

Neoliberal Climate Policy in the United States: From Market Fetishism to the Developmental State

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Abstract

The research question animating this project is ‘what is the nature of neoliberalism’s influence on recent and contemporary US climate change policy?’ Situating itself against several growing bodies of literature which have sought to underscore the fetishism of markets in recent environmental and climate policy agendas under neoliberalism – e.g., the work of Heynen et al (2007) on ‘neoliberal environments’; Paterson and Newell’s (2010) work on neoliberalism and carbon markets; and the work of Dryzek et al (2003) on state forms and ecological modernization – this project argues that any such analysis must be predicated on a considerably more nuanced conception of (a) ‘neoliberalism’, (b) the historic role of states in fostering accumulation, and (c) the nature of policy development within any specific neoliberal context. Applying these theoretical re-conceptualizations to the American context, the project argues that a central tension informing contemporary US climate policy under neoliberalism can be understood a stand-off between two prevailing logics in the federal policy process: on the one hand, Washington’s attempt to build on its tradition of using state power to foster high-tech market development by cultivating the alternative energy realm as a developmental state project, and on the other, the anti-regulationist bent of neoliberalism which seeks to delegitimize the ‘pull’ policies required to ‘creatively destroy’ conventional energy and animate domestic alternative energy markets. Against the general conception of the US as a ‘climate laggard’ whose policy options are restricted market mechanisms and generally anathema to progressive ecological modernization, this body of work shows how the US has managed to develop a robust set of interventionist ‘push’ and ‘pull’ climate policies along ‘alternative policy pathways’, despite the prevailing anti-state rhetoric of neoliberalism.

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For my dad, the wisest person I've yet known.
This book brings to a logical conclusion a
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Part I
Conceptualizing US Climate Policy under Conditions of
Neoliberalism

Chapter one

American climate policy, the developmental state & neoliberalism

American climate change policy is a rather strange thing. There are indeed few other countries in the world that bring to bear quite such a diverse and often contradictory range of factors influencing the shape of its climate politics. In addition to being a rabid fossil fuel addict – accounting for close to 25 percent of the planet’s energy usage (USEIA 2011)¹ – and maintaining close to a quarter of the world’s known coal reserves (BP 2011), the United States simultaneously maintains one of the most open systems of Congressional lobbying in the Western world (where conventional energy interests are able to exert immense influence over the policy process); a highly disaggregated political system that is largely anathema to the passage of large-scale regulatory programs; a non-proportionally represented Senate where fossil-fuel producing states are able to leverage their power to block national climate regulation; and a two-party federal system in which one party has built its entire governing philosophy around anti-regulationism. Indeed, even a cursory scan of some of these features helps to render one considerably more sympathetic to the obstinate nature of US climate politics over the past 20 years.

On the other hand, however, there remains an array of relatively equal and opposite factors keeping the push for climate regulation firmly on the national agenda. First, though it is easy to forget, the US is the birthplace of the modern environmental movement and ‘green

¹ Approximately 83 percent of this is based on fossil fuels. 37 percent of this comes from petroleum, 25 percent from natural gas, and 21 percent from coal. The US is the second largest gross consumer of energy on the planet, and seventh in terms of per capita energy consumption (a statistic which moves closer to first overall if one includes the energy consumed in the production of foreign-made products that are purchased and used in the US).

administrative state’ – a heritage which continues to inform the considerable strength of the domestic climate movement to this day (Steffof 2002; Sale 1993; Bomberg and Schlosberg 2008).² Second, given the multiple points of access to the US legislative process, legislative gridlock on climate has served to open up a large and robust climate policy arena along ‘alternative policy pathways’ (Klyza and Sousa 2008). This has allowed climate policy to be established through strategies like sub-national policy implementation, the use of executive authority, clever use of legislative riders on appropriations bills, and the use of litigation to impose juridical obligations upon the federal government to regulate greenhouse gases, among many others. Third, America is the not-so-proud parent of the policy mechanism that has stood at the centre of contemporary international climate governance: the emissions trading scheme (Driesen 2010). While the country has had a difficult relationship with carbon trading over the years, it was nevertheless the brainchild of the Americans, just as it was the US delegation that effectively forced carbon markets upon the rest of the world at Kyoto, just as it continues to be powerful corporate American interests trying to further entrench these markets domestically and internationally (Cass 2006). Finally, while many policymakers have sought to downplay the long term threat posed by epochal climate change, the American security apparatus has become increasingly vocal in its calls for understanding and acting upon the threat, thereby reframing the issue as one of vital national security importance (Busby 2007). Indeed, this is but a small part of the remarkably complicated milieu into which analysts stray when attempting to understand and conceptualize American climate policy. While taking into account this complex range of factors, this analysis brings into focus two other key constitutive elements of US climate politics: on the one hand, the prohibitive role of neoliberal ideology,

² In terms of financial resources and members, the US continues to maintain one of the largest pro-environment lobbies in the world.

and on the other, the influence of state-led innovation policy logics within the federal government.

With regard to neoliberalism, recent American political life has indeed been indelibly shaped by this resurgent and increasingly hegemonic political, social, and economic philosophy, from which few aspects of governance have escaped unscathed over the past few decades. As an anti-regulationist, anti-tax, and pro-business ideology, neoliberalism has reserved a special ire for environmental regulation, generally viewing it as costly, wasteful, inefficient, and in need of dramatic rollback to allow domestic business to compete and remain profitable in a globalized economy. Given that climate change arose as a relevant political issue at *exactly* the time of neoliberalism's ideological ascendancy in the US, it has necessarily struggled to establish itself as an issue worthy of legislative action in Washington. Indeed, acting on the ideology's hostile rhetoric, the US Congress (under the control of *both* major parties) has consistently taken action to derail any and all major domestic climate and energy initiatives, and has severely hampered international treaty efforts by effectively guaranteeing Washington's non-compliance.

With regard to state-led innovation, much of recent US industrial strategy over the past few decades has been based around a determined effort to achieve and maintain American dominance over emergent global high-tech markets. Despite the anti-interventionist rhetoric of neoliberalism, this search for competitive dominance has, since the mid-1970s, led policymakers in both parties to push for highly interventionist policies and strategies that provide the federal government with a leading role in funding, developing, and commercializing novel technologies (Schrank and Whitford 2009). As was the case in

industries like information technology (IT), biotechnology, semiconductors, electronics, telecommunications, defense, and many others over the past thirty years, this developmental-state logic has come to inform policymakers' drive for the state-led creation of a strong domestic 'greentech' sector, in order to ensure American dominance over emergent alternative energy markets.³ This project can be understood as an attempt to understand the relationship between these two opposing logics in the federal policy process, and their effect on US climate policy.

Research question

Put succinctly, the research question this project seeks to answer is: what is the nature of neoliberalism's influence on climate change policy in the United States? While this project agrees with the common claim that neoliberalism has been the primary force shaping Washington's response to climate change (and the environment more broadly), it seeks to develop a more nuanced account of exactly *how* neoliberalism has shaped these policies, and understand the way that the philosophy has interacted with existing institutions and prerogatives to produce the forms of policy that currently exist.

The project situates itself in relation to effectively three broad bodies of literature which have sought to describe the nature of neoliberalism's influence in this context.⁴ First, a large school

³ Here and throughout, I use the term 'alternative' energy as a catch-all term for, in effect, any form of energy that is not fossil fuel (with the exception of coal carbon-capture and storage technologies). This clarification is helpful given that the term is sometimes used indiscriminately to refer exclusively to renewables, or alternative *types* of fossil fuels (e.g., oil shale, oil sands, coal based liquid fuels, various liquid fuels derived from processing natural gas, etc.) or unconventional extraction methods for fossil fuels (like hydraulic fracking, for example).

⁴ It is worth noting that this project could also potentially have been framed in terms of the existing literature on US climate politics and policy (e.g., Rabe 2004, 2010; Selin and VanDeveer 2009; Bryner and Duffy 2012, etc.). The environmental political economy literature was selected as a better starting point given its stronger theoretical insight into broad state behaviour on environmental issues. These literatures are fully described and assessed in Chapter 2.

of thought focused on the concept of ‘neoliberal environments’ has arisen as an increasingly dominant framework for describing the broad relationship between neoliberal economic thought and environmental policy over the past few decades (e.g., Castree 2003, 2005; Heynen et al 2007; Mansfield 2008). This literature generally argues that neoliberalism has produced responses to environmental problems that have deviated from a prior focus on command-and-control mechanisms, and moved increasingly toward a focus on processes of (a) privatization of resource management systems, and (b) novel commodifications of ‘nature’. These processes are seen as leading to environmental policies that are increasingly market-based, and outside the purview of traditional state management (beyond, of course, the state’s massive role in constructing and legitimizing the markets in question). Applying this line of argument specifically to the issue of climate change, a second body of work has sought to conceptualize neoliberalism’s influence on climate policy in terms of its focus on a progressive privatization and commodification of the earth’s atmosphere (Liverman 2004; Newell and Paterson 2010; Lohmann 2005). Both of these processes are seen as occurring through the creation of either cap-and-trade and/or offset markets around carbon emissions, and the claim is validated by both the immense growth of these markets, as well as their central place in international treaties and many domestic policies. A final body of thought that stands as particularly key with regard to the US and so-called ‘neoliberal states’ is that which focuses on the concept of ‘Ecological Modernization’. This work aims to identify the means by which various economies might undergo major socio-technical shifts in the way that they metabolize nature, and create a ‘virtuous fusion’ between economic growth and environmental recovery – often through active state planning and regulation. Authors in this tradition have generally suggested that it is considerably more plausible to pursue ecological modernization strategies in social democratic

welfare states rather than in neoliberal ones like the US because of its (a) neoliberal ideological climate, (b) notoriously combative relationship between states and markets (which breeds a stand-off between the environment and economy), and (c) its non-conducive legislative system (Dryzek et al 2002; Mol & Spargaaren 2002).

With these literatures shaping much of the conventional academic wisdom, debates about US climate policy have generally gone in two basic directions. First, it is generally expected that, as a neoliberal state, Washington's spectrum of policy options is fairly limited to market-based commodification schemes, and largely anathema to progressive ecological modernization strategies (Schreurs 2002; Cass 2006; Driesen 2010).⁵ And second, in light of its failure to pass any significant climate legislation at the federal over the past twenty years (market-based or otherwise), the dominant tendency has been to largely dismiss Washington as something of a 'do-nothing laggard' on climate, one that is structurally and ideologically incapable of addressing the issue (Selin and VanDeveer 2009; Christiansen 2003).

In effect, the primary problem with these conventional theoretical wisdoms is that they have actually proved quite poor at providing a correct depiction of American climate policy as it actually exists. Indeed, despite its commonly accepted title as the 'archetypal' neoliberal state, we see in American climate policy neither the suggested capacity to implement a system-wide carbon market, nor do we see an inability to pursue ecological modernization strategies. At a theoretical level, this body of work aims to understand why this has been the case.

Laying out the argument

⁵ This expectation is obviously reinforced by the fact that it was the US that presided over the shotgun wedding between Kyoto and carbon markets – before, of course, leaving the bride at the altar shortly thereafter (Driesen 2010).

The project argues that, despite the somewhat deterministic claims of the existing literature, climate policy in the US (even in its neoliberal character) is actually quite dynamic and robust, and characterized by high levels of activist state intervention. It suggests, however, that to understand how and why this turns out to be the case requires us to start from a considerably more nuanced conception of (a) the historic role of the state in market economies; (b) how neoliberalism functions as a pragmatic governing philosophy; and (c) the historic nature of policy development in the US.

With regard to the first point, this project begins from the basic assumption that all states in market economies maintain a first-principle goal of actively fostering economic growth and accumulation. They do so for the simple reason that both the material means (e.g., tax revenue) and social legitimacy (e.g., employment, security, living standards, etc.) required to sustain states in capitalist societies is derived from economic accumulation. The project suggests that, as with an array of other policies, this compulsion to foster accumulation is the primary force informing the American state's response to climate change, and that this compulsion is expressed through an array of institutional arrangements used to promote economic growth.

With regard to neoliberalism, the project suggests that its primary influence does not reside in its penchant to promote the development of commodification schemes or market mechanisms. Rather, it argues that analyses making this claim have generally failed to properly account for two specific points. First, despite the claims of neoliberal advocates, neoliberalism is not tantamount to 'market fundamentalism'. Indeed, neoliberalism (and businesses' embrace of it over the past several decades) has not been premised on a *principled* allegiance to the rollback of state power or the creation of a more competitive marketplace. Rather, business has

strategically supported the notion of market fundamentalism primarily as a means to resist undesirable regulation and obtain increasingly favourable corporate tax treatment (Steger and Roy 2010; Galbraith 2007; Baker 2006, 2011). To the extent that commodification schemes like carbon markets belie this preference (because, indeed, they impose regulation and a de facto energy tax upon industry), they are notoriously difficult to establish in neoliberal states. Second, in spite of the way that neoliberalism has been framed in comparative capitalisms debates as a single type of capitalist political economy, there is, in fact, no singular or homogenous form of neoliberalism. All neoliberalisms are distinct and consist of multiple competing logics, interests, and institutional arrangements that vie for expression in the policy process. This renders all instances of ‘neoliberal climate policy’ unique to their spatial-temporal context – the United States included.

The project suggests instead that neoliberalism’s most important and consistent influence resides in the anti-regulatory and anti-tax policies that it promotes within the policy process. These inclinations remain in constant tension, however, with policymakers’ aforementioned compulsion to cultivate climate policy as means to foster accumulation and economic growth.⁶ This tension, in turn, is manifested in the dominant institutional arrangements through which that compulsion is expressed. In this context, the key question to ask about climate policy in its neoliberal variant is ‘what historical accumulative logics (by which I mean institutions for

⁶ It is worth acknowledging that accumulation and growth are not necessarily the same thing. Profitable accumulation can obviously occur in the absence of broad national economic growth (the concept of ‘accumulation by dispossession’ that is seen as lying at the heart of capital’s accumulation strategy over the past few decades helps to underscore this point – see Harvey 2005), but capitalist-styled GDP growth cannot occur without profitable accumulation (I’m using the term accumulation in its purest Marxian sense here to refer to cycles of surplus value extraction in the production process). I thus couple these terms here and throughout given that capitalist states require both processes to occur in a consistent manner.

fostering accumulation) are acting upon climate policy and affecting its shape, and how has neoliberalism's allergy to regulation influenced the way that these logics are executed?

Putting this all together, the project's primary argument is that much of contemporary US climate policy can be understood in terms of a stand-off between two prevailing logics within the federal policy process. On the one hand is the attempt to foster accumulation through the federal government's decades-old tradition of using state power to promote innovation in burgeoning high-tech markets. This is a process that started in the military-industrial complex in the 1940s, and then was translated to the development of consumer high-tech markets in the 1970s and 1980s, eventually consolidating what many have referred to as a 'hidden' developmental network state in Washington (e.g., Block 2008). This apparatus has helped to furnish the US with its immense leads in an array of industries over the past few decades, and has been attempted to be applied with great tenacity to incipient alternative energy markets since the late-1970s. This obsession with state-led innovation has helped to tacitly redefine the issue of climate *not* as a problem of absent property rights requiring markets for carbon emissions (as neoliberal thought generally suggests), but rather simply as one of inappropriate technologies – thus requiring policy responses aimed at facilitating the development of novel energy technologies (see e.g., Victor 2004).

On the other hand is, as noted, neoliberal ideology's aversion to regulation. This allergy to regulation is especially important in the case of alternative energy given that, unlike the other markets mentioned above which Washington helped to animate over the past few decades, building markets for alternative energy requires the state to use massive amounts of prohibitive regulation to, in effect, 'creatively destroy' conventional energy – or at least artificially raise its

price to a point where alternatives can plausibly compete with it. This is occurring at a time when neoliberal ideology is casting this type of regulation as highly illegitimate.

In this context, what we see since the earliest emergence of the issues of global energy crisis and climate change in the 1970s is these two logics consistently butting heads in Washington. On the one hand, elements of business and government have sought to cultivate the alternative energy realm as a massive developmental project capable of providing a new growth sector for the American economy (and providing the associated jobs, tax revenues, security, legitimacy, etc.), and on the other, an array of neoliberal actors attempting to block the forms of regulation and intervention required to achieve these ends.

The argument made herein is that, while it appears that neoliberalism's anti-state logic always carries the day (as indeed, Washington has never been able to pass any kind of federal climate regulation), in fact, an array of key policies for state-led alternative energy development has emerged along 'alternative policy pathways' that have allowed the US to develop a robust set of climate policies aimed at building these markets, despite the prevailing anti-state rhetoric.

The American developmental state

Before continuing, it will help to briefly expand upon the developmental state concept that lies at the heart of this analysis (Chapter 4 will provide a nuanced account of this concept). In essence, the American government began to undertake a massive expansion of federal innovation policy starting in the 1970s as a simple response to the rapid growth of economic competition from East Asia and Western Europe that began to emerge in the mid-1960s. Indeed, while the early post-war period had seen American industry in possession of seemingly

insurmountable leads in most manufacturing and technology sectors, by the mid-1960s these regions (owing in no small measure to their own active industrial policy programs, in particular Japan's Ministry of International Trade and Industry) had begun to catch-up to and even eclipse many of these previously sacrosanct US leads. This heightened global competition came as rather unwelcome news for the American economy, and in short order began to register as persistent and growing trade deficits, falling corporate profit rates, rising unemployment, and falling tax revenues (Brenner 2002). As capital struggled to profitably unload the glut of commodities resulting from these new productive sites, the American and global economies descended into a long crisis of over-accumulation that would last throughout much of the 1970s.

There are, in effect, two primary ways in which states and capital seek to emerge from these types of generalized over-accumulation crises. On the one hand, there are so-called 'spatial' fixes, in which capital seeks new territorial markets in which to unload existing commodities (this obviously becomes a key logic driving economic globalization around this time), and on the other, so-called 'temporal' fixes – a large part of which involves the creation of qualitatively new goods, services, and industrial processes to move beyond overly-saturated existing commodity markets (Harvey 1989; 2003). In-line with this latter logic, the 1970s would indeed see federal policymakers in the US beginning to seriously rethink the state's role in fostering domestic innovation and the commercialization of novel technologies.

To do so, however, they did not have to look particularly far, as Washington had already become an immense force for spurring innovation through its role in military and aerospace innovation throughout the Cold War. While this capacity had long been acknowledged by

policymakers, the difficulty was that very few of the technological innovations derived from these industries were actually making it to consumer markets and bequeathing the desired spin-off benefits to the economy at large (Hurt 2010). Indeed, the prevailing philosophy among policymakers throughout the early post-war period had been that, if a good idea with a commercial application emerges from government-funded military or aerospace development, the resultant technology can be expected to make a simple (almost effortless) transition to the consumer market over time without state assistance. This philosophy was referred to as ‘pipeline’ model of state-led innovation (see Chapter 4).⁷ The problem with the pipeline model, however, was that it was rather ineffective. Indeed, it was revealed to policymakers in the early 1970s that after three decades of actively funding university and national labs through defense and aerospace, the American government had accidentally found itself in possession of over 28,000 original patents for innovations (increasing at a rate of close to 2000 per year), yet less than 5 percent of these patents had ever made it to the commercial market through the pipeline model (Deucker 1997).

This led to two important conclusions. First, the federal government’s early-stage innovation processes that were being used in these industries was, as already known, a potential gold-mine for developing new technologies and furnishing the US with immense leads in a range of new technology markets. But second, there was an important qualitative difference between, on the one hand, simply developing technologies for the state’s use, and on the other, properly commercializing them and constructing durable consumer markets for their uptake. These dual conclusions would soon produce a tidal wave of federal legislation which began in the late-1970s and reached a fever pitch throughout the Reagan years (indeed, right at the heart of

⁷ I borrow the term ‘pipeline model’ from Fuchs 2010.

neoliberalism's ideological ascendancy) aimed at shoring up this innovative capacity, and focusing on applying it to consumer markets. In total, more than a fifteen major federal laws would be passed, countless developmental agencies would be established, and new federal commercialization mandates would imposed upon every federal agency with an active research and development budget. The aggregate of these activities would, as noted above, result in the consolidation of a powerful developmental state apparatus in Washington, one that quickly began to pay dividends by helping to furnish the US with its enviable leads in a range of high-tech sectors over the following decades (Block and Keller 2010).

The developmental state and alternative energy

While this pattern of state-led high-tech development was maturing in Washington throughout the late 1970s and early 1980s, the same time period would see the emergence of the dual problems of global energy crisis and the first major discussions surrounding global warming. In-line with this growing pattern of state-led innovation, an initial major effort was made on the part of the Carter administration to parlay these two issues into a broad developmental state project to hasten the development alternative energy technologies, and construct both state and consumer markets for them. To this end, beginning in 1978, the administration and Democratic Congress began allocating billions of dollars toward research and development for alternatives, passed a series of laws and regulations aimed at creating sufficient market demand for new technologies, and began to deploy the instrumental strength of this incipient developmental state apparatus to launch the industry (Dooley 2008) (this process is described in greater detail in Chapter 5).

While all of these initiatives (coupled with the general thrust of developmental state activities over this period) seemed to portend the rise of a durable, long-term developmental project for alternative energies, the arrangement would turn out to be rather less inevitable than on first appearance. Indeed, by the early 1980s, neoliberal ideology became increasingly ascendant in American political life, and was gradually adopted as the political and economic backbone of the Republican Party's governing philosophy. In 1980 Ronald Reagan was elected president, and though Reagan himself would prove to be very pro-developmental state (signing into law the lion's share of its underpinning legislation), he was also staunchly anti-regulationist, and pro-oil, coal, and gas industry. In this context (and with the GOP gradually gaining increased electoral traction in Congress throughout the decade), alternative energy and the regulatory intervention required to nurture it would make it less than ideal as a developmental state project. In short order, the Republican Party came to adopt a highly skeptical view of climate science, and took to demonizing both investments in alternative technologies and regulations on conventional energy as wasteful and illegitimate (Weart 2003). In a highly symbolic move that would foreshadow the struggle to come, soon after taking office in 1981, Reagan withdrew several procurement contracts for alternative energy installations on federal lands, and had the 32 solar panels that President Carter had installed on the White House roof in 1979 torn down (Wihbey 2008). These developments would, in effect, serve as the opening salvos in the struggle between the two major logics of US climate policy that this project addresses: the anti-regulationist bent of neoliberal ideology, and the attempt to cultivate alternative energy as a developmental state project.

Importantly, the project tries to underscore two main points about this stand-off. First, that the rhetoric of anti-interventionism does not override the compulsion or capacity of policymakers

to intervene to foster accumulation through climate policy, and thus a state-led project for alternative energy has nevertheless quietly endured over the past three decades. Indeed, while the drive for such development declined during the Reagan years, Congress managed to keep baseline R&D funding levels in place for much of the decade, before the first Bush administration reinvigorated the process somewhat with the creation of a wide array of alternative R&D programs, including the Innovative Renewable Energy Technology Transfer Program, the Tax and Rate Treatment of Renewable Energy Initiative, the Renewable Energy Production Incentive Program, and the Renewable Energy Export Technology Program, among dozens of others (US House of Representatives 1992). A more articulate incarnation of developmental state activities around alternative energy would come under the Clinton administration in the 1990s, with its Climate Action Plan establishing over 40 new relevant federal programs, investing of over \$22.2 billion in R&D funding through the program's flagship Climate Change Technology Initiative, and establishing a series of targeted tax expenditures and loan guarantees totaling over \$60 billion between 1994 and 2000 (Simpson 2001; Dooley 2008). Despite the second Bush administration's aversion to action on climate, over the course of its eight years in office the administration yielded to various pressures upon the state by overseeing the creation of a dedicated developmental apparatus aimed at fostering the creation and deployment of novel climate and energy technologies, the centre-piece of which was the National Climate Change Technology Initiative and Climate Change Technology Program, both based on the same model of development crucial in establishing American leads in biotech, IT, defense, telecommunications, etc.⁸ The administration further oversaw the passage of the Energy Policy Act of 2005, Energy Independence and Security Act

⁸ This is often referred to as the DARPA model of innovation, after the Defense Advanced Research Projects Agency where the model was first established. See Block 2008; Fuchs 2010.

of 2007, and the Farm Bill of 2008 which, combined, allocated more than \$12 billion to the development of a range of alternative energy technologies, established Clean Renewable Energy Bonds (CREBs), and created a range of generous subsidies for small businesses to make energy efficiency improvements (US House of Representatives 1997; Stubbs 2010). The Obama administration has also increased federal investment in alternative energy R&D in unprecedented fashion, building on the developmental template established under the second Bush administration. The American Recovery and Reinvestment Act began this task by investing over \$81.39 billion (US Recovery Program 2011) in alternative technologies, while the subsequent two federal budgets saw an additional \$85.57 invested (US Office of Management and Budget 2011).

But second, the strength of this anti-interventionist rhetoric is such that it does dramatically alter the eventual shape and execution of these policies. The primary effect of this has been to force these initiatives to move around traditional legislative channels in Congress and onto an array of historically viable ‘alternative policy pathways’. These pathways are, in effect, conceptualized as strategic selectivities (or historical path dependencies) in the state’s policy process that are favoured in light of their past success in circumventing neoliberal legislative constraints, and have all been used in an array of other contexts in the neoliberal era.

The project suggests that the initiatives required to build markets for alternative energy can be broken down into two basic categories. On the one hand, ‘pull policies’ are the regulatory initiatives which effectively raise the price of conventional energy, thereby attempting to create an energy market in which alternatives can plausibly compete. And on the other, ‘push policies’ are the developmental state initiatives which help to develop the supply of new

technologies (Gallagher 2009; Victor and Yanosek 2011). It is argued that, because of neoliberalism's anti-interventionist ideology, both push and pull policies have been forced to heed alternative implementation strategies outside of the federal Congress in order to endure.

On the pull side, the project looks at four particularly prominent selectivities used by actors to implement greenhouse gas (GHG) regulation, including the use of a) sub-national regulation within the fifty states, b) civil litigation to impose structural-legal requirements upon the federal government to impose climate regulation c) favourable tax policies and government subsidies through appropriations riders, and d) the use of executive authority by the administration to create and enforce new emissions laws outside of Congress. On the push side, the project argues that the actors pushing for developmental state policies have also been forced to heed alternative implementation strategies because of the harsh neoliberal climate. The main way that this has been accomplished is by building the developmental state as a radically decentralized entity. That is, unlike the developmental states of East Asia and Western Europe – referred to as Developmental *Bureaucratic* States – which are often housed in a single location, with a single agency title, and a single budget, Washington has established what is commonly referred to as a Developmental *Network* State. This form of developmental apparatus is, by contrast, highly decentralized, with its activities being carried out across literally thousands of labs, coordinated across a labyrinth of hundreds of different offices and state level agencies, and its budgets being extremely diffuse. This decentralization has helped to render the American developmental state considerably less visible than others found in Western Europe and East Asia, and has allowed it to develop and mature throughout the heart of neoliberalism's ideological ascendancy. Following in this tradition, much of the alternative

energy innovation policy in question has been forced to adopt this somewhat ‘hidden’ or stealthy characteristic in order to avoid political scrutiny.

Finally, the project attempts to demonstrate that, in spite of their continued progress, the policies and institutions that promote and underpin this state-led development of alternative technologies are always rather precarious and fragile, and that as these two competing logics continue to do battle with each other, the future of a technology-centric American climate policy remains highly uncertain. The project thus traces the ebb and flow of this political battle over the past three decades, with a particular focus on the developments taking place since 2009.

Contributions to the existing literature

In undertaking this type of analysis, the thesis aims to make at least three important contributions to the existing literature. The first is a critical rethinking of the implications of conceptualizing climate policy (and perhaps environmental policy more generally, though I do not extend the empirics beyond climate policy in this work) in terms of neoliberalism’s influence. By focusing specifically on neoliberalism’s tenuous relationship with the state’s broad requirement to foster accumulation, the project attempts to walk-back the common depiction of neoliberal climate policy as being either anti-state in its orientation, or otherwise solely focused on markets in abstract environmental commodities. In so doing, it further aims to generally reframe the common conception of the neoliberal state as an ‘absentee state’, and underscore the extent to which these pressure to promote accumulation may serve to enhance state capacity under conditions of market fundamentalism. Second, this thesis appears to be the first body of work to focus on conceptualizing US climate policy in terms of a developmental

state logic. In so doing, it seeks to provide a new understanding of the federal government's role in promoting and acting upon a technology-centric climate policy, as well as contribute to the limited existing literature on the American developmental state. Finally, as there are actually very few book-length studies of US climate policy from any perspective, the project aims to make an important contribution to studies of American climate policy in general, particularly underscoring the increasingly dynamic and robust shape of the country's climate policy arena.

Methods

The policy process within large states (the US federal government not least of which) is a profoundly complex subject of analysis, and thus direct and/or unambiguous relationships between objects and variables are extremely difficult to determine with certainty. As this body of work is largely an analysis of how existing structures shape the strategies of actors within the climate policy process, there are, in effect, three primary research tasks. The first is to develop an understanding of the historical evolution of the structures and selectivities in question and how they have come to play the roles that they have within the policy process. This has been accomplished through critical analysis of a range of secondary texts focused on each of the structures and selectivities in question. With regard to the developmental network state apparatus, Chapter 4 is the primary site of this analysis, while the four primary alternative policy pathways used to execute this logic are taken up primarily in Chapter 6. In so doing, I am attempting to understand the factors that helped to consolidate them over time, as well as how and why actors within the policy process have felt compelled to recursively reselect for them. Beyond the use of secondary texts, government documents and reports (particularly from

the Committee for Climate Change Science and Technology Integration) have been used to obtain and incorporate additional contemporary developments related to these structures.

The second task is to attempt to understand the specific role of these structures and selectivities in the development of contemporary climate policies – specifically how they have shaped, refracted, and facilitated the goal of fostering accumulation under conditions of neoliberalism. With regard to the four specific alternative pathways, this task is taken up in Chapter 6, while the research on the developmental state is subject of Chapter 7. This has been accomplished through analysis of a combination of governmental documents (Congressional reports, federal agency reports and budgets, Congressional Research Service primers and reports, documents disclosed by federal R&D programs and agencies – particularly the National Climate Change Technology Initiative and Climate Change Technology Program), laboratory reports from the Federal Laboratory Consortium and Department of Energy National Laboratory Network (budgets, objectives, project manifests, etc.), and the limited existing secondary academic literature on these structures and selectivities.

Finally, I am attempting to understand how these structures and selectivities can be subject to change and alteration in the context of anti-regulationist ideology and the changing strength of neoliberal actors in the policy process. This task shifts the analysis into the contemporary moment, as it assesses the major rollbacks that unfolded between 2010 and 2012 as anti-regulationist actors enhanced their relative positions in the policy process and sought to reshape the selectivities used to achieve progressive climate policy. This task, which is the subject of Chapter 8, relies primarily on analysis of US newspapers, Congressional bill proposals, policy platforms, and (in particular) analysis of the 2012 budget passed by the

Republican-controlled House of Representatives, formally titled *The Path to Prosperity: Restoring America's Promise*.

Plan of the dissertation

In Chapter 2, the existing literature against which the project situates itself is laid out and described in detail. The chapter is concerned specifically with the three main bodies of literature briefly described above – those focused on the so-called ‘neoliberalization’ of contemporary environmental and climate policy, and the ‘Ecological Modernization’ literature’s assumptions regarding the political and legislative conditions necessary for progressive socio-technical transitions within a given polity. In so doing, the chapter attempts to set the predicate for understanding why these frameworks have largely misdiagnosed neoliberalism’s influence on American climate policy (as later suggested by this project’s empirical findings), and suggest why the theoretical framework presented in the subsequent chapter provides a more accurate starting place for thinking about the relationship between neoliberalism and climate policy.

Chapter 3 then delineates the project’s main theoretical suppositions. This framework aims to both offset the claims of the existing literature, as well as provide a theoretical rationale for the empirical evidence presented in subsequent chapters. This section takes the form of four main theses which seek to provide both a synoptic understanding of the role of the state in the response to climate and energy crisis, as well as an on-the-ground explanation of how such policies are developed within neoliberal states like the US. Upon making the argument that states aim first and foremost to foster economic accumulation and self-legitimacy, the role of neoliberal ideology is re-conceptualized as an incidental (if highly influential) element of this

much broader process – one which operates in tension with these first principle objectives. The concept of neoliberalism is, moreover, highly disaggregated in an attempt to both walk-back its essentialist and homogenous depiction in much of the literature, as well as understand its dialectical relationship with the policy process.

In Chapter 4, the first of the project’s two main competing logics – state-led, high-tech innovation – is presented as a historical narrative about economic development and state building in the US. The first section of the chapter aims to demonstrate that, far from the fictive *laissez-faire* economy commonly depicted in contemporary neoliberal thought, the early history of American state-market relations was characterized by consistently active state intervention dating back to the birth of the republic. This is shown to have manifested in a variety of forms, including infrastructural development, military mobilization, and active interventionist and protectionist economic policies beginning with Alexander Hamilton’s *Report on Manufactures* of 1791. The second half of the chapter looks at the way that state-led, high-tech innovation in Washington has progressed from its mid-20th century roots in the military and aerospace sectors, and developed into an institutionalized developmental state apparatus geared toward commercial technological development. Against the Varieties of Capitalisms literature’s depiction of innovation in ‘liberal market economies’ as driven by market forces (in the relative absence of extra-economic guidance), this section explains the historical and political logics behind this drive for state-led innovation in the US, and the ways in which this apparatus has developed and endured in the neoliberal era.

Following on this, Chapter 5 aims at two primary objectives. First, it demonstrates how this developmental state logic was initially translated into a state-led effort to develop alternative

energy technologies (and build durable markets for them) with the emergence of the dual issues of climate change and energy crises in the late 1970s. Second, the chapter demonstrates the way in which the rise of neoliberal ideology served to disrupt the logic of alternative energy development, and show how this tension has played out over the past three decades. The chapter argues that while the developmental state apparatus did indeed continue to grow and develop in other incipient technology sectors in spite of neoliberalism's hostile anti-interventionist rhetoric, its relative failure in alternative energy stems from the requirement of the state to 'creatively destroy' conventional energy markets through proactive regulation of this highly entrenched and clientelistic industry. Combined with the anti-environmental rhetoric of neoliberalism's 'green backlash' in the US, the failure to implement sufficient regulatory policies for conventional energy in Congress has meant that durable markets have been extremely difficult to establish for these technologies.

Building on the work of Klyza and Sousa (2008), Chapter 6 introduces the concept of 'alternative policy pathways' in American environmental policy to show how the regulatory initiatives required to create demand for new technologies have continued to be advanced through strategic selectivities inherent in the federal policy process, despite the prevailing anti-regulationist and anti-environmental legislative context. Looking at the four specific strategies noted above, the chapter shows how pro-regulation and developmental forces have managed to circumvent the intractable legislative context in Congress, and exploit the multiple points of access to the policy process, thereby creating an array of pull policies for novel energy technologies.

Chapter 7 then aims to demonstrate the nature and extent of the developmental state policies that have grown up around alternative energy technologies in Washington over the past few decades. With a particular focus on their intensely decentralized nature in the neoliberal era, the chapter traces the evolution of early and late stage innovation and commercialization policies from their roots in the military and biotech sectors, and illustrates how they have been carefully deployed in the alternative energy context over the past few decades. In the first half of the chapter, the role and nature of early stage state-led development is assessed with a focus on two particular elements of this process: a) targeted resourcing and b) networking and technological brokering. In the second part of the chapter, the nature of late stage innovation is assessed, with a particular focus on the processes of technology transfer and commercialization on the part of the federal government.

Chapter 8 then aims to underscore the enduring nature of the political battles between neoliberal anti-statism and the developmental project around alternative energy described in the preceding chapters. With a particular focus on the intense reactionary backlash against these policies that has emerged over the past couple years, the chapter highlights the continuing ebb-and-flow nature of progressive climate and innovation policy in the US, and considers their potential impact on the developmental state project moving forward. Finally, Chapter 9 closes out the project by offering a series of conclusions about what the preceding chapters might mean for how we think about academic debates regarding the relationship between neoliberalism and climate policy, as well as the potential impact of the US' technology-centric climate policy.

Chapter two

Literature Review: Dominant political economy depictions of neoliberal climate policy

Put succinctly, this thesis is motivated at a theoretical level by the fact that American climate policy does not look the way that several dominant political economy literatures suggest it ought to. The project is concerned particularly with two influential schools of thought: first, authors focusing on the relationship between neoliberal ideology and contemporary environmental policy (referred to herein as the ‘neoliberal environments’ literature⁹), and second, those focused on the notion of Ecological Modernization. While these literatures take different routes to arriving at their respective depictions of US climate policy, it will be argued that they share a series of common flaws that serve to limit the potential utility of their analyses, particularly with regard to so-called ‘neoliberal’ states like the US. The general objection to these two literatures has to do with the extent to which they over-estimate the discontinuities in state-market relations and governance brought about by the neoliberal turn. By operationalizing the concept largely at the level of ideology, it is argued that they commit three major errors in particular. First, they wrongly equate neoliberalism with ‘market fundamentalism’; second, they fail to consider the immense variety of forms that neoliberal governance takes in different spatial-temporal contexts (including the influence of existing institutions); and third, by focusing on the dominance of markets and rollback of the state under neoliberalism, they fail to account for the state’s role in fostering accumulation and the forms of traditional and alternative intervention that this incites. This chapter considers each of these bodies of literature in turn, and concludes by (a) underscoring the general theoretical gaps

⁹ I borrow the term ‘neoliberal environments’ from Heynan (2007), which is a fairly canonical text dealing with the question of how neoliberalism influences environmental policy.

that have led these literatures to misdiagnose the current state of US climate policy, and (b) setting the predicate for the theoretical framework delineated in Chapter 3.

Neoliberal environments

In essence, the neoliberal environments literature broadly focuses on the ways in which neoliberal ideology has, over the past three decades, promoted a broad restructuring of environmental governance in line with market principles. Whereas during the post-war period environmental governance was apt to be managed primarily through state regulation, command-and-control policies, the creation of crown corporations and public utilities, infrastructural development, state planning, etc., this literature argues that the era of neoliberalism has brought about a progressive ‘dis-embedding’ of nature from these political constraints, and subjected it to interlinked processes of privatization, commercialization, and commodification (e.g., Castree 2003; Heynen et al 2007; Mansfield 2008). Bakker (2005) summarizes these three interrelated processes as follows:

Privatization entails a change of ownership, or a handover of management, from the public to the private sector. Commercialization entails changes in resource management practices that introduce commercial principles (such as efficiency), methods (such as cost benefit assessment), and objectives (such as profit-maximization)... Commodification entails the creation of an economic good through the application of mechanisms intended to appropriate and standardize a class of goods or services, enabling these goods or services to be sold at a price determined through market exchange (2005: 544).¹⁰

¹⁰ For Bakker, commodification is not merely an economic phenomenon whereby goods formerly outside the market are brought inside. Rather, it is a multidimensional socioeconomic process entailing “transformations in the identities and values ascribed to natural objects such that they can be abstracted from their biophysical context, valued, and displaced... and desired nature(s) can be alienated from their ecological context as standardized goods, amenable to exchange” (2005: 545).

This drive to restructure environmental governance in line with these processes is typically seen in the literature as a product of two dominant characteristics of contemporary neoliberalism. The first is its ideological preference for market solutions to social and economic ills. With regard to the environment, neoliberal thought argues that markets represent the most efficient way to sustainably allocate and use resources, but claims that they can do so *only if* prices reflect all relevant costs (see e.g., Anderson and Leal 2005; Stroup 2003). When, for example, the costs of using resources like clean air and water are not reflected in prices because they are held as common property, market actors will perceive them as cost-free, and subsequently overuse and pollute them. For neoliberal thinkers, therefore, environmental degradation can be understood as a problem of inadequate assignment of property rights, the resolution to which requires the establishment of clear rights of ownership over nature, and the incorporation of all environmental externalities through proper pricing.

Second is neoliberalism's perceived character as a class project aimed at restoring the relative power of capital, chiefly by rolling back the strength of labour and dismantling the redistributive mechanisms of the welfare state (see e.g., Harvey 1989, 2005; Panitch 1994). The goal of environmental reforms is thus not understood simply as an economic means by which to achieve environmental recovery, but rather as a crucial element of neoliberalism's social and ethical philosophy, as it attempts to create a social, cultural, and legal framework that both delegitimizes positive rights of citizenship and common property ownership, and promotes a view of society that is increasingly atomized (Mansfield 2007).

While this restructuring is seen as taking numerous forms, much of the literature to date has focused on two general phenomena, both of which become key with regard to climate

governance under neoliberalism.¹¹ First is the progressive enclosure of common lands and resources, which is seen under neoliberalism as an extension and intensification of Locke's original theories on the proper appropriation of land and nature. According to McCarthy and Prudham (2004), neoliberalism promotes an intensified Lockean view which

constructs a moral economy of liberal society based on exclusive control of land by those individuals who work it, including enlistment of the state to protect individual land rights, and then argues for the unlimited individual accumulation of land and property, including beyond that which individuals could work themselves (McCarthy and Prudham 2004: 276).

Often likened to Marx's concept of primitive accumulation, critical literatures have focused on an array of ways in which this process has been ramped-up over the past few decades, the most notable of which being the increased enclosure of common lands and resources in the global south to facilitate the development of increasingly capitalistic export farming operations (Mansfield 2007; McCarthy 2005; Goldman 1998). Against the supposed beneficial results suggested by neoliberal thinkers, critical works in this area have focused on the ways in which the enclosure and capture of common resources over the past three decades has progressively stripped individuals and communities of access to critical elements of basic human survival, and reduced land, resources, and complex ecosystems to commodities to be bought and sold by Western corporations and local elites.

¹¹ This list that follows in the text is not an exhaustive typology of 'neoliberalizations' of nature, but rather a more limited survey intended to set the predicate for my argument. To this one could certainly add broader issues of governance (Darier 1999; Dryzek 2000; Demeritt 2002), resource trade (McCarthy 2004; Bacon 2005; Goodman 2004), urban space (Harvey 1989; Brenner and Theodore 2002; Jessop 2002; Swyngedouw et al. 2002), environmental risk and justice (Anderton et al. 1997; Haque 1999; Bullard 1994; Barnett 1994; Cable and Shriver 1995; Harvey 1996), and so-called 'green imperialism' (Pratt and Montgomery 1997; Hudson 2001); to name only a few.

A second and related preoccupation in the literature focuses on increased efforts to privatize and deregulate forms of environmental and resource management previously governed as common public utilities under the state (e.g. Bakker 2003; Robertson 2000, 2004; Mansfield 2004). As McCarthy and Prudham (2004) note, the intensification of efforts to privatize environmental management over the past three decades can be understood as part of a broader attack on the state-based regulatory approach to environmental protection developed and entrenched throughout the Keynesian welfare-state era. The result has been dramatic increases in “socially produced scarcity, growing inequality, and often accelerated depletion or degradation of the very resources market mechanisms were supposed to protect” (McCarthy 2005: 9). Authors in this tradition have focused primarily on the ways in which these efforts serve to undermine democratic accountability, ecological sustainability, and basic processes of social reproduction. Specific examples of this include water ownership and provision (Smith 2004; Swyngedouw 2005; Bakker 2003), wetlands (Robertson 2000, 2004), fisheries (St. Martin 2001; Mansfield 2004), wildlife (Robbins and Luginbuhl 2005); and forests (Correia 2005; McCarthy 2005).

Neoliberalism and climate governance

Extending the general logic outlined above, critical political economy literatures attempting to explain neoliberalism’s influence on climate policy have generally followed the neoliberal environments literature’s intense focus on the rise of privatization and commodification policies over the past few decades. Indeed, the primary theme in this literature is that, having emerged as a major political issue in the midst of neoliberalism’s ideological ascendancy, policy responses to climate change have naturally been framed in terms of neoliberal

ideology's preference for market mechanisms and aversion to command-and-control policies (Liverman 2004; Newell and Paterson 2010; Lohmann 2005, 2006; Smith et al. 2005; Brunnengraber 2007; Bond and Data 2004; Begg et al. 2005). As Newell and Paterson describe,

From early on, the debate [about climate policy] reflected the broad shift in the global economy towards the power of neoliberal ideology. In environmental policy debates more generally, there were changes during the 1980s towards the idea of using economic analysis and markets to achieve environmental goals... Cost-benefit analysis, it was argued, could allow [governments] to weigh the pros and cons of particular paths to pollution control and allocate values to them accordingly... promoting the idea that rather than develop policies which specified what technologies business and individuals must use, or to simply ban particular substances or processes (so-called 'command and control' policies) it would be better to use 'market mechanisms' to achieve environmental goals (2010: 24).

The subsequent rise of emissions trading and offset schemes for GHGs (as a staple element of both international and domestic climate governance) is understood in the literature as epitomizing the neoliberal approach to climate policy. As Lohmann (2005) argues, with neoliberal ideology progressively narrowing the space for traditional state intervention and championing free markets as the most efficient and effective resolution to the problem, the rational response has been to subject carbon pollution to the logic of a market calculus and establish the right to pollute as a tradable market commodity. Explaining the rationale of cap-and-trade schemes for GHGs, Lohmann notes,

The earth's carbon dump would gradually be made economically scarce through limits on its use imposed by states. A market would be built for the new resource by creating and distributing tradable legal rights to it. Bargaining would then generate a price that would reflect the value society placed on carbon dump use and denote the financial reward paid to reduce emissions. Emitters who found ways of using the dump more efficiently could profit by selling their unused rights in it to more backward producers. Emitters could also develop new dumps. The market would help society find and move along the least-cost pollution-reduction supply curve (2005: 206; see also Baron 2001; Bond 2008; Lovell and Liverman 2010).

Along with cap-and-trade schemes, these literatures have focused on the simultaneous development and institutionalization of markets for carbon ‘offsetting’. Developed as an alternative way for businesses, individuals, and governments to reduce their net emissions, offsets are, in effect, a market in promises not to emit carbon, where such promises create credits that can be traded to compensate for emissions generated elsewhere (Newell and Paterson 2010). Offset projects can include any number of schemes to establish ‘sinks’ capable of absorbing carbon or ensuring that carbon is otherwise not emitted, including the planting of trees, fertilizing oceans in an attempt to breed carbon-consuming algae, burning methane from landfills to generate electricity, or setting up any type of alternative energy infrastructures like wind or solar farms (Lohmann 2006). As Bumpus and Liverman (2008) note, building on the same rationale of cost-effectiveness and efficiency, “advocates of offsets [argue] that paying for greenhouse reductions elsewhere can be easier, cheaper, and faster than domestic reductions, providing greater benefits to the atmosphere and to sustainable development, especially when offsets involve projects in the developing world” (2008: 128). With the subsequent growth of both types of GHG trading regimes over the past decade, the authors suggest that carbon markets have indeed quickly emerged as one of the most prominent manifestations of a broader neoliberal ideology which asserts that the most effective way to achieve environmental sustainability is to “price nature’s services, assign property rights, and trade these services within a global market” (2008: 132).

For Newell and Paterson (2010), the institutionalization of carbon markets as the dominant response to global warming stems from at least three important characteristics of modern

neoliberalism that are worth briefly noting. First, at the level of international commerce, it is argued that contemporary climate policies have been heavily influenced by the broad shift over the past three decades from a global economy dominated by large manufacturing conglomerates, to one increasingly controlled and influenced by financial services (see also Cabello 2009). This shift, in turn, has created conditions in which many government policies maintain a heavy bias towards fostering growth in the financial sector. In this context, emissions trading emerged as an inherently favoured instrument choice for addressing global warming, with banks and financiers standing among the most ardent lobbyists for the development of carbon markets over the past two decades (see Meckling 2011; Ekins and Barker 2001).

Second, the authors argue that climate policy has been heavily influenced by the general rise in global inequality (specifically the explosion of odious third world debt and the dominance of northern capital) that has characterized the neoliberal era (see also Lohmann 2005, 2006; Bachram 2004; Roberts and Parks 2007; Adger et al. 2006; Bohringer 2003). This influence has been particularly salient with regard to global offset markets and the institutionalization of the Clean Development Mechanism and Joint Implementation program – which serve as the primary offset mechanisms under the Kyoto Protocol. Building on the scientific rationale that global carbon emissions have no regard for national boundaries, contemporary climate regimes are imbued with a logic which says that reductions can and *should* be sought to the greatest extent possible in the global south, where industrial processes are dirty and inefficient, forest offsets can be more effective, and land and labour are cheaper and easier to exploit. Building on Harvey's (1989) notion of increased uses of 'spatial fixes' under neoliberalism, Bumpus and Liverman (2008) argue that

Offsets can be seen as a “spatial fix” in organizing costly emission reductions through a geographic expansion of markets that provide cheaper alternatives in the developing world, as well as creative opportunities for some investors... The use of this spatial fix to find cheap emissions reductions parallels other ways that capital avoids economic crises under neoliberalism and enlists the developing world in the pursuit of further accumulation, as locally specific nature is incorporated as new revenue streams (2008: 134).

Finally, Newell and Paterson point to a supposed paradigm shift in the general way that organizations and governments have developed and executed policy initiatives in the neoliberal era. For the authors, this can be characterized as a shift from rigid bureaucratic hierarchies to increasingly fluid and elastic networks of individuals and groups.

For governments, traditional regulatory and bureaucratic solutions are increasingly seen as ill adapted to the accelerated pace of economic life or to the resolution of problems of ever-greater complexity, of which environmental problems are the perfect example. The notion of ‘governance’ is in large part an attempt to reorganise government in line with these ‘new times’. According to this logic, governments can no longer effectively pursue their goals through simple bureaucratic fiat... Indeed self-regulation is often a convenient way for governments to lighten their regulatory load and outsource responsibilities to the private sector (2010: 23).

The notion of addressing global warming through private markets thus gains considerable traction under neoliberalism in light of its extra-regulatory nature, one that moves beyond the supposedly out-dated forms of direct bureaucratic regulation of the post-war period, and allows organizations and individuals to define the appropriate solution in-line with market principles.

The sum of these elements is thus seen as creating the structural conditions in which carbon markets have emerged as the dominant policy response to climate change under neoliberalism. This view is compelling not only for its persuasive theoretical underpinnings, but also for the impressive tangible growth of these markets over the past several years. Indeed, both cap-and-trade and offset markets have undergone rapid international expansion since the early 2000s,

with markets being established in the European Union (the EU Emissions Trading Scheme), the UK (which now runs in parallel with the EU ETS), Australia (the New South Wales Greenhouse Gas Reduction Scheme), New Zealand (the New Zealand Emissions Trading Scheme), and a series of others under development elsewhere. These markets now stand as the largest environmental markets in the world, worth US\$143bn as of 2009 (Kossoy and Ambrosi 2010: 1).

Anti-carbon market literature

Allied to the above literature is a large and growing body of critical social movement work aimed at highlighting and critiquing the socially unjust nature and technical inefficacy of carbon markets (Adger et al. 2006; Lohmann 2006; Bachram 2004; Smith 2004, 2007; Gilbertson and Reyes 2009; Brunnengraber 2007; Cromwell and Levene 2007). While this literature rightly challenges the neoliberal rationale for carbon markets, its general assertion that neoliberal climate policy is primarily characterized by the appropriation of the atmospheric commons by Western capital helps to naturalize the view of neoliberal environmental policy as essentially market-driven and anti-statist.¹²

There are a few elements of this work worth briefly considering in order to understand the perceived tangible effect of this style of neoliberal climate policy in the dominant literature. Beyond what is viewed as the immense technical inadequacy of these markets¹³, the most incisive critiques of emissions trading and offsetting have focused primarily on their highly

¹² The term anti-statist is meant here in terms of an absence of traditional state management of the environment. This literature is well aware of the state power required to construct carbon markets.

¹³ As Lohmann notes, the Dutch institute RIVM estimated that “with emissions trading, the actual reductions achieved under Kyoto will only be 0.1 percent – far below the already inadequate 5.2 percent reduction from 1990 levels” (Lohmann 2005).

stilted conception of social justice. In line with other works in the broader ‘neoliberal environments’ literature, Bachram (2004) has argued that the Kyoto Protocol’s offset programs stand as a new incarnation of a centuries-old global enclosure movement, representing “the latest strategy in an ongoing process that stems from sixteenth century European land enclosures... to privatize and liberalize the global commons and resources” (2004: 13). In this estimation, offset projects are, in reality, little more than a new form of colonial domination and exploitation of people and the environment, one in which control and ownership of the global atmosphere has been awarded to the world’s worst polluters, who in turn seek to assuage (and profit from) this exploitation by turning the global South into a carbon dump of ineffectual sequestration projects (Ibid; see also Adger et al. 2006). Bumpus and Liverman (2008) further argue that offset markets may be seen as “an example of what Harvey (2003) calls ‘accumulation by dispossession’, based on earlier models of the conversion of collective property, such as common land, to private ownership and colonial takeover of natural resources facilitated by the state through law and military authority” (2008: 142).

This literature has further taken aim at carbon markets for what is often referred to as ‘carbon fraud’ and dodgy regulatory and accounting practices. As Lohmann (2008) argues, the key issue has to do with the fact that the craze for tradable permits has now greatly outpaced any capacity to properly measure and quantify it (indeed, striking at the very heart of the neoliberal goal of privatization through quantification of abstract entities). As the author suggests, the US SO₂ market on which Kyoto’s use of emissions trading was predicated has created a false illusion about our capacity to quantify and regulate GHGs, given that this market

was only made possible by the relative simplicity of the regulatory task (achieving modest numerical cuts in a single industrial pollutant emitted by a comparatively small

group of sources), the possibility of establishing clear property rights in pollution dumps (which were handed over free to polluting corporations) and the recent invention of continuous emissions monitoring equipment capable of transmitting emissions data to Washington, DC in near real-time. Carbon traders are compelled to make the false assumption that similar property rights arrangements, measurement systems and enforcement will be available for global carbon trading. This assumption is demonstrably false on numerous grounds (2008: 361).

In this context, Lohmann and others argue that corporate polluters have been allowed to massively over-inflate both the estimated emissions reductions of existing pollution sites, as well as the quantity of emissions that would theoretically be produced in the absence of the company's offset project. This leads to a carbon market highly reliant on the integrity of corporate actors to file accurate and honest reports of emissions levels and reductions. As Bachram (2004) suggests, the long-term consequences are increased GHG emissions and increased corporate profit obtained from their production (Bachram 2004: 12).

Finally, Smith (2007) suggests that the very 'culture' of carbon markets is corrosive to debates about climate in light of its penchant to effectively 'crowd out' other more effective responses, and create the illusion that substantive changes in lifestyles, industrial practices, energy use, etc., are unnecessary. As the author suggests, instead of forcing society to acknowledge the unsustainable nature of the current course, commodification schemes give the impression that, to the extent that destructive environmental behaviours can be assigned a market price, substantive alternatives are not necessary. A major detriment of such schemes is thus thought to reside in their capacity to create a false sense of security about the problem, while the current course (and the commodification schemes intended to resolve it) serves to exacerbate the problem.

Ecological Modernization literatures

The second major body of thought against which the project positions itself is a branch of environmental political economy referred to as Ecological Modernization (EM). Put simply, EM literatures stand in opposition to the pessimistic assumptions of eco-Marxist works – which maintain a more deterministic view of capitalism’s impact on nature, viewing the relationship as one of perpetual and irreparable exploitation and degradation¹⁴ – by suggesting the possibility of a reformed capitalist system capable of facilitating a ‘virtuous fusion’ between economic growth and environmental recovery. Emerging as both an analytical framework as well as a political strategy over the past three decades, EM advocates suggest that market economies can be re-adapted to promote more efficient and sustainable production processes that simultaneously render less waste and pollution, create less costs emanating from environmental clean-up, and improve the overall structure of society’s ‘industrial metabolism’, while at the same time rendering increased economic growth, employment, and GDP gains from the development of a range of new markets in advanced energy and environmental technologies (see e.g., Mol and Sonnenfeld 2000; Spaargaren 2002; Christoff 1996; Hajer 1995; Barry 2003; Spaargaren, Mol, and Buttel 2003; Mol, Sonnenfeld, and Spaargaren 2009; Redclift and Woodgate 2005, 1997; Dickens 2004).

As this body of work has emerged over the past few decades, two separate conceptions of EM have been popularized: ‘weak’ and ‘strong’ (see Christoff 1996 and Mol 2001 for a nuanced distinction). It is important to note that this project is focused solely on the ‘weak’ variant, which is concerned primarily with technological solutions and greater efficiencies in the industrial process through technocratic and corporatist style policymaking (Christoff 1996). It

¹⁴ This process of exploitation and degradation is commonly referred to as the ‘treadmill of production’. See e.g., Foster 2001; Gould, Pellow, and Schnaiberg 2004; Schnaiberg, Pellow, and Weinberg 2002; Kovel 2004.

thus focuses on quantitative technical changes rather than qualitative shifts in society's political, economic, or cultural underpinnings (see Huber 2004). By contrast, the 'strong' variant of EM discourse focuses on much broader and deeper alterations to society's institutional, cultural, and economic underpinnings. Strong EM advocates, for example, the notions of 'ecological citizenship', processes of open and democratic decision making and planning, use of the precautionary principle over cost-benefit analysis, and greater environmental awareness in both government and civil society (see Hajer 1995).

Of particular concern for our purposes is a general trope within much of this literature regarding the *types* of states and market economies capable of undertaking EM transformations. Indeed, while variations exist in the perceived role of the state in ecological transformations (and indeed, market mechanisms can be considered part of EM strategy), EM typically reserves an important activist role for government in facilitating these transitions, chiefly through active regulation, planning, taxation, and incentivizing market development (Schlosberg and Rinfret 2008; Hajer 1996). Given its penchant to view states as driving forces in these transitions, the literature typically holds that EM responses are considerably more plausible in social democratic welfare states (or polities with corporatist institutional arrangements) rather than in neoliberal ones, given the sorts of collaborative relationships perceived to exist in the former between states and corporations which are not present in the latter. This broad distinction has had dramatic consequences for the perceived potential of states like Washington to promote and undertake these types of transitions. According to much of this work, EM practices, despite being increasingly deployed across much of the West, have consistently failed to win favour in the United States specifically in light of the country's neoliberal political-economic climate, and its resultant weak state capacity, notoriously

combative relationship between states and markets, non-conducive legislative system, and its “old fashioned stand-off between economy and environment” (Dryzek et al 2002: 667. See also: Mol & Spargaaren 2002; Shellenberger and Nordhaus 2004; Dryzek 2004; Kamieniencki 2006).

As Dryzek (2004) argues, the states that consistently excel at implementing the tenets of EM are those which feature cooperative and corporatist political-economic systems, characterized by a culture of co-operation among business, government, and environmental groups.¹⁵ As Schlosberg and Rinfret (2008) continue,

Such a structure has simply not existed in the US, where the adversarial culture and institutional pathologies of US policy-making encourage competition and conflict over cooperation and intelligent policy design... Despite early attempts by individuals and groups to promote such ideas in the US, both governments and industry remain threatened by its discourse while it spreads in Europe (2008: 793; see also Glasbergen 1998).

With specific regard to climate change, Driesen (2010) further adds,

In particular, the United States’ failure arises from an ideological climate that embraced free markets as the solution to all economic and social issues and regarded vigorous government action as anathema. This ideological climate famously led to a failure to adequately regulate the financial industry that produced an economic collapse in 2008. But it influenced government’s approach in a variety of areas, leading to deregulation of formerly regulated industries, privatization of government services, and a lack of vigor in ongoing efforts to protect public health, safety, and the environment. While institutional inertia allowed already existing environmental programs to remain in place – at least nominally – during this period, neoliberalism made it very difficult to take on the challenging new problem of global warming (2010: 112).

This line of reasoning builds on a broader distinction now well-established in the Comparative Capitalisms literature between so-called ‘liberal market economies’ (LMEs) and ‘coordinated market economies’ (CMEs) (see e.g., Hall and Soskice 2001; Weiss 1997; Coates 2005;

¹⁵ As Schlosberg and Rinfret (2008) note, the UK is often viewed as an exception to Dryzek’s argument in light of its relative lack of corporatist institutions. However, the UK was something of a late mover on EM, and the authenticity of its EM discourse is questionable.

Hollingsworth and Boyer 1997; Crouch and Streeck 1997; Johnson 1999; Woo-Cumings 1999). According to this body of work, since the end of the Second World War (but expanding dramatically since the late 1970s) substantial differences have emerged between Anglo-American and Western European/East Asian economies with regard to the general nature of state-market relations. Whereas in LMEs like the United States, firms have come to coordinate their activities primarily through competitive market arrangements, arm's length exchanges of goods, and formal contracts in the absence of state interference or extra-economic oversight, CMEs (like those of Western Europe and East Asia) by contrast, feature firms relying more heavily on non-market relationships, often overseen and mediated by states and political institutions (Hall and Soskice 2001). This, in turn, has significant consequences for the ways in which economies are organized and governed, the role of banks and financial markets, state institutions, organized labour, and the way that public provision is organized and distributed (Block 2007).¹⁶ The United States has long held special standing in much of this literature as the supposed archetype of the LME model, standing in stark contrast to the CMEs of France, Germany, Scandinavia, etc. In the EM context, this same broad distinction has informed the above noted dichotomy, as the atomistic nature of American neoliberalism is seen as militating against the types of broad social and industrial restructuring envisioned by even a very weak version of EM.

Conclusions: taking neoliberalism seriously

The argument put forth in this project is that to take neoliberalism seriously (and properly understand its influence on US climate policy) requires us to think not only about the

¹⁶ This general distinction has been applied to a wide array of state and market functions over the past two decades. For example, on welfare provision see Esping-Andersen 1990. On differences in finance see Zysman 1983. On differences in labour relations see Piven 1991.

discontinuities in state-market relations that have emerged, but also on the ways in which policies and institutions have adapted to the political constraints imposed by neoliberal ideology, thus allowing traditional state intervention to endure. By focusing almost entirely on obvious discontinuities bred by neoliberalism (particularly the marketization of nature and supposed relative retreat of the state), the two literatures surveyed above have painted a somewhat distorted image of contemporary US climate policy. Indeed, building on these assumptions, debates about US climate policy have generally gone in two directions. First, it is generally expected that, as a neoliberal state, Washington's spectrum of policy options are fairly limited to the types of market mechanisms described above, and largely anathema to EM strategies. Second, in light of its continued failure to establish a national carbon market at home (or any program at the federal level), the dominant tendency has been to dismiss Washington as a do-nothing laggard on climate. Yet the reality is that, by almost any metric, American climate policy in its neoliberal variant is considerably more robust and dynamic than its depiction in these literatures, and is guided by the very forms of state intervention that both literatures argue is increasingly unlikely under conditions of neoliberalism.

Why does this turn out to be the case? While the argument that follows does not dispute the broad claims in these literatures that neoliberalism is the predominant force structuring responses to climate change in the US *or* that the US is a neoliberal state, it argues that those suggesting this have too restricted an analysis in focusing solely on the creation of market mechanisms and a perceived aversion to government intervention as neoliberalism's primary effect on climate policy. Beginning from the first-principle assumption that states in capitalist societies maintain an inherent obligation to foster accumulation, this project suggests that the more salient question to ask is 'how do states attempt to do this under the hostile rhetorical

conditions of neoliberalism? Neoliberal climate policy thus cannot be properly understood in terms of a simple rollback of state intervention in the market, but rather needs to be conceptualized in terms of an enduring political tension between the anti-tax and anti-regulationist thrust of neoliberal ideology, and the compulsion on the part of policymakers to cultivate climate policy as a means to foster growth and accumulation.

Both of the literatures surveyed above have generally failed to take this broader view. With regard to the ‘neoliberal environments’ literatures, these analyses are problematic insofar as they tend to take too seriously the ideological claims made by market fundamentalists about how neoliberal states in practice operate, and thereby tend to over-represent the place of commodification and privatization logics in neoliberal policy. In the analysis that follows, commodification schemes are instead conceptualized as one specific application of the much broader objectives of a) creating new modes of regulation for energy security and environmental sustainability, and b) using the tangible forms that climate policies take as a means to create new avenues for accumulation and sectoral growth. While neoliberal ideology regards commodification schemes as inherently preferred means for achieving these goals, this does not negate the state’s historic role in directly intervening in the economy to promote accumulation. This is where the EM literature generally falls short as well. While it rightly acknowledges that the open passage of interventionist environmental policy is remarkably difficult in neoliberal states like the US, it generally fails to dig beyond this *prima facie* observation and understand the ways that actors and institutions adapt to these conditions, and thereby successfully pursue interventionist policies.

While these literatures have failed to undertake this type of broader analysis, this project holds it as a key primary objective. Understanding neoliberalism not as a monolithic or totalizing ideology (but rather as an ongoing political struggle) allows us to develop a considerably more nuanced understanding of the concept, one that is heterogeneous and informed by multiple competing logics within the state's policy process. With the theoretical precepts developed in the following chapter, a proper rationale can be established for understanding how and why the picture of contemporary US climate policy painted throughout this project turns out to be quite so dynamic and out of step with the dominant environmental political economy literatures. It will suggest, moreover, that instead of being fundamentally at odds with the common depiction of the US as a neoliberal state, the forms of interventionist policy that have emerged have risen out of the very tensions that neoliberal states face when attempting to create stable frameworks for accumulation, and attempting to address problems like climate change and energy security under the harsh ideological conditions of neoliberalism.

Chapter three

Theoretical Framework: Four theses on the logics of American climate policy

Understanding why American climate policy looks the way that it does requires us to address at least two major theoretical gaps left by the literatures surveyed in the previous chapter. First, from a broad perspective, it is crucial to understand the roles that capitalist states have historically played with regard to issues like environmental crisis, energy security, and economic growth. Put simply, it is important to ask the question ‘why do states actually adopt climate policies in the first place’? Answering this question will help to understand the compulsions that continue to place interventionist policy on the agenda in neoliberal states like the US. As suggested in the previous two chapters, the main argument advanced in this chapter is that it relates to the state’s broad obligation to foster accumulation and economic growth. On the one hand, this obligation plays out in a very broad sense as states have historically been required to establish and maintain certain ‘modes of regulation’ (Boyer 1990; Aglietta 1998) for ensuring that the broad social, economic, and political conditions of accumulation remain stable enough to support accumulation across the economy broadly. But, on the other, it also plays out in a specific sense as well, as policymakers aim to cultivate the individual mechanisms used to regulate problems like environmental crisis and energy security as new sites of sectoral growth and accumulation. This area of investigation is the subject of the first thesis outlined below.

Second, offsetting this *longue durée* view (which says little about the process by which individual policies take shape in specific contexts), it is important to ask the question ‘how is

climate policy thereafter developed and implemented within the state’? Answering this question will help us to understand how progressive interventionist policies are able to find expression in the context of neoliberalism’s non-conducive anti-state rhetoric. In particular, the chapter attempts to situate neoliberal ideology and the US’ historical tradition of state-led high-tech development as competing logics in the formulation of Washington’s climate policy, and demonstrate how established structures and selectivities help to offset the prohibitive influence of neoliberal ideology in the implementation of these policies. This area of investigation is the subject of the latter three theses. The combination of a synoptic understanding of the broad roles that states play in promoting accumulation with an on-the-ground conception of how competing logics play out in the policy process will thus help to provide a theoretical framework for understanding the current state of US climate policy, and the influence that neoliberal ideology has had upon it.

Thesis 1: All states in capitalist societies aim to foster accumulation. In the context of environmental and energy crisis, this presupposes certain forms of interventionist policy at both the macro and micro levels.

The project’s first broad premise is that states in capitalist societies have to foster economic accumulation at both the macro and sectoral levels. They do this for the rather uncomplicated reason that any capitalist state that ignores the necessity of assisting in the process of capital accumulation risks drying up the source of its own power and legitimacy, society’s surplus production capacity, and the taxes drawn from this surplus that fund the state (O’Connor 1971; Panitch 1977). Indeed, a capitalist economy in which growth and accumulation fail to occur is one in which jobs disappear, unemployment rises, tax revenues decline, trade and budgetary deficits increase, and fiscal crises of the state abound. As these economic problems are diagnosed as political problems, the state’s social legitimacy dissolves along with the economic

structures from which its power is derived. In short, as industrial capitalism and the modern liberal state have co-evolved in a dialectical process over the past two centuries, the state has effectively emerged as a set of institutions aimed at creating and managing the conditions under which relatively smooth growth and accumulation can occur.

This broad theoretical point about capitalist states is indeed worth fully underscoring here lest the argument that follows be reduced – given its American context – to the facile struggle between ‘Hamiltonian liberalism’ and ‘Madisonian limited-government’ that is as old as the republic itself. Obviously these two impulses have always been an important part of the evolving policy terrain in Washington, with Hamiltonians maintaining a bias toward government programming to resolve social and economic ills, and Madisonians leaning toward libertarianism given the perceived inability of states to adequately govern complex societies (see e.g., Hayek 1960).¹⁷ My point is considerably broader than this. I want to underscore here the intimate connection between the durability of the capitalist state form itself and the continuity of expanded accumulation cycles within the societies they govern. As capitalist states cannot long govern societies in which expanded accumulation fails to occur, they have historically carved out a central role in trying to establish the conditions of accumulation through the exercise of political power. This dynamic has historically transcended transient political ideologies and economic strategies.

¹⁷ But also, as will be argued throughout, Madisonianism has little in common with contemporary neoliberal governance in the United States. It is worth further noting that, if their rhetoric is taken to its logical conclusion, those championing Madisonian-style government (the economic wing of the Tea Party, for example) are in many ways advocating a state form that is rather different from the type of modern capitalist state that I am discussing in this project. The form of state that they advocate would still be properly capitalistic to the extent that its material power is derived from siphoning taxes from accumulation cycles, but the massive limitations they seek to impose on the state (what some facetiously suggest ought to be limited to ‘defending the shores, delivering the mail, and getting out of the way’) fits closer with the state form required for governing the pre-industrial agrarian economy and tiny population that the founding fathers lived under. In reality, modern capitalist states are extremely complex entities that require a wide range of policy options to facilitate accumulation in a world of intense global competition (see e.g., Weiss 2003 on this latter point).

At a macro level, this historic role of the capitalist state presupposes a vast array of specific duties including, among many others, facilitative fiscal and monetary policies, infrastructural development, progressive taxation, coherent industrial strategies, conducive social and labour policies, and the creation of a legal apparatus capable of protecting private property rights. In the language of regulation theory, these policies serve as ‘modes of regulation’ designed to provide durable frameworks within which economies can stably reproduce themselves (Boyer 1990).

For their part, climate and energy¹⁸ security can be understood as independent modes of regulation in this context, and the first-principle goal of climate and energy policy can properly be understood as an attempt by policymakers to: a) ensure stable energy inputs for economic accumulation; b) maintain a secure natural environment capable of providing stable natural resource inputs; and c) answer for the legitimacy of the state and capital against growing environmental concerns.¹⁹ This is, of course, not an entirely top-down or hyper-rationalist process on the part of the state and policymakers, but is rather always dependent on the ways that political battles shape state responses. Indeed, particularly in the context of American neoliberalism, the lack of a strong left has made it difficult for policymakers to leverage the political capital necessary to make the policy choices required to rationalize capitalism, and

¹⁸ The point is somewhat banal to make so I will not labour it, but given that such a large volume of carbon emissions are the result of burning fossil fuels, climate policy has necessarily become conflated with questions of energy policy. In this context, the independent logics of energy security under capitalism are intimately wrapped-up in climate policies, as climate policy becomes a potential means for achieving desired energy goals. All things considered, this tacit amalgamation misses a lot of what climate policy is supposed to be about. Climate policy requires thinking about reducing a large range of GHGs (not just CO₂), designing policies around land use, adaptation, terrestrial sinks, etc. (in short, a long list of factors that have little to do with energy per se). For a more intelligent discussion of the relationship, see e.g., Lovell, Bulkeley, and Owens 2009.

¹⁹ On the relationship between the environment and legitimacy, see e.g., Marshall and Goldstein 2006; Agnone 2007.

thereby save it from its own excesses (see e.g., O'Connor 1997).²⁰ It nevertheless helps us to conceptualize the liberal state's historic role as, in effect, a mechanism charged with maintaining the continuity of capitalism, largely by bucking against its crisis tendencies and its penchant to over-exploit natural inputs. It is indeed this role (and the vital nature of energy, the natural environment, and the state's legitimacy in the face of environmental opposition) that has made climate and energy policy an enduring concern for states and policymakers.²¹

Regimes of accumulation and modes of regulation

In its simplest form, regulation theory begins from the premise that while capitalist economies may be the most productive and dynamic form of social organization in history, market economies and the tenuous social, political, economic, and environmental relations they imply are inherently unstable and contradictory (Boyer 1990). In this context, the natural state of capitalist societies *should be* continual crisis, and moments of stability and sustained growth ought to confound us as chance exceptions. Yet in reality, while the history of industrial capitalism has indeed been punctuated by moments of severe episodic crisis, it has also been characterized by periods of relative long-term stability, growth, expansion, and broad social legitimacy. For theorists in the tradition of regulation theory, such moments of prolonged stability arise when a particular set of social relations and structures emerge that are capable of providing a durable framework within which accumulation can reproduce itself.²² These eras

²⁰ Part of O'Connor's (1997) argument is the idea that the labour movement and various social movements (despite building the potential for a transition to a democratic socialist form of society) generally have the effect of rationalizing capitalism's excesses, and thereby strengthening its structural foundations. In the absence of a strong left, excessive exploitation of labour, the environment, and social infrastructure may continue unchecked until the point of crisis – this is part of what the author refers to as the 'second contradiction of capitalism'.

²¹ For a series of thoughtful discussions on environmental policy from a state-theoretical perspective, see Barry and Eckersley 2005.

²² This way of framing the theoretical puzzle also parallels the 'social structures of accumulation' literatures – see e.g., Bowles, Gordon and Weisskopf 1990.

are referred to as ‘regimes of accumulation’, and the enabling institutional arrangements and social structures which buttress them are referred to as ‘modes of regulation’ (Boyer 1990; Aglietta 1976).

Modes of regulation²³ can be understood as taking two basic forms. First, at the level of what Bourdieu might have called ‘*habitus*’, regulatory modes comprise an array of cultural norms, expectations, values, and a certain ‘willingness to play by the rules of the game’ (Lipietz 1986). Second, at a more tangible level (and more salient for our purposes here), modes of regulation include sets of laws, policy paradigms, forms of state, styles of state intervention in the economy, welfare practices, capital-labour relations, wage forms, monetary regimes, forms of competition between firms, money forms, types of international regimes, etc. (Boyer 1990).

Within regulation theory, the clearest instance of a concretized ‘regime of accumulation’ was the Fordist model of production that reigned during the decades immediately following the Second World War. In this instance, the core mode of regulation underpinning the regime was a broad reconciliation of productivity growth with increases in real income – a development which functioned dialectically to the extent that improvements in living standards through wage increases drove further consumption, rising corporate profits, and greater legitimacy (Aglietta 1976; Boyer 1990). This was further buttressed by a series of other conditions including (but not limited to) consistently high levels of investment, a rapidly growing labour force, stable employment structures, systems of relatively broad and deep social safety nets, Keynesian demand management practices on the part of the state, and a set of broad facilitative

²³ In regulation theory the term ‘regulation’ is not used in a conventional sense to refer necessarily to industrial regulation or state intervention to correct market failures. It is perhaps better understood as ‘normalization’, to the extent that the identified modes of regulation help to ‘normalize’ and stabilize accumulation cycles and allow certain forms of capitalism to reproduce.

social norms and values, all of which served to integrate the labour force into industrial capitalism and render consistent endogenous growth for a considerable period of time (Aglietta 1998; Lipietz 1986; Peck 2001; Jessop 1999).

While these modes of regulation are able to help momentarily absorb and offset capitalism's crisis tendencies, regulation theory further suggests that they are never long-term panaceas. A final key element of regulation theory is thus the attempt to understand why stability is ultimately short-lived, and why the durability of a particular mode of regulation is eventually rendered insufficient. This requires understanding the specific tensions and dislocations that arise at times of crisis and how they a) diminish the efficacy of pre-existing institutional responses and b) sow the seeds of new modes of regulation in the midst of the previous one's demise (Aglietta 1976).

Energy and environmental security as modes of regulation

While a broad array of regulatory modes have been analyzed in the regulation tradition, the issues of energy production and environmental security have traditionally received scant attention, tacitly understood as constant inputs or 'institutional bases' of the economy (see e.g., Aglietta 1998). This perhaps owes to the twin facts that, in the former case, major environmental catastrophes have been somewhat exceptional, while in the latter, stable fossil energy production and industrial capitalism have co-evolved in a fairly dialectical relationship over time, and thus a certain inability to conceptually divorce the two has emerged as an apparent blind spot.²⁴ Yet the roles of conducive environmental conditions and cheap, secure

²⁴ A decent conceptualization of energy as a mode of regulation (though not explicitly in 'regulatory' terms) can be found in Gill and Law 1989.

access to fossil energy as a facilitative mode of regulation in recent industrial capitalism cannot easily be overstated – nor can their *entirely provisional* statuses as ‘constant’ inputs.

With regard to environmental integrity, the potential economic disarray emanating from sudden radical changes in climatic patterns and the subsequent destruction of ecosystems, fisheries, arable farmland, and even livable urban spaces pose obvious threats to the economy’s productive capacity (see e.g., Adger et al 2006). This has obviously been framed in terms of a national security question (particularly in the US), as policymakers consider the potential for increasing migration pressures from environmental refugees in Central and South America (and a host of low-lying Asian and Southern European countries), conflicts over water and border security with Mexico, and a series of potential resource wars with other major international powers (see e.g., Schwartz and Randall 2003; Manwaring 2002; Barnett 2001; Harris 2000; Adger 2010; Gallagher 2009; Fletcher 2009; Busby 2007; Campbell 2007; Stuhltrager 2008; Scott 2009; Trombetta 2009; Yergin 2008, 2011).²⁵ These concerns and the establishment of new regulatory modes to address them have indeed served as driving forces behind both international climate treaties as well as domestic climate policies for the past two decades.

Most salient with regard to regulatory modes, however, is the role of access to energy as a condition of growth in capitalist economies. While much can be said on this topic, it should suffice to note that not only did the harnessing of inexpensive fossil energy launch the Industrial Revolution in its earliest days, but the course of economic growth and capitalist

²⁵ Some of Washington’s first major climate change concerns were motivated by such security questions – the best example being the Department of Defense’s 1977 report entitled “Features of Energy-Budget Climate Models: An Example of Weather Driven Climate Stability and The Long Term Impact of Atmospheric Carbon Dioxide on Climate”. This is expanded upon in Chapter 5.

development ever since has been intimately tied to cheap energy access. This access to ever-cheap energy has served not only to increase the productivity of labour and surplus value more than any other commodity in human history – thus liberating capital from its dependence on human labour and accumulation strategies based on absolute surplus value²⁶ – but has also underpinned the massive increases in standards of living and consumerism that form the backbone of contemporary capitalism’s economic growth and social legitimacy. As O’Connor (1991) notes, if a capitalist economy loses access to stable energy inputs, it effectively grinds to a halt in a classic instance of underproduction crisis. “Without such access, there is no productivity, no growth, no markets, no jobs, and no profits. There is no capitalism as we know it. This cannot be said of any other commodity or industry” (1991: 54). As Austin and Phoenix (2005) note, it is this endless hunt for energy resources to fuel domestic economic expansion that has historically led states to actively involve themselves in energy policy.²⁷ In the US, this pattern dates back as far as the mid-nineteenth century when federal policymakers nurtured the fossil fuel industry by, for example: propping up prices for coal and petroleum to support producers in their early years; not allowing too much product into the market at any one time; protecting property and drilling rights through creative proration and utilization rules²⁸; and later providing massive subsidies and deploying aggressive foreign policies designed to keep stable, secure, and cheap fossil energy resources flowing (Tomain 2010; Clark 1987).

²⁶ ‘Absolute’ surplus value, according to Marx (1990), is a form of surplus value achieved by increasing the net amount of hours worked by human labour in a given accounting period. It contrasts with ‘relative’ surplus value, which is primarily obtained by increasing the *intensity* of work (primarily through mechanization, rationalization, etc.). Exploiting fossil energy is a crucial element of relative surplus extraction.

²⁷ For authors advocating the concept of ‘metabolic rift’ (e.g., Foster 2000, 2009; Clark and Foster 2009; Moore 2000, 2011), the early development of industrial capitalism was constrained by the metabolic dependency of markets on renewable resources from the ‘countryside’ (for example, in the case of energy, burning biological matter from the contemporary carbon cycle like wood, or using human labour and animal power). For these authors, the maturation of industrial capitalism required a shift to a linear extraction of fossil fuels to overcome these limitations.

²⁸ Groups like the US Fuel Administration and Federal Oil Conservation Board and acts like the Interstate Oil Compact were critical in this process.

Yet with the combined prospect of a) total US energy consumption increasing from 100 quadrillion British Thermal Units (QBTu) in 2004 to in excess of 130 QBTu by 2030; b) world energy consumption growing from 447 QBTu to 702 QBTu over the same time period (USEIA 2011); c) the need to import greater quantities of petrol from politically unstable regions (Center for American Progress 2011); and d) the looming specter of global peak oil creating consistently high and unstable barrel prices²⁹ and geopolitical rivalries over remaining resources, the notion that a stable regime of accumulation can continue to rest on the assumption of cheap and secure access to fossil energy has largely disappeared, and the search for new modes of regulation for energy provision become a key driving logic of climate policy.³⁰

Sectoral accumulation: creating new markets through climate policy

While regulation theory provides a helpful framework for understanding how the promotion of accumulation implies state intervention in a macro sense, the same logic of accumulation further informs the development of the specific policies used to create these new regulatory modes, as states have consistently sought to use climate policy as a means to promote growth in specific economic sectors. This is largely because, as discussed in Chapter 1, neoliberalism has helped to change the rationale of environmental policy broadly over the past three decades by reframing the relationship between ecological sustainability and economic growth as a non-

²⁹ In the US in particular, the national trade deficit is of immense concern in this context, with fifty-five percent of it owing to petroleum imports. In 2010, the US spent over \$1 billion per day on foreign petroleum (Center for American Progress 2011; see also Klare 2005; Deutch and Schlesinger 2011).

³⁰ On peak oil and potential geopolitical implications see e.g., Li 2007; Hook, Hirsch, and Aleklett 2009; Campbell 2009; Zhao, Feng, and Hall 2009; Sorrell et al 2010; Aleklett et al 2010; Almeida and Silva 2009; Cavallo 2004; Kopits 2009.

zero sum game (Bailey 2003).³¹ In this context, policies designed to protect the earth's climate are only viewed as legitimate if they are framed in terms of their capacity to promote economic growth in a given sector. State intervention, in this context, does not aim toward the simple regulation or reduction of GHG emissions, but rather the creation of novel markets in sectors like financial services (stemming initially from emissions trading and offset schemes themselves, but also from the development of futures and options markets in emissions allowances, as well as downstream markets in insurance where contracts between permit buyers and sellers are insured), or new markets in alternative energy technologies and industrial processes (Paterson 2001; Matthews and Paterson 2005; Cromwell and Levene 2007; Newell and Paterson 1998; Fletcher 2009; Rauch 2007).³²

Thesis 2: There is no singular or homogenous form of neoliberalism. All neoliberalisms are distinct, consisting of multiple competing logics and interests which fight for expression in the policy process, and are shaped by a range of 'strategic selectivities'. This renders all instances of 'neoliberal climate policy' unique.

This second thesis grows necessarily out of the project's 'relational' conceptualization of the capitalist state (see e.g., Poulantzas 1973; Jessop 1999, 2004, 2008; Stones 1991; Bonefeld 2003). In this conception, while certain broad roles like those described by regulation theory always abide, the state cannot be properly understood as a homogenous entity with singular ends and/or means. Rather, as Poulantzas (1973) argues, the state is best understood as a 'social relation' between competing political forces acting both within and upon it, and thus cannot be

³¹ This argument is admittedly debatable and I do not intend to put too fine a point on it. In a broader analysis of how capitalist states undertake regulation, it could perhaps more plausibly be argued that the Keynesian/Fordist era of environmental regulation was more exceptional in its willingness to sacrifice growth for environmental sustainability (this was a considerably easier choice to make when the economy was growing at roughly 5% per year), and neoliberalism marks a return to a certain 'growth first' approach to regulation. The points of reference are obviously limited given that environmental regulation was extremely limited prior to the Keynesian/Fordist era.

³² The salient point in contrast to the authors in chapter two, however, is that the commodification of nature is merely a singular example of this process, and not a general law of neoliberalism.

treated as a simple object, instrument, or subject. As Jessop suggests,

As an institutional ensemble, the state does not (and cannot) exercise power: it is not a real subject. Thus, rather than speaking about *the* power of the state, one should speak about the various potential structural powers (or state capacities), in the plural, that are inscribed in the state as an institutional ensemble... It is not the state that acts: it is always specific sets of politicians and state officials located in specific parts and levels of the state system. It is they who activate specific powers and state capacities inscribed in particular institutions and agencies... The reproduction of fractures and contradictions among and within each and every branch of the state system is reflected in the prodigious incoherence and chaotic character of state policies when seen from the viewpoint of what Foucault calls the ‘microphysics of power’ (1990: 55).

Within this heterogeneous institutional ensemble, however, Poulantzas also argued that states can be seen as maintaining specific patterns of ‘strategic selectivity’ (or in institutionalist terms, path dependency) which reflect the balance of competing forces acting within and upon the state, and render a certain structural favouritism within the policy process for particular ideologies, actors, identities, strategies, and spatial/temporal horizons. According to Poulantzas, this array of *structurally inscribed* strategic selectivities could be understood as imposing a general coherence on diversified micro-policies, one which “justifies talking about specific structures of state power and their dynamic (for example, liberal parliamentary states, authoritarian interventionist states, military dictatorships, or dependent developmental states)” (1973: 55).

It is in this somewhat limited context that I propose to understand the concept of the ‘neoliberal state’, and policy development within it. The broad ascendancy of neoliberal ideals in the United States since the late 1970s has engendered a certain coherent structural selectivity reflective of its relative strength within the halls of government, one which perhaps makes it justifiable to speak of Washington as a neoliberal state. But ultimately, understanding the state as a heterogeneous social relation between multiple political forces without a singular logic

means that a) all policy outcomes within the state are the result of multiple competing logics, and b) neoliberal ideology is merely one player in the process, even if it is perhaps ‘first among equals’ (see also Brenner and Theodore 2002). As Poulantzas again states, taking serious the notion of strategic selectivities means that

there is always scope for actions to overflow or circumvent structural constraints; and since subjects are never unitary, never fully aware of the conditions of strategic action, never fully equipped to realize their preferred strategies, and always face possible opposition from actors pursuing other strategies or tactics, failure is an ever-present possibility (1973: 54).

Further, even the specific policies derived from the state’s neoliberal underpinnings will always be expressed through historically patterned institutions, which in turn can alter their specific form and effect. In short, a relational view of the state which takes into account the full range of structural and institutional influences on policy as well as the capacity of actors within these processes to make strategic selections among a host of structurally inscribed options necessarily forces us to rule out any general theories of neoliberal climate policy, and remain skeptical of essentialist assertions that a particular logic (i.e. commodification or anti-regulationism) will necessarily be a leading characteristic. Rather, each individual neoliberal state arrives at a set of policies according to its own specific conditions and political relations, and not a hegemonic policy form.

Thesis 3: Climate policy in the United States has been guided to a large extent by a historical logic of using state power to actively foster new markets for high-tech innovations.

The conception of the state and neoliberalism laid out above thus asks us to define what particular logics and forces are acting upon the climate policy process in the US, serving both to halt particular strategies and facilitate others. As discussed further in Chapter 5, the traditional neoliberal logics of privatization and commodification have indeed yet to succeed in

establishing a federal carbon market against the combined backdrop of powerful fossil fuel interests, the anti-regulationist tenor of Congress, and a host of other institutional and idiosyncratic factors. As already noted in Chapter 1, however, filling this void has been another influential logic that has served to push interventionist policy forward over the past several years – the federal government’s tradition of actively fostering the growth of domestic high-tech sectors. This logic has helped to tacitly redefine the issue of climate change in the US *not* as a problem of market failure or absent property rights (as the aforementioned neoliberal logics suggest), but rather as simply one of inappropriate technologies, and thus policy responses have implicitly aimed towards the development and facilitation of new markets in novel energy technologies.

This history of this logic is expanded upon considerably in Chapter 4, but to briefly set the predicate here, the massive expansion of federal innovation policy in the US was prompted in its earliest days by a search for competitive advantage in a world where economic competition was becoming increasingly global in scope. In simple terms, when a country’s key economic sectors become areas of intense global competition (as for example, the US’ dominance in a host of manufacturing industries did in the 1960s and 1970s), corporate profits tend to fall, leading to disinvestment, rising unemployment, and generalized economic crisis (Brenner 2002; Rupert 1995). As a Schumpeterian logic suggests, the only way out of this type of overproduction crisis is to create new marketable commodities, new methods of production, new markets, or new forms of industrial organization (Schumpeter 1947). Historically, countries that have developed such technological advances have been able to reap the benefits of such innovations in the form of economic growth and higher taxation revenues. Britain provides an instructive example of this, as the massive array of technological innovations

emanating from their Industrial Revolution ensured an uninterrupted domination of global markets for close to a century (Hurt 2010; Hobsbawm 1999). In more recent times, the revolutionary transformation of Japanese auto manufacturers from mass production to flexible organization allowed them to cheaply produce smaller volumes of a wider variety of products, thus creating the conditions for the country to become a global leader in automotive production, and put an end to the US' post-war dominance of the industry. As Negoita notes, the history of industrial capitalism is indeed fairly clear in these contexts, "If leading countries want to keep dwelling among the economic elite, they have to foster innovation, and their governments have to get involved in the process" (2010: 78).

This is indeed what had begun to occur in the US by the mid-1970s. By the late 1960s, the immense economic lead and competitive edge the country had enjoyed since the close of the Second World War had begun to disappear and policymakers, increasingly acknowledging that American supremacy in global markets was declining, began to rethink the state's role in spurring innovation and market development. The result was the establishment of a host of policies aimed re-establishing the country's dominance in world markets by re-orienting its scientific community – previously serving primarily defense prerogatives – towards the development of civilian consumer markets. The policy response which began in the mid-1970s and reached a fever pitch throughout the Reagan years would aim to hasten the transition of new technologies from government and university labs to the marketplace. In so doing, legislators would undertake the development of a series of new laws aimed at (1) coordinating the country's R&D efforts in a number of key sectors, (2) increasing the aggregate level of state funding for basic and applied research, (3) developing proactive technology transfer mechanisms to ensure that publicly funded research found private investors to take it to market,

and (4) creating specialized regulatory environments designed to foster these new technologies and markets. The overall result of these legislative initiatives has been the creation of what has been referred to as a Developmental Network State (DNS) in Washington, an entity which has furnished the US with immense leads in a range of high-tech sectors like information technology, biotechnologies, semiconductors, defense, etc. (Block 2008; Hurt 2010; Schrank and Whitford 2009; Fuchs 2009; Negoita 2010).³³

What makes this development particularly interesting is that it was occurring at the exact time that an ascendant neoliberal ideology in the United States was expressly rejecting the notion of state involvement in economic affairs, particularly with regard to industrial policy. Yet far from being *anti*-neoliberal in its orientation or existing as some kind of anomaly within American neoliberalism, Washington's policy of ramping-up state investment in new high-tech innovations is rather a key constitutive logic of contemporary neoliberalism, and is precisely illustrative of the way that states have been compelled to engage in increasingly powerful efforts to foster domestic accumulation in the environment of global competitiveness in which neoliberalism has ascended. Indeed, we cannot properly discuss the rise of neoliberalism over the past thirty years without briefly talking about the phenomenon of globalization and its effect on state capacity and accumulation. While much of the traditional discourse has been dominated by 'hyper-globalists' seeking to emphasize the supposedly powerful external constraints imposed upon national governments by global markets and financial flows (see e.g., Ohmae 1995; Guehenno 1995; Strange 1996), it is rather the case that the economic and social instabilities resulting from heightened international competition, industrial decentralization, the

³³ As noted in chapter 1, this design can be distinguished from the Developmental Bureaucratic States of East Asia and, to a lesser extent, Western Europe – see O'Riain 2004.

increased mechanization of production, etc., have served to weaken existing domestic accumulation strategies and the associated stability of employment, taxation, and social legitimacy that, as noted above, stands as a key pre-requisite of state power. In this context, over the past three decades, the state – far from retreating, as neoliberal dogma suggests – has in many ways become an even more crucial vehicle for achieving transformational economic goals aimed at maintaining competitive domestic industry and ensuring stable accumulation. For authors like Cerney (1997) and Palan et al. (2000), developments like this signal the rise of the so-called ‘competition state’, with policies responding primarily to economic pressures from rival competition states, all of whom are seeking to promote the viability of domestic industry and economic growth in a global capitalist system characterized by immense horizontal competition.

This objective of fostering domestic economic growth and competitiveness through state-led innovation has, since the late 1970s, been consistently expressed in federal energy and climate policy. Major federal bills allocating resources to the development of novel energy and environmental technologies have been quite explicit in the broad objectives they aim to achieve. For example, the Energy Policy Act of 1992 – signed into law by the first Bush White House – established an extensive manifest of energy technology development programs, and justified them by assigning the following objectives:

(1) reduce the United States balance of trade deficit through the export of United States renewable energy technologies and technological expertise; (2) retain and create manufacturing and related service jobs in the United States; (3) encourage the export of United States renewable energy technologies; (4) develop markets for United States renewable energy technologies to be utilized in meeting the energy and environmental requirements of foreign countries; (5) better ensure that United States participation in energy-related projects in foreign countries includes participation by United States firms as well as utilization of United States technologies that have been developed or

demonstrated in the United States through publicly or privately funded demonstration programs; (6) ensure the introduction of United States firms and expertise in foreign countries; (7) provide financial assistance by the Federal Government to foster greater participation by United States firms in the financing, ownership, design, construction, or operation of renewable energy technology projects in foreign countries; (8) assist United States firms, especially firms that are in competition with firms in foreign countries, to obtain opportunities to transfer technologies to, or undertake projects in, foreign countries. (US House of Representatives 1992).

In moments of broad economic over-accumulation like those seen at present, these processes tend to take on greater levels of importance. Harvey's concept of 'temporal fixes' is particularly instructive in the current context. Basing his work on Marx's theory of the 'tendency of the rate of profit to fall', Harvey notes that over-accumulation in a given territorial context creates both surpluses of labour (and thus rising unemployment) as well as surpluses of capital. These problems register as a combination of a) an excess of commodities that cannot be realized as profit, b) idle productive capacity, and c) surpluses of money capital without proper outlets for profitable investment (2003: 109). In these moments of over-capacity, surplus capital is required to find new areas for profitable investment. This can occur spatially through geographic expansion and the re-creation of existing markets in new territorial locales, or temporally through investment in long-term capital projects, innovation, research and development, etc., that "defer the re-entry of current excess capital values into circulation well into the future", or a combination of both strategies (Ibid). In this broad context, climate change has, to an increasingly large extent, encouraged certain actors to seek the broad re-cultivation of existing modes of energy production, infrastructure, and end-use processes as potentially massive capital sinks in the midst of a long-term crisis of over-accumulation. Policymakers and elements of the businesses community in the US have thus increasingly sought to articulate the problem of climate change in terms of a lack of sufficient technologies to achieve sustainability, thus increasingly desecrating the old mode of accumulation based on

fossil fuel consumption (this occurs at a discursive level, as well as an economic one through legislative attempts to put a price on carbon), and attempting to create the requisite conditions for novel innovations and their respective markets.

Thesis 4: The policy mechanisms used to execute this logic are necessarily influenced and modified by American neoliberalism's ideological aversion to state intervention. Their eventual forms are shaped by strategically selected pathways which have historically allowed interventionist policy to exist within the context of market fundamentalism.

While the three theses cited above are intended to weaken the rhetorical depiction of neoliberalism as a doctrine that is anti-state and homogenous in form and effect, this is not meant to underestimate the strength of this rhetoric or the influence that it has on policy. Particularly in the American context, it is crucial to understand how neoliberalism's ideological tenor and its abiding preference for 'more-market/less-state' – a trend which has been remarkably consistent in Congressional voting patterns over the past three decades and remains a forbidding force on non-market forms of policy intervention – has informed the specific shape of these developmental policies as they have attempted to swim upstream against neoliberalism's hostile, anti-state ideology.

As in the second thesis, our relational conception of the state and policy process provides a helpful framework for understanding why this logic of high-tech developmentalism has manifested in the specific policy forms that it has. In this depiction, just as general logics within the policy process (like, for example, Washington's tradition of state-led innovation) are recursively reselected as a reflection of their relative strength, the particular policy mechanisms used to express these logics are also strategically re-selected over time as a reflection of their capacity to entrench the logic in question.

In the context of seemingly counter-hegemonic logics like state-led innovation and climate regulation, however, the choice of policy mechanism is aimed largely at working around neoliberal ideological constraints, and thus is partial to policy routes that have historically proven capable of doing this. In particular, the selection of policy forms bends towards those that are capable of moving beyond traditional Congressional channels where neoliberal ideology finds its most dogmatic expression. This process (which Jessop refers to as ‘reflexively reorganized structural configurations’) leads to the selection and re-selection of an array of historically viable ‘alternative policy pathways’ (or structurally inscribed strategic selectivities) outside of the federal Congress along which such interventionist policies are able to develop (see also Hall 1993; Peck 2001). As Jessop puts it,

The scope for the reflexive reorganization of structural configurations is subject to its own strategic selectivity (and thus has *path-dependent* as well as *path-shaping* aspects). This selection of strategies and tactics depends on individual, collective, and organizational learning capacities, and on the “experiences” resulting from the pursuit of different strategies and tactics in different conjunctures... This involves a structurally inscribed strategic selectivity that differentially rewards actions that are compatible with the recursive reproduction of the structure(s) in question (1990: 54).

Put simply, then, the policy forms used to express the developmentalist logic described in this project can be understood as structurally inscribed strategic selectivities in the state’s policy process that are favoured in light of their past success in circumventing neoliberal legislative constraints, and have all been used in an array of other contexts over the past three decades. Chapter 6 will look at three particular institutional manifestations of American climate policy’s pursuit of high-tech innovation, including the rise of sub-national regulation, the increased use of the courts, and the growth of unilateral executive authority. These recursively selected strategies, which have become both path-dependent and path-shaping in their own right, have

allowed for the creation of a relatively coherent set of interventionist climate policies in the midst of a dogmatic neoliberal ideological atmosphere.

Given that the concept of structurally inscribed strategic selectivities is the central process invoked in this analysis, the question of the relative weight assigned to structure and agency is obviously important moving forward. Put simply, this analysis is more concerned with (and therefore assigns greater implicit weight to) the role and influence of the ‘structural inscription’ of options available to various actors. In this conception, while it is obviously “through the actions of individuals that structures and institutions have an effect on political outcomes” (Hall and Taylor 1996: 939), the structural configuration of the state saddles the relevant actors with a bounded rationality that greatly limits their agency as the primary explanatory variable. Thus, in line with traditional historical institutionalist analyses (see e.g., Hall and Taylor 1996; Steinmo et al 1992), this project emphasizes the structuralism inherent in the state as an institutional ensemble, rather than the unbounded influence of agents upon the process. This theoretical framework applies also to the way that the project conceptualizes the use of developmental state strategies. It will become clear throughout that the emphasis is more on the structural requirement for policymakers to promote growth and accumulation imposed by capitalism (and the way that the American developmental state has historically emerged as a structurally inscribed selectivity aimed at satisfying this imperative) than on the agents’ role in implementing these policies.

Conclusions: A framework for understanding neoliberal climate policy in the US

The primary goal of the four theses outlined above is to add a great deal more nuance to the existing depiction of how neoliberalism influences climate policy. Taking a god’s eye

perspective of the behavior of capitalist states, the first thesis attempts to provide a general framework for understanding the factors that compel states to react and involve themselves in issues like climate change and energy provision. This is a crucial point to establish given the general tendency within the existing literature to suggest that neoliberalism is, in large measure, a process of ceding policy priorities like the environment to markets and non-state actors. The argument I am making is that, while neoliberal forces have managed to create substantial gridlock on environmental policy in the US Congress, this says nothing about the actual priorities of states and policymakers broadly, and that to view neoliberal climate policy as a progressive waning of state intervention is to overlook both the historic roles of the state in governing capitalist societies as well as the political battles that actually constitute neoliberal governance. The idea that states and policymakers ever fully cede control over issues like environmental and energy security to the vagaries of the free market (issues that are of paramount importance to the maintenance of capitalist economies) grossly overstates what neoliberalism is ‘doing’. As states and policymakers in capitalist societies derive the lion’s share of their power and legitimacy from economic growth and stability, there remains in climate policy a broad attempt to protect the continuity of economic growth by subjecting things like environmental and energy security to extra-economic protection.

Going from the macro to the micro, the second part of this argument is that neoliberalism has helped to change the rationale of environmental policy broadly over the past three decades by reframing the relationship between ecological sustainability and economic growth as a non-zero sum game. In this context, policies designed to protect the earth’s climate are only viewed as legitimate if they are framed in terms of their capacity to promote economic growth in a

given sector. Carbon markets are, in this conception, merely one example of this process, but their logic of commodification is more incidental than a general law of neoliberalism.

Building on the first thesis, the second thesis aims to further relax the dominant assertions about how neoliberalism influences the policy process by underscoring the heterogeneous nature of policy development within states. This is a crucial point to establish given the general tendency within the dominant comparative capitalisms literatures (and to a certain extent within the ‘neoliberal environments’ literatures) to portray neoliberalization as a fairly consistent and homogenous political-economic process across the globe. The argument I am making here is that, because the state itself is best understood as a heterogeneous social relation between multiple political forces without a singular logic, this implicitly means that a) all policy outcomes within the state are the result of multiple competing logics, and b) neoliberal ideology is merely one player in the process and can be reshaped and overcome by competing forces.

Implicit in this thesis is a question about which particular accumulative logics are acting upon climate policy and shaping its form and effect within the state. Addressing this question, the third thesis proposes that, in the US, a key guiding logic has been the state’s historic tradition of fostering high-tech innovation and nurturing markets for new technologies. In this context, the general proposition that climate change and energy security are problems that can be solved through the development of novel energy and environmental technologies – and in so doing potentially provide American firms with leads in these incipient global markets – has served to animate this historical logic within large elements of the state and business community, and encouraged policies aimed primarily at state-led innovation.

These developmental state policies, however, exist in tension with the anti-interventionist underpinnings of neoliberal ideology, thus begging the question ‘how are these policies able to express themselves in the context of neoliberalism’s dogmatic anti-state rhetoric?’ The fourth thesis aims to answer this question by drawing on the concept of strategic selectivities within the state’s policy process. Put simply, with neoliberal ideological constraints largely rendering the US Congress anathema to the passage of interventionist climate policies, policymakers and those exerting pressure upon the state have opted for alternative policy routes that have historically proved capable of circumventing traditional Congressional channels. It is this primarily this process of organization learning that has allowed for the development of the policies discussed throughout this project.

Building on the third thesis, in the next chapter we turn to the history of the accumulative logic at the centre of this analysis: state-led technological development in the US. Tracing this process back to its earliest origins, we will see how this logic developed throughout the country’s history, how it came to dovetail with federal climate change policy since the late 1970s, and how neoliberal ideology has influenced its shape and effect.

Part II
Competing Logics in American Climate Policy

Chapter four

The American developmental state: a brief history

In the previous chapter it was suggested that understanding the nature of a country's climate policies requires us to first understand the institutional accumulative logics that are animating and shaping it. In this chapter, we look at one of the primary logics that has come to consistently influence the direction of federal climate policy in the US over the past three decades – state-led, high-tech innovation. The point of this chapter is to help establish the strength and continuity of this logic in American economic history, situating it as a general function of advanced capitalist states broadly, and demonstrating how certain elements of this logic have evolved and been progressively institutionalized in the federal government since the 1940s. Moving into Chapter 5, it will be argued that it is this institutional context that has given rise to a technology-centric climate policy in the US, which has subsequently struggled with the anti-interventionist philosophy of neoliberalism to produce the forms of policy that currently exist. The narrative that follows begins by briefly tracing this logic from the earliest years of American confederation (during which the state assumed broad responsibility for establishing the main predicates of economic growth and war), through the maturation of the administrative state's role in organizing and funding science and technological development in the military realm, and finally into the consolidation of an increasingly sophisticated developmental state apparatus after 1980.

The early history of American state-led development

There is a common refrain in neoliberal discourse which suggests that the impressive rates of economic growth enjoyed by the US from the early 19th century through the Great Depression

was, in large measure, the result of so-called ‘night watchman state’ policies and *laissez faire* political-economic arrangements (see e.g., Friedman and Friedman 1990). In this depiction, the implementation of New Deal policies in the early 1930s and subsequent expansion of government intervention represented an ill-fated break with the supposed natural and prosperous course of American economic development. The difficulty with this assertion, however, is that while the American administrative state was undeniably less developed than it would become in later years³⁴, such arguments overlook many of the crucial interventionist state roles that underpinned the first 150 years of the country’s economic and social development. Indeed, keeping with the development pattern of several industrialized nation states from that era, the state’s role fighting and preparing for wars, settling territory, urbanization, and infrastructural and agricultural development were fundamental in spurring national economic development (Tilly 1985; Mann 1984; Scott 2002; Roland 2003; Ruttan 2006). This was indeed the case in the development of every major industrial power from that era beginning with Britain, Germany, Russia, and France in the nineteenth century (Gerschenkron 1962), and continuing through the ascendancy of the Asian Tigers after the Second World War (Wade 1990; Johnson 2001). As Negoita (2010) notes, the notion that the American economy has somehow been exempt from this pattern is at best a slight misinterpretation of history, and at worst an unfortunate ideological construction.

The origins of such policies in the American context is generally traced to Alexander Hamilton’s *Report on Manufacturers* in 1791 which, along with his two reports on public credit, formed the basis of the Hamiltonian economic program and long tradition of so-called

³⁴ Alexis de Tocqueville (2000) famously noted in his 1835 book, *Democracy in America*, that America effectively lacked a central state, as classically defined.

‘Hamiltonian liberalism’ in the United States (Lind 1997). Incorporating elements of England’s Mercantilist System and France’s Colbertism, Hamilton argued (against the *laissez faire* orthodoxy of the time) that in order to ensure the strength of the young republic following the Revolution, the state would need to develop policies aimed at encouraging economic development, in particular the growth of domestic manufacturing. His plan suggested two key means of achieving this end. First, the establishment of protective tariffs that would not only encourage domestic buyers to patronize domestic manufacturers (and thereby avoid the dumping of cheap British goods which he feared would ravage the country’s fragile economic development), but also provide revenue for the second pillar of his plan – direct subsidies to industry. Indeed, Hamilton argued that, through direct subsidies, the state could further expedite the development of domestic industry and allow it to adequately compete with Western European economies. These tariffs and subsidies would be coupled with the state’s subsidization of new public infrastructures such as roads and canals for internal trade, resulting in rapid economic growth, increased immigration, and a stronger industrial base for military defense (Lind 1997).

Despite strong opposition from segments of the Congress, much of Hamilton’s report was gradually adopted, and American industry would develop with the strong support of protective tariffs.³⁵ Throughout the latter part of the nineteenth century, Hamiltonian policy continued to underpin American economic development through the ideas encapsulated in what would come

³⁵ ‘Jeffersonians’ in the Democratic-Republican Party provided staunch opposition to the use of direct subsidies on the grounds that, in addition to overstepping the role of the federal government, it would lead to corruption and a favouring of Northern over Southern industry. The party coalitions that emerged in the nineteenth century were indicative of the general politics of industrialization. The Jeffersonian/Jacksonian Democratic Party, which opposed interventionist economic policies, was derided in the industrial northeast, and relied on the feudal south and rural heartland for votes. American industry and the northeast had staunchly supported the interventionist initiatives of the Hamiltonian agenda, and formed the backbone of the Whig and Republican coalition, as they sought to obtain government support conducive to the process of industrialization.

to be referred to as the ‘American School’ of economics. This program, consisting of high tariffs, funding for infrastructural development, and the maintenance of a strong central bank underpinned the platform of the Whig Party (and its later incarnation as the Republican Party) as it dominated federal politics for latter half of the century, and laid the foundation for the rapid economic and industrial expansion of the Reconstruction and Progressive Eras (Lind 2004; Richardson 1997; Foner 1970; Bense 2000).³⁶ The unprecedented state-led growth of this era stands in contrast to the *laissez-faire* policies of the Democratic-Republican (and later Democratic) governments that ruled American politics for the first seventy-five years of confederation, an era in which American industry was relatively slow out of the gate, and lagged behind their British and European counterparts (Richardson 1997; Foner 1970).

As Skowronek (1982) notes, as has historically been the case in other countries, rapid industrialization and its ills created political tensions and demands that led to the further development of a strong national administrative apparatus throughout the late nineteenth century to stabilize and legitimize economic growth and industrialization. Examples of such Progressive Era developments include the creation of the National Bureau of Education (1867), Department of Agriculture (1889), National Bureau of Standards (1901), Department of Commerce (1903), the Food and Drug Administration (1906), the Federal Reserve Board (1913), Department of Labor (1913), and the Federal Trade Commission (1914). As Block (2010) notes, these new initiatives came to play a dual role in the US’ economic development. On the one hand, they served as a regulatory police against businesses pursuing economically destructive practices and helped build programs aimed at legitimizing the often painful and

³⁶ The American System was generally opposed by the Democratic Party starting with Andrew Jackson, leading to the development of the tradition of ‘Jacksonian liberalism’ and limited government.

dislocating forward march of industrialization. On the other, they acted as collaborators helping businesses to maintain the rapid pace of industrialization by both stabilizing markets and providing conducive social and infrastructural conditions. The mission statement of the Department of Commerce provides an instructive example of these dual roles the new agencies had in promoting accumulation and legitimacy. The agency was officially created in 1903 to “promote job creation and improved living standards for all Americans by creating an infrastructure that promotes economic growth, technological competitiveness, and sustainable development.”³⁷

The early capital forming effects of military mobilization

As a country whose history has been indelibly shaped by its continuous involvement in military conflict, early industrial development in the US was intimately tied to the development of weaponry and other requisites of war procured on large scales by the state.³⁸ The immense funding and centralization of technological development for the military during this period led not only to the development of a range of specific defense technologies, but also the general advent of mechanized, interchangeable parts and other machine tools that would quickly migrate to other industrial sectors (for example, sewing machines, textiles, transportation technologies, and eventually automobiles) helping to facilitate the broader expansion of industrial production and the country’s Industrial Revolution (Ruttan 2006; Block 2010; Hacker 2005). Indeed, by the end of the Civil War in 1865 (at the time the largest industrial

³⁷ <http://burgess.house.gov/Services/FederalGovernment.htm>. (Viewed April 2, 2011).

³⁸ By the early-twentieth century, the US had already undertaken half a dozen major military conflicts, including the Revolutionary War, a century-long frontier battle with indigenous peoples (referred to as the Indian Wars), the Barbary Wars, the War of 1812, the Mexican-American War, the American Civil War, the Spanish-American War, the Philippine-American War, World War I, and countless other interventions in Central and South America in line with the Monroe Doctrine (often referred to as the Banana Wars).

war in human history), the unprecedented mobilization of soldiers and the procurement of materials through the Quartermaster's Department had rendered the US the world's forerunner of mass production technologies (Weiss 2008) which would facilitate the immense growth of the Reconstruction Era (1865-1876) and later the Progressive Era (1876-1900). This was compounded by the federal government's development of a series of critical defense infrastructures such as canals, roads, lighthouses, river navigation capacities, etc., all of which were later appropriated by capital and would come to play a crucial role in the growth of domestic trade and economic development (Skowronek 1982; Bense 2000; North 1961).

In addition to enhancing its role in broad macro-economic development, the First World War was a major turning point in the state's specific role in fostering technological development, as federal funding and coordination would help to oversee the innovation of a host of technologies that would underpin economic development in the twentieth century including, for example, aviation, automobiles, oceangoing vessels, radios, navigational technologies, photography, acoustical technologies, meteorological technology, and various weaponry (machine guns, rifled artillery, hydraulic recoil mechanisms, tanks, incendiary devices, etc.) and led to the development of thousands of inventions by Edison's Naval Consulting Board and other independent scientists and inventors (Koistinen 1997; Hacker 2005; Venzon 1995; Chickering et al. 2000). Often referred to as 'the chemists' war', the First World War further animated the state's push for the development of metallurgical innovations and markets in an array of chemicals, gases, and explosives that would prove integral in both war and industrialization. The German military's development and use of U-boats led not only to the US' reactive development of wireless communications and sonar technology (an important innovation on its own) but also served as the first institutionalized partnership between

academic science and the military through the establishment of the National Research Council, which would be maintained after the war's end (Block 2010). Indeed, given the success of this new partnership, elements within the federal government began to argue for the establishment of a national research endowment through which the state could continue to fund and coordinate the development of novel technologies during peacetime. The result was the creation of the Naval Research Laboratory in 1923 which, though small and modestly funded, represented a first critical step in the enduring relationship between the state, academia, and military establishment in leading national technological development.

In short, far from the *laissez faire* policies commonly depicted in neoliberal thought, early industrial development in the US owed a great deal to a close relationship between states and markets in which Washington: established protectionist tariffs and subsidies to promote domestic manufacturing, built crucial infrastructures capable of moving capital and facilitating internal trade, directly funded and coordinated the development of the technologies that would underpin industrialization and economic growth through mobilization for war, assisted in training the country's labor force, and established a dense network of regulatory agencies designed to promote economic growth while stabilizing markets and legitimizing the social and economic conditions of industrial capitalism. While this pattern had indeed been well established by the early-twentieth century, the onset of the Great Depression and Second World War saw a radical expansion of the state's role both in the economy broadly, and specifically in driving technological development. Building upon Block's (2010) framework of American developmentalism, the following sections understand this expansion as the product of three separate yet interrelated historical circumstances. First, the onset of the Second World War and the limited formal merging of academic science and the military; second, the Soviet

launch of Sputnik and the subsequent ramping up of state-led scientific development through the Space Race; and finally, with the onset of the neoliberal era, the establishment of a decentralized developmental state to compete with growing competitive threats in East Asia and Western Europe.

World War Two

Had no other major developments emanated from this era, World War II would still have been consequential for the sheer volume of state-led technological development that would go on to underpin a series of important markets in the post-war period. In addition to laying the ground work for the development of the computer, the transistor, and the semiconductor, WWII further introduced radical state-led advances in theoretical physics, nuclear technology, the proximity fuse, radar technology, as well as major advances in rocketry, ballistics, and jet propulsion technologies, among many others. The war further established many of the weapons technologies that would go on to underpin the country's emergent military-industrial complex following the war, including fighter jets and bomber planes, glide bombs, and 'smart bombs', missiles (including surface to air cruise missiles and air-launched rockets), armored war-heads, self-guided torpedoes, and napalm and other chemical weaponry (Koistenin 1998; 2004; Hacker 2005). But, for the US, the Second World War was categorically different than any before it because, for the first time, the massive industrialization project of mobilizing a country for war (and procuring the industrial tools necessary to win) was overseen by an increasingly sophisticated and rationalized administrative apparatus in Washington. Indeed, while previous wars had been undertaken as a series of relatively ad-hoc initiatives, by 1941, the state had been radically reshaped by the full implementation of Progressive Era and New

Deal Era expansions, and thus operated for the first time as a full-service entity with the capacity to organize and deploy the full weight of its domestic industry and scientific community.

One of the most significant aspects of this shift was that, for the first time, the federal government became the primary director and funding source for basic scientific research. This development was coordinated by the newly established Office of Scientific Research and Development in 1941, which was given near unlimited access to resources and funding. Washington's scientific and technological capacity was further expanded through the establishment of a network of federal laboratories in which thousands of scientists were put to work developing new weaponry and solving key defense-related problems (Kleinman 1995). Indeed, if previous wars had served as instances of short-term relations between science and government, the Second World War effectively signaled the formal marriage of the two. Not only had the nation's scientific community been fully mobilized in the service of state goals and rendered dependent upon the state for both direction and funding, but a significantly large group of government officials had been forced to turn their attention to scientific research and take responsibility for advancing the scientific frontier (Ibid).

The significance of the Manhattan Project as a crucial historical turning point in this process is difficult to overstate. Its primary accomplishment was that it demonstrated to policymakers, the scientific community, capital, and the American public that by centralizing scientific coordination and furnishing it with massive levels of government funding, there was seemingly no limit to what could be achieved (Kleinman 1995). This effectively represented the birth of so-called 'big science', and would lead the state to exercise strong oversight of the scientific

community in an attempt to determine what new technologies would have military implications (see Stuart 1993; Mukerji 1990; Geiger 1994; Hounshell 2001). The project was also significant in that it represented the first time that a series of large, dedicated laboratories was created across the country for work on state-funded scientific development. This included the establishment of the Lawrence Berkeley, Los Alamos, and Sandia National Laboratories, which would serve as the model for the massive network of national labs established following the war (today, these labs employ over 30,000 full time scientists, and have become a central element of the contemporary scientific innovation system in the US) (Westwick 2003; Markusen and Ogden 1996). Indeed, despite achieving its stated objective of ending the war, the infrastructure of the Manhattan Project was seen as too large, too effective, and ultimately far too valuable to be dismantled, and thus the project and its facilities would become permanent arms of the government in the form of the Atomic Energy Commission and National Laboratory System (Block 2010; Rhodes 1986; Koistenin 1980; Stuart 1993).

In the years following the end of the war, the links established between the military and academic science community were further solidified, as the military maintained and enhanced its role as the primary funding source and director of university science. The late-1940s through the mid-1950s would see the rise of a ‘military-scientific complex’ in US universities, primarily through the flourishing of the National Laboratory System, the founding of the National Science Foundation, and the creation of a series of new research networks under the guidance of each individual branch of the military (Kleinman 1995). Indeed, inspired by the general success of the Office of Scientific Research and Development, each arm of the defense establishment created new science and innovation programs, including, for example, the Navy’s Office of Naval Research and Naval Research Laboratory; the Army’s Scientific

Advisory Program; and the Air Force's establishment of a proprietary research and development system in the USAF Scientific Advisory Board and research program. In addition, each organization began funding a great deal of university-based research for their own specific purposes (Ibid).

While the progressive entangling of military and scientific prerogatives during this period is sometimes depicted in a negative light, in many ways the military's increasingly powerful control over the sciences actually provided American scientists with a new found sense of freedom and autonomy as they, for the first time, had access to immense levels of funding, resources, and laboratories for their basic research. As Mirowski and Sent (2002) note, prior to the military's effective commandeering of organized science, few academic scientists in the US had the resources to undertake full-time lab research, as the majority of such work was done by individuals employed by private industries typically focused highly directed *applied* research. However, the developmental model being established around this time (referred to herein as the 'pipeline model', see below) rested on a fairly sharp division of labour between corporate defense contractors (who were expected to engage only in applied research), and basic researchers in federally funded labs who were relatively free to pursue their research in an unfettered environment – the assumption being that fundamental scientific discoveries would eventually find practical applications that would later contribute to enhanced defense capabilities. As this model developed, the defense establishment began providing immense levels of funding to a wide array of programs in the physical sciences (chemistry and physics), but also new disciplines like nuclear physics, electronics, aerospace engineering, computer science, all fields which developed on the back of military patronage (Weiss 2008).

The Military-Industrial Complex and Procurement

The Second World War was unique for another reason as well. After every previous war in American history, Washington had largely demobilized its military establishment and reduced its size and scope to a fraction of its wartime capacity. Yet with the end of the Second World War, Washington would for the first time in its history opt to maintain a standing military with peacetime capabilities rivaling those of previous ‘total war’ contexts (Koistenin 1980; Weiss 2008). The strategy here was effectively twofold. First, the Cold War and the US’ new role as a hegemonic global power was seen as requiring a sizable defense establishment capable of defending the country’s interests abroad, and thus policymakers sought to grow the military and armaments industry in an attempt to meet this objective. Beyond this, however, it was widely acknowledged that it was the state’s orchestrated mobilization of domestic industry for the war effort that had effectively brought the Great Depression to a final conclusion, and thus military spending was viewed as a crucial means by which to continue to ‘prime the economic pump’ and maintain effective aggregate demand following the war (Block 1977).

As Weiss (2008) notes, serving as a de-facto industrial strategy, the procurement power of the defense budget was crucial in establishing a fertile learning environment for the emergence of technology powerhouses in crucial defense and non-defense sectors such as IBM, EDS, Boeing, Texas Instruments, GE, DuPont, and Motorola (to name only a few), all of whom found their first and most demanding customer in the federal government during the early years of the Cold War. Yet, as defense contracting continued to ramp up throughout the late 1940s and 1950s, the increased politicization of defense contracting in the form of intense lobbying, pork-barrel politics, and collusive relationships between contractors, lobbyists, and

members of Congress would furnish Washington with what we pejoratively know today as a military-industrial complex (MIC) (Markusen et al. 1991). As this entity continued to grow throughout the post-war period, the maintenance of a powerful military soon became a mere ancillary feature of the MIC, and defense spending would come to stand as a key backbone of American economic and industrial development (Smedley 1958; Markusen et al. 1991).

The rise of the DARPA model, ‘engineer-run spin-off’ firms, and the biotech industry

The dovetailing of two seemingly isolated events in late-1957 radically altered the landscape of technological innovation in United States (Block 2010). First, on October 4 1957, the Soviet Union successfully launched the satellite Sputnik into orbit. Caught off-guard by the incident (and still reeling from the international embarrassment of the failed US Project Vanguard)³⁹ many insiders blamed the apparent Soviet lead in the space race on the growing rivalry between military services and research agencies in Washington, and thus a new strategy was sought to ensure full coordination and cooperation. A series of initiatives arose out of this frantic and reactive atmosphere, the most important of which were a) the creation of the National Aeronautics and Space Administration (NASA) to jump start the country’s space program, b) the passage of the National Defense Education Act to bolster public education in math and sciences, and c) the creation of the Defense Advanced Research Projects Agency (DARPA)⁴⁰ in an attempt to move a certain portion of R&D funding out of the rigid channels of specific military services, and into the hands of an independent agency with full discretion

³⁹ Project Vanguard was the US’ own satellite rocket program whose first attempt at launching a satellite into orbit exploded on the launch pad in April 1957.

⁴⁰ When it was first formed, the organization was simply called the Advanced Research Projects Agency (ARPA). The prefix ‘Defense’ was added in the early 1970s for political purposes (then removed in the early 1990s, then added again in the late 1990s), but for continuity sake, I refer to it throughout as ‘DARPA’, regardless of the time-period in question.

to engage in cutting-edge innovation (Block 2010; Roland 2002; Bonvillian 2009; Belfiore 2010; Roland and Shiman 2002).

Liberated from the narrow constraints of specific weapons projects, the newly formed DARPA was free to experiment with radically different strategies for advancing the technological frontier. From the start, the agency established a new form of organizational structure with an intentionally small staff, minimal amount of paperwork and bureaucracy, ambitious benchmarks for its projects, and a minimal peer-review process (Bonvillian 2006). This last point was viewed as particularly salient to the extent that such review processes were seen as a detriment to the established R&D programs. Indeed, funding for typical research grants relied on strict and lengthy peer-review processes which, despite guaranteeing higher caliber technical research, ensured that new initiatives were both slow out of the gate and always defined by the same research community insiders (Ibid). By contrast, DARPA's streamlined grant procedure and highly targeted funding process made the organization extremely agile and capable of overcoming the institutional inertias that had already begun to cripple the established R&D channels.

The Rise of the engineer-run spin-off

A second crucial development also taking place in 1957 occurred when a group of eight scientists and engineers working for a major semiconductor company in California (called Shockley Semiconductor Laboratory) resigned when the company refused to continue research on silicon-based semiconductors. These individuals founded a small spin-off firm called Fairchild Semiconductor that, over the following years, would go on to make massive advances in semiconductor technology, eventually resulting in the founding of IT giant Intel (Goodheart

2006).⁴¹ While the event sounds mundane, these eight individuals would unintentionally usher in a new paradigm for technological development through the advent of the ‘engineer-run spin-off’ firm. This was aided in large measure by the simultaneous passage of the Small Business Investment Act of 1958, which allowed the newly formed Small Business Administration to license Small Business Investment Companies (SBICs) to finance and manage small firms in the US (Ibid).⁴² This ushered in the development of professionally managed venture capital and private equity firms, which focused primarily in their early years on developing and expanding small high-tech start-ups. With the help of venture capital firms like Kleiner, Perkins, Caulfield & Byers (which would go on to become the most prominent high-tech venture capital firm in the US), the following years would see the creation and growth of a series of similar spin-off firms in a range of high-tech industries. This had dramatic effects on the innovation climate in the US. Suddenly, instead of depending on the prerogatives of giant consolidated defense corporations, technological development could be equally driven by processes of ‘economic fission’ (Block 2010), in which small splinter groups from large contractors were constantly spinning-off new innovative challengers.

For DARPA, the simultaneous rise of the engineer-run spin-off firm was an important development that added further relevance to their alternative approach to innovation. The main problem with attempting to push radical innovation through MIC-based firms was that, as ‘monopoly sector’ firms, once they had received a particular contract from the state (which they likely competed with only one or two other firms to obtain), they had little pressure on

⁴¹ Members of the ‘traitorous eight’ would also go on to found the firms National Semiconductor and Advanced Micro Devices, which would, in-turn, spin-off over 65 different technology firms over the next few decades, effectively giving birth to what we know today as Silicon Valley (Gromov 2012).

⁴² This act was also passed in an attempt to foster technological advances capable of competing with the Soviet Union.

them to take risks on unproven technologies. Yet as the engineer-run spin-off trend became increasingly institutionalized, DARPA's program officers began to realize the benefits of targeting resources to smaller companies. Increasingly, the MIC model of the 1940s and 1950s was being replaced by an environment in which program officers could incite fierce competition between large and small companies alike. And large firms, increasingly paranoid about losing their best scientists and developers to spin-offs, were forced to bolster innovative efforts and open their developmental horizons to research areas that may not have fit with their immediate objectives (Block 2010). Perhaps the most brilliant aspect of this model was that this newfound leverage DARPA possessed could be wielded with much smaller dollar amounts than were required to influence MIC firms. While a few million dollars may not have been able to shift the priorities of corporations like Boeing or IBM, it could easily catalyze immense competition and innovation from young start-ups hungry for cash. And by setting ambitious benchmarks and reserving the right to withdraw funding at any time, DARPA was suddenly able to control the process from beginning to end and ensure better results – a further point of distinction from the old MIC model.

As the 1960s wore on and DARPA increasingly moved away from aerospace (NASA effectively took over all space race matters) and towards computer sciences, the agency's model of development and core capabilities evolved further. By far the most dramatic shift was the organization's increased involvement in directly networking and coordinating new R&D efforts. No longer a mere method of distributing funding to various firms and research groups, the DARPA model of development increasingly became a full-service program taking responsibility for facilitating coordination across industry and research groups and finding avenues for commercialization (Hurt 2010; Roland and Shiman 2002). This new model vested

program managers with an array of new tasks that could range from “connecting a professor with an entrepreneur who was willing to build a new firm, linking a start up firm to a venture capitalist who could provide both capital and technical assistance, locating a larger firm that was willing and eager to commercialize the technology, or helping the firm get a government procurement contract that would support the commercialization process” (Block 2010: 10). DARPA officers were further able to facilitate coordination by requiring research groups to take part in workshops in which researchers would exchange ideas regarding new technological pathways and identify potential opportunities and dead ends. Further, the agency also began to finance the development of new research programs in novel fields that the military and federal government had not yet invested in. The best example of this was the agency’s investment in a series of computer science labs in American universities throughout the 1960s which dramatically expanded the number of computer programmers in the country for decades to come (Roland 2002).

DARPA and the IT sector: the advent of the early-stage innovation template

While DARPA became increasingly involved in a host of technologies, it was the agency’s work in IT development through its Information Processing Techniques Office (IPTO) that helped to fully establish the agency’s model for early-stage technology policy (Roland and Shiman 2002). Though the IT revolution and particularly the advent of the personal computer (PC) is widely understood to have been “born out of risk-taking corporate ventures and garage-based innovative individualism”, and thus represents the “epitome of the heights that can be achieved by private-sector, free-market entrepreneurialism” (Fong 2001), these explanations overlook the crucial role of federal initiatives in developing these technologies from the mid-

twentieth century onwards.⁴³ Indeed, when DARPA's IPTO was established in 1962, there was not a single university computer science program in existence in the United States (Fong 2001). It was DARPA that took primary responsibility for building the field from the ground-up, largely by investing the majority of its yearly operating budget in the founding of computer labs and graduate computer science programs across the country, including major first-movers like those at Berkeley, MIT, Stanford, Utah, and Carnegie Mellon that would prove the most consequential the development of the Internet and Human Computer Interface (HCI) (Ibid). Over the following decade, the IPTO's budget would more than quadruple, with the majority of funding continuing to go toward long-term investment in computer science departments. DARPA began targeting its IPTO research community and its resources on two primary projects: the ARPANET project (that would later become the Internet), and the 'man-computer-symbiosis' project that would later manifest itself in the HCI elements of the modern PC (Roland and Shiman 2002; Belfiore 2010). In so doing, the organization would lay the groundwork for the subsequent rapid development of the IT industry, and crystallize a model of early-stage technological development that would soon be put to broad mainstream use in federal innovation policy.

NIH and Biotech: the advent of the late-stage innovation template

While DARPA was refining its targeting and networking template for *early-stage* innovation in

⁴³ The full history begins in earnest during the Second World War when the Navy began research aimed at developing a flight simulation system for bomber crews. Early government-led successes in computer science were built upon throughout the late-1940s and 1950s with the DOD's development of the first mainframe computer in the form of IBM's ENIAC in 1945, the Stretch Computer in 1953, and the Semi-Automatic Ground Environment (SAGE) in 1954 for use by NORAD (Redmond and Smith 2000; Jacobs 1986; Ceruzzi 1998). Washington's support of the chip industry also goes back to military R&D funding in the mid-1940s and massive procurements throughout the 1950s and 1960s by NASA and the Air Force whose orders accounted for a full 100 percent of the industry's production (Martin and Asprey 1996).

the inchoate IT sector, a crucial parallel development in *late-stage* innovation was occurring at the National Institutes of Health (NIH) in its support of biotech research. Indeed, while the technologies that DARPA and the military were establishing still effectively relied on the military and pipeline model of innovation to bring them to commercial markets, NIH's work on biotechnologies had begun to set in motion a new model for late stage development through some initially modest commercialization and facilitation activities that would close the circle on the innovation process, and complete the template for the developmental processes that would be deployed over the next several decades.⁴⁴

Though the deepest roots of the biotech field can be traced back to the establishment of the National Cancer Institute in 1937, much like DARPA, the story begins in earnest in the mid-1950s with James Watson and Francis Crick's famed discovery of the structure of DNA at Harvard University (Vallas et al. 2010). Following on the heels of this discovery, large influxes of funding from NIH throughout the 1950s and 1960s allowed for rapid advances in molecular biology, including a newfound understanding of genetic code, the processes of DNA replication, and the first successful attempts to splice genes together (Ibid). By the mid-1970s, the modern discipline of molecular genetics was thriving in American universities thanks primarily to government funding through NIH which, by 1976, was supporting more than 120 different biotech projects across the country (Rabinow 1996). Of particular importance was

⁴⁴ While DARPA showed little interest in commercialization and facilitation efforts, NIH showed little interest in DARPA's revolutionary targeting and coordination methods. As Vallas et al. note, "Officials at NIH did not follow the kind of model that DARPA had pioneered with computer technology. There is no evidence for the 1970s of NIH officials setting technological goals in the way that DARPA routinely did. On the contrary, NIH continued to rely heavily on the peer review model in which funds were distributed for the research projects that were deemed most worthy by other scientists. Moreover, the timeline on NIH research projects was very different from the way that DARPA worked. In the computer field, DARPA would often expect to see significant results in a year and would decide to either continue or stop funding after twelve months. At NIH, in contrast, grants were usually for five years, reflecting the far slower progress when work in the laboratory involves the manipulation of actual living organisms" (2010: 61).

Herbert Boyer and Stanley Cohen's advent of DNA cloning and discovery of recombinant DNA processes, which would become "the technical foundation for the biotechnology industry" (Vallas et al. 2010: 62). Along with other critical developments, these events generated a tremendous amount of excitement in the nascent field, as the scientific community and federal government awoke to the potential implications for medical technologies. Indeed, these novel bioengineering processes held the promise of revolutionizing the entire pharmaceutical industry, allowing scientists to manipulate genetic content to create 'new molecular entities' (NMEs), and potentially rendering massive new markets in blockbuster drugs and cures for human illnesses (Ibid).

The key moment in the NIH/biotech story came in 1976 when Herbert Boyer helped found the world's first major biotech startup company called Genentech. Though difficult to imagine today, Boyer's decision to found a *for-profit* business was viewed in the academic and scientific community as a major misappropriation of academic funding. Yet NIH and the federal government raised no objections to the move and continued to actively fund Boyer's research group, as well as provide them access to their NIH-funded lab at UC San Francisco for Genentech purposes, and support the firm's first major project aimed at synthesizing human insulin (Vallas et al. 2010). This move (along with similar simultaneous developments) effectively signaled to the entire biotech research community that NIH was no longer merely an academic research agency, but rather a conduit helping to move novel pharmaceutical innovations to the marketplace.

Though the crucial wave of commercialization legislation was still a few years away, NIH's major contribution to the commercialization process in the mid- and late-1970s came in the

form of its efforts to run political interference on behalf of the new industry, thereby allowing new technologies to reach the market. Indeed, as new biotech initiatives gained increased publicity throughout the decade, public anxieties began to grow about the potential dangers and ethical implications of manipulating DNA and developing new life-forms – what was increasingly referred to pejoratively as ‘playing god’. The result was a series of proposals in Congress aimed at stunting the growth of the industry through new regulatory agencies designed to supervise the research and establish limits on the types of research that could be undertaken (Jasanoff 2005; Wright 1994). In an attempt to neutralize the barrage of objections and protect the incipient industry, NIH went on the offensive, proactively drafting its own set of self-imposed bioengineering guidelines and establishing the Committee on Recombinant DNA and the Recombinant DNA Advisory Committee. By rolling-out this wave of self-regulation, the NIH skillfully outmaneuvered the field’s critics and provided the necessary cover to get the industry through its infant years and get the first private firms off the ground (Jasanoff 2005; Kleinman and Kinchy 2003).

While these initial regulations helped to ward-off initial opposition to the industry, the NIH quickly began to quietly relax them in an attempt to enhance US competitiveness vis-à-vis new programs and firms being established in Western Europe in the late 1970s (Wright 1994). This increasingly favourable regulatory context helped US firms leapfrog the emergent European competition, which was saddled with costly and time-consuming regulation predicated on what today would be called the ‘precautionary principle.’ The US, by contrast, established a facilitative regulatory atmosphere which sought to limit the commercialization of novel biotechnologies only where evidence of likely harm would outweigh perceived benefits (Kleinman and Kinchy 2003; Kleinman, Delborne, and Autry 2009). In so doing, the NIH

facilitated commercialization efforts throughout the late 1970s by providing both the funding and resources required to advance the biotech frontier at the academic level, as well as a regulatory context that was both generous and relatively void of uncertainty. The resulting growth was nothing short of spectacular, going from a standing start of one biotech company (Genentech) in 1976 to close to 100 firms by the close of the decade (Block 2008).

In short, by the late-1970s, the respective efforts of DARPA and NIH in early- and late-stage technology development had begun to radically alter the nature of state-led, high-tech innovation in the US. As the lessons from these developments were increasingly absorbed by policymakers throughout the decade, departments and funding agencies across the federal government came to increasingly view the nurturing of new firms and the developmental process broadly as a critical element of their agency's mission. Ironically, however, these templates for state-led development were beginning to form and concretize at a potentially highly unfavourable moment, as the rise of market-fundamentalist ideology during this period would serve to discredit exactly the type of interventionist innovation policy increasingly winning favour in the federal government. These new ideological predicates for governance in the US would once again serve to alter the form and content of American innovation policy.

1980s: The consolidation of the American developmental state

While the growth and spread of neoliberal ideology throughout the 1980s would have a major impact on the way that innovation policies were implemented and executed (see Chapter 7), in the main, it did not serve to undermine the growth of the federal government's growing innovation complex in any first principle way. During this period, the Reagan administration and Republican lawmakers often found themselves walking a fine line between rhetorical

attempts to rollback the state (which mostly manifested in reduced corporate tax rates and deregulation) and pragmatic efforts to use state power to foster economic growth and competitiveness. In this latter endeavor, the role of innovation policy loomed large, as the administration along with a Democratic House and Republican Senate sought to increasingly refine the developmental methods of DARPA and NIH over the course of the decade. Indeed, though the GOP began to rhetorically abandon conventional ideas about industrial policy in favour of an aggressive free trade philosophy⁴⁵, the 1980s actually represents the legislative apogee of state-led innovation in Washington, witnessing the passage of a long manifest of proactive innovation legislation that served to institutionalize and concretize previously ad hoc federal innovation strategies. The question, then, is why did this occur at such a seemingly antithetical ideological moment in US history? To answer this question requires one to look at the rapidly changing competitive international environment emerging around this time, and resultant attempts on the part of the federal government to enhance domestic competitiveness and economic growth.

Since the early twentieth century, Washington's approach to innovation policy had been predicated on two basic ideas. First, that high levels of state investment in basic scientific research and would flow relatively effortlessly through the scientific community to the private sector and provide an adequate base for new innovation and development. Referred to as the 'pipeline model', this approach rejected the idea that scientific funding required any specific predetermined goals, or that active government policies were required to ensure that the funds were properly targeted, or research properly coordinated (Hurt 2010). Second, this design

⁴⁵ For a more comprehensive discussion of how the industrial policy debate publicly played out over this time period, see Graham 1992.

assumed that the immense array of technologies being developed in the military and aerospace realms through state assistance would naturally find relevant civilian applications, and benefit private American industry without any proactive state guidance. This two-part design was largely reflective of the fact that from the close of the Second World War until the mid-1960s, US leads in most manufacturing and high-tech sectors appeared fairly sacrosanct, and thus there seemed no particular need to adjust or enhance the prevailing design.⁴⁶

By the mid-1970s, however, a growing crisis in American competitiveness vis-à-vis Western Europe and East Asia had rendered the pipeline model increasingly insufficient. The problem, it was acknowledged, was not a lack of innovative ideas – indeed, defense and basic science funding through American universities, the space race, and MIC had consistently rendered impressive technological advances. The issue was that these innovations were simply not making the supposedly natural transition from defense technologies to consumer markets in the manner suggested by advocates of the pipeline model. And with the proactive developmental state policies of East Asia and Western Europe increasingly closing the gap on American dominance in a range of markets (Johnson 2001; Wade 1990; Brenner 2002), the passivity of the pipeline model increasingly seemed like a losing bet.

As Schrank and Whitford (2009) note, the Reagan administration and Congress' approach to the issue was influenced primarily by two converging trends occurring around this time. First, by the early 1980s, Washington's international balance of trade had become a serious problem. While the country had maintained a favourable level of exports through the early post-war period, the rise of Japanese and Western European competition throughout the 1960s and

⁴⁶ Also, the design was politically convenient to the extent that burying industrial policy in accepted state roles like defense spending allowed successive governments to avoid potentially volatile discussions about the role of the state in supporting consumer markets (Hurt 2010).

1970s had caused US imports of manufactured goods to rise, leading to increasingly large trade deficits (Brenner 2002; Hughs 2005).⁴⁷ Beginning in the mid-1960s, anxieties about the declining competitive standing of American industry had already forced policymakers to seriously rethink the efficacy of the pipeline model. By the early 1980s, this previously minor concern had evolved into a crisis. The industrial strategies of Western Europe and particularly Japan's Ministry of International Trade and Industry (MITI) had helped these regions to effectively commandeer the global market for things like automobiles, electronics, and steel, and appeared increasingly poised to eclipse previously untouchable American leads in semiconductors, microprocessors, and biotechnology. This led to increasingly vocal calls from elements of both major parties to establish more proactive industrial policies to keep pace.

Second, in the early 1980s, anxieties about the competitiveness of American firms increasingly began to dovetail with the rapid deindustrialization of American industrial centers – this was incited by the collapse of the century-old vertical integration model of production in large US firms, and subsequent decentralization of industrial production and increased outsourcing of labour to cheaper parts of the developing world (see e.g., Bluestone and Harrison 1984). The result, as Schrank and Whitford (2009) suggest, was increased unease about job growth and rising unemployment on the part of policymakers, who became increasingly concerned about whether new jobs would be created for their constituents in place of vanishing manufacturing positions. Thus, at the same time that an ascendant neoliberal ideology sought to desecrate the notion of proactive industrial policies, lawmakers in both parties began to increasingly show support for legislation aimed at converting the country's scientific and technological leadership

⁴⁷ The brief exception being 1979 through 1982 when the trade balance improved slightly. It then began to precipitously decline thereafter.

into marketable commodities that could be produced and manufactured domestically.

With specific regard to jobs and employment, Schrank and Whitford draw on Polanyi's (1944) concept of a 'double movement' between accumulation and social protection to understand the concretization of the American developmental state during this period. The authors suggest that, first, beginning in the late 1970s, American capital reacted to competitive threats from East Asia and Western Europe (as well as bottom-up threats from domestic organized labour) by decentralizing large elements of production to sub-contractors at home and abroad, thus animating massive purges in traditional manufacturing sectors. Second, political practitioners, reacting to bottom-up voter anger over the landslide of job losses, began searching for alternative forms of employment in non-industrial/innovative sectors. As they did so, they found that any supposed opposition on the part of business to interventionist industrial policies had been eliminated "by the very decentralization of production that had animated the job losses in the first place" (Schrank and Whitford 2009: 523). In this context, the authors suggest that capital can be seen as reaping the "rewards of implicit and explicit subsidies that tend to grow as job losses (and fear of job losses) in traditional industries mount, and they are therefore the ironic beneficiaries of the protective double movement" that they themselves helped to incite (2009: 524).⁴⁸

⁴⁸ This type of theoretical explanation obviously deviates considerably from the canonical framework for explaining the nature of national innovation strategies, the Varieties of Capitalisms (VOC) paradigm. In this conception, the US, as a so-called 'liberal market economy' (LME), is thought to have comparatively underdeveloped innovation policies given the general penchant of firms in LME states to coordinate innovation through impersonal, arm's length market relationships, and internal corporate hierarchies, rather than political or other extra-economic arrangements overseen by states and other institutions. Here again, a regulationist perspective is helpful for understanding why LME states continue to get involved in things like technological innovation. In this conception, national innovation strategies (like, for example, the consolidation of a developmental state apparatus) can more appropriately be understood as a 'mode of regulation' deployed in an effort to overcome market inconsistencies and crisis tendencies, and provide a durable, long-term framework within which innovation cycles and economic accumulation can reproduce themselves. In this theoretical context,

The result of these converging trends led the federal government to increasingly search for ways to lead industrial development and economic growth from above. The first and most obvious way to do so was to feed the immensely large military-industrial complex – a method which, given the relatively unassailable nature of defense spending, had the advantage of allowing the government to inject massive industrial stimulus into the economy in the context of the arms race, without appearing to contradict its core principles. As O'Connor notes,

In the early and mid-1980s, military spending grew twice as fast as civilian spending in the US ... [rising] by over forty percent.⁴⁹ The US Military and transnational corporations oriented US high tech development mainly to increasing the communications, coordination, and control capacities of the Pentagon and big business. Finally, the military-industrial complex was the proxy for US social policy with respect to housing, health, and education subsidies and payroll and pensions, especially in what Ann Markusen has called the “gun belt”, a half crescent stretching from Seattle to LA, through the Southwest and Texas, and sweeping up from Florida to route 128 in Boston (1997: 222).

This strategy, however, had serious limits, and effectively continued to rely on the passive transfer of new technologies to the commercial realm through the outdated pipeline model. As Hurt (2010) notes, the real solution to the problem came as policymakers became increasingly aware of the possibility of harnessing the immense potential of the decentralized DARPA and NIH models of innovation, which had recently proven their worth in aiding the impressive growth of domestic IT and biotech/pharmaceutical firms.

Congress awakens to the DARPA and NIH models

markets and the inconsistencies they breed are (contrary to the supposed rationale of the LME model) something to be *overcome* and offset through structured, extra-economic accommodation, and *not* left to self-direct in the uncertain hope that they will remain stable and functional.

⁴⁹ Reagan's across-the-board military build-up stands as the largest peacetime build-up in world history, with federal funding reaching \$34 billion per year in 1986 (PBS 2006).

With the DARPA model of early stage innovation already spreading throughout the country's network of national and university labs, the real issue at this point was building on the NIH model of late stage facilitation, industry protection, and technology transfer strategies. This process had also been set in motion by the Nixon White House in the early 1970s, as the administration began the first major efforts to crack open the insular, military-based culture of the country's university and national lab systems and encourage the migration of public lab innovations to the private and commercial realms (Slaughter and Rhodes 2002). A particularly crucial moment came in the lead-up to the founding of the New Technology Opportunity program when it was revealed to the Nixon White House that, after twenty-five years of actively funding university and national labs, the federal government had accidentally found itself in possession of close to 28,000 original patents, increasing at a rate of close to 2000 per year. Further research uncovered that only about ten percent of these patents had ever made it to the commercial market through the pipeline model (Deucker 1997; Hurt 2010). In order to improve on this poor output, the Ford administration signed the Patent Modernization and Reform Act of 1973 which they hoped, along with other efforts to move innovations out of the labs, would help to hasten the commercialization process. Building on these initial efforts, the Reagan administration and Congress sought to dramatically increase collaboration between public labs and private firms, and establish a legal superstructure capable of accelerating the granting of patents and licenses for publicly funded and developed property. These efforts translated into the wave of laws and initiatives in Table 4.1.

Table 4.1
Selected developmental state legislation and major programming initiatives⁵⁰

⁵⁰ The Stevenson-Wydler Technology Innovation Act and Bayh-Dole Act were signed into law by Jimmy Carter before Reagan was inaugurated.

Legislation	Description
1980: Stevenson-Wydler Technology Innovation Act	This act encouraged the network of federal laboratories to engage in direct collaboration with state and local governments, universities, and private industry on research efforts. It also mandated that the laboratories spend funds on technology transfer activities.
1980: Bayh-Dole Act	This act was passed by Congress in 1980 to encourage universities and small businesses to pursue commercial exploitation of technological breakthroughs that resulted from federally funded research. There is some dispute as to how much difference this legislation has actually made, since previous law allowed universities to gain property rights over key technologies developed with Federal support. Nevertheless, the new legislation served an important symbolic function in legitimating close cooperation between university researchers and industry.
1982: Small Business Innovation Development Act	This legislation created the Small Business Innovation Research Program, which was a consortium between the Small Business Administration and government agencies with large research budgets such as Department of Defense, Department of Energy, and Environmental Protection Agency (EPA). The agencies were required to devote a fraction, initially 1.25 percent of their research funding, to support initiatives that came from small, independent, for-profit firms. Small Phase I awards of \$50,000 could be followed by larger Phase II awards of \$500,000.
1984: National Cooperative Research Act	This act created a blanket antitrust exemption for private firms to engage in cooperative research efforts to develop new products. It created the legal foundation to establish industry-wide research consortia that shared funding and information on “pre-competitive” research.
1985: NSF Establishes Program for Engineering Research Centers	These university-based centers were designed to create a decentralized network of researchers working on concrete problems of translating scientific breakthroughs into usable technologies.
1986: Federal Technology Transfer Act	This created the legal framework for Cooperative Research and Development Agreements (CRADA’s) between Federal laboratories and private firms that would give firms the right to commercially exploit research findings that originated at those laboratories.
1986: Establishment of the Federal Laboratory Consortium for Technology Transfer	FLC is a nationwide network of federal laboratories that provides the forum to develop strategies and opportunities for linking laboratory mission technologies and expertise with the marketplace. FLC networks over 600 research laboratories and centers from

(FLC)	more than 16 federal departments and aims to maximize the transfer of technology. The FLC develops and tests transfer methods, addresses barriers to the process, provides training, highlights grass-roots transfer efforts, and emphasizes national initiatives where technology transfer has a role.
1987: White House Executive Order 12591: Facilitating Access to Science and Technology	This executive order required that federal laboratories and agencies assist universities and the private sector by transferring technical knowledge. The Order required agency and laboratory heads to identify and encourage individuals who would act as conduits of information among federal laboratories, universities, and the private sector. It also underscored the government's commitment to technology transfer and urged government labs to enter into cooperative agreements to the limits permitted by law.
1988: Advanced Technology Program (ATP), Department of Commerce	Originally authorized in the Omnibus Trade and Competitiveness Act of 1988, ATP is a program that provides a Federal matching grant for private sector research efforts designed to commercialize promising new technologies. Potential recipients include both big businesses and small.
1988: Manufacturing Extension Program	The same piece of trade legislation also authorized funding for a network of manufacturing extension projects. These were developed on the analogy with agricultural extension programs—a widely decentralized program that would provide locally available expertise to help manufacturers make use of advanced technologies.
1989: National Competitiveness Technology Transfer Act	This act amended and strengthened the Stevenson-Wydler Act, imposing technology transfer mandates on all ‘government-owned, government-operated’ (GOGO) labs as well as all ‘government-owned, contractor-operated’ (GOCO) labs.
1989: Independent Agencies Appropriations Act	Part of this act mandated the establishment of National Technology Transfer Centers across the country.
1991: American Technology Preeminence Act	This legislation made the National Technical Information Service the federal government’s central hub for actively disseminating and promoting information on government patents across the FLC network available for license to private firms.
1991: Defense Industrial and Technology Base Initiative	The Defense Authorization Act authorized Critical Technology Institutes to “advance the development of technologies deemed critical to U.S. national security and economic competitiveness.” The legislation also authorized manufacturing extension programs that would help diffuse advanced manufacturing technologies developed under DOD auspices to small firms. The act further directed the DOD to actively transfer technologies to American small businesses.

1991: High Performance Computing and National Research and Education Network Act	This legislation was intended to protect the U.S. international lead in high performance computing and networking. It was also explicitly intended that the technological developments would enhance productivity and industrial competitiveness. It initially allocated \$654 million in support of research at the Department of Defense and the National Science Foundation.
1992: Small Business Research and Development Enhancement Act	This act created a program on the model of the SBIR called the Small Business Technology Transfer Program (SBTTR). The basic design of the program is the same as SBIR, except the research effort must involve collaboration between a small business and a non-profit research institution such as a hospital, university, or government laboratory.
1995 National Technology Transfer and Advancement Act	This act permanently provided the 600+ member laboratories of the FLC with permanent funding as part of their controlling federal agencies' annual budgets.
2000: Technology Transfer Commercialization Act	This act dramatically expedites the transfer process, decreasing the length of the process by 80%, and creates opportunities for greater private exclusivity in licensing government patents.

Sources: Block 2008; Federal Laboratory Consortium 2011

Institutionalizing the logic of state-led innovation

The neoliberal period thus, somewhat unexpectedly, proves to be a critical point in the evolution of the American developmental state. Indeed, if the post-war period saw the gradual evolution of developmental methods through the military and basic research support, the neoliberal era has seen these previously ad hoc methods fully institutionalized and put to broad use in civilian consumer markets. A generation later, federally funded scientific research in the US has been fully imbued with what Henderson and Smith (2002) refer to as an “implied duty to commercialize”, as the developmental state has largely come of age under neoliberalism as an apparatus aimed at promoting the progressive commodification of scientific knowledge.⁵¹

⁵¹ The point is not really to cast a normative judgment on this shift, given that scientific knowledge never really ‘existed for its own sake’, but rather, in terms of federal funding, was rooted in militarization.

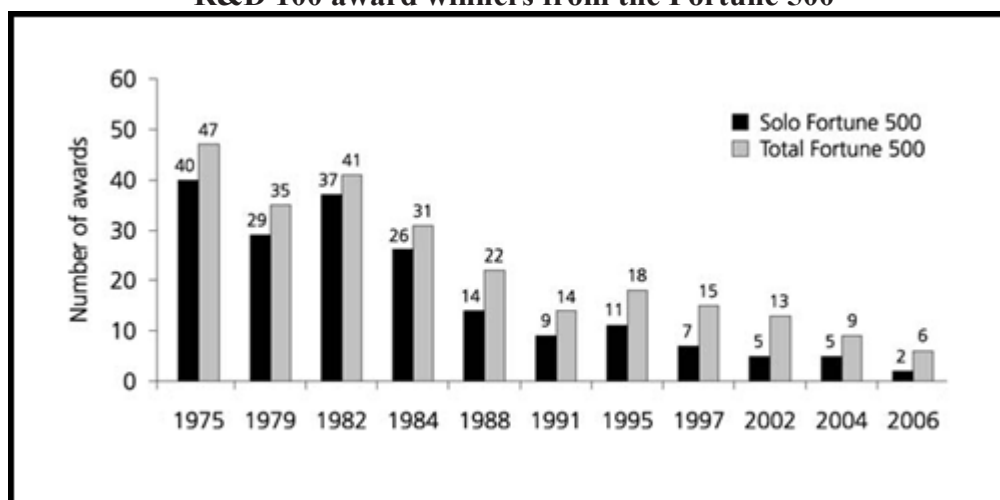
Indeed, the boundaries between basic academic research and applied private R&D have been effectively erased in the wake of these developments, largely transforming the *raison d'être* of scientific discovery into something that exists primarily for the establishment of novel markets.⁵²

As Keller and Block (2009) note, the combination of these efforts to enhance early and late stage innovation over the last three decades have profoundly altered the nature of technological development in the US. In their 2009 study, the authors undertake an assessment of American innovation efforts based on the famed *R&D Magazine*'s annual list of the 'R&D 100 Awards' – a yearly inventory of the 100 most innovative commercial products released in the previous calendar year. The data-set shows that, whereas a generation ago a strong majority of major technological innovations were developed in the independent labs of private companies, today most of the innovations on this list occur among networks of collaborators that cross an increasingly blurry public-private divide. Indeed, while the 1975 list saw a mere thirty-five of the year's top 100 innovations developed with direct state assistance, by 2006 that number had increased to seventy-eight. Perhaps more interesting is the radical decline of top innovations coming from the private laboratories of large Fortune 500 corporations. As Figure 4.1 depicts, whereas in 1975 forty-seven out of the eighty-six domestic innovations making the list had been developed by Fortune 500 firms (forty of which involved no public assistance at all), by 2006 the Fortune 500 was responsible for a mere six of that year's eighty-eight top domestic innovations (only two of which were completely independent of state assistance).

Figure 4.1

⁵² Military development still occupies considerable space, but in the end, its reign as the primary end-goal of science in the US was actually relatively short lived (Henderson and Smith 2002).

R&D 100 award winners from the Fortune 500



Source: Block and Keller 2009

Indeed, fifty of these eighty-eight government-led innovations were developed through the university–national lab system or other public agencies, either working alone or in collaboration with private companies, while an additional thirteen came from state-supported spin-off firms. Of the remaining twenty-five innovations coming from the private sector, at least fourteen were developed with the aid of federal funding. This means that, in 2006, all but eleven of the year’s top innovations were developed with public assistance. With these innovations coming from every major sector of the economy, these patterns can be seen as reflecting much broader trends in the American system of innovation.

Conclusions: the developmental state paradigm and climate change

The coalescing of an increasingly sophisticated and influential developmental state apparatus across the US federal government has, as suggested above, stood as a complex century’s long process. Growing out of the state’s earliest primary roles in building major national infrastructures, preparing for and fighting wars, and establishing the social and economic predicates of economic development, the US federal government increasingly took

responsibility throughout the mid-20th century for funding and coordinating the nation's scientific and engineering community under the auspice of military technology development. As Washington increasingly began to search for ways to enhance American competitiveness and promote economic growth in the early 1970s, concerted attempts were made to apply the developmental models that had been refined (and proven highly successful at high-tech innovation) over the previous decades to civilian consumer markets. With the passage of several pieces of enabling legislation and subsequent major successes in a host of incipient high-tech industries, this logic of state-led innovation would become increasingly institutionalized as a standard logic of accumulation and economic development across the federal government.

By the time that climate change (along with questions about global energy provision) first emerged as major political issues in the late 1970s and early 1980s, this developmental logic was indeed increasingly well established. As we will see in the following chapter, this led to an initial framing of the issue in terms of a logic of technological innovation, in an attempt to foster the growth of markets in novel energy and environmental technologies. Yet, while the rise of neoliberal ideology during this period had proved relatively harmless to the growth and institutionalization of state-led innovation policies broadly, it *would* end up proving extremely prohibitive to the specific growth of alternative energy technologies and markets. In Chapter 5 we will explore the specific elements of American neoliberalism and energy markets that make the application of state-led innovation policies so politically contentious, while Chapter 6 will explore how battles surrounding the politics of climate change and neoliberalism have manifested in the developmental climate policies currently in existence.

Chapter five

Neoliberalism and the creative destruction of fossil energy

There are at least two major problems with attempting to translate alternative energy into a developmental state project that have not been strongly present in previous state-led technology projects. The first problem is simply one of demand – or put more specifically, a lack of effective bottom-up demand for alternative energy. In economic terms, the demand for energy inputs in an economy is generally an *abstract* form of demand, given that, in the absence of a pricing mechanism, markets do not specifically seek or place value on ‘clean’ energy, but rather are generally inclined towards the least costly form of energy. The problem in this equation is that the market for cheap energy has long been cornered by conventional fossil fuels, and the vast majority of alternative energy technologies remain comparatively much more expensive. In fact, to date, the only technologies that have managed to become profitable and somewhat competitive with conventional sources are very low-risk ‘conventional alternative’ technologies that benefit from very generous government subsidies (e.g., biofuels derived from food crops, solar parks, and onshore wind farms) (Yanosek 2012; Rai et al 2011; Graeker and Sagan 2008).⁵³ As capital prefers to invest in projects that are lower risk and have a higher guarantee of profitability, a situation has materialized in which nearly seven-eighths of all public and private sector alternative energy investment worldwide now goes to deploying this small number of technologies that would not otherwise be profitable without government subsidies (Victor and Yanosek 2011). In short, the low price of fossil fuels relative to most

⁵³ In the US, for example, tax credits and depreciation benefits make up more than half of the after tax returns of conventional wind farms and two-thirds of solar energy projects, while the federal government provides nearly \$1.50 per gallon of corn-based ethanol (Victor and Yanosek 2011).

alternative technologies has created an industry that is unable to scale-up and/or compete without generous government largess.

The second problem (which is also largely related to the first) is the extent of fossil energy's market entrenchment. That is to say, the apparent inertia present in the energy shift is not solely the result of prohibitive price differentials, but is also intimately related to the institutional structure of energy production and consumption. Conventional fossil fuel benefits not only from its relatively low price, but also from the fact that its enabling infrastructures, global supply and value chains, consumer biases and behaviors, etc., are already well established and deeply entrenched, while those of alternative energy remain largely undeveloped (Yanosek 2012).⁵⁴ Given the sheer volume of high-risk capital investment required to build these infrastructures and supply chains, few technologies have ever actually been afforded the opportunity to become *capable* of competing with fossil energy.⁵⁵ This is why large-scale energy transitions from one primary energy supply to another have historically been extremely gradual and incremental processes that span several decades.⁵⁶

While this may seem obvious, the presence of an existing market meeting all of the demand for the product in question renders alternative energy an extreme outlier as a developmental state project, and presupposes a categorically different role for the state in facilitating the project.

⁵⁴ This relationship is obviously dialectical to the extent that one of the main reasons why fossil energy is comparatively cheap is because of its entrenchment, and one of the reasons that it remains entrenched is its low price.

⁵⁵ This has been the case not only for large-scale energy production technologies (e.g., coal CCS systems and next generation nuclear reactors, for example), but also storage and transport capacities that would allow renewable technologies to fully mature.

⁵⁶ For example, the shift from biomass to coal in 18th century Europe and America took over 100 years to fully mature, and only did so with the combined development of James Watt's compact steam engine, the broad development of the railroad, and the onset of the Industrial Revolution (Yanosek 2012).

That role is what I refer to as ‘state-led creative destruction’ (MacNeil 2012, forthcoming).⁵⁷ Put simply, given that alternative energy maintains no economically-reified use-value to justify its higher price vis-à-vis conventional energy (and thus cannot generate its own demand to prompt a broad shift in energy provision), governments are required to play a key role in closing the gap between the price of conventional and alternative energy to support the market, as well as help overcome a series of critical market barrier that these technologies face (see Table 5.1). In this endeavor, ‘push policies’ aimed at increasing the supply of new technologies have finite limits. The majority of the work must be done through ‘pull policies’, or government regulation designed to artificially raise the price of conventional energy, and thereby gradually undermine and ‘destroy’ it.⁵⁸

This need for regulation turns out to be an unfortunate pre-requisite under conditions of neoliberalism, as anti-regulationism has long stood as one of the more unequivocal characteristics of neoliberal ideology. Worse still, while American neoliberalism has developed as an anti-regulatory creed broadly, it has reserved special indignation for environmental regulation, viewing it as the product of over-zealous special interests that would sacrifice economic growth for dubious environmental protections. When combined with a series of structural factors specific to the American energy market and federal legislative process, this

⁵⁷ This form of creative destruction is categorically different from the term’s Schumpeterian roots. Rather than a market-driven process creating new cycles of accumulation through the annihilation of outdated or overly-costly technologies or industrial processes, this brand of creative destruction is, at base, a state-led project guided by non-market prerogatives, taking aim at technologies, processes, and industries not prepared to die of their own volition (see MacNeil 2012).

⁵⁸ I am not necessarily trying to suggest that the only goal of climate regulation is simply an attempt to foster alternative energy markets. To be sure, there are many other specific interests and logics that come to bear on governmental attempts to cap and reduce carbon emissions. In the main, however, the attempt to place finite restrictions on carbon emissions or put a price on them stands as an integral element of the shift to a post-carbon economy. Put simply, the goal of regulation in any context is to reduce, limit, or eradicate undesirable behaviors. Fossil fuel consumption (but not *abstract energy consumption*) is, in this context, an undesirable behavior which the government is seeking to eradicate in order to move onto a new mode of regulation around energy usage.

aversion to regulation has rendered it all but impossible to establish formal federal climate regulation in the US.

Table 5.1
Common barriers to novel energy technology deployment

Barrier Category	Sub-Barriers
Cost-Effectiveness	• High Costs: up-front costs of new technologies and infrastructures; limited purchasing capacity and access to financing for small businesses and low-income households; high maintenance costs typical of ‘first-of-a-kind’ technologies • Technical Risks: high up-front capital costs, excessive downtime, high operating and labour training costs; lack of standardization. • Market Risks: lack of demand for new technologies; high cost relative to existing technologies; possibility (if not guarantee) that second-generation technologies will be much better and cheaper – thus creating an incentive not to support the technology’s early incarnations. • External Benefits and Costs: most GHG emissions still do not have a market price in the US, and thus the value of emissions reductions is not a financial priority when businesses make capital investments or individuals and households make personal decisions. • Lack of Specialised Knowledge: first-purchasers of new technologies are forced to incur training costs for workers – which tend to be high with advanced technologies.
Fiscal Barriers	• Competing Fiscal Priorities: the presence of generous distortionary tax subsidies for conventional energy producers like coal, oil, and natural gas. • Fiscal Uncertainty: long history of ‘short-duration’ tax policies for alternative technologies (typical of US energy policy over the past thirty-five years) have led to tremendous uncertainty surrounding the future presence of fiscal incentives and tax credits; immense variability at the state and local levels renders a confusing patchwork of GHG policies across the country.
Regulatory Barriers	• Competing Regulatory Priorities: overly weak regulations regarding power plants, fuel economy standards, building codes, combined power and heat regulations, etc., that favour conventional energy sources and militate against innovation. • Regulatory Uncertainty: varying political priorities of changing governments at the federal and state levels (e.g., states joining and later withdrawing from regional climate treaties, etc.; finer points regarding site regulations for offshore wind farms, changing codes and standards, etc.).
Statutory Barriers	• Competing Statutory Priorities: distortionary policies such as hundred-year-old bans on private wires crossing public streets (which prohibit feed-ins in many instances), laws prohibiting energy-saving performance contracting, a lack of rate-based recovery for efficiency investments, etc., all of which favour maintaining conventional energy sources. • Statutory Uncertainty: a range of unknowns regarding future statutory laws including, for example, the legal status of surface injections of CO₂, and subsurface ownership of methane, etc.

Intellectual Property Barriers	• Intellectual Property Transaction Costs: costs associated with obtaining and enforcing patent rights and potential for anti-trust challenges stemming from technological collaborations. • Anti-Competitive Patent Practices: prohibitive patent tactics like warehousing, ‘submarining’, blocking, and suppression.⁵⁹ • Weak International Patent Protection: adequate patent protection may be inconsistent or non-existent in emerging markets, thus discouraging investors. • University, Industry, Government Perceptions: changing political perceptions regarding the state’s role in industrial development serves to enhance the general air of insecurity surrounding alternative energy technology development and commercialization.
Other Barriers	• Incomplete and Imperfect Information: lack of information about new innovations; misinformation and myths about new technologies; high costs of gathering and processing information about new technologies and their potential benefits, etc. • Infrastructure Limitations: inadequate transmission lines; outdated electrical grids; lack of liquid natural gas terminals and other infrastructures required for moving energy; inadequate supply and distribution sources; lack of complementary technologies (e.g., large scale electric storage technologies), etc. • Industry Structure: the energy market in the US is dominated by powerful monopolies capable of crushing small-scale competition from emerging technologies. • Misplaced Incentives: most common types of misplaced incentives in the energy market occur when the buyer/owner are not the consumer/user. A classic example is the tendency for landlords to avoid high up-front cost investments in energy efficient technologies that will save money over the course of time, when their tenants carry responsibility for paying utility bills.

Source: Committee on Climate Change Science and Technology Integration 2009

The purpose of this chapter is thus to establish the nature of the dilemma for Washington’s technology-centric climate policy. While the logic of state-led technological development has emerged as a primary driving logic of US climate policy, its reliance on prohibitive regulation of conventional energy to generate its own demand places this logic in constant tension with neoliberalism’s anti-regulatory underpinnings.

Initial signs of life: the developmental state and alternative energy, 1978-1981

⁵⁹ These tactics are common in the case of ‘pioneer’ patents. They all represent various ways of blocking an innovation from being opened to competing producers and thereby mainstreamed with competition and lower prices for the technology.

While an increasingly sophisticated developmental state apparatus was consolidating throughout the 1970s and 1980s in Washington, this very same time period would see the emergence of the dual problems of a major global energy crisis and the rising prominence of the problem of global climate change. For its part, the notion of deploying government action to begin to address climate change represented the culmination of decades of concern over the issue within various federal agencies. While it is often thought of as a fairly recent concern, the federal government first began intently studying the earth's atmosphere beginning in the early 1940s through the Office of Naval Research with the goal of understanding both the potential for manipulating weather patterns to improve agricultural yields, as well as developing 'climatological warfare' methods (which, at the time, were considered to be potentially more potent than nuclear warfare, capable of inflicting immense damage on the military and industrial capacity of enemy countries by inciting relentless droughts, floods, snows, hurricanes, etc.) (Weart 1997). As early as the late 1950s, much of these studies incidentally began to reveal the immense fragility of the earth's atmosphere, and the possibility of undesirable climatic changes resulting from burning fossil fuels and increasing GHG concentrations in the atmosphere. Beginning in the early 1960s, these discoveries helped to prompt the formation of entities like the Environmental Science Services Administration (ESSA), National Oceanic and Atmospheric Administration (NOAA), the Climatic Impact Assessment Program (CIAP) and the Committee on Climatic Variation within the National Academy of Sciences, as well as a six-fold increase in atmospheric research throughout the 1960s (Weart 1997). A final series of extremely ominous studies (in particular two DOD studies entitled *Features of Energy-Budget Climate Models: An Example of Weather Driven Climate Stability* and *The Long Term Impact of Atmospheric Carbon Dioxide on Climate*, as

well as the National Academy of Science's 'Charney Report') would help to firmly establish climate change policy as a potentially serious federal priority, and helped initiate the introduction of fifteen small climate bills throughout the late 1970s (Ibid). For its part, major concerns about American energy security had been growing for close to a decade in the wake of 1973 Oil Crisis (in which members of the Organization of Arab Petroleum Exporting Countries implemented an embargo on oil exports to the US)⁶⁰ and the 1979 Oil Crisis (in which Iranian oil production was interrupted during the Iranian Revolution, followed by serious disruptions in both Iranian and Iraqi oil production during the Iran-Iraq war). These events would indeed help to firmly establish the issue of energy security as a pressing priority for policymakers in Washington (Rutledge 2005).

In many ways, the rising prominence of state-led innovation policies around this time seemed to dovetail rather auspiciously with these two issues, given the obvious potential for technological solutions to the problems, and the potential to foster sizeable market growth in alternative energy technologies.⁶¹ Acknowledging this to be the case, an initial major effort was made by the Carter administration and Democratic Congress to parlay these dual issues into a broad state-led project to seed new markets in alternative and low-carbon energy technologies. Beginning in 1978, the federal government poured an initial \$7 billion into R&D funding for alternative and renewable energy technologies, signed into law the National Climate Program Act of 1978 (which sought to expand federal efforts in climate change research), and oversaw the passage of a series of initiatives, including the formation of the

⁶⁰ The embargo came as a response to Washington's decision to supply military armaments to Israel during the Yom Kippur War. The embargo lasted from October 1973 through March 1974.

⁶¹ This increasingly became an obvious strategy when the Carter administration faced overwhelming environmental opposition for initially proposing a shift from oil to the intense extraction and use of domestic coal as a solution to the energy problem (Weart 1997).

Department of Energy (DOE); the DOE National Laboratory System; the Office of Energy Efficiency and Renewable Energy (EERE); the Energy Tax Act of 1978; the Energy Security Act of 1980; the Renewable Energy Resources Act; the US Synthetic Fuels Corporation Act; the Biomass Energy and Alcohol Fuels Act; Solar Energy and Energy Conservation Act; the Geothermal Energy Act; and the Ocean Thermal Energy Act (Simpson 2001; Dooley 2008; MacNeil and Paterson 2012).

While all of these initiatives (coupled with the general thrust of developmental state activities over this period) seemed to portend the rise of a durable strategy aimed at pushing alternative energy technology development in the US, the difficulty of pursuing such a strategy would soon become apparent. Indeed, in the early 1980s, neoliberalism began to dramatically ascend as the Republican Party's governing philosophy. In 1980 Ronald Reagan was elected president, and though he himself was very much *pro*-developmental state and signed into law the majority of developmental state legislation cited in Chapter 4, Reagan (and increasingly Congressional Republicans broadly) was also staunchly anti-regulationist, pro-business, and pro-oil, coal, and gas industry. In this context, alternative energy and the regulatory intervention required to nurture it made it appear less than ideal as a developmental state project – a conclusion which became immediately apparent in the new administration's views on to climate policy. As Weart (1997) notes,

Ronald Reagan took the presidency with an administration that openly scorned [climate and energy] concerns. He brought with him a backlash that had been building against the environmental movement. Many conservatives denied nearly every environmental worry, global warming included. They lumped all such concerns together as the rants of business-hating liberals, a Trojan Horse for government regulation. The National Climate Program Office found itself serving, as an observer put it, as 'an outpost in enemy territory.' The new administration laid plans to cut funding for CO₂ studies in particular,

deeming such research unnecessary. Everything connected with the subject became politically sensitive (1997: 101).

Indeed, from the very beginning of its tenure in office, the administration would adopt a highly skeptical view of the science behind global warming, based largely on a report that it had commissioned from future George C. Marshall Institute⁶² co-founder Bill Nierenberg. Bucking the growing scientific consensus, the resulting study (referred to as the ‘Nierenberg Report’) effectively suggested that, while some warming was likely, the situation was not nearly as dire as previous reports had indicated. Nierenberg’s report noted that the planet had always experienced cyclical changes in its climate patterns, and with many years before the warming would actually become a major issue, it was likely that human ingenuity and innovation would allow society to adapt when the time came (Oreskes and Conway 2010).⁶³ With world oil prices beginning a dramatic 20-year price decline beginning in 1980 (the result of increased production from other Persian Gulf states coupled with declining demand resulting from the global economic slowdown of the late 1970s and early 1980s), Republican lawmakers sought to stem the tide of the federal government’s alternative energy initiatives (Leggett 2005). These developments would serve as the opening salvos in what would become a decades-long struggle between two major prevailing logics in US climate politics: the anti-regulationist bent of neoliberal ideology, and the compulsion to use state power to create the conditions for novel markets in new technology sectors.

⁶² The George C. Marshall Institute would gain notoriety as the leading conservative think tank aimed at disputing the scientific consensus on climate change.

⁶³ This type of analysis fell directly in line with a deluge of so-called ‘cornucopian’ or ‘Promethean’ environmental analyses being produced around this time. Such analyses came as a response to the so-called ‘limits to growth’ literature that rose to prominence throughout the 1960s and 1970s which sought to underscore the ecological limits to the current course of economic growth and development (see e.g., Meadows et al 1972; Catton 1980). Promethean responses underscored the capacity of human ingenuity and technological development to overcome and offset the planet’s ecological limitations (see e.g., Simon 1980)

Neoliberalism, anti-regulationism & American environmental policy

As an anti-regulatory and atomistic ideology, one of neoliberalism's most important contributions to US environmental policy broadly (and climate policy specifically) has been its prohibitive cultural, political, economic, and social framing of broad concepts like government, the role of the state, taxation, industrial regulation, and the roles and obligations of businesses and individuals. As Driesen (2010) notes, "Framing affects the symbols invoked in political discourse and the selection and portrayal of facts. The ideas of any age influence how governments respond to new circumstances. Ideas matter, and ideas hostile to protective government can cripple our ability to deal with environmental problems" (2010: 4; see also Fletcher 2009). Indeed, at a political level, the ability of neoliberal ideology to frame industrial regulation as the product of "overreaching, meddlesome, and power hungry bureaucrats that would detract from rather than enhance social welfare" would, from the beginning, create massive limitations on Washington's capacity to directly address climate change through regulation (Schroeder and Glicksman 2010: 84). At an economic level, neoliberalism's rejection of the 'precautionary principle' and embrace of a cost-benefit approach to climate would create further limits, particularly to the extent that such an approach implicitly dismisses unquantifiable factors like, for example, responsibilities to avoid harming others or future generations (Brown 2002; Applegate 2010; McGarity 2010; Broadbent 2003). This was further buttressed at a cultural level by neoliberal ideology's promotion of rugged individualism as a social norm, a condition which creates a moral and ethical outlook that implicitly rejects things like global burden sharing, the obligations of individuals and corporations, and duties to aid developing countries (Broadbent 2003; Sinden 2010; Cranor 2010).

With neoliberalism's political, economic, and social ideology underpinning the domestic debate over climate, US policy has often appalled the rest of the world and stood as a consistent source of diplomatic ignominy (Driesen 2010; Cass 2006). Beginning with the first Bush administration's efforts to squelch the establishment of firm reductions targets at Rio in 1991 and continuing with the US delegation's watering-down of the Kyoto Protocol; its obstinate posturing which made it impossible to secure commitments from developing nations; the second Bush administration's repudiation of Kyoto and subsequent campaign to cast doubt on the science of climate change; the American-led establishment of a splinter project (the Asia-Pacific Partnership on Clean Development and Climate, or APP) focused on *voluntary* action and *intensity* targets⁶⁴; the successive rejection of an array of formal system-wide climate bills in Congress; and the promotion of a broader energy policy based on increased fossil fuel consumption and enhanced geopolitical control of the global oil spigot, Washington has undeniably acted as a prohibitive force in the global effort to combat rising GHG emissions (Brown 2002; Lutter and Shogrun 2004; Davenport 2006; Betsill 2000).

Yet America was not always an environmental pariah. A mere ten years before global warming reached the level of international negotiation, the US was widely revered as a (if not *the*) pre-eminent Western leader on environmental issues, having recently unleashed an unprecedented wave of progressive environmental legislation (nostalgically referred to as the 'golden age' of American environmentalism) of which even the most progressive European social democracies could only stand in awe (Clark and Canter 1997).⁶⁵ So what happened? How did it all unravel

⁶⁴ For discussions on the suggested inefficacy of intensity-based reductions targets (as compared with absolute targets) see e.g., Ellerman and Wing 2003; Mueller-Furstenberger 2002. On the suggested inefficacy of voluntary measures, see e.g., Steelman and Rivera 2006; Sullivan 2005; van Vuuren 2002.

⁶⁵ For a good discussion of the European reaction to the explosion of progressive American environmental policy in the 1960s and 1970s, see Andrews 1999; Bomberg and Schlosberg 2008.

so quickly, and what role did neoliberalism play in the sudden sea-change in American environmental policy?

The 'golden age' of American environmental policy

The golden age of American environmentalism represents an admittedly anomalous era in American political history, a time during which a general relenting of the historically individualistic, anti-government posture of American culture created uncharacteristically fertile grounds for the broad expansion of a centralized environmental regulatory apparatus in Washington. While this chapter does not propose anything like a comprehensive analysis of these factors, there are at least few key dynamics worth briefly considering.⁶⁶

First, in the late-1960s and early-1970s specifically, mistrust of large industry in the US was, for a variety of reasons, at historic highs. The notion that countervailing state institutions were required to check the strength of big business and prevent abuses of power thus enjoyed great support, as large corporations increasingly came to be perceived by the growing counter-culture movement as authoritarian institutions guilty of massive environmental abuses, supporting segregation, imposing conformity, and profiting from a calamitous war in Vietnam (Schroeder and Glicksman 2010; Sale 1993; Diamond 1995).

Second, this broad cultural leaning gained political expression and coherence in the form of an explosion of environmental advocacy and lobby groups in Washington. Groups like the Environmental Defense Fund, Earthjustice Legal Defense Fund, Natural Resource Defense

⁶⁶ In the main, one could make a compelling argument that the heightened credibility of government during this era is intimately related to the consistency of economic growth and stability (this is not to suggest that Keynesian policies alone were responsible for this stability, but the American economy nevertheless ran at near full employment and grew at a rate of approximately 5-7 percent for much of the 25 years between 1943 and 1968) and the heightened nationalism of the early Cold War period.

Council, League of Conservation Voters, the Nature Conservancy, and international groups like Greenpeace became increasingly prominent players in federal environmental policy, along with their impressive staffs of lobbyists, lawyers, public relations experts, scientists, and activists. Focusing primarily on litigation, research advocacy, and lobbying, these groups actively engaged the legislative and legal processes throughout this period, helping to ensure that ambitious statutory goals were established (Bryner 2008; Shabecoff 1993; Andrews 1999).

Ironically, a final buttress to government-based responses actually stemmed from the work of market-advocates themselves, as a great deal of economic analysis emerging around this time focusing on the concept of externalities (e.g., Coase 1960; Hardin 1968) traced environmental problems back to the notion of market failure. As noted in Chapter 2, much of this work was based on the idea that whenever the costs of using natural resources are not reflected in market prices, individuals and businesses will perceive them as free, and thus over-exploit them. Ironically, as Schroeder and Glicksman (2010) note, at the time of the birth of the modern environmental movement in the late 1960s⁶⁷, the aforementioned social and ideological context would translate the growing recognition of the problem of market failure and externalities *not* into stronger rights of individual ownership over natural resources (as writers like Coase advocated) but rather in the direction of increased government regulation and command-and-control policies.

⁶⁷ The birth of the modern environmental movement in the US is generally seen as commensurate with the 1962 publication of Rachel Carson's *Silent Spring* – a book which took sharp aim at modern pesticide use and other environmental abuses. Other commonly cited catalyzing events in the birth of the American environmental movement include the deaths of 23 members of the Japanese fishing vessel Lucky Dragon (all of whom died after being exposed to radiation from American hydrogen bomb testing at Bikini Atoll); the Santa Barbara oil spill of 1968; the 'Freeway Revolts' that arose in reaction to the development of the Eisenhower Interstate System throughout the 1960s; and the publication of books like Paul Ehrlich's *The Population Bomb*; Science and Survival and *The Closing Circle: Nature, Man and Technology* by biologist Barry Commoner, which took aim at the reckless course of industry and technology. Incisive critiques of the limits of the original Clean Air and Clean Water Acts of the early 1960s are also seen as providing immense strength to the movement in its earliest days (see e.g., Gottlieb 1994; Maher 2009; Steffof 2002; Sale 1993; Shabecoff 1993).

With industry on the defensive and government programming riding a wave of both popular and bi-partisan legislative support, beginning in 1964 and lasting through the late-1970s, the American Congress would embark upon the passage of an epic string of unprecedented environmental legislation aimed at control of pollution, air and water quality, waste disposal, wildlife, wetlands, industrial and agricultural practices, mining, biological contaminants, inorganic and organic substances, various particulate matters, sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, automobile emissions, and the management of public and private lands (Dewey 2000; Duffy 2003). Bi-partisan support for golden-age programs was indeed impressive, with bills like the Endangered Species Act (an act which put the health of endangered species ahead of all relevant economic concerns) passing the Senate with a unanimous vote of 92-0. By the end of this run, no less than twenty-two major laws had been passed, forcing new environmental and regulatory priorities upon nearly every federal and state agency, and cementing the United States' position as a clear global leader on environmental protection. Included in this manifest of legislation was the National Environmental Policy Act, the Council on Environmental Quality, the formation of the Environmental Protection Agency (EPA), the Clean Air Act amendments of 1970 and Federal Water Pollution Control amendments of 1972, and an impressive set of deadlines for implementation and penalties for non-compliance (Andrews 1999; Clark and Canter 1997). Indeed, the standards put in place were so strong that they were generally considered to be somewhat unattainable at the time, and thus had the effect of prompting significant changes and growth in new environmental technologies.⁶⁸

⁶⁸ This is not to suggest that the development and execution of these policies was ever particularly smooth or pleasant. Indeed, industry was generally an unwilling participant in this process and typically contested this

Neoliberalism and the green backlash

By the late-1970s, however, the country's political, economic, and social context had begun to shift immensely, and this tidal wave of protective environmental legislation quickly began to disappear along with the conditions that initially incited it. Indeed, as the social and economic dislocations of the mid-1970s (stagflation, soaring interest rates, oil shocks, rising energy prices, etc.) began to take a major toll on the public's confidence in government and its ability to manage the economy, advocates of market fundamentalist ideas were provided with a long-awaited opportunity to credibly desecrate Keynesian governance strategies and promote stronger faith in market forces. Around this time, public opinion in the US had begun to dramatically shift away from criticizing big business toward merely wanting to see it restored to good health (Shroeder and Glicksman 2010; Clark and Canter 1997; Dewey 2000).

With capital on the offensive and labour and other progressive forces quickly losing strength (environmental groups not least of whom), the intellectual resurgence of the economic-right was further buttressed by the ascendancy of a series of powerful free-market thinktanks and business councils that poured tens of millions of dollars into lobbying for anti-regulatory policies in Congress (Hacker and Pierson 2010; Nownes 2006; Dryzek et al 2003). The Business Roundtable, a free-market advocacy group formed in response to the passage of the Clean Air and Clean Water Amendments, lobbied hard to bring attention to the supposed drag on the economy caused by the surge of environmental regulation. Particularly influential was a paper published by Murray Weidenbaum, Reagan's Chairman of the Council of Economic Advisors, entitled 'The Cost of Federal Regulation of the American Economy' which

legislative progress every step of the way (see e.g., Dewey 2000).

suggested that, by 1978, the cost of all federal regulations had risen to over \$100 billion per year (Schroeder and Glicksman 2010; Gonzalez 2002).

The aggregate of these social and economic changes (coupled with the ideological resurgence of market fundamentalist thought) had begun to substantially undermine the public and Congress' view of industrial and environmental regulation, and served to grind the progress of golden age legislation to an abrupt halt.⁶⁹ The growing discourses of 'globalization' and a mounting obsession with competitive threats from East Asia and Western Europe suggested that a plausible role for the state was merely to facilitate domestic enterprise in its efforts to keep pace with the rest of the world, and take the necessary steps to attract and maintain investment (Young 2001; Teles 2007). The election of the anti-regulationist Ronald Reagan in 1980 would give voice to this vision in government, and provide ascendant free-market forces with a powerful capacity to directly shape policy from above.

Indeed, the new administration's governing philosophy (and increasingly the philosophy of the Republican Party broadly) would help to create a major fissure in the bipartisan consensus on the environment that had ushered in the golden age legislation.⁷⁰ As Bryner (2008) notes, the Reagan administration's enmity toward environmental regulation was clearly reflected in its appointments to the EPA and Department of Interior (among other agencies) during this period.

⁶⁹ This was obviously not an exclusively American shift. For global perspectives on the green backlash see e.g., Beder 1997; Karliner 1997; Rowell 1996.

⁷⁰ The role and influence of a number of grassroots, right-wing movements specifically aimed at federal environmental policy is also worth noting. Examples of such groups that rose to prominence throughout the 1970s and 1980s include the Wise Use Movement, the Property Rights Movement, the County Supremacy Movement, and States' Rights Movement, all of which sought the rollback of federal intrusions and regulations on privately held lands. These movements became prominent particularly in the wake of the Sagebrush Rebellion of the mid-1970s, an instance in which lawmakers in western states began to demand the transfer of federally owned lands within their states back to the states themselves in order that they could be used for economic development (see Switzer 1997). All of these groups sought to draw further attention to the perceived detriment of overreaching federal land and environmental policies.

Individuals like James Watt, William Clark Jr., Donald Hodel (all Secretaries of Interior), Anne Buford, William Ruckelshaus, and Lee Thomas (all EPA heads), were staunch anti-regulationists, and rejected many of the golden age laws and statutes they were responsible for implementing and upholding – viewing them as anathema to the state’s goal of providing a favourable regulatory context for industry. Environmentalism thus increasingly evolved into a pre-eminent ‘wedge issue’ between the two major parties, underscoring the growing divide between the GOP’s rhetorical commitment to smaller government, decreased regulation, and lower taxes, and the Democratic Party’s continued support for Keynesian economic management and golden age environmental protections (Agnone 2007; Burstein and Linton 2002). Though this polarization and the GOP’s anti-regulationist agenda ebbed and flowed throughout the 1980s with the administration’s fluctuating popularity and the resurgence of a new generation of environmental advocacy groups later in the decade⁷¹, the further radicalization of the Republican Party throughout the 1990s would ensure that the bi-partisan support required to establish new environmental laws and programs had all but faded (McCreery 2010).

The challenge of US climate policy: neoliberalism, energy markets & Congress

This was the changing political arena into which the first serious debates over climate change entered in Washington. As noted above, while some officials in the Democratic Party (answering to their increasingly consolidated environmental base) sought legislative opportunities to address climate and build support for alternative energy markets, the GOP

⁷¹ In reaction to the attempted regulatory rollbacks and desecration of environmental values propagated by the administration, the 1980s and early-1990s saw the birth of a new generation of environmental groups aimed at countering the onslaught of anti-regulationist policies and anti-environmental discourse. Included in this are groups like the Center for Health, Environment, and Justice; the Earth Island Institute; Rainforest Action Network; Environmental Working Group; and the National Environmental Trust, among many others.

increasingly established a hard-line on the issue (particularly after the mid-term elections of 1994), framing further environmental regulation as onerous to domestic business, and climate change itself as a hoax.⁷² Yet while the broad anti-regulatory slant of neoliberal ideology would prove influential enough on its own in prohibiting the passage of climate regulation, it would further dovetail with a host of structural factors related to a) the American energy market, b) the federal legislative process, and c) the two parties' electoral coalitions, to render the proposition as yet impossible. It is this combination of factors (discussed in turn below) that has subsequently pushed the shape of policy in the alternative directions discussed in the following chapter.

Energy production, consumption & legislation – American style

When assessing the prospects of any type of comprehensive national policy in the US, one ever-present factor is the potential for inter-regional conflict among the country's half dozen distinct regions. As Lee (2001) notes, the history of national policy in the US has indeed been one of heated regional battles over the direction of legislation, with relatively small regions with particular vested interests often gaining control over specific issue areas. While managing such battles has remained a difficult task even with relatively simple issues, the remarkably broad distribution of fossil energy resources across the American mainland has made climate regulation a uniquely complicated endeavor. With four states responsible for producing the

⁷² Much has already been published about the role of climate skepticism in the United States, and while it is an important part of the discussion about US climate policy, it is not particularly germane to the argument that I am making here. To be sure, neoliberalism's anti-regulationist ideology has rendered these constituencies anathema to *all forms* of environmental regulation, not simply ones that might be based on bad science. Put differently, the reason that these groups oppose climate regulation is not simply that they perceive climate science to be fake, but rather that they do not want to be regulated or pay higher taxes. The 'climate change conspiracy' is, in reality, just a useful way to cast aspersions on undesirable regulation. For good analyses of climate skepticism in the US, see e.g., Washington et al 2011; Norgaard 2011; Grundmann 2007; Jacques 2009; Hulme 2009. For an example of the types of first hand arguments being made by climate skeptics, see e.g., Inhofe 2012; Delingpole 2012; Carter and Stacey 2010; Borelli 2012; Zurbine 2012.

lion's share of the country's oil provision⁷³, eight responsible for the majority of natural gas production⁷⁴, and another fifteen responsible for the majority of the country's coal supply (see Table 5.2), attempts to regulate and reform American energy production is tantamount to an assault on the economies of more than twenty states. Though consuming-states outnumber producing-states by a decent ratio, representatives from producing-states in Congress, in addition to being dramatically over-represented in the Senate (these twenty or so producing states alone have enough senators to prevent any form of climate regulation), have historically managed to establish themselves on important committees with jurisdiction over energy and natural resource policy (Lee et al. 2001). This regional over-representation has historically had the effect of pushing Congress to pass policies aimed at buoying conventional energy (both to protect producing states and bring down energy and gasoline prices in the short-term), while remaining timid on issues like climate and long-term energy security (Bryner 2000).

Table 5.2
Coal producing states by metric tonne

State	Average Metric Tonnes Produced Per Year
Wyoming	307,445
West Virginia	143,568
Kentucky	118,558
Pennsylvania	67,693
Texas	44,904
Montana	34,792
Illinois	30,340
Virginia	29,787
North Dakota	28,368
Colorado	26,433
Indiana	25,369
New Mexico	24,787

⁷³ This list of states includes: Louisiana, Alaska, Texas, and California (USEIA 2012)

⁷⁴ This list of states includes: Colorado, Louisiana, New Mexico, Oklahoma, Pennsylvania, Utah, Texas, and Arkansas (USEIA 2012a).

Utah	24,182
Ohio	20,201
Alabama	17,530

Source: USEIA 2012b

The zeal with which producing states guard against changes to the country's energy policy has been compounded by the historic nature of energy consumption in North America. Indeed, there are deeply entrenched structural differences in the American mode of energy use that render the goal of regulation (or rather the legitimacy of raising energy prices) comparatively more difficult than in other parts of the West. Dalby and Paterson (2008) provide a useful distinction between the prevailing forms of development in Western Europe and the Anglo-American world based on their relative dependence on cheap fossil fuels, referring to them respectively as the 'ecological modernization' bloc and 'carboniferous capitalism' bloc. Whereas Western European development was typically predicated on highly dense settlement patterns (starting as 'walking cities' and becoming increasingly dense with the advent of steel-framed architecture), the US' dominant settlement pattern has been predicated first upon late-nineteenth century 'saucer cities', and later, post-war suburbanization and excessive land development – all of which proceeded on the presumption of ever-cheap and abundant fossil fuel resources (see also Nivola 2010). The result is two rather distinct models of energy use and economic development, and thus two very different structural starting points for climate regulation. With more than fifty percent of its population residing in suburban areas and another twenty percent living in rural areas, a natural or artificial rise in the cost of energy would have dramatically heightened impacts on American industry and lifestyles compared with other parts of the West.⁷⁵ This has important implications for the perceived legitimacy of policymakers raising the price of fossil

⁷⁵ This is not to suggest that there is a lack of continued debate in Western Europe regarding the detriment to economic growth and competitiveness created by GHG emissions reductions efforts.

energy on a public so dependent on their cheap availability – a point which has lent a great deal of credibility to often-exaggerated studies by right-wing thinktanks highlighting the supposedly harmful economic impacts of climate legislation, particularly on individuals and families Bryner 2000).⁷⁶

With regard to the legislative process itself, it bears noting that, with the brief exception of the Depression and post-war eras, the legislative process in Washington has historically been uniquely ill-equipped to execute formal comprehensive regulatory packages like a system-wide climate bill. Indeed, with a federal governmental structure carefully designed to guard against the acquisition of excessive centralized power (complete with a disaggregated executive and legislative branch and a series of prohibitive checks and balances that require either exceptional cooperation or a series of lopsided electoral victories to pass major legislation), the proposition of a comprehensive climate bill implies a legislative gauntlet without much parallel elsewhere in the West.

The first and most obvious element of passage is the attainment of a simple majority in the House of Representatives and a three-fifths majority in the Senate.⁷⁷ This, however, is a considerably more complicated process today than at most points in the country's history, as the consolidation of the major parties' contemporary coalitions over the past thirty years has served to usher in an era of partisan gridlock largely unknown in recent American history (Brick and

⁷⁶ The themes of individualism and anti-taxation that have been so integral to the American experience have made it particularly difficult to regulate energy consumption and, indeed, the idea of personal limitations imposed by climate regulation have been a key trope focused on by anti-regulatory coalitions to reduce public consensus and delegitimize climate legislation (on these themes see e.g., Cohen and Murphy 2001; Paterson 2007). The example of the Canadian Federal Liberal Party's disastrous inclusion of a carbon tax in their 2008 election platform – and successful vilification of the policy by the Conservative government – provides an instructive, if somewhat idiosyncratic, example of this in the North American context.

⁷⁷ The need for a three-fifths majority in the Senate would only be the case if the bill in question was subject to a filibuster, which a climate bill almost certainly would be.

McGreggor 2008). As Hacker and Pierson (2006) note, whereas the first 200 years of American legislative politics were (with obvious exceptions) characterized by loose, interchangeable coalitions and local elections that generally traversed geography and fixed-identity, the modern crystallization of ‘liberal’ and ‘conservative’ coalitions based on rigid values and identities has led to the emergence of highly ideological, ‘lock-step’ party disciplines in Congress that are more reminiscent of European-style parliamentary democracies, but which also lack the historical tendency toward so-called ‘responsible government’ and mixed coalition building that lies at the heart of multi-party parliamentary systems (MacNeil 2012a). Though climate legislation has predictably emerged along these broad partisan battle lines, specific changes in the organizational structures of the two major parties over the past three decades have had uniquely prohibitive knock-on implications for environmental policy. Whereas the golden age of American environmentalism saw a tidal wave of regulatory measures passed with relative bipartisan support, the extensive redrawing of the federal electoral map throughout the 1980s would serve to establish environmental policy as a particularly intractable wedge issue. Among the most crucial elements of this shift is what is referred to as the ‘southern realignment’, through which, beginning in the 1980s, the Democrats began to cede control over their century-old ‘solid south’ base to the GOP, as the Republican Party executed a near wholesale takeover of the South, Rocky Mountain west, and Farmbelt, while the Democratic Party consolidated a more homogenously liberal base in the Northeast, parts of the Midwest, and west coast (Klyza and Sousa 2008; Emison and Morris 2010).

The South’s turn towards the GOP is particularly consequential with regard to climate and the environment for at least two reasons. While the Republican Party was shifting towards a broadly anti-regulationist platform over this period, this broad anti-state philosophy coupled in a

particularly detrimental way with the South's specific historical position on environmental issues. As Klyza and Sousa (2008) note, while the American public tends to claim a broad sympathy for environmental issues (despite rarely supporting them electorally)⁷⁸, southerners, by and large, display much more heightened levels of antipathy towards environmental issues in opinion polls. Much the same can be said of the Rocky Mountain west and Appalachia, which also increasingly embraced the Republican Party after 1980. While many theories have been put forth trying to explain why this is the case, the most compelling has to do with a rather simple theory of space and population density (see e.g., Collins 2012; Emison and Morris 2010). In this conception, states and regions that are predominantly rural and sparsely populated relative to their spatial territory (i.e. most of the solid Republican states) have a culture and worldview that sees the natural environment as, in effect, an endless bounty to be cultivated, extracted, and sold without limits.⁷⁹ The penchant in these regions is thus to exploit rather than protect nature (and, to be sure, a special form of indignation is animated in this context by the imposition of environmental regulations by remote bureaucrats in D.C.). In states and regions where the lion's share of the population lives in densely populated urban centers (i.e. the places where the Democratic base is located), the limits of environmental resources are considerably more apparent to individuals on a day-to-day basis, and thus they are more inclined to support

⁷⁸ For analysis on American opinion polls on the environment, see e.g., Guber 2003; Dunlap et al 2001; Melnick 1999.

⁷⁹ This dovetails with the predominantly Christian worldview of these regions which also sees the natural environment as something of a 'gift from god' that humans may cultivate at will. A famous example of this type of logic specifically on the issue of climate change came from Republican Chairman of the House Committee on Environment and Economy (and also a member of the Committee on Energy and Commerce as well as Energy and Power) John Shimkus, when he rejected the need for action on climate by quoting Genesis 8:21(which takes the form of a conversation between God and Noah after the flood) in which God states "Never again will I curse the ground because of man even though every inclination in his heart is evil from childhood, and never again will I destroy all living creatures as I have done. As long as the earth endures, seed and harvest, cold and heat, summer and winter, day and night will never cease." Shimkus then stated, "I believe that's the infallible word of God, and that's the way it will be for his creation... the earth will end *only* when God declares its time to be over, and man will not destroy this earth...God's word is infallible, unchanging, and perfect" (Samuelsohn 2010).

protection and regulation.

As a result of this electoral realignment, over the past three decades, not only has the anti-regulationist philosophy of the GOP influenced the South's position on regulation broadly, but the South has, in turn, influenced the party's specific position on the environment. With this dynamic in place (and with the party's leadership largely dominated by individuals from these regions), GOP opposition to environmental regulation has become increasingly aggressive over the past thirty years. This process has been further compounded and accelerated by the massive purge of the party's moderate wing across much of the country (and near total disappearance in the Northeast, Midwest, and west coast), which has led to an extremely narrow internal debate on environmental issues (Dunlap et al 2001). To make the proposition considerably worse, the handful of Democratic lawmakers from these regions that round-out Democratic majorities in Congress tend to tow a *local* line on environmental issues, as opposed to the party's *national* policy positions. This means that, even when in possession of the White House and majorities in both houses, Democrats have proved unable to move forward on any progressive environmental legislation.⁸⁰

Struggling against the current: the tattered history of federal climate bills

⁸⁰ This is another unique feature of the US' two-party system. While effectively all state and local electoral politics are organized around the Democratic and Republican Party banners, there is often little continuity between local policy positions and the national positions of each major party (a problem which is compounded by the immense political, economic, and cultural variation between the country's half-dozen regions). This was historically a positive phenomenon given that it led to greater mixed coalition building between the two parties in Washington. In the modern era, however, where the party bases are considerably more consolidated, it has generally placed greater limits on the ability of the National Democratic Party to pursue more progressive social and economic policies, as the small contingent of Democratic lawmakers from rural parts of the country that round out their majorities can rarely be counted on to vote for party line issues. In effect, these representatives get elected based on the credibility of the local Democratic brand, and in many cases campaign on the trope that they are going to Washington to fight against the national Democratic agenda (of, for example, higher taxes, gun laws, marriage equality, environmental regulation, etc.).

These ideological and structural factors have consistently bedeviled attempts by lawmakers to implement regulation capable of structurally handicapping conventional energy. This has played out both at the international level (where both the Clinton and Obama administrations proved unable to gin-up the requisite Congressional support to play a leading role in global climate treaty negotiations – see Grubb et al 1999)⁸¹ as well as in successive attempts to pass national legislation at home. This has been the case in spite of two key developments. First is the US' current under-utilization of another form of domestic fossil energy, its cheap natural gas supplies. These reserves of lower-emitting fossil energy (access to which has continued to increase over the past decade thanks to the growing use of unconventional extraction methods) make the attainment of the paltry reduction targets set in these pieces of legislation fairly straightforward, with some suggesting that natural gas could easily displace roughly half of the country's coal fired power plants by 2020 (US EIA 2009). Second, over the past decade, emissions trading schemes have increasingly earned the broad acceptance of the country's business community as an acceptable means by which to regulate GHGs – particularly following the formation of a pro-trading advocacy coalition called the United States Climate Action Partnership (USCAP) in 2007. Initially led by many of the same large energy conglomerates, banks, and mainstream environmental groups that first helped to put emissions

⁸¹ In the case of Clinton, the attempt to play a leadership role in the Kyoto negotiations was dealt a dramatic blow when the US Congress unanimously passed the Byrd-Hagel bill by a tally of 95-0, which stated that: “(1) the United States should not be a signatory to any protocol...which would (A) mandate new commitments to limit or reduce greenhouse gas emissions for the Annex I Parties, unless the protocol or other agreement also mandates new specific scheduled commitments to limit or reduce greenhouse gas emissions for Developing Country Parties within the same compliance period, or (B) would result in serious harm to the economy of the United States” (US Senate 1997). Adding weight to the clause regarding potential harm to the US economy was the publication of a series of studies regarding the possible effects of Kyoto on American industry and consumers. One particular study released by the Wharton School suggested the Kyoto targets would result in the purge of 2.4 million US jobs, over \$300 billion in lost GDP, a 100 percent increase in electricity prices, and a \$0.65 per gallon increase in the price of gas (Schroeder and Glicksman 2010).

trading on the global agenda in the 1990s⁸², USCAP has gradually consolidated a durable cross-sectoral alliance comprised of major firms representing virtually every major economic sector in the country (Meckling 2011).⁸³ As in the European context, USCAP (along with other major advocates) has deployed the instrumental strength of its extensive lobbying infrastructure to present a unified, economy-wide signal to policymakers in Washington that a large swath of the country’s business community has reached a consensus on climate policy. That consensus, according to USCAP, calls for the establishment of a system-wide cap-and-trade program in the US, with further ambitions to move towards the creation of a single integrated global market for carbon emissions (USCAP 2007).⁸⁴

Yet in spite of this increased momentum over the past decade, sixteen major federal bills (see Table 5.3) and more than eighty non-comprehensive bills (see Table 5.4) featuring ever-growing political-economic support from American industry have died in Congress during this period (Richards and Richards 2008).

Table 5.3⁸⁵
Proposed major climate bills in US Congress, 2003-2010

Proposed Bill	Year	Intended GHG Reductions by 2020	Covered Sources	Primary Reduction Mechanism	Status
Climate Stewardship Act	2003	Maintain at 2000 levels	Electric power, industrial, commercial, transportation petroleum	Cap and trade system	Failed in Senate

⁸² For a nuanced discussion of how this process unfolded, see in particular Meckling 2011, 2011a; Paterson 2012.

⁸³ Notable members of USCAP include BP, Shell, Duke Energy, DuPont, General Electric, AIG, Lehman Brothers, General Motors, Chrysler, Dow Chemical, ConocoPhillips, Environmental Defense, Johnson & Johnson, Natural Resources Defense Council, Pew Center on Global Climate Change, Caterpillar, PG&E Corporation, World Resource Institute, Alcoa, PepsiCo, Siemens, Alcan, the Nature Conservancy, and the National Wildlife Federation (USCAP 2007).

⁸⁴ In addition, calls from the individual states for federal action on climate have become increasingly strong. On May 21, 2009, the governors of 30 US states signed an agreement supporting and urging federal action on climate, citing the need to “create clean energy jobs and industries, protect natural resources, and mitigate costs to consumers and businesses as a basis for supporting federal legislation, and they have agreed to work with Congress and the Administration to create a strong climate and energy strategy” (Center for Climate and Energy Solutions 2009).

⁸⁵ The classification ‘failed in Senate’ includes bills that died either in committee, negotiations, or formal vote.

Clean Air Planning Act	2004	15% below 2005 levels	Generators of electricity	Cap and trade system	Failed in Senate
Climate Stewardship and Innovation Act	2005	15% below 2005 levels	Electric power, industrial, commercial, transportation petroleum	Cap and trade system	Failed in Senate
Clean Power Act	2005	39% below 2009 levels	Generators of electricity	Cap and trade system	Failed in Senate
Global Warming Pollution Reduction Act	2006	Maintain at 2010 levels	Electric power, industrial, commercial, transportation petroleum	Cap and trade	Failed in Senate
Low Carbon Economy Act	2007	Maintain at 2006 levels	Coal facilities; petroleum refineries; natural gas processors; manufacturers and importers of HFCs, PFCs, SF ₆ , and N ₂ O; aluminum smelters, and cement producers	Cap and trade system	Failed in Senate
Climate Stewardship and American Innovation Act	2007	15% below 2005 levels	Electric power, industrial, commercial, transportation petroleum	Cap and trade system	Failed in Senate
Safe Climate Act	2007	15% below 2007 levels	Electric power, industrial, commercial, transportation petroleum	Cap and trade system	Failed in House
Electric Utility Cap and Trade Act	2007	8% below 2007 levels (utilities only)	Electric utilities	Cap and trade system for electric utilities only	Failed in Senate
Climate Security Act	2007	19% below 2005 levels	Electric power, industrial, producers/ importers of petroleum- or coal-based fuels, producers/importers of non-fuel chemicals	Cap and trade system	Failed in Senate
Clean Air/Climate Change Act	2007	6% below 1990 levels (the US' Kyoto obligation)	Not specified	Not specified. Intended to add CO ₂ emissions to list of regulated air pollutants under Clean Air Act	Failed in Senate
Global Warming Reduction Act	2007	15% below 2007 levels	Electric generation, motor vehicles, fuel	Performance standards with the option for an emissions cap and trade system	Failed in Senate
Clean Power Act	2007	17% below 2005 levels	Generators of electricity	Cap and trade system	Failed in Senate
American Clean Energy and Security Act (Waxman-Markey Bill)	2009	17% below 2005 levels	Electric power, industrial, producers/ importers of petroleum- or coal-based fuels	Cap and trade system	Passed in House (Failed in Senate)
Clean Energy Jobs and American Power Act (Kerry-Boxer Bill; Senate	2009	20% below 2005 levels	Electric power, industrial, producers/ importers of petroleum- or coal-based	Cap and trade system	Failed in Senate

counterpart to American Clean Energy and Security Act)			fuels		
American Power Act	2010	17% below 2005 levels	Generators of electricity, petroleum fuels, distributors of natural gas	Cap and Trade	Failed in Senate

Source: Environmental Defense Fund 2012; Center for Climate and Energy Solutions 2012a

Table 5.4
Selected non-comprehensive climate bills in US Congress, 1999-2010

Proposed Bill	Year	Status
S.1369: Clean Energy Act	1999	Failed
S.1949: Clean Power Plant and Modernization Act	1999	Failed; reintroduced in 2003, failed again
H.R.2569: Fair Energy Competition Act	1999	Failed
H.R.2645: Electricity Consumer, Worker and Environmental Protection Act	1999	Failed
H.R.2900: Clean Smokestacks Act	1999	Failed
H.R.2980: Clean Power Plant Act	1999	Failed
S.882: Energy and Climate Policy Act	1999	Failed
S.1776: Climate Change Energy Policy Response Act	2000	Failed
S.1777: Climate Change Tax Amendments of 1999	2000	Failed; reintroduced in 2003; failed again
S.1833: Energy Security Tax Act	2000	Failed
H.R.3384: Energy and Climate Policy Act	2000	Failed
S.556: The Clean Power Act	2001	Failed; reintroduced in 2003, failed again
S.1131: The Clean Power Plant and Modernization Act	2001	Failed
S.3135: The Clean Air Planning Act	2001	Failed
S.1333: The Renewable Energy and Energy Efficiency Investment Act	2001	Failed
S.1716: The Global Climate Change Act	2002	Failed
S.1781: The Emission Reductions Incentive Act	2002	Failed
S.1870: A bill to amend the Clean Air Act to establish an inventory, registry, and information system of U.S. greenhouse gas emissions	2002	Failed
H.R.3037: The Renewable Energy and Energy Efficiency Investment Act	2002	Failed
H.R.4611: National Greenhouse Gas Emissions Inventory Act	2002	Failed
S.389: The National Energy Security Act	2002	Failed
S.597: The Comprehensive and Balanced Energy Policy Act	2002	Failed
S.1008: The Climate Change Strategy and Technology Innovation Act	2002	Failed
S.1293: The Climate Change Tax Amendments	2002	Failed
S.1294: The Climate Change Risk Management Act	2002	Failed
S.932: The Conservation Security Act	2002	Failed
S.1255: The Carbon Sequestration and Reporting Act	2002	Failed
S.892: The Clean and Renewable Fuels Act	2002	Failed
S.17: The Global Climate Security Act	2003	Failed
S.194: The National Greenhouse Gas Emissions Inventory and Registry Act	2003	Failed
S.366: The Clean Power Act	2003	Failed
S.843: The Clean Air Planning Act	2003	Failed; reintroduced in 2006, failed again
S.14 Energy and Climate Change Amendment to the Energy Policy Act	2003	Failed
H.R.1245: The National Greenhouse Gas Emissions Inventory Act	2003	Failed
S.2571: The BOLD Energy Act	2004	Failed

S.2984: Future Investment to Lessen Long-term Use of Petroleum Act	2004	Failed
S.3543: Ten-in-Ten Fuel Economy Act	2004	Failed
S.Amdt.815: Energy and Climate Change Act	2005	Failed
H.R.955: National Greenhouse Gas Emissions Inventory Act	2005	Failed
H.R.2828: New Apollo Energy Act	2005	Failed
H.R.5049: Keep America Competitive Global Warming Policy Act	2005	Failed
H.R.5642: Safe Climate Act	2006	Failed
H.R.6266: 21st Century Energy Independence Act	2006	Failed; reintroduced in 2009, failed again
H.R.6417: Climate Change Investment Act	2006	Failed
S.6: National Energy and Environmental Security Act	2007	Failed
S.133: American Fuels Act	2007	Failed
S. 1018: Global Climate Change Security Oversight Act	2007	Failed
S. 1059: Zero-Emissions Building Act	2007	Failed
S. 1073: Clean Fuels and Vehicles Act	2007	Failed
S. 1168: Clean Air/Climate Change Act	2007	Failed
S. 1324: National Low-Carbon Fuel Standard Act	2007	Failed
S. 1387: National Greenhouse Gas Registry Act	2007	Failed
S. 1411: Federal Government Greenhouse Gas Registry Act	2007	Failed
S.1874: Containing and Managing Climate Change Costs Efficiently Act	2008	Failed
S.1462: The American Clean Energy Leadership Act	2009	Failed
S.2877: The Carbon Limits and Energy for America's Renewal Act	2009	Failed
S. 2776: Clean Energy Act	2009	Failed
S.3464: Practical Energy and Climate Plan	2010	Failed

Source: Center for Climate and Energy Solutions 2012a

Perhaps none of these failed proposals provides a more vivid example of how these bills continue to collapse to in the face of structural impediments than a piece of legislation debated in 2009 called the Waxman-Markey bill and its Senate sister, the Kerry-Boxer bill.

The unspectacular death of Kerry-Boxer

The Kerry-Boxer bill (officially titled the *Clean Energy Jobs and American Power Act*) was neither the first nor likely the last public display of the above-noted structural complications at work, but it was significant for the fact that its House companion (Waxman-Markey) was the first major piece of climate regulation to ever pass the lower chamber (if only by a mere seven votes, despite having a 76 seat Democratic majority and a whipped vote enforcing party discipline). While it therefore demonstrated the growing strength of the pro-carbon trading coalition in the US, its subsequent treatment in the Senate would bring these structural biases

back into clear view. Though the immediate show of Republican indignation was not terribly shocking to observers, the reaction of the Democratic Party's unruly 'blue-dog' coalition (and even some 'liberals') would help to underscore the implausibility of climate regulation's standard legislative passage.⁸⁶ Immediately following the passage of Waxman-Markey in the House, eight Democratic Senators (mostly from coal states and states that produce the majority of their electricity from coal) promptly joined with 33 Republican colleagues in signing a letter to the president indicating their opposition to any such bill, particularly any attempts to enact it through 'back-door' legislation via the budget-reconciliation process.⁸⁷ Following on the heels of this declaration, an even larger group of Senate Democrats composed of both liberals and blue-dogs sent a letter to the Democratic leadership stating that they would not support the bill if it did not provide massive exemptions for the coal industry – a move that would have largely stripped the bill of its intended merit.⁸⁸ Over the following weeks and months, a final crop of five Democratic senators publicly withdrew their support for the bill, variously citing complications related to the 'poor economic climate', but in reality acknowledging the general illegitimacy of such a bill in their home states.⁸⁹ Finally, the small handful of potential

⁸⁶ The term 'blue dog' refers to elements of the Democratic Party considered more conservative – either on social issues, economic issues, or both. They typically come overwhelmingly from traditional Republican strongholds like the South, Rocky Mountain West, and Appalachia.

⁸⁷ This group included Robert Byrd (D-WV), Evan Bayh (D-IN), Robert Casey (D-PA), Mary Landrieu (D-LA), Carl Levin (D-MI), Blanche Lincoln (D-AR), Ben Nelson (D-NB), and Mark Pryor (D-AR) (Americans for Prosperity 2009).

To give a sense of how strong the indignation was toward the bill by some Democrats in coal states, when campaigning to fill Robert Byrd's empty Senate seat in West Virginia in 2010, Democratic nominee (and eventual winner) Joe Manchin released a campaign ad depicting him shooting a copy of the climate bill with a high-powered rifle. <http://www.youtube.com/watch?v=xIJORBRpOPM> (Viewed August 17, 2012).

⁸⁸ This group included Tom Harkin (D-IA), Al Franken (D-MN), Roland Burris (D-IL), Byron Dorgan (D-ND), Herb Kohl (D-WI), Russ Feingold (D-WI), Kent Conrad (D-ND), Michael Bennett (D-CO), Amy Klobuchar (D-MN), Mark Udall (D-CO), Debbie Stabenow (D-MI), and Sherrod Brown (D-OH).

⁸⁹ This final crop included Claire McCaskill (D-MO), Jon Tester (D-MT), Jay Rockefeller (D-WV), Jim Webb (D-VA), and Tim Johnson (D-SD).

Republican supporters of the legislation⁹⁰ all stated their intention to oppose the bill if it came up for a vote, citing various studies regarding the deleterious economic impacts of such a supposedly ‘aggressive’ bill.⁹¹ In the end, despite maintaining the largest single-party Senate majority in a quarter-century (the coveted filibuster-proof ‘super-majority’), Kerry-Boxer would see a full fifty percent of Democratic senators break ranks on the legislation (and 100 percent GOP opposition), rendering it pointless to even put the desecrated bill up for vote. Rightly intuiting the bill’s long odds, the Obama administration kept a substantial distance from the politically-radioactive legislation (beyond a half-hearted support for whipping the bill in the House) and later noted that it had no further intentions to push for a climate bill in its first term.

It is worth noting, however, that even if the bill could have made it through both houses still intact, actors in the federal legislative process would still have a range of secondary opportunities to weaken or even destroy the legislation entirely. First, the bill’s regulatory capacities would be run through the scrutiny of as many as six different committees and dozens of sub-committees in each house, all of whom claim jurisdiction over the formalization of the bill. Each of these committees is likely to be as diverse and ideologically driven as the initial process, guided by their own priorities and answering to their own constituencies (Lee et al 2001). If the bill is still alive in a meaningful way, there still remains the difficult task of

⁹⁰ One could perhaps include here John McCain (R-AZ), Lindsay Graham (R-SC), Richard Lugar (R-IN), Olympia Snowe (R-ME), and Susan Collins (R-ME).

⁹¹ A commonly cited study was one published by conservative policy thinktank the Heritage Foundation which suggested that, over the long-term, Waxman-Markey would “reduce aggregate gross domestic product by \$7.4 trillion; destroy 844,000 jobs on average, with peak years seeing unemployment rise by over 1,900,000 jobs; raise electricity rates 90 percent after adjusting for inflation; raise inflation-adjusted gasoline prices by 74 percent; raise residential natural gas prices by 55 percent; raise an average family’s annual energy bill by \$1,500; and increase inflation-adjusted federal debt by 29 percent, or \$33,400 additional federal debt per person, again after adjusting for inflation” (Beach et al 2009).

funding the legislation. Indeed, the constitution vests the power of the purse in the hands of the legislative branch, where powers are once again divided across at least eight different bodies including both the House and Senate's tax writing, authorizing, appropriations and budget committees, all of whom strongly protect their own powers and objectives, and can disrupt legislative proposals in meaningful ways (Ibid). This is effectively what happened to the Clinton administration's attempt to implement a secondary energy tax in 1993 (again with dual majorities) following the death of the Btu tax proposal – a bill which itself was killed in Senate committee after no less than thirteen major exemptions were made to it (Christiansen 2003; Lisowski 2002). Indeed, in spite of the administration's best efforts in that case, a small handful of senior Senators from both parties managed to chip away at the bill in committee until what eventually emerged after two years of intense battles over energy tax reform was a paltry gasoline tax increase of four cents (Nivola 2010).

Conclusion: circumventing the problem

So this is effectively the rub. Distinguishing itself from other developmental state projects, alternative energy cannot be sustained by its own existing bottom-up demand, given that the demand for energy inputs is, for most consumers, an abstract form of demand that is currently sated by cheap fossil energy. Put simply, while a new laptop or pharmaceutical cure enriches people's lives and thereby generates its own specific demand (as in the case of the state's support of IT and biotech), a new way to turn on the lights does nothing – particularly if the new way is going to cost considerably more money.⁹² At the moment, the only way that this could occur is if the use-value accorded to *clean* energy or a healthy natural environment was

⁹² This problem is obviously compounded if the technology in question is a piece of infrastructure owned by private utilities or governments, and not a piece of individual personal property.

strong enough to persuade a majority of consumers to pay more, or a prohibitive pricing mechanism on GHG emissions was put in place. That not being the case, however, governments are required to close the gap between the price of conventional and alternative energy to support the market. The use of ‘push policies’– in which governments help to bring down the price of new technologies by facilitating and increasing their supply – has finite limits in this endeavor.⁹³ Much of it inevitably has to be accomplished through regulation designed to raise the price of fossil energy, and thereby slowly increase the competitiveness and general demand for alternatives.

In this context, the developmental state project around alternative energy is entirely dependent on the implementation of climate and energy regulation. Yet as this chapter has suggested, the anti-regulationist tenor of neoliberalism – coupled with a host of structural impediments unique to the American context – has rendered this task impossible to achieve in the federal Congress. As we will see in the next chapter, the result is *not* that such regulation has simply failed to take root and subsequently faded from the national agenda. Rather, Congressional gridlock on environmental policy has bred a dynamic climate policy arena around alternative policy pathways that stand in place of a coherent and consolidated national climate policy in Washington.

⁹³ Push policies are discussed further in Chapter 7.

Part III
The Political Engine behind Climate Innovation

Chapter six

Pull policies: Alternative routes to climate regulation

In the previous chapter it was noted that the successful cultivation of a developmental state project around alternative energy relies primarily on the implementation of climate and energy regulation. Regulations, in this context, serve as what are referred to as ‘pull policies’⁹⁴, in light of their capacity to pull new technologies to market by creating effective demand for them. The problem, as was noted, is that the relative strength of neoliberal ideology within in the federal Congress (along with a range of structural impediments) has consistently prevented the passage of any formal national climate regulation in Washington. As noted in Chapter 2, this has led some observers to suggest that the US and its neoliberal political-economic culture is largely anathema to the forms of Ecological Modernization strategies required to oversee the socio-technical shifts presupposed by any serious response to climate change. However, as argued in Chapter 3, by focusing solely on the struggles of the Congressional process, such conclusions overlook the dynamism of the broader policy process within the US state, and the myriad ways that interest groups and policymakers strategically select for alternative policy channels within the broader state apparatus to achieve their goals.

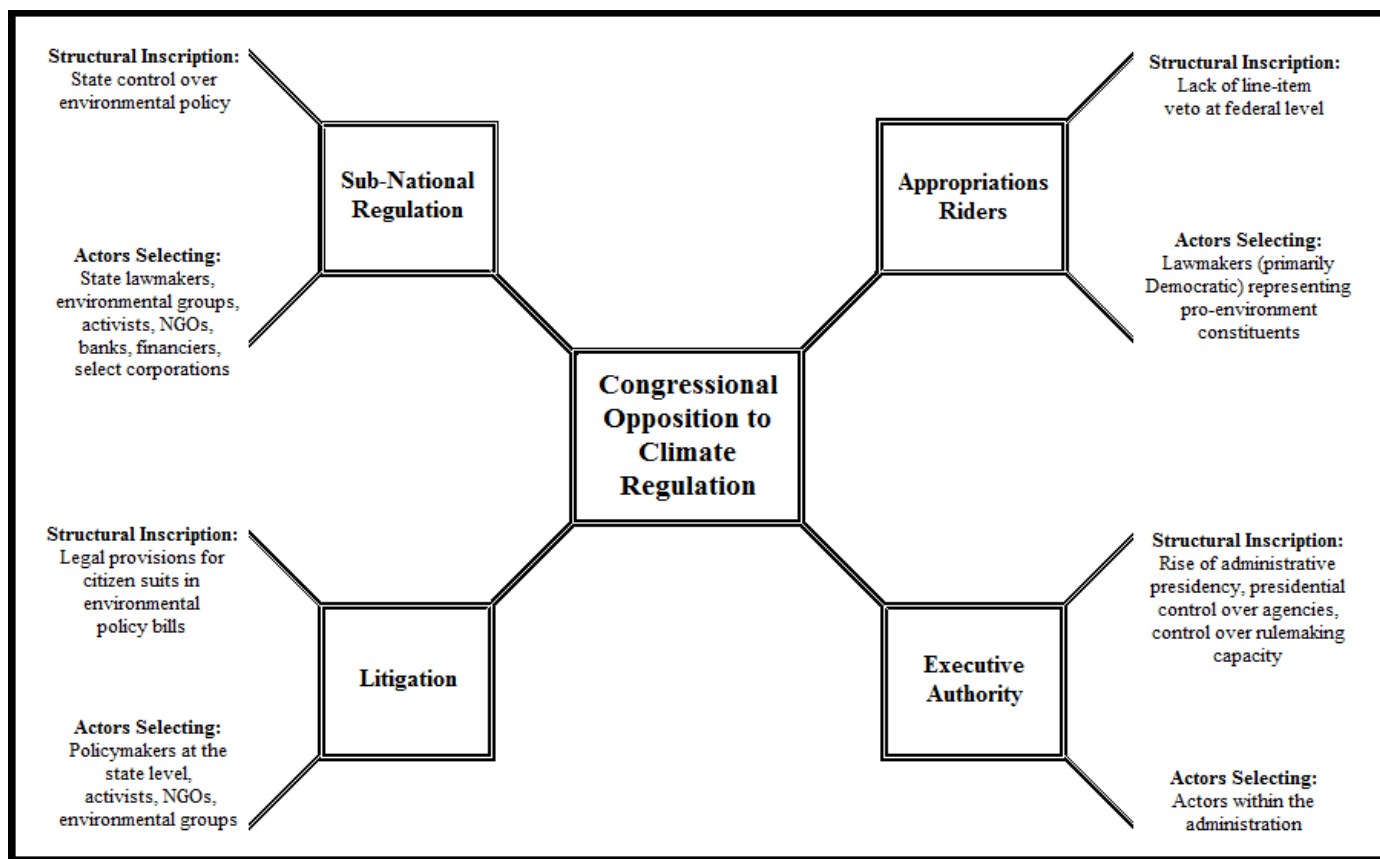
As neoliberal ideology has increasingly prevented the passage of climate regulation in Washington, groups and individuals seeking such regulation have had the option of choosing from an array of structurally inscribed strategic selectivities in the environmental policy process. The combination of these multiple alternative pathways and their penchant to succeed

⁹⁴ The next two chapters make extensive use of the concepts of ‘push’ and ‘pull’ policies for alternative energy technologies. I borrow this framing from Gallagher 2009. It is merely intended as a simple heuristic device for distinguishing between those policies aimed at creating demand for alternatives (pull policies) and those directed at enhancing the supply and further technical evolution of new technologies (push policies).

where traditional legislative channels have failed has, contrary to common depiction, allowed the US to maintain a “vibrant environmental policy arena at the start of the twenty-first century, even as reform impulses confront the institutional and legal legacies of more than a century of state building and the forces that in recent years have tied up Congress” (Klyza and Sousa 2008: 2).

In the climate context specifically, this chapter considers four particularly consequential alternative pathways including: tax policy and appropriation riders, sub-national regulation, litigation against the federal government and industrial polluters, and the use of unilateral executive authority (see Figure 6.1). These recursively selected strategies (which have become both path-dependent and path-shaping in their own right), have allowed for the creation of a relatively coherent set of climate regulations in the midst of a dogmatic anti-regulatory atmosphere. This, in turn, has helped to establish a base-level of politically-generated demand for alternative technologies.

Figure 6.1
Alternative climate pathways – structural inscription and relevant actors



Tax cuts & appropriation riders: working *within* Congress

To the extent that one of neoliberalism’s primary policy objectives is the indiscriminate reduction of taxes on all individuals and businesses, one of the more obvious strategies for establishing pull policies for alternative technologies within Congress has been to simply join in the tax cutting game. With neoliberal ideology increasingly desecrating the passage of regulation and/or government subsidies to alter certain market behaviors, the use of tax cuts has indeed emerged as a crucial strategic selectivity for such objectives over the past three decades. In the context of environmental and alternative energy policy, tax credits and deductions stand as potentially helpful policy mechanisms given how palatable they appear to each of the two major parties. Indeed, while Republican lawmakers typically deplore state

assistance for alternative energy (regardless of the form that it takes), the majority of the GOP will not, on strict principle, vote against a tax reduction of any kind, based (if for no other reason) on the highly ideological principle of ‘bleeding leviathan’. This commitment has been famously formalized by the Americans for Tax Reform ‘Taxpayer Protection Pledge’, which guarantees that signatory members of Congress will refrain from voting to raise taxes or vote against tax reductions under *any* conditions. If Republican lawmakers fail to sign the pledge, Americans for Tax Reform promises to overwhelmingly fund opposition candidates in their subsequent local Republican primary – a threat on which the organization has come good on several occasions. In the current 112th Congress, 236 of the GOP’s 241 House members have signed the pledge, while 40 of the party’s 47 Senators have signed (Americans for Tax Reform 2012).⁹⁵ For most Democrats, on the other hand, tax cuts (as long as they are demand-based tax cuts – that is, reductions for middle and lower income earners) are viewed as a simple element of Keynesian ‘pump-priming’ (in this case at the sectoral level) that can be very useful in contexts like energy and the environment. It is in this structural context that Democrats in Congress have successfully selected for and created a wide array of generous tax policies for alternative energy producers and users over the past two decades, the vast majority of which have been either signed-off on by Republican presidents or passed with the help of Republican Congresses (see Table 6.1).

Table 6.1
Alternative energy tax policies, 1990-2010

Federal Tax Rule
Renewable Electricity Production Credit
Residential Renewable Energy Tax Credit

⁹⁵ For the full list of signatories see Americans for Tax Reform 2012. Two Democratic House members and one Democratic Senator have also signed the pledge.

Residential Solar and Fuel Cell Tax Credit
Alternative Fuel Infrastructure Tax Credit
Business Energy Tax Credit
Alternative Motor Vehicle Tax Credit
Fuel Cell Motor Vehicle Tax Credit
Hybrid Motor Vehicle Tax Credit
Tax Deduction for Energy Efficient Commercial Building Property
Credit for Holders of Clean Renewable Energy Bonds
Clean Coal Facility Tax Credit
Residential Energy Efficiency Tax Credit
Renewable Energy Production Tax Incentive
Small Ethanol Producer Tax Credit
Residential Solar and Fuel Cell Tax Credit
Credit for Production From Advanced Nuclear Power Facilities
Volumetric Ethanol Excise Tax Credit
Advanced Technology Vehicles Manufacturing Tax Incentive Program
Biodiesel and Renewable Diesel Tax Credit
Electric Vehicle Tax Credit
Weatherization Tax Credit
Small Agri-Biodiesel Producer Tax Credit

Source: Committee for Climate Change Science and Technology Integration 2009

The majority of these provisions were passed as part of three major energy policy bills signed into law over the past two decades – the Energy Policy Act of 1992, the Energy Policy Act of 2005, and the Energy Independence and Security Act of 2007. The aggregate of tax expenditures from these policies is estimated by the Congressional Budget Office to cost the federal government over \$12.3 billion by 2015 (Holt and Glover 2007).

While this patchwork of tax credits and deductions can indeed prove capable of helping to ‘pull’ alternative technologies to the market, its capacity to serve as an adequate stand-in for actual regulation has rather obvious limits. In addition to being too small in relative terms to effect serious behavioural changes across the economy, the passage of these tax cuts does not stand in zero-sum relation to fossil energy. That is to say, the same pieces of legislation that have

historically included these provisions have also included considerably *more* generous tax subsidies for conventional energy producers and users. The most glaring example can be found in the Energy Independence and Security Act of 2007, in which, along with tax breaks for alternative energy, Democratic lawmakers also initially included provisions that would a) create a national renewable energy mandate requiring utilities to produce 15% of their power from renewable technologies; b) create a national renewable energy infrastructure fund to be funded by the repeal of over \$21 billion in tax breaks to oil and gas producers; c) raise taxes on oil and gas producers by over \$32 billion; and d) establish a law that would place a price threshold on oil drilled in the Gulf of Mexico requiring oil firms to pay a royalty to the government once the price of oil passed a certain limit (Freeman 2007). Republican lawmakers successfully removed all of these provisions from the final bill, and managed to reauthorize and extend all of the existing tax expenditures for oil and gas producers. The net result of the legislation was that, in effect, the *potential* price of conventional fossil energy was actually reduced in relation to alternative technologies. In short, in order for this type of strategy to be effective, future tax advantages for alternatives must come at the relative expense of fossil energy.

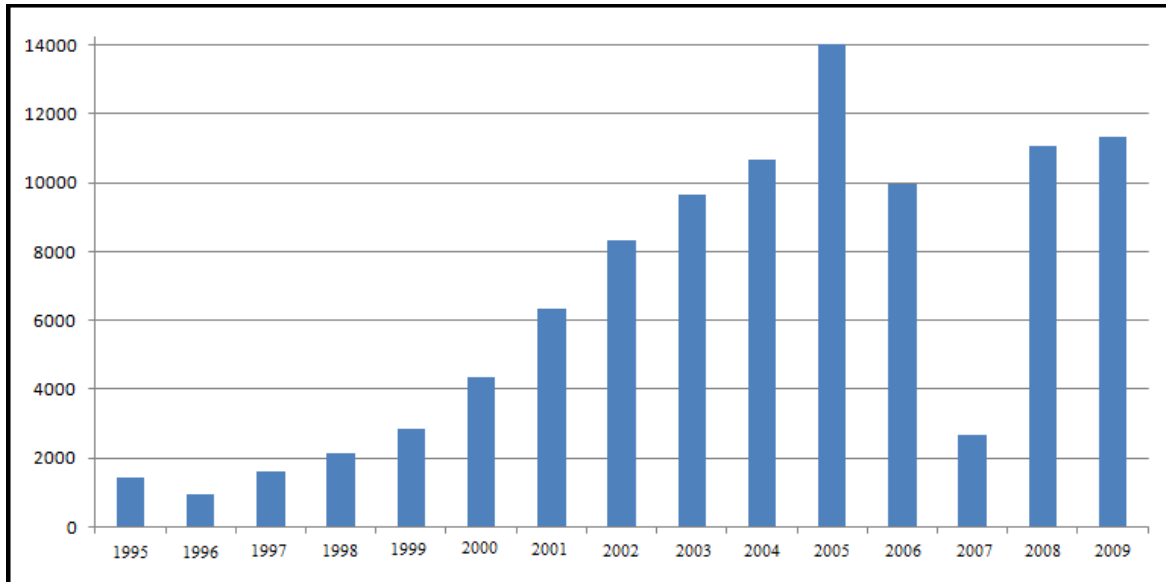
A second increasingly important alternative policy route *within* Congress has been the use of appropriation riders to establish federal subsidies for alternative technologies. Riders have become an increasingly important selectivity (both for policy broadly – see Figure 6.1 – and specifically for environmental objectives) in an era of increased partisan gridlock primarily in light of their relative ease of use in the American Congressional system. Indeed, while most Westminster democracies, by contrast, have rules that make riders quite difficult and rare, the US system features no substantive limits on their use (Frutz 2001; Davidson 1993; Oleszek 2003). In principle, this is not supposed to be the case, as policymaking in Congress (which is

divided between the ‘authorization’ process and ‘appropriation’ process) is supposed to be done entirely by authorizing committees, while appropriations committees are simply supposed to determine funding levels. There is, however, a great deal of flexibility in these rules, and secondary policy directives are very commonly attached to appropriations bills (Frutz 2001; Klyza and Sousa 2008; Tollestrup 2012). Given that appropriations bills are a necessity to fund the government (and given that there is no line-item veto⁹⁶ option for the President in federal policymaking), it is generally unlikely that large and crucially important bills will be struck down over relatively small policy riders.⁹⁷ This makes it possible for otherwise unpopular policies to quietly slip through the legislative process relatively unnoticed and unopposed (Davidson 1993).

Figure 6.2
Increased use of appropriations riders in the US Congress, 1995-2009

⁹⁶ A line-item veto is an option possessed by most governors of American states that allows them to remove individual elements of a piece of legislation (e.g., undesirable riders) without scrapping the entire bill. There have been many attempts to establish a line-item veto rule at the federal level over the past two decades, one of which (the Line Item Veto Act of 1996) was actually passed and signed into law, before immediately being struck down as unconstitutional by the Supreme Court. In 2010, appropriations riders had a total value of \$15.9 billion, and represented a little less than 2 percent of the federal budget (Kane 2010).

⁹⁷ Riders need not even be relevant to the piece of legislation to which they are being attached. For instance, a defense appropriations bill being used to, for example, provide support for US troops in the field of combat could have a rider appended to it aimed at building a piece of infrastructure or beautifying a park in some representative’s local riding. Members of Congress know full well that the president will sign the bill to get the troops the capabilities they require, and thus know that their earmark will pass unscathed.



Source: Citizens against Government Waste 2012⁹⁸

In the context of increased Congressional gridlock around environmental policy, riders have become an important stand-in for traditional legislative passage of progressive environmental objectives. Prominent examples include efforts to have new species listed under the Endangered Species Act, moratoriums on offshore drilling, higher public land grazing fees, the creation of government royalty fees for oil drilling on public lands, stricter rules for mining on public lands, and moratoriums on hunting various species. In the case of establishing pull policies for alternative energy, riders have become an increasingly prominent tool for establishing generous federal subsidies to support these technologies, which otherwise would have difficulty achieving standard legislative passage. Table 6.2 depicts a sample of subsidies and other incentives that have been implemented through the use of riders.

Table 6.2
Alternative technology incentives passed through appropriations riders

Federal Incentive/ Rule

⁹⁸ In 2007, Democratic members of Congress (which took over as the majority party in both houses in January 2007) were asked to sign a ‘no-earmark’ pledge stating that they would not attach riders to any legislation for that year. This explains the ostensibly anomalous data for that year.

Conservation Innovation Grants
Super Energy Savings Performance Contracts
Utility Energy Service Contracts
Clean Fuels Grants
Pollution Prevention Grants
National Hydrogen Learning Demonstration Grants
EPA Ethanol Rule
Federal Gas Guzzler Tax
Appliances and Commercial Equipment Standards
Appliance Energy Efficiency Standards
Efficiency Provisions for Federal Facilities
Energy Conservation Codes for Public and Assisted Housing
Credit for Manufacture of Energy Efficient Appliances
Credit for Construction of New Energy Efficient Homes
Performance Standards for New Buildings
Energy Efficient Labeling for Consumer Electronic Products
Energy Efficient Mortgages Program
Energy Reduction Goals for Federal Buildings
Lighting Energy Efficiency Standards
Low Income Home Energy Assistance Program
Federal Purchasing Standards for Energy-Efficient Products
Advanced Battery Loan Guarantee Program
Advanced Technology Locomotive Grant Pilot Program
Biomass-based Diesel and Biodiesel Labeling Requirements
Carbon Capture Demonstration Grants
Demonstration Grant Program for Local Governments
Energy Efficiency and Conservation Block Grants
Domestic Manufacturing Conversion Grant Program
Commercial Insulation Demonstration Grant Program
Energy Efficiency and Renewable Energy Worker Training Program
Federal Fleet Conservation Requirements
Grants for Biofuel Production R&D
Renewable Fuel Infrastructure Grants
Energy Sustainability and Efficiency Grants and Loans for Institutions
Smart Grid Investment Matching Grant Program
Residential Energy Conservation Subsidy
Renewable Fuel Rules for New Facilities
Grants for Production of Advanced Biofuels
Renewable Energy Deployment Grants
Waste Energy Recovery Incentive Grant Program
Small Business Energy Loans

Source: Committee for Climate Change Science and Technology Integration 2009

Sub-national regulation

In the long history of American federalism, the devolution of environmental policy down to the state level over the past couple decades actually represents a return to the previous course of American state building.⁹⁹ Indeed, from the founding of the republic through the mid-twentieth century, effectively all environmental matters were handled at the state level. Though this may not seem terribly impressive given that environmental policy during this era was not particularly complicated or invasive (mostly consisting of conservation policies around hunting, predator bounties, clear cutting activities, etc.), it remained reflective of the division of labour between federal and state governments existing before the growth of the national administrative state (Klyza and Sousa 2008; Skowronek 1982). Even to the extent that a small handful of environmental regulatory initiatives were implemented in the early New Deal era, the states still managed to claim environmental policy as their relatively exclusive purview. This would change, however, during the so-called ‘golden age’ of environmental policy (discussed in the previous chapter), as states increasingly ceded their authority on the issue to the growing centralized regulatory apparatus in Washington. As this process unfolded, the federal government gradually took over the reins on everything from air and water pollution, to hazardous wastes, toxic chemicals, and drinking water safety. Even the states’ centuries-old control over wildlife, fisheries, private lands, and solid wastes was largely commandeered by overriding federal laws like the Endangered Species Act, Resource Conservation and Recovery Act, Surface Mining Control and Reclamation Act, and the Coastal Management Act, among several others (Ibid). Indeed, by the late 1970s, the states’ role in environmental policy had been downgraded from developers of proprietary policies to overseers of federal ones.

⁹⁹ This general principle is enshrined in the Tenth Amendment to the US Constitution, which states that powers not explicitly granted to the federal government nor prohibited to the States by the Constitution are reserved to the States or the people. This enshrined the idea in James Madison’s Federalist Paper #45 that powers granted to the federal government ought to be ‘few and defined’, while those granted to the individual states may remain ‘numerous and indefinite’ (Constitution Society 2012)

Since the 1980s, however, this trend has been effectively reversed, with states increasingly being asked to take greater responsibility for environmental policy. While this trend began in the 1980s, the Clinton administration and Republican-controlled Congresses of the 1990s sought to institutionalize the new division of labour with the establishment of the National Environmental Performance Partnership System (NEPPS). Under NEPPS, states are required to develop their own performance agreements with the EPA and target resources to the areas that each individual state views as their most pressing environmental concerns. As an incentive-based program, NEPPS further allows for the asymmetrical treatment of states based on their performance records, allowing states with better records to be granted more autonomy and funding (Rechtshaffen 2003; Scheberle 2004). With these new intergovernmental arrangements in place, Rabe (2004) notes that by the late 1990s, states were collectively issuing more than ninety percent of environmental permits, completing more than seventy-five percent of environmental enforcement and disciplinary actions, and relying on Washington for less than twenty-five percent of their environmental program funding.

This shift has had important consequences for both environmental policy broadly and climate policy specifically. In this new structural context in which individual states have had greater policy autonomy bestowed upon them over the past three decades, the same interest groups seeking to influence environmental policy in Washington have increasingly descended upon state capitals seeking to establish a presence and help implement policies that have been stalled in the federal Congress (Posner 2010). As this process has unfolded, state governments have become increasingly responsive to such interest groups, with state policymakers often viewing the situation as an opportunity to render their states industry leaders on issues on which

Washington has balked, and reap the subsequent economic rewards – what Rabe (2006) refers to as a classic ‘race to the top’ dynamic between the fifty states.

For its part, climate policy has been a critical part of this trend. With national legislation failing to achieve passage, dozens of states across the country have established laws and programs of their own aimed at regulating GHG emissions and inciting the growth of greentech industries within their states (Scheures 2008; Rabe 2008; Peterson and Rose 2006; Mazmanian et al 2008). As Rabe (2004) notes, since the mid 1990s, more than one-third of US states have established such programs focusing on everything from electricity generation, to agricultural, transportation, and building code policy. These states have been located in almost every geographic region of the country, and are just as likely to have been implemented by Republican-controlled governments as Democratic ones (Ibid).

To date, one of the primary instrument tools in this effort has been the establishment of Renewable Portfolio Standards (RPSs) – which mandate that state utilities generate a given percentage of their electricity from renewable sources. Of the dozens of states with RPSs in place, the unlikely forerunner has been Texas, which under Governor Bush in the late 1990s passed the Restructuring of Electric Utility Industry, requiring utilities to generate a power load equivalent to approximately three percent of the state’s capacity through renewable sources by 2009 (Rabe 2004). By 2012, twenty-nine states and two territories had RPSs in place, with some of the more ambitious goals coming from New York with its goal of reaching thirty percent by 2015; Maine with its goal of thirty percent by 2020; and California which has aimed to reach thirty-three percent by 2020. Many of these states have also passed various laws as part of their RPSs mandating that new power plants meet strict carbon performance standards,

while others have required utilities to invest in offsets for certain portions of their emissions (CCCSTI 2009; Lutsey and Sperling 2008).

In addition to RPSs, twelve states have established strict targets to reduce stationary emissions of GHGs below certain baseline levels – the most notable example being California’s Global Warming Solutions Act which establishes a comprehensive program to reduce GHG emissions from all stationary and non-stationary sources across the state below 1990 levels by 2020, with mandatory caps on major emitters taking effect in early 2012 (Urpelainen 2009 – see also Chapter 8). As of 2010, twenty-eight other states had produced an array of formal plans to reduce emissions, including strategies like vehicle-use reduction plans in Georgia, mandatory reporting of CO₂ from power plants in Wisconsin, and multi-pollutant standards for fossil fuels in New Hampshire (Posner 2010). Eighteen states are currently developing transportation policies and urban development planning aimed at improving efficiency and reducing automobile usage through transit infrastructure plans and other congestion management strategies. California has once again emerged as a leader in this area with its adoption of a law mandating reductions in tailpipe emissions of GHGs – which was subsequently adopted by the Obama administration in May 2009 in yet another instance of the famed ‘California effect’ (Mazmanian et al 2008).¹⁰⁰ A host of states, most notably Nebraska, have worked GHG reduction strategies into their agricultural policies by working with farmers to improve soil

¹⁰⁰ Some have viewed state level passage as something of a ‘backdoor’ to passage at the federal level. Many have referred to the so-called ‘California effect’ as an example of this. For Vogel (1995), the California effect refers to the way that environmental regulations implemented in one powerful and influential locality can pressure manufactures that sell their products there to improve performance standards elsewhere. In Vogel’s book *Trading Up: Consumer and Environmental Regulation in a Global Economy*, the author uses the example of California’s tighter auto emissions standards established by the California Motor Vehicle Pollution Control Board in 1966. In this case, California’s auto market proved to be large enough to force car manufacturers to improve their hydrocarbon and carbon monoxide standards in order to maintain their ability to sell cars in the state. Given that it made little sense for these companies to produce one special type of car just for California, these models of cleaner, more fuel-efficient cars were mainstreamed across the US market, and federal standards were soon implemented to match California’s.

conservation techniques and enhance its carbon storage capacity. Other states are establishing increasingly strict codes for energy use in commercial and residential buildings aimed at reducing energy consumption and increasing efficiency. For their part, municipal governments also have become key points of access for climate policy as well, with the mayors of more than 700 American cities participating in the Mayor's Climate Protection Agreement, which urges cities to develop emissions reductions strategies through policy areas like transportation and building codes (see Table 6.3 for a larger list).

Table 6.3
List of state-level pull policies

States (& D.C.)	GHG Emissions Target	RPS	Vehicle GHG Standard	Climate Action Plan	GHG Reporting & Registry	Green Technology Reinvestment Fund	Green Pricing Program	Biofuels Mandate/ Incentives	Energy Efficiency Resource Standard
Alabama				✓	✓	✓	✓		
Alaska				✓				✓	
Arizona	✓	✓	✓	✓	✓	✓	✓		
Arkansas				✓				✓	
California	✓	✓	✓	✓	✓	✓	✓	✓	✓
Colorado	✓	✓	✓	✓	✓		✓	✓	✓
Connecticut	✓	✓	✓	✓	✓	✓	✓	✓	✓
D.C.		✓							
Delaware		✓		✓	✓	✓	✓		
Florida	✓		✓	✓	✓		✓		
Georgia					✓		✓		
Hawaii	✓	✓		✓	✓		✓		
Idaho				✓	✓		✓	✓	
Illinois	✓	✓		✓	✓	✓	✓	✓	✓
Indiana					✓		✓	✓	
Iowa		✓		✓	✓		✓	✓	
Kansas					✓			✓	
Kentucky				✓	✓		✓	✓	
Louisiana					✓		✓	✓	
Maine	✓	✓	✓	✓	✓	✓	✓	✓	
Maryland	✓	✓	✓	✓	✓		✓	✓	
Massachusetts	✓	✓	✓	✓	✓	✓	✓		
Michigan					✓	✓	✓	✓	
Minnesota	✓	✓		✓	✓	✓	✓	✓	✓
Mississippi							✓	✓	
Missouri		✓		✓	✓		✓	✓	

Montana		✓		✓	✓	✓	✓	✓	
Nebraska							✓		
Nevada		✓		✓	✓	✓			✓
New Hamp.	✓	✓		✓	✓	✓			
New Jersey	✓	✓	✓	✓	✓	✓	✓		✓
New Mexico	✓	✓	✓	✓	✓	✓	✓	✓	✓
New York	✓	✓	✓	✓	✓	✓	✓	✓	✓
N. Carolina		✓		✓	✓		✓	✓	✓
N. Dakota							✓	✓	
Ohio					✓	✓	✓	✓	
Oklahoma					✓		✓	✓	
Oregon	✓	✓	✓	✓	✓	✓	✓	✓	
Pennsylvania		✓	✓	✓	✓	✓	✓	✓	✓
Rhode Island	✓	✓	✓	✓	✓	✓	✓	✓	
S. Carolina				✓	✓		✓	✓	
S. Dakota							✓	✓	
Tennessee				✓	✓		✓	✓	
Texas		✓	✓		✓	✓	✓	✓	✓
Utah				✓	✓		✓	✓	
Vermont	✓	✓	✓	✓	✓	✓	✓		✓
Virginia	✓	✓	✓	✓	✓		✓	✓	✓
Washington	✓	✓	✓	✓	✓		✓	✓	✓
W. Virginia					✓				
Wisconsin	✓	✓	✓	✓	✓	✓	✓	✓	
Wyoming					✓		✓	✓	

Source: Committee for Climate Change Science and Technology Integration 2009

Perhaps the most notable example of state-level initiatives, however, is the flurry of regional climate treaties that have evolved over the past decade. While at the time of writing many of these accord are fighting for their political lives (see Chapter 9), as of 2011, thirty-four states had become involved in such treaties (either as formal participants or observer-states), with the combination of the three jurisdictions covering more than 50 percent of US GHG emissions, 61 percent of GDP, and 57 percent of the population base (World Resource Institute 2012) (see Figure 6.4). These include the Regional Greenhouse Gas Initiative (RGGI), whose ten member states¹⁰¹ have capped their CO₂ emissions and pledged to reduce their aggregate power sector

¹⁰¹ For a full list of the participants in each of the regional agreements see Center for Climate and Energy Solutions 2012.

emissions 10% by 2018; the Western Climate Initiative (WCI), whose six member states have set a goal of reducing emissions 15% below 2005 levels by 2020; and the Midwestern Greenhouse Gas Accord (MGGRA) whose six member states are working towards the establishment of a multi-sector cap-and-trade system, new low-carbon fuel standards, and an ambitious regional RPS that aims to have 30% of the Midwest's electricity coming from renewable sources by 2030 (Center for Climate and Energy Solutions 2012).¹⁰²

Litigation strategies and climate regulation

There is an old refrain in American politics that where public regulation is lacking, private litigation tends to fill the void (Fund and Wooster 2000; Morris et al 2008; Farhang 2010). Though the court system has long played an integral role in American environmental policy, the increased inability to pass environmental regulation in the federal Congress over the past three decades has served to enhance this role in a rather significant way. As Klyza and Sousa (2008) note, the contemporary use of courts in the environmental realm is largely the result of two key developments dating back to the rise of golden age environmental policy in the 1960s and 1970s. First, as country's consciousness of environmental issues began to grow during this period, federal judges began to ease standing requirements for individuals and groups filing litigation aimed at enhancing environmental protections and holding polluters accountable under new legislation. In the years immediately following this easing of standing requirements, a series of 'David vs. Goliath' cases began to demonstrate to activists and policymakers the potential importance of the court system – the most notable among these was *Scenic Hudson Preservation Conference v. Federal Power Commission* in 1965, a case in which a federal

¹⁰² At the time of writing, much of the discussion about regional climate treaties has shifted toward the idea of a single integrated North American climate strategy called North America 2050. See North America 2050 2012.

appeals court granted an environmental group standing to sue to block the construction of a power generation facility on the Hudson River, which the group later won. Landmark victories like this animated a flurry of new cases, as litigants were, in effect, merely required to demonstrate that individuals or groups could potentially incur damages or losses in order to gain standing. Second, acknowledging the power of litigation and fearing that federal bureaucracies could not be counted on to properly implement or enforce the new golden age laws, Congressional legislators began including provisions in new environmental bills for citizens' suits against both businesses and federal agencies (Grossman 2006; Harrington et al 2004). These two major openings led both governments and environmental groups to view litigation as a critical aspect of their overall operations. To this end, a series of new and existing environmental groups began to allocate greater resources toward litigation, including the Natural Resource Defense Council, Environmental Defense Fund and Sierra Club Legal Defense Fund, among others.¹⁰³

In this structural context, the failure of climate regulation to achieve any forward movement in Washington has indeed produced a direct path to the court room (Kaswan 2007; Grossman 2003; Salzman and Hunter 2008; Gupta 2007; Stewart 2009). From a standing start in the late 1990s, climate change litigation has grown dramatically over the past decade, with 35 cases attaining federal standing in 2008 alone, and 461 gaining lower level standing as of 2012 (Columbia Law School Center for Climate Change Law 2012). As Engel (2010) notes, with just few years' worth of cases having made their way through the legal system, litigation cannot yet be praised for its effect on net reductions of GHG emissions. However, through a)

¹⁰³ A notable result of this brand of judicial activism has been increased attention to the environmental records of candidates for federal judgeships (Engel 2010).

their authority on issues of statutory interpretation, b) their ability to impose common law liability, and c) their capacity to force government agencies to take action, the courts have already begun to have dramatic effects on climate policy in the US. Recognizing this to be the case, governments and environmental interest groups have generally aimed beyond singular victories and trained their focus instead on cases with the potential to trigger broader regulations by setting key precedents. Examples include cases filed to force the Environmental Protection Agency (EPA) to regulate tailpipe GHG emissions under the Clean Air Act, require federal agencies to assess and regulate their impacts on climate change in line with the National Environmental Policy Act, force industrial emitters to reduce their GHG emissions to avoid adding to the ‘perceived public nuisance of climate change’, and regulate emissions in order to avoid violating international human rights laws (Engel 2010; Bryner 2007).

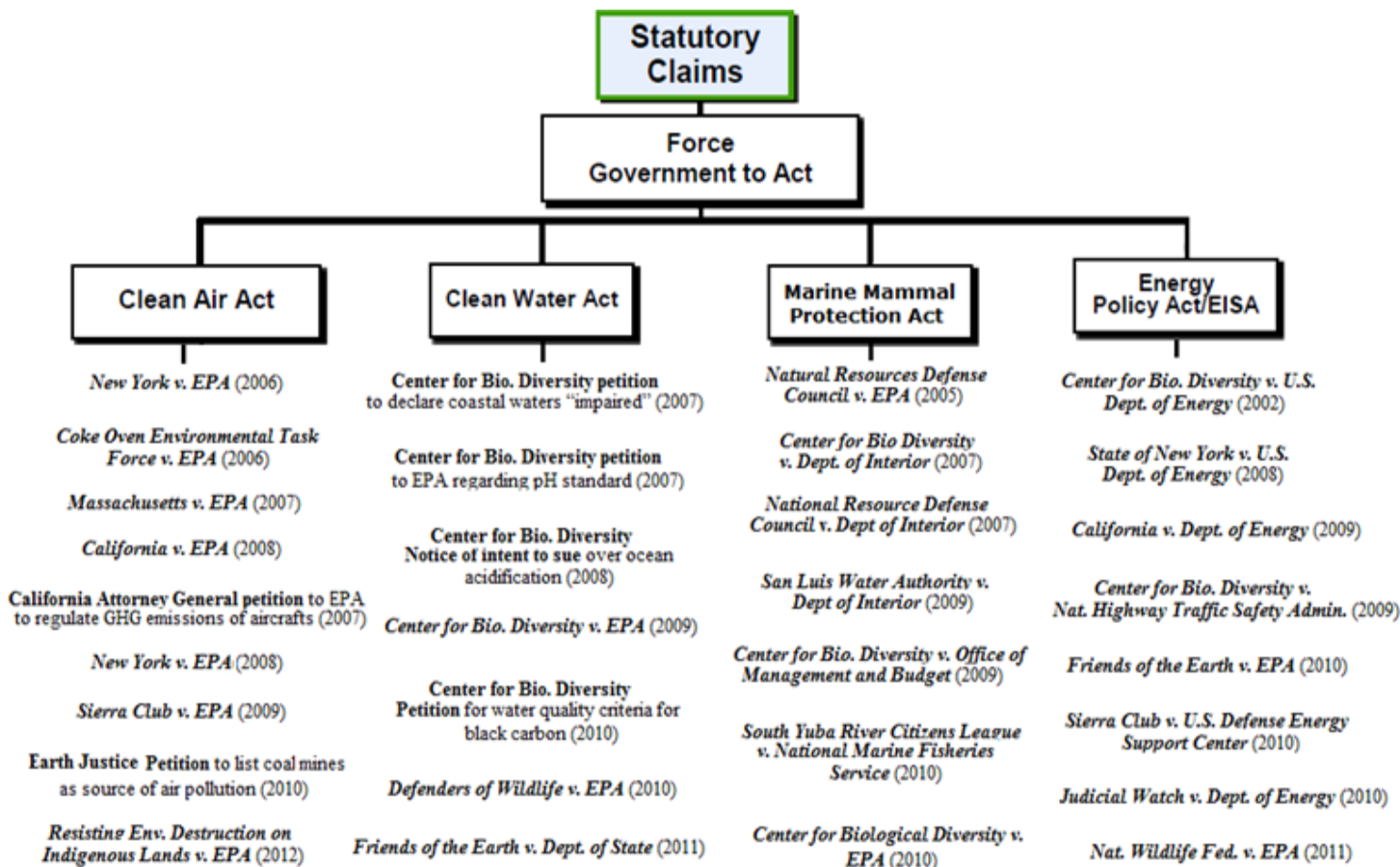
The litigation route further offers a host of secondary benefits to those seeking an alternative to the legislative process. At the level of public relations, the court system, with its supposedly neutral assessment of factual data, has the capacity to depoliticize contentious debates surrounding climate change and climate science by subjecting it to the supposedly rational and objective judgment of the legal system (Hunter 2009). This is further aided as court cases (especially higher profile ones) help to identify and draw attention to the real and sympathetic victims of climate change, thereby underscoring its tangible effects and moving the debate beyond abstract discussions about hypothetical implications for future generations (Ibid). Finally, litigation provides important cues to private industries on the potential magnitude of risk and liability stemming from their GHG emissions, thus highlighting the potential need to

voluntarily reduce emissions or support formal regulation (Posner 2010; Brickman and Ilgen 1985).¹⁰⁴

According to Engel (2010), climate litigation to date has generally taken three different forms – each with different primary objectives. A first type aims to hold industrial emitters responsible for their GHG emissions under common law. These types of suits are typically filed by state governments. Notable examples include an instance in which the state of California sued six major auto manufacturers for common law damages related to GHG emissions, and a case filed by a group of northeastern states against owners of coal-fired power plants in the Midwest. A second strategy, used by both states and environmental groups, aims to force federal agencies to take GHG emissions and climate change impacts into account when making decisions and issuing industrial permits under the National Environmental Policy Act. Notable examples include lawsuits by environmental groups over the construction of new coal fired power plants and the release of methane by from new coal mines. The final and most consequential strategy, once again used primarily by state governments, aims to compel the federal government to regulate GHGs under existing statutory authorities, and thereby trigger broader nation-wide regulation (see Figure 6.5 for selected examples of this strategy). The most important example of this to date has been the case of *Massachusetts v. Environmental Protection Agency (EPA)*, which as of 2011 remains the only climate change case to reach the Supreme Court.

Figure 6.6
Selected examples of statutory climate suits against the Federal Government

¹⁰⁴ Of course, there remains those that highlight the shortcomings of the legal approach. Silverstein (2009), for example, suggests that this reliance on the courts represents a further step back for environmentalists by inciting a ‘juridification’ of environmental policy, and saddling it with the court system’s long delays and changing judicial attitudes toward deferring to administrative agencies.



Source: Columbia Law School Center for Climate Change Law 2012¹⁰⁵

Massachusetts v. EPA

The events leading to the case of *Massachusetts v. EPA* began in 2003 when the state of Massachusetts (along with a host of co-plaintiffs)¹⁰⁶ filed a lawsuit to contest the EPA's rejection of a petition (by the International Center for Technology Assessment) to regulate GHG emissions from motor vehicles under Section 202(a)(1) of the Clean Air Act (Sugar

¹⁰⁵ For full explanations of the nature and outcomes of these cases see Columbia Law School Center for Climate Change Law 2012.

¹⁰⁶ The full list of petitioners included the states of California, Connecticut, Illinois, Maine, Massachusetts, New Jersey, New Mexico, New York, Oregon, Rhode Island, Vermont, and Washington, along with the cities of Washington DC, Baltimore, and New York City, and a range of interest groups including the Center for Biological Diversity, Center for Food Safety, Conservation Law Foundation, Environmental Defense, Friends of the Earth, Greenpeace, International Centre for Technology Assessment, National Environmental Trust, Natural Resource Defense Council, Sierra Club, Union of Concerned Scientists, and US Public Interest Research Group.

2007). This provision requires the EPA to establish and enforce emissions standards for any air pollutant from vehicles capable of endangering public health or welfare. Upon receipt of the petition in 2003, the EPA, under the control of the second Bush White House, responded by stating that a) the EPA lacked the authority under the Clean Air Act to regulate GHG emissions for climate change purposes, and b) even if the agency did have the authority to do so, it had no intentions of acting upon it (Abate 2008).

With the subsequent lawsuit (in which Massachusetts contested these claims by the EPA) eventually reaching the Supreme Court, the nine justices were asked to rule on two primary issues. First, whether or not CO₂ could realistically be considered an air pollutant (as defined by the Clean Air Act) with the potential to endanger human welfare. And second, in the event that it could indeed be considered a harmful pollutant, the court was asked to rule on whether or not the EPA would have the right to decline to set an emission standard for motor vehicles (Monast et al. 2010; Allen and Lewis 2010). The plaintiffs argued that the definition of an ‘air pollutant’ in the Clean Air Act was so ambiguous that there were simply no reasonable grounds (beyond political considerations) for excluding CO₂ as a pollutant. While the petitioners filed immense amounts of scientific evidence demonstrating the toxicity and negative human impacts of climate change resulting from increased concentrations of CO₂, their primary claim was that the question was determined by the phrasing of the statute in the Act, and thus factual debate was effectively irrelevant. Asserting this to be the case, the petitioners further argued that any decision by the EPA to shirk its responsibility to regulate CO₂ and other GHGs would represent a violation of its duties under the law. In response, the EPA argued that it had the discretion under the Clean Air Act to decline to regulate. It further argued that despite the fact that the evidence for CO₂’s relationship to climate change remained incomplete, the agency

was already taking other steps to increase fuel efficiency, and thus had no need to impose regulations upon vehicles.

In a five to four decision, the Supreme Court held in 2007 that GHGs fit well within the Clean Air Act's capacious definition of an air pollutant, and required the EPA to move forward with a formal endangerment finding for GHGs (Monast et al. 2010). While the implications of this ruling are described in detail below, it is crucial to note here that the petitioners' victory in *Massachusetts v. EPA* has subsequently opened the door to a series of similar litigation efforts aimed at forcing the EPA to regulate GHGs under existing statutes. In particular, the state of California has filed several such petitions under the Clean Air Act, including suits aimed at forcing the agency to regulate emissions from airplanes, oceangoing vessels and non-road vehicles and engines (Engel 2010).

Executive authority and rulemaking

The practice of using executive power to impose environmental regulation is by no means a new phenomenon. Pre-dating golden age legislation by several decades, the first president to make extensive use of this strategy was Theodore Roosevelt who, using the administrative discretion granted to the president by the General Revision Act of 1891 and Antiquities Act of 1906, unilaterally established over one-hundred protected forest lands (covering over 150 million acres), eighteen new national monuments (including Mount Olympus and the Grand Canyon – each hundreds of thousands of acres in size), established Pelican Island as the country's first national wildlife refuge, and fifty other major bird and wildlife reserves, all without Congressional approval (Klyza and Sousa 2008). Though the need for such unilateral action declined significantly as both major parties embraced environmental protections

throughout the 1960s and 1970s, the increased inability to move environmental regulation through the federal Congress over the past three decades has served to revive its use and relevance (Lutter and Shogrun 2004).

To properly understand this strategy with specific regard to environmental and climate policy, it is necessary to understand the broader growth of the so-called ‘administrative presidency’ since the 1980s (see e.g., DeConde 2000; Nathan 1983; Durant 1992; Lewis 2009; Rudalevige 2009). Indeed, as the major party bases have become increasingly polarized since the 1980s (subsequently leading increased generalized gridlock in Congress), presidents have been compelled to politicize administrative arrangements and mobilize their control over every aspect of the Executive Branch and its bureaucracies as a means to achieve objectives outside of Congress. Controlling environmental policy through this strategy primarily involves the president politicizing appointments to high-ranking positions in the EPA, Department of the Interior, and Office of Management and Budget, and attempting to coordinate the regulatory systems within these agencies (Bomberg 2001; Shanley 1992; Klyza and Sousa 2008; Arnold and Whitford 2005; West and Sussman 1999). This has been the approach (to a greater or lesser extent) of every presidency since the Carter administration, which first undertook this strategy of using the tools of the administrative presidency to reorient environmental regulation (Lutter and Shogrun 2004).¹⁰⁷

There are at least four primary ways in which this strategy has played out in the environmental policy arena. These include a) the use of constitutional or statutory authority to issue executive orders to agency heads; b) altering the strictness with which laws are enforced by federal

¹⁰⁷ The deregulatory efforts and attempted environmental rollbacks of the Regan era (described in Chapter 5) were also an example of this strategy.

agencies; c) exploiting the open or ambiguous language of statutes to shift policy priorities; and d) using the ‘rulemaking’ process to define and redefine the shape and effect of laws. While all of these strategies have been used by both Democratic and Republican administrations to push policy in either progressive or regressive directions, rulemaking has emerged as the most consequential since the mid-1990s (Lubbers 2008; Struass 1997). Put simply, given that most federal statutes are written in a way that prescribes only the ‘spirit’ and intended effect of the law in question (while failing to describe the actual nuts and bolts of tangible governance), federal agencies are required to produce an ‘agency statement’ to indicate the specific interpretation of the statute and dictate how it will be governed (National Archives 2012). While some statutes leave limited room for this activity, others (for example, the Clean Air Act) provide a great deal of latitude for executive agencies to define the content of the rule, and thus can provide a uniquely potent means to achieve policy goals.

Some of the most important environmental achievements of the Clinton administration were achieved through the rulemaking process, including the implementation of a series of best available technology standards for dozens of air toxins, the strengthening of the Toxic Release Inventory Program, the establishment of new emissions standards for large trucks, stronger wetlands regulation, the adoption of tighter air quality standards for ozone and particulates, the protection of close to sixty million acres of national forest from future development, stricter regulations for hard-rock mining, and increased standards for grazing (Rabe 2010; Bomberg 2001). The rulemaking process was also put to use in the second Bush administration most notably in a series of attempts to reverse Clinton’s progressive achievements by reinterpreting the statutes to reduce regulations. The most publicized example of this came when the

administration took actions to exempt older utilities and industrial emitters from the Clean Air Act's New Source Review standards.

In the climate context, by far the most consequential rulemaking process was that which emerged from the case of *Massachusetts v. EPA*. What the Supreme Court's ruling did in this particular case was force the EPA to reinterpret the Clean Air Act and redefine its rule content with regard to GHG emissions. Nearing the end of its tenure in office, the second Bush administration initially sought to move quickly on this task in order to define the rule on its own terms. With the passage of the Energy Independence and Security Act in Congress in 2007, however, the administration's efforts ground to a halt. Viewing the new legislation as a sufficient means by which to address the same goals, the administration stalled the Clean Air Act rulemaking process, and ran out the clock on its tenure in office without taking action. In response to this failure, several states, local governments, and environmental organizations once again sued the EPA over its failure to produce new regulations in light of the Supreme Court's ruling.

While Bush's EPA failed to take up the task in its final year, in 2009 the EPA (stacked with a new leadership selected by Obama), quickly took up the challenge. Citing resounding scientific evidence of the negative effects of anthropogenic GHG emissions, the agency's endangerment finding officially categorized GHGs as harmful air pollutants requiring regulation (Monast et al. 2010). Though the agency showed reticence when a bipartisan coalition emerged in Congress threatening to pass a law explicitly forbidding it from regulating emissions, the President's indication that he would veto any such bill served to push the plan through to fruition. In December 2010, a full seven years after *Massachusetts v. EPA* was first filed, the

EPA announced that the agency would begin enforcing new industry-specific GHG standards for vehicles under the Clean Air Act. However, though the initial lawsuit and ruling had only taken aim at motor vehicles, additional provisions in the Act referred to as ‘Prevention of Significant Deterioration’ clauses state that once a pollutant is regulated under *any* section of the Act, the EPA is required to regulate emissions of that pollutant from *all* new, modified, and/or existing mobile and stationary sources (Parker and McCarthy 2009). Thus, as part of the settlement with the parties in *Massachusetts v. EPA*, the agency announced that it also would begin regulating GHGs from stationary sources like power plants and oil refineries based on final regulations to be issued toward the end of 2012.¹⁰⁸

While the full scale and scope of these regulations will not be known until after the General Election of 2012 – this comes as an obvious attempt to minimize the political fallout of the regulations – in the meantime, the first round of regulation for *new* facilities – released in May 2012 and governed under Section 111 of the Act, or ‘New Source Performance Standards’ (NSPS) – sets out four primary provisions. First, under the NSPS, power plants, factories, and oil refineries that are currently obligated to buy permits for pollutants that cause smog and acid rain will now be required to purchase credits for GHGs as well. Second, all large polluters will be required to submit annual reports to the EPA disclosing the amount of CO₂, methane, and nitrous oxide they are emitting. Third, those facilities currently emitting at least 75,000 short

¹⁰⁸ While the administration has, in effect, four options for regulating GHGs under the Clean Air Act – these include Section 108-110 (National Ambient Air Quality Standards); Section 111 (New Source Performance Standards); Section 115 (International Air Pollution provisions); and Title VI (Protection of the Stratosphere provisions) – the EPA has opted to make use of Section 111 of the Act – by far the least fraught with potential complication. Section 111(b) provides the EPA the ability to regulate both new sources as well as those undergoing major modifications, while Section 111(d) provides it with the authority to set performance standards for existing sources. Under Section 111, all regulations are implemented through a federal-state partnership, with the federal government first issuing emission guidelines that serve as binding requirements for states, and each state subsequently submitting emissions reductions plans for approval by the EPA (Chettiar and Schwartz 2009).

tons of GHGs per year will be required to use a set of established ‘best available control technologies’ (BACT) when undergoing any major re-tooling. And finally, any facilities emitting more than 100,000 short tons per years will be required to obtain permits for GHGs, even if they have not had to obtain permits for other types of pollutants. Additionally, the agency announced that it will take unilateral authority under the Clean Air Act to issue emissions permits in those states with standards below those outlined in the EPA’s rule.

Conclusions: The best of a bad situation

The point of the preceding chapter is not to suggest that these alternative routes to climate regulation are sufficient to achieve the levels of effective demand required to durably support a federal project around alternative energy development. Indeed, such a project would be immeasurably better positioned in the presence of, for example, an ambitious federal renewable energy standard, national CO₂ emissions reductions targets, a prohibitive system-wide price on carbon, a generous national feed-in tariff standard¹⁰⁹, an independent pool of federal funds for aggressively developing alternative energy projects across the country, ambitious federal energy efficiency standards, a national transportation strategy focused on cleaner technologies, etc. The point, rather, is that neoliberalism’s prohibitive impact on such initiatives in the federal Congress is not the end of the story.

As the modern administrative state (and particularly the federalist configuration of the United States) has emerged as a dizzying labyrinth of agencies and bureaucracies with multiple competing objectives and forms of independent authority, the federal Congress has

¹⁰⁹ A feed-in tariff is a policy mechanism widely used around the world (including several US states) aimed at creating more demand for alternative energy technologies by providing long-term contracts to supply power to the grid at subsidized rates.

increasingly become merely one of several points of access to the policy process (albeit, still the most important one). As interest groups and policymakers seeking progressive climate regulations acknowledge this to be the case, they are able to heed an array of historically viable alternative policy pathways more sympathetic to their objectives. While each policy route on its own may be somewhat insignificant, the point is that the aggregate of these multiple initiatives tends to add up to something considerable, particularly as the forward steps made at each level become self-reinforcing and interact with each other. For example, what began as a few states taking independent action on climate and energy a decade ago has since evolved into an increasingly coherent set of climate strategies in 34 different states, tied together by three regional climate treaties (and potentially a continent-wide agreement between sub-national entities in the North America 2050 Project). What Posner (2010) refers to as the ‘politics of vertical diffusion’ under US federalism provides further insight into the potential of these programs. Indeed, as these sub-national programs become increasingly accepted and mainstreamed on a state-by-state basis, they tend to build a critical mass toward federal policy based on state-level policy experimentation – the clearest example being the great extent to which both the *American Clean Energy and Security Act* and *American Power Act* were explicitly based on the design of the RGGI in the northeast. Litigation strategies provide further evidence of this, as a small handful of cases a decade ago has blossomed into several hundred cases to date – one of which (*Massachusetts v. EPA*) has managed to prompt mandatory federal regulations as it has interacted with the rise of executive authority on environmental issues.

In short, essentialist claims about the relative capacity of so-called neoliberal states to enact climate regulation tend to miss the full story about how policy actually evolves within specific

states. While the golden-age of American environmental policy may well be a distant memory, the neoliberal era has maintained its own subtle progressive dynamism with regard to policy development. Yet at the same time that these pull strategies have sought to generate effective demand for alternative technologies, a series of equally complex political strategies have emerged around ‘push’ policies aimed at driving their supply. In the next chapter we turn to the inner workings of the American developmental state to understand how it has functioned with regard to energy technologies.

Chapter seven

Push policies: The developmental state and alternative energy technologies

In this chapter we shift to a focus on push policies and the actual development of novel energy technologies through state structures and policies. In so doing, the chapter aims to underscore both the extent of the federal government's compulsion to develop novel technologies and foster new markets (as argued in Chapter 3) as well as the abiding influence of neoliberal ideology on this process. The chapter begins by identifying and describing those elements of neoliberalism and the nature of the American developmental state that have caused push policies to materialize in the way that they have. In particular, these sections underscore how these two factors have interacted to render the execution of these policies *highly decentralized*, thereby lending the developmental state a certain nebulous quality. It is argued that this nebulous – almost ‘hidden’ – quality of the developmental state has been crucial to maintaining its durability throughout the neoliberal era broadly, and in the alternative energy realm specifically.

Demonstrating the extent of this decentralization, the second part of the chapter describes how the primary elements of early stage innovation function in the alternative energy realm. In step one, referred to as ‘targeted resourcing’, we see the extent of this decentralization manifested across dozens of federal agencies and thousands of labs and research groups, thus effectively removing all aspects of ostensible centralization from the developmental state and its energy objectives. In step two, referred to as ‘networking and technological brokering’, we see concerted efforts on the part of the federal government to, in effect, quietly *re-centralize*

national R&D efforts at the level of individual research groups and public-private partnerships, thereby allowing the developmental state to operate as a cohesive system in the absence of a centralized developmental structure. Finally, in the chapter's third section, the state's role in late stage development and commercialization is explored. In this final step, referred to as 'technology transfer', the federal government's role in actively moving publicly-developed energy technologies from the public to private sector is explored, with a focus on how this process is once again decentralized across the government's network of national energy laboratories.

Veiling the developmental state

As we saw in the previous chapter, pull policies for new energy technologies have been forced to adapt in various ways to the politics of neoliberalism, requiring policymakers and interest groups to work around inhospitable conditions in Congress and seek alternative routes to achieving their policy objectives. Much the same can be said of push policies. While it was noted in Chapter 4 that developmental state activities were actually ramped-up during the early ascendancy of neoliberalism in the US (much of which was done openly through the passage of a great deal of formal legislation in Congress by Democrats and Republicans alike), this point comes with some important qualifiers. Though the imperative of enhancing American competitiveness and encouraging domestic growth trumped anti-statist ideology in the passage of these initiatives, the subsequent structure and execution of push policies have been greatly influenced by the abiding strength of anti-interventionist dogma, which largely rejects the concept of industrial policy. How, then, have these policies been able to endure over the past three decades?

As a host of authors have suggested, they have managed to do so primarily by keeping a relatively low profile and remaining, in effect, ‘hidden’ from public view and discourse (see e.g., Block 2008; Fuchs 2009; Schrank and Whitford 2009; Keller 2010). To be sure, the idea is not to suggest that the developmental state is some kind of tightly guarded secret kept by Washington insiders. Indeed, many policymakers (particularly Democrats) often speak openly and forcefully about the successes of public investment in technological innovation and the need to enhance these efforts as a means to maintain American competitiveness (see e.g., Democratic National Committee 2012). Moreover, the individual federal agencies providing assistance for innovation efforts openly advertise their services on their websites, brag about their accomplishments, advertise the sale of licenses and patents for publicly funded innovations, and solicit proposals for state assistance in early and late stage innovation efforts (see e.g., US Department of Energy 2012c). Yet, on the whole, the existence of a functional developmental state apparatus in Washington remains effectively unacknowledged in most public and academic debate. This stands in stark contrast to the more familiar developmental states that emerged in East Asia and Western Europe in the post-war period, where innovation and industrial policies were openly acknowledged and lauded, and major political parties generally argued pragmatically over who could more successfully execute an effective developmental agenda, rather than engage in first-principle philosophical debates about whether the state ought to play such a role to begin with (O’Riain 2004). This hidden quality is, in many ways, a necessary characteristic of the *type* of innovation in which Washington engages, but it also tends to provide considerable political cover to the individual R&D agencies whose activities might otherwise come under attack for charges of ‘industrial policy’. While there are many factors that contribute to the developmental state’s relatively low-profile,

three primary issues are worthy of brief consideration here.

The first factor relates to the immensely decentralized character of the American developmental state, and the political imperative of maintaining this decentralization. O’Riain (2004) helpfully differentiates between the Developmental *Bureaucratic* States (DBS) of post-war East Asia and the Developmental *Network* States (DNS) of contemporary Western Europe and the US. While DBSs were able to operate as centralized bureaucracies in their efforts to help established domestic firms ‘catch-up’ and imitate existing technologies created by foreign companies, the DNS is effectively trying to foster the development of innovations that *do not yet exist*. The nature of this objective renders the DBS model completely irrelevant given that there are not any existing technologies to ape. Inventing entirely new concepts and technologies basically involves the federal government trying to mine the nation’s scientific and engineering community for the most promising potential innovations, and subsequently funding and networking disparate research groups in their various efforts. In short, this developmental model does not lend itself to the centralized programs characteristic of post-war East-Asia.

That said, there is still nothing inherent in this model that prevents state-led innovation from being overseen by a single governing agency with an open and publicly debated agenda and budget. The politics of neoliberalism, however, have largely militated against this option, and have promoted increased levels of decentralization in the execution of these policies as a means to avoid political attacks (Negoita 2010). Thus, as these policies and structures have matured in Washington since the 1970s, the American DNS has not been constructed around a single agency, nor has it ever maintained a single office, minister, agenda, or budget. Whereas

agencies like Japan's famed Ministry of International Trade and Industry (MITI) exist as tangible entities whose policies can be easily studied and understood, the American developmental state is, at best, a heuristic term given to the aggregate of the hundreds of diffuse R&D agencies whose projects are implemented across a tangled labyrinth of federal, state, and local governments, and carried out across a network of thousands of government, university, and private sector laboratories. Even the technological and economic impacts of these policies tend to be far too decentralized to trace, as the DNS funds literally hundreds of thousands of scientists and engineers in almost every corner of the economy. In short, unlike the recent spate of overt sectoral bailouts and state interventionism following in the wake of the financial crisis of 2008, the DNS' activities are considerably less obvious, with its projects and impacts being far more ubiquitous and difficult to trace back to one governmental origin or activity. As we will see below, when it fails to maintain this relative anonymity, the political fallout tends to be crippling.

The second primary factor is the role of ideology – specifically the impressive strength and durability of market-fundamentalist thought over the past three decades. Since the broad ascendancy of market-fundamentalist ideology in the early 1980s, a primary narrative promoted by the Republican Party and the right has been that economic growth, innovation, and general social progress is solely a product of free-markets (Aberbach and Peele 2011; American Presidency Project 2012a). This pervasive argument has suggested, moreover, that while the private sector is dynamic, efficient, and inventive, government and the public sector is wasteful and incompetent, and serve primarily to hinder growth, innovation, and economic dynamism (Block 2008). This narrative has become increasingly strong as the Republican Party as a whole has moved further to the right since the early 1990s, and the Democratic Party

has subsequently followed the GOP to the near-right (as the near-right becomes the new centre of the American political spectrum).¹¹⁰ In this context, the reigning market-fundamentalist ideology has, in effect, crowded-out the conceptual space necessary for recognizing the state's role in fostering innovation and market development, and rendered any serious recognition of the extent and impact of developmental state policies inconsistent with the dominant understanding of state-market relations (Hacker and Pierson 2006, 2010).

Finally, and somewhat related to ideology, is the role of partisan political strategy. As noted above, the politics of federal innovation and industrial policy have gradually taken shape as a stand-off between, on the one hand, Democrats who often show explicit support for public investment in innovation versus, on the other, Republicans who (particularly since the early 1990s) have increasingly condemned such efforts and denounced any attempts by the state to 'pick winners' and/or 'save losers' in the private sector (see e.g., Neely 1993; Lindbeck 1981; Schultze 1983). For Republicans, however, staying true to this ideological dogma has been somewhat complicated in light of the party's delicate contemporary electoral coalition. As a party that is home to both big business (whose embrace of market-fundamentalism is, as noted, considerably more rhetorical than principled, and thus supports generous R&D subsidies) *and* staunch economic libertarians (who adamantly oppose 'industrial policy'), opposition to innovation policy requires a careful balancing act, as the party attempts to simultaneously pay homage to its market-fundamentalist constituents by denouncing innovation policy, while at the same time continuing to provide the subsidies, research support, and developmental

¹¹⁰ This dynamic is sometimes referred to as 'rollback' and 'rollout' neoliberalism. In effect, intensely neoliberal policies are often forcefully implemented by right wing governments, and then are subsequently mainstreamed by comparatively progressive governments which accept and validate them. See e.g., Peck and Tickell 2002.

infrastructures that the business community has come to expect and rely upon (Baker 2006, 2010; Galbraith 2009; Johnston 2008).¹¹¹

In this context, while GOP lawmakers were integral in building and maintaining the developmental state (particularly in the its early years), they have occasionally sought to shore-up their credibility with the economic right by attacking those R&D agencies that have become too conspicuous in their efforts (see below). Adding to this tenuous balance for the Republicans, the Democrats have traditionally sought to use innovation and industrial policy as a means to siphon the support of the business community from the GOP through generous R&D subsidies and important facilitation policies. As a result, the Republican Party's position on developmental state policies has appeared somewhat schizophrenic over the years, either quietly supporting them or sanctimoniously denouncing them, depending on the context and intended audience (Schrack and Whitford 2009).

For their part, the Democrats have also faced considerable difficulty building support for developmental state policies. Much like the Clinton administration in the early 1990s, the Obama administration has shown fairly unequivocal support for public investment in research and innovation (see e.g., Democratic National Committee 2012). Yet also much like the Clinton era, the current administration has, following the mid-term elections of 2010, been forced to deal with an ardently reactionary Congress seeking to limit the funding available for

¹¹¹ The GOP's official party platform is rife with this brand of rhetorical dissonance around innovation policy. In the same section of the party's 2000 platform, it is suggested that the country's immense dominance in fields like IT "is the product of the creative efforts and hard work of men and women in the private sector, and not of government bureaucrats", before stating shortly thereafter that innovation in sectors like IT, telecommunication, biotechnology, etc., "require enormous infusions of capital... The federal government must refocus and reinvigorate its role in promoting cutting-edge, basic research, and the tax code must foster research and development." It later champions immense infusions of public funding through institutions like the National Institutes of Health and the Department of Defense (American Presidency Project 2012a).

the such initiatives. In so doing, GOP opposition effectively plays two key roles. First, it provides an important opportunity to portray innovation policies as part of the Democrats' failed 'big-government' economic theories of a by-gone era, and second, by restricting the funding available for R&D programming, Republicans are able to limit the Democrats' capacity to coax the support of the business community through generous developmental programs and subsidies (Block 2008).

The result of these three interacting factors is that the existence of an institutionalized developmental apparatus (despite its continued existence for several decades and enormous accomplishment in a variety of markets) remains effectively unacknowledged in mainstream and academic debate. Indeed, naturalizing the rhetoric of politicians about the virtues of free markets in the pursuit of innovation, major academic frameworks like the Varieties of Capitalisms approach have produced sophisticated explanations for why the US and its 'liberal market economy' have proved so dominant in radically innovative sectors like IT, biotech, defense, telecommunications, etc., attributing it to a range of perceived institutional advantages (flexible labour markets, non-vertically integrated firms, etc.) thought to exist in unplanned and uncoordinated economies (see e.g., Hall and Soskice 2001). While this relative blindness to the role of the state is generally unhelpful in realizing the full capabilities of state-led innovation, this decentralization has been quite useful politically under conditions of neoliberalism. Few examples illustrate why this is the case better than the history of the Advanced Technology Program over the past 20 years.

The Advanced Technology Program

Established in 1988 by a Republican White House as a civilian counterpart to Defense

Advanced Research Projects Agency (DARPA), the Advanced Technology Program (ATP) became a text book case in how not to run a federal R&D agency under conditions of market-fundamentalist ideology. The idea behind ATP was simple enough: fill the investment gaps emerging in the wake of the military-Keynesian policies of the 1980s with a centralized civilian technology development program based on the template used by the DOD (Link 2005). In effect, ATP would ideally have become Washington's answer to Japan's MITI – though obviously based on a DNS model of innovation. After an initially slow start, the Clinton administration sought to reposition the agency as the country's largest technology assistance program outside the military. The attempt to increasingly shift these funds from defense over to civilian parts of the economy would be overseen by the administration's newly created National Economic Council – a *cabinet-level* portfolio intended to maintain a standing on-par with the National Security Council (Negoita 2010; Hughs 2005). Under this plan, the ATP would become the flagship of the administration's new civilian technology policy. With a strong financial capacity and experienced leadership and program managers (many of whom were plucked directly from DARPA), the ATP appeared primed to emerge as a crucial component of the American innovation system and national economy more broadly (Wessner 2001).

However, with its rapidly growing size and centralization (and lacking the credible military orientation of its sister DARPA), the ATP unwisely garnered a great deal of undesirable attention from the right. With the GOP's landslide victories in the 1994 mid-term elections (and its subsequent control of both houses of Congress for the following twelve years), the agency soon came under heavy and prolonged political attack as a wasteful 'corporate welfare' agency. In spite of the administration's strong support for ATP, its funding remained

contingent on Congressional approval, and though the administration managed to keep the agency technically alive until the end of its second term, GOP lawmakers managed to whittle its budget down to a mere \$221 million by 1996, severely limiting its capacity to play any influential role (Negoita 2010; Wesson 2001). With the election of the second Bush administration in 2000, the writing was effectively on the wall for ATP. Though support in the Senate (where the Republican majority was considerably more moderate and centered) allowed it to limp along with drastically reduced funding for much of the decade, the Bush administration officially dissolved the agency in 2007 in a symbolic act of war against industrial policy and ‘picking winners’. Yet demonstrating the GOP’s desire to quietly promote such programs as a means to appease the business community, the administration immediately replaced the ATP with the decentralized Technology Innovation Program and National Nanotechnology Program (the latter maintaining a budget of over \$1 billion per year) under the America Competes Act of 2007 (Negoita 2010).¹¹²

The ATP has thus stood as an important lesson in the political realities of carrying out a developmental program in Washington. When developmental state activities become too centralized and conspicuous, they render themselves vulnerable to political attack and place their futures in jeopardy. This helps to explain why, as we will see in the following sections, the modern DNS exists as a highly complex and decentralized network of agencies operating in ostensible isolation from one another.

Early-stage technology development

¹¹² By decentralized, I mean that they do not exist as stand-alone agencies in the way that ATP did. Rather, their initiatives are executed across the R&D budgets of relevant federal agencies, making their activities considerably less obvious.

As noted in Chapter 4, the dominant template for early-stage state-led innovation in the US is the result of decades of organization learning within the federal government, much of which is derived from DARPA. As pointed out in that chapter, the creation of DARPA was one of several initiatives undertaken by the federal government in the late 1950s in response to a perceived inability to keep pace with the USSR in military capability. With many insiders placing the blame for this loss of technological dominance on a stale development model in Washington (which featured a growing rivalry between military services and research agencies within the federal government), DARPA was created as an independent agency that worked *not* with giant military-industrial complex firms, but rather sought out the best and the brightest individuals and ideas from across the country's academic and national lab communities, as well as the private sector (Belfiore 2010; Roland and Shiman 2002). The model of grassroots development that would solidify in the following decades can be understood as having at least two distinctive features: its mode of targeting resources to specific scientific and engineering groups, and its capacity to network and integrate disparate research groups to collectively advance the R&D frontier across the country. In the following sections, these two elements of early-stage development are assessed in the context of the federal government's developmental efforts around alternative energy technologies.

Step one: targeting

The targeting process is a complex and multi-faceted procedure that involves government officials consulting with experts in a given technology sector (e.g., defense, biotech, IT, aerospace, energy, etc.) and identifying crucial scientific and technological challenges – the solution to which would help advance the frontier of the industry, address certain practical state

needs, and create opportunities for new market growth (Block 2008). Developmental agencies across the federal government that are relevant to each field then release solicitations to research groups (be they in academia, government labs, or the private sector) describing the nature of the scientific problem or technological concept they wish to address, and subsequently begin providing funding and in-kind assistance on a competitive basis to an array of groups with promising proposals. These solicitations can range from highly abstract basic research activities (for example trying to understand the peculiarities of quantum mechanics or the nature of human DNA), to highly practical applied research activities (like designing new triggering mechanisms for ballistic missiles or developing new thin-film photovoltaic technologies).

Building on the DARPA template, this type of targeted resourcing can be distinguished from traditional bottom-up approaches to scientific funding (characteristic of agencies like the National Science Foundation), in which agencies are provided with a set amount of research dollars to be distributed in the relative absence of explicit mandates for results. Creating such mandates from the top-down effectively allows policymakers and project managers to focus the efforts of the country's scientific and engineering communities on specific objectives, rather than waiting for crucial discoveries to passively evolve from undirected efforts (Block 2008). Distinguishing itself from traditional defense contracting (where R&D funding is very loosely tied to benchmarks), the model of targeted resourcing derived from DARPA further involves funding agencies and program officers exerting extensive discipline over funded groups throughout the entire R&D process. This includes establishing ambitious benchmarks and tight deadlines, and unilaterally withdrawing funding from those groups that fail to make the desired progress (Ibid; Fuchs 2010).

Targeting energy and climate: the National Climate Change Technology Initiative

In the alternative energy realm, the targeting agenda is set by the fairly sophisticated labyrinth of agencies and working groups consolidated by the second Bush administration under the National Climate Change Technology Initiative (NCCTI). Despite the appearance of centralization depicted in Table 7.1, NCCTI is not a stand-alone R&D agency, but is rather a general coordination strategy across the entire federal government, whose programs are executed across dozens of federal agencies, and countless R&D programs.

Table 7.1
NCCTI targeting apparatus

Office of the President	
Climate Change Policy and Program Review Operated by: National Security Council, Domestic Policy Council, National Economic Council	
Committee on Climate Change Science and Technology Integration Operated by the heads of: Dept of Commerce, Dept of Energy, Office of Science and Technology Policy, Dept of State, Dept of Agriculture, National Economic Council, NASA, Dept of Transportation, Dept of Defense, Environmental Protection Agency, Dept of Interior, Council on Environmental Quality, Office of Management and Budget, Health and Human Services, National Science Foundation	
Interagency Working Group on Climate Change Science and Technology Operated by the heads of: Dept of Energy, Dept of Commerce, Office of Science and Technology Policy	
Climate Change Science Program Operated by: DOC, DOD, DOE, DOI, DOS, DOT, EPA, HHS, NASA, NSF, USAID, USDA	Climate Change Technology Program Operated by: DOE, DOC, DOD, DOI, DOS, DOT, EPA, HHS, NASA, NSF, USAID, USDA

Source: US Global Change Research Program 2012.

Table 7.1 begins to depict the extent of the DNS' decentralization. In a lengthy review process, the targeting agenda starts in very broad terms in the Office of the President and Climate Change Policy and Program Review (CCPR). Directed by the President's National Security Council, National Economic Council, and Domestic Policy Council, this group defines in very broad terms the Executive Branch's economic and security goals with regard to climate and

energy, and sets the broad direction of the federal government's R&D strategy. At this stage, very few technical details are set, though specific industries may be identified as desirable targets for stimulus and development. These political and economic objectives are then passed to the Committee on Climate Change Science and Technology Integration (CCCSTI) and Interagency Working Group on Climate Change Science and Technology (IWCCST), which, under the direction of the numerous federal agencies maintaining major R&D budgets and programs, begin the task of translating these goals into actionable R&D strategies.

The Climate Change Technology Program (CCTP) stands as the final and most important element of the targeting apparatus. The CCTP is the multi-agency planning and coordination program responsible for setting the actual science and technology agenda, creating an inventory of technology programs, and working with the individual agencies in their respective efforts to prioritize and implement the NCCTI's developmental activities. As the agenda moves forward, the CCTP further stands as the primary conduit between the upper-level groups setting the broad economic objectives and the individual R&D agencies carrying out the program, making recommendations for changes and improvements. A CCTP 'steering group' comprised of senior-level representatives from each participating agency further assists in this process by providing a formal venue for agencies to resolve issues with regard to resources, funding priorities, new programs, etc.

Table 7.2 shows a selected sample of the program areas established by the NCCTI review process as of 2009 – many of which have seen their funding levels altered by the current administration, which has somewhat different views than the Bush administration on where priorities should be placed.

Table 7.2
NCCTI program areas as of 2009

Major Initiative	Description of Activities
Hydrogen Storage Initiative	Addresses key challenges to advancing a hydrogen-based transportation system, which could substitute for oil and dramatically reduce dependence on foreign energy and GHG emissions, as well as incite massive market growth. The NCCTI review determined that a major technological breakthrough is needed to be able to store enough hydrogen on board a fuel cell vehicle to provide a driving range comparable to today's internal combustion vehicles.
Low Wind Speed Technology Initiative	Wind power is currently only cost competitive in areas of high wind speeds, which are relatively sparse and rarely located near major load demand centers. The NCCTI targeting apparatus determined that improving technologies to make wind power competitive in low wind areas is crucial to making wind a reliable grid-scale technology and building a viable domestic industry around it.
Solid State Lighting Initiative	NCCTI determined that solid state lighting has the potential to double efficiency in conventional housing and buildings, and dramatically reduce the growth of future base load electricity generation. Major advances are required, however, to mainstream the technology, and thus NCCTI has made it a main priority.
Cellulosic Biomass Initiative	Cellulosic biofuels can displace fossil fuel products and have the potential to be nearly 'carbon neutral' by cyclically capturing and releasing CO ₂ . NCCTI determined that research focusing on converting complex cellulosic carbohydrates of biomass into simple sugars and the use of waste biomass to produce power, chemical, and fuels is crucial for advancing the industry.
Transportation Fuel Cell Systems Initiative	With its potential to displace fossil fuel use in motor vehicles, NCCTI placed a priority on the promotion of further R&D for activities that work to incorporate fuel cells into vehicles by converting hydrogen into electricity and water vapor.
Nuclear Hydrogen Initiative	Aims to develop technologies that will apply heat available from advanced nuclear energy systems to produce hydrogen at a cost that is competitive with other alternative transportation fuels. NCCTI views this particular process as a unique means by which to produce large amounts of hydrogen without any GHG emissions.
Renewable Technologies Initiative	The NCCTI agenda has placed a heavy focus on the further advancement of a number of renewable industries, including, solar, wind, geothermal, and tidal energy.
Sequestration Initiative	NCCTI determined that a successful carbon sequestration R&D effort could allow the continued use of economical fossil fuels,

	while also limiting GHG emissions.
Integrated Gasification Cycles Initiative	Instead of burning coal, integrated gasification technologies aim to gasify coal in a way that enables more efficient conversion of coal and other carbon-based stocks into electricity and other useful products, providing the potential for over fifty percent reductions of CO ₂ emissions.

Source: Committee for Climate Change Science and Technology Integration 2009

From this list of broad programming objectives, the decentralization continues as individual areas of expertise are set within federal agencies that have major R&D budgets and programs. Based on the programming objectives set out in Table 7.2, Table 7.3 shows a sample of selected issue areas taken-up by twelve specific agencies with significant R&D budgets.

Table 7.3
Developmental activities within individual agencies through CCTP

Federal Agency	Examples of Climate/Energy R&D Activities under CCTP
Dept. of Commerce	Instrumentation, standards, ocean sequestration
Dept. of Defense	Aircraft, engines, fuels, trucks, power, fuel cells, lasers, energy management, basic research
Dept. of Energy	Energy efficiency, renewable energy, nuclear fission and fusion, carbon sequestration, basic energy sciences, hydrogen, electric grid infrastructure
Dept. of Interior	Sequestration, geothermal
Dept. of State	International science and technology initiatives
Dept. of Transportation	Aviation, urban mass transit infrastructure, transportation systems, transportation efficiency
Environmental Protection Agency	CO ₂ mitigation, GHG emissions inventory systems, renewable energy
Dept. of Health and Human Serv.	Basic environmental science, biotechnology, genome sequencing
NASA	Earth/climate observation systems, aviation, measuring and monitoring equipment
National Science Foundation	Geosciences, nanoscale science and engineering, computational sciences
USAID	Land use, sequestration, cropping systems
Dept. of Agriculture	Soil sequestration, biomass energy, biofuels, cropping systems

Source: Committee for Climate Change Science and Technology Integration 2009

Finally, these individual agencies further decentralize the process as they give tangible expression to these objectives through their individual R&D programs, which ultimately undertake and execute the developmental agenda. These programs establish the specific scientific research agendas, create an array of individual programs around each technology, solicit and review applications for funding, review the progress made by individual research groups, help to network various groups, and make decisions about whether to extend or cut funding. They thus represent the heart and soul of the targeting apparatus, with dozens of individual programs operating as part of the CCTP. Table 7.4 depicts a small sample of these programs within several agencies.

Table 7.4
Select developmental programs

Federal Agency	Developmental Program
Department of Agriculture	Cooperative Research Grant Program; Sustainable Agriculture Research and Education (SARE); Bio-energy Research Service, Renewable Energy Program; Biomass R&D Program
Department of Energy	Advanced Research Projects Agency – Energy; Energy Efficiency and Renewable Energy Program
Environmental Protection Agency	Environmental Technology Opportunities Program (ETO); Office of Research and Development (ORD)
Department of Defense	Defense Advanced Research Projects Agency (DARPA)
USAID	Energy Technology Development Program; Carbon Capture and Sequestration Program
Department of Commerce	Asia Pacific Partnership on Clean Development and Climate
National Science Foundation	Energy For Sustainability Program
Department of the Interior	Global Change Research and Development Program (GCRD); National Carbon Sequestration Assessment
Department of Transportation	Research and Innovative Technology Program

Source: Committee for Climate Change Science and Technology Integration 2009

The Advanced Research Projects Agency – Energy (ARPA-E) provides an example of how the individual agencies on the list above then translate their objectives into individual research

programs. Rising to prominence after being established by the Bush administration in 2007¹¹³, ARPA-E received a first year's budget allocation of \$400 million under the American Reinvestment and Recovery Act (ARRA), and saw the creation of fifteen major programs, 121 dedicated projects, and the amassing of an experienced staff of program managers from other major national R&D programs. As depicted in Table 7.5, ARPA-E has now established a large roster of major program areas targeting the objectives set by the CCTP.

Table 7.5
ARPA-E programs

Batteries for Electrical Energy Storage in Transportation
Innovative Materials & Processes for Advanced Carbon Capture Technologies
Grid-Scale Rampable Intermittent Dispatchable Storage
Electrofuels Program
Building Energy Efficiency Through Innovative Thermodevices
Agile Delivery of Electrical Power Technology
Biomass Energy Program
Building Efficiency Program
Carbon Capture Program
Direct Solar Fuels Program
Energy Storage Program
Renewable Power Program
Waste Heat Capture Program
Vehicle Technologies Program

Source: ARPA-E 2012

As depicted in Table 7.6, the decentralization continues, with each major program funding a series of research groups in public and private laboratories across the country – this table uses the specific example of the Innovative Materials & Processes for Advanced Carbon Capture Technologies (IMPAACT) – a program which aims toward the development of coal Carbon Capture and Sequestration (CCS) technology.

¹¹³ Somewhat ironically, ARPA-E was formed as part of the America COMPETES Act of 2007, the very same act which dissolved the Advanced Technology Program after coming under relentless attack for engaging in industrial policy activities.

Table 7.6
IMPAACT projects

Columbia University: Chemical & Biological Catalytic Enhancement of Weathering of Silicate Minerals as Novel CCS Technology Project
Georgia Tech Research Corporation: High Performance MOF Polymer Composite Membranes for CO ₂ Capture Project
GE Global Research: CO ₂ Capture Process Using Phase Changing Absorbents Project
Lawrence Berkeley National Laboratory: High-Throughput Discovery of Robust Metal-Organic Frameworks for CO ₂ Capture Project
Lawrence Livermore National Security: Catalytic Improvement of Solvent Capture Systems Project
Massachusetts Institute of Technology: Electrochemically Mediated Separation for Carbon Capture and Mitigation Project
Oak Ridge National Laboratory: High Performance CO ₂ Scrubbing through Hollow Fiber-Ionic Liquid Sponges Project
Research Triangle Institute and BASF: Novel Non-Aqueous CO ₂ Solvent-based Capture Processes Project
Texas A&M University: Stimuli-Responsive Metal-Organic Frameworks for Energy-Efficient Post-Combustion Carbon Dioxide Capture Project
University of Colorado: Post-Combustion Carbon Capture with Gelled Ionic Liquid-Based Membranes Project
University of Kentucky Research Foundation: A Solvent-Membrane Hybrid Post-combustion CO ₂ Capture Process for Existing Coal-Fired Power Plants Project
University of Notre Dame: CO ₂ Capture with Ionic Liquids Involving Phase Change Project

Source: ARPA-E 2012a

For agencies outside the Department of Energy, all innovative efforts in this context are, as noted in Table 7.4, adapted to apply to their specific organizational goals. An interesting example of such adaptation can be found in the case of DARPA, which integrates its obligations for energy R&D into its specific military and defense objectives. In an attempt to provide an apolitical justification for its numerous alternative energy projects, a range of defense-specific rationales are put forth in the Department of Defense's budget justification. As the agency's website notes, "One of the most critical needs on the battlefield is to minimize the logistics burden of the warfighter in the field. This thrust is aimed at developing novel power generation technologies that reduce the logistics burden. This includes new materials and

concepts for increasing the availability of portable power to the warfighter and efficiently extracting, converting and utilizing power on board military platforms” (Department of Defense 2011). In this context, the federal government’s climate and alternative energy goals can be veiled as incidental elements of each agency’s operating objectives.

Public sector venture capitalism

Further decentralizing the process, targeted resourcing also involves providing funding and assistance to private sector firms engaged in R&D efforts that dovetail with the NCCTI’s objectives. These activities operate at two primary levels. First, less-established companies (for example small businesses, start-ups, and spin-offs) are generally funded by two federal programs which make use of a similar targeted solicitation process as described above – the Small Business Innovation Research program (SBIR) and Small Business Technology Transfer program (STTR). These programs mandate that all federal agencies engaged in technological innovation allocate a given percentage of their R&D budgets (2.5 percent under SBIR and 0.3 percent under STTR) to small businesses engaged in promising R&D initiatives relevant to their R&D objectives. The climate and energy realms feature the DOE as the key agency, establishing a new roster each year of individual program solicitations that invite small businesses to apply for SBIR or STTR grants based on the priorities set under the NCCTI umbrella. Recipient firms are led through three phases of development, at the end of which they are expected to produce a functioning prototype which can be brought to market with the assistance of an array of DOE commercialization programs (see below) and broader federal government programs like the Manufacturing Extension Partnership Program and Small Business Administration.

Over the past decade, however, there has been a growing recognition that programs like SBIR and STTR often fail to support firms long enough for them to achieve commercialization, and, as a result, many otherwise promising private sector innovations have failed to reach the market. Though an array of programs has been established at all levels of government seeking to remedy this problem, among the most radical and consequential has been the second major element of private sector targeting: the creation and proliferation of the modern ‘public venture capital’ (PVC) firm at the federal level. As the name suggests, these entities are not-for-profit organizations housed within individual government agencies (but which, importantly, typically have their own titles and organizational structures) that use public funds to invest in private firms engaged in R&D work relevant to the agency’s objectives (Keller 2010).

The sudden expansion of the PVC model began innocently enough in 1999 when the Central Intelligence Agency (CIA) established a small investment company called In-Q-Tel with the goal of enhancing innovation and procurement efforts as defense budgets declined under the Clinton administration (Weiss 2008). Within five years of In-Q-Tel’s establishment, its positive reception had led to the creation of several similar entities across a range of federal departments. As Keller (2010) notes, today “virtually every federal agency with a technology-focused mission has explored public venture capital as a means to stimulate technological innovation and/or commercialization of federal research” (2010: 151).

For its part, the DOE has been a leading agency in this regard. As of 2011, the department had launched four programs, including a PVC partnership with the Battelle Memorial Institute; the Entrepreneur in Residence (EIR) program through which VC funded entrepreneurs work with the DOE’s national labs to identify and fund market-ready technologies (see below); the

Technology Commercialization Fund through which monies are provided to “help post-research technologies move toward commercial viability by providing funding for prototype development, demonstration projects, market research, and other deployment activities” (US Department of Energy 2012); and a series of favourable loan guarantee programs through the DOE’s Loan Programs Office (LPO).

By far the largest of these activities within the DOE has been the provision of direct loans and grants to established businesses through the LPO.¹¹⁴ Using funds set aside for loan programs under the ARRA, the department has sought to distribute more than \$40 billion to companies working on developing ‘clean’ energy technologies in sectors ranging from electric vehicles to solar PV panels and wind turbines (US Department of Energy 2012d).¹¹⁵ Through these initiatives, the current administration has placed a high premium on the creation and maintenance of domestic manufacturing jobs. A prominent example of this strategy came in 2009 with electric automaker Fisker. Based out of Irvine, California, Fisker was established in 2007 with seed money from Silicon Valley venture capital firms Kleiner Perkins Caufied & Byers (see Chapter 4). While a series of smaller investors put up close to \$160 million to push the company’s first hybrid-electric vehicle (called the ‘Karma’) into early production, Fisker required an additional \$200 million to complete the process (Loeser 2010). In late 2008, the company sought assistance from the DOE’s \$25 billion Advanced Technology Vehicle Manufacturing (ATVM) loan program, which had been established by Congress to help develop and commercialize high-efficiency vehicles. The DOE’s LPO subsequently suggested that if Fisker were willing to design a cheaper version of the Karma and build it at any recently

¹¹⁴ As described in Chapter 8, this program was far too conspicuous for its own good.

¹¹⁵ These funds are officially distributed through two programs entitled ‘1703’ and ‘1705’. These programs authorize loan guarantees for projects that “employ new or significantly improved energy technologies and avoid, reduce or sequester air pollutants or greenhouse gases” (Department of Energy 2012d).

closed domestic auto plant in the US, the DOE would provide the necessary funding for both projects. Agreeing to the terms, Fisker moved forward with plans to design and manufacture a low-cost hybrid-electric vehicle called ‘The Atlantic’ at the abandoned Boxwood Road General Motors plant in Wilmington, Delaware with the aid of over \$528 million in DOE loans (Hyman 2012).¹¹⁶

The impact of these targeting and loan programs has, in many ways, helped to reshape the nature of technological development in sectors relevant to the NCCTI’s mandate. Acknowledging the extent to which federal funds can help attract new private investment (and by the same token that falling outside the DOE’s objectives can create serious competitive setbacks), many young companies engaged in developing and deploying various technologies have begun to tailor their business plans directly to the DOE and NCCTI’s technology objectives in hopes of obtaining state assistance (King 2009). For their part, private investors have awakened to this dynamic and are increasingly pulling back and waiting to see which companies will receive state assistance before investing. As a result, while the DOE had given out more than \$18 billion in grants and loans by the end of 2009 to such firms, private venture capital firms had, during the same period, invested a mere \$2.68 billion (King 2009). Further complicating the equation is an obvious preference on the part of the DOE (largely driven by political concerns about avoiding accusations of industrial policy) to invest almost exclusively in companies that have already procured substantial private funding, in the hopes that the role of federal funds can be limited to the creation of a critical mass of funding, which can then attract more private funding and thereby push the technology to commercialization. This has

¹¹⁶ The future of the Fisker Boxwood plant remains in question after the Solyndra bankruptcy in 2011, which helped to dramatically slow down the release of guaranteed loans from the federal government. See Chapter 8; Hyman 2012.

created a rather complicated ‘chicken-or-egg’ situation for many firms in the emerging alternative energy industry, as private venture capitalists are reluctant to invest in companies that have yet to obtain state funding, while the DOE is wary of funding ventures that have yet to win over the private sector.

Step two: Networking and technological brokering

Building on the model of R&D networking established by DARPA over the years, networking and technological brokering includes an array of efforts aimed at connecting the numerous research groups across the country’s network of national labs, academic institutions, and private firms. This step thus establishes crucial networks across the country’s research community, provides scientists and engineers a chance to collaborate and exchange ideas, as well as gain crucial insights from others in the field that may have solutions to critical problems and bottlenecks. It further creates opportunities to put existent technologies together in new ways, or allow one lab to combine a new technique from another lab with its own incremental change to render something completely new and different (Block 2008). It does so *not* at the level of a centralized bureaucracy, but rather small scale research and working groups overseen by individual agencies.

Across the federal government broadly, there are currently a number of established hubs and liaisons that play these roles. First, officials and program officers engaged in targeted resourcing (at agencies like DARPA, NSF, NIH, NIST, for example) are often able to play a key role in this process in light of their extensive knowledge of the research activities taking place both within the agency and the technological field as a whole. Much the same can be said of SBIR and STTR officers at federal agencies, who have the added benefit of possessing a

keen knowledge of research activities taking place in the small business community. Second, individual university and national lab scientists at the centre of the university-industry research complex are often in a position to move ideas (either formally or informally) from one group or network to another. Third, the technology transfer officials in the national lab system (see below) are often able to act as conduits and facilitate networking activities if they are able to gain enough mastery over a particular field. And finally, a range of academic groups and agencies provide a forum to disseminate ideas and discoveries both formally and informally, including, for example, the American Association for the Advancement of Science, the National Research Council, and the National Academy of Sciences, among many others. The National Research Council, for example, conducts a series of ‘Consensus Studies’, ‘Expert Meetings and Workshops’, and a ‘Program and Research Management Initiative’, and oversees the publication of over 200 reports each year on contemporary scientific and technical work in a variety of fields. While all four hubs have been important in the operation of the federal government’s energy and climate R&D initiatives, two programs have been of particular importance. These are the CCTP’s Integrated Planning and Networking program, and the creation of a number of integrated private industry consortia.

CCTP’s Integrated Planning and Networking Program

The climate and energy realm is a fairly unique case as far as networking and technological brokering are concerned. While the networking stage tends generally to represent a relatively weak and somewhat neglected aspect of DNS activities, the CCTP has answered for the creation of a rather robust apparatus aimed at facilitating constant communication and

integration across research groups, technology areas, and basic and applied research streams.

As the program's rationale on integrated networking notes,

Information can be shared and potential pathways to solutions can be suggested by bringing together multidisciplinary research expertise and applied technology developers. Increased discussion among research personnel from various complementary fields and face-to-face exploration of ideas is crucial in fostering innovative ideas and creating synergies. The traditional structure of research, operating mainly within the narrower confines of specific disciplinary groups, will not be sufficient. Effective integration of fundamental science, strategic research, exploratory research, and applied technology research and development presents challenges to and opportunities for both the basic research and applied research communities. These challenges and opportunities can be effectively addressed through innovative, integrative planning processes, augmented by analysis and decision-support tools. These processes emphasize communication, cooperation and collaboration among the many associated communities (CCTP 2006).

To this end, the CCTP maintains six multi-agency working groups aligned with the program's strategic goals. As Table 7.7 depicts, each working group maintains a series of sub-groups in which researchers from the participating agencies and affiliated labs are required to a) share and exchange information relevant to the R&D process; b) connect with, and coordinate inputs from all relevant agencies and systematically explore various technology program issues, gaps, challenges, impediments to progress, and opportunities; c) explore a range of potential research avenues to address the identified issues; and d) design a strategic research program to pursue the most promising avenues, including clear articulation of research goals and ideas for new solicitations of research proposals to address the identified areas (CCTP 2006).

Groups funded under the CCTP are further required to take part in mandatory technical workshops aimed at bringing together the applied and basic research groups from all agencies within the CCTP to exchange ideas, discuss bottlenecks and barriers impeding development, and propose new research strategies. As part of the CCTP's mandate, workshops are intended

to yield an official report (or ‘periodic review’) which can form the basis for “a framework of high priority research needs, a solicitation for new proposals, and awards” (CCTP 2011). In this way, the workshop process not only provides a venue to facilitate dialogue on contemporary projects, but provides the necessary information to guide future targeting activities across the NCCTI.

Table 7.7
CCTP research and networking groups

Working Group	Sub-Groups
Energy Use Working Group – Led by DOE	Electrical Grid and Infrastructure group Hydrogen End-Use group Buildings group Transportation group Industry group
Energy Supply Working Group – Led by DOE	Hydrogen Production group Renewable and Low-Carbon Fuels group Renewable Power group Nuclear Fission Power group Fusion Energy group Low Emissions Fossil Based Power group
CO₂ Sequestration Group – Led by USDA	Carbon Capture group Geological Storage group Terrestrial Sequestration group Ocean Storage group Products and Materials group
Other (Non-CO₂) Gases Group – Led by EPA	Energy and Waste group Agricultural Methane and Other Gases group High Global Warming-Potential Gases group Nitrous Oxide group Ozone Precursors and Black Carbon group
Measuring and Monitoring Group – Led by NASA	Application Areas group Integrated Systems group
Basic Research Group – Led by DOE	Fundamental Research group Strategic Research group Exploratory Research group Integrative R&D Planning group

Source: Climate Change Technology Program 2006

Finally, in an effort build links among individual research groups and private industry (and also to help guide resultant innovations into the commercialization process), relevant federal agencies have further established an array of networking programs and partnerships aimed at

actively integrating private R&D and demonstration efforts with those being coordinated by the federal government (see Table 7.8).

Table 7.8
Public-private R&D and commercialization coordination programs

Program	Federal Agency
Advanced Energy Storage Program	Dept. of Energy
Bio-based Products and Bio-energy Program	Dept. of Agriculture
Coal Technology Export Program	Dept. of Energy
Clean Automotive Technology Program	EPA
Clean Coal Power Initiative	Dept. of Energy
Carbon Sequestration Regional Partnerships	Dept. of Energy
Clean Energy Technology Exports Initiative	Dept. of Commerce, USAID
Clean Energy-Environment State Partnership Program	EPA
Methane to Markets Partnership	EPA
Commercial Aviation Alternative Fuels Initiative	Dept. of Energy
Consortium for Research on Renewable Industrial Materials	Dept. of Energy
Continuous, Lower Energy, Emissions and Noise (CLEEN) Program	Dept. of Transportation
HFC-23 Emission Reduction Partnership	EPA
Renewable Energy Systems & Efficiency Improvements Programs	Dept. of Agriculture
National Fuel Cell Bus Technology Development Program	Dept. of Transportation
Renewable and Distributed Systems Integration Program	Dept. of Energy
Renewable Energy and Energy Efficiency Partnership	Dept. of Energy
Power the Army Program	Dept. of Defense
Fuel Cell School Buses Program	Dept. of Energy
Transformational Energy Action Management (TEAM) Initiative	Dept. of Energy
21st Century Truck Partnership	Dept. of Energy
Aircraft Fuel Efficiency Program	Dept. of Transportation
Automotive Fuel Economy Program	Dept. of Transportation
Graduate Automotive Technology Education (GATE) Program	Dept. of Energy
Emerging Buildings Technologies Program	Dept. of Energy
Metropolitan and Statewide Transportation Planning Grant Program	Dept. of Transportation
High Performance Buildings Initiative (HPBi)	Dept. of Energy
Partnership for Advancing Technology in Housing	Dept. of Energy
Coal Combustion Products Partnership (C2P2) Program	EPA
Tools for Carbon Inventory, Management, and Reporting	Dept. of Agriculture

Partnership for Home Energy Efficiency	EPA, Dept. of Energy
Underground Injection Control (UIC) Program	EPA
Biomass Research and Development Initiative	Dept. of Agriculture
Plug-in Electric Drive Vehicle Program	Dept. of Energy
Carbon Sequestration Program	Dept. of Agriculture
Geologic Sequestration Training and Research	Dept. of Energy
Hydrogen, Fuel Cells & Infrastructure Technologies Program	Dept. of Energy
Near-term Transportation Sector Electrification Program	Dept. of Energy
Renewable Energy Innovation Manufacturing Partnership	Dept. of Energy
Solar Energy Technologies Program	Dept. of Energy
Geothermal Technologies Program	Dept. of Energy

Source: Committee for Climate Change Science and Technology Integration 2009

Industry consortia and cooperative partnerships

A further major element of networking and technological brokering derived from the DARPA model has been the establishment of a series of private and public-private industry consortia amongst American firms. The template for this strategy was first developed in the mid-1980s, largely in response to growing competitive IT threats from Western Europe and (in particular) East Asia. In this context, DARPA oversaw the creation and funding of an entity called SEMATECH in 1987 – a consortium of 14 major US semiconductor firms aimed at shoring-up American leads in electronics and IT by encouraging them to act as a single coordinated research company on ‘pre-competitive’ research. The primary motivation for these companies to collaborate was the offer of generous federal funding that would match their private R&D budgets almost dollar for dollar (Sematech 2012). The success of SEMATECH in rapidly reestablishing American dominance in semiconductors would thereafter establish the consortium model as yet another important networking template for federal innovation policy.

One of the more prominent examples of this type of collaborative R&D in the alternative energy realm can be found in the United States Council for Automotive Research (USCAR).

Prior to the formation of groups like SEMATECH and other consortia formed throughout the late 1980s, the notion of formal industry collaboration was a rather foreign concept in the US, with powerful anti-trust laws strongly discouraging businesses (particularly large corporations) from working together in this type of capacity. This was especially the case in the American auto industry where the Big Three (Chrysler, General Motors, and Ford) had dominated the market throughout the twentieth century and viewed each other *not* as potential collaborators with whom to share R&D secrets, but rather as competitors to be bested. Yet as competitive threats from Western Europe and East Asia began to increasingly steal the market share of American companies in a host of industries (including the auto industry), Congress passed the Cooperative Research Act of 1984 (see Chapter 4) in an attempt to encourage and create favourable conditions for R&D collaborations between domestic industrial competitors. It was in this context that the Big Three – realizing that organizations like Japan’s MITI were already facilitating highly integrated technical collaboration among domestic firms – began to establish a host of collaborative research programs beginning in the late 1980s, several of which would be supported and coordinated by the federal government. The aggregate of these various consortia were soon thereafter brought under the umbrella of the United States Council for Automotive Research (USCAR) – the purpose of which is to coordinate and strengthen existing collaborative programs, and encourage a host of new ones. The council maintains an organizational structure composed of a Leadership Group (comprising members from each company), nine Technical Leadership Councils to oversee and direct the companies’ collaborative research portfolios, and a series of working groups from each of the program’s 30 individual consortia.

While several of these consortia have been relevant to the NCCTI's objectives (see Table 7.8), among the more prominent of these federally-organized consortia has been the Partnership for a New Generation of Vehicles (PNGV) and its successor programs. PNGV was established in 1993 between USCAR and the federal government, largely in a compromise by the auto sector to avoid the implementation of stronger Corporate Average Fuel Economy (CAFE) standards (see Nader 2000). Though the program failed to meet its goal of deploying a fleet of vehicles with three times the fuel efficiency of conventional mid-sized cars, the program was renewed in 2002 under the title of the FreedomCAR initiative, and again in 2009 as the USDRIVE Program (which is now integrated with the Electric Power Research Institute). Like PNGV and FreedomCAR before it, USDRIVE focuses on coordinating high-risk, federally funded research amongst the DOE national lab system, the Big Three, and parts suppliers to develop a series of technologies (primarily fuel cells and hybrid propulsion systems) aimed at facilitating market growth in a range of affordable, high-mileage vehicles.¹¹⁷

Table 7.9
USCAR consortia relevant to climate and energy

Consortium	Date Formed
United States Advanced Battery Consortium	1991
Environmental Research Consortium	1991
Vehicle Recycling Partnership	1991
Low Emissions Technologies R&D Partnership	1992

¹¹⁷ Other major programs specifically geared toward the DOE's energy and climate goals include the Automotive Composites Consortium aimed at sharing costs and resources in the development of polymer composites capable of yielding improved fuel economies across the American fleet; the Environmental Research Consortium designed to pool resources in the design and implementation of more efficient, environmentally friendly production processes; the Low Emissions Technologies R&D Partnership aimed at coordinating research efforts on emissions control technologies through open exchanges of technical information, cost sharing in development, and shared licensing of promising technological breakthrough; the United States Automotive Materials Partnership established to share costs and information in the development of more efficient and environmentally friendly materials and material processes; and the Twenty-first Century Truck Partnership aimed at developing a new fleet of low-emission trucks and buses that can move larger volumes of passengers and freight longer distances on less imported petroleum.

United States Automotive Materials Partnership	1993
Partnership for a New Generation of Vehicles (PNGV)	1993
FreedomCAR (successor to PNGV)	2002
United States Alliance for Technology and Engineering for Automotive Manufacturing	2004
Driving Research and Innovation for Vehicle efficiency and Energy sustainability partnership (successor to FreedomCAR)	2011

Source: USCAR 2012

Over the past several years, similar consortia with government assistance have begun to emerge in a range of alternative energy sectors, including nuclear (NuStart Energy Development Consortium), wind (the Great Lakes Wind Energy Consortium), and solar (The Solar Consortium). To date, the largest of these groups outside the auto sector is the nuclear industry's NuStart program, whose twelve member firms collaborate with the DOE and National Lab System on a 50-50 cost share agreement with the goal of completing the design and demonstration of fourth generation reactor technologies.

Late stage development and commercialization

In this final section, we turn to the developmental state's role in commercializing and facilitating the uptake of novel alternative energy technologies. It is at this stage that we see the federal government attempt to take the fruits of the publicly funded and coordinated R&D efforts described above and translate them into new markets around the resultant technologies. As discussed in Chapter 4, when a biophysicist named Herbert Boyer first used public funds and research supported by the National Institutes of Health (NIH) to establish a start-up biotech firm called Genentech in 1976, this move was seen as challenging the NIH's long-accepted mission as an academic research institution divorced from the commercial realm. However, a

decade's worth of proactive federal legislation aimed at pushing publicly funded research to private markets would quickly render the Genentech example the rule, and no longer the exception. Indeed, these policy initiatives would increasingly make the task of commercializing new technologies *the* central preoccupation of state-funded scientific research, with university and federal lab administrators being saddled with strict mandates to move novel technologies to the private sector as quickly and effectively as possible. The primary distinctive element of late stage development is a process referred to herein as 'technology transfer'. The following section closes out this chapter by discussing the mechanics of this process in the alternative energy realm.

Step three: technology transfer

ARPA-E is building a world-class commercialization program. No matter how successful ARPA-E-funded technologies are in the lab, they will not succeed in having an impact unless they are fully developed into products that are deployed and used widely in the marketplace. Successful commercialization requires a clear market strategy and business model, strong partnerships, and ample follow-on funding (Department of Energy 2012a).

Technology transfer is the stage at which the federal government either a) helps a research group make the necessary business connections required to bring their publicly-supported innovation to market, or b) helps an established business take ownership of a patented, yet unclaimed, innovation developed with public resources (Block 2008). In the context of the intensified market focus of government-funded science over the past several decades – what Henderson and Smith (2002) described in Chapter 4 as “an implied duty to commercialize” – this stage has come to represent a major lynchpin of state-led innovation. Moving beyond the passive ‘pipeline model’ of technology transfer (also described in Chapter 4), it is at this stage that the government takes responsibility for proactively ensuring that its R&D investments are

parlayed into viable commodities and markets.

Once again we see a strong tendency toward decentralization, with the vast majority of these activities being carried out at the level of individual labs and research groups, as opposed to a centralized agency. In the case of energy technologies, the federal government assumes an important role in facilitating the transfer of publicly-developed innovations from nearly all of the 600 labs doing relevant R&D work within the Federal Laboratory Consortium (FLC) network, but by far the most crucial point of transfer is the Department of Energy's (DOE) National Lab System. The DOE's laboratory system is a network of fifteen federally owned research facilities in which more than 30,000 scientists and engineers currently perform cutting edge energy research. The labs receive an annual operating budget from Congress, but are also funded through the research groups that come to do work in the labs with federal grants, as well as private clients and research partners working on contract.¹¹⁸

Though this cluster of labs has been progressively growing in size and resource capacity since the close of the Second World War, proactive technology transfer strategies represent a fairly recent element of their mandate. Before the wave of 1980s legislation discussed above, moving new technologies developed in these labs to the private sector relied primarily on passive dissemination mechanisms like scientific publications and informal networking. With this strategy proving itself increasingly outdated and ineffective in the context of growing competitive threats, institutionalized technology transfer programs and mandates were imposed upon the National Lab System in the 1980s to help "enhance the chances of commercial impact and societal benefit, thereby justifying the taxpayer investment in the laboratories' research and

¹¹⁸ While all of the labs are owned and funded by the federal government, many of them are operated on contract by not-for-profit management companies. The most prominent example is the Battelle Memorial Institute – a nonprofit, charitable trust which runs several DOE labs.

other activities” (Perry 2010: 6).

The policy foundations for this shift were laid by three crucial pieces of federal legislation. First, the Stevenson-Wydler Technology Innovation Act of 1980 officially added technology transfer to the mandate of all federally funded research labs. The Act provided federal funds for the creation of Technology Transfer and Intellectual Property Management Departments within each lab, staffed by individuals experienced in managing, marketing, and licensing intellectual property, as well as in patent law (Margolis and Kammen 1999). Second, the Bayh-Dole Act (also known as the University and Small Business Patent Procedures Act) of 1980 gave small businesses, universities, and not-for-profits the right to take full ownership of any intellectual property created in the course of their work in the labs.¹¹⁹ By overriding the pre-existing policy of patenting *all* lab innovations in the federal government’s name, Bayh-Dole rebranded the labs as, in effect, public-private workshops where firms could send scientists and engineers to undertake federally sponsored R&D work without worrying about patent protection (Mowery et al 2001, 2004). It also ensured that the government’s backlog of unused patents (which was approximately 28,000 as of 1980 – with a less than 5% transfer rate – under the previous policy), would not continue to skyrocket at the same rate (Duecker 1997). And finally, the Federal Technology Transfer Act of 1986 allowed the labs to establish Cooperative Research and Development Agreements (CRADAs) with private businesses. This arrangement gave the labs the option to share research costs with a private partner and negotiate an exclusive license to the resulting technology (Perry 2010).

The primary way that technologies are transferred in the National Lab System is through basic

¹¹⁹ This provision required that the private partner: a) immediately patented the invention, b) granted the federal government a non-exclusive and non-transferrable license to the technology, c) actively promoted and commercialized it, and d) gave preference to US industry in licensing or selling the technology.

intellectual property licensing agreements with private sector firms. In effect, once the Technology Transfer Department identifies an innovation in their facility that demonstrates commercial potential, the lab patents the design and begins seeking licensees to take it to market. The search for a suitable licensee is carried out through a variety of means, including listings on the lab's website (each lab maintains a searchable database open to the public of patents available to be licensed), publications in scientific journals, as well as notices to relevant industries, academic institutions, and the media. The Technology Transfer Department assesses licensee applicants based on a series of qualifications, including the presentation of a formal plan for commercialization, financial resources, management experience, R&D capabilities, and experience in the relevant market (Lawrence Berkeley National Laboratory 2012). When a suitable applicant is found, the Technology Transfer Department and the applicant negotiate the terms of a licensing agreement.¹²⁰

Beyond standard licensing agreements, three other strategies have become increasingly relevant under the government's mandates. First, most DOE lab have a program referred to as 'Work for Others' (WFO) through which they can enter into collaborations with universities, private firms, non-profit organizations, etc., in which sponsors make a financial grant to the lab stipulating that the funds be used to pursue a specific research agenda on their behalf. In line with Bayh-Dole Act described above, the external funding partner sponsoring the research has the opportunity to maintain all intellectual property rights, thereby implicitly transferring any

¹²⁰ This agreement establishes the invention's issuing fee (a one-time, non-refundable price paid for access to the license based on the perceived market value of the technology, typical licensing fees in the industry, and any additional costs required to bring the technology to market), the running royalty fee paid to the lab (typically based on a percentage of subsequent sales), a minimum annual royalty fee, the terms of exclusivity (licenses may or may not be exclusive, or may only be exclusive to a specific region or specific field of use – and in most lab agreements, the federal government is granted a full license to use the invention for government purposes). Additionally, all technologies must be "substantially manufactured in the US" (Lawrence Berkeley National Laboratory 2012).

resultant innovations (Oak Ridge National Laboratory 2012). Second, through Collaborative Research and Development Agreements (CRADAs), the lab and the industry participant define and undertake the research agenda as a collaborative partnership, with each side providing personnel, services, and equipment. Rights to any novel technologies, intellectual properties, or data generated through the research are negotiated as part of the CRADA, but typically the DOE promotes the arrangement as an expeditious means by which to transfer research findings directly to industry (Argonne National Laboratory 2012). And finally, under User Facilities Arrangements, the DOE labs make their facilities available to private organizations to undertake their own R&D activities. Under these arrangements, the private group generally pays the full cost of conducting research activities at the lab, defines the agenda on their own terms, provides most of the personnel, and maintains all rights to novel innovations and intellectual property derived from the research (Oak Ridge National Laboratory 2012a). If, however, the external party agrees to publish their findings publicly, they may not be required to cover the cost of using the facility.

Since taking on technology transfer as one their primary mandates, the DOE labs have been extremely successful at bringing novel innovations to the market. In 2008 alone, the twelve DOE labs engaged in more than 12,000 technology transfer transactions. These included more than 2500 Work for Others agreements, 2800 user facility agreements, 700 CRADAs, and more than 6000 licenses for patented technologies (Perry 2010). In addition, the labs reported more than 1400 new inventions and filed close to 1000 new patent applications for which, as of

2010, nearly 400 patents had been issued.¹²¹

The commercialization ‘Valley of Death’

Beyond the lack of formal channels for proactively moving innovations to the private sector, there was a second major problem with the pre-existing pipeline model that current transfer mechanisms aim to resolve. This problem (which is inherent to the innovation process broadly, but particularly with regard to high-tech innovation) is referred to as the commercialization ‘valley of death’, and helps to underscore the need for active state involvement in the commercialization process. The valley of death is an extremely challenging point in the innovation process where the *need* for large investments of capital, technical skills, and business skills are at their very highest, and yet the *actual existence* of these inputs is typically at its very lowest (Markham et al 2010; Murphy and Edwards 2003). This stage of the innovation process has historically laid waste to countless valid technologies that have gone unsupported during this period, and thus failed to reach the market. The valley of death begins to take serious effect approximately half way through the process when, ideally, private firms would be acquiring the technology and taking it to market.

Given the reticence of private firms and so-called ‘angel investors’ to see most technologies through the valley of death, this has become a key mission of the Commercialization and Deployment Teams within the DOE labs. To this end, the DOE has created a series of programs to see novel technologies through the three major gaps that comprise the valley.

¹²¹ This success has not come without some perceived drawbacks. Many have argued that the overwhelming focus on commercialization over the past few decades has distracted the DOE labs from their intended focus on basic research, education, and broad public dissemination of data and research findings, and rendered the labs highly schizophrenic entities as they attempt to simultaneously play the part of governmental, industrial, and academic institutions – all of which have very different paradigms for measuring R&D success (Ibid).

The first problem, referred to as the ‘talent gap’, stems from the fact that the scientists and engineers that invent technologies in these labs tend to lack the formal business training required to take an unproven innovation to market. To address this particular issue, the federal government has established two key programs. First, the Entrepreneur in Residence Program (EIR) actively places dozens of representatives from venture capital firms in each of the national labs, where they work in close contact with scientists and engineers to identify technologies for their firms to invest in (US Department of Energy 2012d). Upon signing a non-disclosure agreement, the individuals selected for the residency are allowed full access to all R&D activities and new technologies (save those requiring security clearance). Upon identifying an innovation with commercial potential, the venture capital firm must submit a business plan to the DOE and assemble a management team to help the inventors oversee the commercialization and start-up process (Ibid). Second, the DOE maintains a program called the Innovation Ecosystem Initiative, which aims to mock the spatial integration and coordination of inventors, entrepreneurs, and venture capitalists typical of places like Silicon Valley and the North Carolina Research Triangle. The program works by establishing a series of ‘regional innovation ecosystems’ in five strategic centers (generally located near National Labs) that bring together key players from university labs, the private sector, and the DOE labs to identify and develop promising new innovations, and provide them the combination of technical and business skills required to achieve successful commercialization (US Department of Energy 2012e).¹²²

¹²² The program’s five established major hubs include the Clean Energy Trust in Chicago, the **Fraunhofer Center for Sustainable Energy Systems** in Boston, the University of Utah in Salt Lake City, the University of Central Florida in Orlando, and the University of California, San Diego.

The second major problem, referred to as the ‘information gap’, stems from the fact that attracting investors to help move a new technology from the lab to the market requires great amounts of information dissemination and education, yet in addition to often lacking adequate channels to spread information about new technologies, the technical language of scientists and engineers often obscures an innovation’s potential as a profitable commodity. Two key programs have been developed to address this problem. First, DOE’s Energy Innovation Portal is a comprehensive online database of all the DOE innovations available for licensing at any given time. Through this database, potential businesses and investors can view the DOE’s backlog of nearly 12,000 available energy technologies in non-technical, easy-to-understand language. The DOE further provides a summary of all new innovations from its labs through publications in scientific journals, email alerts, and newsletters to relevant industries, academic institutions, and the media (US Department of Energy 2012c). Second, the DOE’s Technology Commercialization Showcases (TCS) are a series of conferences arranged each year by the DOE aimed at bringing together venture capital firms and representatives from small and large businesses to survey the DOE’s newest available technologies (US Department of Energy 2012f). Through these events, Program Managers from each lab are able to disseminate information about their innovations and attract private investors to bring them to market.

The final major gap in the valley of death is referred to as the ‘capital gap’. This problem stems primarily from the fact that established firms generally prefer to limit the bulk of their R&D spending to funding the ‘learning curve’ of a new product (that is, working out smaller kinks and imperfections before reaching the market), and would prefer not to be saddled with the risk of further developing risky and unproven technologies that still require large resource investments. To address this gap, the DOE’s Technology Commercialization Fund provides

generous financial and in-kind support to timid investors in their commercialization efforts. The program operates by proactively identifying the innovations in the DOE National Lab system that are most likely to fall victim to the capital gap, and subsequently attaching generous matching funds for private sector partners willing to commercialize the technology (US Department of Energy 2012g).

Successful transfers

While small examples of recently successful transfers are numerous (see Table 7.10 for a very brief selection – there were indeed more than 12,000 transfers in 2008 alone), ideal cases are those which not only make it to market, but also prove capable of creating large and durable markets for the technology and creating domestic jobs. Examples like chemical giant BASF's licensing of a novel battery technology from Argonne National Laboratory in 2009 represent something of a 'dream scenario' for the DOE and federal government. When this lab's Technology Transfer Office patented and disseminated invitations to license a novel composite cathode material used in the manufacturing of advanced lithium-ion batteries, BASF (the world's largest chemical company) sought and obtained a world-wide licensing agreement to mass produce and market the technology under the guise of the DOE's Vehicle Technologies Program. Soon after, BASF additionally obtained a grant from the DOE under its Electric Drive Vehicle Battery and Component Manufacturing Initiative to manufacture batteries using the new technology at a domestic plant in the United States. The company has since begun moving forward with plans to build North America's largest cathode material production facility in Elyria, Ohio. In addition to pushing forward CCTP objectives with regard to battery and advanced vehicle technologies (this particular cathode material is claimed to produce

advanced batteries that are longer-lasting, higher-performing, safer, and less-expensive than current lithium-ion technologies), the transfer of this technology is expected to produce thousands of construction and permanent manufacturing jobs to the economically troubled Midwest. As Elyria’s Congresswoman Betty Sutton noted in a press statement, “With this new license and proposed production plant, BASF will invest substantial financial resources in Ohio to bring good-paying, clean-energy jobs to our state... The company’s subsequent innovation will spur critically needed jobs in Ohio, where the unemployment rate in April [2009] was 10.2 percent. Through this development, Ohio can be especially influential in the clean-energy jobs of the future” (Hardin 2009).

Table 7.10
Selected successful transfers

Licensee	DOE Laboratory	Innovation
Aspen Technology	National Energy Technology Laboratory	Advanced Process Engineering Co-Simulator (APECS): Software that allows engineers to optimize advanced power generation systems. Has been used to optimize a solid oxide fuel cell auxiliary power unit and develop co-simulations of a conventional coal-fired, steam plant and an advanced natural gas-fired, combined cycle plant.
M2E Power	Idaho National Laboratory	The Motion to energy power generation system converts the power of motion into electrical generation and battery charging. It uses a micro-generator with power management circuitry that kinetically charges mobile batteries from natural motion, such as walking, eliminating the need for recharging and taking mobile devices off the electrical grid.
Nalco Mobotec, Inc	National Energy Technology Laboratory	The Thief Process for Mercury Capture enables the cleaner use of coal for electricity production. The process uses partially-combusted coal from the furnace of a pulverized coal power plant as an in-situ sorbent to inexpensively remove mercury from flue gas emissions.
Kellogg Brown & Root (KBR)	National Energy Technology Laboratory	The award-winning Continuum Coal Chemistry Module (C₃M) allows scientists and engineers to accurately simulate chemical reactions in science-based simulations of advanced energy processes that use coal or other solid feedstocks such as biomass.
OptiSense Network	Idaho National Laboratory	The Electro Optic Voltage Sensor System will enable utility companies to monitor feeder circuits more cost effectively, enhance system operations, optimize power flows, and provide greater grid security and reliability.

Nuclear Filter Technology	National Renewable Energy Laboratory	The Fiber Optic Hydrogen Sensor provides for early detection of hydrogen so vital to safe handling of hydrogen to support the market viability of a hydrogen-based economy.
Seeo, Inc.	Lawrence Berkeley National Laboratory	Solid Nanostructured Polymer Electrolyte for Rechargeable Lithium Batteries is enabling development of a solid-state rechargeable lithium battery with the potential to improve the storage capability, safety and lifetime of rechargeable batteries for use in electric and hybrid vehicles, cell phones, laptops, and medical devices.
Compass Metals, Inc	Sandia National Laboratories	Inexpensive Fuel Cell Catalysts offer much greater control over the shape, size, porosity, composition, stability, and other functional properties of platinum nanostructures than those achieved by existing methods. Most fuel cells use platinum or platinum alloys as catalysts.
EnerDel	Argonne National Laboratory	High-Powered Battery for Hybrid Electric Vehicles (HEVs): Novel battery technology that is lighter in weight, more compact, more powerful and longer lasting than the Ni-MH batteries in current hybrid electric vehicles.
Simbol Mining	Lawrence Livermore National Laboratory	Method for Mining Geothermal Waters: solves a critical problem of geothermal turbine facilities by extracting the silica that clogs pipes, filters and heat exchangers, enhancing geothermal plant efficiency. The recovered silica can then be used to supplement the short supply of silica for solar photovoltaic cells.
Sunlight Direct, LLC	Oak Ridge National Laboratory	Hybrid Solar Lighting: lightweight, roof-mounted collector that concentrates visible sunlight and blends the natural light with artificial light to maintain a constant level of room lighting, reducing the cost of lighting in commercial buildings.
Solexant	Lawrence Berkeley National Laboratory	The Award-winning Nanocrystal Solar Cell is an ultrathin film solar technology using nanocrystal semiconductors; it is the only photovoltaic technology that is sufficiently long-lasting and inexpensive to compete with electricity from the grid. The cell is a winner of a 2009 R&D 100 award.
Applied Optical Systems	National Renewable Energy Laboratory	Advanced Optical Furnace technology for manufacturing thin-film silicon solar cells, produces solar cells with up to 15 to 18% higher efficiencies than presently available. This technology, which can be used to manufacture any type of solar cell, including diffusion, metallization and oxidation, will also make it possible to process a thin-film solar cell in only a few minutes, which reduces manufacturing costs.
Emcore Corp	National Renewable Energy Laboratory	The Award-winning Inverted Metamorphic Multijunction (IMM) Solar Cell established a solar cell efficiency of 37.9% under concentrated light equal to 10 suns in 2005, and in 2008, a modified version of the IMM design set a new record of 40.8% efficiency under 326 suns. The cell is a winner of a 2008 R&D 100 award.
EnergyPlus + 27 other licensees	Lawrence Berkeley National Laboratory	EnergyPlus , developed at and distributed by the is a building energy simulation software program that evaluates HVAC, lighting and window systems as well as natural ventilation in building plans to identify energy-saving design changes.

Rose Street Labs Energy, Inc.	Los Alamos National Laboratory	ENABLE technology, is an energetic neutral atom beam used to synthesize high quality thin films critical to the development of full spectrum photovoltaics. ENABLE was a winner of a 2006 R&D 100 Award.
Maxon, Inc.	Lawrence Berkeley National Laboratories	Gas Combustion Technology: an ultra-low emission combustion technology for gas turbines that reduces greenhouse gas emissions and pollution to one-tenth that of state-of-the-art burners.
Powerspan	National Energy Technology Laboratory	CO₂ Scrubber process: captures carbon dioxide from flue gas produced at power generation systems that use coal, by using an aqueous-based scrubbing solution. This new wet scrubbing technique provides a solution for mitigating global warming and for pollution control, while allowing cost-effective electricity generation.

Source: US Department of Energy 2012a

Conclusions: Neoliberalism and the developmental state

Against the hostile current of neoliberal anti-interventionism, this chapter has drawn attention to the rather sophisticated developmental state structures that have evolved within the federal government over the past three decades, and are currently being put to use in the alternative energy realm. While the state's drive to push continued innovation is a compulsion that exists despite the strength of neoliberal ideology in the US, the specific forms that these structures have taken is very much a result of neoliberalism's influence. Indeed, largely in light of the ideology's strong repudiation of industrial policy (and compounded by the nature of the American developmental state's objectives), these structures have developed as a somewhat indecipherable maze of decentralized programs. As this chapter has suggested, this decentralization can be observed at all stages of the innovation and commercialization process, from 'targeted resourcing', through the 'networking' and 'technology transfer' phases. When combined with the influence of partisan battles over R&D policy and general perceptions about the relative roles of states and markets in the innovation process, the American developmental state has maintained a certain 'hidden' quality throughout its evolution – a characteristic

which, it has been argued in this chapter, has been crucial to its durability over the past thirty years.

Yet in spite of the success of these policies and structures in driving innovation and market growth, their continuity in the alternative energy realm remains ceaselessly under siege from the right. This has particularly been the case in the wake of the 2010 federal mid-term elections, in which a resurgent Republican majority took control of the House of Representatives and vowed to take aim at what it views as the administration's wasteful green energy agenda. In the following chapter, the continued tension between neoliberal ideology and the developmental state is underscored through an assessment of the recent backlash that has unfolded against the push and pull policies discussed in the previous two chapters.

Part IV
Political Tensions of Technology-Centric Climate Policies

Chapter eight

Reshaping selectivities: Enduring tensions of American climate regulation

While the alternative pathways described in the previous chapters have indeed begun to foster a developmental state project around alternative energy in the US, increased political backlash from the right over these strategies has, particularly since 2011, brought their strength and continuity into serious question. Particularly with regard to the strategic selectivities around pull policies described in Chapter 6, as these strategies have proved increasingly consequential in implementing climate regulation over the past several years, they have begun attract the intense ire of industry groups and neoliberal politicians seeking to re-shape the institutional conditions within which climate policy advocates have begun to operate. To this end, the past few years have seen concerted attempts to not only rollback already-enacted climate policies, but also create legal structures capable of preventing any future policy efforts along these strategically selected pathways. In highlighting these recent attempts, this chapter aims to further underscore the project's general assertion that the politics of neoliberalism and anti-regulationism exist in constant tension with the state's abiding role in fostering accumulation and economic growth – a condition which causes the developmental state project around alternative energy to maintain a continual ebb-and-flow quality.

Backlash against unilateral executive authority

While all of the alternative policy routes described in this project have been the subject of great political contestation of late, likely none has raised the ire of the right quite as much as the Obama administration's attempt to unilaterally regulate GHG emissions through the EPA and

the Clean Air Act. Immediately recognizing the potential for this course of action to unfold following the publication of the EPA's endangerment finding, members of the House and Senate (from both major parties) took to attacking this strategy as not only bad for the economy and American families, but also as an assault on the democratic process itself. In the 112th Congress alone, more than a dozen bills, Continuing Resolutions, and amendments were proposed by both Republicans and Democrats seeking to strip the EPA of its capacity to take such action (see Table 8.1).

Table 8.1
Proposed legislation to block EPA regulation of GHGs, 112th Congress

House of Representatives
H.R. 1023: No More Excuses Energy Act of 2011
H.R. 910: Energy Tax Prevention Act of 2011
H.R. 750: Defending America's Affordable Energy and Jobs Act of 2011
H.R. 199: Protect America's Energy and Manufacturing Jobs Act of 2011
H.R. 97: Free Industry Act
H.R. 279: Bill to prohibit any federal agency or official, in carrying out any Act or program to reduce the effects of greenhouse gas emissions on climate change, from imposing a tax on gaseous emissions emitted directly by livestock
H.R. 680: Bill to overturn the EPA's endangerment finding on carbon dioxide and prohibit United States contributions to the UN Intergovernmental Panel on Climate Change
Senate
S. 231: EPA Stationary Source Regulations Suspension Act of 2011
S. 12: Job Creation Act of 2011
S. 482: Energy Tax Prevention Act of 2011
S. 15: Bill to prohibit the regulation of carbon dioxide emissions in the United States until China, India, and Russia implement similar reductions
S. 482: Defending America's Affordable Energy and Jobs Act of 2011

Source: US Congress 2012

The most comprehensive and far-reaching of these attempts is a piece of legislation (which has passed in the House but is still under consideration in the Senate at the time of writing – though unlikely to pass) titled the Defending America’s Affordable Energy and Jobs Act (or the ‘Barasso Bill’).¹²³ Co-sponsored by ten GOP senators (and backed by groups like Americans for Tax Reform, Americans for Prosperity, and the Competitive Enterprise Institute), this legislation would not only strip the EPA of its current capacity to regulate GHG emissions, but would also work toward the goal of fundamentally reshaping any administration’s ability to make use of this type of strategic selectivity by (a) overturning the EPA’s endangerment finding on GHGs, (b) making it illegal for *any* federal agency to take into account GHG emissions of *any kind* during the rulemaking process, (c) banning all federal agencies from using the science on which the endangerment finding was based (which was published by the National Academy of Sciences) for any policy decisions, and (d) making it illegal for the EPA to gather data on which facilities are emitting GHGs and the amount being released (US Senate 2011). The bill would thus effectively serve as a domestic counterpart to the Byrd-Hagel bill (discussed in Chapter 5), which placed far-reaching constraints on the administration’s capacity to enter into international GHG emissions reductions treaties. The bill comes on the heels of a failed piece of similar legislation co-sponsored by Republican Senators James Inhofe¹²⁴ and Mitch McConnell which, despite receiving a decent amount of bipartisan support, failed to obtain the 60 votes required to pass on cloture and overcome a Senate filibuster. The result has been a series of secondary bills in the Senate aimed at either stalling the regulations or significantly rolling back their regulatory strength until enough support is established to pass a

¹²³ This bill is named after its author, Republican Senator John Barrasso of Wyoming.

¹²⁴ Inhofe is famous for being a leading climate skeptic in the US Senate, having famously dubbed climate change the biggest hoax ever perpetrated upon the American public (Inhofe 2012).

more comprehensive bill like Barasso's or the Inhofe-McConnell bill. Senate Democrats have been among the first to draft such legislation, with Senator Jay Rockefeller of West Virginia (the second largest coal-producing state) introducing legislation that would impose a two-year delay on EPA regulations.

In the House of Representatives (where the GOP maintains a comfortable 49 seat majority), a series of far-reaching anti-climate regulation bills were easily passed in the 112th Congress with the help of several Democratic lawmakers. The most consequential one, entitled the Energy Tax Prevention Act of 2011, would once again unequivocally strip the administration and EPA of its authority to regulate GHG emissions of any kind (House of Representatives 2011). In building support for the bill's passage, Republican lawmakers argued that EPA regulations on CO₂ would raise the price of energy on American households by as much as \$3000 per year – despite protests from Democrats that such figures were mere scare tactics, and the fact that legislation was passed in 2010 that would compensate consumers for higher energy prices associated with regulations on GHGs (Holler 2011). A series of other pieces of legislation along similar lines was easily passed in the House of Representatives, all with different strategies to gain the requisite Senate support to prevent EPA regulation. Examples include Rep Marsha Blackburn's bill to amend the Clean Air Act with a provision explicitly stating that GHGs cannot be subject to regulation; Rep Shelly Capito of West Virginia, whose bill would mirror Rockefeller's Senate proposal to delay implementation for two years; and Rep Ted Poe of Texas, whose legislation would ban funding to any federal agency for the purpose of implementing a cap-and-trade program for GHGs. Other pieces of anti-climate legislation came from: Rep Stearns of Florida, whose proposal would stop the EPA from regulating coal ash pollution; Rep Labrador of Idaho, whose proposal would defund the White House Council

on Environmental Quality; Rep Leutemeyer of Missouri, whose legislation would prohibit funding for the UN's Intergovernmental Panel on Climate Change; Rep McKinley of West Virginia, whose proposal would prohibit the EPA from regulating all coal fired power plants; and Rep Pearce of New Mexico, whose proposal would prevent the Department of the Interior from funding any climate change adaptation efforts (Morello et al 2011).

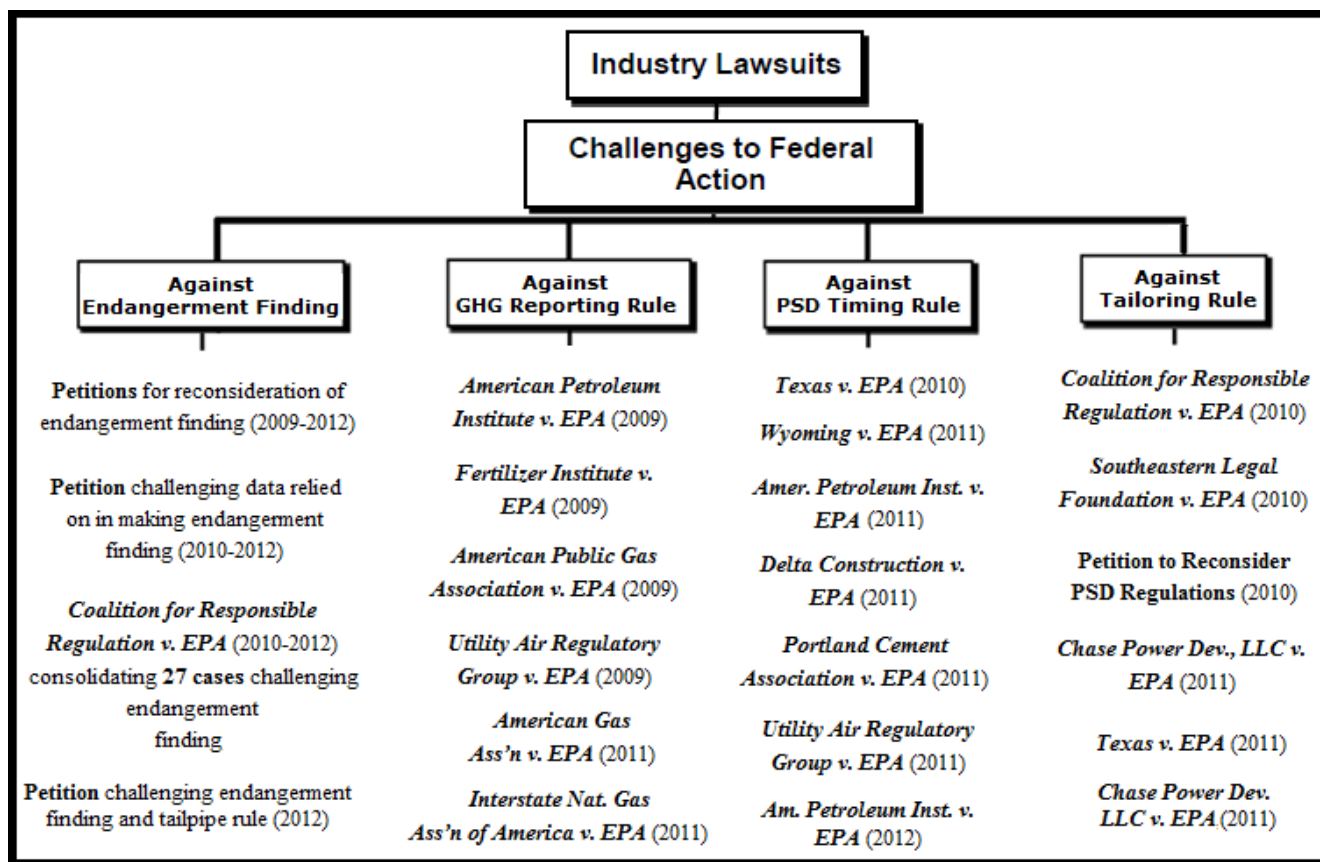
A further key strategy against executive authority pursued by House Republicans has been to use Continuing Resolutions to attempt to remove the EPA's capacity to fund its regulatory initiatives. A Continuing Resolution is, in effect, a contingency appropriations bill used to fund federal agencies in the absence of a formal budget bill. With the 2012 federal budget tied up in Congressional gridlock, House Republicans passed a Continuing Resolution intended to undercut the EPA's GHG regulation efforts by reducing its operating budget by close to 35% (Piltz 2011). In addition, the bill further sought to: block all funds for current and pending EPA GHG regulations for the fiscal year; reduce the agency's Global Change Program (used to study the potential impact of climate change) by one-third; reduce all climate change research programs under the authority of the EPA and Department of Interior by one-third; eliminate a \$500 million contribution to World Bank programs aimed at helping developing nations build clean energy infrastructure; eliminate or drastically reduce all federal climate aid funds for developing countries; and prevent the administration from appointing another so-called 'climate czar' (or creating any similar position) to develop national strategies to address climate change (Sugarman 2011).

Backlash against litigation strategies

In an attempt to close off the selectivity of litigation as a proxy for climate regulation, GOP officials have increasingly made concerted efforts to remove the formal provisions for citizen suits enshrined in most major environmental policy acts. Two such bills put forth by Rep Steve Pearce of New Mexico would remove all civil litigation provisions under the Clean Air Act, the National Environmental Policy Act, and the Endangered Species Act (Library of Congress 2012). The push to eliminate such provisions has taken on heightened importance for the right over the past few years not only in light of the massive increase in such litigation, but also as the Obama administration has (as part of the White House's Regulatory Compliance Transparency Initiative) allocated additional federal funding and resources to a national online legal database called the Enforcement Compliance History Online (ECHO). ECHO aims to provide citizens and environmental groups with 'easy-to-use' facility compliance information for the more than 800,000 EPA-regulated facilities, in a less than veiled attempt to promote litigation against corporate polluters (see e.g., Plumb 2004).

While bills like Rep Pearce's have thus far proved fruitless in the US Senate, a second important strategy employed by those opposed to litigation-induced climate regulation has been to simply file an endless barrage of counter suits against the federal government, in an attempt to overturn or delay the implementation of federal standards (see Table 8.2). These suits have taken aim at everything from the EPA's original endangerment finding on CO₂, to a range of ancillary issue areas covered by the Clean Air Act's Prevention of Significant Deterioration' clause invoked on GHGs. Few of these counter suits have been upheld to date.

Table 8.2
Selected industry suits aimed at blocking federal climate regulation



Source: Columbia Law School Center for Climate Change Law 2012¹²⁵

Backlash against sub-national policies

Sub-national policies and regional treaties have, for their part, also come under heavy fire from the right – particularly as a majority of state legislatures and governorships have been recaptured by Republicans since 2011. Once again, we see in this context not only attempts to roll-back or block existing legislation, but also create legal constraints aimed at preventing future use of the sub-national selectivity.

Among the most consequential of such attempts was an effort in California on the part of energy firms to suspend the Global Warming Solutions Act of 2006 – the largest and most

¹²⁵ For full explanations of the nature and outcomes of these cases see Columbia Law School Center for Climate Change Law 2012.

comprehensive state-based climate initiative to date (see Chapter 6). Given that the California Republican Party is perennially outnumbered in the state legislature, energy corporations seeking to overturn the program were forced to build support for an independent referendum (known as Proposition 23) on the legislation as part of the 2010 gubernatorial elections.¹²⁶ With the success of Proposition 87 in 2006 – a referendum to overturn the Tax on California Oil Producers, which would have established a \$4 billion fund to reduce petroleum consumption in the state by 25% through a tax on oil companies¹²⁷ – opponents saw the referendum as something of a ‘proxy war’, and a key opportunity to take a decisive stand against these types of sub-national initiatives in one of the country’s most progressive states (Basset 2010). Cleverly framing the issue for the left-leaning electorate, the language of Proposition 23 did not seek to brazenly kill the Global Warming Solutions Act, but rather would have legally frozen its provisions until the state’s unemployment rate fell from the 2010 level of 12.4% to below 5.5% for four consecutive quarters – a rate which has been achieved in California only three times since 1980 (Brownstein 2010). While effectively guaranteeing that the program would be shelved indefinitely (and preventing any further regulatory packages along these lines), the strategy of posing the proposition in terms of the state’s unemployment rate shrewdly re-framed the effort as boon to the state economy and working families, as evidenced by the proposition’s official title, the ‘California Jobs Initiative’. Despite a powerful public relations campaign by supporters of the measure, Proposition 23 was defeated with 61.5% of Californians voting against it.

¹²⁶ This required supporters of the measure to collect 800,000 signatures. The main corporations pushing for the referendum were Valero Energy Corporation, Tesoro Oil and Gas, and Koch Industries.

¹²⁷ Proposition 87 stands as the highest funded single-issue referendum in American history, with spending between the two sides totaling over \$154 million (Lomax and Chediak 2010).

Proposition 23 was, however, merely the first in a long line of attempts to rollback an array of progressive sub-national policies signed into law over the past decade, as well as prevent future ones. In Florida, for example, the Climate Protection Act (which would have sought to reduce CO₂ emissions from utilities to 1990 levels by 2025 with a cap-and-trade program at its centre) was handily overturned by the Republican legislature, along with the repeal of the Florida Energy and Climate Commission – a panel charged with creating plans for emissions reductions strategies and opportunities to seed an alternative energy industry in the state (US Department of Energy 2012h; Association of Corporate Counsel 2012). As an outspoken ‘climate denier’ and signatory to the Americans for Prosperity’s ‘No Climate Tax’ pledge, newly elected governor Rick Scott led the campaign to kill the program (Americans for Prosperity 2012a). In New Jersey, the Republican-dominated legislature passed a bill in early 2010 preventing the state from monitoring or collecting data on GHG emissions from utilities. This bill effectively repeals the state’s Global Warming Response Act of 2007 (which sought to reduce emissions by 20% by 2020) and prevents any future climate regulation by making it illegal for the state to monitor GHG emissions from utilities (Baxter 2011). In Wisconsin, the Clean Energy Jobs Act would have set a renewable energy mandate for utilities of 25% by 2025, along with other initiatives to attract clean energy jobs to the state. However, newly elected Republican Governor Scott Walker has since refused to formalize the bill, arguing that it is merely another in a long line of “radical environmental policies that kill jobs” – suggesting that the bill would lead to a loss of 43,000 jobs across the state (Johnson 2010).¹²⁸

A further major form of backlash against sub-national programs has been a spate of Republican governments removing their states from regional climate treaties. The program most impacted

¹²⁸Walker is also a signatory to the Americans for Prosperity’s ‘No Climate Tax’ pledge (Scottwalker.org 2010).

by such efforts to date has been the Western Climate Initiative (WCI), which has been, to all intents and purposes, dismantled. Arizona was the first state to signal its intention to leave the program. Upon taking office in 2009, Republican Governor Jan Brewer, with strong support from the state's legislature, issued an executive order prohibiting any system of regulations that would raise energy costs for businesses or consumers. In addition to withdrawing from WCI, the Governor ordered a review of all of the state's existing efforts to fight climate change (ordering that they be rolled-back or overturned if found to be detrimental – however defined – to business in the state) (Fischer 2011). Following on the heels of Arizona's departure, New Mexico soon followed suit. Though the state had once been a national leader on climate – passing the Renewable Energy Act which imposed a renewable standard of 20% by 2020 and made New Mexico the first state to pass enabling legislation for WCI – the state's Tea-Party backed Governor Susana Martinez immediately withdrew the state from the treaty upon taking office. Martinez argued that WCI and the Renewable Energy Act would impose an unnecessary energy tax on businesses and families, and further suggested that the science to date does not completely support the theory of manmade global warming (Samuelsohn 2010a). Martinez further dissolved the state's Environmental Improvement Board charged with implementing New Mexico's climate and energy strategy, and issued an executive order halting all pending energy regulation. Finally, on November 18, 2011, the states of Montana, Utah, Washington, and Oregon formally withdrew from WCI, citing their intention to participate in the negotiations for an extremely inchoate continent-wide treaty called North American 2050 – but in reality, the move more likely acknowledges the long odds of passing WCI's enabling legislation in the current context. At present, the only remaining members of WCI are California and four Canadian provinces (Craig 2011).

On the other side of the country, the Regional Greenhouse Gas Initiative (RGGI) has also felt the sting of these political battles. Though attrition has been an enduring concern for RGGI since 2006 when then-Governor Mitt Romney first pulled Massachusetts out of RGGI before beginning his presidential campaign¹²⁹, the wave of GOP victories in 2010 has animated serious political challenges to the program's continuity. In early 2012, New Jersey became the first state to officially opt-out of the program. Citing skepticism toward both the program's efficacy as well as climate science itself, Republican Governor Chris Christie (also widely believed to be considering a 2016 presidential run) suggested the program "does nothing more than tax electricity, tax our citizens, tax our businesses, with no discernible or measurable impact upon our environment" (Cited in Navarro 2011). This decision comes despite the fact that one of the biggest critiques of RGGI to date has been that, in fact, the costs to utilities have remained far *too low* to effect serious change, as auction prices for carbon allowances have consistently fallen in light of the slumping economy and cheap natural gas prices. As well, Christie's administration has used more than \$65 million worth of RGGI's auction revenues to offset his government's budget shortfalls (Gruen 2010). The decision was nevertheless cemented by the above-noted rollback of the state's Global Warming Response Act, which previously served as the legislation designed to meet New Jersey's RGGI commitments.

Since 2011, New Hampshire's legislature has also passed two separate pieces of legislation aimed at withdrawing from the program. With Democratic Governor John Lynch vetoing the first bill and promising to veto the second in the event that it was unable to garner a veto-proof vote in the both houses, the Senate was forced to restrict itself to the passage of a series of minor reforms to the state's climate program – including a mechanism for the state to withdraw

¹²⁹ Romney's successor Deval Patrick re-entered the state into the compact upon taking office in 2009.

entirely from RGGI in the event that two other New England states (or one state with 10% of the region's electricity load) withdraws from the treaty. Finally, in Maine, newly elected Republican Governor Paul LePage has indicated his opposition to the state's renewable energy goals, and supported an unsuccessful bill in the House to withdraw the state from the program (Johnson 2010).

Backlash against state procurement

Many elements of direct state procurement (historically a crucial selectivity capable of pulling technologies to market and scaling them up) have been prevented by the GOP after 2011 as well. Among the more interesting cases of this has been a campaign by Republican lawmakers to legally ban the purchase of more costly green technologies by the Department of Defense (DOD) – which has long been viewed as an ideal place to implement generous procurement policies for novel technologies. Indeed, building on this historic pattern, the Obama administration sought to use the DOD's ample (and relatively apolitical) procurement and operating budget as a major stimulus for several alternative energy technologies (Snider 2012).¹³⁰ Among the most important has been biofuels, with the military spending over \$42 million on 1.1 million gallons of biomass fuels between 2009 and 2011, making it the largest single purchaser in the world. The Navy, for its part, had plans to deploy a 'green fleet' of naval destroyers operating solely on biofuels by 2016 (Rizzo 2012). The Defense Department argues that its purchases of biofuels have already dramatically reduced the price of the technology, which in turn improves the nation's overall energy security and the DOD's long-

¹³⁰ Reports from military officials and personnel about how experimental solar equipment used in Afghanistan allowed soldiers to carry fewer batteries and more ammunition more comfortably even led to the creation of the bi-partisan Defense Energy Security Caucus (featuring fifteen Democrats and eight Republicans) to educate Congress about the value of using green technologies in the field of battle.

term operation costs – noting that each time the price of a barrel of oil goes up by \$1, it costs the military an extra \$130 million per year (Ibid). Nevertheless, the House passed a bill banning these procurement policies, stating that the DOD cannot purchase alternative forms of energy that cost more than conventional petroleum (Goldenberg 2012). At present, even the cheapest biofuels are roughly four times more expensive than oil.

For good measure, House Republicans have also taken aim at the administration's green infrastructure strategy, particularly its high-speed rail program – a technology sector which is almost completely dominated by Western European and East Asian firms. The GOP's House bill sought to remove \$1 billion from the Federal Railroad Administration's high-speed rail initiative; slash \$2.47 billion from the Department of Transportation's (DOT) Capital Assistance for High Speed Rail Corridors program (down from \$8 billion); eliminate the entire budget for the DOT's National Infrastructure Investments (which had an operating budget of \$600 million in 2010); and reduce the budget of the Federal Transit Administration's grant program by \$253 million – a program which helps local governments to upgrade their bus and rail systems, with a particular focus on less-polluting technologies and infrastructures (Morello et al 2011).

Backlash against push policies

Push policies, for their part, have also come under heavy attack, with House Republicans in Washington seeking to use their renewed control over Congressional funding after 2011 to undermine programs focused on both early- and late-stage technological development. The strongest attack against early-stage development came in the form of a Continuing Resolution to fund the Department of Energy during the budget battles of 2012, in which the GOP sought

to slash the budget of the Energy Efficiency and Renewable Energy Program (responsible for many high-risk, early stage initiatives) by close to 40%, and additionally strip the DOE of its access to any outstanding stimulus funding from the American Recovery and Reinvestment Act (ARRA). Capable of depriving early-stage initiatives of over \$10 billion in remaining funding, this strategy would significantly undermine the continuity of these programs (Morello et al 2011).

A major symbolic victory for the right on early stage development has been the effective dismantling of the Advanced Research Projects Agency – Energy (ARPA-E). As discussed in Chapter 7, ARPA-E was first established under the Bush administration in 2007 with the mandate of funding a series of potential ‘game changing’ energy technologies that appeared too risky for the private sector to fund. However, coupled with the special attention it received from the Obama administration (which praised it as one of the centerpieces of its greentech strategy), its presence as a stand-alone agency for alternative energy made it a prime target for Republican indignation over the administration’s broader climate and energy agenda. ARPA-E presented itself as a particularly tempting target for the GOP given that, as an ancillary element of the America Competes Act of 2007, the agency was never established as a permanent entity with its own baseline funding. It was thus forced to have its funding re-authorized by Congress every fiscal year (Pentland 2011). With Congress falling back into Republican control in 2011, the agency’s fate was effectively sealed. As part of a compromise to get their Continuing Resolution through the Democratic controlled Senate, the GOP agreed to avoid killing the agency completely, and agreed to provide it with a mere \$180 million for 2013 – barely enough for a dozen more projects (Norris 2011). While the administration has campaigned hard to keep the agency alive in future years, the very nature of ARPA-E’s projects makes the program

rather difficult to justify on a year-to-year basis. Indeed, given that the innovations it aims to spark generally take 10-20 years to mature, and given that the agency will likely continue to lack a signature piece of commercialized technology for at least another decade, the program is likely to remain highly vulnerable.

Similar political contestations have come to characterize late stage innovation processes as well. As noted in the latter part of Chapter 7, in light of its political expedience, one of the more important strategies used by the administration to help commercialize and scale-up new technologies has been the granting of generous federal loans to private firms – a program which took up the lion’s share of the \$81 billion allocated to clean energy in the ARRA. While the right has sought to shroud this program in political controversy from the start, it was the bankruptcy of a small photovoltaic company called Solyndra in 2011 that would serve to politically delegitimize it to a point where the administration was forced to temporarily abandon the strategy. In 2009, Solyndra received a government loan for \$500 million to commercialize and scale-up production of a solar cell technology capable of operating without the use of silicon (Mulkern 2011). This appeared to be an attractive technology given that it was largely the high price of silicon throughout the early-2000s that had contributed to the poor competitiveness of the photovoltaic industry.¹³¹ While Solyndra was working towards commercializing the technology, however, the growing global demand for silicon had begun to spur investment in new production facilities around the globe. The resulting glut of new productive sites (in conjunction with the economic slowdown following the global financial crisis) caused the price of silicon to plummet after 2009. The result was that Solyndra’s

¹³¹ Solar cells have traditionally been made from very low-grade ingot that does not meet the standards for producing computer chips. Thus, the relatively small quantity of rejects from the computer industry has typically been used in the production of solar cells. As solar cells became more popular throughout the 1990s, this low grade ingot fell into rather short supply, and the price subsequently soared, damaging the prospects for solar.

technology instantly became highly uncompetitive, ultimately forcing the company to file for bankruptcy and lay-off more than 1100 workers in late 2011 (Mulkern 2011).

What is most interesting about the case of Solyndra is not the fact that it went bankrupt – indeed, the very nature of the innovation and commercialization process guarantees that *most* technologies (and firms trying to commercialize them) will go bust. This is why the federal government specifically earmarked \$10 billion for losses from bankruptcies. Rather, the interesting aspect of the Solyndra story was the political firestorm that ensued and its subsequent effect on the administration’s alternative energy strategy. Indeed, as the GOP mercilessly pounced on the event as an example of the supposed waste and fraud characteristic of the administration’s broader energy and climate initiative (and with the right furiously scrambling to find the ‘next Solyndra’), the government’s loan program ground to a halt – with no major loans being granted after the Autumn of 2011.¹³² This included the freezing of the more than \$16 billion remaining in an authorized loan fund for the Advanced Technology Vehicle Manufacturing program (AVTM). Citing intensely restrictive terms (requiring higher levels of collateral) and an unruly due diligence process in the wake of the Solyndra bankruptcy, several automakers eventually gave-up and withdrew applications for loans under the program (Vlasic and Wald 2012).

Conclusions: losing while winning

The political battles of the past two years, as described above, have indeed served to slow the increased momentum of the US’ developmental state project around alternative energy. In

¹³² Republican indignation over these programs comes with a sharp hint of irony in this context, given that several prominent GOP officials (including Senate Minority Leader Mitch McConnell) have sought to attract hundreds of millions of dollars of such loans to their home states and ridings in an effort to spur job creation. See Lipton 2011.

somewhat predictable fashion, as those seeking climate regulation and the development of green industries have moved their focus away from the federal Congress and onto these alternative policy channels, anti-regulationist opposition has, in turn, increasingly followed and sought to reshape the institutional conditions that have allowed these selectivities to succeed. While anti-regulationist forces have increasingly slowed the pace of these channels and turned them into sites of intense political contestation, their capacity to fully block the efficacy of these alternative routes remains questionable at the time of writing. With regard to sub-national policies, as dozens of states have rapidly implemented climate action programs over the past several years, the eventual contestation and rollback of several of these programs was, to be sure, an inevitable development. Yet, from a broader perspective, the federalist politics of climate regulation in the US stand as yet another basic incarnation of the battles typical of the US federation and its 50 component members over the centuries. Indeed, most novel issues in social, economic, and industrial policy that are left to the states initially take shape as a battle between those innovative states that view the issue in question as a ‘race to the top’ and those that view it as a ‘race to the bottom’ (Rabe 2006; Posner 2010). While there are many initial gains to be had by states that choose to attract existing industry with low or non-existent standards, over time, the economic gains accrued to those that implement prohibitive regulation eventually forces laggards to catch-up – or, in the meantime, the issue may gain enough broad legitimacy that it becomes federal policy. This has been the case in everything from education standards, to infrastructure, social policy, and even environmental policy. It seems unlikely that climate policy – with its intimate connection to new industrial greentech growth – stands an exception to this rule that can be fully overturned.

With regard to the forthcoming EPA regulations that will unilaterally regulate GHG emissions across the country, while this will increasingly become a politically radioactive issue over the next year, there appears to be enough institutional defenses in place to ensure that these regulations are not overturned. Most importantly, President Obama has stated without equivocation that he will veto any bill containing provisions to overturn EPA regulations. Of course (particularly at the time of writing), there is still the potential problem of the continuity of such a rule as the Executive Branch changes hands in the future. Yet, short of a future Republican administration completely abolishing the Clean Air Act (a near-impossibility given that congressional gridlock on the environment cuts both ways, with the Democratic Party scuttling most every major roll-back proposed by the Republicans since the 1980s), an incoming Republican administration would find itself in a difficult position trying to get rid of the EPA's program. Indeed, in the event that a GOP administration attempted to shirk its obligations stemming from *Massachusetts v. EPA*, the federal government could expect to be barraged by an endless stream of lawsuits from states and interest groups. At best, the administration could attempt to change the EPA's endangerment finding and assert that GHGs do not in fact contribute to climate change, though it would once again be sued for this, and would risk a great deal of international embarrassment and derision, as it would have to cite extremely marginal 'scientific' evidence to substantiate this claim. Much the same can be said of the civil litigation strategies that have become such an integral element of US climate policy over the past decade. The task of fully removing provisions for these suits from the books would require the GOP to not only regain control of the White House, but also obtain a sizeable majority in the House and a filibuster-proof super majority in the Senate – a feat which has not been achieved by the Republican Party since 1921.

The broader point worth underscoring is that these battles are entirely predictable and ought to be fully expected. Just as the structure of American government (coupled with the enduring battle between neoliberal forces and advocates of action on climate) precludes a linear march to a comprehensive federal climate policy passed through Congress, the alternative piecemeal approaches described in this project are also highly fraught with political contestation at every turn. These preconditions (discussed further in the following chapter) dictate that any durable forms of climate regulation in the United States will necessarily materialize as an often frustrating series of advances and retreats.

Chapter nine

Concluding reflections on neoliberal climate policy in the United States

This project opened by noting that contemporary US climate politics was a rather complicated subject matter to conceptualize and understand. While the subsequent chapters have done little to simplify the situation, the project has nevertheless sought to provide a more nuanced framework for understanding the issue by framing it in terms of two of the more crucial political-economic logics acting upon it – neoliberalism and innovation policy. It has argued that much of the struggles characteristic of US climate policy in its neoliberal variant can be understood in terms of a general stand-off between, on the one hand, the state's compulsion to cultivate the issue of climate as a means to promote new cycles of accumulation and economic growth (primarily as translated through its historic tradition of fostering markets for high tech innovation), and on the other, neoliberal ideology's allergy to regulation which aims to delegitimize the state's attempt to do so. It has been suggested that the result of this stand-off has not been that climate policy is non-existent in the US, but rather that such policies have adapted to neoliberalism's ideological and legislative conditions through a variety of strategic selectivities inherent to the US polity, and begun to manifest in alternative forms – in particular, a decentralized developmental state, backed by a patchwork of regulation emerging along alternative policy pathways. This final chapter seeks to draw-out some of the insights of the preceding analysis, and discuss what it might mean in terms of how we think about academic and policy debates related to climate policy and state capacity under neoliberalism.

Thinking about climate policy under neoliberalism

Against the ‘neoliberal environments’ literature’s depiction of climate policy under neoliberalism as driven primarily by commodification and privatization logics – aiming at a shift away from traditional command and control policies and towards the use of markets – this work has argued that such schemes are merely a single aspect of the state’s broader drive to foster accumulation through climate policy, and do not crowd-out traditional interventionist strategies on the part of the state. The implication that is nevertheless clear from both lines of argument, however, is that building feasible climate policy under neoliberalism is largely a matter of capitalizing on accumulative logics that make it possible for businesses, neoliberal policymakers, and mainstream environmental groups to imagine a cycle of growth that moves beyond a carbon economy. That is to say, gone is the regulatory philosophy of the ‘golden age’ which oversaw the passage of a great deal of progressive environmental legislation in spite of the perceived zero-sum relationship between the economy and environment (see e.g., Bailey 2003). In the current context, environmental imperatives are considerably less likely to trump economic ones, and thus new environmental strategies are more likely to succeed politically if framed in terms of their capacity to promote economic growth, and merely hold environmental recovery as an incidental or ancillary social benefit.

In this context, the project’s focus on the need to think about the historic accumulative biases within states and national economies is crucial, and can point to strategies that move beyond the goal of building carbon markets as the most plausible form of climate policy under conditions of neoliberalism – a strategy which reduces progressive climate policy to dubious pursuits like pushing for incrementally stronger targets or shaping offset types, if such a market can even be achieved at all. Indeed, in the United States, while the inability of financial interests to build the requisite support for a national carbon market has made federal policy

impossible for the past two decades, we see that the material transformations required to address climate change has excited a latent developmentalist logic that has been growing within the American state for decades. This institutional logic of accumulation has almost single-handedly proved capable of reframing climate change as a problem of technological inadequacy, and building its own momentum for an active climate policy around high-tech innovation. Understanding the ways in which the economic goals of both the state and capital are translated through entrenched political and economic institutions and logics is thus key for identifying potential avenues for new forms of climate policies, as well as understanding why existing policies have taken the forms that they have.

As argued in this work, neoliberalism's key contribution to these processes is not an inherent bias toward market-mechanisms per se, but rather resides in its anti-statist character, which serves to delegitimize state intervention broadly, and specifically the regulatory efforts required to dismantle the domestic carbon economy. While the Ecological Modernization (EM) literature has tended to view this characteristic of American politics as an intractable destiny precluding EM strategies in Washington, the relational conception of the state advanced herein is helpful for thinking through this problem. Indeed, viewing the state as an arena in which multiple competing interests vie for expression and use a number of viable pathways to achieve implementation (and *not* as a homogenous entity informed by a singular neoliberal logic) allows for a much more nuanced analysis of the policy process. Not only does it ask us to think more critically about the ways in which counter hegemonic policies are implemented and entrenched within neoliberal states (in the case of the US we saw four major pathways facilitating interventionist climate policies), but it asks us to think about the way that newly entrenched interests create new strategic selectivities and path dependencies in the policy

process. That is, for example, at what point do the sunk costs of these R&D programs and the vested interests of alternative energy coalitions create new clientelistic constituencies which, together with a new critical mass of job growth, economic development, and profit, begin to undermine the strength of conventional energy interests in government and allow the process to fully take-off?

Finally, while this has not been a major preoccupation of this analysis, the project's focus on state-led technological innovation is helpful for thinking about the US' potential position in future international climate negotiations. Indeed, some recent analysis (e.g., Barrett 2007) has begun to focus on the concept of a 'multi-track' post-Kyoto agreement, in which cooperation and coordination on new technologies increasingly becomes the central issue. For Barrett, this would include the development of an international R&D and technology standards protocol in which developed countries would contribute resources to a coordinated international R&D program, and be mandated to transfer the technology to developing countries. Similar narratives about technological development have also been key to the rationale of agreements like the Asia Pacific Partnership on Climate and Energy, which is predicated on an inherent belief that innovation coupled with free-markets and free-trade is the most efficient means by which to address the problem of climate change. While the US' intense focus on high-tech innovation may seem an auspicious development for such a strategy, if one considers the political-economic logics that I have suggested actually drive national innovation systems – and particularly the rationale of the developmental state logic in the US over the past three decades – the picture actually becomes considerably *less* auspicious. While such a strategy fits well with the neoliberal vision for addressing climate, it often ends up taking far too seriously the optimistic rhetoric about free-trade and open diffusion of novel technologies across

permeable national borders. As Chapter 4 suggests, the recent history of Washington's national innovation strategies is, in reality, one of technological mercantilism, animated primarily by the goal of establishing unrivaled national dominance over the sector in question. In this equation, international cooperation and pooling resources on competitive research appears completely anathema to a logic that works only to the extent that it can produce and reproduce American technological dominance (MacNeil and Paterson 2012). Obviously, this is not a unique characteristic of American developmentalism, but rather is an inherent aspect of all capitalist states seeking to foster domestic economic growth and competitiveness. This would help to explain why such programs – despite receiving tremendous rhetorical support from the governments of their member states – have generally received only half-hearted support at the level of funding and resources (see e.g., McGee and Taplin 2009). Given that knowledge is first and foremost a commodity for firms and not a common social good, the possibility that collaborators (which are thus better thought of as competitors) could potentially gain ownership of patentable knowledge acts as a serious deterrent to these types of efforts.

There are, inevitably, several other important conceivable questions that are beyond the scope of this particular research project, and thus would require further research to properly address them. For example, how might we begin to evaluate the overall impacts of this type of climate policy? How does it compare (whether at the level of environmental recovery, economic development, social justice, etc.) with other sorts of policies – e.g., emissions reductions targets, cap and trade programs, carbon offsets, traditional regulation, etc.? How does it compare with the dominant strategies being pursued in other countries? Or does the logic that each polity has singular characteristics whose strategic selectivities need to be understood in

order to analyze their domestic climate policy effectively preclude the possibility (and/or relevance) of systematic comparisons between countries?

Thinking about neoliberalism and state capacity

To the extent that a great deal of the Ecological Modernization literature (discussed in Chapter 2) suggests that neoliberal states ought to be considered largely anathema to EM strategies, the policies and structures described in this project ought to appear somewhat out of place in the US. Indeed, in the context of these literatures, the fact that Washington possesses a developmental state apparatus capable of pushing the development of alternative energy technologies with massive amounts of state funding and highly interventionist qualitative assistance (and backed by a messy array of interventionist regulatory policies aimed at pulling these technologies to market) may seem like bizarre behavior for the world's 'archetypal' neoliberal state. The point, however, is that as long as capitalist states are dependent on expanded accumulation for their material strength and legitimacy, even the most reactionary neoliberal governments ought to be fully expected to assist in the process of accumulation, and use interventionist policies where necessary to achieve that end.

Indeed, consider for a moment the likely effects of a modern capitalist state that took seriously the pure neoliberal economic theories (for example, 'adaptive expectations' and/or the 'efficient market hypothesis') that helped to raise neoliberalism from the margins in the 1970s. These theories suggest, in effect, that economic intervention on the part of the state will always prove ineffective and disruptive over time, given the capacity of markets to predict the effect of intervention and subsequently either neutralize its impact or create parasitic clientelistic relationships with the state. They therefore suggest that economic intervention should be

limited to ensuring price stability through control over interest rates and the growth of the money supply, but otherwise markets ought to be allowed to self-direct and self-regulate. If neoliberal politicians were to take these theories of macroeconomic governance seriously, they would have to abide the massive long-term bust cycles wrought by unfettered capitalism, complete with their component Great Depression-level unemployment rates, human misery, and immense political and social unrest.¹³³ Because, however, such action would be both politically illegitimate and drain the state of its material foundations, even the most reactionary neoliberal governments will violate the dogma in spectacular fashion where necessary – the Bush administration’s bailout of the financial sector through the Troubled Asset Relief Program (TARP) being perhaps the most glaring recent example. In short, neoliberalism is not a doctrine that rests on principle, but is rather derived from the same spirit of pragmatic macro-economic governance that guided the thinking of Keynesians throughout the 20th century.

What *is* unique about neoliberalism, however, is the constraints imposed on this objective by its political rhetoric. Neoliberalism, in effect, creates a prohibitive rhetorical atmosphere in which policymakers are blocked from explicitly doing what they aim to do in the economy – namely foster accumulation and economic growth. The response is not that the state pulls away from this objective, but rather that alternative pathways are sought for doing so – specifically in the US, ones capable of circumventing the hostile rhetorical atmosphere of the federal Congress. A useful analogy in this context might be to think of such policies as migrating water – wherever they are not specifically blocked is where they will migrate to. And because a

¹³³ Obviously some of the more realistic advocates of such theories willingly accept that this would have to (and ought to) be the case. Milton Friedman famously taught an introductory macroeconomics course at the University of Chicago by holding up an elastic band at the lectern on the first day of class and stating (paraphrasing here) ‘This elastic band is a national economy’, then stretching the band out to its limits momentarily, then letting it snap violently back to a limp position and stating, ‘Boom!... Bust! That’s how it works.’

state is so large an entity and social relation (and the places where policy is executed are so numerous), it is almost inevitable that they will be expressed somewhere and somehow. In this context, the climate policy apparatus described herein is almost exactly what one should expect of a state under conditions of neoliberalism. Blocked by the anti-statist rhetoric of neoliberalism, the state's compulsion to foster accumulation through climate policy is diverted to alternative pathways where interventionist policies can endure – namely a highly decentralized developmental state apparatus, and an array of historically viable channels for regulation. In short, instead of being considered fundamentally at odds with the common depiction of the US as a neoliberal state, these policies have risen out of the very tensions that neoliberal states face when attempting to create stable frameworks for accumulation, and attempting to address problems like national innovation, climate change, and energy security under market-fundamentalist conditions.

Thinking this way about neoliberalism animates a series of other important research questions that are also beyond the scope of this particular project. In particular, this logic asks us to further identify what reflexive strategies neoliberal states have undertaken to deal with an extremely wide array of basic contradictions within capitalism – for example, its under-consumptionist tendencies, class conflict, job creation, labour supply, security, global competitiveness, etc. – under ideological conditions bent on dismantling the Keynesian mechanisms used to address these issues throughout the 20th century.

It is worth stating that this project does not mean to suggest that alternative forms of implementation – particularly ones that circumvent the elected Congress – are particularly desirable per se. Indeed, it could easily be argued that all of the policy mechanisms described

herein (the hidden quality of the developmental state not least of which) would require a rather charitable definition of ‘representative democracy’ to be considered properly democratic in their implementation and operation. With regard to rulemaking within the Executive Branch, there is an obvious distinction to be made between, on the one hand, federal agencies carrying out the will of the Congress by translating legislation into actionable laws, and on the other, having unelected bureaucrats draft massive comprehensive regulatory packages on the basis of the narrow ruling of unelected judges. With regard to court rulings, the main point of appealing to the law in these contexts is indeed the perceived apolitical nature of the legal process, which aims to raise the issue above political debate. It could thus rightly be argued that creating and implementing policy through these institutions is indicative of a progressive narrowing of the democratic process in Washington.

While this project does not contest this type of claim or propose any definitive solutions to these issues, it is interesting to consider the extent to which, at least in this specific context, an institution like the US Senate (with its seats distributed highly unequally on the basis of territoriality) and the disproportionate strength of conventional energy lobbies in Washington also go a long way towards subverting the country’s democratic will. Indeed, when commentators (primarily on the right) suggest that implementing these policies through the ‘backdoor’ subverts the will of the majority, it is perhaps more accurate to suggest that it subverts the will of a very powerful minority and its institutional ramparts in the Senate – the Waxman-Markey bill did, after all, pass the proportionally-elected House of Representatives. In this context, it could be argued that these alternative pathways can be understood *not* as implicitly anti-democratic per se, but rather as a procedural attempt to restore some semblance

of democratic governance in a federal system that has been rendered increasingly ungovernable over the past three decades.

The aim of this project is thus not to suggest that alternative pathways represent a particularly desirable means by which to achieve climate regulation – obviously traditional legislative passage by elected officials is always preferable in a representative democracy. The point is rather to acknowledge that the use of these bypasses has evolved largely in response to the intractable legislative conditions on the ground in Washington, and that, for the time being at least, they likely represent the only plausible technical means by which to govern climate in the US.

Taking climate change seriously

It is worth re-stating that this project does not take a position on whether the forms of intervention described throughout will be ‘adequate’ with regard to the tangible challenge of climate change – the point is merely that this is the form of strategy that the US federal system has strategically selected for. Like any other policy strategy (be it a system-wide carbon market or traditional command and control regulation), whether or not the US’ developmental state strategy can be helpful or not will depend entirely on the political struggles that continue to shape and determine its future evolution. Still, it is worth here briefly considering the basic rationale of a technology-centric approach to climate, as well as the plausibility of successfully pursuing such a strategy in the context of neoliberal capitalism. With regard to the first point, there is obviously an entire body of literature (not worth re-hashing here) on the relationship between economic growth and environmental sustainability which has much to say about this type of thinking. For simple heuristic purposes, much of the analysis of these debates has

broken the two sides into so-called ‘ecocentric’ and ‘technocentric’ approaches. The logic of technological development imbued in the strategies analyzed in this project fit firmly within the latter, as they inherently hold that environmental crises like climate change can be successfully resolved by deploying the combined capacities of human technology and markets in creative ways. In so doing, such thinking builds upon a large body of so-called ‘Promethean’ and ‘cornucopian’ thinking about civilization’s relationship with nature, which optimistically believes that our ingenuity and creativity will save us indefinitely from any ecological limits the earth might have (see e.g., Simon 1980; Beckerman 1996).

Whether or not a so-called technological silver bullet (or a combination of ‘game changing’ innovations) could actually ‘solve’ the potentially catastrophic concentration of GHGs in the earth’s atmosphere is obviously unknowable at this point. Yet at least two points seem worthy of consideration if the logic is taken at face value. First, while the technocentric ideology may be highly entrenched in Western thinking about human capacity and our relationship with nature, it *is*, first and foremost, just an ideology. And despite the often religious-like belief in technological panaceas, there is indeed no reason to believe that technological fetishism can resolve an issue as immensely complex as global climate change (Downing et al 1999; Schellnhuber 2006). But second, the very concept of having to ‘invent’ technological solutions to climate change ought to seem strange in principle, given that many of the technologies required to drastically reduce GHG pollution are already available to us – take for example, the bicycle or public transit infrastructure – but are rarely advanced as generalized solutions to the problem by business and governments. This is because, in this context, it is less about the technology’s *social use* in battling global warming or preserving the biosphere, and more about the first principle economic (and political) goal of expanded accumulation – obviously,

building a bicycle for everyone on the planet lacks this fundamental quality (see e.g., Paterson 2007; Foster 2001). Indeed, in this context, the social use of these technologies is not environmental, but rather economic. Their rationale is primarily about devising stop-gaps capable of allowing expanded growth for its own sake. This ought to cast doubt on the entire techno-centric strategy, and cause us to ask what exactly is it that we are trying to ‘invent’? Is the point actually about ecological preservation, or is it simply about creating new cycles of accumulation and avoiding ever having to acknowledge the planet’s finite ecological limits?

This leads to a second key point. Assuming that technological changes could facilitate a form of capitalism commensurate with sustainability (as advocates of Ecological Modernization suggest may be the case), the question remains: could this be achieved by the forms of development and political-economic structures described in this project? While this is once again a question without a knowable answer, one key point seems worthy of consideration. The actual ‘innovation’ part of the equation is likely not, in fact, the important independent variable. Indeed, with the push policies put in place by various governments (coupled with the general advance of the technological frontier), the landscape of decarbonizing technologies has the potential to be extremely rich and promising. Moreover, as *fossil* energy is merely an incidental element of contemporary capitalism, markets could probably easily decarbonize themselves once a durable cycle of accumulation began to emerge around clean energy. The problem, as noted, is that any such technology would have to be integrated and fully absorbed in the near term by capitalist markets that continue to be predicated on cheap and highly entrenched fossil energy – and will likely continue to remain so for the near future. That is to say, governments can use all the political structures they like to develop technologies, but unless and until they can, by political means, break the structural dominance of fossil fuels

over the energy market, such technologies are unlikely to be deployed and commercialized to the extent required to make a dent in the problem of global warming.

And this appears to be the most important rub with regard to neoliberal capitalism in this context. Adequately responding to climate change ultimately requires a broad acknowledgement that this is first and foremost a social and environmental objective, and not a purely economic one. It requires us, in this context, to replace words like ‘competition’ with ‘planning’, and ‘profit’ with ‘social use’. In the meantime, the current attempt to clumsily mix a bare minimum of planning with market competition creates such a muddled path forward that, while some technologies will undoubtedly find niches, a true alternative energy revolution is rather unlikely to emerge on the backs of these structures.

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