How energy was commodified, and how it could be decommodified

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Introduction

This paper aims to contribute to discussion about prospects for transforming energy production and use. The starting-point is that not only do the technological systems that use energy need to be transformed, in order to avert dangerous climate change, but that such a transformation will be achieved most successfully as part of a movement towards a post-capitalist society.

Commodification matters, first, because it is one of the ways that capitalism has shaped existing technological systems that use energy. Second, because a movement towards post-capitalism would, by destroying the social relations of which commodification is part, put an end to commodification. By thinking about the role commodification plays now, we will better be able to imagine ways of superseding it and the social relations of which it is part. This, in turn, will help us better to envisage what sort of energy use we want, to supersede what we have now.

The paper discusses (i) the history of the commodification of energy, (ii) the present situation and (iii) the future, and the possibility of decommodification. First, here are some points about how I define "energy" and "commodity".

To a physicist, energy is usually the "ability to do work", a definition that includes human and animal labour power. That definition may be too broad for people, including me, writing about energy in its social context. I describe labour as labour, and define energy as *work done by physical or chemical resources, mobilised by people for that purpose*.[2] This "work" might include running a power station, providing motive force for a car or airplane, or warming a room. Fossil fuels, non-fossil energy sources including solar radiation and wind, and manufactured forms of energy including electricity are often described as energy carriers, i.e. physical phenomena that carry within themselves this "ability to do work".

Commodification has influenced the ways that energy and energy carriers are defined, because many people – including, but not only, politicians and economists – refer to "energy" as something that is being, or even must be, bought and sold. Actually, that buying and selling is very recent in historical terms, became systematised even more recently, and is still not ubiquitous, as I discuss below. This use of the term "energy" tends not only to disguise the fact that energy is taken by humans from our natural surroundings, but also to obscure the distinctions between its different forms.

In the late 20th century, as commodified energy systems became more complex and concerns about them became central to environmentalism, researchers distinguished: *primary energy* (e.g. coal, oil or sunlight); *final energy* (e.g. electricity or heat produced from coal or gas, gasoline refined from oil); *useful energy* (e.g. electricity for a factory, heat from a stove, the

[1] I presented a version of this paper at the Energising Political Ecology session of the on-line conference of POLLEN (Political Ecology Network) in September 2020. I thank the participants, and especially Siddharth Sareen and Stefan Bouzarovski who organised the session. I also thank Gavin Bridge and Les Levidow, who commented on a draft. All the opinions expressed, and any mistakes, are mine alone. I welcome comments and correspondence to simonpirani[at]gmail.com

[2] This is close to the *Oxford Dictionary* definition of energy as "the means of doing work by utilising matter or radiation". See also Simon Pirani, *Burning Up: a global history of fossil fuel consumption* (London: Pluto, 2018), p. 4

movement of a vehicle burning gasoline); and, finally, *energy services* (the use of the factory tools powered by electricity, the cooking of food, the vehicle getting from place to place).

The concept of *energy services* was proposed in 1972 by Warren Devine, an advocate of solar power, as a means of focusing on energy-efficient ways to deliver the end uses that were assumed by the consensus to require complex fossil-fuelled systems.[3] Devine used the term to make transparent the way that energy systems worked, but, as it has come into mainstream use, energy services has taken on meanings shaped by economics. Too often, energy services are seen as an immutable and unquestionable quantity of energy required for economically-defined purposes, rather than as a means to question the logic of economic activity. Socially critical analysis needs to acknowledge that energy services, a valid term for technological analysis, includes the whole gamut of uses of energy, from those uses that meet human need, to a horrific array of anti-human and/or alienated uses produced by late capitalist society.[4]

So, to early 21st century city people, gas for a stove, electricity for a factory or fuel for a vehicle is presented as "energy" ... that needs to be paid for. This false representation is a function of commodification. In considering this, Karl Marx's focus on "commodity fetishism" remains useful. He believed that social relations between people were presented to them in "the fantastic form of a relation between things". This was truly weird, he argued; an analogy could only be found in "the mist-enveloped regions of the religious world".[5] In particular, he had in mind the social process of labour: people work together to make things, but the outcome is presented to them not as a relationship between themselves, but as a relationship between products (commodities). Moreover, the labour power that people expend itself gets commodified, i.e. sold by workers and bought by employers.[6] The social processes and interactions with nature that bring gas to a stove or electricity for a factory are reduced to, and obscured by, cash payments. This view of commodities, as imbued with all the social relations produced historically by capital, is wider than the definition, predominant in economics, of commodities simply as articles that can be bought and sold.[7]

Central to Marx's view of commodity fetishism was that it obscured the contradiction between a commodity's use value, and its exchange value in markets. This mystification persists in energy research today: the idea of "energy demand" elides the need for energy services (the need for a use value) with the economist's concept of demand for a commodity. Looking at how energy was commodified in the first place may help us to unpick this.

The past

For thousands of years, the main sources of energy for agriculture and industry were the muscle power of domesticated animals and of humans themselves. This was supplemented by

[3] W.D. Devine, "Energy accounting for solar and alternative energy sources", in: T. Nejat Veziroglu, *Alternative Energy Sources II. Volume 9. Conservation, Economics and Policy* (London: Hemisphere, 1981), pp. 3815-3844; Daniel Spreng, *Net-Energy Analysis* (New York: Praeger, 1988); Pirani, *Burning Up*, p. 27

[4] By uses "for human need" I mean e.g. to prepare meals, light rooms, etc, and by "anti-human and/or alienated" e.g. production and use of military jets, luxury villas and products of planned obsolescence. Of course there is a huge grey area in between, that can be disentangled only with a series of value judgments. This is touched on below (The future. Question 1), but a detailed discussion would be the subject of another article

[5] Karl Marx, *Capital*, vol. 1, Chapter 1, section 4

[6] Karl Marx, *Capital*, vol. 1, Chapter 6

[7] The *Oxford Dictionary* defines a commodity as "an article or raw material that can be bought and sold, especially as a product as opposed to a service", or, separately, as "a useful thing". Another example: a commodity is "an article of commerce or a product that can be used for commerce" (Scott Barrie, *The Complete Idiot's Guide to Options and Futures* (New York: Penguin, 2002), p. 278)

energy that humans took from their natural surroundings with relatively simple technologies such as windmills and water wheels. Energy carriers such as wood and coal were collected by users and, with the growth of markets and urbanisation, began to be bought and sold.

For these energy carriers to become commodities, it was necessary not only for the capitalist mode of economic activity to appear, but for it to become dominant in some countries, as it did in the 18th and 19th centuries. Capital's accumulation and expansion drove social and technological changes. Labour power was commodified. In industry, the big shift was from water and wood power to coal and steam, in Britain in the late 18th century and more widely in Europe and north America in the early 19th century. As factory-based wage labour spread, urbanisation, which had been underway for centuries, accelerated. This cut people off from the natural surroundings from which they had once accessed energy. Energy carriers were then supplied commercially to townspeople.[8] All these processes turned coal, wood and other fuels into commodities. Through the 19th century, the technological systems that used these fuels became more firmly embedded in economic systems (finance capital) and social systems (class exploitation, imperialist domination) that characterised capitalism. Thermodynamics and other ideas about energy systems developed by the ruling elite normalised and excluded from analysis these social and economic relations.[9]

The "second industrial revolution" of the late 19th century produced two significant new technologies: electricity production and networks; and, a couple of decades later, oil for motor transport. Oil would become the quintessential commodity. Electricity, on the other hand, would become a battleground, between corporations who sought to market it as a commodity, and local and national governments who sought to provide it as a service. In the course of these battles, socialists – from Fabians who saw municipal services as "embryos of the collectivist state" to anarchists who saw it as a bulwark for superseding the state – looked to electricity, if freed from capitalist control, as a technology with powerful potential to improve people's lives. But it was not only anti-capitalist forces that favoured state provision of electricity: no other industry except railways was anywhere nearly so capital-intensive, and it was widely believed that the state should provide electrical infrastructure in order to support economic development.[10]

The provision of electricity as a state service in the UK, the most urbanised country in the world in the late 19th century, is attributed by Ellen Leopold and David McDonald to "municipal enterprise", that was itself a product of public health policy. While some municipal services were bought and sold, services such as gas and water were paid for collectively through rates rather than by individual transactions. Municipal government appropriated powers of private enterprise in a potentially profitable area. In the UK, electricity was mostly provided by municipalities from its inception in the 1880s until 1948, when it was nationalised. Municipal provision was predominant in continental Europe, too. (Note that electricity or gas, provided as a service, stopped being treated as commodities in the narrow, economists' sense, while the challenge to commodification, in Marx's sense, was a limited one.) In the USA, by contrast, electricity provision was initially dominated by private corporations, who were interested mainly in supplying paying (industrial and

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[8] Pirani, *Burning Up*, Chapter 1; David Nye, "Consumption of Energy", in F. Trentmann (ed.), *Oxford Handbook of the History of Consumption* (Oxford: Oxford University Press, 2012), pp. 307-325., pp. 310-311

[9] Larry Lohmann and Nick Hildyard, *Energy, Work and Finance* (The Corner House, 2014); Matthew Huber, "Energizing Historical Materialism: fossil fuels, space and the capitalist mode of production", *Geoforum* 40 (2008), pp. 105-115. On thermodynamics and other ideas about energy, see: Cara New Daggett, *The Birth of Energy: fossil fuels, thermodynamics and the politics of work* (Durham: Duke University Press, 2019).

[10] William Hausman, Peter Hertner and Mira Wilkins (eds.), *Global Electrification* (Cambridge: Cambridge University Press, 2008), especially pp. 18-24

residential) urban customers; it took the 1929 economic crash to produce state-financed rural electrification and to advance publicly-owned utilities. In the post-second-world-war boom, outside the USA – not only in Europe, but also in parts of the global south where urban electrification had begun – the international trend was towards nationalisation.[11]

The present[12]

During the late 20th and early 21st centuries, the trade of energy carriers as commodities expanded to become a globally dominant system. As a result of the disputes over oil prices between consumer and producer nations in the 1970s, bilateral contracts for oil, the largest-volume energy commodity, were largely superseded by market trading. Larger proportions of gas, coal and uranium, too – as well as metals and minerals that are not energy carriers – were traded across borders and on markets supported by increasingly complex financial instruments. From the 1980s, energy commodities were central to so-called globalisation and financialisation.

All this was part of the deep-going changes in capitalism, including the ever-widening commodification not only of industrial labour and domestic labour, but also of "culture, free time, illness, education, sex and even death", as some Marxist writers saw it. By the turn of the century, others wrote of "new enclosures" by which commodification spread both geographically and into areas of life previously outside its sway.[13] Ultimately, commodification was and is a battleground.

Electricity provision was an example of this. State-financed electrification, pioneered in the 1920s by the Soviet Union, became from the mid 20th century a watchword of "development" in China, India and across the global south. From the 1990s, with the adoption by leading capitalist nations and the international financial institutions of the "Washington consensus", there was a concerted drive to privatise electricity provision. Attempts, hugely damaging but mostly unsuccessful over time, were made by the IFIs and multinational corporations to impose the neoliberal "standard model" of privatisation and "market liberalisation" on countries outside the rich world. Very often, after the neoliberal offensive, fossil-fuelled power stations owned by the multinationals sold electricity to poorer countries' state- or municipal-owned utilities, who sold it at lower prices to industry and households, with the state bearing the losses.

The conflicts were not limited to electricity. Oil products, too, were bought by many government-owned companies at world market prices, and resold to households at a loss. From the late 1990s, energy commodities often had a central place in the struggle between working populations and governments over living standards. After the Asian financial crash of 1997, governments' IFI-supported attempts to raise the prices of e.g. diesel, cooking oil

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[11] Ellen Leopold and David McDonald, "Municipal socialism then and now: some lessons for the global south", *Third World Quarterly* 33:10 (2012), pp. 1837-1853; David Nye, *Electrifying America* (New York: MIT Press, 1990); Richard Rudolph and Scott Ridley, *Power Struggle* (New York: Harper & Row, 1986); Hausman et al, *Global Electrification*

[12] This section summarises and develops points covered in Pirani, *Burning Up*, especially chapters 7, 9 and 12.

[13] The quotation is from Ernesto Laclau and Chantal Mouffe, *Hegemony and Socialist Strategy* (London: Verso, 1985). The effect of Fordism, they wrote, was "to transform society into a vast market in which new needs were ceaselessly created, and in which more and more of the products of human labour were turned into commodities. This 'commodification' of social life destroyed previous social relations, replacing them with commodity relations through which the logic of capitalist accumulation penetrated into increasingly numerous spheres". On "new enclosures", see Midnight Notes Collective, "The New Enclosures" (reprinted from *Midnight Notes* no. 10, 1990), and Werner Bonefeld, "The Permanence of Primitive Accumulation: commodity fetishism and social constitution", in *The Commoner*, no. 2 (September 2001) http://libcom.org/library/commoner-2-enclosures-mirror-image-alternatives

and electricity, produced strikes and riots; several governments fell as a result. In the former Soviet Union, the onslaught on working people's living standards during the 1990s slump was balanced by the continued provision of cheap gas and electricity; even in the 2010s, post-Soviet governments hesitated to tamper with these. In South Africa, where the black population had been systematically deprived of electricity access under apartheid, attempts from the 1990s to provide it on a commercial basis led to widespread resistance and demands that the service provision model be adopted. And in newly-urbanising areas across the global south, electricity companies found themselves in conflict with shanty-town dwellers in particular, and urban residents in general, over payment for electricity. Time and again, the companies faced resistance, based on the perception that electricity was a right for which people believed they should not have to pay – a manifestation of what what E.P. Thompson called "moral economy".[14]

The new waves of commodification were always contested and constrained. The commodified energy markets were, and are, far from all-embracing. In 2018 the IEA and other international agencies counted 789 million people who had no access to electricity. A further 2 billion had no access to clean cooking fuels and technologies (i.e. they cook with biomass, charcoal or, in some cases, coal).[15] There are major caveats: primarily, that many people counted as having electricity access, certainly hundreds of millions, actually have only irregular and/or limited supplies. Nevertheless, these numbers indicate the limits to the commercial markets in energy carriers, and, in that sense, to commodification. Those counted as being without electricity – more than one-tenth of the world population – mostly in rural areas in poorer countries, may sometimes pay somebody for fuels, but are essentially living outside the commodified energy system. The 2 billion who have (some) electricity access but can not afford e.g. gas, kerosene or electricity to cook – more than one-third of the world population – give us a rough indication of the numbers living on the edges of that system.

The future

Society is at the beginning of a transition away from fossil-fuel-based technological systems. There are dystopian scenarios in which global warming, constraints on natural resources, etc, will force a collectively paralysed society to change. For the purposes of this discussion, I discount these. It is far more likely that collectively – and notwithstanding the resistance of political and economic elites – we will act. People already are acting.[16] I also assume that to move away from fossil-fuel-based systems most effectively will mean challenging, controlling, combating and/or superseding capitalism. Here I argue that the concept of decommodification can help us work out effective actions to take. This is presented in the form of three questions.

Question 1: energy conservation

Should social and labour movements focus more consistently on energy conservation, by means of changing technological, social and economic systems, as the priority in dealing

[14] E.P. Thompson, "The Moral Economy of the English Crowd in the Eighteenth Century", *Past and Present* 50 (1971), pp. 76-136

[15] IEA et al, *Energy Progress Report* 2020, p. 15 and p. 43

[16] See also Pirani, *Burning Up*, chapter 12, especially pp. 181-185

with global warming?Does rejecting the analytical frameworks of commodification help in this?

My answer to both parts of the question is, yes. We need to move from our current state, in which we live with technological systems largely dependent on fossil fuels, to a zero-carbon or near-zero-carbon state. In terms of technologies, there are four overlapping ways to do this: (1) reducing the amount of energy services provided (e.g. by not making unnecessary work-related journeys, not making and using plastic packaging, not making and using military jets); (2) reducing the amount of final energy needed to provide energy services (e.g. by insulating buildings to reduce heat demand, or substituting SUVs with bicycles); (3) reducing conversion losses in technological systems (e.g. by reorganising electricity networks, reducing waste in steel making, etc); and (4) replacing systems dependent on fossil fuels with systems powered by renewable sources (most obviously, but not only, electricity networks).

Given the threat that global warming poses, we can assume that all these methods will have to be used. The question of which of these methods should be prioritised, and how, is highly politically contentious. Populationists argue for reducing the amount of energy services by reducing the number of human beings; defence ministries, for cutting anything but military jets. Car manufacturers argue for reducing final energy demand by substituting SUVs not with bicycles but with electric SUVs. Oil companies argue for replacing fossil fuels, but not too soon. And so on. Usually, these arguments are underpinned by references to the "need" for "economic growth". All this reflects relationships of wealth and power. In opposition to these arguments, it is common ground among many socialist writers and degrowth scholars that drastic, systemic change is needed, that will not only expand the production of energy from non-fossil sources, but also transform the way that energy is consumed.

The obscuring power of energy-as-commodity plays a role here. The potentials of (1), (2) and (3) are often bundled together under the label "demand reduction", with the implicit assumption that energy needs to be understood as a market, governed by laws of supply and demand. This analytical framework is wrong: it assumes that demand, implicitly by individuals, is the main driver of fuel consumption, stripping out the social and economic processes that underpin the technological systems. Using this approach, researchers very often bundle together energy at different stages of conversion (e.g. crude oil, the gasoline produced from it, and the motion caused by burning the gasoline); this obscures the potential for energy conservation in technological systems (broadly, (2) and (3) above). In public discussion, "demand reduction" is often misunderstood as being about reducing the amount of energy services provided (i.e. (1) above) – and always those provided to ordinary citizens, rather than e.g. to manufacturers and users of military jets.

Another way in which the idea of energy-as-commodity mystifies the issues is that it assumes a commodity ("energy"), of which "the economy" needs a fixed amount. Much discussion on global warming is then diverted to the issue of technological means to "produce energy", including the substitution of fossil fuels by renewable sources as primary energy sources.

Such substitution is indeed necessary, if we assume that electricity generation will be a central element in future energy provision. There are many reasons to believe that electricity use might increase, even if total energy use falls, because electricity produced from renewables may be used to substitute not only for fossil-fuel-produced electricity, but for fossil fuels used in other ways (e.g. for transport or for industrial processes). But the narrative now dominant among politicians and energy corporations, that a straight swap from fossil fuels to renewables will satisfactorily resolve a large part of the global warming problem, is false. Expanding renewables, on the scale implied by mainstream narratives, without

producing fresh crises e.g. in minerals supply may be difficult; to do so under capitalism, without reproducing and exacerbating the neocolonialist relations that underlie oil and gas markets, may be impossible.[17]

Another point often obscured by focusing on the switch from fossil fuels to renewables for electricity generation is that most fossil fuel use is not for electricity generation in the first place. Less than one fifth of global final consumption of energy, as measured by the IEA,[18] comes in the form of electricity – compared to one tenth from coal, four tenths from oil and about one sixth from gas. Biofuels used in poor countries, outside the commercial energy structures, account for about one-tenth. Of the electricity, less than 7% is generated from new renewables, one sixth from hydro and one tenth from nuclear; the other two thirds is from fossil fuels.[19]

Politicians are often pleased to report the progress – in some countries, very real progress – in switching electricity generation to renewables. But they have less to say e.g. about the direct consumption of gas – mostly for heating urban buildings, which can be retrofitted, using technology that has existed for decades, to reduce the final energy requirement to nearly zero, and where necessary fitted with electric heat pumps, incorporated into district heating systems, and so on. As for the oil-dependent urban transport systems that account for a mammoth share of final energy consumption, the politicians talk about electric vehicles, stepping around the realities that these may not reduce the carbon footprint of urban transport at all, unless and until renewables are supplying not only 100% of current electricity demand, but the additional demand from the EVs too.

On what basis can social and labour movements develop strategies that effectively oppose these false approaches? I suggest that, first, we need to see commodified energy as something that has emerged in the context of capitalist social relations; it is not the natural or only form of energy provision – any more than commodified labour is the natural or only form of creative human activity. Long before commodification, humans began to access means of heat, light, motive power, etc, from nature; today, we can again aspire to accessing energy from nature not as a commodity, but in order to meet human needs. Decommodification opens up the prospect of moving away from the fossil-fuel-dominated technological systems of the present, that serve the needs of capital, to new technological systems fashioned to meet human need.

Envisaging the future in this way can inform discussion about the near-term strategy of social and labour movements, in the face of the urgent need to reduce fossil fuel consumption. Against calls by capital for techno-fixes, and for undifferentiated "demand reduction", we may develop strategies based on living better, while conserving energy. For example, trades unionists in Yorkshire are calling for a coordinated programme of retrofitting and

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[17] See e.g. Richard Heinberg and David Fridley, *Our Renewable Future: laying the path for one hundred percent clean energy* (Washington: Island Press, 2016), pp. 47-80; the World Bank, *The Growing Role of Minerals and Metals for a Low Carbon Future* (Washington, World Bank: 2017)

[18] IEA national, regional and global statistics measure (i) Total Primary Energy Consumption, i.e. consumption of fuels and other primary energy carriers (nuclear, solar, wind, hydro, etc), and then (ii) Total Final Consumption, of primary energy carriers that are used by consumers without processing (e.g. natural gas for cooking), and secondary energy carriers produced by the transformation process (e.g. electricity, heat or oil products). The Total Final Consumption numbers exclude the energy used in the transformation processes (e.g. heat lost in power stations).

[19] In 2017, the last year for which IEA statistics are available, electricity accounted for 18.9% of total final consumption of energy; coal, 10.5%; oil and oil products 41%; gas 15.5%; renewables and biofuels (almost all non-commercial biofuels in poor countries) 11.1%; and heat 3%. Of the electricity, 6.6% is generated from new renewables; 15.9% from hydro; 2.5% from biofuels and waste; 10.3% from nuclear; and 64.7% from fossil fuels. IEA *World Energy Balances* 2019, p. II.5.

decarbonisation of home heating, as an alternative to a scheme supported by oil companies to convert the gas network to hydrogen produced using carbon capture and storage.[20]

There is already a body of research arguing for energy conservation as an alternative to techno-fixes globally. One team sought to establish how targets accepted in the UN climate talks for limiting global warming to 1.5 degrees could be achieved, without using the negative emissions technologies (NETs) on which many of the IPCC's scenarios rely. They concluded that changes in "the quantity and type of energy services" could drive "structural change in intermediate and upstream supply sectors"; that energy end-use is "the least efficient part of the global energy system" and therefore has the largest improvement potential. They saw potential for global final energy use in 2050 to be 40% lower than at present. A second team envisaged ways to reach the 1.5 degrees target, "significantly reducing", but not eliminating, the levels of NETs used. A research group focused on the UK made proposals for reducing UK carbon emissions to zero (rather than "net zero", i.e. without NETs) by 2050, using today's technologies (i.e. eschewing techno-fixes).[21]

These publications indicate the potential of energy conservation and make a limited critique of energy demand. This critique could be extended by socially critical research that considers the potential of deep-going transformations of the way people live and work, going beyond capitalism. Rather than being limited to proposals for limiting energy use within capitalism, and the commodified energy system, such research could envisage the possibilities for energy conservation in a society in which production for profit by employed, exploited labour is superseded by purposeful activity for human need.

Question 2: decarbonisation and decentralisation of electricity

What sort of changes to social and economic systems are necessary, in order to realise the potential for energy conservation in electricity systems – and could decommodification be part of this?

Above I have argued that the political priority for tackling global warming should be energy conservation, as opposed to the focus on renewable electricity generation as a techno-fix. That said, I assume that the role of electricity in technological systems, which has been growing since the early 20th century, will continue to grow, and that generation from renewables will displace generation from fossil fuels in significant volumes. Here I comment on how electricity technologies are changing, and how – if social ownership and control can be achieved – they could be used by society to complement energy conservation and to provide for human needs, rather than being subordinated to profiteering imperatives.

Up to the 1980s, the trend in electricity generation was for the size of power stations, mostly coal-fired or nuclear, to grow. In many rich countries, new power plants have since that time tended to become smaller – due, first, to the diffusion of combined-cycle gas turbines, and then to the more widespread use of wind and solar.[22] The consensus among electrical engineers and researchers is that, as the proportion of electricity supplied from renewables sources grows, the tendency for the size of individual generation units will continue to fall.

[20] See: Simon Pirani (Gabriel Levy), "Insulate homes to tackle climate breakdown", *The Ecologist*, 2 September 2020

[21] Arnalf Grubler et al, "A low energy demand scenario for meeting the 1.5°C target and sustainable development goals without negative emission technologies", *Nature Energy* 3 (2018), pp. 515-527; D.P. van Vuuren et al, "Alternative pathways to the 1.5°C target reduce the need for negative emission technologies", *Nature Climate Change* 8 (2018), pp. 391-397; J.M. Allwood et al, *Absolute Zero* (University of Cambridge, 2019)

[22] See e.g. Amory Lovins et al, *Small is Profitable* (Rocky Mountain Institute, 2003); Walt Patterson, *Transforming Electricity* (London: RIIA, 1999)

With current technologies, much electricity can be, and in some countries already is being, generated by household-sized solar and wind sources.[23]

This trend implies significant changes in electricity networks. They will need to be adapted, first, to cope with the variability of renewables-generated electricity (i.e. the fact that it is not constant, because the wind does not always blow and the sun does not always shine), and, second, increasingly to accommodate low-voltage microgrids (i.e. small-scale local grids that operate either partly or completely autonomously). A crucial obstacle is the difficulty of storing electricity: as storage technologies develop, there will be greater potential for 100%-renewable generation, and for integrating small-scale generating units. Especially at the scale of cities, other important technological potentials may be opened up by integrating electricity grids with other types of energy systems, particularly heat provision and transport (that is, e.g., surplus electricity on a windy day can be readily converted to heat, EVs can be used as batteries for the grid).[24]

For renewables-based systems, the costs are almost entirely upfront capital costs, and the operating costs are low. In economists' terms, the short-run marginal cost of generating the electricity is close to zero. Therefore the expansion of renewables endangers the standard market model for electricity systems – based on regulated sale of units of electricity as commodities in wholesale and retail markets. The proliferation of microgrids, which are increasingly able to provide electricity partially or completely independently of the large-scale grids to which markets are currently geared, presents further problems to those who control those markets. (There are similarities e.g. with the diffusion of digital technologies for recording music, which have reduced the short-run marginal cost of producing and distributing copies effectively to zero.)

Do these new technologies create more favourable conditions to supersede the commodification of electricity? In my view, they may help. However, those who own and control electricity grids are well aware of the threat to their way of doing things, and are working out how to incorporate decentralised renewables into their "business models". In China, which has the world's largest fleet of wind turbines, the issue of curtailment – wind turbines being switched off to make way for coal-fired power on networks with insufficient flexibility and storage – has become a national scandal that the authorities are working to resolve. A similar dynamic is underway in Australia. In Europe, there have been occasions on which especially windy weather has led to a surge of electricity from wind turbines, driving wholesale market prices to zero and inducing panic among electricity utility managers. In the USA, home of electricity commodification, some of the large electricity utilities are investing substantial resources into incorporating, and keeping control over, decentralised resources in their areas of operation. (Portland General Electric calls it the "transformation to a clean energy future", FirstEnergy calls it "Energizing the Future".)[25] Academic researchers who

[23] There are significant levels of household-scale generation in China, India and Australia. See, for example, Brandon Owens, *The Rise of Distributed Power* (General Electric, 2014), pp. 34-38; E. Judson et al, "The centre cannot (always) hold: examining pathways towards energy system de-centralisation", *Renewable and Sustainable Energy Reviews* 118 (2020;) M.L. di Silvestre et al, "How decarbonisation, digitalisation and decentralisation are changing key power infrastructures", *Renewable and Sustainable Energy Reviews* 93 (2018), pp. 483-498

[24] Summaries of the issues include: R. Hanna et al, *Unlocking the potential of Energy Systems Integration* (Energy Futures Lab briefing paper) (London: Imperial College, 2018); and Paul Komor and Timothy Molnar, *Background Paper on Distributed Renewable Energy Generation and Integration* (Bonn: prepared for the Technology Executive Committee of UNFCCC, 2015)

[25] In Xinjiang and Gansu provinces up to 30% of wind power was lost due to curtailment in recent years. Dave Elliott, "Green power curtailment in China", *Physics Today*, 17 July 2019. On Australia, "International Electricity Summit Highlights: Australia", *Electric Perspectives*, Nov-Dec 2019, pp. 37-38. On the USA, Maria Pope, "Strengthening the Energy Grid",

assume commodification as the norm are considering the potential for market reforms not only to accommodate renewables, but to create new markets in which "prosumers" (middle class households who invest in decentralised generation) can trade electricity along with larger companies.[26]

Other evidence of shifting dynamics between technological change and social relations is the recent proliferation outside the rich world of mini- and off-grid electricity systems, providing electricity to areas not previously electrified. Such systems supplied an estimated 150 million people in 2019, compared to 1 million in 2010. They vary in scale from solar home systems and solar lanterns to solar PV mini-grids serving e.g. a village. Research in India, Bangladesh and Sri Lanka shows that these systems are clearly located within the property relations that reinforce multiple burdens on the rural poor: capital costs are usually covered by state or IFI funds, but maintenance is usually in private hands, funded by service charges paid by users. Furthermore, the systems only provide a minimal electricity supply where there was none before: they do not come near to providing the all-day every-day connection to which rich world households are accustomed. And sometimes projects to establish such systems end in failure, for a range of reasons. On the other hand, these systems operate outside commercial energy markets. Geographically, they are either completely separate from, or not reliant on, the centralised grids; economically, they are not dependent on electricity exchanged as a commodity in wholesale markets.[27]

Could microgrids, combined with the most recent information and communication technology (ICT), combine to provide the basis for more far-reaching decommodification? Yes they could, says a growing literature from electrical engineers and ICT specialists who see the potential for an "electricity commons". Vasilis Kostakis et al argue that the integration of local microgrids could take a qualitative leap forward with the deployment of two technologies in particular – software-defined energy networks and packetised energy management – which enable "a computationally light but operationally efficient rule-based energy resource allocation".[28] These existing technologies would break down the barriers between production and use that dominate current systems. In conclusion they propose:

> [A] commons-oriented Energy Internet that may be a radical sustainable alternative to energy production and consumption. A commons-oriented Energy Internet is technically feasible given today's technological level. However, it requires a transition towards a new political economy framework centred around the commons. [In such a system] individual microgrids share their resources so that all microgrids can have energy available when needed. No one actually "owns" the generated output, since energy in this technical system is governed by all as a commons.

Electric Perspectives, March-April 2020, pp. 27-41, and Chuck Jones, "Delivering the Energy Grid of the Future", *Electric Perspectives*, Nov-Dec 2019, pp. 29-35

[26] F. Sioshansi (ed.), *Future of Utilities – Utilities of the Future* (Elsevier, 2016); Yael Parag and Benjamin Sovacool, "Electricity market design for the prosumer era", *Nature Energy* (1) April 2016

[27] On expansion of systems 2010-19, see IEA et al, *Tracking SDG7: the Energy Progress Report 2020*, p. 4, and IRENA, *Renewables 2020 Global Status Report*, p. 23. On south Asia, Debajit Palit, "Solar energy programs for rural electrification: experiences and lessons from South Asia", *Energy for Sustainable Development* 17 (2013), pp. 270-279. This is part of a large literature on implementation. See, e.g., Helene Ahlborg, "Changing energy geographies: the political effects of a small-scale electrification project", *Geoforum* 97 (2018), pp. 268-280, and Lorenz Bollwitzer et al, "Rethinking the sustainability and institutional governance of electricity access and mini-grids: electricity as a common pool resource", *Energy Research & Social Science* 39 (2018), pp. 152-161

[28] Vasilis Kostakis et al, "From private to public governance: the case for reconfiguring energy systems as a commons", *Energy Research & Social Science* 70 (2020). See also Pedro Nardelli et al, "Energy internet via packetized management: enabling technologies and deployment challenges", *IEEE Access* 7 (2019), pp. 16909-16924

Such proposals are related to discussions of the technological potential for an internet "commons" free from the control of large corporates. For example, Michel Bauwens et al envisage a technologically horizontal and decentralised computer network not only as one in which computers can "interact with each other without going through a separate server computer", but also as "a social/ relational dynamic through which peers can freely collaborate with each other and create value in the form of shared resources".[29]

A central question, not answered in this literature, is how we envisage the transition from the current state, in which both electricity networks and the internet are almost completely enclosed under corporate control, to any such future state.

Question 3: decommodification

To what extent do current proposals from the political left (e.g. the "Green New Deal"), and actions at local and community level, address the issues – and what could the idea of decommodification add?

Energy supply technologies are central to our lives, and social and labour movements have long confronted the governments and corporations that control them. In recent years, labour movements and left political parties have tried to bring together these issues with policies to address climate change. At national level, in the USA and European countries in particular, left parties have adopted versions of the "Green New Deal"; at local and community level too, attempts have been made to bring these issues together.

In September 2019 the UK Labour Party conference called for a radical "Green New Deal" that included "public ownership of energy, creating an integrated, democratic system" and "large-scale investment" in renewables.[30] In December 2019 Labour suffered defeat at the General Election, due primarily to issues not directly related to energy, and, specifically, Brexit. Nevertheless, it is worth recalling the stiff resistance that this version of the "Green New Deal" – one of the most radical adopted anywhere – faced, not only from capital, but within the Labour party and trade unions.

Due to this resistance, the Labour 2019 manifesto committed to public ownership of the electricity grid, and electricity supply functions – but, crucially, not electricity generation. The manifesto included laudable commitments to a £250 billion "green transformation fund" and a major buildings retrofitting programme – but also promised state support for EV manufacture, on a scale that would have undermined decarbonisation efforts. It committed to a windfall tax on oil companies, and to "support energy workers through transition" to a renewable-dominated system – but both Labour and national trade union leaders maintained (and, with a few exceptions, maintain today) their silence on how the transition might begin in the British sector of the North Sea, which is pumping out oil and gas at a level incompatible with climate targets (e.g. by stopping award of licences or reversing the policy of "maximising economic recovery").[31] Labour also maintained, and maintains, its support for heavily-subsidised nuclear electricity generation projects.

This experience suggests that, even where a radical left social democratic leadership takes the helm of a major political party, it faces substantial resistance from powerful companies and

[29] M. Bauwens, V. Kostakis and A. Pazaitis, *Peer to Peer: the commons manifesto* (London: University of Westminster Press, 2019)

[30] The text of the resolution is at: <https://www.labourgnd.uk/news/2019/9/24/labour-backs-gnd>

[31] Labour Election Manifesto, December 2019, pp. 11-18; on the North Sea, see Oil Change International et al, *Sea Change: Climate Emergency, Jobs and Managing the Phase-Out of UK Oil and Gas Extraction* (2019)

their allies. Had Labour come into government, the radical measures set out in the manifesto would have been counteracted on one hand by the inertia of fossil fuel production and fossil-fuel-dominated industries, and the political pressure by those that control those industries and their allies, and on the other hand by the gaps in Labour's own policies.

The constraints on social-democratic political action at national level are reproduced at local level. The limitations on such action in the UK are exemplified by efforts in Glasgow to use a Sustainable City business model to implement energy conservation measures and investment in renewables. Janette Webb points to "the importance of the financialised governance of infrastructure, which makes the implementation of plans largely dependent on private investment". She concluded from a six-year study of Glasgow that the move from pilot energy projects to large-scale implementation was frustrated by the transnational owner of the city's electricity distribution network; by the global financial market in which that company, and the council, were facing each other on unequal terms; and by the constraints of central government policy.[32]

Another example is that of Berlin, where, against a background formed by Germany's national renewable energy policy (the Energiewende), a long-running campaign has been waged to return the city's privatised electricity and gas utility to municipal ownership. This was resisted not only by the multinational owners of the utility but by the city's authorities. Campaigners won a majority in a referendum on the issue in 2013, but were stymied by turnout requirements and political manoeuvring. Political conflict continued and six years later in 2019 the electricity grid was re-municipalised.[33]

Another important field of struggle over the future of energy systems is at community and local level. In the USA, a strong tradition of community energy projects – often organised and financed as cooperatives, usually centred on developing renewable energy generation independently of the large corporate utilities – has grown in recent years. Participants in this movement have embraced the principles of energy democracy and energy-as-commons. A recent summary of its aims proposed "energy democracy" as

> [A] way to frame the international struggle of working people, low-income communities and communities of colour to take control of energy resources from the energy establishment, and use those resources to empower their communities. [...] It means bring energy resources under public or community ownership and/or control [...].[34]

Cecilia Martinez, a participant in the energy democracy movement advocates an "energy-as-commons" approach that would recognise energy not as a commodity but as "the transformation of a vast array of natural interactions and phenomena for societal use". A fundamental principle is that "these natural endowments should not be owned by, or belong to, any set of peoples, countries or corporations exclusively." Martinez's proposal are focused on developing principles of governance of energy commons at a local scale. Members of a

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[32] Janette Webb, "New lamps for old: financialised governance of cities and clean energy", *Journal of Cultural Economy* 12:4 (2019), pp. 286-298

[33] Ashley Dawson, *People's Power: reclaiming the energy commons* (New York: OR Books, 2020), pp. 173-194; James Angel, "Towards an energy politics in-against-and-beyond the state: Berlin's struggle for energy democracy", *Antipode* 2016. See also Lucy Baker et al, "Power struggles: governing renewable electricity in a time of technological disruption", *Geoforum* 118 (2021), pp. 93-105

[34] Denise Fairchild and Al Weinrub, "Introduction", in Fairchild and Weinrub (eds.), *Energy Democracy: advancing equity in clean energy solutions* (London: Island Press, 2017), p. 6

community should not be reduced to consumers; planning projects are needed in which members of the community become "active planning agents".[35]

The tension between cooperativism and community initiatives that resist commodified relationships at local level, and social and labour movements that at least implicitly challenge the entirety of capital domination and the state, is as old as those movements are. Over the last 25 years, these tensions have played out in new ways. The establishment of autonomous administration by the Zapatistas in Chiapas, Mexico (from 1994); the "water wars" that fended off privatisation of water supply in Bolivia (from 1999); and the experiments with self-management of closed factories in Argentina (from 2001), could all be seen as reactions to commodification and attempts to free society from aspects of it.[36] All of these movements challenged the state; none of them superceded it.[37]

This question necessarily remains open. In a recent book surveying and discussing the US "energy democracy" movement, Ashley Dawson argues that communities aiming to establish "energy commons" independently from corporations and the state, can not avoid the issue of their relations with these forces. He asks:

> But who gains access to the new energy commons? And what is to stop the rich and powerful preying on the commons that communities have laboriously built?

He argues that "community solar power must deploy a politics that exists 'in-against-and-beyond' the state"; rather than "cultivating imaginaries of complete energy autonomy, advocates of energy democracy seek to intervene in what radical theorist Nicos Poulantzas called the 'relation of forces within the state'."[38]

James Angel argues that the example of Berlin both "inspires hope in the potential for commoning or democratising energy through the state", but also shows the limitations of such an approach, because the institutions of the capitalist state "will continually seek to frustrate such endeavours". Angel, with reference to theoretical work by Poulantzas, John Holloway, Bob Jessop and others, concludes that gains in this direction "will likely be hard to come by, incomplete and fragile", and should not detract from political action beyond the state.

> [I]nitiatives to democratise energy by working in-against-and-beyond the state leap towards the broader emancipatory project of transforming the relations of domination – from capital, to coloniality, to patriarchy – which both the energy system and the state are currently produced through and, in turn, reproduce.[39]

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[35] Cecilia Martinez, "From commodification to the commons: charting the pathway for energy democracy", in Fairchild and Weinrub (eds.), *Energy Democracy*, pp. 21-36. Another proposal on governanceis for a "sustainable energy utility" as a model underpinned by "community rather than technocratic institutions and values". See John Byrne, Cecilia Martinez and Colin Rugger, "Relocating energy in the social commons: ideas for a sustainable energy utility", *Bulletin of Science, Technology and Society* 29:2 (2009), pp. 81-94

[36] On Bolivia, see Oscar Olivera, *Cochabamba! Water War in Bolivia* (South End Press, 2004) and Karen Bakker, *Privatizing Water: governance failure and the world's urban water crisis* (Ithaca: Cornell University Press, 2010), chapter 6. On Mexico, Alex Khasbanish, *Zapatistas* (London: Zed Books, 2010). On Argentina, "Zanon: a factory in the hands of the workers – Argentina", *Wildcat* 68 (2006)

[37] See J.K. Gibson-Graham, *A Post-Capitalist Politics* (University of Minnesota Press, 2006). For a wider view of the commons, see Christian Siefkes, "The Commons of the Future: building blocks for a commons-based society", *The Commoner*, March 2009

[38] Dawson, *People's Power: reclaiming the energy commons*, pp. 146-147

[39] Angel, "Towards an energy politics".

A corollary of this conclusion is that the issue of the extent to which social and labour movements will struggle in, against and/or beyond the state will be settled in real life, not just in analysis and research.

Concluding remarks

Here I point to two sets of conclusions about how the above discussion of commodification might help clarify some issues.

The first set of conclusions is about the commodified energy system. The view proposed here is that it it not ubiquitous, not a monolith and not all-powerful. Its reach is limited; hundreds of millions of people live outside it and on the edges of it. The neoliberal attempt to extend and reinforce the system's dominance in the privatisation and liberalisation drive of the 1990s came up against social reality – indeed, up against the state – in a wide variety of countries. The working of the neoliberal project was constrained, time and time again, by social conflict over the way that energy resources were supplied and the prices paid for them by working people. So the system can be challenged.

Having said that, the commodified energy system is a central and powerful manifestation of capitalist social relations, made still more powerful by the way that capitalism itself changed in the late 20th century (globalisation, financialisation etc). This has implications for challenges to it in – as opposed to against and beyond – the state. Should left-leaning political parties come to government and attempt to implement versions of the "green new deal", the weakness of those programmes implicitly to challenge commodification – for example, by focusing on ownership of one or another aspect of the energy sector, but not addressing the commodified markets and their relations with the state – will take its toll. The dynamics at municipal level have been mentioned above with respect to e.g. Glasgow and Berlin.

The second set of conclusions concerns commodity fetishism and the way it works out with respect to energy. The false view of energy as a thing that is supplied to meet an abstract "demand" often conceals the character of demand, which brackets together both energy services needed by communities and households with demand generated by the logic of capitalist expansion that is of no use to people. An understanding of the social and economic relations that comprise "energy supply" (on one hand the technological stages of energy conversion, but also the social and economic relationships within which they operate) and "energy demand" must be unpacked. It is not only that the commodification of energy reinforces hierarchies of exploitation, it is that commodification in the context of the capitalist economy obscures the way that energy is both produced and consumed.

Decommodification of energy implies a set of social relationships in which humans take sources of energy from the natural world, and use them, free of commodified forms of exchange. While such relationships can be prefigured at community level, such projects will always be constrained by the larger, more powerful commodified energy system that overshadows them. In my view this does not mean that co-operative, local or municipal attempts to carve out spaces for "energy commons" should be abandoned, or that we should limit ourselves to repeating "system change not climate change". But we need to be aware that not only the state, but also the commodity form and the workings of the economy, are obstacles that we have to confront.

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Published on People & Nature (peoplenature.org), November 2021