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The impossible transition? The fatality of coal in the United Kingdom

Abstract

This article seeks to understand the reasons for Victorian fatalism towards coal dependency – which led to an inability to abandon this energy – in an effort to better understand what an energy transition would actually entail. The article depicts a providential form of thought in relation to energy at the time, when coal was seen as being a God-given gift that led to world domination: Victorian society was subsequently guilt-ridden due to its waste of coal. How could one imagine a post-coal country without imagining the worst? This tragic vision of the future – there will be no second chance – was based on an understanding of the transition as being connected to the source itself rather than the energy system as a whole.

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INTRODUCTION

1 In 1905, a group of scientists and engineers led by the winner of the Nobel Prize for Chemistry, Sir William Ramsay, founded the British Science Guild in an effort to use science to solve the problems faced by humanity.¹ The many debates regarding the coal shortage threatening the country, which had intensified in nature over the course of forty years, naturally prompted this learned society to address the question.² This led to the publication in 1912 of a collective work taking stock of natural sources of energy, especially to determine whether alternatives to coal existed. The response of the experts involved was clearly negative. According to the author of the chapter on coal, the only possible path for the country was frugal use of this resource:

The most hopeful sign of a coming reform in this direction [domestic consumption] is found in the general awakening of the civic conscience on the subject of smoke prevention. It is earnestly to be desired that this awakening may be really permanent, and that the partially successful, or even the entirely unsuccessful, efforts in the direction of reform may not be interpreted by the public in any hopeless spirit.³

2 The fear expressed here of discouragement should not be surprising, for despite many reflections during the last third of the nineteenth century regarding energy alternatives,⁴ the British seemed incapable at the turn of the twentieth century of initiating a shift away from coal, even as they continued to denounce its

harmful environmental and health effects,⁵ as well as the exclusive dependence in which it placed the country. From 1845 to 1945, coal supplied 90–95% of the energy needs of England and Wales, and the drop came only gradually (still 50% in 1970).⁶ Understanding the reasons for this resistance to change can undoubtedly help to implicitly identify what the notion of transition entails. Many explanations have already been proposed, essentially with respect to economic and technological considerations connected to initial constraints: widespread use of the steam engine, electricity production by coal-burning plants, installations already existing among private individuals, and industrial actors reliant on this energy source all made the changes required to use another energy too costly, which at any rate could not be as accessible and abundant as British coal.⁷ This interpretation is perfectly correct and convincing, but is not sufficient on its own. Postulating the rationality of actors in this way forgets the cultural and ideological motives of their actions. Andreas Malm has astutely suggested that the transition of British industry to coal was not based fully and solely on economic reasoning, but was also founded on political choices and energy-related fashions.⁸ Stephen Mosley has also emphasized the fundamentally cultural refusal of Manchester inhabitants from depriving themselves of an open hearth, which they nevertheless knew was absurd from an energy standpoint.⁹

It is therefore important to take into account the fatalism that was expressed in English society

¹ Roy MacLeod, “Science for Imperial Efficiency and Social Change: Reflections on the British Science Guild, 1905–1936”, *Public Understanding of Science*, vol. 3, no. 2, 1994, 155–193.

² Antoine Missemer, *Les Économistes et la fin des énergies fossiles* (Paris: Garnier, 2017), chapters 1 and 2.

³ G.T. Beilby, “The coal resources of Great Britain”, in British Science Guild, *Natural sources of energy* (London: Burt & Sons, 1912), 18.

⁴ Charles-François Mathis, “Renverser le roi Charbon: Imaginer la transition énergétique en Grande-Bretagne, 1865–1914”, in Yves Bouvier, Léonard Laborie (dir.), *L'Europe en transitions: Énergie, mobilité, communication, XVIII^e–XXI^e siècles* (Paris: Nouveau Monde, 2016), 85–118.

⁵ See for example Peter Thorsheim, *Inventing Pollution: Coal, Smoke, and Culture in Britain since 1800* (Athens: Ohio University Press, 2006).

⁶ Astrid Kander, Paolo Malanima, and Paul Warde, *Power to the People* (Princeton: Princeton University Press, 2013), 274; also the data gathered by Paul Warde at energyhistory.org.

⁷ *Id.*; David Edgerton in *Science, Technology and the British Industrial ‘Decline’ 1870–1970* (Cambridge: CUP, 1996) has shown that the origin of these problems of adaptation was not a lack of technological innovation.

⁸ Andreas Malm, *Fossil Capital. The Rise of Steam Power and the Roots of Global Warming* (London/New York: Verso, 2016), 119 and 211.

⁹ Stephen Mosley, *The Chimney of the World* (Cambridge: White Horse Press, 2001), 75–78.

during the last third of the nineteenth century and the turn of the twentieth century, which had roots in the abiding concern over coal shortage expressed from 1789 onward.¹⁰ This period was one of profound crisis for Victorian values and perceptions of the country's future, especially with regard to energy, for the United Kingdom felt a gradual loss of status in the face of new powers (Prussia, the United States), in addition to increased military, colonial, and economic competition. Doubts were calmed at the end of the Edwardian period, and from a strictly energy standpoint this moment ended shortly before the First World War, when the discovery of new coal deposits in the world and the early uses of oil dispelled the specter of shortage.¹¹ However, from the 1870s to approximately 1910, despite the proliferation of science fiction narratives and more scientific reflections on the subject, what dominated in the press, political analysis, and even among scientists from the period was indeed the notion that the United Kingdom could not escape coal, that its fate was tied to this fossil fuel, and that there was no possible way to escape this particular energy.¹²

¹⁰ I have discussed this fatalism in a recent article: Charles-François Mathis, "King Coal Rules: Accepting or Refusing Coal Dependency in Victorian Britain", *Revue Française de Civilisation Britannique*, special issue on *Environmental questions in Great Britain: Between Visibility and Marginalisation*, vol. XXIII, no. 3, 2018. I notably showed in this article how faith in progress, attachment to free trade, and the paradox of coal's inevitability justified inaction in the shift away from coal use.

¹¹ Antoine Missemer, *Les Économistes et la fin des énergies fossiles*, 87-89 (cf. note 2).

¹² The creation of geology as a science at the turn of the nineteenth century, along with the establishment of the *Geological Survey* in 1835, helped refine prospecting methods: evaluation of actual coal reserves thus became more accurate at the end of the century, encouraged by the Royal Commission appointed in 1866, which issued its report in 1871. However, assessments of the time remaining before the exhaustion of coal resources varied considerably during the century, and was still debated in the early twentieth century, with the geologist Taylor estimating in 1814 that the country still had 1,727 years ahead of it, while in 1865 the economist Jevons reduced this reprieve to 110 years, which was extended to 324 or 1,695 years (!) by Price Williams in 1871. As rightly shown by Jevons, this evaluation had to take economic data into account, notably changes in the consumption of coal, which were much more difficult to determine. For an excellent clarification, see the

Parliament reports devoted to this question, newspaper articles, and works by members of learned societies, geologists, and certain economists regularly presented the apparent impasse in which the country found itself. Their writing often functioned as a system, as they inspired one another and repeated the same figures, or on the contrary questioned the evaluation of a particular individual (the economist Jevons relying on the work of the geologist Hull, both of whom were references during the second half of the century). Revisiting this fatalist thinking and its ramifications based on these documents¹³ helps to clearly identify the country's dominant form of thought toward energy, as well as to use this "non-transition" from the early twentieth century to help understand what a transition could potentially entail.

A PROVIDENTIAL CONCEPTION OF ENERGY

The straight path to power

The first reason for this fatalism was a linear and teleological understanding of history, especially the transition to coal. Both treatises on British industry or coal resources and newspaper editorials highlighted the almost inevitable logic of British domination over the world since at least the eighteenth century: the nation's character, great men, geographic location, and underground resources combined to bring it to power. Traces of such a conception can be found, for instance, in the writings of the economist Stanley Jevons, in his influential 1865 work entitled *The Coal Question*. In its conclusion he refutes the idea that the United Kingdom could be content with a mediocre fate.

To secure a safe smallness we should have to go back, and strangle in their birth those thoughts and inventions which redeemed us from dullness and degradation a century ago. [...] Such experiments could not have succeeded, and

essential work by Rolf Peter Sieferle, *The Subterranean Forest* (Cambridge: The White Horse Press, 2001).

¹³ As I have already studied, in the aforementioned article, late nineteenth century accounts of the future from an energy history perspective, I am voluntarily excluding them from the body of sources used here.

such writing been published among a free and active people *in our circumstances* [emphasis mine] without leading to the changes that have been. [...] One invention, one art, one development of commerce, one amelioration of society follows another almost as effect follows cause.¹⁴

- 6 In doing so, Jevons took his place in a shared tradition of teleological Whig history, whose model was *The History of England* by Thomas Babington Macaulay, which enjoyed phenomenal success with the publication of two of its first five volumes in 1848¹⁵: from the introduction onward the author depicts a nation amid constant material, intellectual, and moral progress since the Glorious Revolution of 1688, up to the height of grandeur attained in the nineteenth century.¹⁶ An example of this thinking can be found—applied to the transition itself—in the writings of the jurist and economist Leone Levi, who in 1855 presented an almost natural and necessary succession of energy systems:

In the early stages of civilisation man knew of no forces but his own. When human strength was found insufficient, the quadrupeds were put under yoke. [...] From the use of animal force we progressed to the use of inorganic motors, such as water and wind. But these again did not meet all exigencies. [...] How shall we value the wonderful influence, physical and moral, of steam – the foremost of all civilizers? It has aroused mankind to a degree of consciousness of their powers over matter, which no other discovery ever accomplished.¹⁷

¹⁴ Stanley Jevons, *The Coal Question. An Inquiry Concerning the Progress of the Nation and the Probable Exhaustion of our Coal-mines* (London: Macmillan, 1865), 346–348.

¹⁵ Thomas William, “Thomas Babington, Baron Macaulay (1800–1859), historian, essayist, and poet”, *Oxford Dictionary of National Biography*.

<http://www.oxforddnb.com/view/10.1093/odnb/9780198614128.001.0001/odnb-9780198614128-e-17349>

¹⁶ Nor did he hide the important role played by coal from the seventeenth century onward. See Thomas Babington Macaulay, *The History of England from the Accession of James II* (New York: Harper, 1849 [1848?]), vol. I, 296.

¹⁷ Leone Levi, *The Law of Nature and Nations as Affected by Divine Law* (London: Cash, 1855), 101–102.

7 There was consequently a constant progression, an almost necessary transition from one energy resource to another, leading to the height of power attained by the United Kingdom thanks to coal. None doubted at the time that the country was at the peak of its glory: its global domination was too obvious, and an immense block of coal, given pride of place alongside the Crystal Palace during the Great Exhibition of 1851, served to remind of its fossil-based origin lest anyone forget. For at least a half century, everyone boasted about this incomparable degree of civilization attained by the country thanks to God.

God, coal, and Victorian conscience

8 The possession of coal was in a way the most obvious sign of being chosen by providence: the United Kingdom had the great fortune of possessing immense, accessible, and high-quality reserves, whose use was made possible by the ingenuity of its great men and the dynamism of its people.¹⁸ In 1873, an engineering magazine little given to mysticism evoked with regard to this energy source “the advantages which the very Creator has bestowed upon ?Britain?,”¹⁹ while a letter sent to the *Colliery Guardian*, the mining and metallurgy industry newspaper, exclaimed: “The use, influence and value of coal as a national agent, are such as cannot fail to impress all with a feeling of gratitude for that munificence manifested and accorded to us by Divine wisdom.”²⁰

9 Such thinking was in keeping with a natural theology framework, which pervaded the first two thirds of the century:²¹ plants, animals, and mineral resources were placed in the world for the instruction and well-being of humanity,

¹⁸ Robert Fox, “Théologie naturelle et géologie à l’époque de William Buckland”, *Travaux du Comité français d’Histoire de la Géologie*, Comité français d’Histoire de la Géologie, 2001, 3rd series, vol. 15, 89–105. <hal-00920000>

¹⁹ “The Committee on Coal”, *The Engineer*, 11 July 1873, 28.

²⁰ C. Hodgson, Letter to the Editor, “Importance of Coal”, *Colliery Guardian*, 12 May 1866, 350.

²¹ David N. Livingstone, “Natural Theology and Neo-Lamarckism: the Changing Context of Nineteenth-century Geography in the United States and Great Britain”, *Annals of the Association of American Geographers*, vol. 74, no. 1, 1984, 9–28.

who is responsible for discovering their possible uses and applying them. Developing the natural sciences in order to learn the uses of these resources, and even discovering where they can be found, consequently became a kind of Christian duty. Coal was no exception, for God had placed it for the happiness and prosperity of British citizens. Geoffrey Cantor has shown how scientific and technological progress was inscribed within a Christian perspective of human progress according to a divine plan, in which the Great Exhibition of 1851 was one stage.²² While natural theology—fairly determinist and also marked by teleology—was in a difficult situation after Darwin, the notion of the duty of civilized peoples to exploit dormant natural resources endured,²³ as did the exceptional God-given energy that characterized the English people.²⁴ For example, in 1862 the eminent geologist Edward Hull proposed at the beginning of his influential *The Coal-Fields of Great Britain*: “May we not [...] as believers in an eternal Providence, acknowledge that the mineral ?coal? is a heaven-born gift to man?”²⁵

10 This association of coal with divine benevolence was all the more pronounced as the power provided by coal was the subject of fascination across the century. Only electricity in its time enjoyed such a magical aura: the humanity that possesses coal and uses it in steam engines is almost completely different than the one that preceded it, so immense and almost limitless its powers appeared to be. The famous poem “Old

King Coal” by Charles Mackay in *The Illustrated London News*, which made the expression “King Coal” popular, depicts a power that changes the world for the benefit of England:

While his miners mine, and his engines work,
Through all our happy land,
We shall flourish fair in the morning light,
And our name and our fame, and our might
and our right,
In the front of the world shall stand.²⁶

With this in mind, Andreas Malm is entirely correct in evoking a kind of steam fetishism,²⁷ which he illustrates with a poem that appeared in the *Times* in December 1829: the poem’s hero is awakened by the spirit of steam, who takes him traveling through a new world, which in 1930 was presided over by this new and somewhat frightening power, but one that was so much more effective than earlier eras...²⁸

Historians themselves have also emphasized the United Kingdom’s amazing luck, from a purely economic standpoint, in possessing such vast and accessible coal resources. Kenneth Pomeranz in particular has made this happenstance one of the reasons for British supremacy during the Victorian period.²⁹ For most contemporaries, such fortune could of course not be simply the result of complete chance, for a divine hand was necessarily involved in bestowing such a godsend on the country.

As the recipients of this divine gift and unprecedented power, nineteenth-century Britons bore an immense responsibility on their shoulders. Victorians continued to praise their civilization, but they also had doubts, which were driven by a recurring fear of shortage, and were based on two pillars: moral concern and a troubled

²² Geoffrey Cantor, “Science, Providence and Progress at the Great Exhibition”, *Isis*, vol. 103, no. 3, 2012, 439-459.

²³ “In speaking of the natural resources of any country, we refer to the ore in the mine, the stone unquarried, the timber unfelled, the native plants and animals – to all those latent elements of wealth only awaiting the labour of man to become of use, and therefore of value”, John Yeats, *The Natural History of Commerce* (London: Cassell, 1870), 2.

²⁴ Bernard Lightman has shown the continuities among popularizers of science, between what he calls “narratives of natural theology” and “narratives of natural history”: Bernard Lightman, “The Story of Nature: Victorian Popularizers and Scientific Narrative”, *Victorian Review*, vol. 25, no. 2, 2000, 1-29. See also his *Victorian Popularizers of Science* (Chicago: University of Chicago Press, 2007), 494.

²⁵ Edward Hull, *The Coal-Fields of Great Britain* (London: Stanford, 1861), 17.

²⁶ Charles Mackay, “Old King Coal”, *The Illustrated London News*, 1 January 1859, 12.

²⁷ Andreas Malm, *Fossil Capital. The Rise of Steam Power and the Roots of Global Warming* (London/New York: Verso, 2016), 195 sqq.

²⁸ “A vision of steam”, *The Times*, 26 December 1829, 3.

²⁹ Kenneth Pomeranz, *The Great Divergence* (Princeton: Princeton University Press, 2000).

conscience. The latter was tormented by how coal had been used: were the British not guilty of wasting such a gift from God? This prompted moral and existential anxiety: Providence had provided for the elevation of the Victorians to the forefront of the world thanks to coal, so what would happen to them without this energy? *Could they* have a second change? The affirmations of the Royal Commission of 1905, tasked with evaluating coal reserves, left no doubt on this question: “We are convinced that coal is our only reliable source of power, and that there is no real substitute.”³⁰ These two concerns merit being presented in greater detail.

BAD CONSCIENCE: “THOU SHALT NOT WASTE”

The precocity of a neglected ethical imperative

14 In the United Kingdom during the Victorian era, there was an imperative—as much moral and religious as economic—to preserve coal reserves. This worry, and especially its precocity, can be best understood by situating it within the ideological framework presented above. It was actually quite early on, in 1789, that worry over a possible coal shortage was expressed in the *Natural History of the Mineral Kingdom* by John Williams. It was not shared by all, as the historian Fredrik Albritton Jonsson has shown that two schools of thought opposed one another during the century, which he has called Malthusians and “Cornucopians”; the latter were convinced of the abundance of coal, and the possibility of replacing it at a chosen time by other resources, thanks to God and human ingeniousness. But Albritton Jonsson has also shown how theological arguments were intertwined with economic or environmental ones among Malthusians³¹: for instance, William Buckland, the greatest

geologist of the nineteenth century, emphasized the pressing need for reasoned coal management *because* it was a divine gift.³² This theological dimension endured, despite the fact that fear of shortage was expressed in various forms over the years. It could take on an essentially moral character, as when the famous man of science John Herschel, who contributed greatly to the success of Jevons’s book, lost his temper in a letter from 1866 against “the enormous and outrageously wasteful consumption” of “populations calling themselves civilised – but in reality luxurious and selfish,” who would “make the Earth a desert”; “a very ugly day of reckoning is impending sooner or later.”³³

These imprecations against waste were 15 expressed at the end of the century in connection with future generations, whose fate should not be forgotten by the present one as it walled in temporary energy abundance.³⁴ Alfred Russel Wallace, the co-discoverer of the theory of evolution, affirmed the following in 1873:

[The non-renewable resources of the earth] must be considered to be held in trust for the community, and for succeeding generations. They should be jealously guarded from all waste or unnecessary expenditure, and it should be considered (as it will certainly come to be regarded) as a positive crime against posterity to expend them lavishly for the sole purpose of increasing our own wealth, luxury, or commercial importance.³⁵

What increased bad conscience and questions 16 surrounding waste at that moment were observations of the general disfigurement of the country, the failure to provide material abundance

³⁰ Royal Commission on Coal Supplies, *Final Report*, 1905, 17.

³¹ Fredrik Albritton Jonsson, “The Origins of Cornucopianism: A Preliminary Genealogy”, *Critical Historical Studies*, vol. 1, no. 1, 2014, 151-168; and “Forecasting Collapse: the Problem of Coal Exhaustion from the Enlightenment to Victorian Britain,” *Anticiper la pénurie énergétique* study day, 25 September 2015, Université Bordeaux Montaigne; “Abundance and Scarcity in Geological Time, 1784-1844,” in Katrina Forrester, Sophie Smith (eds.), *Nature, Action and the Future* (Cambridge: CUP, 2018), 70-93.

³² William Buckland, *Geology and Mineralogy Considered with Reference to Natural Theology* (Pickering: n.p., 1836-1837).

³³ John Herschel, cited in Asa Briggs, *Victorian Things* (Stroud: Sutton, 2003 ?1988), 267.

³⁴ Fredrik Albritton Jonsson has traced this understanding of intergenerational solidarity back to Edmund Burke.

³⁵ Alfred Russel Wallace, *Daily News*, 16 September 1873. He also uses this argument in the conclusion of *The Wonderful Century* (New York: Dodd, Mead & Co, 1899), entitled “The Plunder of the Earth.”

for all, worries about the degeneration of the race, and the extraordinary pollution sparked precisely by wasteful consumption of coal. The crisis experienced by Victorian society beginning in the 1870s was fundamentally a crisis of civilization, which called earlier choices into question, and as such inevitably revived energy-related anxiety. Is this what we did with the power? The engineer Richard Price-Williams said it somewhat bluntly: “The long black flags of smoke which still fly from many a tall factory chimney in our manufacturing towns, and the many thousand smaller flags which stream from our house tops, bear constant and most mournful testimony to this enormous waste of coal.”³⁶

- 17 Since no other energy source seemed capable of replacing it, and it was an incomparable providential gift in comparison to other sources, it had to be saved.

Saving to endure

- 18 People were not content with expressing regret and complaints regarding waste, for there were attempts to quantify it and provide solutions. In 1873, the eminent industrial actor Sir William Armstrong believed that half of the coal used in steam engines and for domestic heating was wasted,³⁷ an assessment that was subsequently echoed at every opportunity and with little discrimination.³⁸ Similarly, the aforementioned collective work by the British Science Guild led, at the instigation of William Ramsay, to the creation within this guild of a Conservation of Natural Sources of Energy Committee, in which he noted a “frightful waste” of coal and tried to provide solutions.³⁹ Two changes were subsequently implemented to save this precious resource and remedy this state of affairs: changing converters and uses.

There was firstly an effort to promote savings in production and consumption, notably by proposing to either improve (the steam engine for industrial actors) or modify existing converters (abandoning the open hearth and transitioning to stoves for private individuals). This is what Armstrong insisted on in his article, whose impact was such that a few months later, a Society for the Promotion of Scientific Industry was created, and held its inaugural meeting in Manchester on 16 January 1874.⁴⁰ That same year, it organized a fairly successful “Exhibition of appliances for the economical consumption of fuel” in Peel Park, Salford.⁴¹ The proposed solution was therefore essentially technical and economic, and was based first and foremost on innovation, along with its adoption by industrial actors and citizens. It is of course difficult to determine the extent to which these calls for moderation and coal savings were heeded, although Paul Warde has shown that British energy intensity decreased beginning with the late 1870s.⁴² Contemporaries do not appear to have been aware of it. Thirty years later, in 1905, the Royal Commission used the same arguments and figures as Armstrong: half of domestic coal consumption could be saved with the installation of central heating, while steam engines of higher quality could reduce their consumption along the same proportions. The verdict was thus the same: “Of the wastefulness of existing methods and of the necessity for economy there is no doubt.”⁴³ These measures were taken regardless of the warnings of Stanley Jevons, who in *The Coal Question* formulated his famous paradox, with technical improvements permitting

³⁶ Richard Price-Williams, “The Coal Question”, *Journal of the Royal Statistical Society*, vol. 52, no. 1, 1889, 19.

³⁷ Sir William Armstrong, “The Coal Supply”, *Presidential Address to the North of England Institute of Mining and Mechanical Engineers* (Newcastle-upon-Tyne: A. Reid, 1873).

³⁸ “The coal famine. Economies and remedies”, *The Engineer*, 21 February 1873, 115.

³⁹ British Science Guild, *Fourth Annual Report of the Executive Committee*, 18 March 1910, 11.

⁴⁰ Robert Hugh Kargon, *Science in Victorian Manchester: Enterprise and Expertise* (Manchester: MUP, 1977), 200.

⁴¹ The exhibition apparently drew 50,000 visitors according to the *The Manchester Courier and Lancashire General Advertiser*, 20 April 1874, 6.

⁴² Paul Warde, “Low carbon futures and high carbon pasts: policy challenges in historical perspective”, *History & Policy*, 1 December 2010. Online: <http://www.historyandpolicy.org/policy-papers/papers/low-carbon-futures-and-high-carbon-pasts-policy-challenges-in-historical-pe>.

See also Astrid Kander, Paolo Malanima, and Paul Warde, *Power to the People*, 232–247 (cf. note 6).

⁴³ Royal Commission on Coal Supplies, *Final Report*, 1905, 20.

energy savings that ultimately lead to a rise in overall energy consumption.⁴⁴

20 Since the improvement of energy converters was not enough to prevent waste, new uses and a new organization of the energy sector were also envisioned. The debate surrounding the nationalization of coal production, which was so pervasive during the interwar period, began at the turn of the twentieth century. The central issue was increased state intervention in such an essential sector for the country, for instance with respect to salary negotiations. Yet there was also sometimes mention of public control over production, in an effort to rationalize and ensure greater efficiency and savings, for instance with the launching of a debate on this topic in the House of Commons in 1912 by the Liberal MP Chiozza Money.⁴⁵ In addition to public control, he suggested more centralized use of coal through an increase in electrical plants. The project was in the spirit of the times, as William Ramsay proposed that same year to burn coal directly underground instead of extracting it, in order to produce gas that could be used at the site, once again in electric plants.⁴⁶ There was little doubt that this centralization of energy production would be more economic than the scattered use of coal in individual households for domestic heating. Such reflections were undoubtedly so many steps toward the implementation of the National Grid in 1926. In the meantime, however, they did not solve the problem. Electricity may very well have been the only energy able to compete with the dream-like power of coal, and to spark the imagination as steam did in its time; its magic dissipated as it became clear to many that it had to be produced as well, with coal remaining the chief primary energy source for this purpose. Such efforts could do no more than adapt an ineffective energy system by

postponing its decline, without addressing the existential anxiety felt by *fin de siècle* Victorian society.

THE STORM-CLOUD OF THE NINETEENTH CENTURY

This was the title that John Ruskin gave to two conferences in 1884, which were later published. The storm cloud heralded by the Victorian thinker was the one he had seen accumulating for a half century thanks to his meteorological observations; one that could only be the expression of his industrial era's supreme blasphemy against natural and divine beauty, and its transformation of the climate of Europe.⁴⁷ It can serve as a revealing symbol of the cloud hovering over the country's energy future. 21

The tragic destiny of the United Kingdom

Early worry over reserves and the ensuing struggle to combat waste were joined by another consequence of providential thought regarding energy: a tragic and sometimes apocalyptic vision of the future. Since coal was the United Kingdom's opportunity—a single opportunity that enabled its extraordinary rise above all other nations—it would surely not be renewed. If reserves were exhausted and prices increased, it would be the undoing of both the country and its power. The descriptions of this collapse were legion each time there was talk of increasing the cost of coal, establishing a tax on exports, or evaluating existing reserves. To take just one example, here is a prediction made by the *Times* in 1913, which relied on Stanley Jevons, that great prophet of decline for the British: 22

“Coal in truth stands not beside, but entirely above all other commodities. It is the material source of the energies of the country – the universal aid – the factor in everything we do. With coal almost any feat is possible or easy; without it we are thrown back into the laborious poverty of early times”. These words, which Stanley Jevons wrote in 1865, are equally true

⁴⁴ On this rebound effect and Jevons, see Antoine Missemer, *Les Économistes et la fin des énergies fossiles*, 42–43 (cf. note 2).

⁴⁵ L.G. Chiozza Money, *Hansard*, House of Commons, vol. XXXVI, col. 1372, 10 April 1912. See also Charles-François Mathis “Renverser le roi Charbon” (cf. note 4).

⁴⁶ William Ramsay, cited in “Can Science Abolish the Coal-Miner?”, *The Illustrated London News*, 30 March 1912.

⁴⁷ John Ruskin, *The Storm Cloud of the Nineteenth Century* (Orpington: Allen, 1884).

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today, for coal has not been, nor does it appear likely to be, supplanted as the main source of industrial energy.⁴⁸

- 23 There is nothing surprising either about the popularity of a New Zealander contemplating the ruins of London ever since the figure was created by Thomas Babington Macaulay in 1840⁴⁹; when Gustave Doré drew it in 1871, it had already become a cliché of the genre, as the prolific author on British mines and miners, John R. Leifchild, bore witness in 1853:

A modern historian has drawn a [...] striking picture of a New Zealander, sitting and musing on the ruins of London, at the débris of the fallen St. Paul's. It has been reserved for the author of this book to conceive the picture of some one of his lineal posterity sitting on the top of the ruins of a great, but exhausted Newcastle colliery and mourning and moralizing over the fate of fallen Britain! Should such a picture ever be drawn, its subject will be more pathetic and powerful than that of [...] the feathered New Zealander!⁵⁰

- 24 Through their very exaggeration, found in some of the futuristic stories that proliferated at the turn of the twentieth century,⁵¹ these descriptions reveal the absolute conviction of an unending link between prosperity and coal, one that could also be painful: King Coal is a tyrant that one must submit to in order to remain the world's leading people.⁵²

Prince or pauper

- 25 What is ultimately interesting about these accounts is that the United Kingdom had to

choose between being a superpower thanks to coal on the one hand, and misery on the other. Any form of more refined or nuanced thinking came up against what I will call an imperative of power: dominate or cease to be. This is the meaning of Jevons's provocative turn of phrase, who concluded his work: "We have to make the momentous choice between brief greatness and longer continued mediocrity."⁵³ In an 1822 book on geology, Reverend Conybeare and his colleague Phillips saw a gentle transition to backwardness rather than a collapse: shrinking population, forests replacing fields, declining industry, evaporating national wealth...⁵⁴

This worry seemed no less exaggerated even though almost all of the country's energy needs were met by coal starting in the mid-nineteenth century, as we saw earlier. The United Kingdom would never entirely lack coal, for it could import it if its reserves were exhausted or became too costly to exploit. A situation such as the following, described in the *Times* during the spring of 1900, would never occur: 26

A famine in fuel [...] is one of the most serious troubles that can affect civilized humanity. In some respects, indeed, a coal famine is much worse than a food famine, for without coal it would be practically impossible to keep our mills, forges, mines, and factories in operation; to maintain our systems of transportation by sea and land; to provide heat and light for a hundred different requirements; or to discharge many other functions that are now rendered so easy as to seem commonplace and matters of course.⁵⁵

What the country could lack was low-cost coal that placed it in a favorable competitive position compared to its European or American rivals. It wasn't British civilization that was under threat, but its absolute superiority over its competitors. The best informed were aware of this, voicing 27

⁴⁸ "Coal resources of the world", *The Times*, 1 December 1913, 21.

⁴⁹ David Skilton, "Contemplating the Ruins of London: Macaulay's New Zealander and Others", *The Literary London Journal*, vol. 2, no. 1, 2004: <http://www.literarylondon.org/london-journal/march2004/skilton.html>.

⁵⁰ John Leifchild, *Our Coal and Our Coal-Pits* (London: Longman, 1853), 12-13.

⁵¹ For example: Henry O'Neil, *Two Thousand Years Hence* (London: Chapman & Hall, 1868).

⁵² See, among many other examples, the following description of King Coal: Reverend Harry Jones, "Coal and its Substitutes", *Illustrated London News*, 18 November 1893, 646.

⁵³ Stanley Jevons, *The Coal Question*, 349 (cf. note 14).

⁵⁴ William Daniel Conybeare and William Phillips, *Outlines of the geology of England and Wales* (London: William Phillips, 1822), part I, 324-325.

⁵⁵ *The Times*, 19 April 1900.

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concerns that were much more level-headed than the panicked expressions of people of modest means unable to purchase coal when it was too expensive. For instance in 1874, the industrialist William Rathbone Greg evaluated available global coal resources, and subsequently affirmed that they were sufficient:

to set at rest all anxiety as to the future fuel of the human race. But to us, and for our immediate purpose, these figures and speculations are utterly irrelevant. Coal is too bulky an article to pay the cost of distant carriage by land or sea; and if ever England is reduced to import her fuel from America or China, the day of her manufacturing prosperity – to say nothing of her supremacy, the matter now in question – will have set for ever.⁵⁶

28 Greg surely took inspiration from the conclusions of the Royal Commission of 1866, which conveyed the same message in quieter language:

Before complete exhaustion is reached the importation of coal will become the rule, and not the exception, of our practice [...]. But it may well be doubted whether the manufacturing supremacy of this kingdom can be maintained after the importation of coal has become a necessity.⁵⁷

29 The issue of maintaining this relative superiority, breached during the last third of the nineteenth century by the rise of the United States, Germany, and new countries, explains the intensity of debates, especially at the turn of the twentieth century, of whether to tax coal exports, which continued to increase.⁵⁸ Those who were the most concerned called for an exception to the ideology of free trade with respect to a good so valuable and vital to the United Kingdom,

whose hemorrhaging had to be stopped. Let us keep what remains of coal in order to extend our prosperity and that of future generations, affirmed both Londoners affected by peaks in energy prices, as well as an intellectual such as Alfred Russel Wallace.⁵⁹ Politicians and industrialists were indignant over a measure that could cut the country off from international commerce by provoking retaliatory measures; they believed that mine prospecting should be promoted in the empire (which would help lower coal exports to these areas, who themselves could become exporters), and progress made with regard to energy saving.⁶⁰

CONCLUSION

I believe there was a fatalist attachment to coal in British society of the long nineteenth century, which was rooted in a providential conception of the God-given energy it enjoyed. This attachment contained a dual anxiety: a conscience tormented by the waste of this highly precious resource, and anxiety over an opportunity that would not occur again. This is why most of the British political, economic, and intellectual elite was incapable of conceiving the end of coal without simultaneously envisioning the collapse of English civilization. They proposed certain *adaptations* – essentially by optimizing production and consumption – all while knowing full well that this would only postpone its decline, but not prevent it. They were running toward a wall, as it were.

This incapacity most likely resulted from a conception that focused on the energy source rather than the system: the British expended tremendous effort thinking about replacing coal with another energy source that would provide the same advantages within the same social,

⁵⁶ William Rathbone Greg, “Rocks ahead”, *Contemporary Review*, vol. 24, 1874, 42. For an analysis of these questions, see Antoine Missemer, *Les Économistes et la fin des énergies fossiles*, 77-78 (cf. note 2).

⁵⁷ Royal Commission on Coal, *Report*, 1871, vol. I, XVIII.

⁵⁸ Two percent of the coal produced was exported in 1800, as opposed to 34% in 1913, at a time when coal represented 1/10th of British exports.

⁵⁹ See for example the account of a protest in *The Nottinghamshire Guardian*, 7 March 1873; Alfred Wallace, “Free Trade Principles and the Coal Question,” *Daily News*, 16 September 1873.

⁶⁰ For example: “‘Don’t Care’ and the Coal Tax”, *Colliery Guardian*, 17 May 1901, 1088; Carlyon W. Bellairs, “The Coal Problem: its relations to the Empire,” *Colliery Guardian*, 17 May 1901, 1082-1083.

economic, and even potentially political organization, which was in fact impossible. No other energy source could do so. As clearly shown by the aforementioned book published by the British Science Guild in 1912, neither water power nor oil, nor the exceedingly rare wood in the United Kingdom—not to speak of course of solar energy—were as abundant, evenly distributed across the territory, cheap, or well-adapted to British society as it had built itself for a century as coal. As observers from the time had understood, there was a British energy singularity⁶¹ that made coal an exceptional godsend that ensured the country's supremacy in a given international, technological, and commercial context, and that forged a particular culture.⁶² The secondary source of electricity could not maintain an illusion in this respect for long.

32 This is most certainly the major lesson to be learned from this non-transition: envisioning a transition precisely entails changing a system *as a whole*. Yet the British of the turn of the twentieth century were unable to do so, for they remained prisoner to a conception of their country that was unfailingly connected to free trade, manufacturing production, and material abundance – at least for some – which is to say so many elements that closely depended at the time on low-cost and abundant coal. For that matter, this is potentially a trap specific to systems based on fossil resources: energy affluence is such that it is difficult to imagine anything other than a decline if it were to stop; yet we know by definition that these resources are finite, hence the anxiety that bursts forth

⁶¹ Astrid Kander, Paolo Malanima, and Paul Warde have highlighted this British singularity in *Power to the People* (cf. note 6): in the United Kingdom around 1870, static steam engines had twice the power of those in the United States and Belgium, and five times the power of those in France (184); in 1913 coal represented 80% of energy consumed in France (compared to 95% for the United Kingdom) (210), but for a per capita consumption that was three times lower in France (243).

⁶² Industrial novels, for instance *Mary Barton* (1848) or *North and South* (1855) by Elizabeth Gaskell, bear witness to this imagination and way of life through a multitude of concrete details and anecdotes. However, they do not reveal the concerns surrounding coal shortages, instead taking an interest in the condition of laborers.

when they become more expensive or scarce.⁶³ To escape such declinist thought and to change more fundamentally as a whole, the system must at a minimum be adapted to allow an energy mix. However, an energy system does not just consist of technical networks, economic infrastructure, etc. It is a global socio-political configuration, underpinned by specific representations and imaginaries. Reflecting on transition consequently involves inventing possibilities and credible alternative futures, which require taking a step back in order to better grasp the system in its entirety.⁶⁴

In a sense this is what major intellectuals such as John Ruskin, William Morris, and those who imagined utopias at the turn of the twentieth century succeeded in doing, most of whom preached a more respectful frugality toward resources, in addition to a return to nature. In doing so they criticized the materialism of their time, how it had made the world ugly, thereby breaking the seemingly unshakeable link between coal, energy abundance, and happiness. This is a reminder of the fundamentally political dimension of the transition as it is envisioned here,⁶⁵ or at least with respect to its subversive dimension. The poet and literary critic Matthew Arnold was not mistaken in his major work *Culture and Anarchy* from 1869, when he made culture the force that enabled this step back, and a clearer vision of his country's situation: 33

⁶³ Ducio Basosi has shown, in a conference paper entitled *Les transitions dans l'histoire de l'énergie* (Milan, 28 November – 1 December 2017), that reflections on energy transition during the 1970s were based on fears surrounding the exhaustion of oil, dispelled (for a time) by the sustained production of the 1980s. Antoine Missemer has revealed that after the First World War, fears of coal shortage also eased in the United Kingdom for the same reason (Antoine Missemer, *Les Économistes et la fin des énergies fossiles*, 88–89 – cf. note 2).

⁶⁴ On this subject see the work by Yannick Rumpala, *Hors des décombres du monde. Écologie, science-fiction et éthique du futur* (Ceyzérieu: Champ Vallon, 2018), which analyzes how science fiction narratives precisely allow for reflecting on the environmental issues of our time, and for envisioning possibilities.

⁶⁵ Charles-François Mathis “‘Renverser le roi Charbon’” (cf. note 4).

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Our coal, thousands of people were saying, is the real basis of our national greatness; if our coal runs short, there is an end of the greatness of England. But what is greatness? culture makes us ask. [...] If England were swallowed up by the sea to-morrow, which of the two, a hundred years hence, would most excite the love, interest, and admiration of mankind, would most, therefore, show the evidences of having possessed greatness, the England of the last twenty years, or the England of Elizabeth, of a time of splendid spiritual effort, but when our coal, and our industrial operations depending on coal, were very little developed?⁶⁶

⁶⁶ Matthew Arnold, *Culture and Anarchy* (Cambridge: CUP, 1932 [1869]), 51.

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