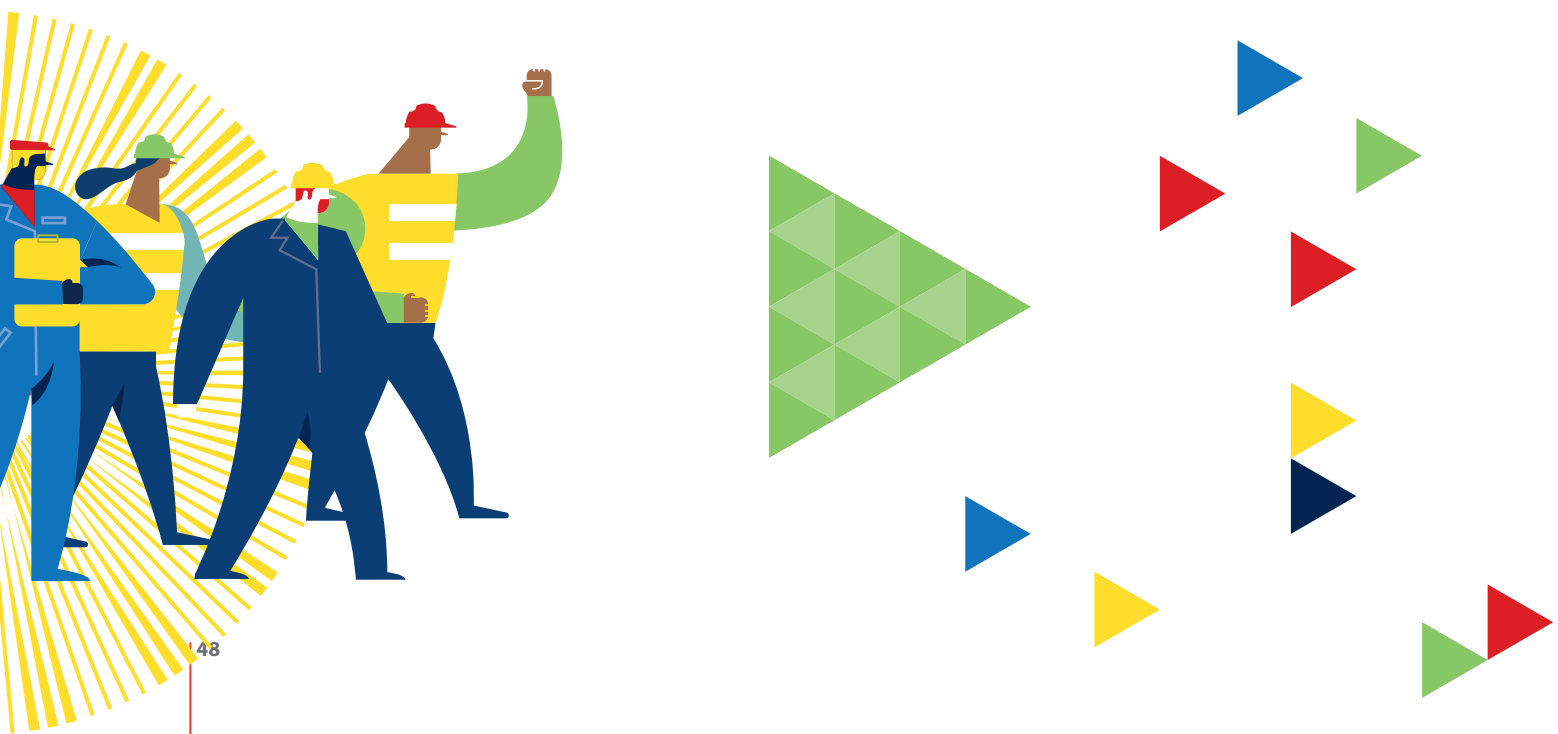
Over recent years there has been a drive across the EU towards local participation in energy systems and municipal and community ownership. Participative governance – the promotion of direct democracy and

citizens' influence on energy and climate policies – has led to a growing number of citizen-led energy initiatives such as cooperatives, encouraged by civil society organisations.¹⁸⁵ However, the falling investment in renewable energy could undermine this trend. In addition, while decentralisation can create the initial space for community and/or worker-run cooperatives, citizen-led energy also bears the risk of expanded private sector involvement. If individuals and communities produce their own energy and sell it for profit, it fosters the dominant market logic instead of challenging it. The individualisation of energy production has become a profit opportunity for multi-national data companies like Amazon and Google, which are moving into the energy sector through home-energy automation.¹⁸⁶

Cooperatives do not necessarily ensure universal access to energy and an electricity system that benefits everyone. Unless based on good intention and a concern for the wider community, there is a danger that electricity co-operatives may become gated energy communities where more affluent citizens generate and supply their own electricity at preferential prices for their neighbourhood and leave poorer communities excluded. Regardless of the form public ownership takes, the principle of universal access must be enshrined. Decentralisation should reinforce rather than undermine the public regional and national infrastructure.

4.5 Re-nationalisation and re-municipalisation

Central governments can initiate the return of privatised services to the public sector. This is particularly beneficial if expansive infrastructure and/or large investments are required. Re-municipalisation means the return to public bodies of control of privatised local and regional government services¹⁸⁷ that are commissioned and funded by municipalities and regional governments either at individual or inter-municipal level. Re-municipalisation can relate more closely to local public interest and direct citizen need, as people often take a greater interest in strong public services where they live and work. Most examples of re-municipalisation are in the electricity sector. In 2017, 311 cases were identified worldwide, with 90 per cent in Germany.¹⁸⁸ Stadtwerke, municipal organisations, now supply half of all electricity to households in Germany and 80 per cent of the distribution networks are now owned and run by regional and municipal public authorities.¹⁸⁹



The wave of re-municipalisation in the electricity sector in Germany was mainly driven by society's demand for increased renewable energy and the poor performance of the private companies. The big four private companies that dominated the German energy market stuck to traditional energy production through coal and nuclear power. The German energy transition shows that re-municipalised energy is about much more than a mere change of ownership. Civil society groups demanding more renewable energy and a sustainable energy supply have been the main drivers behind this wave.

Opportunities for re-municipalisation arise when a contract for a privatised service expires. In Germany, energy transition was facilitated by the expiry of numerous concessions. However, in some cases local and regional governments may decide to terminate contracts early because they are failing or because they are too expensive in the context of austerity. Early termination of a contract can be costly, as companies may demand compensation. However, the long-term benefits may outweigh the short-term risk of compensation or prevent environmental damage in the future.

Re-municipalisation can be an opportunity to build trade union strength and restore bargaining power. It is also a vehicle for building socially-just and environmentally-sustainable local communities. By campaigning for re-municipalisation, workers, trade unions, consumers, environmentalists and politicians can unite around a future model of society that puts the planet and people before profit maximisation. However, it will not automatically translate into more trade union members and better working conditions – particularly where local authorities and public bodies have been subject to austerity measures. Trade unions must also build insourcing, membership, representation and organising campaigns.

Box 3: Energy re-municipalisation in Hamburg and the trade unions

Until 1998, in Germany electricity and gas sales were operated by municipal utilities and other regional suppliers. The bill on the revision of the Energy Industry Law (EIL) that liberalised the electricity supply market changed this. The liberalisation of the supply market went hand-in-hand with the privatisation of the energy grid. In 2000, Hamburg privatised its electricity grid, which was bought by the Swedish multinational Vattenfall, long distance heating, also bought by Vattenfall, and gas, bought by E.On – an investor-owned multinational based in Germany. Vattenfall did not only take over the grid, it also became the main producer of energy from large coal-fired power stations.

The demand for public energy was driven by environmental concerns. Aiming to increase renewable energy, in 2009 Hamburg established a public utility, Hamburg Energie, as an autonomous subsidiary of Hamburg waterworks,¹⁹⁰ which were fully in public hands. Hamburg Energie supplies and produces green energy. However, while its customer numbers are growing, it only serves a small percentage of the population – by the end of 2016 around seven per cent of the population (125.000 people).¹⁹¹ Vattenfall still has the biggest market share in Hamburg.

It became clear that supplying renewable energy was simply not enough to enable a transition towards green energy. Hamburg's citizens demanded the re-municipalisation of the electricity and gas grid and the long-distance heating provision, as having the grid in public ownership and control would enable the local authority to make the investments needed for the grid to be capable of transporting renewable energy more efficiently.

A coalition-led campaign for the re-municipalisation of the energy grid led to a narrow referendum victory (50.09% in favour) in September 2013. The legally-binding referendum led to the re-municipalisation of electricity in 2014, of gas in 2018 and of long-distance heating in 2019.¹⁹²

The Verdi and IG-Metall trade unions were divided on the issue of the energy re-municipalisation but gave partial backing to the anti-re-municipalisation campaign. Verdi is very supportive of public ownership and has supported re-municipalisation campaigns elsewhere in Germany. Locally, however, workers feared their hard fought for, freshly negotiated and strong collective bargaining agreement would be undermined by re-municipalisation and that their working conditions could worsen.¹⁹³ The citizen re-municipalisation campaign did not successfully engage with the workers, so the companies involved were able to spread fearmongering.

The fears did not materialise,¹⁹⁴ and after re-municipalisation, wages and working conditions remained the same, while the working environment improved and job security increased.

Since the re-municipalisation, Hamburg has invested in the infrastructure of the grid to make it fit for the transition towards renewable energy and plans to further invest \$2 billion over the next decade.¹⁹⁵

Vattenfall attempted to delay the re-municipalisation of the long-distance grid and feed in energy produced in its coal fire plant in Moorburg. However, the re-municipalisation went ahead in 2019, and in June 2019 Hamburg passed a bill to phase out coal for long-distance heating by 2030.¹⁹⁶

There are a number of lessons to be learned from this case study:

- By reclaiming its energy grid, Hamburg could invest to modernise and extend the grid and make it fit for renewable energy;
- A very broad-coalition led to a successful referendum in September 2013 that paved the way for the re-municipalisation, despite a private-sector fightback and a counter-campaign that mobilised against it;
- Fears among workers, which resulted in the trade union movement adopting an anti-re-municipalisation stance, did not materialise;
- Civil society campaigns for re-municipalisation need to ensure they involve workers from the very beginning.



5. Conclusions

A critical evaluation of the energy liberalisation experiment shows it has failed to achieve its goals and was probably always doomed to fail because of the nature of the electricity and gas sectors. There is now an urgent need to tackle the climate emergency and the liberalised model has shown that it is not up to the job, with limited progress only possible through compromises to the liberalised market. The EU must abandon policies that pursue economic efficiency at the expense of sustainable energy that is reliable, affordable and can end energy poverty. The trade union's commitment to a Just Transition to a low carbon economy is key to the formation of radical energy policies for the future that protect workers, communities and the environment. These are particularly important in the light of the European Commission's push for further liberalisation to increase competition.

The concept of Just Transition puts worker's issues at the centre of climate policies. A transition to a low-carbon economy involves communities that currently heavily rely on fossil fuels developing alternative economic activities and reskilling workers for new and decent jobs. However, Just Transition does not always challenge the neoliberal, pro-growth¹⁹⁷ and pro-profit ideology and practices in energy. This involves challenging, for example, the logic of public subsidises to provide incentives for private companies to invest in renewables that are then sold through a dysfunctional market system. This report has demonstrated that government support for renewables, in forms of subsidies, is at odds with energy liberalisation. Instead of abandoning the support by phasing out the subsidies, it is the market model that needs to be rejected.

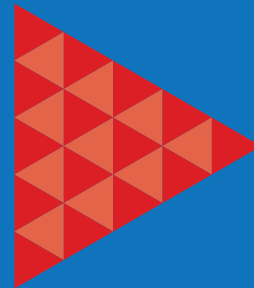
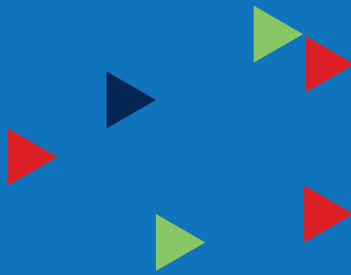
Public institutions are in a much better position to address the urgency of climate change while also protecting workers. At best, a new public energy system covers the natural monopolies – transmission and distribution, supply and production. The grid, transmission and distribution, is a natural monopoly, therefore when it is privatised control over the energy network is lost. Experience shows that private sector involvement in the grid has led to underinvestment that has slowed progress in renewable energy. For renewable energy to grow, the grid needs to be fit for purpose – it needs to be modernised and expanded to integrate renewable energy. It does not matter how many wind farms are built if they cannot connect to the grid. Public ownership and control are therefore central to the green energy revolution.

This report confirms that Just Transition cannot be divorced from the question of ownership, and across the energy sector there are examples that demonstrate the value of public ownership in pursuing Just Transition. In Denmark, one of Europe's leaders in terms of renewable energy, it is public ownership and control of the grid that made the transition towards renewable energy possible. In Germany, concern for

the environment and society's demand for renewable energy triggered a wave of re-municipalisation in the energy sector. The poor performance of the private sector in generating renewable energy and the fact that the privately-operated electricity grids have not delivered renewable energy fuelled demands for public ownership. While the move towards public ownership is strongest in Germany, the UK Labour Party also recognises that tackling climate change has to be underpinned by renewed public ownership of the national grid. Only through public ownership can swift enough progress be made to solve the energy 'trilemma' – providing energy that is low carbon, affordable and secure.

In light of the failure of the Big Five private energy companies to promote renewable energy, and the financial crisis they find themselves in, there is now a logic to public ownership and control over energy supply through the nationalisation of the biggest supply companies. As an alternative to renationalisation, the establishment of local or regional public supply companies can combine greening the energy system with ensuring a better deal for workers, as the example of Robin Hood Energy in Nottingham, UK demonstrates. The question of national, regional, local or cooperative ownership requires further debate, and the voice of the unions must be heard in this debate. Across Europe there is an understanding that public ownership is the cornerstone of a successful Just Transition and that trade unions are central to energy democracy. New models of ownership will require the representation of communities and workers based on workers' rights and decent work.





References

- ¹ Hermann, C. and Flecker, J. (2009) *Privatisation of Public Services and the Impact on Quality, Employment and Productivity (PIQUE) – Final Report*. Available at : https://cordis.europa.eu/docs/publications/1224/122489371-6_en.pdf (Accessed 9 July 2019).
- ² Atzmüller, R. and Hermann, C., 2005. The Liberalisation of Public Services and Its Effects on Employment, Working Conditions and Industrial Relations. *RJ, Final Report. FORBA-Working Life Research Centre*. Available at: https://www.researchgate.net/profile/Christoph_Hermann2/publication/265987427_The_Liberalisation_of_Public_Services_and_Its_Effects_on_Employment_Working_Conditions_and_Industrial_Relations/links/55003e5c0cf28e4ac347ee2e.pdf (Accessed 20 Aug. 19)
- ³ ECOTEC (2007) *The employment impact of opening of electricity and gas markets, and of key EU directives in the field of energy*. Available at: https://www.epsu.org/sites/default/files/article/files/Summary_report.pdf (Accessed 5 July 2019)
- ⁴ Pollitt, M.G., 2018. The European single market in electricity: an economic assessment. *Review of Industrial Organization*, pp.1-25. Available at: <https://link.springer.com/article/10.1007/s11151-019-09682-w> (Accessed 20 Aug. 19).
- ⁵ Haas, R. and Auer, H., 2019. On New Thinking and Designs of Electricity Markets. In *the Technological and Economic Future of Nuclear Power* (pp. 369-385). Springer VS, Wiesbaden. Available at: https://link.springer.com/content/pdf/10.1007/978-3-658-25987-7_18.pdf Accessed 20 Aug. 19).
- ⁶ European Parliament (2016) *Understanding electricity markets in the EU*. Available at: [http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/593519/EPRS_BRI\(2016\)593519_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/593519/EPRS_BRI(2016)593519_EN.pdf) . (Accessed 5 Jul. 2019).
- ⁷ Hall, D. et al (2013) Energy Liberalisation, privatisation and public ownership. *Public Services International Research Unit (PSIRU)*. Available at: https://www.world-psi.org/sites/default/files/en_psi ru_ppp_final_lux.pdf (Accessed 20 Aug. 19)
- ⁸ Ilie, L et al. (2007) Liberalisation and regulation in the EU Energy Market. *Munich Personal RePEe Archive*. Available at: https://mpra.ub.uni-muenchen.de/6419/1/mpra_paper_6419.pdf (Accessed 20 Aug. 19).
- ⁹ Pollitt, M. (2012) The role of policy in energy transitions: Lessons from the energy liberalisation era. *Energy Policy*, pp 128–137. Available at: <https://www.sciencedirect.com/science/article/pii/S0301421512002091> (Accessed 20 Aug. 19).
- ¹⁰ Thomas, S. and Hall, D., 2003. Restructuring and outsourcing of electricity distribution in EU. *PSIRU*. Available at: <https://www.epsu.org/sites/default/files/article/files/psiruFLAEIall-final.pdf> (Accessed 20 Aug. 19).
- ¹¹ Copenhagen Economics (2005), *Market Opening in Network Industries: Part I: Final Report*, Brussels: European Commission. Available at: https://www.copenhageneconomics.com/dyn/resources/Publication/publicationPDF/1/111/0/Market_opening.pdf (Accessed 20 Aug. 19).
- ¹² Pollitt, M.G. (2018) The European single market in electricity: an economic assessment. *Review of Industrial Organization*, pp.1-25. Available at <https://link.springer.com/article/10.1007/s11151-019-09682-w> (Accessed 20 Aug. 19).
- ¹³ Pollitt, M.G. (2018) The European single market in electricity: an economic assessment. *Review of Industrial Organization*, pp.1-25. Available at <https://link.springer.com/article/10.1007/s11151-019-09682-w> (Accessed 20 Aug. 19).
- ¹⁴ Fiorio, C.V., Florio, M. and Doronzo, R. (2007) June. The electricity industry reform paradigm in the European Union: testing the impact on consumers. In *Consumers and Utility Reforms in the European Union Conference* (pp. 8-9).
- ¹⁵ European Parliament (2016) *Energy Poverty Protecting vulnerable customers* Available at: [http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/583767/EPRS_BRI\(2016\)583767_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/583767/EPRS_BRI(2016)583767_EN.pdf) (Accessed 5 Jul. 2019).
- ¹⁶ Fiorio, C.V. and Florio, M. (2011), 'Would you say that the price you pay for electricity is fair? Consumers' satisfaction and utility reforms in the EU15', *Energy Economics*, 33 (2): 178-187.

- ¹⁷ European Commission (2016) *Clean energy for all Europeans* Available at: https://eur-lex.europa.eu/resource.html?uri=cellar:fa6ea15b-b7b0-11e6-9e3c-01aa75ed71a1.0001.02/DOC_1&format=PDF (Accessed 5 Jul. 2019).
- ¹⁸ Eurostat (2018) *Energy consumption and use by households* Available at: <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20180322-1> (Accessed 5 Jul. 2019).
- ¹⁹ Agora and Sandberg (2017) *The European Power Sector in 2017* Available at: <https://sandbag.org.uk/wp-content/uploads/2018/01/EU-power-sector-report-2017.pdf> (Accessed 3 Jul. 2019).
- ²⁰ Pollitt, M.G. (2018). *The European single market in electricity: an economic assessment*. Review of Industrial Organization, pp.1-25. Available at <https://link.springer.com/article/10.1007/s11151-019-09682-w> (Accessed 20 Aug. 19).
- ²¹ European Parliament (2016) *Understanding electricity markets in the EU* Available at: [http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/593519/EPRS_BRI\(2016\)593519_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/593519/EPRS_BRI(2016)593519_EN.pdf) . (Accessed 5 Jul. 2019).
- ²² Ofgem (2014) *Bidding Zones Literature Review* Available at: https://www.ofgem.gov.uk/sites/default/files/docs/2014/10/fta_bidding_zone_configuration_literature_review_1.pdf (Accessed on: 5 Jul 2019).
- ²³ Under a contract for differences, the generator is paid a guaranteed, contract price made up of the market wholesale price with the difference between the contract price and the wholesale price made up by a consumer subsidy.
- ²⁴ European Commission (2019) *State aid: Commission opens in-depth investigation into British Capacity Market scheme* Available at: http://europa.eu/rapid/press-release_IP-19-1348_en.htm (Accessed on: 5 July 2019).
- ²⁵ Sky News. (2019). *Economy Energy collapse: Hundreds of thousands of customers in limbo as firm goes bust* Available at: <https://news.sky.com/story/economy-energy-collapse-hundreds-of-thousands-of-customers-in-limbo-as-firm-goes-bust-11601960> (Accessed: January 11, 2019).
- ²⁶ European Commission (2016) *Clean Energy for All Europeans* Available at: https://eur-lex.europa.eu/resource.html?uri=cellar:fa6ea15b-b7b0-11e6-9e3c-01aa75ed71a1.0001.02/DOC_1&format=PDF (Accessed 5 July 2019).
- ²⁷ CEER (2017) *Retail Markets Monitoring Report* Available at: <https://www.ceer.eu/documents/104400/-/56216063-66c8-0469-7aa0-9f321b196f9f> (Accessed 8 July 2019).
- ²⁸ CEER (2017) *Performance of European Retail Markets in 2017* Available at: <https://www.ceer.eu/documents/104400/-/31863077-08ab-d166-b611-2d862b039d79> (Accessed: 5 July 2019).
- ²⁹ CEER (2017) *Retail Markets Monitoring Report* Available at: <https://www.ceer.eu/documents/104400/-/56216063-66c8-0469-7aa0-9f321b196f9f>. (Accessed: 5 July 2019).
- ³⁰ European Parliament (2016) *Understanding electricity markets in the EU* Available at: [http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/593519/EPRS_BRI\(2016\)593519_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/593519/EPRS_BRI(2016)593519_EN.pdf) . (Accessed 5 Jul. 2019).
- ³¹ Jamasb, T. and Pollitt, M. (2005) 'Electricity Market Reform in the European Union: Review of Progress toward Liberalization & Integration'. Centre for Energy and Environmental Policy Research. *The Energy Journal*, pp.11-41. Available at: <https://dspace.mit.edu/bitstream/handle/1721.1/45033/2005-003.pdf> (Accessed 20 Aug. 19).
- ³² Gugler, K. et al (2012) Ownership unbundling and investment in electricity markets — A cross country study. *Energy Economics*. Vol. 40, pp. 702-713. Available at: <https://www.sciencedirect.com/science/article/pii/S0140988313001953> (Accessed 20 Aug. 19).
- ³³ Nardi, P., 2012. Transmission network unbundling and grid investments: evidence from the UCTE countries. *Utilities Policy*, 23, pp.50-58. Available at: <https://www.sciencedirect.com/science/article/pii/S0957178712000367> (Accessed 20 Aug. 19).
- ³⁴ Gugler, K. et al (2012) Ownership unbundling and investment in electricity markets — A cross country study. *Energy Economics*. Vol. 40, pp. 702-713. Available at: <https://www.sciencedirect.com/science/article/pii/S0140988313001953> (Accessed 20 Aug. 19).
- ³⁵ Bolle, F. and Breitmoser, Y. (2006) *On the allocative efficiency of ownership unbundling*. Discussion Paper No. 255. Europa University Viadrina Frankfurt (Oder). Available at: https://www.econstor.eu/bitstream/10419/23824/1/255_Bolle_Breitmoser.pdf (Accessed 20 Aug. 19).
- ³⁶ Cremer, H. and Cremer, J. et al. (2006) Legal versus ownership unbundling in network industries. Working Paper. University of Toulouse. Available at: https://www.researchgate.net/profile/Philippe_De_Donder/publication/5106653_Legal_vs_Ownership_Unbundling_in_Network_Industries/links/0912f50c6c32206119000000.pdf (Accessed 20 Aug. 19).

- ³⁷ Höffler, F., Kranz, S., 2011. Legal unbundling can be a golden mean between vertical integration and separation. *Int. J. Ind. Organ.* 29 (5), 576–588. Available at: <https://www.sciencedirect.com/science/article/pii/S016771871100004X> (Accessed 20 Aug. 19).
- ³⁸ Gugler, K. et al (2012) Ownership unbundling and investment in electricity markets — A cross country study. *Energy Economics*. Vol. 40, pp. 702-713. Available at: <https://www.sciencedirect.com/science/article/pii/S0140988313001953> (Accessed 20 Aug. 19).
- ³⁹ Pollitt, M.G. (2018) The European single market in electricity: an economic assessment. *Review of Industrial Organization*, pp.1-25. Available at <https://link.springer.com/article/10.1007/s11151-019-09682-w> (Accessed 20 Aug. 19).
- ⁴⁰ Tomas, S. (2018) Corporate performance of the Seven Brothers of the European energy market: Then there were five. *Utilities Policy*. 50, pp.164-174. Available at: <https://www.sciencedirect.com/science/article/pii/S0957178717301534> (Accessed 20 Aug. 19).
- ⁴¹ Tomas, S. (2018) Corporate performance of the Seven Brothers of the European energy market: Then there were five. *Utilities Policy*. 50, pp.164-174. Available at: <https://www.sciencedirect.com/science/article/pii/S0957178717301534> (Accessed 20 Aug. 19).
- ⁴² Orbis
- ⁴³ Financial Times (2018) *Germany's €43bn energy shake-up wins market favour* Available at: <https://www.ft.com/content/d020a052-25e4-11e8-b27e-cc62a39d57a0> (Accessed 5 July 2019).
- ⁴⁴ The Times (2019) *Unions fear break-up as EDF plans to renationalise nuclear operations* Available at: <https://www.thetimes.co.uk/article/unions-fear-breakup-as-edf-plans-to-renationalise-nuclear-operations-nx8p6bhrr> (Accessed 5 July 2019).
- ⁴⁵ Jamasb, T. and Pollitt, M. (2005) Electricity Market Reform in the European Union: Review of Progress toward Liberalization & Integration. Centre for Energy and Environmental Policy Research, *The Energy Journal*, pp.11-4. Available at: <https://dspace.mit.edu/bitstream/handle/1721.1/45033/2005-003.pdf> (Accessed 20 Aug. 19).
- ⁴⁶ Pollitt, M.G. (2018) The European single market in electricity: an economic assessment. *Review of Industrial Organization*, pp.1-25. Available at <https://link.springer.com/article/10.1007/s11151-019-09682-w> (Accessed 20 Aug. 19).
- ⁴⁷ Steiner, F. (2002). Regulation, industry structure and performance in the electricity supply industry. *OECD Econ. Stud.* 32, 143–182. Available at: <https://pdfs.semanticscholar.org/6b61/c25383231b8885bca6a211711ec843bcd844.pdf> (Accessed 20 Aug. 19).
- ⁴⁸ Hattori, T., Tsutsui, M. (2004) Economic impact of regulatory reforms in the electricity supply industry: a panel data analysis for OECD countries. *Energy Policy*, 32 (6), 823–832. Available at: <https://www.sciencedirect.com/science/article/pii/S0301421503000041> (Accessed 20 Aug. 19).
- ⁴⁹ Thomas, S. (2006) Understanding European policy on the internal market for electricity and gas Evaluation of the Electricity and Gas Directives. PSIRU. Available at: https://gala.gre.ac.uk/id/eprint/3588/1/PSIRU_9703_-_2006-09-E-Directives.pdf (last accessed 22 August 2019).
- ⁵⁰ Pollitt, M.G. (2012) The role of policy in energy transitions: Lessons from the energy liberalisation era. *Energy policy*, 50, pp.128-137. Available at: <https://www.sciencedirect.com/science/article/pii/S0301421512002091> (Accessed 20 Aug. 19).
- ⁵¹ Fiorio, C.V. and Florio, M. (2009) The reform of network industries, privatization and consumers' welfare: Evidence from the EU15. *UNIMI-Research Papers in Economics, Business, and Statistics*, 1088. Available at: http://wp.demm.unimi.it/tl_files/wp/2009/DEMM-2009_041wp.pdf (Accessed 20 Aug. 19).
- ⁵² Brau, R. et al (2010) EU Gas Industry Reforms and Consumers' Prices. *The Energy Journal*. Vol. 31, No. 4, pp. 167-182. Available at: https://www.researchgate.net/publication/227356526_EU_Gas_Industry_Reforms_and_Consumers'_Prices (last accessed 22 August 2022).
- ⁵³ Pollitt, M. (2012) The role of policy in energy transitions: Lessons from the energy liberalisation era. *Energy policy*, 50, pp.128-137. Available at: <https://www.sciencedirect.com/science/article/pii/S0301421512002091> (Accessed 20 Aug. 19).
- ⁵⁴ Pollitt, M. (2012) The role of policy in energy transitions: Lessons from the energy liberalisation era. *Energy policy*, 50, pp.128-137. Available at: <https://www.sciencedirect.com/science/article/pii/S0301421512002091> (Accessed 20 Aug. 19).

- ⁵⁵ European Commission (2015), Working paper on Energy Poverty – Vulnerable Consumers Working Group available at: <https://ec.europa.eu/energy/sites/ener/files/documents/Working%20Paper%20on%20Energy%20Poverty.pdf> (Accessed 5 July 2019).
- ⁵⁶ Bouzarovski, S and Tirado, H. (2015), “The energy divide: integrating energy transitions, regional inequalities and poverty trends in the European Union”, in *European Urban and Regional Studies*, 1(18). Available at: <https://journals.sagepub.com/doi/pdf/10.1177/0969776415596449> (Accessed 20 Aug. 19).
- ⁵⁷ Thomson, H. and Snell, C., 2013. Quantifying the prevalence of fuel poverty across the European Union. *Energy Policy*, 52, pp.563-572. <https://www.sciencedirect.com/science/article/pii/S0301421512008671> (Accessed 20 Aug. 19).
- ⁵⁸ Bouzarovski, S., 2014. Energy poverty in the European Union: landscapes of vulnerability. *Wiley Interdisciplinary Reviews: Energy and Environment*, 3(3), pp.276-289. Available at: <https://onlinelibrary.wiley.com/doi/pdf/10.1002/wene.89> (Accessed 20 Aug. 19).
- ⁵⁹ B. Boardman (2010), *Fixing fuel poverty: challenges and solutions*, London, Earthscan.
- ⁶⁰ Right to energy coalition (2019) *Power to the people: Upholding the right to clean, affordable energy for all in the EU* Available at: <https://righttoenergy.files.wordpress.com/2019/02/ep-report-18.02.19.pdf> (Accessed 5 July 2019).
- ⁶¹ Euractiv (2018) *Energy poverty hinders EU push to end regulated electricity prices* Available at: <https://www.euractiv.com/section/electricity/news/energy-poverty-hinders-eu-push-to-end-regulated-electricity-prices/> (Accessed 5 July 2019).
- ⁶² The Labour Party (2019). *Bringing Energy Home Labour’s proposal for publicly owned energy networks* Available at: <https://www.labour.org.uk/wp-content/uploads/2019/03/Bringing-Energy-Home-2019.pdf> (Accessed 5 July 2019).
- ⁶³ Right to energy coalition (2019) *Power to the people: Upholding the right to clean, affordable energy for all in the EU* Available at: <https://righttoenergy.files.wordpress.com/2019/02/ep-report-18.02.19.pdf> (Accessed: 5 July 2019).
- ⁶⁴ Montt, G., Maître, N. and Amo-Agyei, S. (2018) *The transition in play: Worldwide employment trends in the electricity sector*. International Labour Organization. Available at: http://www.oit.org/wcmsp5/groups/public/---dgreports/--inst/documents/publication/wcms_625865.pdf (Accessed at 20 Aug. 19).
- ⁶⁵ Sweeney, S. and Treat, J. (2017) *Preparing a public pathway: Confronting the investment crisis in renewable energy*. Trade Unions for Energy Democracy, Rosa Luxemburg Stiftung New York Office, Murphy Institute at the City University of New York, New York. Available at: <https://journals.sagepub.com/doi/full/10.1177/1095796018789907> (Accessed 20 Aug. 2019).
- ⁶⁶ Euractiv (2014) *Report: In EU, renewable energy is the first recipient of state aid* Available at: <https://www.euractiv.com/section/energy/news/report-in-eu-renewable-energy-is-the-first-recipient-of-state-aid/> (Accessed 5 July 2019).
- ⁶⁷ Pollitt, M.G. (2018) The European single market in electricity: an economic assessment *Review of Industrial Organization*, pp.1-25. Available at: <https://link.springer.com/article/10.1007/s11151-019-09682-w> (Accessed 20 Aug. 19).
- ⁶⁸ Sweeney, S. and Treat, J., 2017. *Preparing a public pathway: Confronting the investment crisis in renewable energy* Trade Unions for Energy Democracy, Rosa Luxemburg Stiftung New York Office, Murphy Institute at the City University of New York, New York. Available at: <http://unionsforenergydemocracy.org/wp-content/uploads/2017/10/TUED-Working-Paper-10.pdf> (Accessed 20 Aug. 2019).
- ⁶⁹ Blazquez, J., Fuentes-Bracamontes, R., Bollino, C.A. and Nezamuddin, N. (2018) The renewable energy policy Paradox. *Renewable and Sustainable Energy Reviews*, 82, pp.1-5. Available at: <https://www.sciencedirect.com/science/article/pii/S1364032117312546> (Accessed 20 Aug. 19).
- ⁷⁰ Sweeney, S. (2018) September. *The Energy Revolution Will Not Be Subsidized In New Labor Forum* (Vol. 27, No. 3, pp. 77-82). Sage CA: Los Angeles, CA: SAGE Publications. Available at: <https://journals.sagepub.com/doi/full/10.1177/1095796018789907> (Accessed 20 Aug. 2019).
- ⁷¹ Blazquez, J., Fuentes-Bracamontes, R., Bollino, C.A. and Nezamuddin, N. (2018) The renewable energy policy Paradox. *Renewable and Sustainable Energy Reviews*, 82, pp.1-5. Available at: <https://www.sciencedirect.com/science/article/pii/S1364032117312546> (Accessed 20 Aug. 19).
- ⁷² Sweeney, S. (2018) The Energy Revolution will not be subsidized. *New Labour Forum*. Available at: <https://journals.sagepub.com/doi/full/10.1177/1095796018789907> (Accessed 20 Aug. 2019).

- ⁷³ Hall, D., van Niekerk, S. and Thomas, J.N., (2013). *Energy Liberalisation, privatisation and public ownership* Public Services International Research Unit (PSIRU). Available at: https://www.world-psi.org/sites/default/files/en_psiro_ppp_final_lux.pdf (Accessed 20 Aug. 2019).
- ⁷⁴ Imperial College Business School (2018) *The dangers of subsidy-free renewable energy* Available at: <https://www.imperial.ac.uk/business-school/knowledge/finance/dangers-subsidy-free-renewable-energy/> (Accessed 5 July 2019).
- ⁷⁵ European Commission (2019) *Renewable energy* Available: <https://ec.europa.eu/energy/en/topics/renewable-energy>. (Accessed 5 July 2019).
- ⁷⁶ European Commission (2019) Commission staff working document. Accompanying the document. Energy prices and costs in Europe. Available at: <https://ec.europa.eu/transparency/regdoc/rep/10102/2019/EN/SWD-2019-1-F1-EN-MAIN-PART-4.PDF> (Accessed 5 July 2019).
- ⁷⁷ Eurostat (2018) Electricity, gas, steam and air conditioning supply statistics - NACE Rev. 2
- ⁷⁸ NACE is the acronym used to designate the various statistical classifications of economic activities developed since 1970 in the EU. NACE provides the framework for collecting and presenting a large range of statistical data according to economic activity in the fields of economic statistics. Statistics produced on the basis of NACE are comparable at European level.
- ⁷⁹ Atzmüller, R. and Hermann, C., 2005. The Liberalisation of Public Services and Its Effects on Employment, Working Conditions and Industrial Relations. *RJ, Final Report. FORBA-Working Life Research Centre*. Available at: https://www.researchgate.net/profile/Christoph_Hermann2/publication/265987427_The_Liberalisation_of_Public_Services_and_Its_Effects_on_Employment_Working_Conditions_and_Industrial_Relations/links/55003e5c0cf28e4ac347ee2e.pdf (Accessed 20 Aug. 19).
- ⁸⁰ ECOTEC (2007) *The employment impact of opening of electricity and gas markets, and of key EU directives in the field of energy* Available at: https://www.epsu.org/sites/default/files/article/files/Summary_report.pdf (Accessed 5 July 2019).
- ⁸¹ Hermann, C. and Flecker, J. (2009) *Privatisation of Public Services and the Impact on Quality, Employment and Productivity (PIQUE) – Final Report. PIQUE*. Available at: https://cordis.europa.eu/docs/publications/1224/122489371-6_en.pdf
- ⁸² European Parliament (2017) *Employment in privatised utilities: A higher risk of precariousness?* Available at: [http://www.europarl.europa.eu/RegData/etudes/STUD/2017/602061/IPOL_STU\(2017\)602061_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2017/602061/IPOL_STU(2017)602061_EN.pdf) (Accessed 5 July 2019).
- ⁸³ European Parliament (2017) *Employment in privatised utilities: A higher risk of precariousness?* Available at: [http://www.europarl.europa.eu/RegData/etudes/STUD/2017/602061/IPOL_STU\(2017\)602061_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2017/602061/IPOL_STU(2017)602061_EN.pdf) (Accessed 5 July 2019).
- ⁸⁴ Pedersini, R (2010), *Changing business landscape and industrial relations in the EU electricity sector*. Eurofound. Dublin. Available at: <https://air.unimi.it/retrieve/handle/2434/231687/306272/Changing%20business%20landscape%20and%20industrial%20relations%20in%20the%20EU%20electricity%20sector%20%28tn1202028s%29.pdf> (Accessed 20 Aug. 19). Hermann, C. and Flecker, J. (eds.) (2012), *Privatization of Public Services: Impacts for Employment, Working Conditions, and Service Quality in Europe*, New York, NY: Routledge. European Parliament (2017) *Employment in privatised utilities: A higher risk of precariousness?* Available at: [http://www.europarl.europa.eu/RegData/etudes/STUD/2017/602061/IPOL_STU\(2017\)602061_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2017/602061/IPOL_STU(2017)602061_EN.pdf) (Accessed 5 July 2019).
- ⁸⁵ ECOTEC (2007) *The employment impact of opening of electricity and gas markets, and of key EU directives in the field of energy*. Available at: https://www.epsu.org/sites/default/files/article/files/Summary_report.pdf (Accessed 5 July 2019).
- ⁸⁶ Birkett, D. (21 August 2017) *Research shows significant increase in outsourcing energy contracts* Available at: <https://www.apolloenergy.co.uk/increase-in-energy-outsourcing> (Accessed 5 July 2019).
- ⁸⁷ ECOTEC (2007) *The employment impact of opening of electricity and gas markets, and of other key EU Directives in the field of energy*. Available at: https://www.epsu.org/sites/default/files/article/files/Summary_report.pdf (Accessed 5 July 2019).
- ⁸⁸ European Parliament (2017) *Employment in privatised utilities: A higher risk of precariousness?* Available at: [http://www.europarl.europa.eu/RegData/etudes/STUD/2017/602061/IPOL_STU\(2017\)602061_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2017/602061/IPOL_STU(2017)602061_EN.pdf) (Accessed 5 July 2019).

- ⁸⁹ Atzmüller, R. and Hermann, C. (2005) The Liberalisation of Public Services and Its Effects on Employment, Working Conditions and Industrial Relations. *RJ, Final Report. FORBA-Working Life Research Centre*. Available at: https://www.researchgate.net/profile/Christoph_Hermann2/publication/265987427_The_Liberalisation_of_Public_Services_and_Its_Effects_on_Employment_Working_Conditions_and_Industrial_Relations/links/55003e5c0cf28e4ac347ee2e.pdf (Accessed 20 Aug. 19).
- ⁹⁰ European Commission (2016) Clean Energy For All Europeans: Available at: https://eur-lex.europa.eu/resource.html?uri=cellar:fa6ea15b-b7b0-11e6-9e3c-01aa75ed71a1.0001.02/DOC_1&format=PDF (Accessed 8 July 2019).
- ⁹¹ European Commission (2016) Clean Energy For All Europeans: Available at: https://eur-lex.europa.eu/resource.html?uri=cellar:fa6ea15b-b7b0-11e6-9e3c-01aa75ed71a1.0001.02/DOC_1&format=PDF (Accessed 8 July 2019).
- ⁹² Bowen, A. et al. (2016) 'Greengrowth' and the new Industrial Revolution. *Grantham Research Institute on Climate Change and the Environment and Global Green Growth Institute*. Available at: <http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2016/01/Bowen-et-al-2016.pdf> (Accessed 8 July 2019).
- ⁹³ ILO (2018) *The transition in play: Worldwide employment trends in the electricity sector*: Available at: https://www.ilo.org/wcmsp5/groups/public/---dgreports/---inst/documents/publication/wcms_625865.pdf (Accessed 8 July 2019).
- ⁹⁴ Markandya, A. et al (2016) Towards a green energy economy? Tracking the employment effects of low carbon technologies in the European Union. *Applied Energy*. Vol. 179. Pp. 1342-1350. Available at: <https://www.sciencedirect.com/science/article/pii/S0306261916302781> (Accessed 20 Aug. 19).
- ⁹⁵ Cameron, L. and van der Zwaan, B. (2015) Employment factors for wind and solar energy technologies: A literature review. *Renewable and Sustainable Energy Reviews*. Vol. 45. Pp160-172. Available at: <https://www.sciencedirect.com/science/article/pii/S1364032115000118> (Accessed 20 Aug. 19).
- ⁹⁶ EurObserv'ER Report (2018) *The state of Renewable Energies in Europe. Edition 2018*. Available at: https://www.isi.fraunhofer.de/content/dam/isi/dokumente/ccx/2019/The_State_of_RES_in_Europe-2018-GB.pdf (Accessed 8 July 2019).
- ⁹⁷ EurObserv'ER Report (2017) *The state of Renewable Energies in Europe Edition 2017*. Available at: <https://www.isi.fraunhofer.de/content/dam/isi/dokumente/ccx/2018/EurObservER-Annual-Overview-2017-EN-1.pdf> (Accessed 8 July 2019).
- ⁹⁸ EurObserv'ER Report (2017) *The state of Renewable Energies in Europe Edition 2017*. Available at: <https://www.isi.fraunhofer.de/content/dam/isi/dokumente/ccx/2018/EurObservER-Annual-Overview-2017-EN-1.pdf> (Accessed 8 July 2019).
- ⁹⁹ The Guardian (30 May 2019) Renewable energy jobs in UK plunge by a third. Available at: <https://www.theguardian.com/environment/2019/may/30/renewable-energy-jobs-in-uk-plunge-by-a-third> (Accessed at 8 July 2019).
- ¹⁰⁰ European Commission (2016) *Clean Energy for All Europeans*. Available at: https://eur-lex.europa.eu/resource.html?uri=cellar:fa6ea15b-b7b0-11e6-9e3c-01aa75ed71a1.0001.02/DOC_1&format=PDF (Accessed at 8 July 2019).
- ¹⁰¹ EurObserv'ER Report (2018) *The state of Renewable Energies in Europe Edition 2018*. Available at: https://www.isi.fraunhofer.de/content/dam/isi/dokumente/ccx/2019/The_State_of_RES_in_Europe-2018-GB.pdf (Accessed 8 July 2019).
- ¹⁰² European Commission (2016) *Clean Energy for All Europeans*. Available at: https://eur-lex.europa.eu/resource.html?uri=cellar:fa6ea15b-b7b0-11e6-9e3c-01aa75ed71a1.0001.02/DOC_1&format=PDF (Accessed 8 July 2019).
- ¹⁰³ EurObserv'ER Report (2017) *The state of Renewable Energies in Europe Edition 2017*. Available at: <https://www.isi.fraunhofer.de/content/dam/isi/dokumente/ccx/2018/EurObservER-Annual-Overview-2017-EN-1.pdf> (Accessed 8 July 2019).
- ¹⁰⁴ EurObserv'ER Report (2018) *The state of Renewable Energies in Europe Edition 2018*. Available at: https://www.isi.fraunhofer.de/content/dam/isi/dokumente/ccx/2019/The_State_of_RES_in_Europe-2018-GB.pdf (Accessed 8 July 2019).
- ¹⁰⁵ EurObserv'ER Report (2018) *The state of Renewable Energies in Europe Edition 2018*. Available at: https://www.isi.fraunhofer.de/content/dam/isi/dokumente/ccx/2019/The_State_of_RES_in_Europe-2018-GB.pdf (Accessed 8 July 2019).
- ¹⁰⁶ Sweeney, S. (forthcoming) The Energy Revolution will not be subsidized. *New Labour Forum*.
- ¹⁰⁷ European Commission (2018) *Commission welcomes political agreement on conclusion of the Clean Energy for All Europeans package*. Available at: http://europa.eu/rapid/press-release_IP-18-6870_en.htm (Accessed 8 July 2019).

- ¹⁰⁸ European Commission (2018) EU coal regions: *Opportunities and challenges ahead*. Available at: <https://core.ac.uk/download/pdf/160035104.pdf> (Accessed 8 July 2019).
- ¹⁰⁹ Galgozi, B. (2019) *Phasing out coal – a just transition approach*. European Trade Union Institute. Available at: <https://www.etui.org/Publications2/Working-Papers/Phasing-out-coal-a-just-transition-approach> (Accessed 8 July 2019).
- ¹¹⁰ Tagliapietra, S. (2017) *Beyond Coal: Facilitating the Transition in Europe*. Available at: http://bruegel.org/wp-content/uploads/2017/11/PB-2017_05_SimoneTagliapietra-1.pdf (Accessed 13 May 2019).
- ¹¹¹ Tagliapietra, S. (2017) *Beyond Coal: Facilitating the Transition in Europe*. Available at: http://bruegel.org/wp-content/uploads/2017/11/PB-2017_05_SimoneTagliapietra-1.pdf (Accessed 13 May 2019).
- ¹¹² Tagliapietra, S. (2017) *Beyond Coal: Facilitating the Transition in Europe*. Available at: http://bruegel.org/wp-content/uploads/2017/11/PB-2017_05_SimoneTagliapietra-1.pdf (Accessed 13 May 2019).
- ¹¹³ Tagliapietra, S. (2017) *Beyond Coal: Facilitating the Transition in Europe*. Available at: http://bruegel.org/wp-content/uploads/2017/11/PB-2017_05_SimoneTagliapietra-1.pdf (Accessed 13 May 2019).
- ¹¹⁴ Regions here refer to Nomenclature of Territorial Units for Statistics (NUTS) 2 regions, which are in the range of the range 800,000-3m population.
- ¹¹⁵ European Commission (2018) *EU coal regions: opportunities and challenges ahead*. Available at: <https://core.ac.uk/download/pdf/160035104.pdf> (Accessed 8 July 2019).
- ¹¹⁶ European Commission (2018) *EU coal regions: opportunities and challenges ahead*. Available at: <https://core.ac.uk/download/pdf/160035104.pdf> (Accessed 8 July 2019).
- ¹¹⁷ Hirst, N. (2018) The role of nuclear electricity in a low-carbon world. Imperial College. Available at: <https://www.imperial.ac.uk/media/imperial-college/grantham-institute/public/publications/briefing-papers/BP24-The-role-of-nuclear-electricity-in-a-low-carbon-world.pdf> (Accessed 8 July 2019).
- ¹¹⁸ Barnham, K. (2015) False solution: Nuclear power is not ‘low carbon’. Available at: <https://theecologist.org/2015/feb/05/false-solution-nuclear-power-not-low-carbon> (Accessed 8 July 2019).
- ¹¹⁹ Hirst, N. (2018) The role of nuclear electricity in a low-carbon world. Imperial College. Available at: <https://www.imperial.ac.uk/media/imperial-college/grantham-institute/public/publications/briefing-papers/BP24-The-role-of-nuclear-electricity-in-a-low-carbon-world.pdf> (Accessed 8 July 2019).
- ¹²⁰ European Parliament (2017) Competition Policy and an Internal Energy Market. Available at: [http://www.europarl.europa.eu/RegData/etudes/STUD/2017/607327/IPOL_STU\(2017\)607327_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2017/607327/IPOL_STU(2017)607327_EN.pdf) (Accessed 8 July 2019).
- ¹²¹ Eurostat Statistics Explained. (2019). *Nuclear energy statistics - Statistics Explained*. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php/Nuclear_energy_statistics (Accessed 8 July 2019).
- ¹²² Eurostat Statistics Explained. (2019). *Nuclear energy statistics - Statistics Explained*. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php/Nuclear_energy_statistics (Accessed 8 July 2019).
- ¹²³ Deloitte (2019) *Nuclear energy – Powering the economy. Economic and Social Impact Report*.
- ¹²⁴ Eurostat Statistics Explained. (2019). *Nuclear energy statistics - Statistics Explained*. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php/Nuclear_energy_statistics (Accessed 8 July 2019).
- ¹²⁵ Deloitte (2019) *Nuclear energy – Powering the economy. Economic and Social Impact Report*.
- ¹²⁶ Deloitte (2019) *Nuclear energy – Powering the economy. Economic and Social Impact Report*.
- ¹²⁷ Economic Report Series (2016) *Powering ahead: How UK industry can match Europe’s environmental leaders*. Available at: https://www.tuc.org.uk/sites/default/files/Powering_Ahead_Report.pdf (Accessed 8 July 2019).
- ¹²⁸ EDF Energy Economic Strategy (2019). *Hinkley Point C Development Consent Order Application*. Available at: <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010001/EN010001-005333-8.16%20Economic%20Strategy%201.pdf> (Accessed 8 July 2019).
- ¹²⁹ Windindustrie-in-deutschland.de. (2019). *Erneuerbare brummen, kein Jobverlust durch Atomausstieg*. Available at: <https://www.windindustrie-in-deutschland.de/fachartikel/erneuerbare-brummen-kein-jobverlust-durch-atomausstieg/> (Accessed 8 July 2019).
- ¹³⁰ IG Metall. (2019). *IG Metall fordert schnellstmöglichen Atomausstieg*. Available at: <https://www.igmetall.de/politik-und-gesellschaft/umwelt-und-energie/ig-metall-fordert-schnellstmoeglichen-atomausstieg> (Accessed 8 July 2019).

- ¹³¹ Reuters. (2018). *France CGT union calls for strike on Dec. 3 to protest energy policy*. Available at: <https://uk.reuters.com/article/uk-france-energy-strike/france-cgt-union-calls-for-strike-on-dec-3-to-protest-energy-policy-idUKKCN1NW1P1> (Accessed 8 July 2019).
- ¹³² ITUC (n.d.) The Just Transition Centre. Available at: <https://www.ituc-csi.org/just-transition-centre> (Accessed 8 July 2019).
- ¹³³ Galgozi, B. (2019) *Phasing out coal – a just transition approach*. European Trade Union Institute. Available at: <https://www.etui.org/Publications2/Working-Papers/Phasing-out-coal-a-just-transition-approach> (Accessed 8 July 2019).
- ¹³⁴ EPSU, IndustriALL, eurelectric. (2017). *Electricity European Social Partners stand up for just energy transition*. Available at: <https://www.epsu.org/sites/default/files/article/files/24.11.2017%20Joint%20PR%20EPSU-IndustriAll-Eurelectric.pdf> (Accessed 8 July 2019).
- ¹³⁵ ETUC. (2019). *A GUIDE FOR TRADE UNIONS Involving trade unions in climate action to build a just transition*. Available at: https://www.etuc.org/sites/default/files/publication/files/20180511-cop21_guide_etuc_2018-web.pdf (Accessed 8 July 2019).
- ¹³⁶ ETUC (October 2018) Spain guarantees a just transition for miners. Available at: <https://www.etuc.org/en/spain-guarantees-just-transition-miners> (Accessed 8 July 2019).
- ¹³⁷ The Guardian (26 October 2018) Spain to close most coalmines in €250m transition deal. Available at: <https://www.theguardian.com/environment/2018/oct/26/spain-to-close-most-coal-mines-after-striking-250m-deal> (Accessed 8 July 2019).
- ¹³⁸ European Commission (May 2016) State aid: Commission clears €2.13 billion aid to alleviate social and economic impact of closing 26 uncompetitive coal mines in Spain. Available at: http://europa.eu/rapid/press-release_IP-16-1910_en.htm (Accessed 8 July 2019).
- ¹³⁹ Sweeney, S. and Treat, J. (2018) Trade Unions and Just Transition. The Search for a Transformative Politics. *Trade Unions for Energy Democracy*. Available at: http://www.rosalux-nyc.org/wp-content/files_mf/tuedworkingpaper11_web.pdf (Accessed 8 July 2019).
- ¹⁴⁰ LSE (2018) *Climate change and the just transition – A guide for investor action*. Available at: <http://www.lse.ac.uk/GranthamInstitute/publication/climate-change-and-the-just-transition-a-guide-for-investor-action> (Accessed 8 July 2019).
- ¹⁴¹ Ituc-csi. (n.d). *International Trade Union Confederation*. Available at: <https://www.ituc-csi.org/just-transition-centre> (Accessed 8 July 2019).
- ¹⁴² Sweeney, S. and Treat, J. (2018) Trade Unions and Just Transition. The Search for a Transformative Politics. *Trade Unions for Energy Democracy*. Available at: http://www.rosalux-nyc.org/wp-content/files_mf/tuedworkingpaper11_web.pdf (Accessed 8 July 2019).
- ¹⁴³ Euractiv (2018) *Energy poverty hinders EU push to end regulated electricity prices*. Available at: <https://www.euractiv.com/section/electricity/news/energy-poverty-hinders-eu-push-to-end-regulated-electricity-prices> (Accessed 8 July 2019).
- ¹⁴⁴ European Commission (2016) *Clean Energy For All Europeans*. Available at: https://eur-lex.europa.eu/resource.html?uri=cellar:fa6ea15b-b7b0-11e6-9e3c-01aa75ed71a1.0001.02/DOC_1&format=PDF (Accessed 8 July 2019).
- ¹⁴⁵ Euractiv (2018) *Energy poverty hinders EU push to end regulated electricity prices*. Available at: <https://www.euractiv.com/section/electricity/news/energy-poverty-hinders-eu-push-to-end-regulated-electricity-prices> (Accessed 8 July 2019).
- ¹⁴⁶ EPSU (20 December 2019) Regulated prices remain in the toolbox to protect Europeans from market failure. Available at: <https://www.epsu.org/article/regulated-prices-remain-toolbox-protect-europeans-market-failure>
- ¹⁴⁷ Sweeney, S. and Treat, J. (2017) *Preparing the Public Pathway*. *Trade Unions for Energy Democracy*. Available at: http://www.rosalux-nyc.org/wp-content/files_mf/tuedworkingpaper10.pdf (Accessed 8 July 2019).
- ¹⁴⁸ Hall, D. (2015) *Why Public-Private Partnerships don't work. The many advantages of the public alternative*. Available at: <https://www.psisu.org/sites/default/files/2015-03-PPP-WhyPPPsdontworkEng.pdf> (Accessed 8 July 2019).
- ¹⁴⁹ Labour (2019) *Bringing Energy Home*. *Labour's proposal for publicly owned energy networks*. Available at: <https://www.labour.org.uk/wp-content/uploads/2019/03/Bringing-Energy-Home-2019.pdf> (Accessed 8 July 2019).
- ¹⁵⁰ Küfeoğlu, S. et al (2018) *Electric Power Distribution in the World: Today and Tomorrow*. Available at: https://www.bennettinstitute.cam.ac.uk/media/uploads/files/Electric_power_distribution.pdf (Accessed 8 July 2019).

- ¹⁵¹ Euractiv. (2018). *China set to fully control Portugal's power grid amid Europe's inertia*. Available at: <https://www.euractiv.com/section/eu-china/news/china-set-to-fully-control-portugals-power-grid-amid-europes-inertia/> (Accessed 8 July 2019).
- ¹⁵² Financial Times (2017) *UK electricity and gas making 'unjustified' profits*. Available at: <https://www.ft.com/content/cd179a4e-6629-11e7-8526-7b38dcaef614> (Accessed 8 July 2019).
- ¹⁵³ The Guardian. (2017). *Energy networks' £7.5bn windfall 'should be returned to consumers'*. Available at: <https://www.theguardian.com/business/2017/jul/12/energy-networks-consumers-electricity-gas-national-grid> (Accessed 8 July 2019).
- ¹⁵⁴ BBC (2019) *Labour unveils National Grid takeover plan*. Available at: <https://www.bbc.co.uk/news/business-48286563> (Accessed 8 July 2019).
- ¹⁵⁵ Cornwall Insight (2018) *Energy Spectrum, 602*. Available at: https://www.cornwall-insight.com/uploads/Energy%20Spectrum/180122_es_602.pdf (Accessed 8 July 2019).
- ¹⁵⁶ Labour (2019) *Bringing Energy Home. Labour's proposal for publicly owned energy networks*. Available at: <https://www.labour.org.uk/wp-content/uploads/2019/03/Bringing-Energy-Home-2019.pdf> (Accessed 8 July 2019).
- ¹⁵⁷ EPSU. (2014). *Slovenian Unions protest against privatisation of electricity*. Available at: <https://www.epsu.org/article/slovenian-unions-protest-against-privatisation-electricity> (Accessed 8 July 2019).
- ¹⁵⁸ Agen-rs.si. (2017) *Report on the energy sector in Slovenia*. Available at: <https://www.agen-rs.si/documents/54870/68629/a/78f74b68-dbf6-415e-ab88-882652558d94> (Accessed 8 July 2019).
- ¹⁵⁹ UNISON (2019) *Power to the People. How to achieve zero emissions through public ownership of the retail operations of the big six*. Available at: <https://www.unison.org.uk/news/2019/06/nationalise-big-six-create-green-army-help-uk-hit-net-zero-says-unison/> (Accessed 8 July 2019).
- ¹⁶⁰ Guardian (2015) *Robin Hood Energy: Nottingham launches not-for-profit power firm* Available at: <https://www.theguardian.com/environment/2015/sep/07/robin-hood-energy-nottingham-council-launches-not-for-profit-energy-company> (Accessed 8 July 2019).
- ¹⁶¹ Department of Energy and Climate Change (2016) *Annual Fuel Poverty Statistics Report*. available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/637430/Annual_Fuel_Poverty_Statistics_Report_2016_-_revised_26.04.2017.pdf (Accessed 8 July 2019).
- ¹⁶² Department of Energy and Climate Change (2016) *Annual Fuel Poverty Statistics Report*. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/637430/Annual_Fuel_Poverty_Statistics_Report_2016_-_revised_26.04.2017.pdf (Accessed 8 July 2019).
- ¹⁶³ Department of Energy and Climate Change (2016) *Annual Fuel Poverty Statistics Report* Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/637430/Annual_Fuel_Poverty_Statistics_Report_2016_-_revised_26.04.2017.pdf (Accessed 8 July 2019).
- ¹⁶⁴ Department for Business, Energy and & Industrial Strategy (2017) *Sub-regional fuel poverty data*. Available at: <https://www.gov.uk/government/statistics/sub-regional-fuel-poverty-data-2017> (Accessed 8 July 2019).
- ¹⁶⁵ National Grid UK (2019) *Networks and assets*. Available at: <https://www.nationalgrid.com/uk/about-grid/our-networks-and-assets> (Accessed 8 July 2019).
- ¹⁶⁶ Robin Hood Energy (n.d.) *What a year!* Available at: www.robinhoodenergy.co.uk/news/what-a-year/ (Accessed 8 July 2019).
- ¹⁶⁷ Robin Hood Energy (2019) *What fuels are used to generate my electricity?* Available at: <https://robinhoodenergy.co.uk/home-help/fuels-used-generate-electricity/> (Accessed 8 July 2019).
- ¹⁶⁸ BBC (2017) *Council-owned Bristol Energy aims to be in profit by 2021*. Available at: <http://www.bbc.co.uk/news/uk-england-bristol-39803173> (Accessed 8 July 2019).
- ¹⁶⁹ Bristol Energy (n.d.) *About us*. Available at: <https://www.bristol-energy.co.uk/about-us/our-fuel-mix> http://www.energy-cities.eu/IMG/pdf/local_energy_ownership_study-energycities-en.pdf
- ¹⁷⁰ Bristol Energy (2019) *Our fuel mix*. Available at: <https://www.bristol-energy.co.uk/about-us/our-fuel-mix> (Accessed 8 July 2019).
- ¹⁷¹ Agerholm, H. (2017) *London gets 'first not-for-profit energy provider in more than 100 years'*. Available at: <http://www.independent.co.uk/news/uk/politics/london-islington-council-energy-provider-not-for-profit-a8007136.html> (Accessed 8 July 2019).

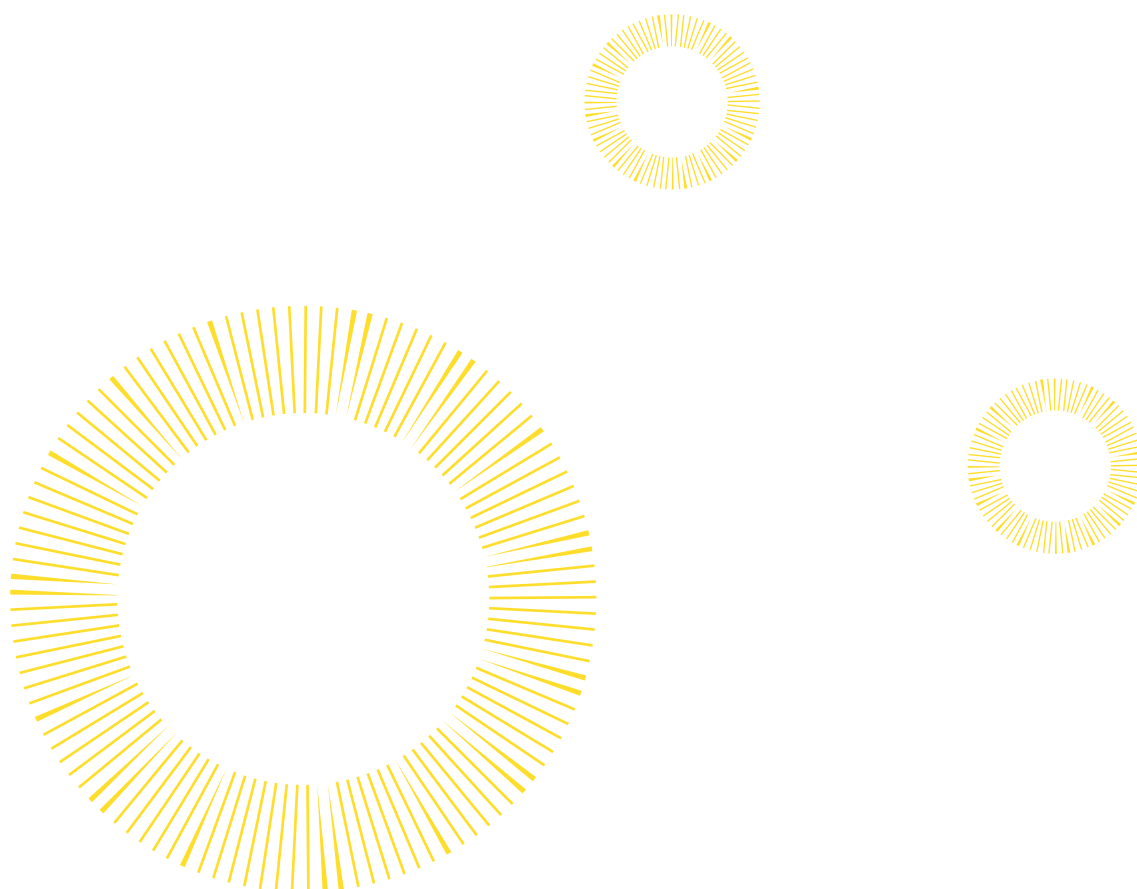
- ¹⁷² Robin Hood Energy (n.d.) *What a year!* Available at: <https://robinhoodenergy.co.uk/news/what-a-year> (Accessed 8 July 2019).
- ¹⁷³ Robin Hood Energy (n.d.) *What a year!* Available at: <https://robinhoodenergy.co.uk/news/what-a-year> (Accessed 8 July 2019).
- ¹⁷⁴ Vaughan, A. (2017) *Publicly owned energy minnows take on big six in troubled UK market*. Available at: <https://www.theguardian.com/business/2017/oct/27/publicly-owned-energy-minnows-take-on-big-six-in-troubled-uk-market> (Accessed 8 July 2019).
- ¹⁷⁵ Scottish Housing News (2017) *Not for profit energy supplier ignites fight against fuel poverty in Scotland*. Available at: <http://www.scottishhousingnews.com/19116/not-profit-energy-supplier-ignites-fight-fuel-poverty-scotland/> (Accessed 8 July 2019).
- ¹⁷⁶ 173 UNISON (2018) *Municipal energy companies* Available at: <https://www.unison.org.uk/motions/2018/energy/municipal-energy-companies/> (Accessed 22 August 2019).
- ¹⁷⁷ Labour energy forum (2017) *Who owns the wind, owns the future*. Available at: https://labourenergy.org/wp-content/uploads/2017/08/Who-owns-the-wind_2017_Labour-Energy-Forum.pdf (Accessed 8 July 2019).
- ¹⁷⁸ Hall, D. (2015) *Why Public-Private Partnerships don't work. The many advantages of the public alternative*. Available at: <https://www.psir.org/sites/default/files/2015-03-PPP-WhyPPPsdontworkEng.pdf> (Accessed 8 July 2019).
- ¹⁷⁹ Labour energy forum (2017) *Who owns the wind, owns the future*. Available at: https://labourenergy.org/wp-content/uploads/2017/08/Who-owns-the-wind_2017_Labour-Energy-Forum.pdf (Accessed 8 July 2019).
- ¹⁸⁰ IPPR. (2015). *When the levy breaks Energy bills, Green levies, and a fairer low-carbon transition*. Available at: https://www.ippr.org/files/publications/pdf/when-the-levy-breaks_Jun2015.pdf (Accessed 8 July 2019).
- ¹⁸¹ Die Welt (2017) *Das sind die dunklen Seiten des deutschen Atomfonds*. Available at: <https://www.welt.de/wirtschaft/article166191067/Das-sind-die-dunklen-Seiten-des-deutschen-Atomfonds.html> (Accessed 8 July 2019).
- ¹⁸² Danish Energy Agency (2016) *The Danish Energy Model*. Available at: https://ens.dk/sites/ens.dk/files/Globalcooperation/the_danish_energy_model.pdf (Accessed 8 July 2019).
- ¹⁸³ European Committee of the Regions (2018) *Models of Local Energy Ownership and the Role of Local Energy Communities in Energy Transition in Europe*. Available at: <https://cor.europa.eu/en/engage/studies/Documents/local-energy-ownership.pdf> (Accessed 8 July 2019).
- ¹⁸⁴ Energinet (N.D). *About us*. Available at: <https://en.energinet.dk/About-us> (Accessed 8 July 2019).
- ¹⁸⁵ European Committee of the Regions. (2018). *Models of Local Energy Ownership and the Role of Local Energy Communities in Energy Transition in Europe*. Available at: <https://cor.europa.eu/en/engage/studies/Documents/local-energy-ownership.pdf> (Accessed 8 July 2019).
- ¹⁸⁶ Markman, J. (2019). *Amazon And Google Launch Secret Plot To Power Your Home*. *Forbes*. Available at: <https://www.forbes.com/sites/jonmarkman/2019/02/27/amazon-and-google-launch-secret-plot-to-power-your-home/#5e643c676aa8> (Accessed 8 July 2019).
- ¹⁸⁷ Public Sector Services (n.d) *Local and Regional Government/Municipal sector*. Available at: <http://www.world-psi.org/en/issue/local-and-regional-governmentmunicipal-sector> (Accessed 8 July 2019).
- ¹⁸⁸ Becker, S. (2017). *Our City, Our Grid: The energy remunicipalisation trend in Germany*. In: Kishimoto, S. and Petitjean, O. *Reclaiming Public Services*. p. 117. Available at: https://www.epsu.org/sites/default/files/article/files/Reclaiming%20public%20services%20EN_0.pdf (Accessed 21 Aug. 2019).
- ¹⁸⁹ Hall, D. (2016). *Public ownership of the UK energy system – benefits, costs and processes*. Available at: <https://www.psir.org/sites/default/files/2016-04-E-UK-public.pdf> (Accessed 8 July 2019).
- ¹⁹⁰ Becker, S. (2017). *Our City, Our Grid: The energy remunicipalisation trend in Germany*. In: Kishimoto, S. and Petitjean, O. *Reclaiming Public Services*. p. 117. Available at: https://www.epsu.org/sites/default/files/article/files/Reclaiming%20public%20services%20EN_0.pdf (Accessed 21 Aug. 2019).
- ¹⁹¹ Hamburg Energie. (N.D) *Wir sind partner fuer die Energiewende*. Available at: <https://www.hamburgenergie.de/privatkunden/ueber-uns/unternehmen/> (Accessed 8 July 2019).
- ¹⁹² Unser Hamburg unser Netz (n.d.) *Die Akteure*. Available at: <http://unser-netz-hamburg.de/die-initiative/akteure/> (Accessed 8 July 2019).
- ¹⁹³ Kishimoto, S. and Petitjean, O. eds., (2017). *Reclaiming public services: How cities and citizens are turning back privatisation*. Amsterdam: Transnational Institute.

¹⁹⁴ Interview with Verdi on the 31.05.2018, conducted by Vera Wegmann

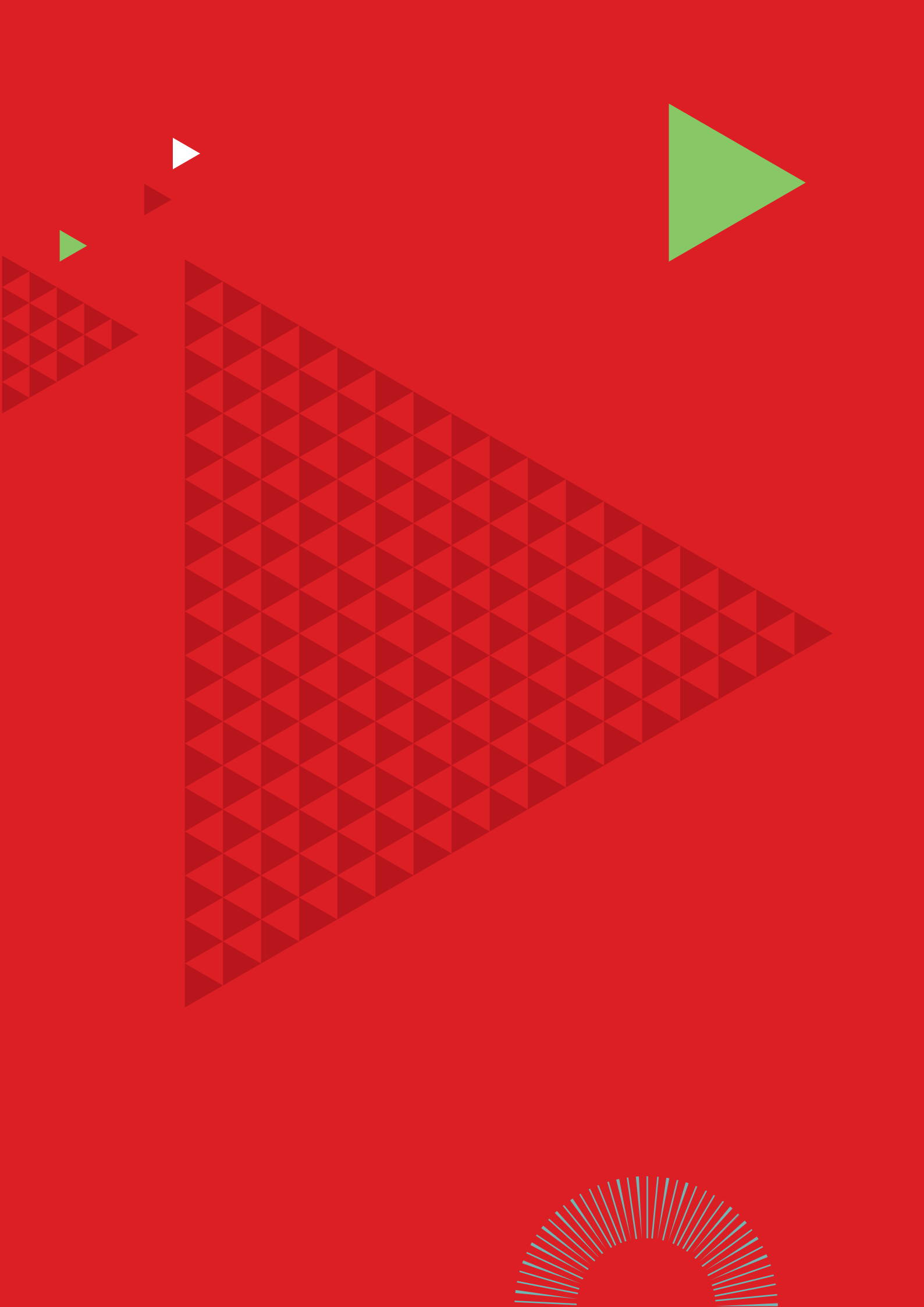
¹⁹⁵ Stomnetz Hamburg (2014) *Stromverteilung bleibt in staedischer Hand*. Available at: <https://www.stromnetz.hamburg/stromverteilung-bleibt-staedischer-hand/> (Accessed 8 July 2019).

¹⁹⁶ NDR (2019) Einigung steht: Ab 2030 Fernwaerme ohne Kohle. Available at: <https://www.ndr.de/nachrichten/hamburg/Einigung-Ab-2030-Fernwaerme-ohne-Kohle,kohle178.html> (Accessed 8 July 2019).

¹⁹⁷ Sweeney, S. and Treat, J. (2018) Trade Unions and Just Transition. The Search for a Transformative Politics. *Trade Unions for Energy Democracy*. Available at: http://www.rosalux-nyc.org/wp-content/files_mf/tuedworkingpaper11_web.pdf (Accessed 8 July 2019).









EPSU is the European Federation of Public Service Unions. It is the largest federation of the ETUC and comprises 8 million public service workers from over 260 trade unions across Europe. EPSU organises workers in the energy, water and waste sectors, health and social services and local, regional and central government, in all European countries including the EU's Eastern Neighbourhood. It is the recognised regional organisation of Public Services International (PSI). For more information please go to: www.epsu.org

