Chapter One

Energy and the Modern State

To fully grasp the development of the modern state, we must distinguish between capitalism with a small "c" and Capitalism. The former describes an economy that is predicated on free market relations, credit, liquidity, advanced accounting techniques, international firms, and so on. Capitalism with a capital "C" is the unity of capitalism with the state. It is this unity that serves as the basis of the modern state (both historically and in the contemporary era). Why did this transition from *capitalism* to *Capitalism* occur?

The answer to this question lies in energy—the shift from muscle power first to wind (in shipping) and later to fossil fuels (coal, natural gas, petroleum). The early revolutions in energy use resulted in the British Empire. Contemporary global politics is characterized by an American fossil fuel (especially oil) empire.[1]

Early Capitalism

I recently had the privilege of visiting the Hanseatic League Museum in Lübeck, Germany. The museum effectively shows that European premodern history is not so premodern. The European economy of the late Middle Ages (1200 to 1500) had all of the accoutrements of a modern trade regime.[2] The importance of the museum is that it educates us to the fact that prior to the rise of nation-states there was an economic, political regime that achieved a very broad scope and high level of sophistication. Thus, neither modern history nor capitalism begin with the rise of the nation-states. Quite the contrary (and this may be why

European history prior to the sixteenth and seventeenth centuries is obscured to many of us), European capitalism began with cities and in some opposition to the aristocratic classes that would be the precursor to the modern Western state. Exactly what was premodern about Europe in the centuries leading up to the modern era was precisely that there was a bifurcation between economic and political power. European economic vibrancy was centered in cities like Lübeck, Venice, among others, but political power was invested in a landed gentry, aristocracy.

Leading cities in Europe were key centers of trade, industry, banking, and so forth. Through such devices as the Hanseatic League, urban elites regulated trade and economic activity—with the aristocracy almost entirely outside of the trade, economic, regulatory processes that dominated the continent.

In this way capitalism developed outside of the state—with the military, political apparatuses serving as something of a parasitic role (taxing an industrial, finance, and trade regime it arguably contributed nothing to). Worse still, monarchical governments in the late Middle Ages were something of a liability to the Eurasian trade regime—in that a lot of the risk associated with long-distance trading came from political authorities that could arbitrarily, unduly interfere with even established trade routes. Most deleterious of all, aristocracies would go to war with one another and this could shut down trade and, by implication, economic activity. The great irony was that monarchical regimes were growing richer from increasing trade and they used that wealth to engage in conflicts that disrupted profitable activities. Moreover, war and conflict created greater need to tax wealth-creating urban zones. Hence, contrary to Charles Tilly's thesis that war forwarded the creation of the state, in premodern Europe war subverted key political regimes—those of urban elites and the aristocracies that were maintained by them.[3]

Unsurprisingly, thriving cities manifested a hostility to the pretense of government outside of the urban-based trading, manufacturing network. This hostility was ostensibly most clearly manifest in the Republic of the Netherlands. Established in the sixteenth century by freeing itself from the Spanish crown, early Netherlands was a confederacy—with authority vested in provinces (Holland being most important) that tended to be dominated by urban zones (the most significant being the major entrepot of Amsterdam).[4] Rather ironically, this republic of free trade played something of a key role in the rise of Capitalism (the unity of the state and capitalism).

Wind Power and the Early Modern State

The key to the founding of the modern state was wind power—particularly because it served to propel navies. Both the Dutch and the British pioneered in shifting their navies to wholly operating via wind sail. Venice and other Mediterranean naval powers still relied on oars (muscle power) for their military ships. According to historian Carlo M. Cipolla, Spain was slower in the sixteenth century to shift its naval vessels to wind power than the Netherlands and Great Britain. These latter countries combined wind power and cannons into an effective and devastating naval strategy, while others stayed with the ram and board approach.[5]

Where Great Britain and the Dutch diverged on the question of the prowess of their respective navies was each country's political institutions. The Dutch polity was highly fragmented on the question of military policy. Most glaring, the country's admiralty was divided among its provinces.[6] Additionally, the Netherlands was threatened in its interior (by France) and this created internal divisions over whether to emphasize naval or (land-based) military challenges. In contrast, the British polity (and its military policies) was centered in London[7] and able to focus research and development on naval matters. Thus, when geopolitical tensions came to head in the seventeenth century with the Anglo-Dutch Wars, British naval ships outclassed those of the Netherlands. Maarten Prak, in his history of the Netherlands' golden age (when it was a world power), highlights that once England settled its civil war in 1648 it set upon a sustained effort in developing and deploying a new advanced navy: "The English immediately launched an ambitious program of fleet construction, producing a whole series of specialized warships that were larger than the Dutch ships and could carry more and heavier artillery." Prak goes on to explain that "the consequences were harsh indeed. The Dutch, suffering one defeat after another, were forced to accept the humiliating terms of the Treaty of Westminister."[8]

Hence, beginning in the fifteenth and sixteenth centuries military technologies (such as naval ships) required an ever-greater concentration of resources to develop, and this favored political establishments that could absorb the substantial and sustained costs associated with developing such technologies. Individual cities didn't have the resources to successfully engage in such long-term endeavors. Nevertheless, it bears noting that if the provinces of the Netherlands could have agreed to focus sufficient resources on advancing their navy, the modern era could

have been ushered in under the banner of republicanism, as opposed to monarchy.

This conclusion would seemingly confirm Tilly's supposition that war and at least the modern state are coterminous. I would respectfully submit that Tilly's formulation obscures more than elucidates. What in fact spurs the development and expansion of state power in the modern era is that the interests of capitalism and national political power merge with the advent of wind-powered ships. It is this merging that serves as the political foundation of Capitalism (the unity of state and economy). What the capturing of wind power by ship did was revolutionize Eurasian trade. Portugal was the first to establish direct shipping links to Central Asia in the fifteenth century by circumnavigating Africa. This effectively ended the millennia-long centrality of Eurasian land routes (as well as of the Mediterranean)[9] and shifted power to the Atlantic states of Europe—even before the colonization of the Americas.[10] When the Dutch and the British aggressively entered the oceangoing Eurasian trade, Portugal was displaced. Subsequently, the Anglo-Dutch Wars established British hegemony on the high seas[11]—which it maintained into the twentieth century.[12] Now political power in the form of navies was key to trade since governments were the institutions that patrolled the shipping lanes that made long-distance trade possible—again, this relationship was most pronounced, salient in the case of Great Britain. To take it one step further, now states were making affirmative and necessary contributions to economic activity.

Wind power prompted, however, an even more fundamental change in global politics. By accessing wind power (later coal—railroads[13]) political authorities could rather inexpensively project power. This, along with advancing armaments, meant relatively small armies could be used to expand a polity's sphere of influence/control.[14] This was clearly evident in the carve-up of Africa, where the various European powers with rather limited financial outlays were able to rapidly overrun a massive, well-populated continent.[15]

This is the modern nation-state system: political, military apparatuses able to control territory beyond the principality without the need of large, expensive militaries. Whereas under capitalism merchants and entrepreneurs in essence sought to avoid political authorities in seeking economic and trading opportunities, with Capitalism economic interests became reliant on military power to maintain sovereignty and to secure access to markets and raw materials.[16] This is consistent with Karl

Marx's view that modern capitalism is the product of a distinct political configuration, not the result of new economic processes as suggested by Adam Smith and others.[17]

Coal and the Modern State System in the Nineteenth and Early Twentieth Centuries

The matter of improved armaments deserves attention. Significant for this discussion, the advancement of armaments is centered on energy. The heat needed to melt and mold iron ore is not trivial. Forests in Great Britain and elsewhere were depleted in the process of making cannons. With ships serving as key strategic tools, wood became a prime strategic resource in the sixteenth century and beyond.[18] Thus, another resource was needed to make the cannons that were increasingly central in early Capitalism. This resource was coal. With coal, we start to see happenstance play a key role in global affairs, because not every country has coal—nor iron ore, for that matter.[19] The prime sources of coal on Eurasia are in China and Russia[20]—two areas where the unity of political power and capitalism didn't occur until the twentieth century. Great Britain, nevertheless, had coal in appreciable amounts[21] and this played a considerable role in its production and advancement of armaments.[22] Later, British coal supplies would power its navy.[23] The point is that control of (especially scarce, vital) natural resources became a prime function of the state under Capitalism—arguably the most important natural resources being fossil fuels (i.e., energy).

While the French[24] and especially the British[25] surged forward under the regime of Capitalism (as would the United States), Germany (among others) faltered. I emphasize Germany because it has the largest reserves of coal in Central and Western Europe[26] but was hampered in that it didn't have a unified state until the late nineteenth century.[27] Coal, of course, has more than military applications. The Second Industrial Revolution, for instance, was powered by coal—more on that later. Coal made Germany a center of knowledge of science, chemistry, and engineering.[28] Without a centralized strong state to capture markets and other natural resources, however, Germany's relatively advanced economy was dependent on a system of world trade that was frequently manipulated by those powers that held large territories (France, Great

Britain, the United States). Thus, Germany was part of the networks of northwestern Europe where scientific knowledge and its practical application were greatly advancing,[29] but it was hampered in that it was economically dependent on the likes of Britain and France.

Germany didn't begin to pursue overseas possession until it was unified in 1871. By this point it had to contend with the fact that the world was mostly either effectively under the control of existing imperial powers (mostly, France and Britain) or had gained national independence (most of the Western hemisphere). There has virtually been endless debate on what specifically caused World War I (1914–1918), and I will not engage this expansive, multifaceted literature.[30] Nevertheless, focusing on the question of energy, Great Britain in a proximate sense is primarily culpable for precipitating the Great War. Again, due to its significant coal deposits, Germany in important ways had a modern, cutting-edge economy. Its advanced exporting industries included (at the beginning of the twentieth century) electrical engineering, pharmaceuticals, chemicals, metals, finished goods, and machine-tool production.[31] While Germany domestically had the energy to grow economically, it lacked secure access to international markets and the other raw materials needed to reliably economically expand. Reflective of this reality, leading into the Great War capital flight was a salient political issue facing Germany—as holders of capital seemingly perceived limits to Germany's medium-to-long-term economic prospects. Hence, instead of reinvesting their profits into Germany's economy, investors moved their money elsewhere.[32]

Great Britain saw Germany as an immediate, unacceptable threat to its global hegemony. It was particularly concerned with Germany's aggressive naval-building effort, which did suggest that it was going to challenge Great Britain's hold over its vast colonial possessions.[33] Great Britain was determined—even to the point of going to war—to hem in Germany, regardless of the effect this would have on the German economy. For instance, when Germany and France came into dispute over Morocco in 1905, Great Britain blocked Germany's effort to institute an "open door" policy in Morocco.[34] Great Britain was motived by a strong anti-German bias,[35] which made war a virtual inevitability. British antipathy toward Germany was ostensibly predicated on the fact that Germany, due in significant part to its domestic coal reserves, was a major geopolitical threat—particularly if it could gain secure, robust, reliable access to the international system. In the aftermath of World War I, a new energy source—oil—began to shape the global system.

A New Global System and Oil

While World War I was not about oil, by the early twentieth century this resource was beginning to shape global politics. The significance of Great Britain's dominant position in the world system leading up to World War I is evident with its decision on the eve of the war to switch its naval fleet to oil.[36] Such a switch was possible because of its presence in Iran and the government's financial sponsorship of the Anglo-Iranian oil firm.[37] Thus, given its imperial system, Great Britain was able to engage the next generation of naval technology, whereas Berlin (who had naval ambitions of its own[38]) could not make this leap due to Germany's paucity of colonial possessions and influence.

The big winner, however, of World War I was the United States. It became the world's top economy. This is because of its copious fossil fuels and its strong central government. The issue of centralized political authority resulted from its civil war, where the forces of political decentralization (the South) were defeated.

The victory of the North had a pronounced effect in the realm of trade policy. An underappreciated aspect of the American Civil War (1861–1865) was the trade question. The South sought a dependent relationship with Europe, whereby it would provide raw materials (primarily cotton) to this region in exchange for finished goods. This required low tariffs. The North desired high trade duties to protect domestic industry from cheaper and better-made European industrial products.[39] The first secessionist crisis in the U.S. was in the 1830s with South Carolina's threat to withdraw from the country in response to national trade tariffs.[40] With the victory of the North, the U.S. set a policy to in effect utilize its coal supplies to forward its national industry.[41] The prime global reserves of coal are in the U.S.—close to 30 percent of total supply.[42] The U.S. also holds significant supplies of natural gas.[43]

The rise of the U.S. (broadly speaking) is a story of energy and sovereignty. Shortly after the American Revolution, the First Industrial Revolution was predicated on hydro-power, with the rivers of the northeast harnessed for industrial production[44] and the American system of production—that is, interchangeable parts.[45] The Second Industrial Revolution was centered in the U.S. because of its tariff policy and its massive coal supplies. The heat generated by coal allowed for the economies of scale that characterized this industrial revolution.[46]

While the United States greatly advanced because of the Second Industrial Revolution, so did the economies of northwestern Europe and

Japan. Where the U.S. economy entered a plateau of its own was with the advent of what should be rightly recognized as the Third Industrial Revolution. This revolution is commonly referred to as the automobile revolution or the consumer durables revolution. These revolutions are viewed as resulting from Fordism, or the moving assembly line, which initiated the age of mass producing sophisticated technologies (most saliently the automobile).[47] More accurately, the Third Industrial Revolution was the result of oil. The 1920s is the beginning of the age of oil.[48]

This Third Industrial Revolution was monopolized by the U.S. for two key reasons. First, and most obviously, the U.S. was the world's largest producer of oil from the late nineteenth century to the post–World War II period. Second, the other advanced regions of the world did not have appreciable amounts of oil. Here is where World War I had a significant impact. The war left Britain and France deeply indebted to the U.S., which financed the Allied war effort through loans. Germany was punished with heavy war reparations and was further punished by efforts to deny it any international influence. Hence, one of Europe's advanced economies was left entirely dependent on a world trading system it had no direct role in shaping.

Arguably, this is most significant on the issue of the carve-up of the Middle East after World War I, where prior to the war German interests had a direct role in developing Iraqi oil fields. This was particularly important because in the early twentieth century Germany was an important pioneer in the advent of the automobile.[49] Germany's piece of Iraqi oil fields went to U.S. oil firms. The consortium of oil firms that controlled these fields blocked their development during the interwar years in an effort to bolster world petroleum prices.[50]

With Europe financially prostrate because of the war, and one of the continent's most technologically advanced automobile producers cut off from a reliable source of oil, the automobile revolution essentially bypassed this region. Investors in the U.S. could finance ever technologically advancing and expanding automotive production with the knowledge that there was ample, domestically available inexpensive gasoline to power a growing automobile fleet. The result was that the U.S. in the 1920s produced 85 percent of all automobiles.[51]

Automotive production in the U.S. had broad implications for its entire economy. Automobiles require the input of glass, steel, and rubber, so growing automotive production meant an expanding industrial base. Perhaps more importantly, the sophisticated manufacturing techniques developed to produce automobiles (Fordism) spread throughout the

industrial sector. This made the U.S. industrial base in the 1920s the most advanced in the world; moreover, by the 1920s the U.S. economy accounted for fully 25 percent of the world's GDP (gross domestic product); also, the U.S. became the globe's largest creditor nation, with European countries (as noted) heavily indebted to the U.S.[52]

Economic historian Peter Fearon observes of the other leading industrial power in the 1920s, Great Britain, that its "economy was retarded by the weight of the old staple industries such as cotton textiles, coal, shipbuilding and iron and steel . . ." He explains that this is "in contrast to the striking advance of the consumer durables sector in America."[53] Thus, the U.S. economy excelled in the production of such commodities as household appliances.[54] Indeed, economic historian Alexander J. Field contends that "almost all of the [technological] foundations for [U.S.] postwar prosperity were already in place by 1941."[55]

I argue in *Energy and the Politics of the North Atlantic* that World War II was primarily caused by energy issues.[56] The global energy imbalance, whereby the United States was surging ahead and the other advanced economies were quickly falling behind, created a profound political instability in the world political system. This imbalance was exacerbated by the fact that the U.S. was actively seeking to limit the Third Industrial Revolution to itself. It did so through a high tariff that was reinstituted just as the automobile revolution was being established in the early 1920s (chapter 3).

The state played a more salient role in the Third Industrial Revolution than in earlier such revolutions.[57] The success of the U.S. economy in the 1920s depended on changing consumer spending patterns. Most glaring, urban zones in this period were not adapted to the automobile because cities were densely organized, as well as lacking automobile-friendly roads and parking. Beginning in the 1920s the American federal government, through the Commerce Department, began promoting urban sprawl. Urban sprawl necessitates public road building and appropriate zoning rules. Such urban sprawl is built around the automobile and, indeed, fosters automobile dependency. Additionally, urban sprawl tends to create large single-family homes, which can accommodate significant amounts of furniture and appliances (i.e., consumers durables—retail items expected to last three years or more).

The Great Depression of the 1930s deepened the global political crisis from the concentration of the Third Industrial Revolution in the U.S. Most saliently, the U.S. turned further inward with the Smoot-Hawley protectionist tariff and by abandoning the gold standard. The

federal government employed a national strategy to counter the economic downturn by creating financial incentives to move people into suburban communities that were automobile dependent (chapter 4).

Perhaps following the lead of the U.S., other countries took destabilizing unilateral actions in the context of the depression. Japan responded to its dependent position in the global system by invading China in 1937. By 1930, the German government stopped looking to the U.S. for global leadership and adopted a truculent outlook—ultimately, with the rise of Hitler in January of 1933. Hitler looked with envy at the automobile revolution in the U.S. and sought to replicate it. This required bringing Soviet oil reserves within the orbit of Germany (Europe), which, of course, resulted in World War II. In the Pacific theater an American oil embargo against Japan resulted in the U.S. militarily engaging Japan, as Japan responded to the embargo with the attack on Pearl Harbor.[58] A key factor that resulted in the Axis Powers' defeat was their lack of oil—with 75 percent of the German military being horse drawn.[59] In contrast, the Allies were amply supplied with petroleum, provided predominately by the U.S. (nearly six billion of the seven billion barrels of petroleum used in the Allied war effort from 1941 to 1945).[60]

In the aftermath of World War II and the onset of the Cold War, the U.S. adopted the leadership position of the capitalist camp. The Cold War itself was seemingly the result of the West's (especially America's) opposition to the Soviet Union's effort to form an industrial state based on copious energy reserves while ideologically opposed to the profit motive.[61] During the Cold War, the U.S. consistently sought to prevent its allies from purchasing Soviet oil.[62] After the oil shocks of the 1970s, Saudi Arabia pursued an aggressive oil production strategy, which played a key role in the sharp decline of world oil prices in the 1980s.[63] Arguably, a prime goal of Saudi Arabia (a solid American ally[64]) in undercutting world petroleum prices during this period was to end the financial windfall that the Soviet government was garnering through the export of oil at the time.[65]

At the center of American Cold War leadership and the capitalist alliance was urban sprawl. The postwar economic boom in the U.S. was a direct result of government sponsoring of urban sprawl. The countries of West Germany and Japan geared their industrial development to the reliable access they had to the expanding consumer demand taking place in America. This worked to cement the pro-capitalist Cold War alliance.[66]

This international relations formula of relying on urban sprawl to forward the capitalist alliance and the capitalist economy (more broadly) was fundamentally threatened with the oil shocks of the 1970s. By 1973 the U.S. was no longer the leading oil producer, as production in America peaked in 1970 at just under ten million barrels a day. Moreover, the U.S. was importing roughly 35 percent of its oil needs. The center of global petroleum production shifted to the Persian Gulf—with Saudi Arabia, Iraq, Iran, and Kuwait being the prime global producers. Saudi Arabia in 1973 showed a willingness to use its oil as a political instrument—announcing a selective embargo directed at Israel's allies. This roiled the global oil market. This market was even more severely shaken by the Iranian Revolution in 1979, which brought an anti-U.S. government to power. Additionally, there were concerns that this anti-West, anti-U.S. revolution could spread to other Persian Gulf countries.

The countries of Western Europe and Japan never adopted the urban sprawl that the U.S. had. Nevertheless, Western Europe had predicated industrial and electricity production on oil. But with the 1970s oil shocks, France and Germany announced plans to shift to nuclear energy to power their respective economies. Popular political pressure prompted Germany to essentially abandon this plan, whereas France went ahead—today, 75 percent of electricity in this country is drawn from nuclear power. Moreover, France powers the other countries of Western Europe, as the largest exporter of electricity in the world. Elsewhere I explain that the European Union and its precursors were formed to deal with the reality that Western Europe had comparatively little domestic fossil fuel and as a result were reliant on an international energy system it essentially had no influence over.[67]

The United States responded to the oil shocks of the 1970s in a decisively different way (chapter 6): not by curbing its automobile/oil dependency but by focusing its political and military power upon the Persian Gulf. Similarly, in the early 2000s, as concerns arose about global petroleum supplies, the U.S. invaded the oil-rich country of Iraq. A trade embargo had been in place against Iraq since 1991 (as a result of the First Persian Gulf War). Thus, Iraqi oil fields were being underutilized in 2003 when the U.S. invasion took place. Today, American saber rattling against Russia and the Putin regime coincides with the reassertion of Russian sovereignty over its oil fields. In the immediate aftermath of the collapse of the Soviet Union the Yeltsin government privatized control of Russian petroleum. Under the Putin government, the state has taken back control of Russian oil.[68]

Something else in U.S. energy politics occurred during the 1970s that is curious. The U.S. turned away from nuclear power. American utility firms stopped ordering new nuclear power plants in the late 1970s. This raises a different facet of American energy politics. Up to this point I have emphasized the role of energy in propelling forward the U.S. economy and how this economy had a central role in the Cold War. Next, I turn to alternative energy—including nuclear. American policies on alternative energy can only be fully comprehended by considering how energy for the U.S. is a hegemonic device. The U.S. seeks to control the energy systems of other countries, and this has driven American policy on alternative energy. I take up this issue next.

Alternative Energy and the American-Led World System

Perhaps it will turn out that the most historically significant policy by the American government will be its indifference to clean renewable sources of energy.[69] Additionally, as other countries have sought to expand their use of clean renewable energy (most significantly Germany), the U.S. government is manifesting hostility to these efforts.

In 1952 a U.S. presidential commission (the Paley Commission) advised the federal government to aggressively sponsor research into solar energy. The U.S. has the advantage of the sun-drenched desert Southwest and the warm and sunny South. Moreover, America has a windy Midwest and Northwest.[70] Thus, unlike Europe or Japan the United States has a meteorology whereby significant amounts of surplus energy can be generated through wind and solar power. Presidents from Truman to Nixon mostly ignored the Paley Commission's recommendations.[71]

In the aftermath of the 1979 Iranian Revolution, the Carter administration did commit political and financial capital to developing solar power—taking the high-profile step of placing solar panels on the White House. Once oil prices declined in the first half of the 1980s, the Reagan administration drastically cut spending on alternative energy and took down the solar panels from the White House.[72]

Even now in the era of global warming, the U.S. government manifests an unserious attitude, at best, to clean renewable energy sources.[73] The Obama administration's $70 billion allocated to clean energy in 2009 was a one-off expenditure.[74] Maybe more significantly, the administration did not use this money to finance government research but instead utilized it to issue loan guarantees for entrepre-

neurial projects. Five hundred million of this money was dispensed in an irregular manner, and the result was that a Barack Obama campaign finance donor was reimbursed on a bad investment.[75]

The Donald J. Trump administration has publicly cast itself as indifferent (even hostile) to the issue of climate change and as pro fossil fuels.[76] The Trump White House website, for instance, declares the president's "commitment . . . to reviving America's coal industry."[77] Additionally, President Trump approved the Keystone XL Pipeline project, which was canceled by his predecessor (President Obama). (The pipeline would ostensibly accelerate petroleum production from the carbon-intense Canadian oil sands located in the province of Alberta.)[78] Finally, President Trump withdrew the U.S. from the voluntary 2015 Paris global warming accord.[79]

Why has the U.S. manifested an indifferent, unserious stance on clean renewable energy? This, despite historically and still today consuming massive amounts of energy—due in significant part to its sprawled urban zones. Clean renewable energy cannot serve as a hegemonic device. Most everyone has access to the wind and sun. Also, startup costs for solar panels and wind turbines manufacturing are not high.[80]

In *Energy and Empire* I juxtapose U.S. policy and politics on clean renewable energy with America's stance on nuclear energy.[81] Unlike solar energy, whose potential the government virtually ignored, the U.S. aggressively researched and promoted civilian nuclear energy in the 1950s and 1960s. Unlike solar energy, U.S. policymakers thought civilian nuclear technology could be monopolized. Thus, the U.S. classified its nuclear energy know-how and selected a fuel for nuclear power plants that it could monopolize. On the fuel question, instead of using heavy water technology, the government selected enriched uranium for the nuclear technology it exported to its allies. Heavy water can be used as a medium to ignite unprocessed uranium. Heavy water and unprocessed uranium are more broadly available than enriched uranium. Uranium enrichment involves increasing the amount of uranium-235 (^{235}U) in nuclear fuel. Uranium enrichment is a process that requires an expensive and sophisticated infrastructure. Going into the 1970s, the U.S. was virtually the only source of enriched uranium in the world outside of the Soviet Bloc. Hence, America's allies depended on it to fuel their nuclear power plants.[82]

The Nixon administration (1969–1974) made a misstep when it sought to privatize the U.S.'s uranium enrichment facilities. As part of the privatization process, the administration significantly raised the

cost of enriched uranium. With concerns that the U.S. was now going to use its monopoly of enriched uranium to maximize price, Europe and Japan initiated their own enrichment facilitates, and with that the U.S. lost its civilian nuclear monopoly.[83]

With the loss of this monopoly, the U.S. government in the late 1970s turned against nuclear energy (chapter 7). The American government abandoned nuclear energy under two pretenses: nuclear weapons proliferation and the Three Mile Island nuclear plant incident in 1979. Of course, nuclear weapons proliferation had always been possibility, but in the late 1970s this somehow became a top concern. It is also noteworthy that internationally the U.S. came out against nuclear energy before the Three Mile Island incident. Additionally, in the first decades of the 2000s there was a resurgence of activity in the planning of nuclear power plants, with significant progress made toward completing two new plants.[84] (More on this later.) Next, I turn to the question of plutonium power.

Plutonium Politics

The U.S. damaged civilian nuclear energy with it policies on plutonium (chapter 7). Plutonium held the promise of a virtually inexhaustible energy source, with few of the liabilities of fossil fuels (e.g., scarcity, air pollution, greenhouse gas emissions). Moreover, plutonium use would "close" the nuclear energy cycle. (Nuclear waste could be almost perpetually recycled, as the "waste" produced in nuclear reactions would be used over and over again in the form of plutonium.) Thus, in withdrawing support from plutonium and actively opposing it, the U.S. as a result lowered the utility of nuclear power and sustained its liabilities (i.e., nuclear waste and a reliance on an international trading system of raw uranium potentially dominated by producing countries). Therefore, the implication of the U.S. international opposition to plutonium was not solely maintaining the utility of its huge stockpile of nuclear weapons[85] (i.e., limiting international access to nuclear weapons material), but this opposition also had the effect of maintaining the world's dependency on fossil fuels.

The U.S. opposition to plutonium as an energy source took the form of the Nuclear Non-Proliferation Act of 1978.[86] Empowered by this legislation, the Carter administration established a policy of preconditions for the U.S. transfer of enriched uranium and nuclear technology to other countries. The U.S. sought guarantees that nations receiving

American nuclear materials would not engage in fuel recycling, nor could they export any nuclear materials to those who did. (France and Great Britain were not penalized for their recycling facilities, but any exporting of recycled fuel would require U.S. approval.)[87]

Also damaging to the idea of a plutonium-powered economy was the ending of the U.S.'s effort to perfect nuclear fuel recycling and the commercial breeder reactor. The U.S. government was financing the construction of the Barnwell recycling/reprocessing facility and the Clinch River breeder reactor. The Carter administration suspended political support for both projects. Reprocessing nuclear fuel involves the extraction of plutonium from nuclear waste, and the breeder reactor can run on the plutonium retrieved from reprocessing. Breeder reactors generate more plutonium than they consume (by converting uranium-238 [^{238}U] into plutonium).[88] Thus, both the Barnwell reprocessing center and the Clinch River breeder reactor were potentially key to a virtually never-ending fuel cycle and unlimited energy. The U.S. ended its reprocessing/recycling and breeder reactor projects to set moral examples to stop the proliferation of plutonium.[89]

Since plutonium could be used to manufacture weapons, the U.S. argued that its proliferation represented a nuclear weapons risk. There are reasons to question that this was the prime reason that motivated the U.S.'s anti-plutonium policy. First, nuclear weapons proliferation can take place in the absence of plutonium production for civilian purposes. This was the central point of the International Nuclear Fuel Cycle Evaluation, a 1980 study sponsored by the International Atomic Energy Agency (chapter 7). Second, the U.S. has not acted very harshly toward friendly states that have pursued nuclear weapons programs or actually adopted nuclear weapons. The most obvious cases are India and Pakistan—which have nuclear arsenals and have openly tested their weapons. The less evident cases are Israel (which is believed to have a secret nuclear weapons program) and apartheid South Africa (which is believed to have had a nuclear weapons program).[90] The case of India is particularly glaring. India never signed the Nuclear Non-Proliferation Treaty (NPT), but in 2008 the U.S. nonetheless sponsored it into the civilian nuclear trading system.[91] Under the NPT (negotiated in the late 1960s)—outside of the United States, Russia, Great Britain, France, and the People's Republic of China—countries that possess or pursue nuclear weapons are excluded from the trade in civilian nuclear power.[92] The only countries the U.S. aggressively opposes attaining nuclear weapons are those countries with which it already has a hostile relationship: the

clearest examples being Iran and North Korea.[93] (Despite being outside of the NPT framework, Pakistan has received tens of billions of dollars in military and economic aid from the U.S.[94]—nor does the U.S. object as Pakistan is attaining a nuclear power capacity.[95])

Third, the idea that the U.S. would use the fear over the spread of so-called weapons of mass destruction (WMDs) to forward an ulterior agenda is bolstered by the Bill Clinton (1993–2001) and George W. Bush (2001–2009) administrations' WMD allegations against Iraq—including claims that Iraq under Saddam Hussein had an active nuclear weapons program. As became especially evident with the American 2003 invasion of Iraq, U.S. allegations of Iraqi WMD programs were motivated by the American objective of regime change.

Fourth, the U.S. in pursuing its campaign against plutonium elided proposals for the internationalization of the nuclear fuel cycle. With a backlog of orders for enriched uranium, the Nixon administration put forward an offer to create an international uranium enrichment cartel. The offer, however, did not go beyond allowing foreign governments to invest in future privately controlled U.S. enrichment facilities.[96]

In light of the current threats of peak oil production[97] and climate change,[98] the U.S.'s opposition to civilian plutonium production and use beginning in the late 1970s may ultimately serve as the undoing of the international energy system and the biosphere (by means of global warming). Of course, plutonium production does present significant safety problems[99] and, as already noted, a nuclear weapons proliferation threat. Internationalization of plutonium production could have worked to meaningfully address the safety and weapons proliferation issues surrounding plutonium. Through internationalization, the countries of the world could have worked together to overcome the technical and safety barriers to large-scale plutonium production/use. (A global market for plutonium could have provided the incentives to resolve the significant technical/safety issues that currently serve as considerable obstacles to robust plutonium civilian utilization.) The U.S. government reaffirmed its hostile stance toward plutonium in 2012 with the Obama administration's Blue Ribbon Commission on America's Nuclear Future (chapter 7).

Additionally, a fully effective anti-nuclear weapons proliferation regime could be envisioned through internationalization of nuclear fuel production (including plutonium), as countries that deviate from the nuclear fuel regime could be punished with an absolute worldwide economic/energy embargo. Hence, internationalizing the global energy

system (via nuclear power) could have worked to move humanity toward a world regulatory system to manage such momentous issues as conflict, weapons proliferation, and the environment (e.g., global warming).[100]

As noted earlier, in the first decade of the twenty-first century the U.S. appeared to be on the cusp of a nuclear energy renaissance, with numerous new nuclear power plants in the planning stages. Writing in 2017, all but one of these planned facilities were abandoned.[101] This is because of the hydrofracking revolution—whereby oil and gas shale are processed into commercially viable petroleum and natural gas. By the early 2000s North American natural gas supplies were declining. As the cost for this resource increased, nuclear power was viewed as a price-competitive alternative. Hydrofracking radically changed the energy terrain in the U.S., with natural gas prices dropping precipitously. Natural gas stocks are now so voluminous in the U.S. that it is now exporting liquified natural gas overseas.[102] Not only did hydrofracking ostensibly destroy the market for nuclear power,[103] but it creates a substantial barrier to clean energy alternatives.[104] This is not true only within the U.S., as low and declining energy prices draw investment from Germany—as its decisive move to clean renewables have pushed up its energy prices.[105]

Noteworthy is the fact that the hydrofracking revolution in America would not be occurring but for the U.S. government, which went to great lengths to identify gas and oil shale deposits for producers. European governments have not done the same.[106] As a result there is great uncertainty as to whether shale deposits exist in this region in appreciable amounts. American policymakers continue to support and champion the hydrofracking revolution despite its deepening of the world's dependency on fossil fuels, making any significant move in preventing catastrophic global warming a seeming impossibility. The world in 2015 missed perhaps the last meaningful opportunity to curb climate-changing emissions[107] when, under the leadership of the Obama administration,[108] the Paris global warming conference failed to produce a treaty to regulate and reduce emissions.[109] Central to this failure was American hydrofracking and the continued development of the Canadian oil sands (chapter 6)—which primarily serve the U.S. market.[110] Additionally, the *New York Times*, in 2014, reported that the U.S. State Department created in 2011 a Bureau of Energy Resources "for the purpose of channeling the domestic energy boom into a geopolitical tool to advance American interests around the world."[111]

Conclusion

The modern state and energy have a dialectic relationship, with this state first arising from the successful military harnessing of energy (wind). This began a centuries-long process of increasing access to and use of energy, which ultimately resulted in the entirety of the globe being divided into nation-states. Through energy, state power can be expanded without the need for a massive military. Moreover, the advancement of the modern economy is predicated on sufficient access to energy and this has salient public (foreign) policy implications. State decisions over what energy sources (e.g., solar, oil shale, plutonium) to pursue or not pursue has a profound impact on the use and development of these sources. The final theoretical supposition of this study is that with energy tending to be a zero-sum resource, throughout the twentieth century and into the twenty-first, energy has been an acute source of geopolitical tension and conflict. As noted in the theoretical overview, these suppositions can only be fruitfully applied in specific historic contexts and circumstances.

The modern state arose in Western Europe with the Netherlands and England first successfully tying together wind and cannons (derived from molding iron ore with intense heat). This region of the world operated through capitalism—with a sophisticated trade regime, based on firms and networks of broad scope. Hence, the first states projected capitalism—thereby creating what we recognize as modern Capitalism. The fact that Great Britain was victorious in its competition with the Netherlands meant that the modern state and international Capitalism were founded on aristocracy, as opposed to republicanism.

Another happenstance that had a profound effect on the development of the modern world system was the fact that Germany had relatively significant coal reserves and was within the orbit of the science and technological development of Western Europe. The result was great technological and industrial advancement for the German economy. Germany's national government formed late (1871) relative to those in Great Britain and France. By the time Germany had a pressing need to secure foreign markets and raw materials for its advanced economy, the globe was either divided predominately between Great Britain and France or already had national governments (mostly, the Western hemisphere). Great Britain determined that Germany not gain secure access to foreign markets and raw materials, and this caused World War I.

Happenstance intervened again and the United States quickly rose to the top of the world system in the early twentieth century. The U.S., which had a centralized government, was the first major oil producer and it contains the largest coal reserves in the world. The U.S., like Germany, was part of the network of science and technological development that was centered in northwestern Europe throughout the seventeenth, eighteenth, and nineteenth centuries. With the Third Industrial Revolution predicated on copious amounts of oil, this network was not only now centered in the United States but monopolized by it. American dominance of the Third Industrial Revolution was facilitated by World War I, which left France and Great Britain deeply in debt and Germany politically prostrate. Thus, these otherwise leading countries were in no position to engage the Third Industrial Revolution and thereby compete with the U.S. With the automobile revolution firmly entrenched in America, the U.S. government took the destabilizing step of turning inward during the 1920s and the 1930s (e.g., the Smoot-Hawley tariff). One result was Germany and Japan undertook their own destabilizing actions to cope with the Great Depression and their otherwise dependent economies. This resulted in World War II. Arguably, the prime goal of Germany during World War II was to compete with the United States by replicating the automobile revolution. This necessitated the incorporation of Soviet oil fields within the German (European) sphere of control.[112]

In the aftermath of World War II and in the context of the Cold War, the United States assumed a global leadership position—specifically of the capitalist alliance. The U.S. government used its domestic urban sprawl to establish its leadership and to cement its alliance with Western Europe and Japan. Its allies are given access to the robust, massive economic demand created by American urban sprawl. One fundamental flaw in this formula is that it is predicated on the massive consumption of oil. Ultimately, the U.S.'s consumption of oil outstripped its ability to domestically produce oil, and this meant the U.S. became dependent on the global petroleum system. This became an obvious political, economic liability in 1973 when Saudi Arabia demonstrated a willingness to use its role as the major exporter of oil as a political tool. America's significant oil dependency was further called into question with the Iranian Revolution of 1979. The U.S. government responded to its salient energy vulnerability by seeking to militarily, politically dominate the Persian Gulf—the world's primary oil-producing region. This strategy culminated with the 2003

invasion of Iraq. Additionally, the U.S. has come into political conflict with Russia over the Putin government's unwillingness to turn over Russia's oil reserves to private capital.

Whereas the U.S. adopted urban sprawl as an economic stimulus strategy as well as a Cold War strategy, Japan and Western Europe did not.[113] Western Europe in the postwar period did rely on oil to power industry and generate electricity. With the oil shocks of the 1970s, Western Europe (under the auspices of the French state) shifted to nuclear power. Also, Germany today is seeking to center its economy on clean renewable energy sources (wind and photovoltaic solar). Doing so will serve to insulate it from volatility in the world energy system—particularly as the decline of conventional oil production is a general concern.

In sharp contrast, the U.S. has turned anti-nuclear and only in the immediate aftermath of the Iranian Revolution did it seriously pursue clean renewable energy. Otherwise, the U.S. actively works to maintain the global dependency on fossil fuels. This results from the American strategy of dominating global politics through the dominance of energy. Thus, its takes an aggressively hostile stance toward plutonium and undermines clean renewable energy by sponsoring the hydrofracking revolution and the development of the Canadian oil sands. This strategy both directly contributes to the global warming phenomenon and prevents the formation of an international treaty to prevent catastrophic climate change.

American energy politics profoundly shaped the twentieth and the twenty-first centuries, as evidenced by World War II (chapters 3 and 4), the Cold War (chapter 6), nuclear energy in the 1950s and 1960s (chapter 5), and the momentous decision to turn away from plutonium in the 1970s (chapter 7). These politics were and continue to be decisively determined by economic elites in the U.S., the subject of the next chapter.