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Socialism and Electricity: Renewables and Decentralisation Versus Nuclear

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ABSTRACT

A socialist energy supply system should be based on centralised electricity generation, primarily from nuclear power, Matthew Huber and Fred Stafford argue. They propose only a minor role for wind and solar, and see decentralised renewables as unworthy of support. Huber further contends that neoliberalism fostered decentralised renewables, while undermining centralised generation, and socialists seduced by "green" thinking have unwittingly become neoliberalism's allies. In this response, I propose that nuclear power has been opposed by socialists for good reasons: it requires a strong state, and is inherently linked to the military. The trend towards decentralisation of electricity networks has been underway for decades; claims that it is at odds with public ownership or socialist principles are unfounded. Portraying renewables as a burden on existing networks is misleading. Instead, we need discussion of whether, and how, socialism can challenge capital's control of these electricity technologies, including decentralised renewables, and turn them to our advantage. The potential of decentralised networks to enhance forms of common ownership and decommodification needs to be tested. Claims that renewables are, by comparison to nuclear, inherently inimical to labour organisation or public ownership, or that they are historically underpinned by neoliberal ideology, are baseless.

KEYWORDS Socialism; energy; electricity

Introduction

Matthew Huber and Fred Stafford's insistence that "electricity is poised to be a central site of political struggle in the twenty-first century" (2023, 65) is welcome and timely. But the approach they set out in "Socialist Politics and the Electricity Grid," in *Catalyst* journal, is flawed. They argue that the basis for a socialist energy supply system is centralised electricity generation, primarily from nuclear power; that renewable electricity generation

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should play only a minor role; and that decentralised renewables are unworthy of support, for both technological and political reasons. Indeed, Huber adds, in an article on the Unherd website (2023), neoliberalism fostered decentralised renewables while undermining centralised generation, and socialists seduced by "green" renewables have unwittingly become neoliberalism's allies.

In this response, I suggest, first, that nuclear power has overcome none of the problems that led several generations of socialists to oppose it (links with the military, absence of waste disposal, and so on), and that it features only in the most impoverished views of the transition away from fossil fuels and the most conservative, state-centred versions of socialism. Second, I discuss the decades-long trend towards decentralisation of electricity networks - a reality for which Huber and Stafford fail to account. I argue that our focus should shift away from outworn pro-nuclear arguments towards a discussion of whether, and how, socialism can challenge capital's control of electricity technologies, including decentralised renewables, and turn them to our advantage. Third, I challenge Huber and Stafford's claims that renewables are, by comparison to nuclear, inherently inimical to labour organisation and to public forms of ownership. Finally, I question the misrepresentations on which Huber relies in an account of the relationship through the history of energy technologies and neoliberalism. I build on arguments presented previously (Pirani 2023a, 2023b, 2023c).

Nuclear and Renewables

In their *Catalyst* article, Huber and Stafford (2023, 75) write: "From a socialist perspective aiming for reliable nonstop, zero-carbon power, nuclear energy would be the foundation of the grid." The risks associated with nuclear are exaggerated in popular attitudes; problems with radioactive waste have been "overstated." They do not engage with researchers of nuclear who assert that there is: (1) no long-term solution to the waste problem; (2) that there is "no working deep repository for high level waste anywhere", despite limited progress in Finland and Sweden (Cullen 2021); (3) that a solution is "decades away"; and (4) that plans for new nuclear in the UK should be frozen "until we have a geological disposal facility", which is timetabled for the 2040s but likely to take longer (Laville 2022).

Huber and Stafford pass over in silence the way that nuclear power implies and requires a strong state, and its close connection with the military – an omission all the more remarkable, given the occupation since 2022 of Europe's largest nuclear plant, at Zaporizhzhia, by the Russian army, which bears responsibility for the collapse of the nearby Kakhovka hydro plant (Glantz et al. 2023). For the rich tradition of socialist writing on technology, the nuclear-military connection is not only about such "accidents," but about deeper-going economic and technological relationships. Only nuclear reactors produce the fissile material needed for nuclear bombs; military imperatives shape national industrial supply chains more broadly; the overlaps in education, design, research and security are all extensively researched. Civilian nuclear power has been in long-term decline due to its high cost, but has proved "surprisingly resilient" to market conditions in a limited group of countries, due to this interdependence (Stirling and Johnstone 2018).

Ultimately, the way socialists see nuclear power is bound up with our views of potential post-capitalist futures. Huber and Stafford's vision (2023, 79) is "of 'big public power', in which the public sector would subsidise the mass buildout of large-scale zero-carbon energy generation infrastructure including nuclear power and, where geography suits, renewables." Against this, I commend the view held by Cullen (2021) that nuclear power is "antithetical to the world we want to see. From its origin as a figleaf to distract us from the grim truth of mutually assured destruction, to its recent resurrection as a bogus solution to climate change, it is inherently bound up with violent state forms and paranoid and secretive hierarchies."

Views of nuclear also vary according to our approaches to the transition away from fossil fuels. The two most vital changes needed are: (1) to transform the way final energy is used (e.g. by insulating homes to reduce the need for heating, improving public transport to reduce the need for cars, and ending wasteful forms of consumption), and (2) to reduce the throughput of energy in technological systems (e.g. by replacing gas boilers with heat pumps). The remaining energy required must be produced with nonfossil-fuel technologies, of which renewables and nuclear are the most developed. The copious scenario analysis literature shows that climate change can only be dealt with in the course of deep-going social transformations (Allwood et al. 2019, Grubler et al. 2018, van Vuuren et al. 2018). For socialists, these transformations are bound up with overcoming and superceding capitalism (Pirani 2018, Pirani, 2023a).

For the present discussion, there are three relevant points that I would like to emphasise. First, climate change deprives us of time. Nuclear power stations take many years to build, while decentralised renewable energy systems do not. Second, the future of electricity networks must be considered in the context of broader economic changes overshadowed by climate change, and the need for transforming final energy use and reducing throughput, mentioned above (in his writing on "degrowth," discussed elsewhere, Huber (2022, 31–32 and 162–175) has remained agnostic on energy consumption and throughput scenarios). Third, highly flexible electricity networks are both necessary for reducing throughput and transforming final energy use – and, happily, also facilitate decentralised renewables. Integrating nuclear power stations that generate large, unchanging quantities of electricity into such networks may be less easy.

Under the present political conditions, in which labour movements and social movements are struggling for change under capitalism, choices made by the state about which energy resources to invest in do matter. Huber and Stafford (2023, 78) advocate opting for nuclear, despite the extraordinary expense: it "needs socialism to grow – or at least a form of public investment that socialises the costs of construction and does not privatise the gains." The corollary should be spelled out: resources invested in nuclear would not be invested in renewables.

Discussions among socialists would benefit from greater attention to the transition scenarios mentioned above, which afford a way into some of the social and technological issues. It would also be worthwhile to develop a socialist critique of "100 percent renewables" scenarios (i.e. models depicting hypothetical paths towards electricity networks run solely from renewable electricity, without any fossil fuels or nuclear) developed by researchers from engineering and scientific backgrounds (Pirani 2023d). Huber and Stafford, characteristically, dismiss these scenarios as "largely based on the models of one researcher, Mark Z. Jacobson." They are mistaken. A recent survey covered the work of some thirteen research teams (Brown et al. 2018, Heard et al. 2017).

Renewables and Network Integration

Huber and Stafford (2023, 65–66) propose "core principles" on which to base a socialist approach to electricity. They argue that electricity should be produced as a public good, rather than a commodity, that control by capital will always subvert this goal, and that for this reason "public or alternative ownership structures" are crucial. All this is welcome. Further, they propose that electricity is a "complex material system of production," conducive to socialist planning, which "consequently requires a deep materialist understanding of how it works and how it might be transformed." In my view, the conclusions they draw from this – that this understanding points toward "the importance of centralised, large-scale reliable power generation like hydroelectric dams and nuclear power, as opposed to decentralised, small-scale and intermittent forms of power like rooftop solar panels" – need to be challenged.

Huber and Stafford refer repeatedly to the supposed threat to electricity systems from decentralised renewables: intermittency "creates unavoidable problems for grid planning"; when there is too much wind and solar, that leads to curtailment, and when there is too little, electricity prices go up. They highlight the dangers of blackouts to "the very survival of the system," but, unfortunately, remain silent on the fact that the world's most devastating electricity blackouts (Puerto Rico 2017, Bangladesh 2022, Pakistan 2023) occurred in fossil-fuel-dominated networks for reasons that had nothing to do with renewables. They claim, mistakenly, that it is "still not clear how [renewables] can provide reliable power for the entire grid the way centralised power plants do today."

These assertions are disproved by reality. While renewables' share of global primary energy supply remains pitifully small, renewables generate a substantial share of electricity in a significant number of rich countries. Wind and solar account for 41, 40 and 35 percent respectively of electricity generated in Germany, the UK and Spain, three of the largest European economies, and 43 percent in California, which consumes more electricity than most nations. Denmark generates 61 percent of its electricity from wind and solar and 23 percent from modern biofuel use. Variable renewables' share of electricity generation in Scotland averaged 60 percent in 2019-2021. This expansion of renewables, that, like fossil fuels and nuclear, are predominantly controlled by corporations and the state, is fraught with dangers, not least to the people of countries being plundered for minerals used in equipment manufacture. Grid integration, though, is less a danger, and more of an engineering challenge (Pirani 2023b).

Wherever variable renewables expand, network upgrades are required. In particular, grids supplied by a large proportion of renewable generation need more, and newer, ways to store energy and to ensure grid stability. Because electricity grids are controlled by capital, just as the power stations are, the infrastructure investment needed to modernise them lags far behind the shift towards renewables in power generation. The most common problems caused by this failure to modernise are shortages of transmission and storage capacity (see e.g. IRENA 2023b, 11–14). The chronic level of curtailment of wind power in China in the late 2010s is noteworthy; so is the success of electricity transmission and distribution companies in fixing it (Chen et al. 2022). In the U.S.A. and Europe, the years-long queues for electricity generators to get a grid connection have become public scandals (Rand et al. 2022) But the underlying cause of poor infrastructure is not renewable technologies, but underinvestment. And the cause of that is, often, neoliberalism.

As for Huber and Stafford's point that wholesale electricity prices may rise when less power than expected comes from wind – well, that's how (pending improved weather forecasting) markets regulate supply and demand (the example they cite, of too little wind in Europe in December 2022, is factually incorrect. See Pirani 2023b, section 2.4). The problem is not the wind, it is the way markets function.

Not only does Huber and Stafford's "deep materialist understanding" fail to explain what is going on in Scotland, California, and elsewhere; it also omits any account of the trends over several decades towards decentralisation of electricity networks, and, more recently, from uni-directional to multi-directional operation. The networks installed in rich countries in the first half of the twentieth century, and across much of the global south in the second half, were designed to carry electricity in one direction: mostly from big coal, gas and nuclear power stations, to users. Peak centralisation was in the 1970s. Combined heat and power plants, and power stations using combined-cycle gas turbines (CCGT) built in the 1980s and 90s were smaller; wind and solar plants, even utility-scale ones, smaller still (IRENA 2023a, 17–18, 64–66; Patterson 1999, 68–70, 72–75, 114–116).

As the number and type of electricity sources increase, networks adapt to manage their inputs, in the context of the "third industrial revolution," which started with semiconductors and gave rise to a new generation of technology, including personal computers, mobile phones and the internet. The next big change, now getting underway, is towards flows of electricity in multiple directions, with the potential for microgrids, including those using direct current only, and for supply by decentralised generators to local users. These changes raise vital political issues, including: (1) whether these decentralised technologies, which are largely but not completely developing under corporate and state control, have the potential to enhance and be strengthened by, forms of social ownership and control, to work towards the decommodification of electricity; and (2) whether co-ops, community energy projects and municipal ownership forms may be stepping stones in these directions (Pirani 2023b).

Huber and Stafford's concern that the addition of renewables disrupts an existing system might have made sense ten or more years ago. But the technology – if not the economics – of electricity networks has moved on. Rather than engage with this reality, it is unfortunate that they fall back on the following polemical misrepresentations:

☐ They quote Mark Nelson, a consultant and nuclear advocate, to the effect that "claiming cheap renewables are a viable solution for our grid system is like claiming flimsy tents are a viable solution for the housing crisis." They incorrectly describe Nelson as an "energy analyst," imputing to his words an authority they do not have.

☐ Huber and Stafford claim that "cheap prices of renewable energy don't include the transmission lines to their remote locales or the costly back-up required when the weather isn't favourable," and that "the limited use value of solar and wind" leads to "broader system costs" not covered by renewable generators. They ignore the complexities of the integration into grids of variable renewables, and the substantial body of research on the costs (e.g. Elliott 2020, 7–9; Heptonstall and Gross 2021; IEA/NEA 2020). They misrepresent modelling by Robert Idel to create an exaggerate impression of renewables costs (For details, see Pirani, 2023a, "Note: infrastructure costs."). The simplified framing of renewables as an economic burden to an existing system has long been a staple of fossil-fuel-based

generators' propaganda, answered by mainstream energy economists with proposals for market reform and by socialists with calls for public ownership and decommodification. It has no place in a serious discussion.

☐ Huber and Stafford pay unwarranted attention to the microscopic portion of off-grid solar in the global North, writing: "While the Elon Musks of the world hawk the benefits of 'delinking' from the grid through the individual purchases of rooftop solar equipment and battery storage, we must fight for the expansion of electricity as universal public infrastructure." Yes, Elon Musk is a dangerous clown, and, yes, a small number of rich households may see rooftop solar as the road to a reactionary, isolationist, off-grid existence. But in the big picture, they are irrelevant. The overwhelming majority of rooftop solar, whether household, municipal or corporate, is connected to the grid. All these solar panels are part of a universal infrastructure. The barriers to that infrastructure being geared to use, and not profit, is not that the panels are decentralised, but that neither panels nor networks are publicly or commonly owned and controlled.

It would be regrettable if discussion among socialists were to be dominated by outdated pro-nuclear arguments, rather than by the real-world problems in electricity networks and other energy systems posed by climate change and the crises of capital. Collectively we should develop a critique of the work by engineers in politically mainstream contexts who assume markets as a key regulating mechanism (e.g. Cochran et al. 2014, Hanna et al. 2018, Kroposki et al. 2017), and build on arguments for greater public control (Elliott 2017, Elliott 2020, Kristov 2019). Research by a group of European scholars on the potential for flexible grids and decentralised renewables to open the way to forms of common ownership and to decommodification of electricity deserves our attention (Giotitsas et al. 2020, 2022). They envisage "commons-based peer production," under which "smart" technology is used not to trade electricity as a commodity but to share it as a common good; they show how software technologies that currently "align with the existing liberalised market with ancillary and balancing services" also "open up the possibility for democratising electricity if governed as a commons."

Renewables, Labour and Socialism

Matthew Huber proposes that (i) renewable electricity generation is, by its nature, hostile to working-class organisation in a way that nuclear and hydro are not; (ii) decentralised technologies are poorly suited to public ownership, and that using them to enhance forms of social ownership at sub-national level is a blind alley; (iii) in any case such "localism" is at odds with Marxism; and (iv) there is a split in "the Left" between traditional labour unions that go with centralised generation, and "environmentalists

and ecosocialists" who like decentralised renewables. I suggest that each link in this logical chain is broken.

Let us take up some of these arguments, which are important to the direction of the climate justice and labour movements.

Is Renewable Energy Hostile to Working-Class Organisation?

Huber (2023) writes, on the Unherd website, that, in the U.S.A. in the 1980s, "the shift away from utilities and towards decentralised merchant generation explicitly undermined the labour unions who had built up their power under the older, established utility system. [...] It is much easier to organise workers in centralised power plants than scattered solar and wind farms whose [*sic*], after all, only provide temporary construction jobs."

The message – that solar and wind are bad for unions, large nuclear and hydro are good for unions – is oversimplified. The break-up of the U.S. utility system did indeed damage the unions, with the loss of 150,000 unionised jobs (Beder 2003, 125). But renewables played a negligible part: those merchant generators used gas and some nuclear instead. And there was a context, which Huber does not mention: the gigantic, global shifts in labour markets that have made precariousness the "normal condition of labour under capitalism," especially outside the rich world and among women in rich countries (Huws 2019, 51–66).

It is not in dispute that many renewable energy and other "green tech" companies are ferociously anti-union, just as many nuclear companies are anti-union. Huber and Stafford (2023) point to energy sector unions that favour nuclear, and argue that we should "listen to what these workers and unions say." Yes, we should. But we should also probe the extent to which unions really speak for workers. In addition, we should confront the reality that in this case, as in others, there may be tensions between some workers' sectional interests and the aims of the workers' movement more widely.

Are Decentralised Technologies Poorly Suited to Public Ownership?

In his article for Unherd, and his book on climate change, Huber shows little sympathy for the widespread movement towards co-operative and municipal ownership of electricity generation, facilitated by renewables technologies. He opposes the "localist path" as a matter of principle. It is "deeply at odds with the traditional Marxist vision of transforming social production," he writes (2022, 250). And to drive the point home: "Duke Energy does not care if you set up a locally owned micro-grid." It should be noted, first, that the "traditional Marxist vision" had a far more generous attitude to co-ops: in his classic critique of utopian socialism, Friedrich Engels (1882) went out

of his way to welcome Robert Owen's co-ops, envisaged as "transition measures to the complete communistic organisation of society," for having "given practical proof that the merchant and the manufacturer are socially quite unnecessary."

Second, and relevant to twenty-first century practice, the limits to the potential of co-ops and municipal forms of ownership of electricity generation have not yet been sufficiently tested. The valuable contributions to the discussion of this include: (1) the assessment by Trade Unions for Energy Democracy of the damage done to co-ops and community energy projects in Europe by pro-business market regulation (Sweeney et al. 2020); (2) commentary on the legislation passed in New York directing the municipal power company to plan, build and operate renewables projects (Dawson 2023) and (3) research on the damaging impact of state and corporate power on efforts to use co-operative and community energy forms to advance electrification in developing countries (Baker 2023, Ulsrud 2020). Huber's blanket rejection of "localism" obstructs these important discussions, and offers a conservative view of socialism as something brought about primarily or only by state action at the national level.

Is Localism at Odds with Marxism?

In his polemic against "localism," Huber (2022, 250) writes that "capitalism produces the material basis for emancipation through the development of the large-scale and ever-more centralised industry." Marx, he writes, explained that capitalism "tends to centralise capital through the 'expropriation of many capitalists by a few'. But through this centralisation process, the production itself becomes more and more socialised." This is a misunderstanding of Marx's point, in my view. When writing about the expropriation of many capitalists by a few, he was referring to the centralising effect of money capital and the development of corporations. But it was the *socialised* nature of production under capitalism, not *centralisation* as such, that in Marx's view laid the basis for social ownership and control. To conclude from this a principled approval of "centralisation" makes little sense. To transpose it to a twenty-first century context, to claim that Marxism embraces the physical centralisation of electricity generation, makes even less sense.

Is There a Split Between Labour and Environmentalists on Decentralised Renewables?

For Huber and Stafford (2023, 67), those who see the potential for building elements of opposition to capitalism in co-ops, community energy projects or municipal ownership of decentralised renewables, are on the wrong

side of a political divide. They see a "split within the capitalist class" between "historically embedded investor-owned utilities" who claim a commitment to reliability, and "industrial consumers of electricity" who seek flexible supply contracts and "emphasise their green credentials." This split, they write, is replicated in "the Left": "traditional labour unions" are siding with utilities, and therefore with centralised generation, while "environmentalists and ecosocialists" are with "renewable energy producers, Google and increased marketisation of electricity."

This is a contrived argument. The division between U.S. utilities and industrial electricity consumers is not one of principle, it is simply sellers vs buyers. And the identification of more renewables with "increased marketisation" is a myth: the fastest expansion of renewable generation is in China, one of the most heavily regulated electricity markets on earth. As for the supposed alliance between "environmentalists and ecosocialists" with "increased marketisation", "Google," and so on, this is a declaration of guilt by association.

Renewables and Neoliberalism

So powerful is his crusading fervour against decentralised renewables, that Huber (2023) does the following: (i) paints decentralisation as a product of neoliberalism; (ii) claims inherent links between renewables and private capital, and between nuclear and public ownership; and (iii) sees environmentalists and leftists who embrace renewable electricity dragged along behind an "anti-social [neoliberal] reaction against society itself." None of this withstands scrutiny.

Decentralisation as a Product of Neoliberalism and the Links Between Renewables and Private Capital

Huber writes that, in the 1970s and 80s, neoliberalism set out to demolish "large, rigid institutions" of the post-war boom – unions, universities, even monopolistic corporations – "in favour of smaller, more flexible production guided by a decentralised price mechanism." He argues that this supposed "decentralisation" underpinned the rise of renewable electricity generation. But even in its use of price mechanisms, neoliberalism was the very opposite of "decentralised." The weapons it wielded on behalf of big, centralised corporations included the deregulation of finance capital, by such measures as the abolition of capital controls and expansion of offshore financial zones. Financial markets were "globalised," in many cases subordinating national markets to internationally-determined prices.

Huber cites the neoliberal ideologue Friedrich Hayek writing about "decentralised planning." But those words tell us little about the

neoliberalism that actually existed, which Marxists long ago understood as a "political project to re-establish the conditions for capital accumulation and to restore the power of economic elites" rather than a "utopian project to realise a theoretical design [of markets]," (Cahill and Konings 2017, 94–98; Harvey 2005, 12–19).

Are Renewables Inherently Suited to Private Capital?

Huber also writes that neoliberal ideology "seized the [US] electricity sector" in the late 1970s; for neoliberals, electric utilities "epitomised the kind of inflexible and corrupt institutions targeted for demolition"; environmentalist ideology of the time, epitomised by Amory Lovins's "soft energy path," "conformed to this neoliberal critique of 'big' and 'centralised' utilities." Thus, "against a complex and centrally-planned system, 'grassroots' local communities aspired to get off the grid entirely," while at the policy level, a "vision of a decentralised renewable-powered utopia actually accompanied a broader project of electricity deregulation" under President Jimmy Carter.

First, let us put aside local communities who aspired to get off-grid. They are interesting for the history of counter-culture, but irrelevant to energy policy.

Second, recall the context for the neoliberal reforms in the U.S. electricity sector: the "energy crisis" caused by the assertion of pricing power by Middle Eastern oil producers in 1973, and the dominant capitalist powers' alarm at the shifting terms of trade. This produced a politically-driven investment boom in nuclear and other non-fossil energy that overlapped with market liberalisation.

Third, the technological development of wind turbines was taken on by the state, via NASA; the speculative wind "boom" that followed during the 1980s was a footnote in the story of electricity, that produced less per year than one typical power station's output; and while as Huber notes neoliberal market reform helped the corporations who dabbled in the wind, it was a tax dodge (the Energy Tax Act) that was decisive. When this subsidy was junked, the "boom" collapsed (Newton 2015, Owens 2019). Only in the 2000s did wind power expand significantly in the U.S.A.

Huber's "new class of capitalists building renewable energy projects," who "need not care about the grid as a social system" is, at least in the 1980s and 90s, a phantom. His connection between Lovins's (1979) "soft energy paths" argument (which in the 1970s was anyway focussed on energy conservation and cogeneration, and not on renewable power), Carter's market reforms, and the expansion of decentralised renewables a quarter of a century later, is a specious construct.

Yes, the market reforms weakened the utilities and reinforced wholesale electricity markets. Gas rose, coal retreated. However, the overarching 12 👄 S. PIRANI

theme is not decentralisation, but neoliberal support for gigantic corporations, including the construction companies and nuclear generators whose lobbying led to a massive excess of generating capacity (Pope 2008.)

To tell this story as one in which renewables are identified with neoliberalism, and nuclear with public power, is to rewrite history in the service of ecomodernist ideology.

A brief glance outside the U.S.A. confirms that, as a rule in the twentieth century, wind and solar technologies were developed by the state and by social movements; private capital only moved in later. In Denmark, the world's leading developer of wind power, the initial impetus came from a community movement based on co-ops; later, the state, having accepted the dominance of wind power, brought in the corporations. In Germany, a parliamentary alliance of greens and social democrats gave the initial impetus, through state subsidies. Since the 2010s, China, where the state direction of industrial policy is anything but neoliberal, has been overwhelmingly dominant in the production, export and deployment of renewables technologies (Maegaard 2013; Morris and Jungjohann 2016; Pirani 2023b).

Leftists, Environmentalists and a Reaction Against Society

Huber also writes, with reference to the 1980s: "[I]f most of the twentieth century was about large-scale social integration of complex industrial societies, the neoliberal turn represents an anti-social reaction against society itself. For parts of the right, there was 'no such thing' as society, only individuals. But the environmental Left made a comparable turn: large-scale complex industrial society was rejected in favour of a smallscale communitarian localism. In this framework, 'communities' could opt out of society and usher in democratic control over energy, food and life."

Huber evidences this colourful denunciation by quoting the German philosopher Rudolf Bahro ("we must build up areas liberated from the industrial system") – an absurd own goal, since, however widely you define the "left," Bahro, by his own account and those of his colleagues, had in the 1980s long ceased to be part of it (Hart and Mehle 1998).

In contrast to Bahro's drift to anti-industrial environmentalism, there is a wealth of socialist writing that saw capitalist social relations as the underlying cause of the 1970s "energy crisis" and environmental crises. Examples include the Italian autonomists who urged a "post-nuclear transition" that presupposed transforming "not only energy use but also the capitalist mode of production and social organisation" (Sapere 1985, 71), and the American writer Barry Commoner (1990, 193) who thought of environmentalism in terms of "transformation of the present structure of the technosphere," in the context of social change.

Even André Gorz (1987, 19), perhaps the 1980s' most forceful socialist proponent of decentralised energy, saw its development as inextricably bound up with social transformation. He wrote that objections could be raised to a focus on such technologies, on the grounds that "it is impossible to change the tools without transforming society as a whole." "This objection is valid, providing it is not taken to mean that societal change and the acquisition of state power must precede technological change. For without changing the technology, the transformation of society will remain formal and illusory."

It is to be hoped that collectively, we will develop a socialist approach to electricity systems, including the problems that decentralised renewables pose, in the context of the struggles for social justice and to tackle climate change. A robust critique of our above-mentioned predecessors would strengthen the foundations of such an approach. Huber's misrepresentations of these writers as allies of neoliberalism is an unwelcome obstruction to such a critique that should be moved out of the way.

Conclusions

Renewable electricity generation is not perfect - the social and environmental impacts of its materials supply chains are only the most obvious of its drawbacks. But it operates without fossil fuels or carbon emissions. Unlike nuclear power, it is (i) free of inherent links with fearsome state structures and the military, and (ii) highly compatible with more flexible networks, reductions in throughput and rapid changes in energy end-use that are the most important ways of reducing greenhouse gas emissions. The increasing decentralisation of electricity generation is not perfect either. It is a technological change that has been in progress for decades, in the context of the "third industrial revolution." Huber and Stafford ignore this process, and suggest, mistakenly, that technological decentralisation equals political decentralisation, and that both are somehow inimical to workingclass organisation and socialism. They ignore, too, the rich history of socialist writing on technology and its relationship to society, to construe a false alliance between nuclear power and working-class interests. To support this, Huber offers a sketched history of renewable electricity generation, rewritten to depict it as a child of neoliberalism, that is replete with distortions.

A starting-point for discussion on the role of electricity systems in the transition away from fossil fuels, and in struggles against capitalism, in my view, is an assessment of the technological changes underway, and the corrosive effect of the corporate and state interests under whose control it is taking place. Perspectives and policies must be considered together with the need for transformation of energy end-use, for reduction of throughput and for the supply of electricity to the hundreds of millions of people who do

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not have it. In rich countries, the potential of co-operative, municipal and other forms of public ownership must continue to be tested, alongside traditional demands for public ownership. Finally, the interests of workers directly employed by electricity companies must be considered not sectionally but as part of the broader working-class and societal interest.

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