



A New Understanding of the American Energy Crisis of the 1970s

Author(s): Robert D. Lifset

Source: *Historical Social Research / Historische Sozialforschung*, 2014, Vol. 39, No. 4 (150), Special Issue: The Energy Crises of the 1970s: Anticipations and Reactions in the Industrialized World (2014), pp. 22-42

Published by: GESIS - Leibniz Institute for the Social Sciences

Stable URL: <https://www.jstor.org/stable/24145526>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <https://about.jstor.org/terms>



JSTOR

GESIS - Leibniz Institute for the Social Sciences is collaborating with JSTOR to digitize, preserve and extend access to *Historical Social Research / Historische Sozialforschung*

A New Understanding of the American Energy Crisis of the 1970s

Robert D. Lifset*

Abstract: »Eine neue Interpretation der U.S.-amerikanischen Energiekrise der 1970er Jahre«. The energy crisis of the 1970s in the United States consisted of three separate but related problems in the oil, natural gas, and utility sectors of the energy economy. The OPEC price increases and the OOAPEC embargo of 1973 merely exacerbated existing problems. This article traces these problems over several decades and their development into a crisis in the early 1970s.

Keywords: Energy, energy crisis, energy policy, energy history, oil, natural gas, electricity, 1970s.

1. Introduction

A growing body of scholars has come to view the 1970s as a pivotal decade in American history.¹ This scholarship has identified the 1970s as ushering in fundamental transformations in American cultural, political and economic life. These changes took place in a nation experiencing and trying to recover from a series of political assassinations, the end of the Vietnam War, Watergate, economic decline and inflation.² Within this scholarship, the energy crisis of the 1970s has often been interpreted as an oil crisis brought about by an embargo by OOAPEC, the Organization of Arab Petroleum Exporting Countries. A cartel comprised of Third World nations successfully wreaked havoc on the American economy. As such, the energy crisis is taken as symbolic of national decline. This understanding of the energy crisis of the 1970s is not entirely accurate. This paper argues that this is an overly simplistic understanding of the changes taking place within the energy economy of the United States in the 1970s. What was the energy crisis of the 1970s?

* Robert D. Lifset, Honors College, University of Oklahoma, 1300 Asp Avenue, Norman, OK 73019, USA; robertlifset@ou.edu.

¹ For their critical comments and insight I want to thank the participants at the "Energy Crisis of the 1970s as Challenges to the Industrialized World" conference, the Honors College faculty seminar at the University of Oklahoma, and Rüdiger Graf.

² For surveys and edited volumes that examine the decade see Bailey and Farber 2004; Killen 2006; Ferguson et al. 2010; Stein 2010; Cowie 2010; Sandbrook 2011; Schulman 2002; Borstelmann 2011.

The energy crisis in the United States consisted of three separate but related developments that were often lumped together as part of one energy crisis in contemporary discourse. First, there existed an oil crisis. This is the familiar story of a sudden spike in prices and gasoline lines. Second, there was an equally serious natural gas crisis characterized by physical shortages. Finally, a crisis in the electrical utility sector caused several major publicly regulated monopolies to teeter on the brink of bankruptcy during the decade. This paper defines an energy crisis as the onset of physical shortages in the form of gasoline lines, insufficient natural gas supply, and widespread and consistent black-outs or the bankruptcy (or near-bankruptcy) of publicly regulated utility monopolies. The problems that produced these crises were themselves sometimes described as crises years before the shortages materialized. But the term “crisis” has become so ubiquitous and politically useful, that its presence in the political discourse is an unreliable means by which to define a particular period of time as experiencing an energy crisis.

This paper will argue that the United States would have experienced an oil crisis, a natural gas crisis and an electrical utility crisis *with or without* the OAPEC embargo. The embargo chiefly exacerbated and overshadowed existing problems in the energy economy.³ This paper will focus on the post-World War II years leading up to the OAPEC oil embargo of 1973. In doing so it seeks to diagnose the problems plaguing the US energy economy. This will allow us to see more clearly both the reaction of American energy policy and politics in that decade and its contribution to the larger transformations in the political and economic life of the country.

2. The Oil Crisis

On a cold January morning in 1974, Mary Korechoff swung her delivery van in front of Frank Knight's blue paneled truck. They were waiting on a gas line at a Mobil station on Atlantic Avenue in Brooklyn, New York. Mr. Knight, who used his truck to deliver rugs, was two hours behind schedule and had been waiting in line for forty-five minutes. “The hell with her,” he said as he swung his truck onto the sidewalk and, after maneuvering between some parked cars, cut back into his rightful place in line. Ms. Korechoff, a carpenter also making deliveries, was unapologetic. “In my case it's either gas or welfare. I need the gas and I need the time.”⁴ For Korechoff, Knight, and many other Americans in the 1970s, there was a good deal of anger and frustration at their inability to

³ There is some scholarship from the 1970s and '80 that interprets the energy crisis as an oil and natural gas crisis but does not link that to an analysis of the electrical utility crisis. For examples, see Stobaugh and Yergin 1979; Greenberger 1983; Tugwell 1988.

⁴ 'Drivers Waiting to Fill Empty Tanks' 1974.

secure adequate supplies of a commodity that many had never expected to become scarce. They were experiencing the oil crisis: an oil shortage that produced gasoline lines. To understand precisely how Mary Korechoff and Frank Knight found themselves fighting to get gasoline, this paper will look for answers not in events in the Middle East, but in the structure and nature of the American oil market. For here we will find a market on the brink of crisis several months before the OAPEC embargo.

In 1930, two giant new oil fields were discovered in the mid-continent oil region of the United States. The Oklahoma City field and the East Texas field put tremendous quantities of new oil on the market at the very moment that the Great Depression was reducing demand.⁵ As prices plunged below the cost of production, the industry faced a crisis of unprecedented scale. In response, by the mid-1930s, a system emerged in which the oil-producing states would ration allowable production quotas to existing oil fields within their territories. In Texas, the nation's largest oil-producing state, this system was administered by the Texas Railroad Commission. This system of pro-rationing was keyed to estimates of domestic demand forecast by the federal government.⁶

This restructuring of the domestic oil market served several purposes. First, it put a hard floor beneath oil prices, thereby reducing volatility. In Figure 1 we can see a stable US (and world) oil market in which US regulatory authorities (and the international majors) carefully matched supply and demand. Second, the policy protected independent oil producers, smaller in size but greater in number and political influence.⁷ This ensured the survival of an independent oil industry and avoided the concentration of the nation's oil business in the hands of a small number of companies. Finally, there was a national security argument. Independents in support of pro-rationing and the restriction of imports, suggested that a reliance on foreign oil supplies created a strategic weakness that could be exploited in time of war. Alternatively, this argument could be turned on its head as the international majors argued that increasing imports

⁵ On the east Texas field see Hinton and Olien 2002, 167-92; on the Oklahoma City field see Lifset, "A City Built By and on Oil: The March of the Mud Hogs and Derricks in Depression-Era Oklahoma City" (unpublished paper, in the author's possession).

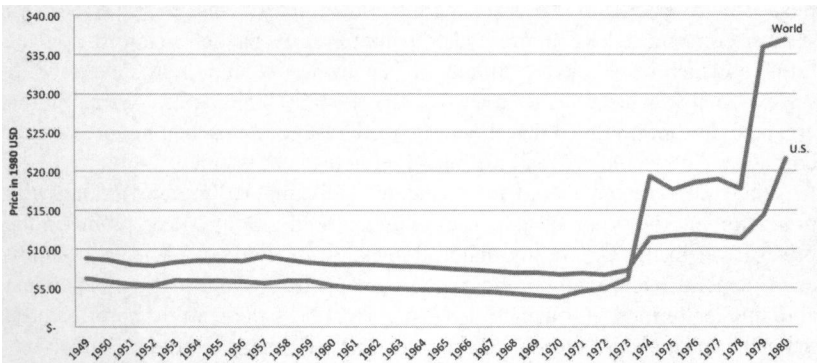
⁶ Oklahoma began experimenting with pro-rationing as a conservation reform justified by fears of an impending oil shortage as early as 1915. Texas followed soon thereafter. But because the rule of capture weakened the price signal of oil, significant new discoveries in 1930 threatened the viability of the industry. Now pro-rationing was defended as a measure to protect price. For a detailed history of oil conservation and early pro-rationing efforts in Texas see Malavis 1996; see also Clark 1987, 151-2, 195-6; Nash 1968, 113-56; Rister 1949, 368-77.

⁷ "Independent producers" is a term generally referring to oil companies that were not descended from Standard Oil and did not grow to become one of the "majors" (i.e. Texaco and Gulf). Generally, independents were focused on the exploration for and production (and sometimes refining) of oil and did not engage in the transportation or retail ends of the business.

preserved the domestic production capacity of the United States, thereby insuring that the US would have access to oil in any future conflict.

The cost of this effort was the market distorting effects of what became a politically controlled oil market. Over time, the price of domestically sold oil in the US rose above world prices (see Figure 1). As it did, the US market became an increasingly attractive commercial opportunity for those companies that could produce oil overseas and import it into the United States.

Figure 1: Crude Oil Prices from 1949 to 1980



Sources: World Oil Prices: BP Statistical Review of World Energy, June 2013. U.S. Oil Prices: U.S. Energy Information Administration 2012, Table 5.18. Conversions from nominal prices were made using the U.S Bureau of Labor Statistics' Inflation Calculator.

Left uncontrolled, growing imports of cheap foreign oil could significantly damage the independent oil producers in the domestic oil industry. Cheap foreign oil was long recognized as a threat that could upset the political and economic calculus necessary for pro-rationing to function. This was not a problem in the early 1940s as the Second World War generated enough demand to create a relatively tight international oil market. However, after the war the international oil companies began to significantly increase their imports. Between 1947 and 1949 foreign oil imports more than doubled (from 2.7 percent to 6.2 percent of total supply), while domestic production declined. By 1959 imports accounted for nearly 12 percent of total supply.⁸

This imported oil was not meeting new domestic demand. The imported oil was instead taking business from the domestic oil industry as pro-rationing authorities (i.e. the Texas Railroad Commission) ordered reductions in production. Ernest Thompson, chairman of the Texas Railroad Commission, testified that the daily average import volume corresponded almost precisely with reductions in Texas allowables. The Texas Railroad Commission protected the

⁸ Williamson et al. 1963, 810.

existing price structure and then, with its allies, went to the federal government to lobby for restrictions on the importation of oil.⁹ After a period of voluntary import quotas failed, President Eisenhower established a mandatory quota system in 1959 and justified doing so as a national security measure. Foreign oil was to be restricted to meeting 12 percent of domestic demand.¹⁰ Since it was politically unpalatable for the federal government to administer the program in a manner that protected and advanced the market share of the large international oil companies, the oil import quota was administered in a fashion that favored smaller and independent producers and refiners. This was accomplished by freezing and then reducing historical import quotas to make room for smaller companies. The program also included an exchange program for inland refiners (which would never naturally be in a position to import oil), and a sliding scale, which was designed to grant disproportionately large quotas to small refiners. Inland refiners argued that if permits were restricted to actual importers, their cost advantage would drive all the inland refiners out of business.¹¹

What were the impacts of the Mandatory Oil Import Program? Along with pro-rationing, the program helped to establish both a floor and a ceiling on the price of oil in the US. It stimulated domestic productive capacity and dampened demand while maintaining a reserve capacity. It kept many independent and smaller refiners in business (in the early 1970s there were more than ten thousand independent producers and over 130 refiners).¹² But more importantly, it prevented the US market from adjusting gradually to the growth of world demand and the depletion of US reserves, and by closing off the world's largest oil market it helped to put downward pressure on world oil prices.¹³ President Richard Nixon ended the program in April 1973.¹⁴ By then, world oil prices

⁹ U.S. Congress, House, Select Committee on Small Business 1949, pt. 1, 958.

¹⁰ Presidential Proclamation 3279, March 10, 1959, 24 FR 1781, March 12, 1959; in a press conference the following day not a single question was asked about the imposition of a mandatory import quota. Nearly all the questions focused on the growing crisis in Berlin. See Eisenhower 1959; In addition to pro-rationing and the import quota, the industry benefitted from favorable tax treatment. The oil depletion allowance is described in a number of places most recently in Shulman 2011.

¹¹ Viator 1984, 121-40.

¹² Viator 1984, 214.

¹³ The introduction of Soviet oil into the world oil market in the late 1950s and the oil import quota pushed the market price below the posted price (a negotiated price between the international majors and Middle Eastern nations). This led Standard Oil of New Jersey (Exxon after 1973) to unilaterally reduce the posted price on Arabian Light Crude by fourteen cents, a factor in the decision by oil producers to form OPEC. See Venn 2002, 37; Wall 1988, 600-4.

¹⁴ Proclamation 4210, 38 FR 9645, April 19, 1973; President Nixon established the "Cabinet Task Force on Oil Import Control" in March 1969. See "Memorandum from President Nixon to Secretary of Labor Shultz." National Archives, RG 59, Central Files 1967-69, PET 17-2 US; The Task Force issued a report "The Oil Import Question; A Report on the Relationship of Oil

had nearly reached US prices (see Figure 1), and since there was no additional spare production capacity in the US, the nation had reached peak oil production.¹⁵

US domestic production peaked in 1971. In April 1972, the Texas Railroad Commission (along with the other state pro-rationing authorities) allowed full production.¹⁶ It had been a long time in coming, but peak oil production was not simply a story of the leveling off of US oil production; it needs to be seen in the context of massive increases in domestic oil (and gas) consumption.¹⁷ In 1950 the United States produced 5.9 million barrels of oil per day (bpd). Twenty years later US oil production peaked at 11.6 million bpd. Over that same period, US oil consumption rose from 6.4 million to 14.6 million bpd. In 1950 the country imported 5.5 percent of the oil it consumed; twenty years later that figure was 21.5 percent. During those twenty years, oil production doubled, but consumption *nearly tripled*.¹⁸ A growing economy, the spread of suburbanization, an expansion of auto-mobility (and the de-funding of mass transit), an increase in the use of oil for heating (replacing coal) and electricity production, and a petro-chemical revolution all served to increase the use of oil.¹⁹ Petroleum used for transportation grew 131 percent between 1950 and 1970. The United States experienced significant growth of oil consumption in commercial (85 percent), industrial (109 percent), and residential (114 percent) use.²⁰ This can be seen in Figure 2 where a steep rise in consumption only ends in the late 1970s. When production levels off in the early 1970s, this rising consumption is met with new net imports.

Imports to the National Security" (Washington: U.S. Government Printing Office) in February 1970.

¹⁵ One study found that the import quota cost consumers \$6.2 billion annually in the 1960s and produced an annual gain of \$3.9 billion to producers and \$0.5 billion to refiners. Burrows and Domencich 1970, 168.

¹⁶ U.S. Energy Information Administration 2012, Table 5.2.

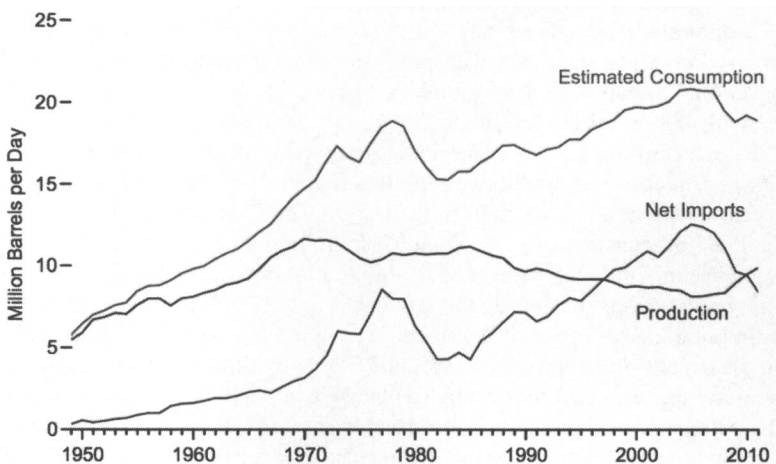
¹⁷ President Jimmy Carter did define the oil crisis toward the end of the 1970s partly as a result of rising consumption, and his administration put into place policies designed to slow the growth of oil demand. However, this was politically risky, because it was interpreted as blaming the American people for the crisis. While Nixon and Ford supported conservation efforts, these efforts would never become the centerpiece of their response to the energy crisis. See Mattson 2009; Horowitz 2005.

¹⁸ U.S. Energy Information Administration 2012, Table 5.1a.

¹⁹ Historians have devised two primary explanations for the rise in energy consumption in post-war America. One view holds that the rise in consumption can best be explained by changes in American culture. Another view sees the rise in energy consumption as a result of economic and political support. For the former view see Nye 1999; for the latter view see Melosi 1985.

²⁰ U.S. Energy Information Administration 2012, Table 5.13a and U.S. Energy Information Administration 2012, Table 5.13c.

Figure 2: Petroleum and Other Liquids Overview, 1949-2011



Source: US Energy Information Administration 2012, Table 5.1a.

Spare capacity outside the OPEC cartel was now nearly nonexistent. In these new market conditions, OPEC successfully negotiated a series of price increases between 1970 and 1973.²¹ This served to further the economic nationalism of oil producers and Arab nations began to contemplate the possibility of using the “oil weapon.”

At this moment there was a sharp turning point in federal oil policy. For two generations the federal government had supported policies that subsidized and supported oil producers. Within the four year span from 1971 to 1975 the three foundations of this support (pro-rationing, the import quota, and the depletion allowance) were ended and replaced with price controls that supported refiners and consumers at the expense of producers.²²

In the summer of 1971 President Nixon imposed a freeze on all wages and prices as part of a larger set of emergency measures designed to fight inflation.²³ The price freeze gave way to a series of price controls which were lifted in 1974 except for those on oil. With the increases in foreign oil prices negotiated by OPEC, the delivered price of foreign oil caught up with the wellhead price of domestic oil in early 1973 (see Figure 1).²⁴ While pro-rationing and

²¹ A good narrative of how OPEC gained the upper hand in a tighter world oil market can be found in Bamberg 2000, 447-89.

²² The depletion allowance was eliminated for large firms in 1975. It survived for small producers at a lower rate.

²³ Exec. Order No. 11615, 36 FR 15727, 1971.

²⁴ Johnson 1975; the Nixon administration considered price controls necessary because it knew a number of economic measures it announced to fight unemployment and interna-

import quotas were based on regulating physical quantities of oil, price is much more ephemeral and, not surprisingly, was more difficult to control without quickly creating unintended consequences. One example could be seen almost immediately. When Nixon imposed a freeze on prices in the summer of 1971 gasoline prices were seasonally high while prices for home heating oil were seasonally low. With these prices now fixed in place, refiners sought to maximize their gasoline production at the expense of building up heating oil stocks. As a result, shortages of home heating oil materialized during the unseasonably cold winter of 1972-1973 that drove up demand. Responding to these shortages, refiners built up heating oil stocks in 1973, resulting in shortages of gasoline inventories. This was compounded by the inability of some refiners and retailers to secure adequate petroleum supplies, given that the import quota was only lifted that April. A survey by the American Automobile Association found that 47 percent of gasoline stations were not operating normally in May; by June every station in the Northeast had curtailed hours.²⁵ Gasoline shortages appeared on the east and west coasts in June of 1973, four months before the OAPEC embargo.²⁶

In this context the OAPEC embargo had a significant impact. Initiated in October 1973 and lasting until March 1974, the embargo's impact was greatest in February 1974 (because of the time it took Middle Eastern oil to reach North America). In that month, oil imports fell 1.2 million bpd (19 percent) below their September levels. Since imports accounted for 34 percent of US consumption, this represented a loss of about 8 percent of the nation's total supply.²⁷ This was sufficient to produce the gas lines experienced by Mary Korechoff, Frank Knight, and many others. However, it should be noted that the embargo impacted a domestic oil market that had already begun to experience shortages.

Two principal interpretations seeking to understand the oil crisis emerged in the 1970s. The first view held that the crisis was a market failure produced by policy failure. This critique took several forms. One maintained that the US had

tional speculation (i.e. fiscal stimulus and the suspension of gold convertibility) would make the existing inflation problem worse. Price controls were also very popular. See Waterhouse 2013.

²⁵ Hakes 2008, 22.

²⁶ 'California Standard Limits Supply' 1973; 'Exxon Stations on 2 Toll Roads' 1973.

²⁷ Hakes 2008, 35; despite the embargo the United States actually imported more oil from the Persian Gulf in 1973 than it did in 1972, this same trend is true of 1974. U.S. Energy Information Administration 2012, Table 5.4; price controls had the effect of capturing a significant percentage of the increases in income that would have accrued to domestic oil producers in the presence of rising world prices. Between 1974 and 1980 this has been estimated to total \$14-50 billion per year. Of this total, refiners captured \$9-32 billion per year and consumers \$5-12 billion. The difference between the estimated loss to producers and the subsidies to refiners and consumers is the value of economic waste produced by larger than optimal levels of petroleum consumption and smaller than optimal levels of crude oil production. Kalt 1981, 286-9.

a series of fuel policies but no unified energy policy.²⁸ Or energy policies had hampered the nation's ability to smoothly transition from surplus to scarcity.²⁹ Or that the crisis resulted simply from increasing demand and inadequate supply (due to import quotas).³⁰ A second view saw the crisis as the result of concentration and conspiracy. This view attracted a good deal of support in the 1970s. The oil crisis was created by the international majors. These companies were holding tankers offshore, knowing that the price they could obtain would be higher tomorrow than today. The oil companies were manipulating the data the government relied upon to make policy.³¹ A poll conducted in February 1974 revealed that 73 percent of Americans believed that there was no shortage of oil. Many Americans were sure that the energy crisis was a fraud perpetuated by the oil companies to increase prices.³²

Whether the oil crisis in the US was the result of market forces or conspiracy is beyond the purview of this paper. The reality is that shortages appeared beginning in the summer of 1973. While the OAPEC embargo contributed to the intensity of these shortages, the US oil market was in crisis prior to the embargo.

3. The Natural Gas Crisis

In the summer of 1971 the Northern Illinois Gas Company requested permission from the Illinois Commerce Commission to reduce service to nearly two hundred customers by fifty percent for the rest of the year and to eliminate their service beginning in 1972.³³ "Due to the national gas shortage our natural gas pipelines (subsidiaries) have curtailed the gas we can buy from them...we have no choice" according to a spokesperson for the company. The decision was designed to protect existing supplies for residential customers.³⁴ Along with the growing fuel oil shortage, by early 1973 thousands of workers in the upper Midwest were laid off or furloughed from their jobs because fuel supplies were unavailable. Public schools were closed; in the southern Great Plains, the Uni-

²⁸ Kash and Rycroft 1984, 12.

²⁹ Vietor 1984, 202.

³⁰ Yergin 1991, 590.

³¹ A sampling of this view can be found in Allvine and Patterson 1974; Blair 1976, 235-60; Mitchell 2011, 174-7; on the manipulation of data see Wildavsky and Tenenbaum 1981.

³² Richman 1979, 577. The oil companies grew increasingly unpopular beginning in the 1950s. I would argue that this was a result of the growing awareness of the role of Texas oil money in funding right-wing politics. On the political contributions of prominent independent oil men see Burrough 2009, 229-49; this change in popular perceptions was also reflected in the Hollywood-produced movies about oil. See Lifset and Black 2012.

³³ 'NI-Gas Seeks to Reduce' 1971.

³⁴ 'NI-Gas Seeks to Reduce' 1971.

versity of Texas at Austin postponed the opening of its spring semester for a week because it could not heat student dormitories. In short, there existed a serious crisis in the natural gas sector of the energy economy ten months to two years before the OAPEC embargo.³⁵

Unlike oil, the price of natural gas had been regulated since the 1960s. This came about as a result of a long struggle that began almost as soon as the enactment of the Natural Gas Act of 1938 granted the Federal Power Commission (FPC) the authority to regulate interstate natural gas pipelines.³⁶ While the law itself did not explicitly give the FPC authority over natural gas producers, the industry lobbied Congress to pass a law exempting producers from FPC oversight. President Truman vetoed it in 1950.³⁷ The industry then obtained an opinion from the FPC itself (which as a test case chose to examine Phillips Petroleum, the largest natural gas producer in the nation) declaring that it did not have jurisdiction over natural gas producers.³⁸ The state of Wisconsin appealed the FPC's decision, and in June of 1954 the United States Supreme Court decided that Phillips was a natural gas company whose sales were subject to FPC jurisdiction.³⁹ A Congressional effort to overturn this decision was vetoed by President Eisenhower in 1956, but it would be several years before the FPC began actively regulating natural gas prices.⁴⁰

While the strict regulation of oil prices in the 1970s was designed to be temporary and was enacted in a time of impending crisis, the regulation of natural gas prices in the 1960s was intended to be permanent, and those efforts were made when plentiful supplies of natural gas existed.⁴¹ An explanation can be found in the differences between the fuels and the industries that emerged to produce them. In the middle decades of the twentieth century, the natural gas industry was less concentrated than the oil industry. Vertical integration offered fewer cost savings from economies of scale in natural gas as the technology was less complicated and the supply more stable. Moreover, most gas was discovered and produced by oil companies that did want to integrate forward so

³⁵ 'Real reason behind fuel crisis' 1973.

³⁶ P.L 75-668, 52 Stat. 821.

³⁷ After two contradictory high profile reports by the FPC, natural gas consumers had lined up against precluding the FPC the authority to regulate well head prices. Truman 1950; the Leland Olds affair no doubt contributed to Truman's willingness to veto the bill.

³⁸ Federal Power Commission 1953.

³⁹ Phillips Petroleum Company v. State of Wisconsin, 374 U.S. 672.

⁴⁰ On the day the Senate passed the bill a Senator announced that he had been offered a bribe in return for his vote. While expressing support for the legislation Eisenhower vetoed it, alluding to the necessity of maintaining the "integrity of governmental processes." Eisenhower 1956.

⁴¹ I use the term "strict regulation" to differentiate from the fact that while pro-rationing and the import quota effectively set a floor and ceiling for oil prices, until the 1970s the federal government did not explicitly set oil prices.

as to avoid being regulated by the FPC.⁴² But while oil could be transported by pipeline, rail, ship, and trucks, natural gas could only be moved by pipeline. This tied natural gas producers to their customers in a way that did not apply to oil producers and their refiners and end users. Merchant pipeline companies physically tied producers to utilities who distributed the gas to end users for heating and cooking or used it to generate electricity. While the natural gas industry as a whole was less concentrated than the oil industry, there could and did exist significant concentration within particular natural gas fields, thereby potentially granting monopolistic pricing power to producers.⁴³

Two additional facts supported natural gas price regulation. First, until the 1960s it was widely believed that natural gas was discovered only as an adjunct to oil exploration. Therefore, the price of natural gas would not directly affect its supply.⁴⁴ Second, the utility companies that purchased natural gas from the merchant pipeline companies were regulated by state utility commissions. The merchant pipeline companies that bought the gas from producers and sold it to utility companies were regulated by the FPC. Neither of these actors was free to charge whatever the market might bear; the very existence of this regulation was a recognition that pipelines, like power lines, were most efficiently run by publicly regulated monopolies. It could be seen as only a matter of time before this logic ran upstream to the natural gas producers.

After determining that a cost-based company-by-company system of rate making (common in the regulation of the utility industry) was administratively impossible to determine, the FPC settled upon a system of cost-based area rates.⁴⁵ The FPC chose as its test case the Permian Basin (a large oil and gas field in west Texas) where it set rates in 1965; these were upheld by the Supreme Court in 1968.⁴⁶ In 1968, for the first time, the unregulated intrastate price of natural gas rose above the regulated interstate price for natural gas. The price for gas within the state in which it was produced had always been lower (and less attractive to a producer) than shipping it to consumers in another state. Intrastate gas was cheaper because transportation costs were lower and the existence of a greater number of smaller producers increased competition thereby putting downward pressure on price. But the price increase for intrastate gas (which was not subject to FPC regulation) revealed that the demand for new gas was exceeding available supply.⁴⁷ As this trend continued, producers worked to service intrastate pipelines and markets at the expense of the

⁴² Neuner 1960, 5–18.

⁴³ Neuner 1960, 35–42.

⁴⁴ Federal Power Commission 1965, 325–7.

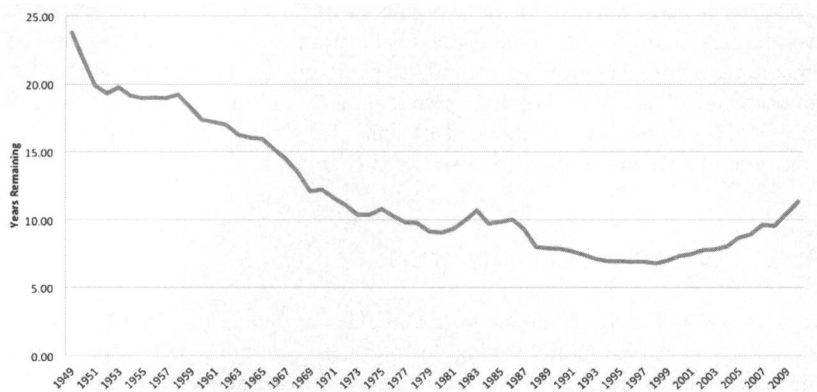
⁴⁵ On the eve of the Phillips decision there were more than four thousand independent natural gas producers in the United States. The sheer size of the industry made linking prices to the costs incurred by each company an administrative nightmare. Castaneda 1999, 154.

⁴⁶ See Permian Basin Area Rate Cases, 390 U.S. 747.

⁴⁷ Vietor 1984, 160.

interstate market. At the same time, as Figure 3 indicates, the reserve to production ratio for natural gas had been declining since 1958, meaning the country was producing more natural gas than it was discovering. All this resulted in physical shortages. The FPC was forced to develop criteria for the rationing of natural gas beginning in 1971.⁴⁸ These shortages intensified over the course of the 1970s resulting in the plant closings, lay-offs, and interruptions in service described at the beginning of this section.⁴⁹

Figure 3: Reserve to Production Ratio for Natural Gas, 1949-2010



Sources: From 1949-1976: American Petroleum Institute and American Gas Association Data: American Petroleum Institute, American Gas Association, and Canadian Petroleum Association (published jointly), *Reserves of Crude Oil, Natural Gas Liquids and Natural Gas in the United States and Canada as of December 31, 1979*, Volume 34 (June 1980). From 1977-2008: EIA, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, annual reports. From 2009-2010: EIA, *Summary: U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves 2010* (August 2012), Tables 7 and 17.

Similar to the oil crisis, there are two competing explanations for the natural gas shortages of the 1970s. As the above narrative implies, first, while natural gas prices were held relatively stable by the FPC, the costs of exploring for and producing natural gas (plus inflation) reduced its profitability and resulted in a declining supply. Essentially, by 1970 natural gas prices were set at rates premised on antiquated cost estimates. At the same time, relatively cheap and stable natural gas prices helped the fuel to penetrate industrial markets. Growing

⁴⁸ The FPC approached the problem of rationing on a case by case basis in 1971. Eventually the Commission issued more general regulations. See Federal Power Commission. 1973a; Vietor 1984, 276-7.

⁴⁹ One example can be seen in the difficulty experienced by Consolidated Edison of New York (the City of New York's utility) in meeting its natural gas demand. 'Gas Shortage is Pinching Con Edison' 1971; 'FPC is Urged to Take Action' 1971.

suburbanization and the increasing attractiveness of the fuel for utility companies concerned about air pollution also served to increase demand, resulting in the shortages of the 1970s.⁵⁰ A second explanation posits that the natural gas industry conspired to create a crisis in order to circumvent regulation and achieve higher prices. These critics were suspicious of the fact that the reserve to production ratio turned negative shortly after the Supreme Court found in 1954 that natural gas prices could be set by the FPC for producers, and the price of intrastate gas rose above interstate gas in 1968, the very year that the Supreme Court for the first time upheld FPC rates. These critics were not just consumer groups, but also included a number of former FPC commissioners.⁵¹ My purpose is not to determine which explanation is more persuasive. But it is important to note that growing natural gas shortages existed before the OAPEC embargo of 1973.⁵² Furthermore, these shortages and the natural gas crisis of the 1970s would have materialized (whether as a result of market forces or conspiracy) even in the absence of an OAPEC embargo.⁵³

4. The Electrical Energy Crisis

In May 1974, Charles Luce stood in the glass-walled visitors' gallery of the New York State legislature, gazing down at the floor while nervously rubbing his hands.⁵⁴ Luce was the CEO of Consolidated Edison of New York, the utility servicing New York City and Westchester County. He had spent the night lobbying legislators. Now, at 6 a.m. after a twenty-hour session, he watched as the Republican-controlled legislature passed a half billion dollar bailout of his company amid jeers from Democrats.⁵⁵ This was the first time that a state had taken such action to preserve a major public utility, and it likely prevented the nation's largest private utility company from having to declare bankruptcy. How was it possible that a company with a monopoly on the sale of natural gas and electricity in the nation's largest city, an entity permitted to create a rate

⁵⁰ MacAvoy and Pindyck 1975a, 7-9; MacAvoy and Pindyck 1975b, 27-8; Federal Power Commission 1973b, 563.

⁵¹ See Joseph Swindler's testimony in U.S. Congress, House 1971, 271.

⁵² These shortages increased over the course of the 1970s even as natural gas surpluses developed within producer states. On the growing surplus within Texas see Prindle 1981, 103-4.

⁵³ This is not to suggest that the OPEC-induced price spikes of the 1970s did not have an impact on the debate surrounding domestic US natural gas prices. Consumer groups argued against efforts by natural gas producers to raise interstate prices to match intrastate levels. They believed that producers were misguided to point out that natural gas demand slackened only when gas reached the Btu-equivalent of oil prices, since oil prices were a reflection not of a free market but a cartel. Vietor 1984, 288.

⁵⁴ This account borrows from Lifset 2014a.

⁵⁵ 'Albany Approves \$500-Million Aid' 1974; 'Area Lawmakers Oppose State' 1974; 'Con Ed Sale' 1974.

structure designed to guarantee a rate of return on its investment, could find itself on the brink of bankruptcy? The answer is that Con Ed was painfully experiencing a series of problems endemic throughout the American utility industry during these years. These problems constitute what I refer to here as the “electrical energy crisis.”

American utility companies found themselves in financial difficulty because the business model they had relied on for the first six decades of the twentieth century was falling apart. The historian Richard Hirsh has argued these companies had long been successful in encouraging demand while expanding supply and reducing the price of electricity by building increasingly larger power plants, thereby taking advantage of economies of scale. But this model broke down in the 1970s for three reasons: technological stasis, the environmental movement and the oil and natural gas crisis.⁵⁶

The ability to build larger, more efficient plants hit a technological wall in the 1970s. For decades, greater efficiencies had been possible by building larger plants producing greater economies of scale. The advances can be seen in the successful efforts to improve thermal efficiency (the percentage of a fuel’s energy content actually converted into electricity). Yet, thermodynamic theory limited steam systems to a top efficiency of 48 percent. Thomas Edison’s first generating station, built in 1882, had a thermal efficiency of 2.5 percent. By 1965 the average thermal efficiency was 33 percent. Efficiencies were gained by increasing steam temperatures and pressures. In the 1960s, manufacturers began to discover that improving thermal efficiency was producing diminishing returns, with metallurgical problems appearing at around 40 percent. Manufacturers and utilities learned that less-efficient plants could be run more reliably.⁵⁷ Hoping to overcome the decline of thermal efficiency improvements and meet increasing demand, utility companies tried building larger power plants. Lacking the time to test and slowly introduce larger turbines, manufacturers extrapolated from existing designs and produced equipment that frequently broke down. Utility companies were in a race to keep up with demand, and they were losing.⁵⁸

⁵⁶ Richard Hirsh described the crisis as the breakdown of a “utility consensus”; see Hirsh 1999. On how utility companies encouraged demand, see Rose 1995, and Platt 1991; New York City’s utility, Consolidated Edison, was also caught in a financial crisis resulting from a vicious cycle in which rising interest rates and increasing demand for electricity led to high-priced construction requiring new financing at higher interest rates. This meant higher rates to consumers to cover the interest and attract new investment. The Public Service Corporation, its regulator, generally gave the company a percentage of its requested rate hikes, producing a gradual financial erosion. Higher fuel prices in the 1970s drove the company to the brink of bankruptcy. See Pratt 1988, 91.

⁵⁷ Hirsh 1999, 55–6.

⁵⁸ Hirsh 1999, 58; Nuclear energy, powered by domestically mined uranium and free (for a time) from environmental controversy was the last hope of the growth strategy. To under-

Environmentalism also played a role in producing the electrical utility crisis. Before the 1960s, utility companies enjoyed almost complete autonomy in choosing production and transmission technologies, the fuel used in their systems, the location of generating plants, and the type of air and water pollution control systems they chose to employ. The historian Joseph Pratt has noted that by the 1970s utilities had lost this autonomy as new environmental laws and regulations scrutinized and slowed the ability of utility companies to build new plants and determine the fuels used to generate electricity. Perhaps most important, environmentalism questioned the growth-centered ideology and business model of the industry. Increasing power consumption had long been viewed as critical to the growth of the overall economy; as the historian David Nye has argued, it literally fueled the American way of life.⁵⁹ Environmentalists were attracted to those critics who called into question this ideology of growth. Paul Ehrlich, Ernst F. Schumacher, Denis Meadows, Barry Commoner, and Amory Lovins all provided the intellectual ammunition, which environmentalists used to focus the attention of utility companies on the demand for energy.⁶⁰ The effect of this discourse is that it placed utility companies and their environmental critics in starkly different positions. Utility companies responded to the blackouts by arguing that they needed more generating power. To environmental critics, this solution, and the mind-set that produced it, was the problem. But it should be noted that environmentalists attacked utilities because a large number of environmental problems are energy related. And though expanding energy production did garner the attention of conservationists hoping to preserve a particular stretch of river or the sanctity of the national park system in the first half of the twentieth century, it was during the post-World War II years, during an intensifying interest in pollution that utility companies found themselves in the crosshairs of environmentalists.⁶¹

Finally, the oil and natural gas crisis contributed to an electricity crisis precisely because of the pressure applied by environmentalists to the utility industry. In the 1960s and early 70s, utility companies began to use ever larger quantities of oil and natural gas to generate electricity. By 1973, 17 percent of the nation's electricity generation was produced by burning oil; 18 percent was produced burning natural gas.⁶² Both of these fuels were relatively cheap in the

stand how nuclear power became increasingly controversial in the U.S. during the 1970s see Walker 2014.

⁵⁹ See Nye 1999.

⁶⁰ See Pratt 1988, 255; Ehrlich 1968; Schumacher 1973; Meadows and the Club of Rome 1972; Commoner 1976; Lovins 1976.

⁶¹ Utility companies were attacked in the early 20th century by environmental activists' intent on reducing air pollution. This paper argues that the pressure on utility companies increased considerably in the post-war decades. On these earlier efforts to reduce air pollution see Stradling 1999.

⁶² U.S. Energy Information Administration 2012, Table 8.2a.

1960s. FPC regulation had kept natural gas prices relatively flat across that decade, and domestically produced oil dropped 25 percent in price from 1957 to 1970.⁶³ Oil and natural gas are also cleaner burning than coal, an important consideration for urban utility companies striving to meet new air pollution requirements.⁶⁴

When natural gas shortages materialized in the 1970s, utilities like Consolidated Edison had difficulty acquiring all the natural gas they needed. Furthermore, the FPC approved price increases in the 1970s, as part of an effort to encourage new production. At the very moment when American utilities were beginning to switch away from coal to oil, they were confronted with OPEC price increases and the OAPEC embargo, both of which served to drastically raise fuel costs. With these kinds of costs, electricity prices would no longer decline. As a result of these three issues (technological stasis, environmentalism, and the oil and natural gas crisis) utility companies lost the ability to meet demand while lowering prices.⁶⁵ In Con Ed's case, simply meeting demand became a significant challenge.⁶⁶ To be sure, the OAPEC embargo and the swift rise in oil prices during the 1970s played a role in undermining the business model of utility companies in this era. However, oil was quickly abandoned as a fuel source by the industry in the 1970s, and technological stasis, environmentalism, and the crisis in oil and natural gas together were sufficient to produce an ongoing crisis in the utility industry.⁶⁷ The electrical energy crisis was exacerbated by but not a product of OPEC or the OAPEC embargo.

5. Conclusion

While this paper has attempted to demonstrate that the energy crisis of the 1970s consisted of three separate but related crises, this was not how the crisis was understood at the time. This confusion contributed to the paranoia and fear of a citizenry buffeted by a series of traumatic shocks and undergoing significant change. But understanding that the American energy crisis consisted of three separate but related crises provides a number of new insights into the direction of energy policy and politics in the 1970s. First, it helps us to make sense of the policies debated and enacted in Washington in that decade. There were a number of debates (i.e. natural gas de-regulation) and controversies that

⁶³ U.S. Energy Information Administration 2012, Table 3.1.

⁶⁴ For a discussion of the the stricter air pollution requirements emerging in these years see Dewey 2000.

⁶⁵ Hirsh 1999, 60-1.

⁶⁶ On Consolidated Edison's difficulties in the 1960s and '70s see Lifset 2014b.

⁶⁷ The market share of oil in electricity generation declined from 17 percent in 1973 to 6 percent in 1983. U.S. Energy Information Administration 2012, Table 8.2a.

had nothing to do with oil and the oil crisis. Second, while OAPEC and OPEC contributed to the crisis, they also became convenient scapegoats. One of the effects of blaming the Middle East was that it empowered consumers in their struggle with producers over price controls. It was easier to defend price controls if lifting them meant that undemocratic regimes would thereby benefit from their cartelistic pricing power. Third, the above dynamic likely slowed down the pace of neo-liberal reforms that eventually took place at the end of the decade.⁶⁸ The 1970s saw large swaths of the American economy (i.e. transportation, communications) de-regulated as policy makers placed greater faith in the market. However, the shortages described in this paper and the degree to which they might be mistakenly blamed on a foreign cartel provided support for continued and increasing government involvement in the energy sector. Fourth, it allows us to see that the oil crisis continues to dominate our memory of the energy crisis partly because the policies designed to address the natural gas and electrical utility crises were largely successful, while the policies designed to address the oil crisis were not. Americans see the energy crisis through the failures inherent in an oil policy that by the 1980s came to rely on the free market (with a near exclusive focus on supply and not demand) and, since a growing percentage of that market was met with foreign supply, oil became an increasingly important national security concern.⁶⁹

Finally, much of the scholarship on the 1970s predictably focuses on the impact of the energy crisis on that decade. Beyond the inflation, gasoline lines and conspiracy theories, a more precise understanding of the energy crisis of the 1970s will allow us to see how the policies adopted at that time have worked to influence and shape the succeeding decades. A more precise understanding of the crisis will allow us to better understand both our contemporary challenges and the burden of the past.

References

- Albany Approves \$500-Million Aid To Rescue Con Ed. 1974. *New York Times*, May 17.
- Allvine, Fred C., and James M. Patterson. 1974. *Highway Robbery: An Analysis of the Gasoline Crisis*. Bloomington: Indiana University Press.
- Area Lawmakers Oppose State Buying Con Ed Plants. 1974. *Times Herald Record*, May 14.

⁶⁸ On how conservatives unsuccessfully battled against increasing the size of government as a response to the energy crisis see Jacobs 2008.

⁶⁹ On the securitization of oil see Jones 2012; on the growing importance of oil in American diplomacy see Painter 2014; on how the concept of energy security expanded in the 1970s see Graf 2010.

- Bamberg, James. 2000. *British Petroleum and Global Oil, 1950-1975: The Challenge of Nationalism*. Cambridge: Cambridge University Press.
- Blair, John. 1976. *The Control of Oil*. New York: Vintage Books.
- Borstelmann, Thomas. 2011. *The 1970s: A New Global History from Civil Rights to Economic Inequality*. Princeton: Princeton University Press.
- Burrough, Brian. 2009. *The Big Rich: The Rise and Fall of the Greatest Texas Oil Fortunes*. New York: Penguin Books.
- Burrows, James C., and Thomas A. Domencich. 1970. *An Analysis of the United States Oil Import Quota*. Lexington: Heath Lexington Books.
- California Standard Limits Supply to Gasoline Stations. 1973. *New York Times*, May 8.
- Castaneda, Christopher. 1999. *Invisible Fuel: Manufactured and Natural Gas in America, 1800-2000*. Woodbridge: Twayne Publishers.
- Clark, John G. 1987. *Energy and the Federal Government: Fossil Fuel Policies, 1900-1946*. Urbana: University of Illinois Press.
- Commoner, Barry. 1976. *The Poverty of Power: Energy and the Economic Crisis*. New York: Knopf.
- Con Ed Sale of Plants Scored. 1974. *The New York Times*, June 6.
- Cowie, Jefferson. 2010. *Stayin' Alive: The 1970s and the Last Days of The Working Class*. New York: The New Press.
- Dewey, Scott Hamilton. 2000. *Don't Breathe the Air: Air Pollution and U.S. Environmental Politics, 1945-1970*. College Station: Texas A&M Press.
- Drivers Waiting to Fill Empty Tanks Pour Out Their Many Tales of Woe. 1974. *New York Times*, Jan. 4.
- Ehrlich, Paul. 1968. *The Population Bomb*. New York: Ballantine Books.
- Eisenhower, Dwight D. 1956. Veto of Bill To Amend the Natural Gas Act, February 17, 1956. *The American Presidency Project*, online by Gerhard Peters and John T. Woolley <<http://www.presidency.ucsb.edu/ws/?pid=10736>>.
- Eisenhower, Dwight D. 1959. The President's News Conference, March 11, 1959. *The American Presidency Project*, online by Gerhard Peters and John T. Woolley <<http://www.presidency.ucsb.edu/ws/?pid=11678>>.
- Exxon Stations on 2 Toll Roads Are Limiting Sales of Gasoline. 1973. *New York Times*, June 20.
- Farber, David, ed. 2004. *America in the 70s*. Lawrence: University Press of Kansas.
- Federal Power Commission 1953. *Opinion No. 217*, 10 FPC 246 (August, 1951). *Opinions and Decisions of the Federal Power Commission*, vol. 10. Washington, DC: United States Government Printing Office.
- Federal Power Commission. 1965. *Opinion No. 468*, 34 FPC 159 (August, 1965). *Opinions and Decisions of the Federal Power Commission*, vol. 34. Washington, DC: United States Government Printing Office.
- Federal Power Commission. 1973a. *Order No. 467* "Utilization and Conservation of Natural Resources – Natural Gas Act." 49 FPC 87 (1973). *Opinions and Decisions of the Federal Power Commission*, vol. 49. Washington, DC: U.S. Government Printing Office.
- Federal Power Commission 1973b. Report of the Supply-Technical Advisory Task Force-Regulation and Legislation, December 15, 1972. *Natural Gas Survey, Volume II*. Washington, DC: U.S. Government Printing Office.

- Ferguson, Nial, Charles S. Maier, Erez Manela, and Daniel J. Sargent, eds. 2010. *The Shock of the Global: the 1970s in Perspective*. Cambridge: Harvard University Press.
- FPC is Urged to Take Action On Need For Natural Gas Here. 1971. *New York Times*, September 20.
- Gas Shortage is Pinching Con Edison. 1971. *New York Times*, September 2.
- Graf, Rüdiger. 2010. Between 'National' and 'Human Security': Energy Security in the United States and Western Europe in the 1970s. *Historical Social Research* 35 (4): 329-48.
- Greenberger, Martin. 1983. *Caught Unawares: The Energy Decade in Retrospect*. Cambridge: Ballinger Publishing Company.
- Hakes, Jay. 2008. *A Declaration of Energy Independence: How Freedom from Foreign Oil Can Improve National Security, Our Economy, and the Environment*. Hoboken: Wiley.
- Hinton, Diana Davids, and Roger M. Olien. 2002. *Oil in Texas: The Gusher Age 1895-1945*. Austin: University of Texas Press.
- Hirsh, Richard. 1999. *Power Loss: The Origins of Deregulation and Restructuring in the American Electric Utility System*. Cambridge: MIT Press.
- Horowitz, Daniel. 2005. *Jimmy Carter and the Energy Crisis of the 1970s: The "Crisis of Confidence" Speech of July 15, 1979*. New York: Bedford/St. Martin.
- Jacobs, Meg. 2008. The Conservative Struggle and the Energy Crisis. In *Rightward Bound, Making America Conservative in the 1970s*, ed. Bruce J. Schulman and Julian E. Zelizer, 193-209. Cambridge: Harvard University Press.
- Johnson, William A. 1975. The Impact of Price Controls on the Oil Industry: How to Worsen an Energy Crisis. In *Energy: The Policy Issues*, ed. Gary Eppen. Chicago: University of Chicago Press.
- Jones, Toby Craig. 2012. America, Oil, and War in the Middle East. *Journal of American History* 99 (4): 208-18.
- Kalt, Joseph P. 1981. *The Economics and Politics of Oil Price Regulation: Federal Policy in the Post-Embargo Era*. Cambridge: The MIT Press.
- Kash, Don E., and Robert W. Rycroft. 1984. *U.S. Energy Policy: Crisis and Complacency*. Norman: University of Oklahoma Press.
- Killen, Andreas. 2006. *1973 nervous Breakdown, Watergate, Warhol, and The Birth of Post-Sixties America*. New York: Bloomsbury.
- Lifset, Robert. 2014a. Environmentalism and the Electrical Energy Crisis. In *American Energy Policy in the 1970s*, ed. Robert Lifset, 283-302. Norman: University of Oklahoma Press.
- Lifset, Robert. 2014b. *Power on the Hudson: Storm King Mountain & The Emergence of Modern American Environmentalism*. Pittsburgh: University of Pittsburgh Press.
- Lifset, Robert, and Brian C. Black. Imagining the "Devil's Excrement:" Big Oil in Petroleum Cinema, 1940-2000. *Journal of American History* 99 (4): 135-44.
- Lovins, Amory. 1976. Energy Strategies: The Road Not Taken? *Foreign Affairs* 55.
- MacAvoy, Paul W., and Robert S. Pindyck. 1975a. *Price Controls And The Natural Gas Shortage*. Washington: American Enterprise Institute.
- MacAvoy, Paul W., and Robert S. Pindyck. 1975b. *The Economics of the Natural Gas Shortage*. Amsterdam: North-Holland Publishing Company.

- Malavis, Nicholas George. 1996. *Bless the Pure & Humble: Texas Lawyers and Oil Regulation, 1919-1936*. College Station: Texas A&M Press.
- Mattson, Kevin. 2009. *What the Heck Are You Up To, Mr. President?: Jimmy Carter, America's "Malaise," and the Speech That Should Have Changed the Country*. New York: Bloomsbury.
- Meadows, Denis, and the Club of Rome. 1972. *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind*. New York: Universe Books.
- Melosi, Martin. 1985. *Coping With Abundance: Energy and Environment in Industrial America*. New York: Alfred A. Knopf.
- Mitchell, Timothy. 2011. *Carbon Democracy: Political Power in the Age of Oil*. New York: Verso Press.
- Nash, Roderick. 1968. *United States Oil Policy 1890-1964*. Pittsburgh: University of Pittsburgh Press.
- Neuner, Edward J. 1960. *The Natural Gas Industry: Monopoly and Competition in Field Markets*. Norman: University of Oklahoma Press.
- NI-Gas Seeks to Reduce, then Eliminate, 'Off-Peak' Customers. 1971. *Chicago Tribune*, August 25.
- Nye, David. 1999. *Consuming Power: A Social History of American Energies*. Cambridge: MIT Press.
- Painter, David. 2014. From the Nixon Doctrine to the Carter Doctrine: Iran and the Geopolitics of Oil in the 1970s. In *American Energy Policy in the 1970s*, ed. Robert Lifset, 61-92. Norman: University of Oklahoma Press.
- Phillips Petroleum Company v. State of Wisconsin*, 347 U.S. 672. 1954. FindLaw <<http://caselaw.lp.findlaw.com/scripts/getcase.pl?court=US&vol=347&invol=672>>.
- Platt, Harold L. 1991. *The Electric City: Energy and the Growth of the Chicago Area, 1880-1930*. Chicago: University of Chicago Press.
- Pratt, Joseph. 1988. *A Managerial History of Consolidated Edison, 1936-1981*. New York: Consolidated Edison Company of New York.
- Prindle, David F. 1981. *Petroleum Politics and the Texas Railroad Commission*. Austin: University of Texas Press.
- Real reason behind fuel crisis. 1973. *Chicago Tribune*, January 21.
- Richman, Al. 1979. The Polls: Public Attitudes Toward the Energy Crisis. *Public Opinion Quarterly* 43 (4): 577.
- Rister, Carl Coke. 1949. *Oil! Titan of the Southwest*. Norman: University of Oklahoma Press.
- Rose, Mark H. 1995. *Cities of Light and Heat: Domesticating Gas and Electricity in America*. University Park: Pennsylvania State University Press.
- Sandbrook, Dominic. 2011. *Mad As Hell: The Crisis Of the 1970s and the Rise Of the Populist Right*. New York: Anchor Books.
- Schulman, Bruce J. 2002. *The Seventies: The Great Shift in American Culture, Society, and Politics*. New York: Da Capo Press.
- Shulman, Peter A. 2011. The Making of a Tax Break: The Oil Depletion Allowance, Scientific Taxation, and Natural Resources Policy in the Early Twentieth Century. *Journal of Policy History* 23 (3): 281-322.
- Schumacher, E. F. 1973. *Small Is Beautiful: Economics As If People Mattered*. New York: Harper and Row.

- Stein, Judith. 2010. *Pivotal Decade: How the United States Traded Factories for Finance In The Seventies*. New Haven: Yale University Press.
- Stobaugh, Robert, and Daniel Yergin. 1979. *Energy Future, Report of the Energy Project at the Harvard Business School*. New York: Random House.
- Stradling, David. 1999. *Smokestacks and Progressives: Environmentalists, Engineers, and Air Quality in America, 1881-1951*. Baltimore: Johns Hopkins University Press.
- The Oil Import Question; A Report on the Relationship of Oil Imports to the National Security*, February. 1970. Washington, DC: U.S. Government Printing Office.
- Truman, Harry S. 1950. Veto of Bill to Amend the Natural Gas Act of 1938, April 18. *The American Presidency Project*, online by Gerhard Peters and John T. Woolley <<http://www.trumanlibrary.org/publicpapers/index.php?pid=711&st=&st1=>>.
- Tugwell, Franklin. 1988. *The Energy Crisis and the American Political Economy: Politics and Markets in the Management of Natural Resources*. Stanford: Stanford University Press.
- U.S. Congress, House, Select Committee on Small Business. 1949. *Effects of Foreign Oil Imports on Independent Domestic Producers* (81st Cong., 1st Sess.), May <<http://congressional.proquest.com.ezproxy.lib.ou.edu/congressional/docview/t29.d30.hrg-1949-sbh-0004?accountid=12964>>.
- U.S. Congress, House, Subcommittee on Communications and Power, Committee on Interstate and Foreign Commerce. 1971. *Natural Gas Act Amendments of 1971* (92nd Cong., 1st Sess.), September <<http://congressional.proquest.com.ezproxy.lib.ou.edu/congressional/docview/t29.d30.hrg-1971-fch-0006?accountid=12964>>.
- U.S. Energy Information Administration. 2012. *Annual Energy Review 2011. Table 3.1: Fossil Fuel Production Prices, 1949-2011*. Washington, DC: U.S. Energy Information Administration.
- U.S. Energy Information Administration. 2012. *Annual Energy Review 2011*. Washington, DC: U.S. Energy Information Administration.
- Venn, Fiona. 2002. *The Oil Crisis*. London: Longman.
- Vietor, Richard H. K. 1984. *Energy Policy in America Since 1945*. Cambridge: Cambridge University Press.
- Walker, J. Samuel. 2014. The Nuclear Power Debate. In *American Energy Policy in the 1970s*, ed. Robert Lifset, 221-56. Norman: University of Oklahoma Press.
- Wall, Bennett H. 1988. *Growth in a Changing Environment: A History of Standard Oil Company (New Jersey) Exxon Corporation 1950-1975*. New York: McGraw-Hill Book Company.
- Waterhouse, Brian C. 2013. Mobilizing for the Market: Organized Business, Wage-Price Controls, and the Politics of Inflation, 1971-1974. *Journal of American History* 100 (2): 454-5.
- Wildavsky, Aaron, and Ellen Tenenbaum. 1981. *The Politics of Mistrust, Estimating American Oil and Gas Resources*. Beverly Hills: Sage Publications.
- Williamson, Harold, Ralph L. Andreano, Arnold R. Daum, and Gilbert C. Klose. 1963. *The American Petroleum Industry: 1899-1959, The Age of Energy*. Evanston: Northwestern University Press.
- Yergin, Daniel. 1991. *The Prize: The Epic Quest For Oil, Money & Power*. New York: Free Press.