

REVIEW ESSAY

Energy in Pennsylvania History

ENERGY REPRESENTS A LENS through which some of the most unique and compelling insights about human life in the commonwealth may be viewed. Every type of American prime mover—the power to do work—has been harvested and used in Pennsylvania and, in the process of its use and management, has defined entire regions of the state. Exciting new scholarship—as well as new readings of existing literature—is teaching us much about this important history while also pointing us to promising areas for future inquiry.

In his recent book, *Routes of Power: Energy and Modern America*, Christopher Jones provides new terminology to allow us to organize Pennsylvania's energy history. He urges us first that each energy regime—an identifiable period of predominant reliance on a specific source of power—"was neither natural nor inevitable." Coining the term "landscapes of intensification," Jones continues:

In conjunction with the activities of energy entrepreneurs, economic incentives, and new consumer behaviors, these material alterations of the environment transformed the nation's energy practices. The roots of America's energy transitions can be found in the building of routes along which coal, oil, and electricity were shipped.¹

In short, energy development has a physical impact on its surroundings, and moments of change (such as intensification or take-off) are particularly revealing. Any investigation of such corridors and transitions, of course, pulses through and from Pennsylvania history—possibly making the commonwealth the single most significant site of energy "intensification" that our nation has seen.

¹ Christopher F. Jones, *Routes of Power: Energy and Modern America* (Cambridge, MA, 2014), 2. This book is discussed at length, alongside Sean P. Adams's *Home Fires* and Andrew Arnold's *Fueling the Gilded Age*, in a review by Allen Dieterich-Ward in this issue.

Pennsylvania's landscape is a text containing each of Jones's regimes and transitions; indeed, historians who write about energy from a national or global perspective frequently use Pennsylvania as a case study. Fossil fuels have defined much of its energy story since the early 1800s, as the commonwealth led the nation into regimes organized by, successively, coal, petroleum, and natural gas. Although Pennsylvania ceased to be a major source of oil in the twentieth century, it was the birthplace of the first commercial industry and many of the modern-day corporations that have led the global quest for crude. Coal and natural gas continue to shape the state's history and terrain today.

In addition to towns, canals, and pipelines, the landscapes of energy encompass old mine tunnels, culm banks, acidified streams, long-wall surface mine scars, gas well derricks, pipeline alleys, coal slurry and fracking fluid holding ponds, and other physical manifestations of the extraction process. They also contain the coal company patch towns and other built landscapes that testify to the defining role of human labor in energy extraction. In a sometimes overlooked connection between environmental history and labor history, the exploitation of people often parallels the exploitation of the environment in the commonwealth. Working people have used and shaped the landscape as an ally in struggles with the power of industrial capitalism even as some of the greatest fortunes of the industrial era grew from the resources drawn from the mountains of Pennsylvania.

Energy history is an essential aspect of the role Pennsylvania has played in our nation's past and will continue to play in its future. Our goal in this essay is to identify key works in the scholarship about Pennsylvania's energy history and to suggest promising areas for future study. In the spirit of the work of Jones and others, any such overview must explore the definition of energy. When we do so, we find that landscapes of power are also marked by complex connections between mining, processing, and transmission. Even our idea of landscapes must expand as we consider means of transferring energy that preceded the harvest of fossil fuels. In short, we find that human life in the commonwealth has, from its beginning, been built around various methods of transforming energy into work and that future histories may assist in telling this story more completely.

Early Patterns of Energy: Water, Timber, and Animal Power

The efforts of industrialists to develop Pennsylvania's energy resources began with the land's ubiquitous waterways. Native peoples and European

settlers had often created their communities on the banks of rivers and streams; it made sense to apply in the commonwealth the milling technologies modeled in New England and elsewhere. The first element of the landscape to be regarded an energy commodity was very likely these rivers and streams.

Some of the earliest industrial historians have emphasized waterpower, among them Louis C. Hunter, who wrote the seminal work *A History of Industrial Power in the United States, 1780–1930*. Hunter's study, combined with newer titles such as Donald C. Jackson's *Pastoral and Monumental*, provide the necessary context for approaching the preeminent work in the field.² Anthony F. C. Wallace's *Rockdale: The Growth of an American Village in the Early American Revolution*, a bedrock study for many students of material culture, provides a careful anthropologic enumeration of the cultural impact of early industrialization in the Philadelphia region.³ Of course, the real story of industrialization is that the early patterns of energy use will be overwhelmed by the scale and scope of expansive fossil fuel. This distinction, however, makes *Rockdale* a superb primer for understanding different levels of industrialization.

Canals—particularly those in Pennsylvania, such as the Main Line—have received scarce historical consideration. Sources on neighboring (and competing) canal systems, such as Carol Sheriff's *The Artificial River: The Erie Canal and the Paradox of Progress, 1817–1862*, may provide a template for future scholars to apply to the canals of Pennsylvania. At present, readers should consider Robert J. Kapsch, *Over the Alleghenies: Early Canals and Railroads of Pennsylvania*, or Ronald E. Shaw, *Canals for a Nation: The Canal Era in the United States, 1790–1860*. Other historians such as Donna Rilling and Joel Tarr have used the era of waterpower and canals to explore larger, related questions such as industrial pollution and sewage technology.⁴

² Louis C. Hunter, *A History of Industrial Power in the United States, 1780–1930*, 3 vols. (Charlottesville, VA, 1979–86, and Cambridge, MA, 1991); Donald C. Jackson, *Pastoral and Monumental: Dams, Postcards, and the American Landscape* (Pittsburgh, 2013).

³ Anthony F. C. Wallace, *Rockdale: The Growth of an American Village in the Early American Revolution* (New York, 1978).

⁴ Carol Sheriff, *The Artificial River: The Erie Canal and the Paradox of Progress, 1817–1862* (New York, 1996); Robert J. Kapsch, *Over the Alleghenies: Early Canals and Railroads of Pennsylvania* (Morgantown, WV, 2013); Ronald E. Shaw, *Canals for a Nation: The Canal Era in the United States, 1790–1860* (Lexington, KY, 1990). See for instance, Joel A. Tarr, *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective* (Akron, OH, 1996).

Forest use has received little specific treatment by historians of Pennsylvania; readers are likely best served to refer to Michael Williams's general work *Americans and Their Forests: A Historical Geography*.⁵ Efforts to convert Pennsylvania's expansive forests into fuel have, similarly, received minimal historical consideration. The use of timber for charcoal, particularly in the iron industry, provides a crucial model of the intensification of industrialization in the commonwealth. Historians have yet to create literature that properly places timber harvest and iron—subjects superbly interpreted at historical sites such as Hopewell Furnace—as an important crossroads—or site of intensification—in our use of energy.

In the instructive work, *The Texture of Industry*, Robert B. Gordon and Patrick Malone catalogue the material culture of early industrialization in North America. In addition, Gordon's *A Landscape Transformed*, which studies the iron industry in Salisbury, Connecticut, provides a wonderful example of what a similar study of Pennsylvania could follow.⁶ Each of these studies grows from the field of industrial archaeology, which is well represented in many of the historically preserved sites of industry in Pennsylvania. However, these focused studies often overlook the larger context of energy use represented by such industrial sites.

The major prime mover of early settlement in Pennsylvania and elsewhere lived and labored among the human community. The work animal population, consisting primarily of horses, mules, and oxen, expanded sixfold during the nineteenth century and continued to increase into the second decade of the twentieth century. (During this same period, by contrast, the human population merely tripled.) As Dolores Greenberg shows in her essay "Energy Flows," the majority of power used by Americans came from animal sources until the 1870s.⁷ At the turn of the twentieth century, animal energy still accounted for one-third of energy consumed. And even as the percentage of energy from animal power declined relative to all energy consumed, the amount of energy from work

⁵ Michael Williams, *Americans and Their Forests: A Historical Geography* (Cambridge, 1989); Donna J. Rilling, "Sylan Enterprise and the Philadelphia Hinterland, 1790–1860," *Pennsylvania History* 67 (2000): 194–217.

⁶ Robert Boyd Gordon and Patrick Malone, *The Texture of Industry: An Archaeological View of the Industrialization of North America* (Oxford, 1994); Gordon, *A Landscape Transformed: The Ironmaking District of Salisbury, Connecticut* (Oxford, 2000).

⁷ Dolores Greenberg, "Energy Flow in a Changing Economy, 1815–1880," in *An Emerging Independent American Economy, 1815–1875*, ed. Joseph R. Frese and Jacob Judd (Tarrytown, NY, 1980), 28–58.

animals continued to increase until 1930. It is safe to say that until World War I it would be difficult to find a product in the United States that did not involve animal power in its production, processing, transport, or marketing at some point in its life cycle. There was no separate animal energy economy; animal energy was embedded in the economy.

In addition to Greenberg, a number of scholars have studied animal power. Clay McShane and Joel Tarr, for example, focus on the urban horse, arguing that as “living machines,” horses were indispensable to the nineteenth-century city and that urban history cannot be understood without understanding the role of horses. Horses shaped and were shaped by urban environments. In focused chapters addressing horse markets, regulation of horse use and behavior, mass transit, recreation and leisure activities with horses, stables and the built environment, nutrition, and health, McShane and Tarr provide a comprehensive view of the city as a world of both horses and humans.⁸

Most recently, Ann Norton Greene’s *Horses at Work: Harnessing Power in Industrial America* disputes the conventional narrative of industrialization—“machine replaces muscle”—by demonstrating that, contrary to popular and scholarly belief, the first wave of industrialization had quite the opposite effect on the use of animal energy. She explores the cultural and biological choices that defined the American workhorse population and traces the rising use of animal energy through the transportation and market revolutions, the Civil War, and postbellum urban and agricultural expansion. Greene argues against deterministic explanations for the decline of animal power that occurred after 1915, exploring the social, cultural, and political factors that favored automotive technologies and tracing the gradual, complicated decline of animal power across the first half of the twentieth century.⁹

Coal and Industrial Intensification

Scholars have carefully considered the commonwealth’s primary energy source, coal, from a number of angles. Thomas Dublin and Walter Licht’s *The Face of Decline: The Pennsylvania Anthracite Region in the Twentieth Century* remains the crucial initial reading for the pattern of extraction

⁸ Clay McShane and Joel A. Tarr, *The Horse in the City: Living Machines in the Nineteenth Century* (Baltimore, 2007).

⁹ Ann Norton Greene, *Horses at Work: Harnessing Power in Early America* (Cambridge, MA, 2008).

and decline that has proven to be the legacy of anthracite mining. Sean Patrick Adams's *Old Dominion, Industrial Commonwealth: Coal, Politics, and Economy in Antebellum America* analyzes the political importance of coal to the entire mid-Atlantic region in the 1800s.¹⁰

Historians have produced a number of excellent works on the history of coal that are specific to Pennsylvania and the surrounding Appalachian region.¹¹ Studies by Janet MacGaffey and Karen Metheny examine Pennsylvania's history of energy extraction on very local scales, one focusing on the eastern anthracite coal fields, the other on the western bituminous region. Both scholars have personal connections to coal miners in Pennsylvania's landscape of extraction. These works, in common with other histories from below, draw on the tools of social science, anthropology, and historical archaeology as well as more conventional archival research. Among other similarities, they both investigate why place matters so much to the residents of these areas now that mining jobs are mostly gone.

In *Coal Dust on Your Feet: The Rise, Decline, and Restoration of an Anthracite Mining Town*, Janet MacGaffey draws on her personal contacts in Coal Township to highlight the importance of community in the hard coal region of northeastern Pennsylvania.¹² She recounts the experiences of miners and their families, beginning with their southern and eastern European origins and continuing through their early struggles as new immigrants during the anthracite boom, the eventual decline of the regional mining industry, and the current challenges their children and grandchildren face to keep the town alive. Immigrants drew on survival skills initially learned from the dangerous and oppressive conditions that drove them from Europe to the mining towns. They forged strong communities based on broad ethnic identities formed after they reached America. The resultant community solidarity and mutual help enabled the miners to support strong labor unions and to resist (to some extent) their exploitation by mine company owners.

¹⁰Thomas Dublin and Walter Licht, *The Face of Decline: The Pennsylvania Anthracite Region in the Twentieth Century* (Ithaca, NY, 2005); Sean Patrick Adams, *Old Dominion, Industrial Commonwealth: Coal, Politics, and Economy in Antebellum America* (Baltimore, 2004).

¹¹In addition to the works discussed here, see Chad Montrie, *To Save the Land and People: A History of Opposition to Surface Coal Mining in Appalachia* (Chapel Hill, NC, 2003); and Shirley Burns, *Bringing Down the Mountains: The Impact of Mountaintop Removal on Southern West Virginia Communities* (Morgantown, WV, 2007).

¹²Janet MacGaffey, *Coal Dust on Your Feet: The Rise, Decline, and Restoration of an Anthracite Mining Town* (Lewisburg, PA, 2013).

Landscape and place, MacGaffey stresses, continue to impact the inhabitants of Shamokin and Coal Township. The countryside is scarred with old mine pits and culm waste banks, juxtaposed with gold church cupolas. These markers of place record the history of hard rock mining, labor struggles, ethnic heritage, and human endeavor and perseverance. Miners partnered with the landscape in their labor struggles; when out of work or on a prolonged strike, they depended on food they grew and gathered, animals they raised, and fuel they scavenged for subsistence. The attachment to place that was fostered continues to exert a powerful influence, even on those many inhabitants who have moved away or eventually retired in the town.

Karen Metheny likewise studies Pennsylvania's landscape of extraction and the relationship between people and place. In *From the Miner's Doublehouse: Archaeology and Landscape in a Pennsylvania Coal Company Town*, she combines environmental and social history and material culture methods to demonstrate the landscape's cultural meaning during the nineteenth century.¹³ Metheny examines the agency of miners and their families who inhabited the coal-patch company town Helvetia, Clearfield County, a product of the Rochester and Pittsburgh Coal Company located in the soft coal region of western Pennsylvania. The company town and its infamous company store have long been treated by historians as symbols of capitalist domination and corporate paternalism. But in recognizing working-class resistance only in the disruptive activities of labor movements and unionization, Metheny argues, scholars have neglected to see the empowering force of community stability and cooperation and the reciprocal exchange of influence between capital and labor. Metheny finds that despite the exploitation and dominance exercised within this order, mining families constructed a physical and cultural landscape that gave them a measure of control over their lives.¹⁴

In Helvetia, as in Shamokin, people used the landscape to improve the quality of their lives, particularly to gain a measure of food independence. Helvetians also shaped their environment to compensate for the ugliness of the mined landscape, planting trees and flowers and distinguishing Helvetia among company towns for its attractive, well-kept appearance. The company owners also participated, underwriting the installation of

¹³ Karen Bescherer Metheny, *From the Miners' Doublehouse: Archaeology and Landscape in a Pennsylvania Coal Company Town* (Knoxville, TN, 2007).

¹⁴ *Ibid.*, xvii–xviii.

tidy cement walkways and giving substantial cash prizes to winners of gardening contests.

Pennsylvania is important in energy studies of large cities as well as small mining towns. In *Energy Capitals: Local Impact, Global Influence* contributors examine the importance of place and fossil fuel extraction in urban centers, including Pittsburgh.¹⁵ Editors Joseph Pratt, Martin Melosi, and Kathleen Brosnan, citing historian Alfred Crosby, characterize modern civilization as the result of an “energy binge” based on coal, petroleum, and natural gas. In this sense, all urban spaces are shaped by fossil fuel use.¹⁶ However, in the places described as “energy capitals,” energy extraction and consumption has had a particularly profound and long-term effect on the environment as well as on social conditions, including local economies, infrastructure, labor markets, educational opportunities, public health, and political and cultural climates.¹⁷ The cities examined in this volume—Pittsburgh; Houston; Los Angeles; Perth, Australia; Stavanger, Norway; Calgary, Canada; Tampico, Mexico; Port-Gentil, Gabon; and various locations in Louisiana—exemplify the close and self-reinforcing interconnections between expanding energy use, urban growth, and environmental degradation that are so integral to the modern world.

As these sources demonstrate, studies of coal frequently emphasize the social implications of energy extraction. In *Coal: A Human History*, Barbara Freese provides a concise overview of both the creative and destructive power of coal as a shaper of civilization on a grand scale.¹⁸ Freese examines three areas of the world: Great Britain, China, and the United States, where her discussion focuses primarily on Pennsylvania. Freese provides a thorough accounting of coal’s role in nineteenth- and twentieth-century energy transitions and in establishing “routes of power.” Pittsburgh, situated over the wide soft coal formation at the forks of the Ohio River, was uniquely positioned to develop as a major industrial center. As “the smokiest city in the western hemisphere,” it followed an accelerated version of the British switch to mechanized steam-powered manufacturing.¹⁹ In eastern Pennsylvania, the discovery of anthracite hard coal at the turn of the nineteenth century

¹⁵ Joseph Pratt, Martin Melosi, and Kathleen Brosnan, eds., *Energy Capitals: Local Impact, Global Influence* (Pittsburgh, 2014).

¹⁶ *Ibid.*, xiii.

¹⁷ *Ibid.*, xi.

¹⁸ Barbara Freese, *Coal: A Human History* (Cambridge, MA, 2003).

¹⁹ *Ibid.*, 109.

initiated the shift away from the widespread use of wood fuel, as well as dependence on waterpower in the textile mills of the northeastern United States. Philadelphians began to heat their homes with anthracite coal in the late 1700s; although difficult to ignite, it burns cleaner than soft bituminous coal or seasoned firewood. The first canal in Pennsylvania, the Schuylkill Canal, linked the state's hard coal regions of the Northeast with consumers (and exporters) in Philadelphia, and other canals soon followed that expanded this network throughout the mid-Atlantic region. The transportation of coal stimulated the construction of railroads as well.

During the nineteenth century, the magnates of "King Coal" and their associated railroads accumulated enough wealth, power, and political influence to arouse public outrage. Even more disturbing were the violent labor disputes between management and miners' groups as laborers attempted to gain some control over the difficult and dangerous conditions of their lives. One such group was the Molly Maguires of the anthracite fields. The use of soft coal, which led to badly polluted air in cities such as Pittsburgh, also prompted citizen activism. Nevertheless, Freese's synthesis shows that until the 1920s, it would have been difficult for anyone to envision a modern industrial economy that did not depend primarily on coal. Pennsylvania's history supports this claim.

Petroleum and the Boomtown Model

Landscapes of intensification involve a shift in priorities and ethics that can often be observed in land-use patterns. The concept of the ethic of extraction evolves in Brian Black's *Petrolia: The Landscape of America's First Oil Boom*.²⁰ His analysis grows partly from the work of cultural geographer John Brinckerhoff Jackson, who contends:

no group sets out to create a landscape. . . . What it sets out to do is to create a community, and the landscape as its visible manifestation is simply the by-product of people working and living, sometimes coming together, sometimes staying apart, but always recognizing their interdependence. . . . It follows that no landscape can be exclusively devoted to the fostering of only one identity.²¹

²⁰ Brian Black, *Petrolia: The Landscape of America's First Oil Boom* (Baltimore, 2003).

²¹ John Brinckerhoff Jackson, *Discovering the Vernacular Landscape* (New Haven, CT, 1984), 12. The natural environment bears little pertinence in Jackson's landscape hierarchy unless it is set off by human boundaries for some cultural reason, such as preservation or conservation.

Under this logic, it would seem that a community organized under a single motivation is incapable of sustaining itself. No built landscape better exemplifies this logic than the boomtown, particularly one so completely dependent on the single commodity for which it has been organized that it ceases to exist when that commodity is exhausted. Although many extractive communities fit into this category, the oil boomtown—as exemplified by a Pennsylvania town known as Pithole—may best demonstrate the transience of a place based on the ethic of extraction.

Pithole developed in a backwards fashion. Although it had the trappings of a regular community, Pithole was essentially a large oil camp, entirely dependent on laborers and the crude that they would generate for lubrication and refinement into kerosene. At the peak of Pithole's production in October 1865, it supplied at least six thousand of the nine thousand gallons produced in the entire Pennsylvania oil region. Of this supply, over half came from just two wells. In a place where the product was the only rationale for development, these two wells sustained the largest town in the oil region, and yet few voiced concern about wells running dry. The town of Pithole, similar to many energy boomtowns, existed only for oil.

But supply would be only one of the problems confronting Pithole. As Black describes in *Petrolia*, from December 1865 through January 1866, Pithole experienced one fire per week. Throughout the rest of 1866, Pithole experienced one fire after another. But Pithole had no ability to cope with a large fire or even to notify its occupants in the event of one's occurrence. In the end, local apathy and the inability to rally any sort of community sentiment thwarted attempts to stabilize the town. By January 1866, the population had fallen to barely four thousand. Then the oil supply began giving out as well. In February 1867 another fire destroyed almost all of the remaining businesses in Pithole. Under the model of the ethic of extraction, this was a job well done.²²

From this specific case study of oil in Pennsylvania, energy historians have traced the global dimensions of petroleum in books such as Black's *Crude Reality* and the emergence of the field of petroleum geology in studies such as Brian Frehner's *Finding Oil* and Paul Lucier's *Scientists and Swindlers*. Jones's *Routes of Power* also includes a fascinating chapter on the corporate and industry systems that were introduced through Pennsylvania's experience with crude. Finally, working from an angle of business history, Jon Wlasiuk's work on the history of Standard Oil, "A Company Town

²² Black, *Petrolia*, 234.

on Common Waters,” was recently published in *Environmental History*.²³

As Black’s *Petrolia* demonstrates, extraction of petroleum—unlike coal or natural gas—expanded from Pennsylvania to the farthest reaches of the earth, including the deep ocean. By the 1990s, even the corporate headquarters of the industry—for companies such as Quaker State and Pennzoil—left their roots in the commonwealth for new destinations, such as Houston. The legacy of Pennsylvania crude, therefore, became almost entirely the domain of historians.

The Emergence of Natural Gas

Such energy transitions, of course, have not necessarily meant that patterns of development, such as boom, also left the commonwealth. New drilling technologies and higher energy prices fueled a twenty-first-century boom in natural gas that continues to play out in the present; however, history can contribute mightily to the resource’s development by providing lessons and guidance from past episodes.

In the chapter on Pittsburgh in *Energy Capitals*, Joel Tarr and Karen Clay argue that energy capitals that persist in the long term are those that make successful transitions between energy regimes.²⁴ For Pittsburgh, the most significant transition has been between coal and natural gas. Coal initially fueled the development of industrial Pittsburgh, but it also produced the air and water pollution that motivated city leaders to look for cleaner alternative fuel. In the late nineteenth century the city experienced a short-lived transition to natural gas. The skies cleared, and people enjoyed a cleaner environment and better health—until the shallow local gas wells were exhausted and the smoke returned. Then, in the mid-twentieth century, pipelines transported natural gas from the southwestern United States to Pennsylvania, contributing to the success of the Pittsburgh Renaissance urban renewal project.

²³ Brian C. Black, *Crude Reality: Petroleum in World History* (Lanham, MD, 2012); Brian Frehner, *Finding Oil: The Nature of Petroleum Geology, 1859–1920* (Lincoln, NE, 2011); Paul Lucier, *Scientists and Swindlers: Consulting on Coal and Oil in America, 1820–1890* (Baltimore, 2008); Jones, “Pennsylvania’s Petroleum Boom,” in *Routes of Power*, 89–122; Jonathan Wlasiuk, “A Company Town on Common Waters: Standard Oil in the Calumet,” *Environmental History* 19 (2014): 687–713.

²⁴ Joel A. Tarr and Karen Clay, “Pittsburgh as an Energy Capital: Perspectives on Coal and Natural Gas Transitions and the Environment,” in *Energy Capitals*, 5–29. Joel Tarr has written extensively on Pittsburgh’s environmental history. On urban air, water, sewage, and mining pollution, see Joel A. Tarr, ed., *Devastation and Renewal: An Environmental History of Pittsburgh and Its Region* (Pittsburgh, 2003). In addition, Joel A. Tarr, *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective* (Akron, OH, 1996), draws heavily on case studies from Pennsylvania and the Ohio River valley.

Tarr and Clay primarily describe the uses and effects of natural gas in the late nineteenth and early twentieth centuries, during a boom in gas production from shallow wells. Tom Wilber addresses the Pennsylvania boom that began in about 2005 in *Under the Surface: Fracking, Fortunes, and the Fate of the Marcellus Shale*.²⁵ Wilber's work concerns the history of events dictated by local conditions in Dimock, Pennsylvania, on the New York border. However, he connects those events with larger issues of global warming, environmental sustainability, energy independence, land use, public policy, and the effects of poverty and wealth. Wilber frames his narrative of the Marcellus Shale gas boom by arguing that there is a parallel between the geological forces that produced the formation and the social forces that shape the destiny of the people who live above it:

In all these shale gas regions, the relationships people have with the land, and with their neighbors, are as complicated and multidimensional as the topographical and geological terrain. Here, too, there are cracks. They are created by forces that sometimes pull in opposite directions, at other times collide with great force, and often are buried from view.²⁶

Drawing on the findings of Penn State University geosciences professor Terry Engelder, Wilber presents detailed information on the extent and potential reserves in the Marcellus Shale formation and explains the new extraction technologies of horizontal drilling and hydraulic fracturing, or fracking. He describes the physical effects of this method of gas drilling—the damage to land and water supplies, the noise, dust, and danger of explosions, and the fragmentation of forests and roads—and also examines the characters and actions of the residents of Dimock, who live in a region with relatively few economic opportunities but a long history of resource extraction, beginning with timber. Nevertheless, some local people who would never have self-identified as environmentalists have become “accidental activists” as they learned the extent of the impact that fracking caused. Histories of events concerning natural gas in the Marcellus Shale have a way of turning into something more like journalism, because fracking there is so recent and so controversial. Yet the conditions Wilber describes, during the first frenzied rush by gas companies to secure drilling leases, have already changed as efforts galvanize to resist development.

²⁵ Tom Wilber, *Under the Surface: Fracking, Fortunes, and the Fate of the Marcellus Shale* (Ithaca, NY, 2012).

²⁶ *Ibid.*, 8.

Energy in a National and Global Context

The commonwealth's role in each of the fossil fuel industries has drawn the state's economy into a national and global context that is organized by humans' growing reliance on inexpensive energy. For many of these micro-histories of the commonwealth or region, energy's broader considerations fall outside of the author's purview. Including these specific stories within a wider lens offers a promising avenue for future scholarship. For instance, Freese's *Coal* begins with an elementary discussion of the way plants transform and store solar energy and the geological processes by which plants became coal. Her effort to connect this well-known resource to its organic roots provides a context that similarly allows us to see all energy use as an organic portion of the human existence; variations in use and transitions between sources, as Jones and others have pointed out, then extend an understanding of energy use that is informed by environmental history.

Even though petroleum became the most important fuel during the twentieth century, coal interests still possessed significant wealth and political power. These interests were and are able to resist efforts to combat climate change caused by the greatly increased levels of atmospheric carbon dioxide from fossil fuel combustion. Freese's narrative of coal consumption in China focuses primarily on the problems inherent in China's use of coal to modernize industry and stimulate economic growth. Chinese leaders have recently become more aggressive in dealing with their nation's extremely high level of air pollution and greenhouse gas emissions. However, their pollution problems, combined with those of other industrialized and industrializing nations, are truly a global concern. As a product of coal use, these larger implications become a portion of Pennsylvania's energy legacy that is worthy of exploration by historians who wish to understand Pennsylvania's place in the larger world.

In *The End of Energy: The Unmaking of America's Environment, Security, and Independence*, Michael Graetz provides a valuable overview of these interdependent factors concerning energy production and consumption in the last forty years.²⁷ Despite the complex and contingent nature of fossil fuel usage, Graetz claims, there is one simple underlying thread: the artificially low price. He argues that American energy producers and consumers have never paid the actual cost of the energy that fuels the modern world

²⁷ Michael Graetz, *The End of Energy: The Unmaking of America's Environment, Security, and Independence* (Cambridge, MA, 2011).

and that the most effective way to address the current state of energy-related environmental and political crises is to pay the real price of energy.²⁸

Graetz puts oil at the center of his narrative, but he also demonstrates how coal and natural gas are essential to the story. The 1970s oil shocks prompted a renewed interest in domestically produced energy. Coal was an important component, despite the difficulties and hazards of extraction, transportation, and environmental degradation associated with its extraction and use. American policy makers of the time referred to the United States as the “Saudi Arabia of coal,” suggesting that developing such a resource trumped other considerations.²⁹ For a few years Pennsylvanian and other eastern coal companies profited from the increased demand and relaxed regulation designed to encourage the use of coal. However, a number of factors—including labor activism in the unionized eastern coal fields, legislation such as the Surface Mining and Reclamation Act, and amendments to the Clean Air Act that created demand for low-sulfur western coal—combined to favor coal production in western states.

Similar to oil, natural gas was in short supply in the late 1970s. The winter of 1977 was unusually cold, and natural gas shortages prompted factory layoffs and school closings in the Northeast and the upper Midwest. The southwestern oil fields were producing plenty of gas, but a complicated system of federal price regulation designed to protect consumers had discouraged interstate gas sales. Gas is in many ways a more desirable and less polluting fuel than oil or coal, but it is more difficult to transport. The infrastructure of pressurized pipelines required to move it caused the federal government to regulate natural gas as a public utility and natural monopoly. Graetz summarizes the subsequent legislative battles that resulted in the Natural Gas Act of 1978, which did not deregulate gas prices but encouraged production sufficiently to cause gas surpluses, while also encouraging deep-well drilling.

Natural gas produced in Pennsylvania has been an important part of the nation’s energy supply for a century, and the Marcellus boom has generated public and scholarly interest. The social and environmental impact of the twenty-first-century gas boom currently receives a high level of popular and scholarly attention. In recent years, major newspapers have dedicated special sections for coverage of gas drilling. Josh Fox’s 2010 documentary film *Gasland*, in which the resident of a Pennsylvania gas field famously

²⁸ Ibid., 7.

²⁹ Ibid., 79.

set the water coming from his kitchen tap on fire, has aroused considerable controversy.³⁰ Authors of popular books explore the impact of the new drilling boom on people in Appalachian regions.³¹ Scholarly researchers study the social effects of new fracking technologies.³² However, less attention has been paid to the history of drilling for natural gas in Pennsylvania in earlier decades. As in Graetz's work, nearly all the existing political and economic history of natural gas is concerned with what happened after gas left the wellhead. Little has been written about what was happening on the ground, in the countryside, as gas companies and landowners negotiated gas exploration and extraction.³³ Yet, the experiences of rural residents who were affected by the energy extraction process in the 1970s and 1980s would be well worth examining as important context for the Marcellus Shale boom.

Conclusion

Energy transitions, writes Jones, "are reorientations of how people live, work, and play."³⁴ Particularly in the commonwealth, energy landscapes clearly represent history worth preserving. They provide evidence that mutability is a leading characteristic of energy acquisition and use. Equally mutable is the wealth that derives from energy. In the nineteenth century, under the leadership of J. Edgar Thomson, the Pennsylvania Railroad was the largest publicly traded corporation in the world. A quarter of a million people worked for it, and it had a bigger budget than the United States government. Part of its success came from Thomson's willingness

³⁰ *Gasland*, directed by Josh Fox (New York, 2010).

³¹ For well-received examples see Wilber, *Under the Surface*; and Seamus McGraw, *The End of Country: Dispatches from the Frack Zone* (New York, 2011).

³² See, for example, Jeffrey Jacquet, "Boomtowns and Natural Gas: Implications for Marcellus Shale Local Governments and Rural Communities" (NERCRD Rural Development Paper no. 43, Northeast Regional Center for Rural Development, Pennsylvania State University, Jan. 2009), <http://www.nercrd.psu.edu>. This study examines the impact on jobs, community infrastructure and services, and quality of life. See also Simona L. Perry, "Using Ethnography to Monitor the Community Health Implications of Onshore Unconventional Oil and Gas Developments: Examples from Pennsylvania's Marcellus Shale," in "Scientific, Economic, Social, Environmental, and Health Policy Concerns Related to Shale Gas Extraction," ed. Robert E. Oswald and Michelle Bamberger, special issue, *New Solutions: A Journal of Environmental and Occupational Health Policy* 23 (2013): 33–53.

³³ Environmental historian Joel Tarr comments on the lack of good historical treatments of twentieth-century natural gas drilling in Julie Grant, "Historian Makes Case for Tougher Fracking Laws in PA," *Allegheny Front*, Jan. 31, 2014, <http://www.alleghenyfront.org/story/historian-makes-case-tougher-fracking-laws-pa>.

³⁴ Jones, *Routes of Power*, 20.

to embrace innovation, as when he had the railroad switch from wood- to coal-powered locomotives.³⁵ When Bernard DeVoto wrote in the 1930s and 1940s about resources and conservation in the western United States, he saw Pennsylvania as representative of the controlling, eastern, big-money interests that plundered the natural resources of the West.³⁶ Such wealth, though, has proven transitory for the region. Forty years later, the Pittsburgh region struggled to reinvent itself after the bulk of its heavy industry closed.

In the histories of energy sources reviewed here we see common themes as well as promising directions for future scholarship. The stories of energy use and development in the commonwealth reveal connections between the local and the global, the importance of adaptability for sustainability, and the inseparability of protecting the environment and protecting the citizen. In sum, these stories reveal the costs of energy that are externalized to the environment and the people who live and work there. The human stories are critical; however, the landscape created and left behind also becomes an essential text that illustrates energy priorities and transitions.

In the past, the relative scarcity or expensiveness of a particular energy source was the most common reason for transitioning to another type. Now, the impetus for change may be a scarcity of sinks for the disposal of waste products rather than a scarcity of the energy resource itself. Clearly, pollution has long been a cause of public concern, and the problem of peak oil is still an issue. However, the acceleration of climate change is the primary global environmental danger. Climate change is driven by increasing levels of carbon dioxide in the atmosphere from the combustion of fossil fuel—a result of using the atmosphere as a sink for emissions. The questions prompted by climate change are less about what we will do if oil, coal, or gas runs out, but rather what we will do about the consequences of using the abundant supplies still in the ground.

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³⁵ James A. Ward, "Power and Accountability on the Pennsylvania Railroad, 1846–1878," *Business History Review* 49 (1975): 37–59.

³⁶ Bernard DeVoto, *DeVoto's West: History, Conservation, and the Public Good*, ed. Edward K. Muller (Athens, OH), 2005.