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POWER OVER POWER: THE POLITICS OF ENERGY TRANSITIONS

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Power lines sparking wildfires, destroying homes, and shutting down power across Northern California have generated public fury against Pacific Gas & Electric (PG&E). This bankrupt utility's grid needs substantial investment and upgrades to be made safe. Yet, the death knell for monopoly utilities may have already sounded; California's energy transition is underway, and new energy providers and models challenge the incumbent utility's monopoly control. Political struggles amidst legislators, utilities, new energy providers, and communities have emerged, and will be at the core of energy transitions in California and elsewhere.

To understand the social and political ramifications of future electricity systems, this dissertation explores how energy has been and will be provided and governed. Making the case that electricity is 'political', a historical narrative follows a series of concerted political decisions on technology and infrastructure that, over a century ago, created a centralized electricity grid under regulated monopoly utilities. This model is gradually disrupted by decentralized energy resources such as solar rooftop, electric vehicles, charging stations, batteries and microgrids. New technologies see new institutional and governing arrangements, from city-, municipal-, cooperative- to individual control. As blackouts make it clear that energy is a commodity fundamental to our modern livelihoods, climate change and pollution concerns increasingly lead to the consideration of clean affordable energy access as a right. Communities, such as in the case below, increasingly mobilize for this right.

Since its beginning in the 1990s, the Community Choice movement has explored alternative imaginaries of utilizing decentralized energy technology for local self-sufficiency and sustainability. CCAs are a model for local power regulated by local not-for-profit entities acting in their communities' best interest. CCAs began as a bottom-up and grassroots initiative, transforming into an urban governance movement as the size and number of the organizations grow. The first CCA in California emerged in Marin County in 2010, and today 19 CCAs provide electricity to 10 million state residents. The development of CCAs depicts the politics of energy transitions; competing visions of clean energy models by new energy providers are met with resistance by the incumbent utility and government regulatory agencies. My cases display how imaginaries of more sustainable futures clash in political realms, producing new ecologies of power.

With a bankrupt utility, still nascent CCAs, and the intermittent nature of renewable energy, the state finds itself at crossroads. Through personal interviews with regulators, policymakers, energy companies, activists and local communities, I explore these imaginations and the social and political implications of various energy and governance configurations.

Developments in California have implications elsewhere. Changes in energy provision are intertwined with social and ecological futures, justice and democracy around the world. The concluding chapter, drawing from personal research across both the developed and developing world, puts these elements into dialogue with each other.

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Energy makes the world go round

Introduction

It's January 1st, 2050. Energy is everywhere. The sun's rays start breaking through the morning fog, its light captured by residential solar rooftops flanking East Cliff Drive in Santa Cruz, California. The sun sparkles on the ocean's surface. Waves crash against the cliffs with magnificent force, slowly eroding the natural landscape as it has for millennia. A handful of surfers harness nature's power, seemingly walking on water as their electrically-powered boards glide along the waves. The Santa Cruz mountains are hidden from view by the fog, which provides thousands of gallons of fresh water and electric power as it drifts over the hillsides. As the thick fog rolls out the mountains on the east and recedes out to sea, the shoreline of Monterey Bay creeps into sight. Its magnificent landscape has long stimulated the imaginative faculties and dreams of its onlookers.

Unfolding in the middle of the 21st century is a dance between humans and nature. The abundance of nature's energy had been captured and controlled by a few and distributed for profit to the many since the beginnings of the Industrial Revolution. But this thrall has been broken. After wildfires ravaged communities and consequent public power shutoffs by a privately owned utility thirty years earlier, a new balance between society and nature was created through engagement with sustainability. In Santa Cruz, a town that has long drawn entrepreneurs and visionaries, the threat of climate crisis and discontent with monopoly energy control evoked a strong sense of self-reliance, creativity and responsibility that ultimately burgeoned into a political opportunity: an energy transition.

In Santa Cruz of 2050, as in many of the state's coastal towns, many residents' homes remain wooden structures, with main streets' 19th century buildings, landmarks and cultural sites preserving localities' unique character and identity. But technological artifacts are woven through their structures. Power networks have been broken into neighborhood microgrids that can be islanded during times of high fire risk or cyber attacks. Photovoltaics and concentrated solar power are commonplace on local rooftops. Solar systems come with inverters that adjust to the sun, connected to batteries and software systems that efficiently gauge supply and demand. The *prosumer* – the engaged citizen – is notified of demand and load forecasts through an application on a handheld device and may choose from pre-automated settings based on previous cost calculations and solar projections. The prosumer in one neighborhood may choose to send its power to an automotive shop, or any other business, in a different neighborhood in exchange for discount on goods and services or even a cut in the shop's profits.

The leading solar technology has long ago displaced crystalline silicon (c-Si) and its reliance on silver for electrical contacts with a higher intrinsic light absorption requiring a thinner silicon wafer. This newer technology with better performance and lower manufacturing complexity uses more Earth-abundant materials that allow for the more efficient capturing of the Sun's rays. Energy consequently becomes a common pool resource: the sun shines on everyone, and its near-limitless source of energy is fundamental to the functioning of modern society. Children ride around on solar-powered electric scooters that self-direct away from obstacles and respond to voice commands.

Far out in the sea, floating solar farms extract carbon dioxide from the ocean, converting it into a liquid fuel instead. Across the Bay, the smokestacks where the Moss

Landing Power Plant once stood are historical artifacts. An algae biofuel plant now takes its place, storing energy not in lithium-ion batteries but hydrogen fuel cells. Its centralized energy infrastructure serves as a back-up to smaller-scale technologies, but its research, development and ownership is the product of on-going efforts to grasp a growing market share in renewable energy technologies.

A series of microgrids woven through town are deployed through a low-carbon economy with various public-private partnerships. The local community choice aggregator – a municipal energy procurement agency – coordinated with the state's energy commission to fund pilot microgrid projects decades earlier. A series of suppliers emerged as newer solar technologies and declining costs allowed solar's deployment at grid parity with fossil fuel sources. The town's socially liberal leanings encouraged a host of policy initiatives incentivizing rooftop solar, and ratepayer fees are reinvested in local job training programs and energy efficiency measures to promote both environmental- and social justice. Communities promote its new energy independence under the banner of alternative community lifestyles.

How do we build more sustainable societies? What do more sustainable societies even look like? The power to create has always followed from the power to imagine. And embedded in that imagination lie philosophical assumptions about what sustainability looks like, what role science and technology ought to play in society, and how (re)distributive politics ought to be. These assumptions inform the particular policy decisions of policymakers, energy providers and communities, including private or public control of energy provision and redistribution.

The imaginations of clean energy futures are highly speculative, and vary from individual to individual. This dissertation will explore the various imaginations held by communities, new and emerging energy providers, and government officials to explore how and why energy transitions emerge and what these transitions look like. By exploring the emergence of Community Choice Aggregation in California, this dissertation will discuss why local energy transition efforts emerge and how these efforts may scale up to become embedded in, and provide changes to, a larger political structure. Notably, the changes in energy provision are intertwined with various social and political ideals, and the new governance structures are shaped and reshaped within contentious politics. This dissertation will explore these politics of energy transitions to provide insight into how societies give political leverage to certain imaginations over others, and in turn, how various imaginations may come to shape a society's trajectory.

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California has an international reputation as the "Golden State" – its 1850 Gold Rush and lawlessness served as motivations to gain fast wealth and fame in a new land. Generations of immigrants flocked to the Pacific Coast in pursuit of the California Dream, as the state provided fortunes to farmers, oil drillers, movie stars, and "dot-com" entrepreneurs.

In no other state, perhaps, has technology played as big a role in its residents' futures, spurring horizons of change and realizing miraculous futures. Technological advances and imagination have long exuded a certain promise of creating the world we want to live in. But for all its technology and innovation, and despite its pristine landscapes, the Golden State has also been the birthplace of a complex set of problems

that have grown more intractable, multifaceted, and diverse over time: overpopulation, a housing crisis, and rising economic inequality, to name a few.

California residents' livelihoods are not infrequently disrupted by shaking, wildfires, tsunamis and mudslides. Recent years' wildfires raging through communities leave a trail of destruction in its wake – one that ends any delusion that humans can keep Mother Nature in check. But, California has always exuded resilience too; following a quake, wildfire, or mudslide, its residents rebuild, finding strength and community amidst disaster.

Climate change is only the latest threat that requires a series of political decisions, ethical considerations, technological innovation and resilience. Described by some as an ailing disease that cannot be cured, climate change will certainly cause more extreme weather and destabilize livelihoods in the future. Over the past two decades, the state saw fifteen of the twenty most destructive wildfires in its history, the longest drought on record (2011-2018), followed by storms bringing more water than its dams could hold (Newsom's Strike Force 2019; Netburn 2019). As the global average temperature is projected to rise 4.5 degrees by the end of the century, climate modeling seeks to determine whether an as yet uncertain sea-level rise, increased wildfires, and more intense storms might render certain regions of the state uninhabitable (Wallace-Wells 2019;), leaving the poorest scrambling to recover after disaster wipes them off their feet.

Climate adaptation and mitigation will require collective decision-making and social resilience. According to the United Nations Intergovernmental Panel on Climate Change (IPCC) projections, all sectors of our economies – from electricity to transportation to manufacturing – will need to be decarbonized by the end of the century

(OECD 2015). This is no small feat, and many places look to California, projecting optimism and a can-do spirit that reverberates around the world.

California has taken more steps to combat climate change than any other state, with laws encouraging electric vehicles, renewable energy and other clean technologies. Consequently, emissions of carbon dioxide peaked in California in 2004, and fell 14% by 2017, despite the state's population growth by 3.4 million people during this period (Plumer 2017; Rogers 2020). California has plucked most of the low-hanging fruit. Consequent far-reaching change will weave deeply through California's economy and livelihoods; electrifying trucks and cars that get residents to home and work (coming with several infrastructural changes), getting all electricity from renewable sources such as rooftop- and utility-scale solar, cutting emissions from cement plants, doubling efficiency savings from residential and industry buildings, cutting methane from landfills, and so on.

Several substantial political and organizational challenges lie at the core of cutting emissions in these sectors. Existing energy systems have emerged following a series of concerted political decisions on technology and infrastructure that created a centralized electricity grid under regulated monopoly utilities a century ago (Hirsch 1999). But California – and the United States' – largest utility is experiencing its second bankruptcy in twenty years. The bankrupt utility's grid has sparked several devastating wildfires, and needs substantial investment and upgrades to be made safe. While the utility's restructuring plan seeks to convince investors, communities and government officials its regulated monopoly model will be integral to California's clean energy future, the death knell for monopoly utilities may have already sounded. With the advent of decentralized

energy resources and a growing desire for local accountability and energy control, government officials, investors and communities contemplate other models to address communities' social justice, climate change and safety concerns.

The century-old monopoly utility model is gradually disrupted by innovations at grid edge (there where electricity is consumed); solar rooftop, electric vehicles, charging stations, batteries, and microgrids are fragmenting the energy market. New technologies see new institutional and governing arrangements, and political struggles amidst legislators, utilities, new energy providers and communities have emerged. With a bankrupt utility, still nascent public-energy providers, and the intermittent nature of renewable energy, the state finds itself at crossroads of centralized versus decentralized electricity pathways. Various imaginations of clean energy futures exist. These imaginations are publicly performed when they clash in the political realm, at stakeholder symposiums or in town hall meetings or during marches or the writing of legislation. In these instances, political realities can be created as imaginaries struggle for realization within existing political power structures.

This dissertation addresses the big conceptual puzzle of the challenge of energy transitions faced by communities around the world, looking primarily through the lens of electricity provision. In exploring energy transitions already underway, this work finds that conflict arises as a result of imaginaries of sustainable futures that inform adequate and immediate pathways forward. As a result of newer (and low-carbon) technologies, we see a shift in how energy is provided and controlled.

With the advent of decentralized energy resources allowing localized power provision, it becomes possible to address communities' social justice, climate change and

safety concerns, taking control away from monopoly utilities. Yet, as century-old centralized and top-down energy provision structures are challenged – and perhaps even eroded – these more "fossilized" energy providers and powerholders are resistant to changing energy models. These actors create different narratives built on modeling and calculations of futures in a capitalist system to convince polities and political authorities to stake out a place for them in this energy transition (Beckert & Bronk 2018). Expectations of sustainable futures, therefore, are subject to political challenge, debate and choice (see e.g. Jasanoff & Kim 2009).

Political struggles among legislators, utilities, new energy providers and communities have already emerged, and will be at the core of energy transitions. Amidst conflict, new "ecologies of power" emerge: new stakeholders, new relations, new norms and ideas about how energy should be provided and governed are shaped and reshaped within contentious politics. These developments have been set in motion in California and across the globe.

Perceptions of climate change, choice of technology, choice of control and considerations of equitable distribution of risks and benefits are important considerations in energy transitions. From a social science perspective, history, institutions and place matter: 50-100 year old centralized and fossil fuel powered electricity systems need to be decarbonized, and existing law and regulation was created for the adequate functioning of these structures. The price decline and more widespread availability of more distributed renewable energy resources emerge at a time localities are expressing a desire for more local control and decision-making. From a science and technology studies (STS) perspective, technology matters: it is embedded in knowledge, social norms and practices

surrounding how energy is provided and used, but vice-versa also informs how energy ought to – or could be – used, owned, and governed (see e.g. Jasanoff 2004: 3). Taken together, tensions between communities, regulators, and energy providers are becoming more common-place in energy transitions, and must be studied to understand what energy transition processes will look like.

This dissertation will argue that the realization of a local imaginary of a sustainable future is contingent upon a variety of factors: a local movement, resources, and political opportunity. Grassroots actors in Marin County in the 1990s conjured an imaginary of energy self-sufficiency in their county. These activists formed non-profit organizations, rallied for support in their community, and their imagination attained support from local political officials. The state's energy crisis in 2000-2001 provided a critical opportunity for writing legislation that would enable power procurement under a non-monopoly utility entity. Building on the initial imaginary of local self-sufficient systems, local planners and political officials then began formulating a vision of a publicly owned energy agency that could provide its community with renewable energy. Feasibility studies, conversations with grid operators, brokering with PG&E and third party reviews emerged, and officials seeking to launch this public energy organization, a community choice aggregator (CCA), focused their narrative heavily on procuring renewable electricity at prices below those of the incumbent utility. It became clear, following initial social movement activity and a new legislation, that whatever clean energy organization would emerge, that it would need to fit within existing political structures. The shape this organization would take would follow from various sources of

knowledge and expertise; needing to make decisions on how much electricity to procure, prices to set, governing relations (choices on making a Joint Powers Authority).

As the movement grew and carved out a place for itself in California's energy politics, the imaginary underlying the CCA movement shifted and evolved. Environmental and social justice norms, linked to the imaginary of energy democracy, were incorporated in MCE programs and initiatives. Yet, interviews and participant observation suggest that "CCAs", "community choice", and "sustainability" had different meanings for different actors in California's energy transition. This shows the internally fragmented nature – and consequently what will be the on-going politics – of an energy transition.

This dissertation, in exploring the reasons for the grassroots emergence of CCA, pays particular attention to the influence of local politics. The local level increasingly becomes prominent following the decentralized nature of renewable energy technologies (microgrids, rooftop solar, or electric vehicles) having political implications for more local governance and control. These developments are seen around the world, ranging from community-led renewable energy projects in Scotland to rural electrification projects in Bangladesh to community-based microgrids in rural Kenya to wind cooperatives in German and Danish communities to community choice aggregators in California, among many others. In these types of projects, engagement among a range of social actors produces new political and economic relations, fostered by technological change and possibilities (Miller et al 2013: 146).

But to understand how the disputes over some of these technologies play out and what its implications are for their governance, one must understand the role of energy in

contemporary societies, debates and perceptions of climate change, and how contemporary societies and economies have grown on the back of fossil fuels. The upcoming sections will outline these elements to lay the groundwork for understanding energy transition processes and the political tensions over emerging and current energy providers, regulations/legislators and communities.

Energy & Our World

E.F. Schumacher once observed that energy is "not just another commodity, but the precondition of all commodities, a basic factor equal with air, water, and earth" (Schumacher & Kirk 1977: 1-2 as cited in Goldthau & Sovacool 2012); energy makes life possible and, in some sense, energy is everywhere. The sun shines on us all; it supplies Earth with 885 million terawatt hours per year, about 6,200 times the amount of energy used in the world in 2008 (Holmes & Fletcher 2015). Streetlights illuminate our roadways, our cars are (still primarily) powered by gasoline or diesel, our televisions or WiFi do not work when the power goes out, and even the banana eaten with breakfast got flown in from a warmer climate.

Energy is woven through our societies, and it is fundamental to our modern lives and livelihoods. The technologies that form the energy systems powering our societies – whether a combustion engine or power plant and series of transmission or distribution lines electrifying our households and office buildings – were built in tandem with different social, economic, and political arrangements (Miller et al 2013: 139). The energy system we depend upon daily consist not solely of hardware – machines, pipes, oil refineries, and devices – but humans who design and adopt these technologies, consume

energy, and devise institutional systems that coordinate and regulate these flows and devices (Miller et al 2013). Our energy systems, therefore, are *sociotechnical* systems requiring social, economic and political systems built around – and in conjunction with – technological artifacts (Miller et al 2013).

The sources that supply our energy have gone through various transitions over time, and the make-up of our societies has been inextricably tied to energy. Throughout much of human history, energy production and consumption was very place-based: under a predominantly agricultural world energy was generated from natural flows such as sun, water and wind, and human and animal muscle power (Grübler 2004; Huber 2009 in Bridge 2011: 311).

Upon the discovery of seemingly abundant, highly profitable, and dense reservoirs of energy in the form of fossil fuel energy roughly 200 years ago, the current form of industrial capitalism and societal organization began to take shape. Coal, oil and natural gas are buried in-hard-to-reach places and difficult to transport (through drills, mines, pipelines, storage facilities tankers and so on) (Miller et al 2013: 14). The extraction, refining, and distribution of fossil fuels rely on machines and large-scale infrastructures that create conditions for the concentration of capital (Bridge 2011; Huber 2009) and, beginning in the late 19th century, the ownership, production and distribution of energy became the private property of large cartels (with the occasional state-owned company thrown in). Energy was sold for much more than it cost to produce, generating a high return on investment, providing widespread albeit uneven energy access across the world, and producing numerous both place-based and global negative externalities (pollution and climate change, for instance).

During the 20th century, oil became embedded in social institutions and material infrastructure (Bridge 2011). In North America and Europe, oil was integral to the post-war Keynesian solution designed to avoid another worldwide Great Depression. Through both physical engineering and socio-cultural convention, mass automobility, suburban lifestyles, and mass markets for consumer goods were created, leading to today's social and geographic structure of urban, national and international economies (Huber 2009b; Mitchell 2009; Bridge 2011). The world economy, then, has grown on the back of convenient and low cost fossil fuel sources of energy for well over a century.

The political and regulatory structures guaranteeing "fair and reasonable" rates for electricity, and ensuring near-universal access in much of the Western world emerged almost one hundred years ago. Yet, these infrastructures are not politically neutral; a series of concerted political decisions on technology and infrastructure discouraged decentralized energy systems and created a centralized electricity grid under regulated monopoly utilities (Hirsch 1999; Granovetter & Mcguire 1998). Technology has enabled and provided political order in the sense that it sustains particular structures of established power (Winner 1980).

In the United States, the 1970s oil crises followed on the heels of the 1960s nonviolent mass action movements by activists under the work of Gandhi, Martin Luther King, and Cesar Chaves and corresponded with the emergence of the environmental movement. Visions of reactor catastrophe and a nuclear apocalypse produced public resistance to nuclear energy and a desire for solar instead, imagined to carry the seeds of a new social order (Wasserman 1979). Lovins (1976) wrote of the social and political implications of 'hard' centralized energy paths versus 'soft' decentralized energy paths

relying on non-depletable local energy sources (such as sun, wind and vegetation) through a myriad of smaller devices.

While the grid in subsequent decades has largely retained its centralized ownership and control structure, our energy systems have been in constant flux nonetheless. Decreasing costs for PV and wind technology, the advent of fracking and consequent public protests, oil extraction and fluctuation in oil prices, the nuclear meltdown in Fukushima leading to phasing out nuclear power in numerous European countries, and the discourse on climate change and energy transitions (Miller et al 2013).

The flux in our energy systems occurs against the backdrop of larger destabilizing factors. The 21st century, particularly, has been marked by fluctuation and change, political unrest and discontent, and destabilization around the world. Public frustration with contemporary modes of governance and regulation are evident in populist movements across the West, demonstrations in Hong Kong for political freedom, and other forms of unrest in other locales. Citizens' discontent lead them to reconsider the role of the state and multi-scalar interactions and consider local epistemologies and contestation in relation to larger political power structures. They hereby transcend earlier nation-based structural understandings of knowledge and power in assumptions on the social and political ordering of society. We are underway for the biggest changes seen in a century. As the World Economic Forum (2017) writes:

> The global energy ecosystem is in the midst of a transformation at a scale and pace perhaps unseen in a century, buffeted by discontinuities in every direction. Deep trends in the global economy, including industrialization in emerging markets, changing demographics, rising nationalism, and innovations affecting cost and efficiency are overturning past assumptions about the demand for energy – and the supply of fuels and feedstocks that drive it.

The uncertainty of a changing climate, and the anticipated costs to mitigate and adapt, are a significant driving force to changes in the economy and energy systems. Following the United Nations Intergovernmental Panel on Climate Change (IPCC), virtually every coal power plant in existence would need to be phased out within decades, transportation sectors would need to be decarbonized, and power grids would need to become virtually emissions-free by the end of the century (OECD et al 2015). Decarbonizing existing energy structures is estimated to require $61 trillion in low-carbon investments (Hall et al 2018). Questions surface whether climate change would increase income inequalities between and within countries, and whether a transition to decarbonized energy systems could build more inclusive and equal economies and societies.

Energy & Society

Social science research increasingly recognizes energy as the central fabric of our society, but the impacts of contemporary energy regimes on society are often still poorly understood (see e.g. Szolucha 2019). The social, political and economic implications of a global energy transition will be profound, and the transition will not go without contention, disagreement, and struggle. It is the processes of conflict and consensus building that will be closely analyzed in this work. This study will pay particular attention to the following two factors.

First, the connections between technology, political power and societal organization. There will be a big transformation in the sources supplying our energy needs. Distributed energy resources (DERs), such as utility and consumer-owned solar panels, energy storage devices, wind turbines and electric vehicles are disrupting the

traditional grid-operating model. We are now moving away from an era of large-scale technologies to one of more complex, socio-technological systems wherein energy is linked differently to transportation, housing and food production (Miller et al 2013: 146). A growing share of energy consumed for heating, lighting, cooking or transportation will increasingly be powered by electricity rather than fossil fuels (McKinsey 2018). These newer technologies will be owned and operated by newer players, leading to a fragmentation in the energy market, and the emergence of new forms of energy governance and control. A growing market segment of renewable energy producers will be controlled by city, municipal, community and co-operative groups (Brisbois 2019). As solar rooftop, electric vehicles, and a variety of other electricity gadgets become more common-place, this leads to the engagement and control of electricity by the citizen, referred to as the "prosumer" (Szulecki 2018).

This energy system fragmentation sees increasing local ownership by new players (WEF 2017). Transforming production and control of energy from the private sector to numerous decentralized energy providers requires developing new institutional structures, evolving norms, identities and social relations. The declining price of solar PV has led to a new race among companies, communities, and governments to determine the technology's incorporation through utility-scale, community-scale or rooftop solar (Miller et al 2013). New regulation then needs to be devised to ensure adequate energy provision, with advanced resource adequacy planning.

Incumbent energy providers view the emergence of decentralized actors as a threat to their business models (e.g. Hess 2019; Lauber & Jacobssen 2016). Elites will seek to shape and coopt the energy transition process by exercising their power and

maneuvering to capture market share – or maintain monopoly control (Sovacool et al 2019; Bakke 2012 xviii). This leads to tensions with newly emerging actors who seek to transition not just to low-carbon technologies, but who also seek to provide political change through greater local democratic control and ownership (see eg Hess 2019).

A growing literature body shows that newly formed energy transition coalitions have broader societal change aspirations associated with energy justice and energy democracy (Hess 2019: 39). The term *energy democracy* has become understood as "a demand for increased accountability and democratization of a sector that was previously not seen as requiring public involvement, and was (is) most often depoliticized" (Szulecki 2018: 27). The term has proliferated primarily in Europe in recent years, and denotes a normative goal of energy decentralization, accomplished most often through bottom-up mobilization (Szulecki 2018). Kunze and Becker (2014) and Sovacool (2013) show that increasingly locally controlled and governed share of renewable energy becomes an emancipatory project, where energy ownership eludes to civil society empowerment.

This, then, leads to the second point. Changes to energy are intertwined with social and ecological "futures" that have a very "local" and place-based dimension to them. Social science scholarship has long pointed towards local politics as playing a strong role in influencing how the environment is protected and governed, yet local politics in academic scholarship is often "black-boxed" and poorly understood (Lawhon & Patel 2013).

Bond (2009: 2) suggests that local initiatives and action are at the heart of contemporary environmental [and energy] politics for two reasons: 1) greenhouse gas

emissions originate from activities occurring in locales, and 2) adaptation is localized in that "climate risk decisions will be made by the decentralized decision-makers in the private sector, local government, and households." Lipschutz (2003: xi) contends that social change and consciousness at a local level are important means for protecting our ecosystems; while environmental regulatory strategies are produced by international institutions, global markets, science and the greening of consumption patterns, they must ultimately boil down to a recognition of an intimate relationship between human and nature that therefore cannot be disconnected from the local. Martello & Jasanoff (2004) and Haraway (1989) explore how a seemingly global phenomenon – such as climate change – is interpreted locally and acted upon based on local perceptions of the threats the community faces, the local knowledge of environmental and governmental regulatory structures, and finally perceptions of the local community in relation to the larger world (for instance, does the community perceive it has a responsibility to reduce greenhouse gas emissions locally, as an effort to fight global climate change?).

This study adds to, and builds on, these works to consider not solely how localities respond to the perceived climate change threat by reducing greenhouse gas emissions through a range of local initiatives, but also how particular action follows from a wider series of concerns. This study therefore contends that while emerging initiatives are often driven by concerns about climate change, they are also rooted in on-going tensions over energy provision and local livelihoods: fossil fuel depletion, socioeconomic equity and the right to clean energy access, and overall human well-being.

By using Marin County as a case study, I explore how local citizens locked into a regulated monopoly electric utility model began putting political pressure on local

governments for reform, transforming both economic frustrations and climate concerns into political action. Local political organization and action emerged from visions of local energy self-sufficiency through renewable energy technologies, which would allow for the deployment and control of energy under a vastly different scale than the centralized and fossil fueled energy system of the past 100 years. The public energy model that emerged has spurred energy decentralization trends across California.

This study explores the tensions between local ideas of sustainability, renewable electricity, and the underlying dynamics and power struggles amidst existing and emerging actors, communities and the state. These developments are not unique to California. Locales across the world are experimenting with renewable energy technologies and embedded social and political structures. These range from community-led renewable energy projects in Scotland to rural electrification projects in Bangladesh to community-based microgrids in rural Kenya to wind cooperatives in German and Danish communities, among many others. These developments, situated in little pockets around the world are, "context-specific adaptations to energy projects and creative engagement with energy solutions" (Szolucha 2019). They use the power of energy to promise, enchant, disappoint, engage, and democratize in the present and future (Szolucha 2019).

In scaling up, these developments produce contestations over sustainable futures – this work seeks to shed some light on this process. Consequently, this work focuses on what I term "the politics of energy transitions." I explore how California's electricity model transitions from fossil fuel to renewable energy sources, and the wider visions of sustainable futures that play out during this process. California's electricity delivery

model is around a century old: Pacific Gas & Electric – California and the nation's largest utility – was founded in 1905, and the California Public Utilities Commission that serves as the regulatory entity of a the monopoly utility model ensure adequate electricity delivery and fair/reasonable electricity rates has been in place since the 1920s (Hirsch 1999). The utility owns the electricity grid spanning thousands of miles throughout the state – a fire-threatened electricity grid in need of substantial investment as illustrated when found at fault of several disastrous Californian wildfires. The utility seeks to upgrade its grid and help the state meet its clean energy goals – among the most progressive decarbonization goals around the world – by purchasing clean energy from centralized solar and wind (cite PG&E report).

But competing models have emerged following from alternative imaginaries of owning and governing clean energy locally. Energy is a commodity fundamental to our modern livelihoods and clean affordable energy access is increasingly considered a right. As the case of Marin County above shows, communities increasingly mobilize for this right. The first Community Choice Aggregator (CCA) in California emerged in Marin County in 2010, and in 2019 19 CCAs provided electricity to 10 million state residents (approximately a quarter of the state's population). The development of CCAs depicts the politics of energy transitions; competing visions of clean energy models by new energy providers are met with resistance by the incumbent utility and government regulatory agencies (Hess 2019).

The California Public Utilities Commission projects that in the next decade, 85% of utilities' customers will be taken by Community Choice Aggregators, direct access providers, and rooftop solar (CPUC 2018). But the state is unclear how California will

reach its clean energy future, and its fear of climate change disrupting livelihoods is met with another fear of an electricity model in disarray producing another energy crisis (CPUC 2018).

Furthermore, in considering a clean energy future, a more equitable low-carbon economy has emerged as an imaginary. Despite being the fifth largest economy in the world, California also experiences increasing economic inequality. Questions of social justice, democracy, centralized or decentralized/local control are invoked at political settings ranging from community meetings, city townhalls, and the legislature. Yet, concrete visions of a "fair and just" or "adequate" clean energy future are often unclear – and widely disparate across parties in the energy transition and society at large.

Dissertation Outline & Chapter Conclusion

The remainder of this dissertation will build on the puzzle pieces outlined in this introduction chapter. The second chapter will provide an overview of academic scholarship on environmental governance, energy transitions, and sociotechnical imaginaries and will discuss how to build on these conceptual tools academic scholarship provides. The chapter will primarily draw from social science scholarship: environmental politics, social movements, and Science and Technology Studies. The chapter will draw on these literatures to take a closer look at developments underway in California, zooming in and providing a historical analysis of decisions on technology, political- and energy power provision. The chapter will explore the social, political, and economic structures that have governed electricity supply through a 100-year old grid

infrastructure. The particular power struggles of public versus private control of infrastructure will be traced through America's political development historically.

The third chapter explores the emergence of Community Choice Aggregation in California, and its roots in grassroots activities beginning in the late 1990s (Marshall 2010; MCE history). What was the reason for grassroots rather than top-down activity? Which political histories shaped the discontent that led activists to act, and what political and legal spheres demarcated their actions? This chapter will pay more particular attention to the imaginary that led to the emergence of Community Choice Aggregation, the reasons for its emergence in Marin County, and how different actors in pursuit of their imaginaries of renewable energy futures have utilized "Community Choice" differently.

The fourth chapter will explore the tensions between centralization and decentralization of California's energy provision currently underway, and explores what the future may hold. With a bankrupt utility, still nascent CCAs, and the intermittent nature of renewable energy, the state finds itself at crossroads in outlining how it will meet its policy objective of meeting statewide electricity demand with renewable resources by 2045. Through personal interviews with government officials, policymakers, energy companies, activists and local communities, I explore these imaginations and the social and political implications of various energy and governance configurations.

Analyses of interviews loosely draw from Layder's (1998) middle-range adaptive theory approach for both theorizing and conducting research, going back and forth between scholarship, legislative documents and interviews using both inductive and deductive reasoning. Adaptive theory goes beyond reliance on existing energy transition

processes to incorporate historically situated structural factors and power relations. Interviews were transcribed and coded. Throughout chapter two, three and four, citations and several block quotes from interviews are used to illustrate imaginaries, and how history and particular events shape our characterization of acceptable futures and the particular types of consequent action deemed necessary and adequate. Particularly, interviews outline specific historical, cultural, social, and environmental contexts that shaped participants' understanding of sustainability, energy efficiency, and social and political change. Interviews have been conducted with each of the stakeholder groups identified in California's energy transition.

Information on actors, the broader context of energy transition politics, and California state goals were gathered through analyses of:

- Media reports, press releases, and documents on the history of CCAs (including CCA founding reports and consulting studies);
- Ballot propositions and legislation passed;
- CPUC and PG&E websites, annual reports, and outlooks;
- Personal interviews and attendance of meetings with policymakers, grassroots advocates, CCA organizers, energy analysts, and PG&E representatives

In short, much of this dissertation explores the relations between communities, energy providers and the state through a historical analysis of energy provision structures and local advocacy in reshaping energy governance. In doing so, the dissertation helps understand emerging local energy governance initiatives as drawing upon ideas of decarbonized futures and political possibility to give ideas for further research on climate change and energy transitions.

Paradise on Fire

Introduction

It is Fall 2018, and wildfires are burning across California at an unprecedented scale. An apocalyptic fog hangs over the Bay Area, hiding the picture-perfect Pacific Coast from one's view, rolling into towns, and its particles settling into our lungs. The smoke comes from the Camp Fire – sparked by a utility's power line – and has burned the town of Paradise to ashes. As the death toll of the fire mounts to 85, the now deadliest in California history, residents of smog-choked Northern California wake up in October to learn that pollution levels now rank among the world's worst. The state's governor characterizes these conditions as the new "abnormal." As a New York Times article (Turkewitz & Richtel 2018) reads:

> In the communities closest to the Paradise fire, an apocalyptic fog cloaked the roads, evacuees wandered in with masks and officials said respiratory hospitalizations had surged. Nearly 200 miles south, in San Francisco, the smoke was so thick that health warnings prompted widespread school closings. Even the city's cable cars were yanked from the streets. And researchers warned that as large wildfires become more common – spurred by dryness linked to climate change – health risks will almost surely rise.

The Camp Fire was not the first wildfire sparked by California's largest utility's equipment: state officials blamed Pacific Gas & Electric (PG&E) for 17 of 21 major 2017 California wildfires (Penn et al 2019). In January of 2019, PG&E said it anticipated more than $30 billion in wildfire liabilities, and filed for its second bankruptcy protection in two decades (Penn & Eavis 2020). U.S. District Court Judge William Alsup in San Francisco, overseeing PG&E's probation from six felony convictions after its gas

pipeline exploded in San Bruno in 2010 and killed eight people, ordered the utility to overhaul its power-line maintenance efforts by trimming and removing trees that could fall into power lines and spark new wildfires (Christie 2019). The utility, serving 16 million customers (40 percent of California's population), estimated that maintaining and updating its power lines spanning more than 125,000 miles across Northern California would cost between $75-150 billion (Christie 2019). The utility faced heavy public scrutiny and outrage for its safety culture, payments of dividends to shareholders and for spending millions on lobbying politicians for more favorable regulations in lieu of physical infrastructure investments (Fuller & Penn 2019).

As a new wildfire season arrived in summer and fall 2019, citizens, regulators and policymakers alike were confronted with another layer of vulnerability in a state prone to earthquakes, tsunamis, mudslides and wildfires: blackouts. On a windy October day, PG&E pre-emptively shut off power to 2.5 million customers. The impact of electricity on livelihoods and society became abundantly clear – it put elderly and disabled citizens at risk, shut down universities and put millions of dollars of research projects in jeopardy, and disrupted the local economy (Fuller 2019). Despite public fury and regulatory and legislative accusations that the blackouts were another power play by the utility, PG&E said it anticipated public safety power shutoffs for the next ten years to reduce wildfire risks (Gonzales 2019; Luna 2019).

While wildfires spurred tales of the apocalypse, they also drew attention to visions of clean energy futures. Is a clean energy future possible? What would it look like? How would energy be provided and by who would it be controlled?

These are questions about California's climate change- and energy transition politics. California's energy delivery system now finds itself at crossroads. Its century-old centralized electricity model is in disarray under its largest utility's bankruptcy and a fire-threatened grid. State takeover proposals are floating around the state senate floor, and calls for municipalization of the grid have resurfaced by San Francisco and San Jose's mayors. The proliferation of still nascent Community Choice Aggregators (CCAs), as local not-for-profit entities procuring electricity for over 10 million California residents, embody calls for local electricity control and ownership.

The California Energy Commission, the state's planning body, projects that distributed renewable energy generation will play an important role in California's clean energy future (CEC 2018). But absent a clear vision of a reliable, sustainable and clean energy future, the state's Public Utilities Commission (the electric utilities' regulatory body) worries that fragmentation of the delivery model will lead to a break down in services and another electricity crisis that caused rolling blackouts in 2000-2001 (CPUC 2018).

Despite challenges and uncertainty at home, California has taken on a global leadership position in reducing carbon emissions through progressive policy goals, and has engaged with other leaders to address the climate change threat. Its efforts see a changing locus of governance; as international governance has increasingly become multi-scalar, California seeks to inform global governance through international collaboration with nation-states, progressive policy goals that stimulate change elsewhere, and through an array of action and engagement from local actors.

What tools does academic scholarship provide to understand California's climate change and energy transition politics? This chapter will provide a broad conceptual overview, drawing primarily from social science scholarship: environmental politics, social movements, and Science and Technology Studies.

While providing an overview of key scholarship, this chapter explores the series of concerted political decisions on technology and infrastructure that created a centralized electricity grid under a regulated monopoly utility model over a century ago. Social movement activity and the formation of an activist coalition in the 1960s and 1970s led to growth of state capacity and California's global frontrunner position to date. Particular conceptions of the American and Californian dream, energy provision, and sustainability will inform pathways forward. Social movement activity again informs pathways forward, and various forms of knowledge on energy provision and a sustainable future struggle to capture the political imagination, and therefore control.

In other words, understanding pathways forward requires asking several questions. What decisions on technology have led to existing systems, and what are political power relationships that decide on electricity models? What are the social forces putting pressure on change, and how can we understand the extent to which they can influence California's politics? What are the different options of energy ownership and control proposed, and how do actors claim knowledge and power that give weight to their proposals?

The American Dream

In a study of American history and the roots of the American Dream, Chris Jennings in "Paradise Now", remarks:

> No moment in history or place on the globe has been more crowded with utopian longing and utopian experimentation than the United States in the middle of the nineteenth century. … Looking West across the Atlantic, European visionaries saw a wide-open wilderness, sparsely populated and loosely governed by liberal institutions. Through the rosy lens of millenarian optimism, the New World looked like a blank slate … This sense of a clean start was woven into the keenest hopes of the American Revolution.

A confluence of two underlying ideas shaped an imaginary of a society in paradise. The first a Judeo-Christian proposition of a bountiful, property-free existence, of a life uncorrupted by capitalism or technology. The other idea, rooted in seventeenth century Enlightenment, perceived the human race advancing to endless and inevitable progress under new technologies of mass production mass production that "augured a future in which scarcity would become a dim legend" (Jennings 2016). To many new settlers, the New World in the West looked as the place for the "end of history," either for its freedom from European principalities and churches, plentiful availability of land, and/or its visions of technological progress transforming human society.

These ideas developed into two competing economic visions that gained traction at the dawn of industrialization in the early 18th century. On the one hand, Thomas Jefferson envisioned an agrarian democracy with self-governing democratic republic of free and independent farmers. On the other hand, Alexander Hamilton envisioned a commercial republic and centralized government responsive to, and controlled by,

merchant and banking elites. This latter vision of economic growth for the nation's common good would triumph, and guided policy decisions for a century after Hamilton's death (Bertram 2018).

The Civil War (1861-1865) would remake the American economy by stimulating industry, increasing manufacturing, foreign trade to fight the war, and investment banking. Communication and transportation would speed up through railway and telegraph advances. Following the Civil War, a national state and market emerged under an emphasis on basic principles of free-market economic systems. In theory, federal and state governments pursue a policy of "laissez-faire" – minimal government interference – so that individuals may follow their own self-interest in the competitive market. The market then coordinates the efficient use of resources in a way that yields overall societal benefits (Hirsch 1999; Heilbroner & Milberg 2012).

The rise of mass production through the exploitation of new technologies and market manipulation changed the fragmented market structure of the early- and mid-nineteenth century and concentrated production in the hands of very powerful business owners (Heilbroner & Milberg 2012: 83). To reduce destructive price competition, managers of large companies established trust agreements with other firms or consolidated several businesses into one. John D. Rockefeller's Standard Oil Trust in 1882, for instance, brought more than 90 percent of oil businesses under the control of a nine-person directorate (Hirsch 1990). By 1904, one percent of American companies controlled 45 percent of manufactured goods (Eisner 1995).

A similar pattern followed the development of the electricity industry (discussed more extensively in chapter four), where electricity provision emerged under small scale

and decentralized systems in the late 1800s. The profitable industry grew to almost 2,000 suppliers by 1891, all small scale and decentralized systems under direct current electricity where consumers needed to be located within one mile of the power plant (Granovetter & McGuire 1998: 150). With the invention of alternating current (AC) allowing the long distance transmission and distribution of power, large power stations were developed to transmit power along high-voltage lines. In 1891, Niagara Falls saw America's first large-scale power plant sending power twenty miles to nearby Buffalo. Numerous electrical installations were built soon thereafter, and this made possible the growth of electric utilities into giant, centralized corporations (Hughes 1983).

Several concerted decisions on technology by political figures were influential in shaping the emerging electricity industry into a centralized structure under territorial monopoly control. These four men, referred to as the 'Insull circle,' were Samuel Insull (Thomas Edison's confidant), John Lieb, Charles Edgar and Louis Ferguson, who had working in the drafting room of the Edison Electric Light Company's manufacturing plant between 1882 and 1885. These men leveraged personal and trade relationships to implement an industry-wide development strategy by creating and expanding a territorial monopoly, increasing total and per capita load, and scrapping and replacing older decentralized technologies with new systems (Granovetter & McGuire 1998: 155-156). Business owners with decentralized and smaller-scale electricity systems were effectively attacked and bought up by the Insull group (Granovetter & McGuire 1998 157). The new electricity industry consequently saw minimal organizational and technological diversity despite heterogeneous power sources (hydroelectric, coal, or other fossil fuels),

hampering the industry's adaptability in the contemporary period (Granovetter & McGuire 1998).

Electricity provision emerged in areas dense enough to make profit, and rural areas and the poor were overwhelmingly left in the dark; by 1907 approximately eight percent of American homes received electricity (Bakke 2016: 45). As cities saw the emergence of electric monopoly systems during the first decade of the 1900s, utilities became classed with railroad companies as both public necessities and public "demons" (Hirsh 1999: 13). In an attempt to break up monopolies and restore fair economic competition, government leaders offered nonexclusive franchise models that, partially due to political corruption, were often unsuccessful. Insull then began working with government leaders, to develop the regulated investor utility as we know it today (Bakke 2012: 65-72). His efforts ultimately led to the "utility consensus" as in order to survive, utilities reached consensus with politicians, and the latter group sought to provide equal access under an emerging norm that electricity access is a universal right (Bakke 2016). Under the utility consensus, power companies became "natural" monopolies within specified geographical regions and, in return, would provide "ample and reasonably priced electricity," regulated by utility commissions created by legislators in each state (Hirsch 1999: 11). This is the model under which the majority of utilities in the United States are still regulated to date.

At first glance, the utility consensus as choice of regulation seems to go against the ideology of the free-market American economic system. But constitutional justification for government oversight of business proved significant for establishing authority over companies that offered essential public services (Hirsch 1999: 15). In

particular, the Tenth Amendment to the U.S. Constitution left to the individual states all governance powers not mentioned in the Constitution as belonging to the federal government. Thus, state regulation of business emerged under the 10th Amendment interpretation of state police powers to be used "for the protection of the health, safety, morals, and general welfare" of citizens (Hirsch 1999: 15).

Over time, utilities have made most of their profit from building new power generators. Under a system known as "rate base," utilities could make more money by spending more to build new generators, gearing the American energy grid for both centralization and increasing electricity consumption (Wasserman 1979: 229). The supply of fossil fuels seemed infinite, and demand increased substantially under a growing consumer base and rising energy consumption: between 1950 and 1979 the American population increased 45%, energy use 250%, and electrical consumption 600% (Wasserman 1979: 229). By the mid-1970s, the United States was home to six percent of global population, but was responsible for a third of overall global energy consumption (Wasserman 1979: 229) Under abundant and cheap electricity supply, growing electricity consumption became tied to the American Dream: bigger houses with more appliances became perceived as holding more status and wealth.

Hence, as America modernized over time, professions, businesses and government developed along increasingly interdependent paths. Several elites effectively encouraged the development of large-scale centralized energy infrastructure over decentralized and diversified energy systems, and the regulated utility still existent today emerged from these efforts. This alliance among elites, seen within the development of the electricity infrastructure here, undermined the local, democratic politics of the 19th

century and encouraged the rise of an administered state of bureaucrats, experts, and industrial leaders (Wellock 1998: 4).

After the Second World War, growing economic wealth and the 1960s civil rights and environmental movement would lead to both more public engagement in politics and the formation of advocacy coalitions that mobilized on the basis of newly formulated imaginaries to pressure and redirect the state. By the 1970s, the "iron triangles" between bureaucrats, scientists and industry would become resisted or countered by an emerging network of actors (Wellock 1998). This network included public interest groups, citizen activists, journalistic, and sympathetic politicians developing alternative imaginaries of the relationship between economic growth, society, and the natural environment. A new era of social regulation would expand state bureaucratic capacity following social welfare, consumer- and occupational protection, and environmental concerns under new networks. The emerging social movement activity and the new political coalitions would change the state's political structure and control, and the method of creating political change holds striking similarities with the contemporary energy transition.

Political Trends after World War Two

In the late 1950s, PG&E sought to develop the nation's first commercially viable nuclear power plant. Their efforts would be met with substantial resistance, driven by environmental and nuclear safety concerns, that would follow a pushback against power relationships entrenched in the time period's political order (Wellock 1992).

The utility had identified the Bodega Bay, a rugged area fifty miles north of San Francisco – and atop an earthquake fault line – as the location for the power plant. PG&E

approached Rose Gaffney in 1958, the owner of a large piece of land, to purchase her property for an electric generating facility. Gaffney resisted, but had little choice: states had "delegated their powers of eminent domain to electric utilities, since power plants were considered to be in the public interest" (Wellock 1992: 193). Gaffney consequently formulated local opposition to the construction of a power plant by creating a petition that received hundreds of signatures in a sparsely populated area (Wilson 1995). Emerging local opposition resisted the power plant under concerns about aesthetics and biodiversity of the natural landscape (Wilson 1995). Yet, PG&E found allies in local business groups and politicians to attain support from the Sonoma County Board of Supervisors, and subsequently the California Public Utilities Commission (CPUC) (Wellock 1992). The latter dismissed concerns of aesthetics by remarking that decisions on power plant locations are left to the utility management (Wellock 1992: 198).

The emergence of the New Left and other protest movements during the 1960s, and this focus on civil rights and liberties would spill over onto the conservation movement. The emerging New Left ideology desired decentralization (in distrust of elites and nuclear technology), and this became linked to the civil rights movements at Berkeley in the 1960s. These developments coincided with the new environmental consciousness from Rachel Carson's *Silent Spring* whose writings about the pervasive use of chemical pesticides in local communities conjured images of catastrophic ecological futures with no birds or birdsongs (Jasanoff 2001). Citizens developed opposition to industrial pollution, pesticides, and radioactive fallout, and began drawing into question the risks imposed on them by scientific elites (Wellock 1998).

The environmental movement of the early 1970s consequently contained some new perceptions about technology, industrialization, and the environment. The huge oil spills that destroyed the Santa Barbara coastline in early 1969 only further fueled the 1970 Earth Day environmentalists' pollution-, overpopulation-, and resource constraint concerns. The environmental movement increasingly associated industrial expansion's destruction of environments as a "symptom of a 'crisis of survival' that could be overcome only by a fundamental transformation of politics and society" (Hays 1987; Joppke 1993: 31).

Coalitions of citizens, peace groups and former New Left groups joined a mounting nuclear opposition movement to challenge the corporate and federal power structure (Wellock 1998: 9). Initial critiques of aesthetics were formulated into new questions of reactor safety considering the proposed location atop the San Andreas major earthquake fault. A growing number of actors problematized the newly proposed technology's potentially destructive force. They questioned whether deference to authority and further economic growth would be worth environmental destruction and harm to quality of life (Wellock 1998).

The nuclear industry still attempted to create a countermovement by incorporating the rise of environmental concerns in their own marketing: a media campaign emphasized that "clean" nuclear electricity over "dirty coal" held distinct environmental advantages (Joppke 1993: 34). This position was supported by the Atomic Energy Commission chair, Glenn Seaborg, who remarked, "nuclear power properly managed can be a tremendous environmental asset" (Seaborg 1970: 269 in Joppke 1993: 34). But these statements could

not sway the strong links between new environmentalism and the public's nuclear opposition.

A powerful coalition of nonmaterialist politicians, regulators and scientists, and an accommodating political and regulatory system allowed antinuclear activists to create legal and regulatory change. Lobbying and voter initiatives further proved effective in reshaping energy regulation. These victories influenced the behavior of the state by incorporating nonmaterialist values into regulation and science (Wellock 1998: 11). As a state, California then successfully challenged the federal government's control over nuclear energy (Wellock 1998: 12).

After the 1970 Earth Day, environmentalism became an issue in California to the point that Republican Governor Ronald Reagan remarked in his State-of-the-State address (1970),

> there is not a subject more on our minds than the preservation of our environment and the absolute necessity of waging an all-out war against the debauching of the environment. A booming economy and the 'good life' will be no good at all if our air is too dirty to breathe, our water too polluted to use, our surroundings too noisy and land too cluttered and littered to allow us to live decently.

It was under this Republican governor, and for a few years a GOP-dominated legislature, that three key pieces of legislation were enacted by 1974: the California Environmental Quality Act in 1970, Proposition 20 creating the California Energy Commission in 1974, and the Warren-Alquist Act creating the California Energy Commission in 1974 (Wellock 1992: 134). The creation of the Energy Commission in California enabled a shift from the federal government developing a strategy to states asserting their traditional police powers and authority in energy and nuclear regulation.

The public's resistance strongly opposed nuclear energy's opaque, illiberal and centralized forms of political organization (Winner 1980). These complex technological systems with destructive potential were resisted by the movements and political coalitions in the 1960s and 1970s. What we saw following nuclear opposition was a newly formulated alliance between local actors, civil society, and policy that was able to change some of the orderings of society. Even amidst these tensions between economic power and political organization, visions of the American Dream are at the backdrop of organizing society and lifestyle. The American Dream has always been a distinctly private dream of providing a better future for your children. Despite the early 19th century slowly dilating circle of social justice and citizenship, people hoped for free market prosperity and individual opportunity (Jennings 2016: 379). This never faded, and an emphasis upon private life remained despite a growing centralized society with political power.

The 1960s and 1970s saw the questioning of the authority of political power relations and the reconfiguration of daily lives. With the turn of the 21st century under rising economic inequality and climate change, narratives of dystopian futures gather steam in the film industry – and other social institutions and settings – and politics alike. Without significant climate mitigation, IPCC reports warn, ecological and civilizational doom is in our future. In other words, absent rapid decarbonization and alternatives to economic growth – on a planetary scale – an uninhabitable planet may be let for future generations. Large-scale change, it seems, is again on the horizon. But what will be the scale at which we address rising economic and environmental concerns – local, national

or global scales? What does governance at each of these scales look like? And how will underlying visions and imaginations inform politics going forward?

Locus of Governance – Our Planet, Our Nation, or Our Community?

Climate change is controversially depicted as a slowly unfolding disaster – as a disease like "diabetes for the planet" – that cannot be solved, but needs to be lived with. The best we can do is simultaneously cut carbon emissions and adapt to a warmer planet (Harder 2017). The United Nations Intergovernmental Panel on Climate Change (IPCC) – an intergovernmental body providing scientific research on climate change and its social, economic and political impacts – states with high confidence that human activities are increasing the mean global air and surface temperatures, and that the effects of warming will fall disproportionally on the poor (Allen et al 2018).

Several important questions about global climate change, and that which can be conceptualized as "global" and "local" governance are important to this study. Namely, what has been the role of elite scientific bodies in providing knowledge on climate change and planetary trajectories under emission projections? What are the international and national institutions that identify and conceptualize climate change threats and governance or policy initiatives? And how do these stand in line, or in contrast, with local identities and political systems?

Beginning with the role of elite scientific bodies, international institutions such as the IPCC have been influential in creating supranational norms and regulations (Martello & Jasanoff 2004). The 2007 assessment by the Intergovernmental Panel on Climate Change (IPCC) concluded that the planet had warmed by about 0.75 degrees Celsius

between 1906 and 2005, with models predicting another 2-6 degree Celsius warming by 2100 (depending greenhouse-gas emissions and deforestation, among other factors) (Edwards 2010: 7). Consensus among most scientists through the IPCC on the aforementioned global warming estimates was influential in global warming becoming an established fact (Edwards 2010).

Miller (2004) notes that "climate" was consciously framed as a global phenomenon over time: since the 1950s, satellites and computer models allowed for information gathering on climates across the world, and led to a network of scientific institutions and practices that span worldwide. "Climates," historically conceptualized under regional variations and patterns in a plural sense, became the "global climate," a singular and worldly phenomenon to be predicted by, and understood, under emerging Earth System science (Miller 2004; Hulme 2010: 560). The climate modeling and scientific research produced by the IPCC – highlighting how human activity raises the mean surface temperature – further conceptualizes climate change as a global phenomenon.

Beck & Mahoney (2018: 1) refer to the IPCC's influence as 'world-making' power by providing "politically powerful visions of actionable futures, for example, based on speculative technologies of bioenergy with carbon capture and storage" (BECCS). Under the Paris Climate Agreement of 2015, nations committed to implementing policy to keep global warming at 1.5 degrees Celsius. Yet, the climate scenarios that would make 1.5 degrees Celsius feasible are increasingly drawn into question, as each of these models assumes wide-scale deployment of negative emission technology (such as BECCS), which does not currently exist at scale (EASAC 2018;

Flegal 2019). Some worry that these global climate visions, and the politics behind them, are not "useful" or "robust," and that reliance on these models raises important questions about the relationship between knowledge and policy (Hulme 2016).

Consequently, what climate hawks and Green New Deal advocates have in mind to avoid climate apocalypse is politics: a combination of long-standing policy goals and short-term action. Yet, setting goals in the Anthropocene is considered the "ultimate challenge for planetary stewardship" (Young et al 2017: 53) following a series of political constraints at both the global and the national level. Global governmental action on climate change has lost momentum since the 2015 Paris Climate Agreement. Critics had already claimed the Paris Climate talks a "bet on the power of peer pressure" with modest voluntary pledges of emission reduction missing the mark of what scientists deem safe targets to prevent catastrophic global warming (Plumer 2017). U.S. withdrawal from the agreement – as the world's second largest greenhouse gas emitter, behind China – appears to leave much of the agreement in limbo, and consequent talks in Madrid late 2019 were widely considered a disappointment (Sengupta 2019). What explains the inability to cooperate internationally?

An international institutional architecture is in place, emerged decades ago, and has served as the framework for nation-state cooperation on transboundary issues. When scientists in the 1960s discovered that acid rain was destroying forests in Northern Europe and Eastern North America, a framework for international environmental cooperation was perceived needed (O'Neill 2013). The 1972 UN Conference on Humans and the Environment (UNCHE) convened world leaders in Stockholm, Sweden, and established the initial architecture of global environmental governance (Ivanova & Roy

2007). Global environmental governance was managed under state-centric institutions, with rational states deciding on the basis of their national interests to cooperate (Keohane 1989).

Since the 1972 conference, international institutions have proliferated, and large numbers of multilateral environmental agreements (MEAs) have been negotiated. Among the major MEAs, the 1987 Montreal Protocol arguably was the most successful instance of bringing together science, actor cooperation, and technical development to phase out ozone depleting substances (ODS). CFCs were found to be destroying the stratospheric ozone layer, and based on scientific consensus, the ozone regime became an international regulatory institution. The existence of technologically available and economically attractive alternatives minimized the interest-based politics that has restricted the adoption of binding emission targets that has gridlocked climate change negotiations (Mitchell 2010: 134).

These latter decades of the twentieth century saw globalization, trade liberalization, the end of the Cold War, the marketization of socialist economies, and finally the internet, seemingly making the world a smaller and more connected place (Martello & Jasanoff 2004). During this time, a greater diversity of actors emerged in the international system, contributing to growing state and non-state actor engagement to solve environmental challenges. These environmental challenges occur across scales of governance (from international, to national, to place-based), across a growing number of institutions with overlapping jurisdictions, and a growing number of actors (civil society and NGO, epistemic communities, cities and municipalities, corporations and individuals). Action on reducing greenhouse gas emissions, for instance have emerged at

multiple scales, and frequently following bottom-up activity. Cities increasingly set their own greenhouse gas reduction targets (Gordon & Johnson 2017), corporations use their private authority to set certain own rules on greenhouse gas accounting standards (Green 2013; Pattberg 2007), and non-governmental actors can work both locally or internationally, for instance by create transnational advocacy networks (Andonova & Mitchell 2010). Nonetheless, scholarship points out that these actors still perform within the institutional environment set by governments (see for e.g. Green 2013 and Pattberg 2007 in De Wit et al 2020).

These different actors bring new types of knowledge of climate change solutions to the table. Yet, they also bring power dynamics and social and cultural characteristics that are present at local, national and international politics. While globalization research has often assumed a growing universality of climate change understandings and solutions, a growing literature body has shown the various local identities that climate scientists, policymakers, or citizens may experience and that influence political decision-making. Lahsen's (2004) study of the climate episteme in Brazil, for instance, revealed that Brazilian scientists participating in IPCC-related arenas express some frameworks of understanding in line with their professional networks – closely related to the epistemic community framework presented by Haas (1992) – yet these Brazilian scientists held onto identities very different from those vis-à-vis Western scientists. Lahsen (2004: 153) observes that,

> The identities of Brazilian actors participating in IPCC-related arenas are complex and hybrid, with important consequences for their interpretations of international science, the global environment, and their own agency. Some of their frameworks of understanding reflect the transnational nature of their professional networks. Other levels of understanding reflect the continued impact of history, geography and socio-economic realities.

> Among other things, Brazilian climate scientists and policy makers are keenly aware of structures of difference within international and transnational climate-related forums in which they participate, including conditions of inequality, reflecting the dominance of actors from richer countries ("the North").

She continues to note that (2004: 157):

> While these Brazilian scientists have been influential in putting climate change on Brazilian political leaders' agendas, these same scientists portray international science (legitimized by transnational expert networks) as biased by Northern framings and interests, and therefore not to be accepted at face value.

Lahsen's research shows that social and cultural characteristics (such as race, ethnicity and development level) are important characteristics in climate policymaking, and herein tease apart the "global". These are ultimately social and cultural differences that inform an actor's identity and influence participation in politics.

Scholarship indicating that matters of identity will be important in climate politics has been around for several decades, albeit not significantly explored. As early as 1990, Turner et al (1990) warned that place-based differences following from social and cultural factors will provide different experiences, interpretations of, and solutions to even a globally uniform climate change. Consequently, Turner et al (1990) wondered whether the governance of "global" followed from a global systemic change or rather from cumulative local changes. Over time, the "local" increasingly became considered the important scale for environmental action. But, as Lawhon & Patel (2013) point out, as the local becomes disconnected from the global, the term "local" remains a "black box," with much ambiguity remaining about what the local means, and why it is the key site for climate action. What then, is the difference between local and global politics and knowledge, and how does it inform climate change politics?

According to Martello & Jasanoff (2004), environmental politics has historically been a politics of the local – much of environmental awareness and its subsequent governing is driven by people's attachment to particular places, landscapes, and livelihoods, founded upon an engagement and ethical understanding about human and nature (Lipschutz 1997; Lipschutz 2003: xi; Ostrom 1990 as cited in Martello & Jasanoff 2004). The slogan "Think Globally, Act Locally," points towards the continued emphasis upon local action and place-based identities. Local movements and proposals are part of a complex patchwork of regional initiatives, but according to one author, are based upon environmental action that citizens believe address and solve a palpable local threat (Ball 2014).

The juxtaposition of local and global is at the heart of contemporary environmental politics, as global solutions to environmental governance require local initiatives and action. In the case of climate change, for example, Bond (2009: 2) points out that the local scale is at the heart of the issue for two reasons: 1) GHG emissions originate from activities occurring in locales, and 2) adaptation is localized in that "climate risk decisions will be made by the decentralized decision-makers in the private sector, local government, and households." As explained by Lipschutz (2003: xi), social change and consciousness at a local level are important means for protecting our ecosystems. Consequently, while environmental regulatory strategies are produced by international institutions, global markets, science, and the greening of consumption patterns, they must ultimately boil down to a recognition of an intimate relationship between human and nature that therefore cannot be disconnected from the local.

Local movements, and the energy democracy movement in particular, draw strongly from local knowledge by seeking to provide renewable energy control under decentralized renewable energy resources (Burke & Stephens 2018). The changes to energy intertwine with protest, risk, justice, and democracy experienced at place-specific sites, and consequently are in response to local and national (rather than international) political power structures, policies, and regulations (Szolucha 2019). Nonetheless, as chapter three will show, local actors and movements may draw from international science to give legitimacy to their claims (Fogel 2009). Consequently, what we see is that energy transitions and climate change politics see substantial interplay between local, subnational and national, and international actors. History, institutions, identity, and power structures are important factors in these interactions.

How do these analyses inform California's climate and energy transition politics?

California is not a nation-state, but in the face of disagreement with the federal government, the state has long taken a stance on climate mitigation and adaption. Following President Bush's retreat from mandatory climate policy measures upon US' withdrawal of the Kyoto Protocol in 2001, California policy elites, viewing their state as part of the global community, stepped in to position their state as a venue for action on climate change (Karapin 2016: 141). California passed legislation to reduce emissions in two of its biggest sectors: transportation and electricity, responsible for forty and fifteen percent of the state's greenhouse gas emissions in 2000 respectively (California Air and Resources Board 2019). The Pavley Bill set greenhouse gas emission standards for cars and trucks and the Renewable Portfolio Standard (RPS) in 2002 reduced emissions in its

electricity sector.

Inaction from the US government under the Trump Administration has only furthered California's efforts to position itself as a global leader and frontrunner in addressing climate change. Under former Governor Jerry Brown, California took an aggressive posture against the White House on climate change, suing the Trump administration for threatening to eliminate a special exemption that allows California to routinely set emission requirements that exceed Federal rules (effectively driving national emission standards), and meeting with Chinese President Xi Jinping to discuss governing climate change on a global stage. These steps further tensions between the state government and federal government that have been present throughout American history, and have been seen in the realm of energy provision when California took a stance to oppose federally promoted nuclear energy. California's negotiations with the Chinese President add a new layer to international environmental governance that was historically dominated by intergovernmental agreements.

Within the state, California's laws encourage electric vehicles, set renewable energy and other clean technology goals, and have cut the state's carbon emissions despite population growth. During fall 2018, then-Governor Brown signed Senate Bill 100 into law, committing California to get all electricity from renewable sources by 2045.[12] Yet, despite the state's progressive policy, international leadership position, and economic power (as the fifth biggest economy in the world), the state's electricity delivery model is in disarray under its largest utility's bankruptcy and a fire-threatened

[1] See here the bill: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB100
[2] More broadly, Governor Brown issued an executive order committing California to "achieve carbon neutrality" across the board by 2045. https://psmag.com/environment/can-california-be-carbon-neutral-by-2045

grid. State takeover proposals are floating around the state senate floor, and calls for municipalization of the grid have resurfaced by San Francisco and San Jose's mayors. The proliferation of still nascent Community Choice Aggregators (CCAs), as local not-for-profit entities procuring electricity for over 10 million California residents, embody calls for local electricity control and ownership. As the fifth largest economy in the world, California also experiences one of the highest poverty rates in the nation (PPIC 2019). The Golden State, seeking to create both economic growth and environmental (CEC 2018: 4) has the opportunity to address both economic inequality and the climate crisis through the development of local renewable energy resources and a local workforce in transitioning to a low-carbon economy. Different stakeholders – from CCAs, to PG&E, to policy makers and regulators, to activists – draw from different sources of knowledge to participate in the clean energy and equitable economy debate.

It is the different sources of knowledge that come into play during an energy transition that I want to tease out in the remainder of this dissertation, and how these different types of knowledge claim validity. Particularly, knowledge on climate change solutions is embedded in a particular vision of a clean energy future. But these particular visions will vary among stakeholders. This next section will explain this.

Whose Knowledge has Power in California's Climate Politics?

The politics of energy transitions discussed in subsequent chapters will show that various actors draw from diverse sources of knowledge, and seek to frame this knowledge in a particular way to gain legitimacy – for instance to influence policy. Earlier sections of this chapter discussed how IPCC climate modeling has influenced policy. In California, a group of scientists has also done modeling that influences awareness and perceptions of climate change, and its climate reports detract from the focus of "global" climate change to closely look at how changing climate patterns affect local livelihoods. For instance, the 1999 publication of a report by the Union of Concerned Scientists and the Ecological Society of America outlined expected impacts of global warming in California's water supply, agriculture, wildfire, and coastlines (Karapin 2016: 141). This report led to mounting pressure for political action, and was influential in the state passing legislation to reduce emissions in two if its biggest emission sectors (transportation and electricity) in the early 2000s.

These reports' projections of climate scenarios and consequent livelihood impacts under various greenhouse gas emission trends influence policy. Policy shapes perceptions of the future: Senate Bill 1045 mandates that California supplies its electricity demand with renewable energy sources by 2045. In response to this bill, various energy providers seek to ensure they are the delivery model to this policy goal, drawing on various narratives, projections, calculations and models. For PG&E as a corporation, for instance, their pathways out of bankruptcy and their presence as an integral part of California's clean energy future require that its restructuring plan inspires confidence among investors, regulators and the governor. PG&E's reorganization plan shows how much the

utility will compensate wildfire victims, and improve safety and operational performance. In the words of their CEO, Bill Johnson (PG&E 2019):

> Under the Plan we filed today, we will meet our commitment to fairly compensate wildfire victims and we will emerge from Chapter 11 [Bankruptcy] financially sound and able to continue meeting California's clean energy goals.

In essence, the reorganization plan is founded on an imagination of PG&E's role in a clean energy- and climate volatile future. This is reflected in the utility's statement at the bottom of a press release announcing their restructuring plan (PG&E 2019), which reads:

> This press release contains forward-looking statements that are not historical facts, including statements about the beliefs, expectations, estimates, future plans and strategies of the Corporation and the Utility, including but not limited to their bankruptcy emergence plan and related financings. The statements are based on current expectations and assumptions, which management believe are reasonable, and on information currently available to management, but are necessarily subject to various risks and uncertainties.

Its proposal therefore responds to how PG&E envisions the future, and the changes it deems it needs to make to provide safe, affordable electricity. Notably, the imagined future cannot be calculated in economic rational terms, because the future is unknown and therefore incalculable (Beckert 2014 as cited in Frankel :3).

Other parties have critiqued the numbers PG&E put forward in its plan. Governor Newsom questions whether the proposal goes far enough to provide "safe, reliable and affordable power for Californians" (Penn & Eavis 2020), and wildfire victims, lawyers and other critics have denounced PG&E's assessment of its contribution to the wildfire fund as "fair". Former CPUC president Loretta Lynch has gone one step further to explicitly state that the utility's financial strategy is not sound (Penn & Eavis 2020):

> The numbers do not add up, unless the money that ratepayers pay increases…. There's no way for PG&E to pay off all of the people without raising rates. The shareholders aren't taking a haircut. That's why Wall Street is excited about this deal, because they don't have to pay for it.

PG&E's restructuring plan is embedded in a fictional expectation of the future that deems their role as integral to California achieving its clean energy goals. They seek to maintain monopoly control, and the coalition behind it seeks to give this narrative leverage to maintain power also (Bakke 2012; Sovacool & Brisbois 2019). For other actors, the imaginary of a clean energy future is embedded in a deeper set of ideals and tensions; fossil fuel depletion, socioeconomic equity and reliable energy access, and overall human well-being.

The local CCA has begun constructing a different narrative, and one that address a wider array of social and justice concerns. The CCA provides consumers a choice over their provider, a cleaner energy supply, and cheaper rates than the incumbent utility. Ratepayer fees are reinvested in energy programs, particularly community energy efficiency strategies that directly benefit constituents without diverting funds to private investors (MCE 2017). New governance relationships (as will be discussed in chapters 3, 4 and 5) are imagined between CCAs, utilities, and local governments. How can we conceptualize and frame these developments?

Science and Technology scholarship drawing from sociotechnical imagination provides a starting point. It claims that any plan that is formulated invokes imagination – it is based upon a particular conception of a future we can create, and establishes steps to realize this future (Jasanoff 2015). In subsequent chapters I will explore how different actors may hold different imaginations that pertain to their interests and perceptions and,

as these imaginations are acted upon in attempt to create a new reality, they clash with the imaginations of other stakeholders.

But what exactly are these imaginations, and why do they differ strongly across stakeholders within California's energy landscape? These imaginations, and how they are acted upon, can be encapsulated under the concept of "sociotechnical imaginary," defined as "collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology" (Jasanoff 2015: 4). This definition can be separated into two parts: first, collectively held visions of desirable futures can be held by different actors within society following from different perceptions of identity, energy control, and regulation. The local activist who conceptualizes "sustainability" as living within one's means, therein attempting to have their community be energy self-sufficient under small-scale local generation systems, has a different imagination of the future than the California state senator or PG&E executive. Chapter three will provide a more detailed overview of these imaginations, and how they may shift as actors mobilize.

These imaginations are publicly performed when they clash in the political realm, at stakeholder symposiums or in town hall meetings or during marches or the writing of legislation, therein becoming imaginaries. In these instances, political realities can be created as imaginaries struggle for realization within existing political power structures, and may even alter political power structures. As we will see in chapter three, activists visions of local sustainability through local energy self-sufficiency under renewable led to mobilization for this vision, led to policy change at the state level to enable a public

utility. But if we see that the local activist draws from imaginations of decentralized energy systems, and the politician from smart-grid wind farms to conjure different visions of sustainable futures, then where does technology fit in the imaginary?

This leads to the second part of Jasanoff's (2015: 4) definition of sociotechnical imaginaries as "understandings of social life and order attainable through, and supportive of, advances in science and technology." Technology plays a significant role in the politics of energy transitions, and their underlying imaginaries. Earlier parts of this chapter explored the emergence of the centralized energy infrastructure, dominated by politically powerful centralized interests. Emerging community or decentralized solar require a fundamental redefinition of century-old regulatory utility-citizen power structures, and transforms the role and function of the existing electricity grid. The distributed nature of low-carbon technologies allows for the capitalization of more local governance and ownership structures amid desire for more local accountability and control (see for instance Sweeney et al 2015; Stirling 2014; Szulecki 2017).

To an extent, these sociotechnical imaginaries cannot be detached from knowledge. As the next chapter will show, the emergence of Community Choice Aggregation followed from local actors' local knowledge of their environment, their utility, and critical leverage points in their local governments. Their community self-sufficient energy models were imagined to benefit their local communities and economies. Sustainability planners and consulting organizations took this information to develop these imaginations into policy initiatives to become separate organizational entities. What became CCAs, therefore, followed from a general imaginary of energy

self-sufficiency and sustainability, but developed into its current shape as a result of context-specific factors and power structures.

Changes in the state's political opportunity only gave the nascent local energy and sustainability imagination more leverage. The 2000-2001 California Energy crisis gave appeal to alternative energy models, and the nascent CCA movement reframed its efforts as fitting with the state's renewable energy goals (see chapter 3). Once what began as an imagination of a clean energy system moved towards implementation, resistance by the incumbent utility emerged. Competing sources of knowledge were evoked within historical patterns when the utility asked whether a government could be trusted to provide electricity when industry had done so reliably for close to a century. This next chapter will draw this out in detail.

Furthermore, as the CCA movement has grown it competes with PG&E to gain political power in California's clean energy future. As the movement grew from local to state-wide, it increasingly has sought to fit within, and conform to, the state's values. The state of California places heavy emphasis on economic growth, and argues it can go hand-in-hand with environmental protection. Its energy planning body, the California Energy Commission, notes on page four of its 2018 Integrated Energy Report that,

> For decades, California has remained at the forefront of clean energy leadership demonstrating that environmental protection does not need to come at the expense of a thriving economy. … Since 2000, California has seen 9% decrease in greenhouse gas emissions, 16% increase in population, and a 46% increase in GDP.

The CEC anticipates more local renewable energy in the state's future (CEC 2018). CCAs seek to become an integral part of California's low-carbon economy by working with local unions, green-collar job-programs and hiring local workers for local energy

programs in their jurisdictions. Yet, as more intermittent and decentralized renewable sources of energy enter the electricity grid, the CPUC is nervous about blackouts, and uncertain how to supply all energy from renewable sources by 2045 (CPUC Greenbook 2018). Chapter four will pay attention to the tension between various centralized and decentralized clean energy futures.

Actor	**Imaginary**	**Normative dimension**	**Material dimension**
California Energy Commission	Technological modernization & economic prosperity	Global frontrunner energy transition	Greening existing energy structures: electrification of transport sector and household water/stove appliances. SB 100: all electricity from renewables by 2045
California Public Utilities Commission	PG&E supplies electricity through centralized market structure (deregulation and fragmentation may lead to a breakdown resulting in electricity crisis)	Reliable/stable electricity markets with affordable electricity for residents	Regulate investor owned utilities. SB 100: all electricity from renewables by 2045
Pacific Gas & Electric	Centralized control	Expertise for efficient and reliable electricity through 100 year experience	Centralized electricity infrastructure; efficient; reliable
Marin Clean Energy / CCA	Local control, choice, energy self-sufficiency, clean energy technology	Build local green economies with local accountability and control	Provide: customer choice, local transparent decision-making, rate stability, green energy, energy efficiency and community-based programs
Grassroots Activists	Ecological/Social Balance, energy self-sufficiency, decentralized clean energy technology	Local Sustainability in ecological/system balance	Drawdown / small-scale, decentralized energy technologies

Table 2.1

Ultimately, I argue, modern imaginaries of decarbonizing California's energy landscape and local frustration with California's monopoly utility model are rooted in a discourse surrounding environment and energy, and conceptions/power struggles of public versus private control of infrastructure that can be traced throughout America's political development historically. This discourse is, in turn, rooted in personal histories, including lived events and memories, that shape a conception of climate change, its impacts on local livelihoods, and the extent of mitigation and adaption required. To tease this argument apart further, the emergence of Community Choice Aggregation in California is rooted in grassroots activities beginning in the late 1990s (Marshall 2010). What was the reason for grassroots rather than top-down activity? Which political histories shaped the discontent that led local activists to act, and what political and legal spheres demarcated their actions? The imaginaries held by environmental activists have been formulated within the environmental history of the state. This includes the 1970 Earth Day, the 1970s energy crises, environmental discourses and literatures prominent in shaping the narrative portraying California as climate concerned, and their particular conceptions of sustainability. Chapter 3 will explore this in more detail.

Political and legal spheres, and overarching conceptions of which goods should be publicly or privately controlled, are at the core of imaginaries held by actors as well. The emergence of Community Choice Aggregation creates changes to the social, political and economic structures governing electricity supply through a 100-year old grid infrastructure. Consequent chapters will tease out these tensions to understand California's politics of energy transition.

"Community" and "Choice" in Marin County

Introduction

Climate change is a global phenomenon, and the consequences of our carbon emissions will be disastrous on our planet and livelihoods. Elite scientific bodies, including the UN's Intergovernmental Panel on Climate Change (IPCC) project that virtually every coal power plant in existence would need to be phased out within decades, transportation sectors would need to be decarbonized, and power grids would need to become virtually emissions-free by the end of the century (OECD et al 2015). In other words, climate experts are arguing increasingly that much of the debate on emission cuts will be fought at the national and local levels, rather than globally. Hence, rather than focusing on global obstacles and developments, understanding how and why localities have started taking steps towards more sustainable societies and communities and how these efforts might aggregate is an important puzzle piece to understanding energy transitions.

Simultaneously, the energy landscape at national and sub-national levels is rapidly transforming, resulting in not just a debate on emission cuts, but a wider fragmentation in energy technology's ownership and control. The increasing availability and declining cost of decentralized energy resources has provided opportunities for local power provision, and has spurred imaginaries of sustainable futures under energy self-sufficiency in locales around the world. Solar rooftop, batteries, and electric vehicles are innovations at grid edge (there where electricity is consumed) that gradually disrupt centralized power provision models in many places around the world. With the advent of

new energy technologies come new institutional structures to govern these technologies and new norms (see e.g. Miller et al 2013). An important emerging norm is the right to clean and affordable energy access, woven through communities' imaginaries of clean affordable energy futures.

A number of communities around the world increasingly mobilize for this right, and a growing body of social science scholarship studies how renewable energy advocates express concerns about the geopolitical instability of fossil fuels, tied in with calls for local direct action and visions of "technological democracy" (Burke & Stephens 2018; 9-11). An energy democracy has been developing in Europe and the United States in the past ten years, taken up among climate justice activists, some trade unions and academics, and political parties (Burke & Stephens 2018). It is a movement committed to advancing social and environmental justice through a transition to renewable energy technologies (Burke & Stephens 2018). These efforts are seen as an extension of various, widespread social movements working to address climate and economic crises by not only resisting fossil fuel use and a market-driven green economy agenda, but also by advocating for decentralized, democratized and community-based renewable energy futures (Burke & Stephens 2018). But, simultaneously, these movements also fall within broader, and very context-specific landscapes, with specific political opportunity structure that open the way for mobilization. The local movement, then, is confronted with competing local agendas, and a gap exists in contemporary scholarship in terms of understanding how these dynamics play out (Burke & Stephens 2018).

It is in this context that this chapter turns our attention to a community-based project, Marin Clean Energy (MCE), its grassroots origin, and the growth and change of

the movement in response to confrontation with political opponents. The roots of "community choice" emerged in the late 1990s, when discontent among citizens locked into a regulated monopoly utility model began to put political pressure on local governments for reform, transforming their economic frustrations and climate concerns into political action in support of California' renewable energy targets.

In 2010, Marin Clean Energy (MCE), California's first Community Choice Aggregator (CCA) emerged to provide public rather than private energy from a higher renewable energy supply, and at rates competitive to the incumbent utilities. When MCE first emerged, it procured renewable electricity via a century-old power infrastructure to households, offices, and public buildings. The grid is owned and operated by Pacific Gas & Electric (PG&E), the primary power provider in much of Northern California, but the utility's century old monopoly energy structure is quickly changing. The desire for local autonomy and more effective climate change solutions are challenging PG&E with two words that situate localism amidst a global energy crisis: "community choice." Since Marin Clean Energy's inception, nineteen CCAs serving more than ten million customers have emerged in California. Now, the energy landscape is changing rapidly: the California Public Utilities Commission (CPUC) projects that by 2027, CCAs, rooftop solar, and direct access providers could take away 85% of privately-owned utilities customers (CalCCA 2018; CPUC 2017).

Notably, projects such as MCE are altering political and social power relationships among citizens, utilities and regulators amidst a changing energy landscape. MCE, beginning with 6,500 accounts growing into 435,000 by 2018, envisions a future where it will lead the way to California's clean energy future through innovative low-

carbon- energy technologies with an array of local programs (including green business projects, solar projects, electric vehicle programs),[3] longer-term power purchasing agreements with clean-energy suppliers and a growing local energy self-sufficiency. Its imaginary engages growing social and environmental justice concerns by creating stepping-stones for more equitable low-carbon economies by hiring and training its local workforce and disadvantaged communities. The effort has grown from Marin-based to California-wide. Yet, as the movement has grown, contesting ideas of how CCAs will develop (and whether CCAs will even continue to exist in a changing regulatory environment) have emerged as a result of competing ideas among the various stakeholders.[4]

What can the case of MCE tell us about the influence and power of bottom-up movements to change established power- and institutional structures? And what can this case tell us about the inherent politics of energy transitions, considering various competing perspectives on energy control and ownership needed to create a low-carbon system? In particular, this chapter traces the origin of the "community choice" movement, its realization into a new political institution, and the consequent power struggle with incumbent energy providers. In doing so, it examines the particular local imaginaries of Community Choice Aggregation and sustainable energy futures on exhibit in places such as Marin County.

This chapter draws on personal interviews, participant observation, media reports and press releases, consulting studies and founding documents, state ballot positions and

[3] See for instance: https://www.mcecleanenergy.org/local-programs/

[4] I refer to stakeholders as any actors seeking to participate in California's energy landscape. These include politicians such as California senators, commissioners at the California Public Utilities Commission, PG&E the utility, Marin Clean Energy employees, local activists, and even citizens with rooftop solar.

legislations passed, and documents from MCE, CPUC, and PG&E for understanding the broader context of the energy transition, politics, and bottom-up efforts for sustainable energy provision and control in California. At a theoretical level, this chapter speaks to the social movement literature in characterizing how decision-and policymaking changing energy provision legislation occurred as a result of grassroots movement efforts. The chapter draws on social movement literatures to understand the emergence of energy coalition and incumbent coalitions, and consequent interactions among them. This chapter also addresses science and technology studies (STS) by exploring different forms of knowledge about the local environment, energy and politics, and the mobilization of imaginative acts with the intention of creating a future that is better, or at least an improvement, on the present. I bridge the social movement and STS literature bodies by contending that while energy transition coalitions form among grassroots- civil society-, and political actors to increase the likelihood of an energy transition (and shift power away from the incumbent actors), these subsets of actors within the coalition hold to different imaginaries that may cause fragmentation within a coalition in later stages of a transition when new ecologies of power emerge and the new institution gets interwoven with remnants of the old system.

This chapter outlines the grassroots strategies and social movement activities used to realize CCAs, and consequent utilities' and regulators' responses. In doing so, it illustrates what I refer to as the "politics of energy transitions": strife over various visions of renewable energy access and sustainable futures.

Environmentalism in Marin County

Marin County, just north of San Francisco's Golden Gate Bridge, is known for its scenic beauty. Views of the picture perfect Pacific Coast with rugged coastlines and beautiful surfing spots, its red wood trees further inland with hikes along waterfalls, marshes, and creeks. To many, Marin County is paradise. Protecting this natural beauty led to a long line of environmental awareness, activism, and policy. The County's 1970s "no-growth" policy has left seventy-five percent of the county's land undeveloped, with the remaining twenty-five percent of developed landmass inhabited by some of the country's most affluent population.

Marin County has 261,000 inhabitants[5] over an area of 520mi^2 (1300km^2) of land. The county has a semi-urban character, governed under a five-member Board of Supervisors, and is known for its liberal politics and environmental awareness. Marin County is a blue county with an educated affluent population – the population gets much of its economic wealth from residents working in the high-skill service sector in Silicon Valley. The county aims to achieve 100% renewable energy for electricity by the year 2020, and aims to increase energy efficiency and energy savings in the region (Ruppert-Winkel et al 2016). On a climate change policy front, the county may be conceptualized a frontrunner already: greenhouse gas emissions were 15% below 1990 levels in 2012 – 8 years ahead of the 2020 California target (Marin County Climate Action Plan 2015). The county aims to achieve 100% renewable electricity for Marin municipalities by 2020 (Sierra Club 2017).

Marin County has seen substantial bottom-up politics to fight climate change –

[5] See US Census Bureau Quick Facts for Marin County Population statistics http://www.census.gov/quickfacts/table/PST045215/06041

grassroots activism to create the first Community Choice Aggregator, a series of non-profit sister organizations across the County's cities and towns to attain carbon reduction and lobby for the County's progressive climate action plan. Efforts in Marin County to create the first Community Choice Aggregator in the early 2000s, and PG&E's counter-efforts/resistance show the contentious politics of energy transitions following from competing imaginaries of sustainable futures. Why and how did these efforts emerge in Marin County, who are they organized by? And what can we learn from them to understand what the politics of energy transitions – understood as the tensions among new and existing energy providers, the local government, and communities – could look like elsewhere too? To understand how different conceptions of energy and societal organization emerged, I first return to the decades after World War Two to show how power structures developed over time.

Environmental Forum of Marin

In the decades after World War Two, certain long-held assumptions of economic growth and expansion became contested. In the words of Boulding (1966 as cited in Jasanoff 2012: 86), images of the "earlier cowboy economy with reckless exploitative, romantic and violent behavior, especially with respect to resource consumption," were increasingly replaced with "a new kind of economic discipline wherein man must find his place in a cyclical ecological system." The growing middle class in the Bay Area and Los Angeles was increasingly attracted to personal freedom and health, and – under a growing environmental movement – an environment free from pollution (Wellock 1998: 8).

In Marin County, as well as other parts of the state, a tension emerged between

the public and developers over economic growth on the one hand, and environmental protection and aesthetics on the other. In Marin, the years between 1961-1973 saw what some deemed uncontrollable growth: freeways, harbor districts and marinas, and cities sprang up. As developers and land speculators with political connections to Washington, D.C. and Santa Rosa sought to develop the Point Reyes National Seashore, a counterforce emerged in the Audubon Canyon Ranch (ACR). ACR, established by Dr. L. Martin Griffin, started purchasing ranches and parcels to stay one step ahead of land developers, and coordinated the work of thirteen scientists on agricultural zoning, wildlife habitat, erosion and geological hazards, among others, to create a framework of environmental protection (Environmental Forum of Marin 2016).

As the young non-profit organization's activities grew in size and scope, its directors created the Environmental Forum of Marin in 1972 to train volunteers to be speakers in the field of environmental protection and planning (Environmental Forum of Marin 2016). The organization's Master class has graduated over 1,100 people, and hundreds have attended the organization's programs and workshops. Consequent activism from graduates of the Environmental Forum of Marin have been credited for the County's rich history of environmental activism, its "no-growth" policy that leaves seventy five percent of land undeveloped, and the emergence of the "Sustainables" – a series of sister organizations created in cities and towns across Marin County (Chipkin & Hartwell-Herrero 2012).

As the term "sustainability" took hold in Marin County in the 1990s, visions of "meeting the needs of the present without compromising the needs of future generations to meet their own needs" were combined with interpretations of the need for local

governance. In the mid-1990s, Rebekah Collins, a graduate of the Environmental Forum of Marin, learned that electricity generation was responsible for nearly 50% of all greenhouse gas emissions (Chipkin & Hartwell-Herrero 2012), and began to research solutions to more sustainable and local electricity generation models. In 1999, Collins then co-founded Sustainable Fairfax, the first of the "Sustainables" in Marin County, to help her town of Fairfax and Marin County address climate change through a community scale clean energy program (Hiller 2015).

After Collins co-founded Sustainable Fairfax, other graduates created sister organizations in their cities and towns to respond to climate change. These organizations sought to respond to the urgency of the social, economic and environmental crises on our planet by creating change in their own backyards. To achieve local sustainability, the "Sustainables" voice opposition to "Big Box" stores driving small and locally-owned businesses to closure, selling goods with negative externalities, including poor production processes, human rights violations, and environmental degradation (Chipkin & Hartwell-Herrero 2012: 11). Instead, these organizations seek to "re-create a strong resilient and diverse set of ecologically sound local systems to produce and distribute goods that are truly needed by the population without creating waste, pollution or excess" (Chipkin & Hartwell-Herrero 2012: 11).

A particular type of local knowledge was generated from first ACR and then the Sustainables: that local communities know their environment and can protect it through local education, local organization, and local policy. Local knowledge that strongly stands in juxtaposition with knowledge of developers and larger corporations is not uncommon, and the site of much strife around the world. One example can be seen in the

documentation of struggle between US citizens and the global chemical industry as they struggle with industry pollution and prevention. STS scholar Alastair Iles (2004: 286) observes that citizens began organizing out of concern for the neighborhood plant's environmental impact, arguing that the knowledge needed to prevent pollution is not purely technical, but also pertains to "local" knowledge such as community priorities in choosing which chemicals to reduce and participation in project evaluation and development (Iles 2004).

Much of the creation of the "Sustainables" – and their impetus for Community Choice Aggregation as discussed in the next subsection – was in response to both a desire for fighting climate change, and a frustration with the incumbent utility's high electricity prices. While the regulated monopoly utility model (discussed in chapter 3) was intended to provide secure, reliable and affordable electricity access, many Bay Area citizens had become frustrated by their lack of choice in energy provider and rising electricity bills. Residential power bills for Northern California's incumbent utility, PG&E, have increased by $60 in recent years, up to $165.80 monthly in late 2017 for an average household.[6] Californian households pay over 40% more per kilowatt-hour than the national average (EIA 2016; Daniels 2017).

Addressing both frustration with increasing electricity prices and the rising impetus around environmental concerns and the climate crisis, one interviewee heading one of the Bay Area's largest non-profit organizations on fighting climate change remarked:

[6] These price increases follow from trickled down payments on new power plants and a $1.6 billion penalty PG&E received for a gas pipeline explosion. See these two sources for more info: Avalos (2017) and Penn & Menezes (2017)

> *There has been, and is, a frustration with this unique situation we have with utilities where we allow a regulated monopoly, but a monopoly nonetheless… Rising impetus around environmental concerns and climate crisis, and communities exposed to poor air quality near power plants, but also have this emergence of new technology that for the first time allowed for a different kind of energy production and electricity generation that was more easily installed even down to people's own rooftops. So confluences of electricity and people starting to realize, "we can do something different." Monopoly model has been around for over 100 years, and people are thinking we are due for a change, going through energy transition globally away from big plants to decentralized model and to a more economically and democratically decentralized model.*

The interviewee's comments elude to what literature has come to understand as an *energy democracy*: "a demand for increased accountability and democratization of a sector that was previously not seen as requiring public involvement, and was (is) most often depoliticized" (Szulecki 2018: 27). To create such a model, grassroots actors drew from their knowledge of organizing and conducted research of initiatives underway elsewhere.

Rebekah Collins' attention became drawn to a model called "Community Choice Aggregation," which would allow her community and local government to address both climate change- and monopoly power concerns. An individual by the name of Paul Fenn had developed Community Choice Aggregation as an idea of localized, democratized and community energy while in graduate school in Germany (Hess 2019). The idea first became institutionalized in the Massachusetts state legislature in the mid-1990s, framed in terms of giving communities a "choice" over their supplier of electricity (Local Power 2009). When Collins learned about CCA in Massachusetts, she researched its potential for sustainable- and local electricity generation in her town and county. Consequently, as Collins co-founded Sustainable Fairfax in 1999, she imagined local energy self-sufficiency through a community scale clean energy program in Fairfax, scaled up to

Marin County (PacificSun 2015).

Collins brought the idea of creating a CCA to Fairfax and the Marin County Board of Supervisors as a solution to address climate change. In founding Marin CAN (Clean Energy Now), she was influential in spurring advocacy through organizing local events, and networking with renewable energy experts and regional organizations in the late 1990s. She organized public forums on the possibility of implementing the Community Choice Aggregation locally, pitched the idea of writing legislation to enable Community Choice Aggregation (only the incumbent utility could provide electricity at the time), inviting all elected officials in the county to attend (Chipkin & Hartwell-Herrero 2012: 113), canvassing neighborhoods, and passing out packets on renewable energy at local events (Wright 2008).

The Fairfax Town Council signed on to Cities for Climate Protection (CCP) Campaign through the International Council for Local Environmental Initiatives (ICLEI).[7] Through the CCP Campaign, city governments join other city governments in signing an agreement to reduce GHG emissions in their city. Members of the Fairfax Town Council began to urge County officials to champion the Community Choice Law. County Supervisor Hal Brown was the first to agree (Chipkin & Hartwell-Herrero 2012).

Consequently, the CCA movement that took shape had both the goal of creating a low-carbon electricity system, and a desire to create political change toward greater local, democratic control and ownership (Hess 2019). As is not unusual for environmental

[7] "International Council for Local Environmental Initiatives (ICLEI) is an international association of local governments as well as national and regional local government organizations that have made a commitment to sustainable development. ICLEI provides technical consulting, training, and information services to build capacity, share knowledge, and support local government in the implementation of sustainable development at the local level. ICLEI's basic premise is that locally designed initiatives can provide an effective and cost-efficient way to achieve local, national and global sustainability objectives" Chipkin & Hartwell-Herrero 2012: 114).

movements, to gain legitimacy, the Sustainables had called upon global science (such as UNIPCC reports) to highlight environmental fragility and the need for conservation through local institutions or policies (Fogel 2004). While most important challenges to the traditional model of energy production come from the environmental movement (Hirsch 1999; Pobodnik 2006 as cited in Vasi 2011: 13), how environmental movements – particularly those outside of Europe – affect government policies, change the practices of electric utilities, and influence the behavior of electricity consumers is less understood (Ruppert-Winkel et al 2016; Vasi 2011: 12).

As we will see in the next section, leveraging grassroots activity into large-scale change in an energy system requires the convolution of several factors, including political opportunity structure, energy transition coalition resources, policy brokers and visionary leaders (Hess 2019: 39). These factors were present for Marin County's eventual rollout of a CCA.

The emergence of Community Choice Aggregation

As grassroots efforts in Marin County were gaining strength, a window of opportunity at the state level would add impetus to the CCA movement and eventually take power away from investor owned utilities. Changes to California's electricity model had begun several years earlier: in 1996 under the Electric Utility Restructuring Act (AB 1890), California deregulated and created an electricity market. PG&E, along with other utilities business, consumers and both Democratic and Republican Parties, were in favor of deregulation, anticipating that the newly created electricity market would allow prices to drop due to competition, and lawmakers consequently had capped rates. PG&E and other

utilities were reimbursed – amounting to $8 billion coming from consumer charges – for previous power plant investments and power purchase agreements that the state deemed unrecoverable in a competitive market (Halstead 2010). Neither the state nor PG&E had foreseen that economic withholding and inflated price bidding would occur by Enron, causing electricity prices to surge and leading into a full-blown energy crisis (Weare 2003).

In the summer of 2000, wholesale electricity prices had started escalating, increasing on average 270% between June and July 2000 compared to the same period in 1999 (US EIA n.d.). PG&E went bankrupt, and the State of California became an active market participant, purchasing electricity and selling it to PG&E at a loss.[8] For twelve months in 2000-2001, blackouts were a major public concern, and the crisis led to a spike in public attention to energy issues in 2001 that was even larger than the 1974 peak during the Arab oil embargo (Karapin 2016: 139).

These events strongly influenced the drafting of legislation that became AB117, California's Community Choice Law in 2002. Its legislation was written amidst the crisis, going through several versions (AB48x, AB 9-xx) before being approved as AB117 in 2002 (Hess 2019). Following the Massachusetts law, AB 117 also contained an "opt out" provision for CCA: if customers choose to "opt out" they can remain with the utility as the electricity provider, but otherwise are automatically enrolled under the new CCA. An "opt in" law, on the other hand, would have required the CCA to gain permission from each individual customer before switching them over from the incumbent electricity provider (Hess 2019: 40). The bill did not attract widespread media attention and the utilities were unable to formulate broad resistance, partially a result of the largest utility

[8] Chapter 3 discusses this in more detail.

being in the midst of a bankruptcy and litigation (Hess 2009).

It was clear though, that the monopoly utility delivery system was on unstable ground; two San Francisco ballot proposition (one in 2001 and one in 2002) proposed municipalization (where cities own the electricity infrastructure), and PG&E invested large sums of money to defeat these measures (Hess 2019). Following broad public interest, and support by consumer groups, environmental groups, and international leaders in renewable energy, the city in December 2002 adopted an Electricity Resource Plan calling for energy efficiency measures, increased solar and small-scale distributed generation (such as fuel cells) and wind energy imports by 2012. In 2004, the city council passed ordinance 86-04, beginning the process of a CCA in 2004 (Local Power n.d.).[9]

The energy crisis had created a window of opportunity to address public discontent with a monopoly utility and high electricity prices, and simultaneously address a rising concern for climate change by creating local energy control and greenhouse gas emission reduction. Explained in the social movement literature as political opportunity – an event changing the political environment and/or disruption of established power relations (McAdam 1982: ix) – the sponsor of the Community Choice Aggregation legislation, former California State Senator Carole Migden noted: "the failure of deregulation and the power shortages created a receptive climate for AB117" (Halstead 2010). Migden continued, "the objective of my bill was clear: to enable municipalities to invest in cleaner, more efficient sources of energy such as solar and wind power and to reduce their exposure to volatile energy markets" (Hess 2019: 44).

[9] The ordinance establishing a CCA can be found here: http://www.localpower.com/sfccaord.pdf

Creating the first Community Choice Aggregator

Under AB117, a public agency could offer electrical services to its residents within its jurisdiction and within the service territory of an electrical corporation. The public agency may consist of a County, its cities, and/or towns and the CCA would be a not-for-profit electricity provider governed by a board comprised of locally-elected officials.[10] Three early efforts to realize a CCA in California took shape – each was built on a different vision. Efforts in San Francisco under Paul Fenn wanted to roll out with 100% renewable energy under Fenn's vision of not solely procuring power but more extensively promoting local ownership and local clean energy adoption. In San Joaquin Valley, the district sought to provide reliable electricity to address cost and agricultural issues. The Task Force in Marin County had hereby distinguished itself from separate CCA formation efforts. Marin County sought to place a more short-term focus on purchasing renewable energy on the open market (to keep rates competitive with the incumbent utility), with a longer-term objective of local power production (Ruppert-Winkel et al 2016).

Marin County would see the roll-out of the first CCA in 2010 as a result of the formation of an energy transition coalition driving things forward under on-going grassroots advocacy in the community, technical experience from several policy and consulting actors, and a visionary political leader. In Marin County, two public officials were driven by the climate imperative; Charles McGlashan was concerned that the climate crisis might create an inhabitable planet for his children and future generations. As an elected representative from a local government, McGlashan sought to create a

[10] The Bill can be found here, see p. 92 for a description of a public entity that may serve as an electric service provider: http://www.leginfo.ca.gov/pub/01-02/bill/asm/ab_0101-0150/ab_117_bill_20020924_chaptered.pdf

CCA on higher portfolio of Renewable Energy, and prices competitive to PG&E under local accountability and decision-making. Then, Dawn Weisz, as sustainability planner for the County of Marin provided much technical expertise. Weisz worked in conjunction with Ann Hancock to update the County's sustainability plan, and they were influential in forming Sustainable North Bay, which expressed a central concern for climate projection and clean power.[11] Dawn Weisz was consequently tasked with continued research of what a CCA would look like, and hired a local consulting firm (Navigant) for a feasibility study.

First in 2004, then revised in 2008, Navigant produced an initial feasibility study and risk analysis regarding rate outcomes if towns and cities in Marin County were to create a Community Choice Aggregator. The feasibility study found that Marin could increase its use of renewable energy while providing electric rate stability and potentially reduce electric rates over the long-term relative to PG&E. The study further found that it would be economically feasible for the county and eleven cities to jointly implement a CCA program and increase the use of renewables, and found that additional cost savings could be achieved if the county and cities joined together to procure electricity for the program and conduct certain common activities (Navigant 2008). Under these feasibility studies, the CCA was an electric generation services entity only (Navigant 2008: 3):

> Delivery of the electric power would continue to be provided over PG&E transmission and distribution facilities at rates regulated by the CPUC and under the same terms and conditions that apply today.

The involvement of both technical consults and outside experts was seen as generating validity to grassroots- and policy advocates claims that renewable energy could be

[11] See also for more information: https://www.sustainablemarin.org/new-page-12

procured without increasing electricity rates. The following year (2005), a $30,000 feasibility study was conducted at the Marin Municipal Water District – the largest electricity consumer in Marin County (Hess 2019). The study was supported by additional funding from the California Energy Commission and received encouragement from the grid operator (the California Independent System Operator, or CAISO). CCA advocates were able to strengthen their coalition with more environmental and sustainability organizations by tying their public agency in with statewide energy transition goals proposed in legislations in the early-to-mid 2000s: the 2002 Renewable Portfolio Standard (SB 1078) requiring twenty percent renewable energy from utilities by 2017 and the 2006 cap-and-trade law (AB32) (Hess 2019: 42).

By 2006, advocates and policy officials began having detailed conversations with grid operators, brokering with PG&E, and getting third party reviews to determine when a CCA would roll out, how it would procure electricity to its citizens, which rates were feasible, and what percentage of overall electricity procured would be renewable (a council member proposed offering various premiums; 50% supply of renewable energy and 100% renewable energy). Negotiations with PG&E did not lead to agreement; PG&E sought to support a three year pilot process of CCA with the ability to cancel operations if deemed unsuccessful. Widespread education – often under the directive of Charles McGlashan, who by then was on the Marin County Board of Supervisors – occurred through lunches with electives, community education in people's homes, one-on-one tutoring and small group tutoring. These conversations studied CCAs, a potential budget failure, education about what a Joint Powers Authority is.

Since the passage of the CCA Law in 2002 until 2007/2008, steps toward the

formation of a CCA in Marin County had been incremental, following many on-going conversations with community members, policy officials, local government officials, a number of technical advisory groups and solar groups. Slowly, an energy transition coalition had begun to grow in strength and numbers. But a tipping point was reached when Dawn Weisz began making public education presentations at city council meetings in Marin County to gather support for a municipal energy procurement agency. Consequently, a counter-coalition emerged, their vehement opposition both publicly and indirectly seeking to stop the energy transition coalition in its tracks. PG&E attended the city council meetings, sowing fear, uncertainty and doubt about whether a public entity could provide reliable and affordable electricity. The city council meetings were attended by both the pro-CCA coalition, and by PG&E. PG&E representatives sowed fear, uncertainty and doubt about whether a public entity could provide reliable and affordable electricity. Public standoffs occurred at these settings, and both PG&E and the pro-CCA coalition sought to convince council members of their talking points.

One local advocate remarked in a personal interview:

> Those guys [PG&E representatives] and others working for them would go around to all city and council meetings and make a lot of claims and making everyone afraid. They also had private meetings with city council meetings and supervisors. Similar to what happened with cigarettes and tobacco, now with global warming. We ["ragtag" group of activists] just took the lead and went to all city and council meetings and addressed concerns of PG&E. Council members themselves with PG&E in their suits and everyone telling you your finances are going to go to hell, and then they had a ragtag group come up to you, and they [council members] were really scared, so who are you going to believe? It was quite a grueling time. Grueling because we were coordinating, and there's council meetings every night of the week, every week of the month.

Conflict arose in Marin County between the pro-CCA and the incumbent coalition. Around 2007, PG&E launched what was criticized as a "Disinformation Campaign,"

sending out brochures claiming taxpayer money would be used for the MCE program without public consent. These brochures were referred to as Astroturf mailers, sent out by what supporters called the "Astroturf Group," signed as follows:

> This information was provided by Coalition for Reliable and Affordable Electricity, a coalition of consumers, small businesses, labor, community organizations and Pacific Gas and Electric Company.

The Coalition for Reliable and Affordable Electricity had been founded in 2005 by several former PG&E executives. Astroturf ads are public attack advertisements making it appear as originating from, and supported by, grassroots participants. The literature refers to it as synthetic grassroots organizing, where the financial source's connection is often withheld to give the statements credibility. Most astroturf operations are targeted at vulnerable or undecided lawmakers (McNutt & Boland 2007), or in the case of Marin, at council members.

A grassroots actor remarked in response:

> We calculated at some point that PG&E spent over $4 million on little Marin County with [its] 250,000 population to attempt to defeat us.

Despite the formation of an opposition coalition, a local government task force had been formed in June 2006, consisting of elected officials and representatives of the County of Marin and each municipality.[12] The task force consequently had five meetings, looking at issues including the costs, benefits and risk, and legal liabilities of a CCA as well as governance and business planning. Its meetings were directed towards whether to pursue the formation of a countywide organization and continuing public education. Consequently, Marin County's city councils, with the exception of Sausalito and two

[12] A 2008 ordinance issues by the City of Belvedere provides more insight: https://www.mcecleanenergy.org/wp-content/uploads/ordinances.pdf

others, formed a joint powers agreement (JPA) in December 2008. Under a local government task force, named Marin Energy Authority, a public agency separate from its Parties, who are municipalities and counties, was formed (MCE 2008). Under a JPA, the parties cannot be held liable for debts, liabilities or obligations of the CCA (Marin Energy Authority 2008).

To get a Community Choice Aggregator up and running, a bridge loan was needed, which was proving challenging following the uncertainty the Astroturf campaign had sowed regarding expertise and financial viability. Activists from the "Sustainables," other local non-profits, and other citizens gathered what one participant described as "a critical mass," with which they approached council supervisors for a bridge loan.

> *It was a day in February 2009. We the advocates had maybe 175 people in the audience with science and talking points and earnest presence, and we lined up and spoke, and the five supervisors had to make their decision. Their decision was to go / no go. … Although she's no longer a supervisor, Susan Adams was the deciding vote, and my colleagues and I went to go meet with Susan Adams the day before the vote and we explained to her our reasoning as constituents and laid it all out for her. She said, 'I have 2 speeches prepared, one 'no' and one 'yes'. But after everything I've heard [from you] I'm going to vote in favor.'*

Marin Energy Authority had received seed money through assistance from Peter Luchetti.[13] Following the securement of its business plan, Marin Energy Authority planned to launch Marin County's first Community Choice Aggregator in June 2010, but accelerated its launch date to May 2010 following organized PG&E opposition through a proposed ballot initiative at the state level. Marin Clean Energy launched to 6,500 accounts in June – a slice of the roughly 100,000 households in Marin County since many residents had chosen to "opt out" and remain with PG&E.

[13] See for some more information: https://tablerockpartners.com/people/

Contestations in the Political Realm

As Marin Clean Energy got ready to launch, PG&E's "first formal big attack" emerged in the form of Proposition 16, initially titled Taxpayers Right to Vote Act. Governor Jerry Brown ordered the Proposition to be renamed to "New Two-Thirds Voter Approval Requirement for Local Public Electricity Providers," deeming the initial title to be misleading.[14] The Proposition, if passed, would require two-thirds of voters to support their local government launching a public electricity service or community choice aggregator. Pacific Gas & Electric was the primary financial sponsor of the initiative, contributing $46.1 million. Proponents named the initiative the "Monopoly Protection Act," anticipating that it would effectively prevent local governments from implementing CCAs. While the 'Yes on Prop 16' did not receive additional financial donors, it did receive endorsements from the California Taxpayer's Association, the California Chamber of Commerce,[15] the utility union, the National Association of Colored people (a civil rights group), and former San Francisco mayor and pro-utility politician Willie Brown (Hess 2019: 44). The 'Yes on Prop 16' campaign (see Figure 1) asked constituents whether they trusted politicians or experts who had provide electricity in the past century to reliably provide electric service.

The opponents of Proposition 16 were led by grassroots actors, including the Taxpayers Against the PG&E Power Grab and Local Clean Energy Alliance, spending approximately $128,000 on the campaign. They received support from The Utility Reform Network (a consumer advocacy organization) (TURN), with TURN alleging that the ballot proposition would violate the consumers' "right to choose for themselves",

[14] For an overview of the Proposition, see: https://lao.ca.gov/ballot/2010/16_06_2010.aspx
[15] See for more information California Choices, an organization providing nonpartisan information on statewide ballot initiatives: https://www.californiachoices.org/proposition-16

making it more difficult to get "clean, green, and affordable power." (Hess 2019: 45). The 'No on Prop 16' campaign served to reunite the CCA stakeholders that previously split, reuniting CCA advocates. Prop 16 gained widespread news media attention, and outrage among a range of civil society organizations, environmental and consumer groups, and elected officials regarding the utility's large expenditure of ratepayer funds on a ballot measure (Hess 2019). When the vote came in, voters in counties served by PG&E had rejected the measure by large margins, while counties not served by the utility tended to support it (Lifsher & Klein 2010). Overall, 52.5% of voters opposed, and 47.5% of voters supported the measure (Lifsher & Klein 2010). The widespread media attention had raised statewide awareness and public knowledge of Community Choice Aggregation.

In an attempt to prevent future PG&E misinformation campaigns, MCE approached the California Public Utilities Commission (CPUC) about lack of protection for CCAs from threats by a multi-million dollar company. Charles McGlashan was one of the principal authors of what became known as The Charles McGlashan code of conduct (Senate Bill 790) to restrict investor owned utilities from spreading factually incorrect information or using ratepayer funds to lobby against CCAs.[16] More generally, one interviewee argued, SB790 affirmed the legislature's support for Community Choice energy and displayed governmental support in ensuring the consideration, development, and implementation of Community Choice Agencies.

[16] the bill can be found here:
https://leginfo.legislature.ca.gov/faces/billCompareClient.xhtml?bill_id=201120120SB790

Figure 3.1: *An image in a newspaper urging citizens to vote yes on Prop 16. The text reads: who do you trust: experts or politicians? Politicians are publishing a new government-run energy scheme in Marin, without your vote, that will automatically switch your electric service and enroll you, unless you proactively opt out. The independent voices say it's a risk we can't afford.*

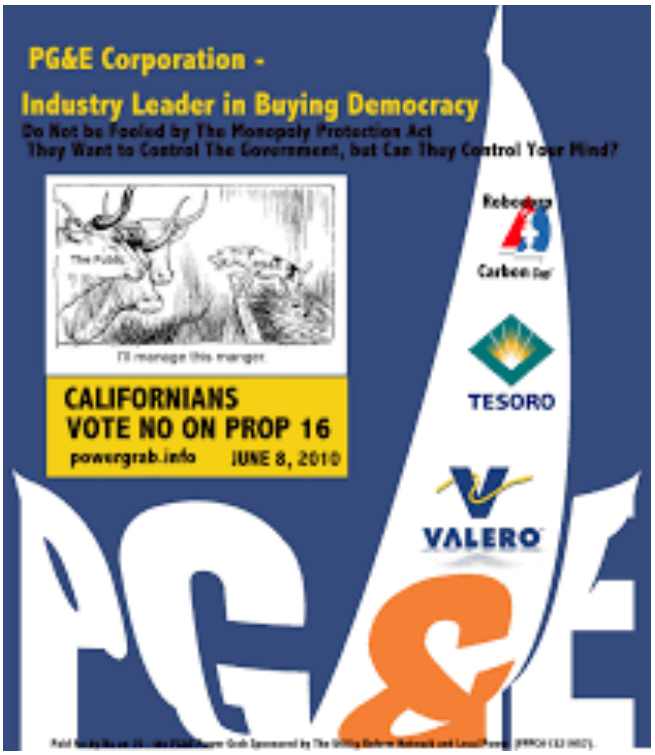


Figure 3.2: *a political ad urging citizens to vote No on Prop 16. The text in black reads: Do not be fooled by the Monopoly Protection Act. They want to control the government, but can they control your mind?*

Step by step, a grassroots movement had gathered momentum, policy- and institutional changes, The energy crisis had provided an important political opportunity, local policy pioneers and advocates engaged in education and outreach to gather local support and understanding; technical expertise and planning further developed what would become Marin Clean Energy; and the actors' strategic framing connected to the state's renewable energy targets and local price concerns were key choices that tied the movement to context-specific situations that helped overcome resistance from PG&E.

The politics behind reconfiguring the grid

Marin Clean Energy emerged in 2010. It was not until 2014 that the next CCA emerged in Sonoma County as Sonoma Clean Power, followed by Lancaster Choice Energy in 2015, Clean Power SF and Peninsula Clean Energy in San Mateo in 2016 before more rapidly expanding to become nineteen CCAs across California serving ten million customers in 2019 (UCLA 2016) (annex 1 shows the CCAs on a map of California as of 2018). By 2019, nineteen CCAs served ten million customers in California.

As the movement grew and carved out a place for itself in California's energy politics, the imaginary underlying the CCA movement shifted and evolved. Environmental and social justice norms, linked to the imaginary of energy democracy, were incorporated in MCE programs and initiatives. Yet, what interviews and participant observation (discussed below) suggest, is that CCAs, community choice, and sustainability had different meanings for different actors in California's energy transition. This shows the internally fragmented nature of – and consequently what will be the on-going politics – of an energy transition. The remaining part of this chapter will explore

these varying interpretations encountered in efforts to outline a clean energy future. Particularly, a close analysis of the public performance of imaginaries in the political realm shows the contradictions, ambiguities and complexities that are embedded in a fledgling energy transition. Differences are important, yet not always clearly expressed since stakeholders seek to consolidate support for their visions and their efforts. Within the interactions, and the progression of an energy transition, we see new power and identity formation.

Matters of identity shape understandings and experiences of sustainability and an energy transition, and they perceive energy knowledge as typically reflecting certain assumptions, agendas and interests following established power relations. Such perceptions, and the differences they reveal, add complexity to our understanding of an energy transition, representations that reveal important questions about the intersection of science, knowledge, power and politics.

Normative tension & convergence

The energy transition had begun in the 1990s, drawing on visions of local energy self-sufficiency while drawing upon local knowledge of protecting the environment that had emerged after the Second World War. The Sustainables had drawn on the global science of climate change to give legitimacy to their local movement and efforts to make their "backyards" more sustainable. Yet the visions of this movement did not neatly match that of policymakers or citizens. As a co-founder of one of the "Sustainables" remarked:

> Marin County is extremely wealthy, the fifth richest county in the country – or somewhere in the top of affluence and education. But there is a certain disconnect in terms of understanding how that lifestyle contributes

> to climate change, to say the least. Marin County thinks it is environmental, and that is the disconnect.

With the initiation of Community Choice Aggregation, several Marin County activists hoped for local energy systems, perceiving the "local" to be at the core of sustainability. Another founder of one of the "Sustainables," remarked that:

> Over the past 15 years, the word "sustainability" has lost almost all of its juice. It's kind of in an Astroturf in that way, losing its real roots. To me, the important components are obviously Environment, Equity or Social Justice, Economy, and then we always add Education – so it's the E's… Yet, it's been co-opted by the corporate side of the world that greenwash their activities. And government and policy. So people commonly don't really get that sustainability means environment, social justice, social equity. It would be great if we could get back to that, but we have passed that point.

Part of the feeling of disconnect emerges from scale – the hope for some of the grassroots activists had been that Marin Clean Energy would remain small, serving the communities of Marin with sustainable electricity and becoming at the heart of reinvigorating small-scale sustainable economies:

> Our mantra here in Marin, amongst the advocates was promoting it [Community Choice Aggregation] as "let's all go green together." It was a community thing. It was our community, being a model, creating resiliency. … that was for Marin County's 250,000 residents. And now MCE has 400,000+ ratepayers, and it has seemed to us over time that they have been more interested in expansion and becoming another utility, just selling a green product rather than a community based [organization].

It is in these observations that the early mobilizers question the interpretation of the word "Community" in the growing CCA movement. In the words of one participant:

> Now the grassroots effort has been taken over by the county. The government works slowly. Politics is always involved. The heart of the effort is subsumed by the paradigm.

These concerns are not shared by MCE's CEO, Dawn Weisz. By January 2018, MCE was serving approximately 450,000 customers in 33 communities, and Weisz remarked in February 2018 (Tuckey 2018):

> CCAs are of service to community by our very nature. We're governed by local elected officials who advocate for diversity and a thriving community with social equity, workforce development, and fair wages. They've been elected because people believe in them and their ability to lead communities transparently, and with accountability.

One of the individuals who had spearheaded CCA from the local government (rather than the activist side) remarked:

> My vision [of what a CCA could look like] has expanded quite a lot because I did not anticipate that our CCA work in my county would expand so dramatically across the state. I didn't see the amazing things that I see now. I saw it locally.

Differences in scale and vision of a CCA, fluid and subject to change, are reflected in data collection from participant observation at the January 2018 Diversity Symposium in Richmond, California. Organized by the California Community Choice Association (Cal-CCA) and the Greenlining Institute, the gathering brought together local and state politicians, commissioners from the California Public Utilities Commission (CPUC), data management companies, job-training programs, labor union representatives, and others. PG&E was noticeably absent. The Symposium discussed building more inclusive communities, not leaving communities of color behind, and strategies to address environmental justice and socioeconomic inequalities in our communities.

A grand vision for CCAs was articulated in the remarks by keynote speaker, California State Senator Ricardo Lata, who framed the importance of nascent CCAs for the future of California's energy landscape as follows:

> California is the fifth largest economy in the world. It is cutting edge, has a lot of resources, incentives, [and] advanced technology. It will move on to the next best-advanced technology, and then to the next best. Other technologies are coming up to move us forward. … Community Choice Aggregation can be one where everyone benefits. An energy revolution, and California being the world leader, making changes at the world stage.

A new vision of a low-carbon economy began taking shape, closely intertwined with elements of social justice and energy democracy expressed through hopes of building a green-collar workforce. Panelists discussed training programs for solar panel construction jobs that do not require students to take out loans, give opportunities to individuals of disadvantaged communities (such as those previously incarcerated) and ways to foster a less hostile local business environment for energy efficiency projects funded through MCE.

Dawn Weisz as California's CCA Board President and CEO of MCE pointed towards CCAs' buying power as creating opportunities for local businesses in communities to partake in what is becoming a new clean energy economy. MCE's ability to build renewable energy, including their recent centralized solar farm, saw investments of $1.6 billion, creating 2,800 jobs. MCE, Weisz pointed out, was building renewable energy plants faster than investment owned utilities, providing fair wages, local officials, and environmental justice in communities.

The referenced solar farm was MCE's Solar One Project, built on a former Chevron refinery site just outside the city of Richmond (falling within MCE's jurisdiction). Richmond had long experienced externalities of big oil; Chevron was long Richmond's largest employer, yet the refinery's toxic fumes raised dangerous levels of air pollution and created a public health crisis (Cohen 2017). MCE partnered with RichmondBUILD to hire locally trained workers who come from diverse and

disadvantaged communities experiencing high unemployment rates. These workers are 95% people of color with over 30% having previously been incarcerated (MCE 2018). The solar site currently provides power to 3,900 homes in Richmond, will replace 3,234 metric tons of CO2 per year, and at lower rates than the incumbent utility (Davis 2018).

MCE investments in communities further supported home retrofits, local training programs, and local community programs collaborations (Weisz 2018), discussed more extensively in chapter 4 as efforts to decentralize energy control and build low-carbon clean energy economies. In short, the discussions at the symposium saw MCE as creating a greener economy, in part through taking advantage of technological advances. The scale of MCE saw community in terms of local projects and local government decisions, yet at the center of California's new energy landscape.

The imaginaries of various stakeholders regarding energy transitions come out of diverse visions of environmental protection, sustainability at expanding scales of governance from community, to county to state. We see that imaginaries adjust over time, and that involved actors (such as the local government official quoted above) envision pathways to various possible futures (Jasanoff 2015). Technology, furthermore, gives the ability to combine various values and interests (Erzahi 2012 in Jasanoff & Kim), as observed in the dialogue at the stakeholder forum. Multiple imaginaries coexist within a society in a dialectical relationship. It is in legislatures, courts, the media, stakeholder symposiums or other institutions of power where certain imagined futures are elevated above others, considered more important for policy positions (and generally more effective pathways for the attainment of a common goal, such as low-carbon energy provision).

Scenarios of California's future energy landscape

The future development of CCAs certainly will not be without struggle, particularly as the effort to create CCAs in the first place was a strong grassroots initiative. What is most notable here is that Marin Clean Energy and Community Choice Aggregation emerged not from some pragmatic or instrumental reason but, rather, as a result of environmental activists imagining a different future, seeking to protect California's natural landscape, fight climate change, and alter 100-year old energy provision regulatory structures. Open-ended interviews I have conducted with local activists in Marin reveal that, at a deeper level, these activists seek to change the underlying basis of the connection between sustainability and their local livelihoods, achieved through local (energy) self-sufficiency and creation of a balance between humans and nature. The possibility for highly-localized deployment of renewable energy technologies has allowed them to envision a different future with different energy provision structures, greater socioeconomic equality and increased human well-being. Activism in pursuit of a less exploitative human-nature relationship and the creation of consequent local governance formations based on a local knowledge of environmental resources and governance configurations is not novel (see for instance Conca & Lipschutz 1993; Martello & Jasanoff 2004; Kauffman 2016).

What is the future of CCAs in California? While CCAs have been conceptualized as a promising vehicle to move California away from fossil fuel energy, the future of CCAs is uncertain. All interviews conducted for this chapter pointed out that the emergence and growth of CCAs has seen constant tensions between grassroots actors, CCAs, existing utilities, and regulators. Amidst these tensions both utilities and

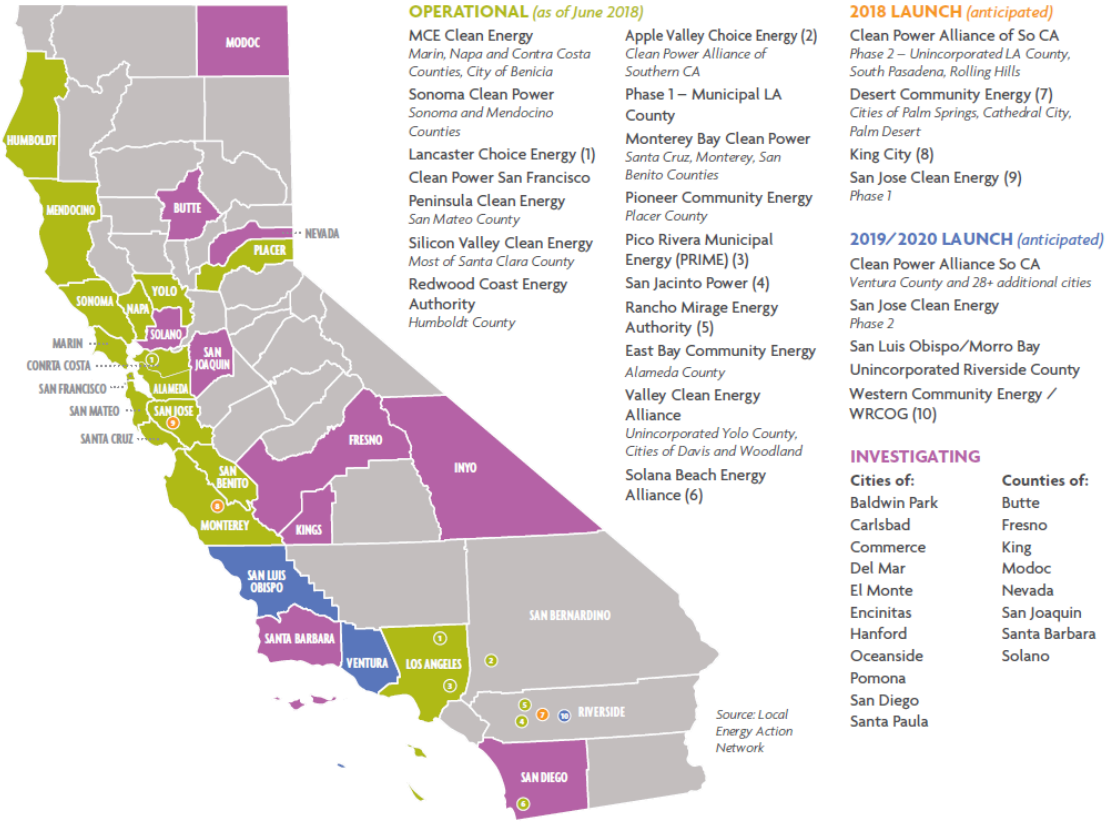
regulators tend to provoke the question of authority and expertise in electricity provision, calling into question the accuracy and reliability of the procurement of power by a non-utility entity.

As one interviewee argued, and as will be elaborated upon in the next chapter, investor owned utilities (IOUs) are conceptualized as the major delivery systems of power in AB32 (the Global Warming Solutions Act of 2006) and all other greenhouse gas reduction legislation at the state level. Various actors have been community choice skeptics, including Michael Picker, 2014-2019 CPUC president and former advisor to then-governor-Jerry Brown. Picker spearheaded a series of reports[17] outlining potential risks posed by the rise of alternatives to the big utilities, not just CCAs but also rooftop solar, home battery systems and companies buying energy through a limited competitive market (Roth 2019).

A tension has emerged between centralized and decentralized forms of energy provision, with different underlying visions of what a clean energy future will look like. Many stakeholders are asking what the delivery mechanism to California's progressive policy goal of all electricity from renewable sources by 2045 will be, and consequently what the electrification of California's transportation sector (accounting for forty percent of the state's total emissions) will look like (California Air and Resources Board 2019: 10). This next chapter will discuss this.

[17] For these reports, please see: http://www.cpuc.ca.gov/customerchoice/

Annex 3.1: Operational CCAs



OPERATIONAL *(as of June 2018)*

MCE Clean Energy
Marin, Napa and Contra Costa Counties, City of Benicia

Sonoma Clean Power
Sonoma and Mendocino Counties

Lancaster Choice Energy (1)

Clean Power San Francisco

Peninsula Clean Energy
San Mateo County

Silicon Valley Clean Energy
Most of Santa Clara County

Redwood Coast Energy Authority
Humboldt County

Apple Valley Choice Energy (2)
Clean Power Alliance of Southern CA

Phase 1 – Municipal LA County

Monterey Bay Clean Power
Santa Cruz, Monterey, San Benito Counties

Pioneer Community Energy
Placer County

Pico Rivera Municipal Energy (PRIME) (3)

San Jacinto Power (4)

Rancho Mirage Energy Authority (5)

East Bay Community Energy
Alameda County

Valley Clean Energy Alliance
Unincorporated Yolo County, Cities of Davis and Woodland

Solana Beach Energy Alliance (6)

Source: Local Energy Action Network

2018 LAUNCH *(anticipated)*

Clean Power Alliance of So CA
Phase 2 – Unincorporated LA County, South Pasadena, Rolling Hills

Desert Community Energy (7)
Cities of Palm Springs, Cathedral City, Palm Desert

King City (8)

San Jose Clean Energy (9)
Phase 1

2019/2020 LAUNCH *(anticipated)*

Clean Power Alliance So CA
Ventura County and 28+ additional cities

San Jose Clean Energy
Phase 2

San Luis Obispo/Morro Bay

Unincorporated Riverside County

Western Community Energy / WRCOG (10)

INVESTIGATING

Cities of:	Counties of:
Baldwin Park	Butte
Carlsbad	Fresno
Commerce	King
Del Mar	Modoc
El Monte	Nevada
Encinitas	San Joaquin
Hanford	Santa Barbara
Oceanside	Solano
Pomona	
San Diego	
Santa Paula	

California's Clean Energy Future

Introduction

For almost one hundred years, much of California's electricity was provided by state regulated, investor-owned utilities – Pacific Gas & Electric (PG&E) in Northern and Central California, San Diego Gas & Electric, and Southern California Edison around Los Angeles – and smaller, municipal operations, such as the Sacramento Municipal Utility District. Then, in 2010, California's first Community Choice Aggregator (CCA), a new type of public entity, was rolled out in Marin County, to procure power for 5,000 customers. A decade later, nineteen California-based CCAs are providing electricity to 10 million customers across the state. Developments have been so rapid and significant that the California Public Utilities Commission (CPUC) projects that, by 2028, CCAs, rooftop solar, and direct access providers could capture 85% of privately-owned utilities' customers (CalCCA 2018; CPUC 2017). This would signify a marked shift from the centralized utility model toward decentralized and locally governed energy providers and a precursor of an energy transition long in the making.

Under CCAs, local governments acquire local control of resource planning decisions by seeking competitive bids from electricity suppliers to procure power for its residents at higher renewable and cost competitive rates, using existing utility's transmission and distribution lines for delivery. Desiring greenhouse gas reductions in communities, these public governance entities increasingly create local energy programs

with social and economic objectives such as workforce diversity and local green job growth.

CCAs are an example of how local, democratic control of energy can scale up, and how local social forces can put pressure on regulatory agencies and legislative bodies to foster an energy transition. Technology plays a central role, but politics is just as important: decentralized, 21st century renewable energy sources such as rooftop solar, microgrid systems, and wind allow for the deployment and control of energy at a vastly different scale than the centralized, 20th century fossil-fueled energy system delivering electricity through electricity grids. The implications of energy decentralization trends occurring not just in California, but around the world, as well, are profound.

But this will not be a smooth transition. A close look at California's climate politics – directly linked to renewables and decentralization – reveals widely-disparate visions of how energy should be generated, distributed and governed, especially with respect to the struggle over climate change. Incumbent utilities seek to establish a renewable energy system whose distribution and control reflect the same centralized arrangements already in existence, while the state wavers between empowering/encouraging further energy decentralization and favoring regulated utilities' efforts, both in pursuit of the state's goal of generating all electricity from renewable sources by 2045. Consequently, the actors in California's electricity system, ranging from grassroots and local NGOs to CCAs, utilities, and state regulators all draw on different visions of how to achieve a decarbonized California and what it would look like. Politics follow as each group struggles to realize its particular vision and carve out a spot for itself.

In this chapter, I explore the emergence of contemporary political relations and control over energy, making the case that 'electricity is political'. Californian grassroots and local governance forces challenge the incumbent utility's control in electricity provision and put pressure on political and regulatory bodies for legislative change and expansion of local control. To illustrate the embedded power dynamics in these transition processes, the latter part of this chapter explores how grassroots activists, local governments and CCAs utilize different visions of a decarbonized California than utilities and regulatory bodies. Visions of a decarbonized California outline different solutions to the perceived threat of climate change, updates to a century old electricity system, and societal well-being. The culmination of the different visions leads to a struggle of centralized vis-à-vis decentralized energy control. In drawing from energy transition- and STS scholarship, this chapter contributes to political science and social movement literatures focused on how social forces can change legislative and regulatory structures in pursuit of their "imaginaries" of energy futures.

The chapter builds on existing social science scholarship on energy transitions and climate change, and social forces, including the work of Hess (2019), who sees the CCA movement as an important case for theory development about advocacy and coalition-forming in sustainability transitions. I begin with a review of research on political relations and energy democratization, then outline the various ideas and imaginaries held by actors in California's energy transition, and finally discuss how these imaginaries cause disruption of, and apply pressure to existing regulatory and legislative structures.

Information on actors, the broader context of energy transition politics, and California state goals were gathered through analyses of:

- Media reports, press releases, and documents on the history of CCAs (including CCA founding reports and consulting studies);
- Ballot propositions and legislation passed;
- CPUC and PG&E websites, annual reports, and outlooks;
- Personal interviews and attendance of meetings with policymakers, grassroots advocates, CCA organizers, energy analysts, and PG&E representatives

Engineering Political Relations and Energy Decentralization

When one looks at the large distribution towers and power lines crossing the land, it is hard to imagine that this centralized grid might not have come into existence at all, absent a number of concerted political decisions in the late 19th and early 20th centuries. In fact, early electricity arrangements were small-scale systems owned and operated by multiple providers, seeing a chaotic array of wires crisscrossing streets in cities like New York and Chicago. These small scale and decentralized emerging electricity systems in the late 1800s relied on incandescent light, offering Direct Current (DC) at low voltage.[18] Expansion was rapid, as the number of privately owned-electric stations grew from approximately two dozen in 1882 to almost 2,000 by 1891 (Bakke 2016: 40; Granovetter & McGuire 1998: 150). Technological innovation soon brought long distance transmission and distribution of power via Alternating Current (AC)[19], which was much

[18] Prior to this time, most homes and factories were lit by candles, kerosene and manufactured gas. See for instance Bakke 2016 for a more extensive history on the emergence and development of electricity systems.
[19] Transformers convert electricity from the low voltage of direct current into higher voltages, allowing electric power transmission over larger distances.

easier to send over long distances, thereby making feasible much larger distribution systems.

A group of four men led by Samuell Insull, Thomas Edison's confidant and protégé, used their personal and trade organizations relationships to shape the emerging electricity industry around territorial monopoly control and to attack and discourage decentralized and smaller-scale provision of DC electricity (Granovetter & McGuire 1998: 157). Insull had to be strategic about the economics of his plan: on-site power plants that were owned and operated by private factories were cheaper than distant utility generators because at least ten percent of power was lost in transmission. Insull and Edison, therefore, charged factories a lower price than they would charge if they would generate their own power, and they built profit margins on municipal customers as ratepayers who had no alternative electricity provider (Wasserman 1979: 229).

Consequently, despite the fact that electricity was produced in heterogeneous environments by heterogeneous technologies – ranging from hydroelectric to coal to other fossil fuels – the diversity of organizational and technological forms in the electricity industry was limited (Granovetter & McGuire 1998: 149). This is seen today, as hundreds of thousands of miles of high voltage power lines stretch across California's landscape to comprise the electrical grid – owned and operated primarily by three Investor Owned Utilities who are regulated by California's Public Utilities Commission.

Beginning with Insull's efforts, the number of power plants diminished rapidly, and early in the 1900s electric power fell into the same pattern as other big US industries; smaller utilities went bankrupt amidst the competition, and were bought up to create giant, centralized, electric power corporations (Hughes 1983). These became classed with

railroad companies as both public necessities and demonized as public predators – by 1907, only about 8 percent of American homes received electricity, primarily homes in areas dense enough to make profit (Hirsch 1999: 13; Bakke 2016: 45).

Much of the regulated, investor-owned utility model as we know it today emerged in the 1920s when Insull worked with government leaders during the Progressive era in American politics (Bakke 2016: 65-72). An alliance formed among Progressives, seeking to create a non-corrupt government bureaucracy, and utility company managers seeking a survival strategy. Referred to as the "utility consensus," utilities became "natural monopolies" within specified geographic regions, regulated by utility commissions created by legislators in each state and receiving a fixed profit on revenues (Hirsch 1999: 11). This consensus created a system known as "rate base," where utilities make profits from building generators to increase electricity supply (the more money they spent, the more profits could make in return), developing a centralized electricity grid with growing electricity consumption (Wasserman 1979: 229). Consequently, until the advent of CCAs in California in recent years, the electricity market had been divided into quadrants with fixed prices set by a provider, the borders of each quadrant enforced by a public commission. Contemporary energy regulation therefore has grown out of anti-trust law and has been primarily concerned with keeping energy prices low, supplies ample, and controlling the natural monopolies (Freeman 2017).

By receiving "ample and reasonably priced" electricity from one monopoly utility, citizens became ratepayers rather than customers, and only by appealing to the regulatory commission could customers obtain recourse for poor service. Centralized infrastructures under economies of scale made electricity production and governance a

good administered by increasingly powerful bureaucrats, experts and industrial leaders discouraging local democratic politics in the 19th century United States (Wellock 1998: 4).[20] Electricity, therefore, became considered a good too complex for ownership and control by the public, the advent of DC electricity systems effectively discouraged until the 1970s oil crises created an institutional impetus for greater domestic sources of energy, including renewable energy (Laird 2001).

It was during the 1970s energy crises that debate over centralized energy provision versus a more decentralized – 'soft' – path emerged. Amory Lovins (1976), followed by Langdon Winner (1986), discussed how different technologies for electrification have different social impacts. Federal policy incentivizing nuclear energy would see an extrapolation of elitist governing structures and centralized high technologies to meet, and facilitate, increasing electricity demand. However, federal policy prompting developments of renewable energy would yield social, economic and geopolitical advantages (Lovins 1976). An affluent industrial economy could, Lovins (1976) argued, meet its electricity needs by harnessing non-depletable local energy sources (such as sun, wind and vegetation) through a myriad of small devices and energy efficiency increases. Lovins wrote (1979: 14):

> While soft technologies give everyone the costs and benefits of the energy system he chooses, centralized systems allocate benefits to suburbanites and social costs to politically weaker rural agrarians. Siting big energy systems pits central authority against local autonomy in an increasingly divisive and wasteful form of centrifugal politics that is already proving one of the most potent constraints on expansion. … The scale and complexity of centralized grids not only make them politically inaccessible to the power and weak, but also increase the likelihood and size of malfunctions, mistakes and deliberate disruptions.

[20] For more information on these historical developments, see dissertation chapter 2.

The 1970s oil crises followed on the heels of the 1960s nonviolent mass action movements by activists under the work of Gandhi, Martin Luther King, and Cesar Chaves and corresponded with the emergence of the environmental movement. Visions of reactor catastrophe and a nuclear apocalypse produced public resistance to nuclear energy and a desire for solar instead, imagined to carry the seeds of a new social order. As Wasserman wrote in 1979:

> Solar power means an energy economy based on grassroots democracy. It could undercut not only the nuclear industry, but the very existence of Exxon and the multinational cartels that dominate the world energy market – and its political power structure. Ultimately, solar energy could be a revolutionary vehicle with which people can take charge of their own power supplies, leaving the world's richest corporations out in the cold. If there's a bottom line in this energy war, that's it.

During the 1970s, deployment of small-scale residential solar technologies were incentivized through tax credits under President Jimmy Carter, a federal policy reversed under President Reagan in the 1980s (Rich and Roessner 1990; Laird & Stefes 2009). In subsequent decades, the grid largely retained its centralized ownership structure. Efforts for more local control over electricity seemingly became tabled until a perfect storm of events merged almost 40 years later; increasing climate change concern, wider economic and political discontent among the public, and the price reduction and advancement of decentralized energy technologies.

What's happening in California?

In California, the California Public Utilities Commission (CPUC), established in 1911, regulates retail rates in electricity, as well as natural gas, telecommunications, water and transport sectors (Duane 2010: 744). Upon the CPUC's establishment and prior to

California's 1996 deregulation of its electricity sector, three investor-owned utilities (IOUs) with their generating assets, transmission and distribution lines fell under the public agency's jurisdiction.

The CPUC's regulating role transformed under the deregulation era in the 1990s when the IOUs sold most of their electricity generating assets to private generating companies who fell outside of the CPUC's regulatory scope (Duane 2010: 744). In 1996, California's AB 1890 created an electricity market, and 80-85% of all market transactions went through either the PX or ISO daily spot market rather than long-term contracts. Upon economic withholding and inflated price bidding, wholesale electricity prices surged 800%, rolling blackouts ensued, and PG&E – California's largest IOU – filed for bankruptcy (Duane 2002: 499; Weare 2003). In response, the state government stepped in to buy electricity for consumers and bailout PG&E. The state reset the three large regulated IOUs as the "dominant providers of electric service," returning California to a monopoly retail market with a competitive wholesale market where IOUs purchase long-term contracts from independent power providers to meet the state's overall electricity needs (CPUC 2018).

For twelve months in 2000-2001, blackouts were a major public concern, and the crisis led to a spike in public attention to energy issues in 2001 that was even larger than the 1974 peak during the Arab oil embargo (Karapin 2016: 139). As below sections will show, the Energy Crisis has become a powerful marker for key actors going forward: it reinforced the awareness that shortage of electricity leads to blackouts affecting all populations, well-functioning institutions should assure efficient flow of electricity and

ancillary grid services, and manipulation and control of the electricity industry lead to a desire for energy diversification, and ultimately, alternative ownership and control.

In the years following the energy crisis, the state saw a shift in its governance due to another powerful driver – the emergence of climate change on political agendas. Mounting pressure for political action followed from the 1999 publication of a report by the Union of Concerned Scientists and the Ecological Society of America detailing expected impacts of global warming in California's water supply, agriculture, wildfire, and coastlines (Karapin 2016: 141). Upon President Bush's retreat from mandatory climate policy measures upon US' withdrawal of the Kyoto Protocol in 2001, California policy elites positioned their state as a venue for action on climate change (Karapin 2016). The state passed legislation to reduce emissions in two of its biggest emission sectors: transportation and electricity. The Pavley Bill set greenhouse gas emission standards for cars and trucks and the Renewable Portfolio Standard (RPS) in 2002 reduced emissions in its electricity sector.

RPS saw the interlocking effects of both energy and climate change: apparent in the text of its two bills: SB 1078 referred to "stable electricity prices" as a key goal, while SB 1038 pursued "environmentally sound, safe, reliable, and affordable energy" (Karapin 2016: 140). RPS requires all utilities to source half of their electricity sales from renewable sources (such as wind, solar, geothermal, and biopower) by 2030, preferably secured through Power Purchase Agreements with large-scale suppliers (Duane 2010: 747?).

In attaining California's climate goals, the Legislature and the CPUC have relied on incumbent utilities' "economies of scale as a finance model to underwrite energy

efficiency investments, market transformation programs for technologies such as rooftop solar and battery storage, demand response programs, and low-income programs" to reach renewable energy goals (CPUC 2018: 4). The CPUC implements decarbonization and environmental policies through IOU programs implementing and incentivizing procurement of renewable energy, installing electric vehicle charging stations within municipalities, energy efficiency programs, rooftop solar, and storage mandates. The utilities are paid in these instances, not for selling electricity, but for costs incurred when implementing low-carbon technologies and measures that help the state reach its policy goals.

Since the 2001 Energy Crisis and the advent of climate change on political agendas, California's energy policy has shifted to place high priority on carbon-free electricity, such as utility scale renewables, all-source procurements and transmission solutions as the best way to meet demand growth (CPUC 2018: 22). While the legislature gives direction to the CPUC, this regulatory body is designed to direct three IOUs. The current regulatory model is not designed to regulate more decentralized and numerous energy providers, including the nineteen CCAs procuring electricity for ten million citizens in California (CPUC GreenBook 2018).

The future of the energy landscape is marked by uncertainty and unpredictability amidst wildfires,[21] increases in intermittent renewable energy procurement, and new energy providers. Regulators appear uncertain how to govern these changes. The CPUC's "Green Book" noted that a lack of comprehensive planning for pathways that account for

[21] An April 2019 report from Governor Newsom's Strike Force states that the state's fifteen of the twenty most destructive wildfires have occurred in the past twenty years, with ten of the most destructive wildfires within the past five years. Energy transition as a mitigation to climate change fueled wildfire risk, yet the fragmented energy market is seen as a governing complication for the state to reliable procure clean energy. Report: Wildfires and Climate Change: California's Energy Future, April 12, 2019.

more alternative providers and choices for customers could lead California "to an unintended outcome and breakdown in services like the Energy Crisis" (CPUC Green Book 2018: 5). The currently fragmented nature of the state's energy market is seen as a complication in the state's ability to reliably procure clean energy (Newsom's Strike Force Report 2019). While the CPUC seeks to expand its scope of control over the still nascent CCAs, these efforts are resisted by CCAs, and the future regulatory model is currently uncertain (also considering the utility's bankruptcy, as discussed in chapter two).

As a norm established under the 1920s utility consensus, electricity is considered a public good; yet decisions about who gets renewable or non-renewable electricity and at what price have been decisions made by centralized actors with little input from the majority of the population. Electricity, therefore, was previously seen as depoliticized, but a demand for increased accountability and democratization is taking hold across the state.

Exploration of the regulatory history has shown an intimate relationship between legislators/regulators and industry, under assumptions of technically complex economic and engineering models necessitated for electricity provision. Energy policy in promoting public interest now needs to consider what this public interest is, and how public engagement with decentralized energy technologies sees the emergence of a very different energy landscape with varying social and political implications. We would do well, therefore, to study the decentralized energy initiatives underway, and the social and politics visions embedded within them.

Social forces disrupting the centralized model

Social forces that had been brewing for an extended period of time gained a foothold after California's Energy Crisis, becoming a greater force of disruption to California's century old regulatory model than previously anticipated. Utilizing the Energy Crisis, AB 117 was sponsored in 2001 by then-assemblywoman Carole Midgen (D-San Fransciso) to create a local energy procurement model (Local Power Inc., 2009). The new legislation, going into effect in 2002, allowed procurement of electricity by a non-utility entity, and is the coming into fruition of efforts by local grassroots actors, Marin County elected officials and technical support in pursuit of more local control of energy and governance.

Fully discussed in dissertation chapter 4, the roots of "community choice" emerged in the late 1990s, when discontent among Marin County citizens locked into a regulated monopoly electric utility began to put political pressure on local governments for reform, transforming their economic frustrations and climate concerns into political action in support of California's renewable energy targets. The effort was picked up by a visionary Marin-based political leader and county officials in the early 2000s. A confluence of grassroots advocacy, technical experience, and a visionary political leader were influential to the emergence of Community Choice Aggregation in California. Their imagining of the possibilities of local energy governance formations, their brokerage with PG&E, and community education were important early steps in gathering community and local government buy-in.[22]

Hired by the county in 2004, Navigant Consulting found that Marin County could increase its use of renewable energy while providing electric rate stability and potentially reduce electric rates over the long-term relative to PG&E (Navigant 2008: 11).

[22] Information gathered through interviews.

Consequent presentations at city council meetings and activist organizing lobbied to get elected officials in Marin County towns and cities on board for a joint powers agreement in 2008. Consequently, MCE became a not-for-profit electricity provider governed by a board comprised of locally-elected officials separate from its municipalities and counties under a joint powers agreement, ensuring that the local governments cannot be held liable for a CCA's debts or other obligations (Marin Energy Authority 2008).

MCE rolled out to 5,000 customers in 2010, initially envisioned by local grassroots actors and government forces alike to remain a Marin-based program.[23] In subsequent years, MCE considerably expanded its size and scope to 435,000 customers in 2019. Efforts were first replicated by Sonoma Clean Power in 2014, Lancaster Choice Energy in 2015, CleanPowerSF and Peninsula Clean Energy in San Mateo in 2016 before more rapidly expanding to become nineteen CCAs across California serving ten million customers in 2019 (Gattaciecca et al 2017; CalCCA Year). While local programs differ in technology development and program implementation, the general zeitgeist of the CCA movement has been one of climate protection and mitigation achieved through greater local control over energy provision.[24]

CCAs have greatly contributed to a changing discourse in California's energy transition politics. Initially established as publicly controlled energy procurement agencies, the CCA movement increasingly seeks to transition not just to low-carbon electricity, but to also provide political change through greater local democratic control and ownership of electricity (Hess 2018). It does so by expanding autonomy of local programs through the adoption of innovative energy technologies, supplier and workforce

[23] Information compiled from personal interviews with grassroots actors and public officials.
[24] Information compiled from personal interviews.

diversity in its energy programs, an increase in the number and scope of Power Purchasing Agreements (PPAs) with renewable energy suppliers, and by petitioning to the CPUC to become providers of last resort. CCAs argue that, due to their creation by cities, counties, or joint power authorities, they provide better access to community needs locally, including in terms of billing and distribution circuits, than regional IOUs (Gattaciecca et al 2017).

Consequently, CCAs have moved beyond providing cheaper electricity and rate stability to focus upon energy democracy, good government, and job creation (Hess 2019). MCE, for instance, has installed over 19 megawatts of renewable energy projects within its communities, hiring at least 50% of workers locally. By partnering with RichmondBUILD, locally hired and trained workers come from diverse and disadvantaged communities experiencing high unemployment rates, 95% people of color and over 30% previously incarcerated (McGee 2018). Nineteen operational CCAs in California have cumulatively supported over 4,200 jobs in California, created over 2,000 Megawatts of new renewable energy, and have avoided over 940,000 metric tons of greenhouse gas emissions annually (CalCCA nd; The Climate Center nd).

With an emphasis on local control, ratepayer fees are reinvested in energy programs without diverting funds to private investors: half of the premium on energy bills – $5 monthly for a typical home – are charged for community energy efficiency strategies that directly benefit constituents (MCE n.d.). These energy programs are centered around assistance with resource conservation, ranging from building energy efficiency upgrades, solar hot water, water efficiency, battery storage, load shifting, and electric vehicle charging (MCE 2017).

CCAs' expanding decentralized model threatens to upend the 100-year regulated monopoly scene. This will certainly not happen without continued struggle and contestation. Following the passage of AB117 in 2002 and the emergence of CCAs, the increasing autonomy over energy procurement and CCA development has come paired with various PG&E obstruction efforts, and a CPUC desire to expand its autonomy over CCAs. PG&E, for instance, views CCAs as a threat to its business model: a dozen CCAs in PG&E's service territory collectively fill nearly half the utility area's electricity demand (Roth 2019), and CCAs' local renewable energy construction and energy-efficiency improvements enhance the risk of stranded assets and load management difficulties for utilities (Hess 2019: 14). As the utility undergoes its second bankruptcy in twenty years following wildfire liability, the CPUC contemplates how to attain its policy objectives of getting all renewables from electricity by 2045. The developments of CCAs illustrate the politics of energy transitions; they display tensions among new and existing energy providers, communities, and legislators, and raise larger questions over adequate scale of governance in a decarbonized society.

California's Imaginaries of Low-Carbon Futures

From a policy standpoint, the increased adoption of clean energy sources is often seen as a step towards sustainable development and society's decarbonization. And development is often conceptualized as a linear path to progress – a direct step to achieving more sustainable futures (Jasasnoff 2018). Yet, a closer look at different actors' interpretations of sustainable futures reveals that disparities within societies exist, each putting forward different solutions to climate change (Jassanoff 2018). Moreover, disparities exist among

actors following from different interpretations of what energy looks like, how it impacts various elements of society, and how various actors and state planning bodies ought to address the challenges embedded in the state's clean energy goals: social justice and inequality, cost, and energy ownership. Different actors have different interpretations of how each of these aforementioned topics intersects with energy, the state, and communities. The remainder of this section will outline the imaginaries of clean energy held by several of California's key stakeholders to illustrate the complex and multifaceted understandings embedded in scenarios of clean energy provision. This discussion will draw on news reports, webinars, and personal interviews with various stakeholders.

Many of the decarbonized technologies are distributed renewable energy sources and represented a fundamental political struggle between new and existing energy providers, legislators, and communities (e.g. Burke & Stephens 2018). The emergence of distributed energy resources such as rooftop solar, energy storage devices, wind turbines and electric vehicles are disrupting the traditional grid-operating model (in part due to their multi-directional energy flow). These sources often have a more fragmented and intermittent nature, and allow ownership by a multitude of actors. Consequently, the adoption of renewable energy sources increasingly sees disruption of centralized electricity models, in part due to the more fragmented and intermittent nature of low-carbon energy technologies.

In California, the growing amount of renewable energy coming into the grid (particularly solar), has strongly changed what California's electricity load looks like, and requires planning to anticipate intermittency and demand. On May 26, 2018, for instance, 73.9% of instantaneous load on the grid was provided by various renewable energy

sources (CEC 2018: 15). Planning is needed following the growing "duck curve," wherein electricity supply surges in the middle of the day as rays hit solar panels, but demand spike as residents come home from. As more solar enters the grid over time, the duck curve is expected to grow, providing a need for either storage or other energy sources to provide electricity during high demand in evenings (CEC 2018).

Consequently, increased emphasis has been placed on electricity system planning to forecast the increasingly disaggregated load. CEC conducts demand forecasting, and all load-serving entities (such as PG&E, CCAs and other electric service providers) must meet Resource Adequacy requirements set by the CPUC (CPUC 2017). The resource adequacy model was developed to ensure that enough electricity will be available to meet demand – a method developed after the 2000-2001 electricity crisis to ensure the system would not have a repeat of power shortages, extreme price spikes and rolling blackouts (Gridworks 2018). Ultimately, these forms of planning are for ensuring short-term electricity supply. It is the longer-term planning that sees challenges of interest to this study.

The CPUC published a booklet, "Green Book," which noted that a lack of comprehensive planning for pathways that account for more alternative providers and choices for customers could lead California "to an unintended outcome and breakdown in services like the Energy Crisis" (CPUC 2018: 5). What this report highlights, therefore is a concern that there is no clear pathway for a clean energy future. Part of the public utilities commission's concern is that (2018: iii),

> in the last deregulation, we had a plan, however flawed. Now, we are deregulating electric markets through dozens of different and legislative actions, but we do not have a plan. If we are not careful, we can drift into another crisis.

Among the various actors in California's energy transition, various perceptions of best pathways forward exist. Considering the CPUC's statement of a lack of clear vision forward as intriguing, I consequently interviewed various actors that are key stakeholders with the California clean energy future. I spoke with individuals at the CEC, CPUC, CCAs, and former PG&E employees (since current employees were unable to speak, presumably considering uncertainty with the company's bankruptcy). All participants received the same set of questions regarding their perceptions and expectations of the state's clean energy future. Varying focal points of clean energy futures were expressed, following very different narratives of dangers, type of expertise, locus of electricity control and associated social impacts. Notably, interviewees responded to the questions very differently, each with very different implications and concerns, with different underlying perceptions of the relationship between energy and society, different perceptions of decarbonization, and different ideas of the best locus of governance.

The CPUC's concerns regards having three different business models procuring electricity, considering the CPUC's organizational structure as evolving also. The CPUC worries about creating the right type of market design for the emerging business models, and how to police markets that are fair. Its focus in the energy transition therefore strongly follows its mandate of regulating the load serving entities that fall under its jurisdiction. When prompted particularly about the future, the official remarked:

> PG&E is paving the way to the future. They need to sell off gas and get rid of contracts. San Francisco's proposed takeover of [PG&E's] infrastructure is a bad idea. They have many low-income communities and the PUC would need to figure out the cost.

When prompted to think about the energy transition more generally, the official remarked:

> If you want to reduce CO2, you need to count greenhouse gas emissions, not renewable energy. The purpose of RPS was to stimulate risky technology. Most value for actually reducing CO2 has been energy efficiency, which has remained flat over the last forty years.

In this regard, the official was critical of CCAs, local elected officials and activists alike who argue for building more renewable energy, but then rely on purchasing Renewable Energy Certificates instead.

What we are seeing with the change in structure is tensions between two models, one interviewee at the government remarks:

> It brings us back to Jeffersonian model of democracy where we need a czar wielded to the notion of a central power, versus the tragedy of the commons. The centralized problems are a lack of real vision. Vision needs to follow from picking real targets. The Important question of what will we do, who is accountable in terms of IRB scoping plans. What technologies do we choose and how do we get them to mature? We need capacity to hit local distribution constraints.

The concerns about a clear vision was shared by an individual at the California Energy Commission also, who noted nonetheless that goal-setting is important:

> even if we don't reach them, with setting goals things get easier. But 100% [renewable electricity by 2045] is whacko… An incremental approach might be better. But everyone wants a new big thing, a new bill.

When considering how to implement these goals, and which stepping-stones will lead to the attainment of this goal, it becomes clear how electricity provision is connected to the state's transportation sector (responsible for 40% of statewide greenhouse gas emissions), and the state's housing crisis:

> transportation emissions are going up. People are driving more. What we need to do is reduce reliance on petroleum. But what we haven't done is look at housing. Social issues complicate attaining energy goals: for instance, the high cost of housing increases the commute times, which increases transportation emissions. There's only so much you can do at the top – adaptation is local.

Other government employees identified other challenges as well: as storage technologies may be deployed at higher rates over the next twenty-five years, and as technologies such as electric stoves and water heaters replace conventional furnaces, gas consumption is likely to decrease. But many years and dollars have been spent on safety upgrades since the San Bruno gas explosion in 2010 that killed eight, and the implementation of these technologies require resources and are costly. Furthermore, with a conversion from gas to electricity, rates go up ten times for the last ten million homes, and this cost will land on the state's poorest citizens, another participant remarked. Interviews with government officials therefore raised many concerns, and identified the need for anticipating social justice- and cost issues that require careful planning.

Participants expressed concern about CCAs, their rapid growth, and their narrative. The CCA boom was referred to as a "bunch of teenagers in the room without adult supervision," questioning their careful planning and informed decision-making. The question of whose knowledge counts and interest-based politics was implicitly referenced when participants argued that Navigant (the consulting firm that did MCE's initial feasibility study in the mid-2000s) told a "favorable" story of electric rates, furthered by city council officials who emphasized PG&E's rising electricity rates. These narratives were misleading, some argued:

> CCAs talk about local control. But do they have the expertise in unforeseen circumstances? If things go wrong, we cannot just black out

> San Francisco. We would come full circle with 2000. This means that we need a provider of last resort. This is needed, and we need to think through things better.

Proposals for a provider of last resort, or backstop, emerged in front of the California State Legislator in the summer of 2019. AB 56, which would create a central procurement entity and give the PUC the authority to direct a new central buyer to order procurement. CCAs claimed that they see value in central procurement entity if focused on resource adequacy, but oppose the bill in concern that it takes centralization too far (John 2019; CALCCA nd). While the bill was defeated, it will likely return in a different form in the future, and its disagreements show various visions of centralization versus decentralization of energy control.

CCAs on the other hand provide models of future energy systems in their reports. CalCCA reports and slideshows show their central concerns as: customer choice, local transparent decision-making, reliance on green energy, and energy-efficiency and community-based programs. Spoken with labor unions to gain political leverage and bottom-up and community support. Their narrative of a clean energy future shows a growth in utility-scale solar, and follows a growth in both local installed energy capacity and a growing number of Power Purchasing Agreements. Different CCAs vary in the extent they see a future collaborating with PG&E – MCE's hostile past with PG&E makes it distrustful of the organization, while East Bay Community Energy for instance is open to joint programs with the utility (EBCE nd). Furthermore, as CCAs become more established and increasingly receive credit ratings, they are increasingly entering Power Purchase Agreements.

CalCCA, of all stakeholders, expressed the clearest vision and steps to a clean energy future. Its focal points as listed on their CalCCA overview presentations (2019) listed: customer choice, local transparent decision-making, provide rate stability, green energy choices, energy efficiency and community-based programs. Its graphs depict future load projections with big growth in utility-scale solar, growth in battery storage, and smaller growth in wind (see annex 4.1). It envisions its procurement future as drawing on both a growing number of decentralized energy resources within its communities and larger Power Purchasing Agreements with utility-scale solar suppliers, and to a lesser extent, wind. It anticipates a growth in storage, microgrids and partnerships with a variety of community and local government stakeholders for energy projects. They show collaboration with local labor unions, and highlight their efforts at addressing social justice concerns. CCAs are very conscious of the narrative they construct, addressing local concerns for local customer buy-in and local elected official support.

On the state-level politics front, CCAs are more in a defensive position, and did not put forward any pro-CCAs bills during 2018-2019. Shawn Marshall, head of the Local Energy Aggregation Network (LEAN), a non-profit organization supporting the spread of CCAs throughout the United States, stated that pro-CCA entities (including her organization) would like to be more “on offense” in state-level politics by sponsoring pro-CCA legislation, but that they are stretched thin in terms of resources (LEAN 2019, June 14). Several bills in summer 2019 were affecting or threatening business models, or threatened to give the PUC the authority to direct a new central buyer to order procurement (a central procurement entity that would take control away from CCAs).

CCAs claimed that they see value in the central procurement entity if focused on resource adequacy. Marshall stated that CCAs began looking into issues that affect "their ratepayers" and "what ratepayers want," such as wildfire liability issues, and cities' desire to work more closely on decarbonizing the transportation and building sector (LEAN 2019).

PG&E, on the other hand, has its greatest interest in influencing state-level politics through a variety of lobbying and voter initiatives, to enhance both its emergence out of bankruptcy and minimize the influence of the nascent CCAs. In the year 2018, PG&E spent $10 million on lobbying (roughly twice the amount spent by other investor-owned utilities), spending around $9 million on 900 campaign contributions to both Democratic and Republican parties over the past decade (Fuller & Penn 2019). What critics refer to as a "Culture of cronyism" … wielding political influence at the state and local level to protect its monopoly. PG&E's local programs and local fundraising note that it is dedicated to (PG&E nd. a):

> Building better communities for our employees and our customers with a program of charitable giving that addresses critical social, educational and environmental challenges, helping to ensure a safe and prosperous future for all Californians.

The local charitable program has four focus areas: emergency preparedness and safety, education and workforce development, environment, and economic and community vitality. In 2018, PG&E contributed nearly $28 million to charitable organizations and supported over 1,200 different nonprofit organizations. The list consists of community foundations, and numerous "underserved" and "low income" populations such as for instance Black Men of the Bay Area receiving $10,000, African American Community

groups receiving $22,000 (PG&E nd. b). PG&E's strategy of influencing local and state politics through charitable giving is not an uncommon strategy for threatened utilities. Electric utilities around the country are increasingly funding local organizations and minority groups for support. Some say that it is like turning the clock back 100 years in terms of strategy (Penn 2020). In response, the well-known civil rights group NAACP tries to stop its state and local branches from accepting fossil fuel money by providing information on the connections between fossil fuels, climate change and how climate change's storms may disproportionately impact low-income and minority neighborhoods (Penn 2020).

Most of PG&E's lobbying efforts and its narratives through its reconstruction plan are geared towards addressing the wildfire threat and ensuring future grid reliability. In a plan to limit blackouts, PG&E seeks to build two – most likely natural gas fired – substations around the North Bay and in Lake Mendocino, Nevada and Tehama counties to provide backup power to 400,000 ratepayers in these communities that experience high wildfire risk (Morris 2020). The substation proposals fall in Sonoma Clean Power and MCE service territory, who seek to provide power from solar and wind to their residents through PG&E's wires. Weisz, viewing the proposal as another attempt from PG&E to ensure its survival, worried about "conflict of interest, perverse incentives and opportunity for manipulation [being] inherent" (Morris 2020).

In the meantime, San Francisco Mayor London Breed and San Jose Mayor Sam Liccardo both intensified calls for a municipal utility, to which some lawmakers responded that this decision ought to be respected if following community's interests (Verghese & Baker 2019). Mayor Liccardo submitted a proposal to the CPUC late 2019,

backed by over twenty cities, including Sunnyvale, Oakland and Sacramento to make PG&E a cooperative (a customer-owned power company) (Chan 2019). The cooperative, according to Mayor, would need to be run like a business, not governed by elected officials (Chan 2019).

The proposal emerged in response to frustration with PG&E's bankruptcy. PG&E announced that it would emerge from bankruptcy a "strong and effective company" (Penn 2019). Newsom needs to approve PG&E's restructuring plan for the company to emerge from bankruptcy, and has "suggested that state ownership or cooperative could be options … in addition to other possibilities, including a takeover by Berkshire Hathaway, the holding company of Warren E. Buffett, which has extensive energy interests throughout the West. PG&E as we know it cannot persist and continue," Mr. Newsom said last week. "It has to be completely transformed. There will be a new entity. It will be reimagined" (Penn 2019).

Yet, some wonder whether non-profit utilities would "cure what ails California's electricity" system. In a blog published by UC Berkley's Energy Institute, Borenstein (2019) points out that PG&E's 70,000 square mile service territory "includes some of the highest and lowest population densities in the state". The low fire risk areas are the urban areas that would become municipal utilities. The high fire risk areas that are more forested, rural, remote, and often poorer is going to be of no interest for public or private ownership of these areas (Borenstein 2009). Borenstein's points, therefore, indicate that certain important governance questions, such as risk and cost distribution, will need to be addressed in further conversations.

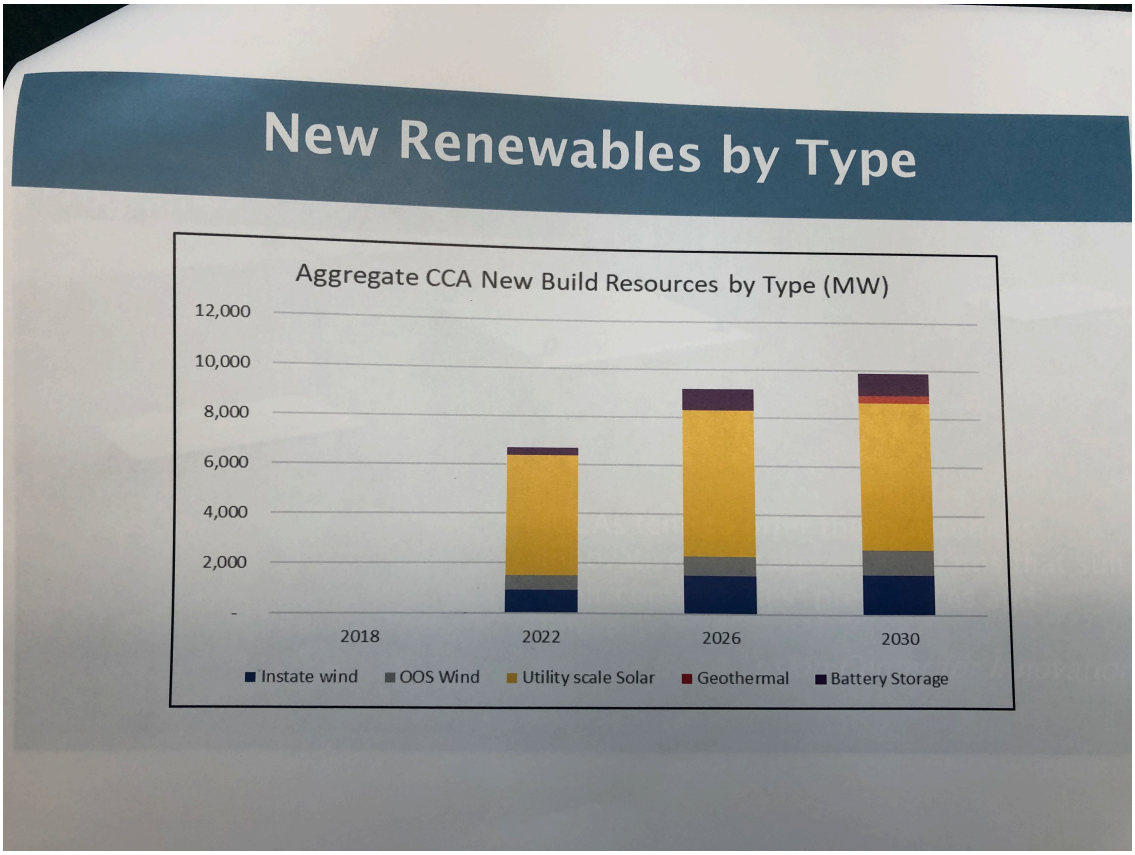
Conclusion

The state has identified a policy, but no clear pathway, to decarbonization. The ambiguity and complexity of the problem leaves many officials wondering how to collectively address electricity provision, decarbonizing a transportation sector amidst rising commute times, which technologies to encourage and how to promote their adoption and cost distribution. The lack of coherence in the state's vision leaves wriggle room for PG&E to construct a favorable narrative of its importance in a clear energy future. PG&E uses its resources to lobby state and local officials and groups. CCAs are growing and developing rapidly, and with less financial resources at their disposal they work with local groups to formulate clean energy futures and address local social justice and transparency concerns in the narratives of these futures. A tension between centralized versus decentralized and government versus corporate control is growing, as seen through the municipal takeover models of the grid. Throughout the discussions of California's clean energy future, it becomes clear that certain important governance questions, such as risk and cost distribution, are raised repeatedly. The answers to these questions are embedded in ethical considerations.

Studying the varying imaginations of California's clean energy future, and ultimately what energy means for different actors, exemplifies the politics of climate change and energy transitions. It shows the varying imaginaries actors hold about renewable energy futures, and how these interact in the political realm. We see that tensions over competing imaginaries are at the core of fights over what climate change solutions should look like, and how they ought to be implemented. This holds importance

for further research on climate change and energy transitions amidst increasing urgency, technological developments and local discontent.

Annex 4.1: New Renewables by Type (CalCCA 2019)



Our Common Future

Introduction

Satellite images from NASA show our Earth spinning in the atmosphere. Glowing dots illuminate some, but not all, areas of dense inhabitation. Almost 150 years after the invention of electric light, the outlines of many continents are visible. Most clearly visible in these satellite images are Western Europe, urban areas in the United States, and coastal lines that see dense inhabitation (NASA nd). Notably, the lights seen from outer space do not demarcate country lines. They do not demarcate communities, histories, or identities – albeit a closer look provides insight into some geopolitical differences of wealth distribution (the brightest areas of the Earth are most urbanized, but not necessarily most populated).

In 2018, 67.3% of these lights around the world were powered by fossil fuel energies (IEA 2018). They are mined, extracted, refined, and distributed under power structures and regulatory initiatives that emerged 100 years ago. The energy system emerged in an era of concentrated power and ownership. The grid itself in many parts of the western world is between 50-100 years old – and in some instances, in dire need of replacement and investment (Bakke 2012). In the poorer parts of the world, economic development is often hindered by lack of electricity access: in 2018, 860 million people in the world, particularly in areas of sub-Saharan Africa and Asia, had no electric light (IEA 2019a). Cities in the developing world are more often electrified than rural areas, but even here, electricity access may be intermittent or expensive.

Meanwhile overall global electricity consumption is growing, and growing rapidly. In 2018, the US electricity sector increased its consumption by 6.2% (Global Energy Statistical Yearbook 2019), and economic growth and industrial demand also raised power consumption in Canada, Brazil, Russia, and in nations across Africa and the Middle East (remaining stable in Europe). With global energy consumption at 22,963TWh, North America consumed almost 20% of this, Europe 15%, Asia 45.5%, Latin America 5.8% and Africa 3% (IEA 2019b).

In a 2019 Global Energy Report and Outlook, the International Energy Agency, described electricity as the "fuel of the future". Other global consultants and governmental bodies such as the McKinsey Company and World Economic Forum, too, project that while renewables counted for only 10% of global primary energy consumption in our grids in 2017, this number will likely increase drastically in coming decades (WEF 2017). A growing share of energy consumed for heating, lighting, cooking or transportation will increasingly be powered by electricity rather than fossil fuels (McKinsey 2018). And these newer technologies will be owned and operated by newer players, leading to a fragmentation in the energy market (WEF 2017), and consequently see the emergence of new forms of energy governance and control.

In a growing number of locales around the world, decentralized energy resources are adopted. These take various shapes and forms, ranging from community-led renewable energy projects in Scotland to rural electrification projects in Bangladesh to community-based microgrids in rural Kenya to wind cooperatives in Germany and Denmark, among many others. The integration of these technologies in locales often see engagement among a range of social actors producing new economic and political

relations (Miller et al 2013). But they also produce tensions between communities, existing- and new energy providers, and overarching political structures designed for centralized energy systems or not existent in areas with no electricity access.

Community Choice Aggregation (CCA) in California, then, is one model displaying efforts to find the "correct" locus of governance for a clean energy future. Its resistance by incumbent energy providers and the existing political structure serve as an exemplifier of the political change energy transitions may bring. This chapter will draw on the CCA case study to discuss why local energy transition efforts emerge and how these efforts may scale up to become embedded in a larger political structure. These developments are not unique to California: local energy production and governance practices emerging around the world are indicative of social and political experiments. Decentralized renewable energy structures and their experiments create cases that, albeit shaped and reshaped within contentious politics, are increasingly subject to local governance and participation. This final chapter of this dissertation puts developments in California in conversation with developments around the world to explore how changes in energy provision are intertwined with various social and political ideals, including social and ecological futures, justice and democracy around the world.

Capital and Energy

This dissertation's exploration of Community Choice Aggregation (CCA) and energy transition politics in California explored the social and political ramifications of future electricity systems, with a close exploration of how energy has been and will be provided and governed. The study's argument that electricity is 'political' is not unique to

California. The series of concerted political decisions on technology and infrastructure that created a centralized electricity grid under monopoly utilities followed developments in American Political history. But, around the world, coal, oil and natural gas have been central to the development of energy systems, the organizations of our cities and transport networks, and even the development of democracy (Mitchell 2009). The configurations of our economies, therefore, emerged long before scientists identified the impact of rising greenhouse gas emissions on the Earth's climate and livelihoods.

Now the United Nation's IPCC Fifth Assessment Report (2014) warns that all greenhouse gas emissions need to be reduced to net-zero by the end of the 21st century to avoid catastrophic climate change face a series of challenges. This requires decarbonizing all electricity grids, phasing out power plants, electrifying the transport sector, and so on. To date, approximately 67.3% of the world's electric energy supply remains based on fossil fuels (IEA 2018). While the share of renewable resources in our grids are increasing, as of 2017 they still accounted for only 10% of global primary energy consumption (WEF 2017). Recent research estimates that decarbonizing existing energy infrastructure would require $61 trillion in low-carbon investments (Hall et al 2018).

From a global perspective, this would require that the international fossil fuel regime meeting global energy demand either ceases to exist or begin large-scale investments of renewable energy. The existing regime is, Lipschutz & Mayer (1993: 248) argue, a social institution governed by a series of power relations that have been constructed historically and have been repeated through interactions and customs. From oil extraction to refinement, to transport, to transmission, distribution and consumption follow a series of rules and institutions, pre-set prices, and social interactions that evolved

following a series interactions and disruptions over time. These large regimes would change slowly; incrementally rather than drastically. While the global energy ecosystem is experiencing a transformation in its energy sources – the majority of oil majors are undertaking investments in renewable energy strategies (Pickl 2019) – the vast flows of profit provide incentives to prolong the existing regime.

Energy provision at national and sub-national levels too, follows a series of practices that emerged decades ago. Historically, across Europe and the United States, economies of scale and low-cost energy production were often features of vertically integrated monopolies supplying residents with liquid fuels, natural gas and electricity (Meeus et al 2005; Weil 2006). Even when these utilities begin to incorporate renewable energies into their business models, research shows they continued to favor corporate structures providing "shareholder value," and relying on high and increasing volumes of sale and regulated price increases rather than a more customer-centric and energy efficient model of supply and demand (Richter 2012; Lozano & Reid 2018). Financialization often results in private returns to investors being prioritized above possible social and environmental costs and potential benefits as well as public participation (Burke & Stephens 2018).

Financialization often results in private returns to investors being prioritized above possible social and environmental costs and potential benefits as well as public participation (Burke & Stephens 2018). The result has been loss of social acceptance and legitimacy, slowing the deployment of renewable energy technologies despite a growing sense of urgency (Hall et al 2018; Burke & Stephens 2018). This model has, too often,

also led to poor social justice outcomes and a failure to address the maldistribution of wealth and power that have led to increasing inequality around the world (Jasanoff 2018).

Social and political barriers hence prevent significant hurdles to the deployment of low-carbon technologies at a time where climate change science calls for rapid change to our still fossil-fuel dependent systems. A better understanding of the challenges of decarbonizing electricity sectors and transportation systems while tackling wider social justice and inequality concerns, begins with a consideration of not solely clean energy technologies, but the wider sociotechnical systems they are embedded within.

Innovation in our energy industry reflects new ideas about energy use and control, as well as socioeconomic and organizational components (Geels 2004; Miller et al 2013). A growing market segment of renewable energy falls under city-, municipal-, community-, co-operative- or citizen control (Brisbois 2019; Szulecki 2018). These entities' choice of technology is impacted by a host of factors, not limited to consideration of cost, but including sustainability and self-sufficiency, and social and environmental justice concerns. These emerging models gradually disrupt the centralized electricity provision we have seen in the past century by fragmenting the energy market and providing innovations at grid edge (there were electricity is consumed); solar rooftop, electric vehicles, charging stations, batteries and microgrids (WEF 2017; GTM 2019). But, these technologies are costly, and the poorest in our societies may not have access to them, nor have other resources at their disposal to advocate for a redistribution of control and governance of energy.

The low-carbon pathways societies therefore embark upon may extend existing processes of exclusion and inequality (Sovacool et al 2019). Contemporary elites will

seek to shape and coopt the energy transition process by exercising their power and maneuvering to capture market share – or maintain monopoly control (Sovacool et al 2019; Bakke 2012 xviii). This leads to tensions with newly emerging actors who seek to transition not just to low-carbon technologies, but who also seek to provide political change through greater local democratic control and ownership (see eg Hess 2018). This increasingly leads to friction between communities and energy providers, and consequently sees a challenge to incumbent power relations. From a theoretical standpoint, power is embedded in structure: in institutions, infrastructure and cultural and structural frameworks (Sovacool & Brisbois 2019: 2). Yet, power also has an agentic component, allowing it to be exercised by various agents within the overarching structure (Sovacool & Brisbois 2019; Scott 2007). We are increasingly seeing these power contestations and the reshaping of structures under new regulations and legislations accommodating new energy technologies.

In addition to power and politics, there is another component at play: ethics. At some point, climate change solutions and decisions on renewable energy ownership and control cannot be found solely in the realms of science and technology. Rather, the decisions we are confronted with have applications rooted in ethics and politics. As Jasanoff (2018: 13) argues, "while climate science can tell us with high certainty that human activities are raising the earth's mean surface temperature," it cannot tell us "where and when the next disaster will strike, how to allocate resources between prevention and mitigation, or whom to hold responsible for protecting the poorest of the poor." Similarly, transitioning to renewable energy sources, decisions have to be made on which technologies to adopt, how to regulate them, and how to distribute their costs. It is at this juncture that diverse

forms of knowledge need to be tapped into: drawing from scientific knowledge of climate change and how it may impact our local livelihoods, technological advancements for sustainable energy technologies, understanding of history and decisions made to achieve existing regulatory structures and regimes, types of governance structures desired locally, and drawing from local resources and knowledge of effective governance systems that are culturally situated to produce redistribution of risk and wealth deemed effective, adequate, and just. How did developments in California inform this conversation? How do my research findings inform this? This next section will provide an overview of this study's findings.

California's energy transition

This dissertation turned our attention to a community-based project, Marin Clean Energy (MCE), located just North of San Francisco's Golden Gate Bridge, where renewable electricity is procured via a 100-year old power infrastructure to households, offices, and public buildings. This grid is owned and operated by Pacific Gas & Electric (PG&E), the primary power provider in much of Northern California, but the utility's century old monopoly energy structure is quickly changing. The desire for local autonomy and more effective climate change solutions are challenging PG&E with two words that situate localism amidst a global energy crisis: "community choice."

The roots of "community choice" emerged in the late 1990s, when discontent among citizens locked into an energy provision structure under a regulated monopoly utility began to put political pressure on local governments for reform, transforming their

economic frustrations and climate concerns into political action in support of California's renewable energy targets.

Today, Marin Clean Energy, California's first Community Choice Aggregator (CCA) providing public rather than private energy, has eliminated over 185,000 metric tons of greenhouse gas emissions – the equivalent of taking 39,615 passenger vehicles off the road for one year in a county of only 100,000 households (MCE 2018; EPA nd). Eighteen other CCAs have since emerged in California – procuring power to 10 million California citizens as of 2019 – and the effort has shifted from a grassroots to a county-based effort. As the movement has grown, contesting ideas of how CCAs will develop (and whether CCAs will even continue to exist in a changing regulatory environment) have emerged as a result of competing ideas among the various stakeholders.[25]

The CCA case shows how communities formulate an imaginary of a more sustainable future, how this imaginary leads to local grassroots action and then political action as it both provides changes to, and gets embedded in existing political structure. The case provides insight into the social movement literature discussing how energy transition coalitions are formed, but also draws form the science and technology literature understanding how locales draw from various sources of knowledge to decide which technologies to adopt, how to regulate them, how to distribute costs, and how to incorporate various community concerns (such as cost and social and environmental justice).

[25] This dissertation has referred to stakeholders as any actors seeking to participate in California's energy landscape. These include politicians such as California senators, commissioners at the California Public Utilities Commission, PG&E the utility, Marin Clean Energy employees, local activists, and even citizens with rooftop solar systems.

As the energy transition grows, it is met with resistance from incumbent actors and provides larger questions about energy control, costs, sustainability at state-level under varying visions of energy control and resistance to changing 100-year-old regulatory structures. What developments in California show are the competing imaginaries that emerge in contemporary politics over creating more sustainable futures. These next two subsections, divided into *social movements* and *imaginaries of clean energy futures,* will discuss these findings.

Social movements:

The CCA movement that took shape had both the goal of creating a low-carbon electricity system, and a desire to create political change toward greater local, democratic control and ownership (Hess 2019). As is not unusual for environmental movements, to gain legitimacy, local grassroots actors called upon global science (such as UNIPCC reports) to highlight environmental fragility and the need for conservation through local institutions or policies (Fogel 2004). Marin County would see the roll-out of the first CCA in 2010 as a result of the formation of an energy transition coalition driving things forward under on-going grassroots advocacy in the community, technical experience from several policy and consulting actors, and a visionary political leader.

The 2000-2001 California electricity crisis following the state's 1996 electricity deregulation led to rolling blackouts and Pacific Gas & Electric's bankruptcy. The energy crisis created a window of opportunity to address public discontent with a monopoly utility and high electricity prices, and simultaneously address an emerging concern for

climate change. The events influenced the drafting of legislation that became AB117, California's Community Choice Law in 2002.

Between 2002-2007, steps taken towards the formation of a CCA were incremental, and much of the early efforts saw the formation of a transition coalition consisting a variety of actors, including local activists, environmental organizations, local public officials and sustainability planners. CCA advocates were able to strengthen their coalition with more environmental and sustainability organizations by tying their public agency in with statewide energy transition goals proposed under the 2002 Renewable Portfolio Standard (SB 1078) requiring twenty percent renewable energy from utilities by 2017 and the 2006 cap-and-trade law (AB32) (Hess 2019: 42).

Building on the initial imaginary of local self-sufficient systems, local planners and political officials began formulating a vision of a publicly owned energy agency that could provide its community with renewable energy. Feasibility studies, conversations with grid operators, brokering with PG&E and third party reviews emerged, and officials seeking to launch a CCA focused their narrative heavily on procuring renewable electricity at prices below those of the incumbent utility. It became clear, following initial social movement activity and a new legislation, that whatever clean energy organization would emerge, that it would need to fit within existing political structures. The shape this organization would take would follow from various sources of knowledge and expertise; needing to make decisions on how much electricity to procure, prices to set, and governing relations (choices on making a Joint Powers Authority).

An opposition coalition formed once the energy transition coalition began making public presentations to city officials to secure a Joint Powers Agreement and make steps

towards rolling out the first CCA. PG&E created both an astroturf campaign sending out mailings to local households asserting that a public entity could not reliably procure power for communities, and funded ballot oppositions seeking to prevent the launch of CCAs. PG&E's opposition campaign created much doubt among citizens, and MCE initially rolled out to around 6,000 customers, a number well below its current 435,000.

Step by step, a grassroots movement had gathered momentum, policy- and institutional changes. The energy crisis provided an important stepping-stone from local vision to state-wide policy. Local policy pioneers and advocates engaged in education and outreach to gather local support and understanding, technical expertise and planning further developed what would become Marin Clean Energy, and the actors' strategic framing connected to the state's renewable energy targets and local price concerns. These were key choices that tied the movement to context-specific situations that helped overcome resistance from PG&E.

As the movement grew and carved out a place for itself in California's energy politics, the imaginary underlying the CCA movement shifted and evolved. Environmental and social justice norms, linked to the imaginary of energy democracy, were incorporated in MCE programs and initiatives. Yet, interviews and participant observation suggest that "CCAs", "community choice", and "sustainability" had different meanings for different actors in California's energy transition; while grassroots actors' imaginary envisioned a series of smaller organizations replicated across the state to make communities energy self-sufficient, officials at the helm of the CCAs envisioned local transparency and representation under boards of publicly elected officials under expanding Joint Powers Authorities including a growing number of cities and towns. This

shows that, while imaginaries may not necessarily be embedded in a political organization, they are a driving force behind political change. Furthermore, this shows the internally fragmented nature – and consequently what will be the on-going politics – of an energy transition.

Imaginaries of clean energy futures

Policy shapes perceptions of the future: Senate Bill 1045 mandates that California supplies its electricity demand with renewable energy sources by 2045. In response to this bill, various energy providers seek to ensure they are the delivery model to this policy goal, drawing on various narratives, projections, calculations and models (Beckert & Bronk 2016).

For PG&E as a corporation, their pathways out of bankruptcy and their presence as an integral part of California's clean energy future require that its restructuring plan inspire confidence among investors, regulators and the governor. It requires that its plan is convincing enough to other political actors to ensure it will maintain monopoly control. Yet, different actors make different calculations; the numbers PG&E put forward in its plan have been critiqued by other parties, with important ethical questions of which parties would bear the costs of future wildfire and whether PG&E ought to reduce shareholder returns to increase investments in the electricity grid.

The local CCA has begun constructing a different narrative, and one that addresses a wider array of social and justice concerns in its energy provision models. The CCA provides consumers a choice over their provider, a cleaner energy supply, and cheaper rates than the incumbent utility. Ratepayer fees are reinvested in energy

programs, particularly community energy efficiency strategies that directly benefit constituents without diverting funds to private investors (MCE 2017). New governance relationships are imagined, and increasingly created, between CCAs, utilities, and local governments to implement local energy programs and develop utility scale solar such as MCE's Solar One.

Furthermore, as the CCA movement has grown, it competes with PG&E to gain political power in California's clean energy future. And as the movement grew from local to state-wide, it increasingly has sought to fit within, and conform to, the state's imaginary of a global frontrunner in fighting climate change, therein seeking to both promote economic growth and protect the environment.

The state has adopted a policy, but no clear pathway, to decarbonization. The ambiguity and complexity of the problem leave many officials wondering how to collectively address electricity provision, decarbonize a transportation sector amidst rising commute times, which technologies to encourage, how to promote their adoption and cost distribution and at which governance scale. The lack of coherence in the state's vision leaves wriggle room for PG&E to construct a favorable narrative of its importance in a clear energy future, emphasizing its expertise in providing electricity throughout these past 100 years. PG&E uses its resources to lobby state and local officials and groups. CCAs are growing and developing rapidly, and with less financial resources at their disposal they work with local groups to formulate clean energy futures and address local social justice and transparency concerns instead.

A tension between 'centralized versus decentralized' and 'government versus corporate control' is growing, as seen through the various proposals under consideration

by the legislature, the regulatory body, and the Governor: municipal takeover, cooperative, state utility models, PG&E or takeover by another private utility. The existing energy model, though, is firmly rooted in both America's history and its political culture. The American Dream has always been a private dream, and public imaginaries of a future tend to lean towards private control with some hesitancy for government models.

Energy has become something the individual can increasingly engage with, own, and control, and the energy landscape will likely fragment further as energy technologies provide new opportunities for a host of new actors. As the energy market fragments further, a series of new public-private partnerships will likely emerge to provide sustainable and affordable electricity. Emerging energy providers are often decentralized, forming new governance relations to install solar PV, and facilitating citizen engagement and control of energy through rooftop solar and electric vehicles. These developments make the citizen a political actor (Szulecki 2018), and public decision making under CCAs shifts the locus of control from utilities supplying millions of ratepayers to cities and towns meeting local social justice and governance concerns. Yet, considering capital costs of these technologies, the poorest in our population may not have access to them, and may hesitate in adopting these technologies following economic- and other livelihood concerns. Throughout the discussions of California's clean energy future, it becomes clear that certain important governance questions, such as risk and cost distribution, will need to be guiding questions.

Energy transitions elsewhere

To conclude this dissertation, this final section will take a brief look at three other energy transition efforts around the world. How did other transitions emerge, and what lessons can we derive from them? To answer these questions, this subsection will take a closer look at Denmark, Germany, and South Africa. We see that both Germany and Denmark, similar to California, have a strong institutional capacity and policy incentives that lead them to identify as global energy transition leaders. In both cases here too, these countries' energy transition policies have roots in social movements. In both Germany and Denmark, renewable energy adoption and local movements emerged before carbon emissions and climate change entered public consciousness, and their initial efforts followed from local social and economic concerns. In South Africa, local movements resist incumbent energy providers and an energy structure created in the Apartheid era. Lack of institutional capacity and transparency under entrenched political power relations resist the alternative political ideals by social forces and pose challenges to decarbonization.

Danish farmers in the 19th century began adopting small-scale wind energy technologies to overcome a lack of domestic energy sources. Grassroots bottom-up learning facilitated a growing adoption of wind and biogas technologies in the early 1970s and 1980s, ultimately creating cooperatives owned by local communities (Toke 2011). Initially individual farmers provided the market for wind turbines, but between 1979 and 1983 slightly larger turbines were sold to local wind power cooperatives or wind power schemes. Feed-in tariffs emerged as a result of renewable energy movements persuading utilities to pay operators of wind turbines premium rates for generated

electricity from the turbines, a call that was backed up by the Danish Parliament. These payments evolved into the modern-day 'feed-in tariffs,' a development Toke (2011) attributes to the persistence of social movements in the early development of renewable energy technologies. To date, Denmark has among the world's most progressive policy goals for renewable energy, seeking to be 100% renewable energy and carbon neutral by 2050.

The Danish have moved from a centralized to a distributed energy system, the latter permitting more decentralized energy provision (Remmen 2015). Nonetheless, elements of centralized provision remain in place through a smart energy system that connects urban and rural areas and neighboring countries Norway, Sweden and Germany to dispatch surplus renewable energy (Vad Mathiesen 2015). Meanwhile, a fundamental power struggle is emerging, and sees much debate between public and private actors. Coal plants are shifting to biomass, but in ten to twenty years even these will become obsolete, and while central actors want to see economies of scale, national and local communities push towards decentralized energy provision model (Vad Mathiesen 2015).

These Danish energy campaigns inspired a movement in Germany known as the *Energiewende* ("energy transition"). Renewable energy adoption efforts in southwestern Germany also have roots in their opposition to block regional industrialization plans. A German conservative farming community near the French border successfully blocked plans to industrialize the region. In this town, Freiburg, the local opposition campaign led the adoption of renewable energy well-before federal renewable energy policy (Hager 2016). Freiburg, known as Germany's ecological model city since the 1980s, saw a strong interplay between policy, community dynamic and innovation that is rooted within

the context of culture, history and local interpretations of sustainability (Reeve et al 2013).

Social movement activity in Germany, too, was influential in shaping the nation's energy policy. Nationwide protests opposing nuclear energy reached their peak in the 1970s with violent demonstrations at Brokdorf, Grohnde (nuclear power plant sites) and Gorleben (location for the national disposal center) in the years 1976/1977 and demonstrations in Hanover and Bonn in 1979, both with more than 100,000 participants (Hake et al 2015: 535). Following the 2011 Fukushima meltdown and renewed public protests, Germany shut down eight nuclear reactors in 2011, slating to shut down the remaining nine by 2022 (Hake et al 2015).

Germany, proactive in international climate negotiations, has long been a world leader in installing renewable energy technologies. Its *Energiewende* nationally receives widespread political support following a strong environmental ethic dating back to the 1970s oil crises and its public opposition to nuclear (Laird & Stefes 2009; Reeve et al 2013). Consisting of two main policy tools: eighty percent electricity from renewable by 2050,[26] and phasing out nuclear by 2022. Two primary challenges provide mounting concern. For one, the transition is accompanied with an overall increase in greenhouse gas emissions resulting from cheaper coal than gas as a substitute for nuclear and renewable energy intermittency. Second, consumers pay more than $22 billion of annual renewable energy subsidies through their electricity bills – a higher number than all other European countries with the exception of Danish citizens (The Economist 2016).

[26] Specifically, goals for 2050 are: 80% of electricity production by renewables and 60% of overall energy use, and reducing GHG emissions in 2050 at 80-95% below 1990 levels (Economist 2014).

Germany has a four investor-owned utilities in its grid network,[27] yet of the total share of renewables into the grid in 2010, only 6.5% was generated by the big utilities, the remainder coming from new actors who had not been engaged in electricity production before (Kungl 2015). Under the national feed-in tariff law (EEG) renewables are given priority feeding into the grid, and German companies and households produced 11% of the national power from demand in 2012 (Appunn & Russel 2015). This is taking its toll on the large utilities' balance sheets, with E.ON's (one of the four largest electricity utilities) production falling by 38% between 2010 and 2013 and a 1.9 billion euros loss in profits (Appunn & Russel 2015). Yet electricity prices in the market have been rising and a surplus of coal following renewables' intermittency is leading to higher CO_2 emissions (Amelang 2017).

These paragraphs illustrate how the needed global grid infrastructure changes disaggregate into local infrastructures and decade-old tensions over electricity provisions and transportation practices/sectors. Particularly, it pays attention to the local actors that are driving change to create a more decarbonized energy system, and how these change fall within the larger energy landscape. In doing so, it compares different local ideas and developments that change electricity systems from fossil fuel to renewable energy sources. Notably, in these developed nations that are global frontrunners, the state plays a strong role.

Developing nations, on the other hand, may lack this institutional capacity. South Africa, for instance is one of the world's most energy-intensive economies with the highest per capita greenhouse gas emissions (Baker et al 2014). South Africa's power

[27] The "big four" private utilities are E.ON, RWE, EnBW and Vattenfall. They are involved primarily in power production, distribution and sales.

sector's institutional structure emerged in the apartheid era, and communities seek to resist the historical dependence on abundant coal and labor relations rooted in racial divisions that developed a cheap electricity for minerals-based export-oriented industry (Baker et al 2014: 797). The explosive strikes by workers at the end of 2012 revealed on-going racial tensions, and a strong display of local culture and identity through striking workers' dances, followed by police brutality. An electricity sector in crisis provides opportunity for the decarbonization of South Africa's electricity sector, yet a lack of transparency and power struggles in the government, will likely provide significant hurdles on top of the usual energy transition battles about which technologies to prioritize and under which institutional arrangements (Baker et al 2015).

In other developing countries, institutional capacity and policy often pose significant barriers to both rural electrification and clean energy access. While renewable energy comes from fuel sources that cannot be depleted, energy access requires high upfront capital costs and local workforce training to be implemented and maintained. These costs are often covered by large international funding institutions, who play an important role in developing countries where the government may lack the administrative and organizational capacity to reliably fund rural electrification projects (Bhattacharyya 2013) or may be challenged by scattered low-income consumers, high upfront equipment costs, and a lack of electricity supply grids (Urmee et al 2009).

This dissertation began with a vision of a renewable energy future to reflect on the notion of energy, society and imagination. Consequent chapters explored what energy means to different stakeholders in society. In these cases, and the three cases referenced in this conclusion, we see that matters of identity shape understandings and experiences

of sustainability and an energy transition, and they perceive energy knowledge as typically reflecting certain assumptions, agendas and interests following established power relations. Such perceptions, and the differences they reveal, add complexity to our understanding of an energy transition. We see that tensions over competing imaginaries are at the core of fights over what climate change solutions should look like, and how they ought to be implemented. Studying the varying imaginations of clean energy futures, and ultimately what energy means for different actors, exemplifies the politics of climate change and energy transitions. It shows the varying imaginaries actors hold about renewable energy futures, and how these interact in the political realm. This holds importance for further research on climate change and energy transitions amidst increasing urgency, technological developments and local discontent.

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