

# The Accumulation of Energies

*by Marius Bickhardt*

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**Historian Jean-Baptiste Fressoz provides the first genealogical study of the concept of energy transition. In the face of discourses that keep postponing “the transition” to a later date, Fressoz takes up the unprecedented political challenge of a complete phase-out of fossil fuels.**

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About: Jean-Baptiste Fressoz, *More and More and More: An All-Consuming History of Energy*, London, Penguin Books, 2024, 309 p.

The recent publication of the book by environmental historian Jean-Baptiste Fressoz, *More and More and More: An All-Consuming History of Energy*,<sup>1</sup> has sparked considerable controversy in French political ecology. While some have accused Fressoz of “defeatism,” others have praised him for an investigation that is “at once gripping and astounding.” To better understand this debate, one needs to examine the two main theses defended by the author in the twelve chapters that make up the book. Fressoz begins by describing a cumulative dynamic wherein energies have tended to accumulate rather than substitute each other over the course of history. He then traces the intellectual origins of the transition narrative, highlighting its wait-and-see and ideological character. In this narrative, the transition to non-fossil energy—like other transitions before it—is presented as a substitution made possible by technological progress, yet one whose outcome is uncertain since the problem of fossil fuel phase-

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<sup>1</sup> Fressoz, Jean-Baptiste, *Sans transition. Une nouvelle histoire de l'énergie*, Paris, Seuil, 2024. Note that all page numbers provided in this review refer to the original French edition.

out has yet to be resolved. The contrast between the scope of the book and the limited number of theses defended is due to the empirical richness of the study.

## A Symbiotic History of Energy

In the first part, which encompasses two-thirds of the book (Chapters 1-8), Fressoz claims to offer a “completely new understanding of the dynamics of energy” (p. 14). Developing an argument that was sketched earlier in many of his articles,<sup>2</sup> he refutes the central trope of “the epic of energy transitions” (p. 19) whereby energies have replaced one another over the course of history. In his view, this “false history” has been conveyed by the “stagist narratives” (p. 15) produced by environmental historians and political theorists alike.<sup>3</sup> After noting that “humanity has never burned so much oil and gas, so much coal and so much wood” (p. 16), Fressoz concludes that “primary energies have tended to add to rather than substitute each other” (p. 26). He proposes to quantify the phenomenon. The 2 billion cubic meters of wood felled each year represents a three-fold increase compared to a century ago, rendering obsolete the idea of a shift from an organic to a mineral economy defended by the historian Edward Anthony Wrigley. As for coal, it experienced its “strongest growth [...] between 1980 and 2010 (+300 per cent)” (p. 17).

According to Fressoz, the poor understanding of this phenomenon is linked to historians’ methodological limitations. The first of these limitations lies in the “epics on energy” (p. 20), whose ideal-type he attempts to specify. Chronologically, these epics move from wood and hydraulic power to coal and steam, then to oil, electricity, and nuclear power, and finally to renewable energies. The second limitation relates to the bias David Edgerton identified in the history of techniques: the tendency to define each era by its novelty, with the proliferation of “chrononym[s]” (p. 55) that have constructed various “ages”: the age of wood, coal, etc. The last limitation lies in mono-energetic approaches that “study one form of energy separately from others and from

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<sup>2</sup> Jean-Baptiste Fressoz, “‘The age of’ et ses problèmes. Du phasisme matériel dans l’écriture de l’histoire,” *Revue d’histoire du XIXe siècle*, 64 (1), 2022: pp. 173-188; “La ‘transition énergétique,’ de l’utopie atomique au déni climatique: États-Unis, 1945-1980,” *Revue d’histoire moderne & contemporaine*, 69-2 (2), 2022: pp. 114-146; “Pour une histoire des symbioses énergétiques et matérielles,” *Annales des Mines – Responsabilité et environnement*, 101 (1), 2021: pp. 7-11.

<sup>3</sup> The main historical works cited by Fressoz are *The Great Acceleration* by John McNeill and Peter Engelke and *Power to the People* by Astrid Kander, Paolo Malanima, and Paul Warde. On the political history of energy, he cites Andreas Malm’s *Fossil Capital* and Timothy Mitchell’s *Carbon Democracy*.

materials in general” (p. 21). To counter the omission of mass phenomena such as the rise of renewables in the nineteenth century, the development of biomass and muscle power in the twentieth, and the recent revival of coal, Fressoz develops a holistic method that radicalizes the thesis of energy additions defended in his earlier book *The Shock of the Anthropocene*. He now speaks of a “symbiotic expansion of all energies,” the analysis of which involves “a host of objects and techniques [...] that are absent from standard accounts” (p. 25).

The question of symbiosis leads to an epistemological problem: the “blurred nature of energies” (p. 44). Fressoz seems to support a materialist epistemological approach which posits that we can only understand energy flows if we acknowledge their irreducibility to primary energy concepts, these being mere “linguistic conveniences that obscure” the entanglement of energy sources (p. 44). In the pre-fossil-fuel era, the symbiosis rested “on slavery in Africa, but also on many other workers, other materials and sources of energy: on the toil of the peasants who grew rapeseed and poppy, on the mills that crushed oilseeds, on the millions of hectares of grassland in Europe and America used to fatten cattle” (p. 46). As for the fossil fuel era, it has been marked by the symbiosis between coal and wood (due to the use of mine props and railway sleepers), the symbiosis between oil and coil (as exemplified by the car), and the “pétrolization of wood” (p. 187) which stems from the absorption of forestry into a high-carbon, intensive agriculture based on fertilizers, pesticides, and machinery.

## **Transition as the Wait-and-see Futurology of Capital**

The second part of the book (Chapters 9-12), dedicated to intellectual history, takes as its starting point the following paradox: “How was ‘transition’ able to take hold at the end of the twentieth century, when the whole energy dynamic of the time contradicted it?” (p. 202) From the Technocrat Movement to the Atomic Energy Commission (AEC),<sup>4</sup> to the International Institute for Applied Systems Analysis (IIASA),<sup>5</sup> and to Working Group III of the Intergovernmental Panel on Climate Change

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<sup>4</sup> The AEC, which was founded in 1946 and dissolved in 1975, is a U.S. federal agency whose mission was to transfer military control of atomic energy to civilians and promote nuclear research.

<sup>5</sup> The International Institute for Applied Systems Analysis (IIASA) is an independent international research institute founded in 1972 and located near Vienna in Austria. During the Cold War, it

(IPCC), the author traces the slow process of ideological construction of the transition narrative, which he describes as “the ideology of capital in the twenty-first century” (p. 333).

The emergence of the concept of transition is closely linked to the rediscovery of the logistic curve (or S-curve) in the interwar period. This curve was first developed in the field of population ecology to describe “rapid growth, an inflection point (already passed), and a trend towards the asymptote” (p. 213). The geologist Marion King Hubbert applied the logistic curve to coal in his 1934 *Technocracy Study Course*, and then used it to develop his peak oil theory in the 1960s. Against the nightmarish scenario of a peak in fossil fuels followed by a collapse described by William Stanley Jevons in *The Coal Question*, Hubbert and the technocrats envisaged a “transition to fast-breeder reactors” (p. 219) that would ensure a stationary state at a high level of production, made possible by hydroelectricity.

Fressoz traces the development by the AEC atomic Malthusians of a new energy futurology centered on peak energy, climate change, and the promotion of nuclear power. Thus, as early as 1953, Palmer Putnam remarked in his book *Energy in the Future* that the rising sea levels observed in all American ports were due to the melting of glaciers caused by the greenhouse effect. In 1967, the atomic scientist Harrison Brown presented the concept of “energy transition” at a neo-Malthusian conference on birth control. Fressoz identifies two origins of this concept, though without explaining the link between them. According to him, Brown first took the concept of “transition” from nuclear physics, where it is used to designate the “change of state of an electron around its nucleus” (p. 224), and later “set it up as an analogue for the demographic transition” (p. 236), a term coined by demographer Kingsley Davis in 1945.

Fressoz also devotes a few pages to the influential Italian atomic physicist Cesare Marchetti, who changed the representation of energy systems at the IIASA: Rather than being described by “stacked curves showing [their] *cumulative* evolution,” primary energies were now “presented in *relative shares* in order to show a historical dynamic of *substitution*” (p. 263). Marchetti stressed the inertia of the energy system against the then popular scenario of a “smooth transition” over fifty years. Contra the Malthusians, he showed that energy sources “faded away not due to depletion but due

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functioned as an East-West scientific cooperation initiative and conducted research into climate change, energy security, population aging, and sustainable development. Fressoz points out that the IIASA sought to refute the models proposed by the Club of Rome in its 1972 *Limits to Growth* report.

to obsolescence” (p. 269). His relative shares model has since been used to describe the history of energy as a process of diffusion of technological innovation. The emphasis placed today on the diffusion curve of wind and solar power—without any reflection on how fossil fuels can be phased out of the economy—implicitly draws on Marchetti.

Following his arrival at the IIASA in 1974, the renowned economist William Nordhaus was introduced to climate issues by Marchetti himself. Although best known for his criticism of the Club of Rome, Nordhaus was in fact inspired by the future of the atomic Malthusians: “The final stage of the transition,” he wrote, corresponds to an economy running “solely on hydrogen and electricity from infinite resources” (p. 282). Nordhaus developed his own mathematical model for the maximization of GNP, in which he integrated the climate constraint of avoiding a doubling of CO<sub>2</sub> atmospheric content. He considered efforts to conserve energy to be pointless, since for him technological progress would provide the ultimate solution—the fast-breeder reactor—by the year 2000. The conclusion to the working paper he published in 1975 stated that “we have a comfortable amount of time to carry out research and draw up plans to reduce CO<sub>2</sub> should this prove necessary” (p. 283). The Marchetti-Nordhaus synthesis provides the ideal-typical model for what Fressoz describes as a “wait-and-see approach” that relies on technical progress.

The success of the concept of transition can also be explained by its early adoption among fossil fuel industrialists, who were not so much seeking to deny the problem as to “justify present procrastination” (p. 333) on climate action. Thus, in 1982, Edward David, the president of Exxon R&D, declared that “we have entered an energy transition” and that the company was committed to “a mix of renewable energies that will not pose a CO<sub>2</sub> problem” (p. 287), a statement that earned him the praise of climate scientist James Hansen. Based on an internal Exxon memo stating that “society has sufficient time to technologically adapt to a CO<sub>2</sub> greenhouse effect” (p. 301), Fressoz describes the ideology of American elites as a combination of “transition claims and resignation to adaptation” (p. 302).

This ideology is palpable in the publications of Group III of the IPCC, a technical advisory body of the United Nations created in 1988. Before becoming a climate skeptic and fossil fuel lobbyist, the second head of the group, Robert Reinstein, consulted mainly with Nordhaus, who extolled the virtues of “*Homo adaptus*” (p. 309) and claimed that the optimal temperature of the Earth corresponded to a global warming of 3.5°. It was not until the turn of the 2000s that the group finally adopted a transition discourse. In 2020, the expression was three times more frequent in the IPCC

literature than it had been forty years earlier, despite the fact that none of the 3,000 scenarios evaluated by Group III “envisage[d], even as a hypothesis, any reduction in GDP” (p. 316).

## **Transition: The Ecopolitics of Human Muscle Power**

Against accusations of defeatism, one must emphasize the constructive thrust of the book. Fressoz is indeed careful to emphasize that his aim is not to provide “a critique of renewable energies” (p. 16). Rather, he purports to reveal the ideological function of wait-and-see discourses, while also shedding light on “the depth of the problem” (p. 330) and the “essential obstacles on the road to decarbonization” (p. 329). Yet, as he also emphasizes, decarbonization is a “necessary condition [that] is far from sufficient” (p. 321), since it does not in itself determine a phase-out of fossil fuels. Electricity generation has been decarbonized by 40%, but only accounts for 40% of global CO<sub>2</sub> emissions; meanwhile, sectors that are very difficult to decarbonize—aviation, shipping, but also steel, cement, plastic, and fertilizer production—account for more than a quarter of global emissions. Given the “novelty and scale of the climate challenge,” Fressoz writes, “the climate imperative does not call for a new energy transition, but it does require us to voluntarily carry out an enormous amputation: to get rid, in four decades, of the proportion of the world’s energy—more than three quarters—derived from fossil fuels” (p. 31).

Nevertheless, one wonders whether the author is not underestimating the critical re-appropriations of the concept of transition that he himself mentions in the book. Thus, as early as 1980, MIT physicist David Rose opposed the wait-and-see “smooth transition” championed by Exxon engineers, noting that “we don’t believe we can wait” because “the rapidity of change exceeds historical technological shifts,” and concluding that “we have to fundamentally change the nature of economic and political systems” (p. 290). In the absence of critical uses of the concept of transition, the coherence of the critique of transition ideology depends on an alternative theorization of the scenario of socio-ecological change that does justice to the symbiotic complexity of the fossil fuel economy. Bifurcation, planning, ecological revolution—several models are currently being debated. Yet, apart from scattered references to “sobriety,” “degrowth,” or “energy amputation,” the book does not clarify the scenario envisaged by the author—though this scenario can be assumed to be that of ecosocialist degrowth, for which “[g]etting out of carbon will be far more difficult than

getting out of capitalism, a condition that is probably necessary but certainly not sufficient” (p. 23). This lacuna can be explained by the polemical goal of the book, which is to refute “the normative positions on climate that prevail in the social sciences” (p. 332).

If the book offers “no emancipating green utopia,” it is because this “essay in materialist history” (p. 332) is primarily concerned with the technico-material limits that condition all environmental policy. Due to this focus, however, Fressoz loses sight of socio-political limits and class conflicts.<sup>6</sup> When adopting an immanent critical approach, one wonders why the social conflicts around mining described in Chapter 3 are absent from his reflection on the climate problem. As Fressoz points out in this chapter, the timbering of galleries was crucial for the safety of miners at the end of the nineteenth century, at which time one in a thousand miners died each year in Europe due to collapsing roofs. Yet, payment by the ton made “timbering unremunerative” (p. 83), and the miner was held responsible when a roof collapsed. In this context, wood became a “recurring battleground” (p. 84) for workers who refused the alternative between pay and safety. Thus, during the 1913 strike in Colorado, miners demanded payment for “dead work” —the common name for timbering at the time. Beyond the polemic against Andreas Malm and Timothy Mitchell, the tangled history of coal and wood could be interpreted as a non-stagist reformulation of the political history of energy.

In the context of climate change, employers long raised the false alternative of jobs vs. the environment, thereby sealing the fate of workers in fossil fuel industries. Since then, a number of researchers, eco-activists, and trade unionists have rejected this false dilemma, calling for capital to bear the costs of transition. Fressoz makes his own contribution to the debate by taking up an idea that is now embraced by the different currents of ecological Marxism: “the labour behind the materials” (p. 44). He thus points out that the productive use of non-human energies relies on the exhaustion of the “work/energy” (Jason Moore) generated by human bodies.

It is at this point that a tension emerges between the two parts of the book. While Fressoz reduces the climate class conflict to a *problem of distribution* (for instance, the “inequalities” (p. 331) reinforced by the carbon tax or the imperative for better “distribution” (p. 333)), the history of the symbiotic economy reveals instead the centrality of human muscle power in the *production process*. The example of mining

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<sup>6</sup> This point was made by Pierre Charbonnier: <https://pierrecharbonnier.substack.com/p/la-transition-mission-impossible>

struggles suggests that muscle power is not only the condition of the energy symbiosis, but also its Achilles' heel. FressoZ outlines the possibility of an ecopolitics of workers' muscle power, but unfortunately leaves it aside<sup>7</sup> despite its potential for solving the main problem confronting all decarbonization projects today: the climate change backlash,<sup>8</sup> which instrumentalizes legitimate fears in the face of the economic insecurity created by climate liberalism. In fact, as Rose already suggested in 1980, an ecopolitics of muscle power should respond to this backlash by questioning both property relations and private control over investment decisions.

### Further readings:

- FressoZ, Jean Baptiste, Bonneuil, Christophe, *The Shock of the Anthropocene: The Earth, History and Us*, London, Verso, 2017.
- Guillibert, Paul, *Exploiter les vivants. Une écologie politique du travail*, Paris, Éditions Amsterdam, 2023.
- Malm, Andreas, *Fossil Capital. The Rise of Steam Power and the Roots of Global Warming*, London, Verso, 2016.
- Mitchell, Timothy, *Carbon Democracy. Political Power in the Age of Oil*, London, Verso, 2011.

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<sup>7</sup> FressoZ has recently announced that the issue of muscle power will be the subject of future research: <https://legrandcontinent.eu/fr/2024/02/22/une-monde-sans-transition-une-conversation-avec-jean-baptiste-fressoZ/>

<sup>8</sup> "In short, European policymakers face the challenge of persuading voters that the green transition is in their own interest, at a time when living standards are under severe pressure [...]. This makes climate change an issue that populist or hard-right parties feel they can exploit to their electoral advantage." See "Populists seek dividends from a climate change backlash," *Financial Times*, 25 November 2023: <https://www.ft.com/content/437a1058-d0d3-40cf-8eea-6a7b3e626cde>