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The British Shaping of America's First Fossil Fuel Transition

When early Americans first came across outcrops of a shiny black rock in the mountains of eastern Pennsylvania at the end of the eighteenth century, they knew they had found coal. Though seemingly mundane, this simple fact merits further attention. It reveals that Americans were not encountering their world with a blank slate, but were deeply imprinted with ideas developed elsewhere. In particular, American knowledge of coal, like many other aspects of the young republic's culture, came from Britain. It was in America's former colonial power that many of the techniques were pioneered to bring coal out of the ground, prepare it for market, and burn it in homes and factories. Through the transfer of people, ideas, and written texts, Americans were well aware of the potentially revolutionary role of coal for the nation's political economy. Thus, when Americans initially found coal, they already had a clear picture of why it might be important to the nation's future.

American knowledge of British coal practices had at least two crucial implications for the timing and shape of the nation's first fossil fuel energy transition. First, British experiences dramatically accelerated the speed with which Americans sought to develop their coal reserves. When anthracite was first discovered, the nation was already blessed with abundant forests and falling streams. Another energy source was not needed. Yet because some Americans were hoping to replicate British economic success, they began experimenting with fossil fuels far earlier than they would have without this model. American use of anthracite was undertaken in a context of energy abundance, not scarcity. Second, Americans had ambivalent feelings about British industrial developments that shaped the patterns of the coal industry. While some saw coal as an opportunity to protect the young republic's independence and challenge the old European order, others looked with horror at the "dark and satanic mills" of British industrialization and feared that it would undermine the nation's republican ideals. These debates led to a series of policies concerning corporate rights and responsibilities that sought to balance economic growth with measures to encourage a virtuous citizenry.

The history of energy transitions is often written from the perspective of individual nations. This story suggests that attention to transnational contexts can help us better understand how, when, and why energy transitions occur.

Imagining a Coal-Fired Future

European settlers colonizing America arrived to a world of energy abundance. Dense forests offered what appeared to be an endless supply of firewood, countless streams were available to power mills, and wide tracts of land could be cleared to support horses and oxen. Whereas forests in the Old World were shrinking and most mill sites had already been claimed, Americans lived in a world of natural bounty. As a result, at the dawn of the nineteenth century, coal played a negligible role in American energy practices. The delivery of a few thousand tons of coal a year from Britain and Canada could meet the needs of a large city like Philadelphia and the whole nation imported only about 13,000 tons in 1810 (Powell 1978). With plentiful trees, rivers, and land, there was no pressing need for Americans to pioneer an energy transition.

And yet they did. Beginning in the 1790s, a heterogeneous group of Philadelphia merchants, scientists, industrialists, politicians, and citizens began to promote the use of anthracite coal, accelerating their efforts in the 1810s. Their imaginations were fueled by opportunity rather than scarcity. In part, they were inspired by looking northwest to the Lehigh, Schuylkill, and Wyoming valleys. Local citizens in these areas had identified outcrops of anthracite and had since begun using "stone coal," as it was often called, for several decades. But the view to the east was far more important for these early energy boosters. They knew that over the previous century Britain had entered a remarkable period of economic and industrial growth fueled by coal, iron, and steam engines. As Thomas Cooper, an American professor of chemistry, observed: "Every suggestion that brings forward the importance of coal to the public view is of moment: we know little of its value in Pennsylvania as yet. All, all the superior wealth, power and energy of Great Britain, is founded on her coal mining" (Cooper, quoted in Powell 1978, 1).

Cooper, along with Tench Coxe, Alexander Hamilton, and several others believed that the young nation should encourage the growth of manufacturing because it would generate profits, tax revenue, and a stronger military. In his influential 1790 report on American manufacturers, for example, Hamilton argued: "Every nation … ought to endeavor to possess within itself all the essentials of national supply" (Hamilton, quoted in Folsom and Lubar 1982, 90). Manufacturing was not simply a matter of economic gain; it was a matter of nation-building. And from observing British practices, Americans knew that

coal was an important component of manufacturing because it could be used to power steam engines, produce iron, and provide heat for countless industrial operations.

Not everyone saw Britain as a desirable model, however. For many Americans, British society was characterized by great disparities in wealth, filthy urban slums, a degenerate working class, and a corrupt political system. Echoing a republican ideology made most famous by Thomas Jefferson, they favored policies that would support independent farmers and virtuous citizens. For this reason, Jefferson wrote bluntly: "For the general purposes of manufacture, let our work-shops remain in Europe" (1999 [1785], 171). If manufacturing was necessary, it should be located in the countryside at small mills. A nation of independent farmers with ample woodlots had little need for coal.

Though America's subsequent development as the world's foremost industrial power and consumer of fossil fuels may make it seem inevitable that citizens would have favored policies that promoted coal, this was hardly the case in the early nineteenth century. Americans already possessed abundant energy sources and a widespread aversion to replicating the evils of British factories. A transition to anthracite coal appeared anything but certain.

Canals for a Coal-Burning Nation

The breakthrough for coal boosters came with the development of canals in the two decades after 1815. Canals served two crucial functions. First, they provided the key technological breakthrough necessary to initiate a pattern of ever-increasing consumption. Mining anthracite was not a great challenge, as large quantities of coal were located near the surface and could be gathered with shovels, pickaxes, wagons, and brute strength. But shipping a bulky and heavy commodity long distances over rough roads and choppy waters was prohibitively expensive. As I have argued elsewhere, canals made it possible for the first time to ship anthracite cheaply and in abundant quantities; they created a landscape of intensification that stimulated and sustained an energy transition (Jones 2014; Jones 2010). Second, canals offered a point of compromise between advocates of manufacturing and supporters of republicanism. Whereas government policies to support manufacturing were fiercely contested, canals broadly

appealed to early Americans because they could enable independent farmers to ship their harvest to markets. Explicitly invoking Jeffersonian ideals, the founders of the Erie Canal argued that "[Canals] constitute improvements peculiarly fit for a republic" (The State of New York 1816, 8).

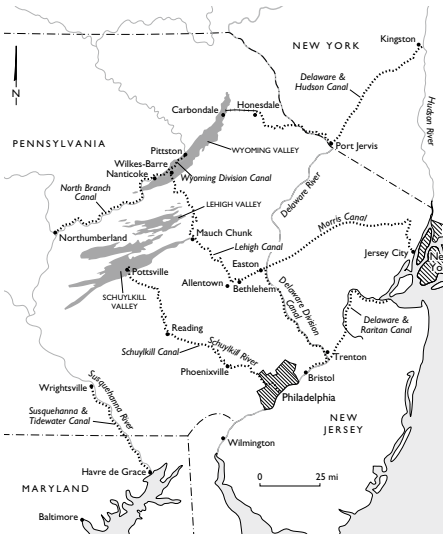

Figure 1: Canals important to the Anthracite Trade, 1834. Image courtesy of the author.

Coal boosters also recognized the potential value of canals. Josiah White, pioneer of the Lehigh Canal, made the case for the links between coal, canals, and economic growth explicit by drawing on Britain: "What would the value of all [British] labor be … without their canals? Canals are the foundation of their wealth. Canals give industry its essence—the collecting of raw materials and the sending of the products of the factory to market" (quoted in Hansell 1992, 56). Advocates of manufacturing and republicans may not have agreed about much, but building canals offered the potential of a common project.

Though republican dreams of agricultural conduits provided the stimulus for many canal developments, anthracite coal came to dominate the traffic of those built in Pennsylvania and New Jersey. The Schuylkill Canal epitomizes this rather unexpected development. When first proposed in 1815, the Schuylkill Canal was intended to capture the rich agricultural trade along the river, and local farmers purchased many of the shares of stock in the company. Coal was only an afterthought. Once it began operating, however, coal constituted more than three-quarters of the total shipments (Jones 1908). In conjunction with the Lehigh, Delaware & Hudson, Morris, and Delaware & Raritan canals, the Schuylkill channeled coal into cities such as Philadelphia and New York, thereby stimulating the growth of urban manufacturing. The modest gains of independent farmers were overshadowed by the advantages canals provided to urban industrialists. Canals, coal, and manufacturing grew together synergistically.

Constraining Corporate Power

In addition to debating *whether* to build canals, early Americans also discussed *how* such projects should be governed. They recognized that constructing canals might generate the undesirable concentrations of wealth and power that characterized British society. This led citizens and politicians to search for measures that would balance the need for large organizations to build and manage these systems with republican values. These deliberations were often manifested in restrictions to the corporate charters granted to canal companies that shaped the contours of America's first energy transition.

In the early nineteenth century, every corporate charter had to be approved by a separate act of a state legislature. Because canal companies were requesting extensive rights to raise capital, augment waterways, and charge tolls, politicians frequently insisted on limitations that augmented these privileges. When the Schuylkill Canal received its corporate charter in 1815, for example, the Pennsylvania Assembly sought to ensure that no single party obtained control of the canal. Each investor could buy a maximum of twenty shares, and the shares were divided between the counties along the path of the canal; each 50 US dollars share could be purchased with a down payment of only 5 US dollars, allowing many farmers to participate. This capitalization structure discouraged monopoly control.

Corporate charters could also be amended over time. The Schuylkill Navigation Company was initially authorized to raise 500,000 US dollars. By 1821, these funds had been spent and the company approached the Pennsylvania Assembly for the right to increase its capitalization. Because coal was now recognized to be an important article of trade, legislators insisted that in exchange for the right to raise more money, the company cede any right to operate coal mines. This provision encouraged a proliferation of independent mining operations in the Schuylkill Valley. But independent miners did not thrive everywhere. The operators of the Lehigh Canal refused to give up their right to mine coal in exchange for a higher capitalization. Instead, they took on large amounts of debt (a more expensive and risky financial strategy) so that they could control coal developments in the Lehigh Valley. These differences in corporate charters led to greater concentrations of power in the Lehigh Valley than in the Schuylkill Valley.

Public ownership was another option employed by Americans to avoid the pitfalls of powerful corporations. Because canals were often seen as profitable investments, some state legislatures formed organizations that would channel the gains into state coffers. For example, in 1824, the state of New Jersey chartered the Morris Canal to cross the mountainous northern part of the state. Similarly, in 1827 the state of Pennsylvania undertook the construction and operation of the Delaware Division canal. While the profits from these canals did not match initial expectations, they were still channeled into public budgets.

The attempts to craft a careful balance between corporate privilege and the broader public good produced tangible results. The first third of the nineteenth century saw the most widespread patterns of stock ownership in the antebellum era (Majewski 2006). The corporate checks on the Schuylkill and Lehigh canals limited their activities, helping support independent miners in the former case and slowing the growth of the latter. While these policies did not stop the rising use of anthracite coal, they altered the timing and contours of this energy transition.

Conclusion

America's turn to anthracite reveals two features of energy transitions worth considering further. First, it was an imitative transition based on the attempted emulation of British patterns. Many of the world's energy transitions have similarly been undertaken in times of abundance, not scarcity. They have been driven by the desire to replicate the accomplishments of others, such as economic growth, industrial power, and greater personal comfort. This suggests a greater role for trans-regional and trans-national history in energy studies, a useful departure for a field in which nation-specific studies predominate.

The widespread debate about the advisability of replicating British patterns is a second feature of this history worth noting. Many Americans in the early nineteenth century thought deeply about the connections between manufacturing and the nation's future. In many respects, they were far more attuned to the potential social consequences of energy transitions than we are today. They realized that such developments could gen-

erate concentrations of wealth and power that might undermine the nation's future. As a result, early Americans offer a model of integrated thinking about energy and society that today's citizens could benefit from replicating.

Suggested Readings

Further notes on historiography and evidence relevant to this paper can be found in: Christopher F. Jones, *Routes of Power: Energy and Modern America* (Cambridge, MA: Harvard University Press, 2014); and Christopher F. Jones, "A Landscape of Energy Abundance: Anthracite Coal Canals and the Roots of American Fossil Fuel Dependence, 1820–1860," *Environmental History* 15, no. 3 (2010).

On the history of energy transitions, see: E. A. Wrigley, *Energy and the English Industrial Revolution* (Cambridge: Cambridge University Press, 2010); David E. Nye, *Consuming Power: A Social History of American Energies* (Cambridge, MA: MIT Press, 1998); Martin V. Melosi, *Coping with Abundance: Energy and Environment in Industrial America* (New York: Knopf, 1985); Vaclav Smil, *Energy Transitions: History, Requirements, Prospects* (Santa Barbara, CA: Praeger, 2010); Astrid Kander, Paolo Malanima and Paul Warde, *Power to the People: Energy in Europe over the Last Five Centuries* (Princeton, NJ: Princeton University Press, 2014).

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