Local Power in the US Energy System:

Municipal Policies for 100% Renewable Electricity

by

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ABSTRACT

This dissertation consists of three chapters that investigate the rapid adoption and complex implementation of city commitments to transition to 100% renewable energy (100RE). The first paper uses a two-stage, mixed methods approach to examine 100RE commitments across the US, combining a multivariate regression of demographic, institutional, and policy factors in adoption and six interview-based state case studies to discuss implementation. Adoption of this non-binding commitment progressed rapidly for city councils around the US. Results show that many cities passed 100RE commitments with no implementation plan and minimal understanding of implementation challenges. This analysis highlights that many cities will need new institutions and administrative capacities for successful implementation of these ambitious new policies. While many cities abandoned the commitment soon after adoption, collaboration allowed cities in a few states to break through and pursue implementation, examined further in the next two studies.

The second paper is a qualitative case study examining policymaking for the Utah Community Renewable Energy Act. Process tracing methods are used to identify causal factors in enacting this legislation at the state level and complementary resolutions at the local level. This Act was passed through the leadership and financial backing of major cities and committed the investor-owned utility to fulfill any city 100RE resolutions passed through 2019. Finally, the third paper is a mixed-methods, descriptive case study of the benefits of Community Choice Aggregation (CCA) in California, which many cities are using to fulfill their 100RE commitments. Cities have adopted CCAs to increase their local voice in the energy process, while fulfilling climate and energy goals.

Overall, this research shows that change in the investor-owned utility electricity system is in fact possible from the city scale, though many cities will need institutional innovation to implement these policies and achieve the change they desire. While cities with greater resources are better positioned to make an impact, smaller cities can collaborate to similarly influence the energy system. Communities are interested in lowering energy costs for customers where possible, but the central motivations in these cases were the pursuit of sustainability and increasing local voice in energy decision-making.

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INTRODUCTION

1. Localization of Energy Policy

The energy sector in the United States has historically been highly centralized, predominantly run by large, fossil-fuel based monopoly utilities. The urgency of solving anthropogenic climate change requires a rapid shift away from fossil-fuel sources, though there are many institutional barriers, particularly given the strong political influence of utilities (Brisbois, 2019; Stokes, 2020). Federal clean energy policy in the US has focused on funding research and deployment, with regulation of this transition left to lower levels of government (Hess & Gentry, 2019). While many states have pursued regulations to encourage increased adoption of renewable energy, progress at the state level has been disjointed; clean energy policy adoption tends to be reduced in areas with strong fossil-fuel sectors (Hess, 2014; Hess & Gentry, 2019).

Local governments have been stepping up to a larger role in renewable energy policy (Armstrong, 2021; Breetz et al., 2022; Hess & Gentry, 2019), highlighting several benefits of local level energy policy. First, this scale allows for greater flexibility and tailoring to local needs and the local environment, and the policies can better account for local values (Bayulgen, 2020; Busche, 2010). Communities can use local policy to address a variety of local concerns at once, such as air pollution and energy security (Bulkeley & Betsill, 2013). Cities also own significant infrastructure that they could transition to more efficient and renewable operations as well as leverage their regulatory authority over key areas such as building codes (Bayulgen, 2020). Finally, local policies also allow communities to act as test beds of innovation, later diffusing successful policies to other communities (Armstrong, 2019). Progress at this scale has been historically rare, however, as there are fewer resources available to encourage change in the entrenched investor-owned utilities (IOUs).

Energy democracy has emerged as a social movement that encourages this shift from the energy monopoly status quo to more localized solutions (Burke & Stephens, 2017). This includes both the shift from centralized fossil-fuel sources to decentralized renewable sources, as well as the shift from centralized decision-making with monopoly utilities to a more democratic system (Burke & Stephens, 2017). Democratic involvement includes the empowerment of communities to participate meaningfully in both the process and outcomes of energy decision-making (Coy et al., 2021). Decentralization of energy generation is slowly underway as electricity providers use more renewable sources, particularly as costs for renewable generation continues to drop (REN21, 2017, p. 21). Decision-making power, however, remains mostly with the IOUs operating regionally across the US. One of the few options available to a community looking to localize energy decisions has been to form a municipal utility. Even in cases of significant motivation and resources, such as in the case of Boulder, Colorado, seeking municipalization can be an expensive, drawn-out, and ultimately futile pursuit (Burke & Stephens, 2017; Homsy, 2016; Kunkel et al., 2022).

Local governments are finding new ways to claim their power and engage with IOUs through adoption of a broader range of energy policy solutions. This dissertation examines one such policy: the widespread adoption of local commitments to 100% renewable electricity (100RE) in the US. This research outlines how implementation is slowly beginning to democratize the energy system through local decision-making.

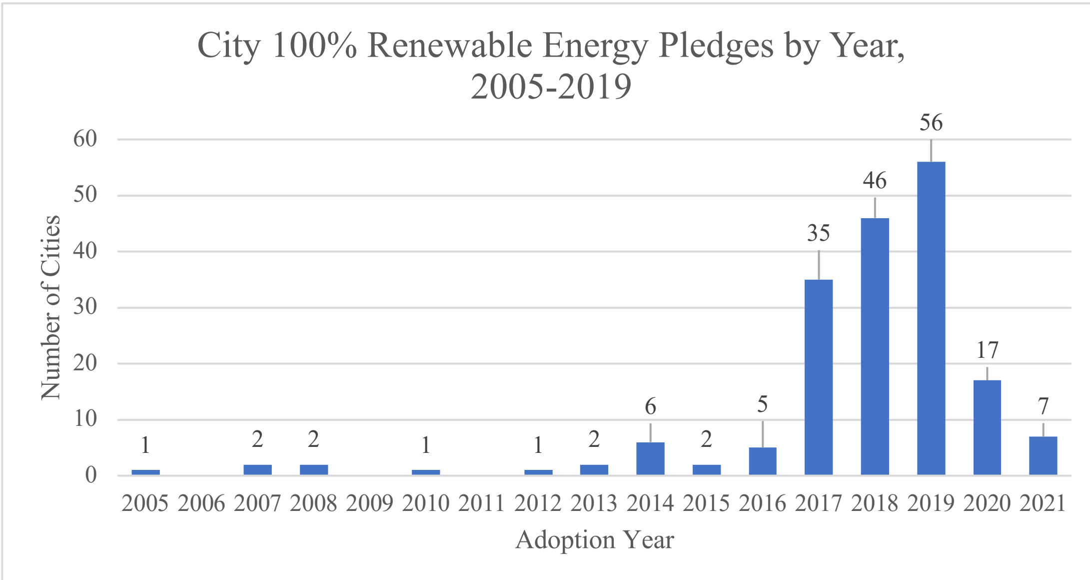
2. 100% Renewable Electricity Commitments

The transition to local policy solutions in the US accelerated following President Trump's election in November 2016 and his June 2017 announcement of intent to withdraw the US from the Paris Agreement. Announcing intention to withdraw was a signal of a major step backwards for US federal climate policy; local initiatives arose to address this gap and show disagreement with the direction of federal policy. Mayors, universities, businesses, faith and tribal leaders, and more signed the 'We Are Still In' declaration, pledging to do their part to meet the goals set in the Paris Agreement regardless of federal progress (Hess & Gentry, 2019; We Are Still In, 2022).

The Sierra Club harnessed this momentum by launching their 'Ready for 100' campaign, encouraging city governments to commit to transition their electricity consumption to 100% renewable electricity (100RE). Over the next several years, more than 180 communities committed to this goal before the Sierra Club ended the campaign in the Spring of 2022 (Figure 1) (Sierra Club, 2022).

Figure 1

Timeline of 100RE Adoption



While these city-scale 100RE resolutions are only one example of increased momentum to address climate change at the city scale, this is a particularly interesting case given the centralization of the energy system and the potential for systemic change. Most cities making this commitment do not have municipal utilities and therefore lack operational control over their energy, with limited opportunities to lobby for change (Kunkel et al., 2022). Further, 100RE commitments have been adopted by a wider variety of cities than is typically seen in sustainability policy (Breetz et al., 2022). Still, each city that committed to 100RE indicated that they were ready for change to a newer, more sustainable energy system. Where implemented successfully, these 100RE policies could significantly transform the energy sector and democratize energy decision-making.

This dissertation examines city commitments to 100RE in the United States, to investigate why and how cities decided to adopt a policy that would likely be quite challenging to enact and examine cases of cities that found unique ways to succeed in implementation.

3. Dissertation Structure

This dissertation is comprised of three chapters, each focusing on a different aspect of 100RE policy adoption and implementation (Table 1). First, chapter two uses a two-stage analysis to quantitatively examine the adoption and implementation of 100RE across the US. It analyzes the demographic, institutional, and sustainability policy factors in adoption using multivariate regression analysis, then examines implementation through case studies of the six most adopting states in the sample. Results from this chapter highlight two states—Utah and California—with unique and successful implementation approaches. The third and fourth chapters provide in-depth studies of these two states.

Chapter three provides a case study of 100RE adoption in Utah, where cities were successfully able to lobby for a state policy that required the IOU to support local 100RE implementation. The fourth chapter then examines Community Choice Aggregators (CCAs) in California, which many communities are using to achieve climate and sustainability goals, including 100RE commitments. Each of these cases provides an example of local actors successfully gaining the right to participate in energy decision making in new ways.

Table 1

Research Overview by Chapter

	Chapter 2	Chapter 3	Chapter 4
Overview	Mixed methods analysis of US adoption and implementation	Case study of 100RE adoption in Utah	Case study of CCAs in California
Purpose	Examine where and how 100RE was adopted, with implementation case studies	Examine state policy as an implementation method	Examine the proposed and real benefits of CCAs
Sample	US Adopting Cities	Utah 100RE Cities	California CCA Cities
Research Question	What types of cities have adopted 100RE? How is implementation progressing?	How did the state-level 100RE policy pass in Utah?	Are CCAs delivering on their proposed benefits?
Methods	Multivariate regression, interviews	Interviews, document analysis, process tracing	Descriptive quantitative analysis, inductive and deductive textual analysis

Chapter two found that adoption of 100RE commitments was correlated with population and higher education, but also correlated with lower incomes and higher poverty rates. This is a concern when considering the potential costs of a major energy transition but may be due to the non-binding nature of the commitment. 100RE adoption was correlated with prior green energy planning or municipal energy actions, but not correlated with sustainability policy generally. These quantitative results also raised questions about communities' institutional capacity to implement 100RE commitments, as adoption was negatively correlated with the presence of sustainability staff and locally controlled utilities.

The case studies in chapter two revealed interesting implementation trends, with potentially replicable approaches in Utah and California that are further examined in chapters three and four. Case studies further revealed typologies of city implementation styles, based on two key factors: local control of energy procurement and community financial and sustainability resources. Cities that had both community resources such as staff and financial capacity as well as institutions for local control have been able to make significant progress in implementing 100RE commitments and other sustainability policies. By contrast, cities that were lacking in one of these factors required additional support. Cities with energy jurisdiction that lacked capacity needed informational support to imitate best practices and follow the footsteps of earlier adopters. Cities without jurisdiction that had significant resources could lobby the IOU or state government to enact change. Cities that lacking in both factors made minimal progress, with interviewees sounding disheartened about their options for progress, not knowing where to begin the process.

Utah stands out as a hopeful and potentially replicable case from chapter two and was examined in greater depth in chapter three. In this case, the largest city and the wealthiest city in the state—Salt Lake City and Park City—teamed up to envision pathways to 100RE for their communities. Leveraging their resources, these communities were able to draft state legislation that would require the main IOU in the state to provide 100RE by 2030 to any community that signed on by 2019. Despite the conservative nature of the state government, policymakers were able to argue for the broadly supported values of customer choice and cleaner air. A rare win for environmental policy in Utah, the Utah Community Renewable Energy Act of 2019 has allowed 23 communities of all sizes in the state to pursue 100RE with a realistic implementation plan and utility involvement.

Finally, in chapter four, California provides an example of localized energy decision-making through CCAs. While CCA-enabling legislation was passed in California in 2002, and CCAs have been operating in the state for the last decade, these entities are now seeing broader adoption as a way for cities to implement local climate and sustainability goals while increasing local energy democracy. This study found that CCAs can deliver minor cost savings to customers with an average 9% additional renewable energy compared to the IOU. Nearly all CCAs also offer cost competitive 100RE options, though these are underutilized. CCAs also discuss the increased local input, operation, and reinvestment in community as key benefits beyond the IOU.

This dissertation is organized as follows. Each of the three papers will include an overview of the study topic, followed by the research methods used, results, and conclusion. First, chapter two presents a two-stage mixed methods analysis that quantitatively examines adoption trends, followed by qualitative case studies of implementation. Chapter three then expands on one of these case studies, using process tracing to examine the Utah Community Renewable Energy Act of 2019. Chapter four then examines the benefits of CCAs in California, including their ability to implement 100RE goals. Finally, the dissertation will conclude with an overview of the policy implications from this body of work.

CHAPTER 2

100% RENEWABLE ELECTRICITY POLICIES IN U.S. CITIES: MIXED METHODS ANALYSIS OF ADOPTION AND IMPLEMENTATION

Abstract

Since 2016, nearly 180 US cities have committed to 100% renewable electricity (100RE). This paper uses a two-stage, mixed methods approach to examine adoption and implementation of these ambitious new policies, highlighting that many cities will need new institutions and administrative capacities for successful implementation. We first conduct a multivariate regression to examine demographic, institutional, and policy factors in 100RE adoption. Although adoption is correlated with prior municipal and green energy policies, adopting cities are no more likely to have key institutional resources to support implementation, such as locally controlled utilities, sustainability staff, or city managers. An unexpected correlation with poverty rates raises further questions about potential policy costs and the importance of developing financial and administrative capacity for policy design. To examine how cities are addressing these challenges, we subsequently conduct case studies of implementation in six states. We find that cities in different states are pursuing markedly different implementation pathways, showing that state-specific policies and networks shape how cities address institutional challenges. Although there are multiple approaches for implementation, successful 100RE commitments required institutional innovation, communication, and networking.

1. Introduction

US cities have been national leaders in climate action since the early 2000s, motivated by the federal government's inaction on climate policy (Betsill & Bulkeley, 2007; Doran, 2006; Stokes & Breetz, 2020). In contrast to their leadership on climate, cities have not played a prominent role in energy policy. Following the election of President Trump in 2016, and his 2017 announcement of intent to withdraw from the Paris Agreement, however, local communities have become more involved in energy transitions (Graff et al., 2018).

One rapidly-growing policy trend are city commitments to 100% renewable electricity (100RE), spurred by the Sierra Club's "Ready for 100" campaign (Adesanya et al., 2020; Hess & Gentry, 2019; Martinez et al., 2018; Skill et al., 2020, 2021). Nearly 180 US cities have now committed to 100RE by dates through 2050 (Sierra Club, 2022). Many of these cities defy conventional expectations about sustainability policy adoption. Sustainability policies are typically adopted by large, affluent, liberal cities (Krause, 2011; Lubell et al., 2009; Salon et al., 2014). In contrast, cities adopting 100RE commitments include a diverse array of college towns, rural agricultural towns, suburbs, ski towns, tourist destinations, and major cities. These discrepancies raise novel questions about why cities adopt these policies and whether they have the resources for implementation.

Since 100RE policies are new, few scholarly articles have examined them to date (Adesanya et al., 2020; Hess & Gentry, 2019; Long & Kincaid, 2018; Martinez et al., 2018; Skill et al., 2020, 2021). This paper builds on this nascent literature in two ways. First, we leverage a 2015 sustainability survey as a 'pre-test' to quantitatively analyze demographic, institutional, and sustainability policy factors in 100RE adoption, with the largest sample size to date (N = 179). Second, we conduct qualitative case studies of implementation pathways in six states to follow up on counterintuitive results from the quantitative analysis.

The regression finds that while 100RE policies are correlated with green energy action, they are not correlated with sustainability staff, council-manager governments, or locally controlled utilities. In addition, 100RE policies are unexpectedly correlated with higher poverty rates. Together these raise concerns about whether cities have the institutional, administrative, and financial capacities for implementation. Case studies subsequently show that while implementation pathways vary with state policies, resources, and institutions, it is critical to have local voice in energy decisions. This is most easily achieved through a municipal utility or community choice aggregator (CCA). Cities without these institutional options are innovating to find additional implementation pathways.

This paper begins with a review of prior literature on urban sustainability policy (Section 2). Next, it describes methods and data sources (Section 3). Results are presented from the quantitative analysis (Section 4) and case studies (Section 5). To close, it discusses the findings (Section 6) and policy implications (Section 7).

2. Literature Review

We review the literature on urban energy and climate policy adoption, which we draw on for regression variables. We then review the literature on pathways and barriers to implementation of municipal energy policy, which informs the case studies.

2.1 Factors in Policy Adoption

Many empirical studies of urban sustainability policy adoption focus on demographic factors. Literature consistently finds that larger, wealthier, and better educated cities are more likely to adopt energy, climate, and sustainability policies (Armstrong, 2019; Bayulgen, 2020; Huang et al., 2007; Krause, 2011; St. Louis & Millard-Ball, 2016; Yi, 2013). These cities often have more administrative capacity to implement environmental policy, though samples may be biased as they also have more capacity to respond to surveys (Krause, 2011; Salon et al., 2014). Cities in certain states—generally more populated, politically liberal states—are also more likely to adopt sustainability policies (Kwon et al., 2014; St. Louis & Millard-Ball, 2016). This is likely due to stricter top-down requirements from the state as well as a more supportive political environment, though this influence varies across policy types (Kwon et al., 2014). Similarly, 100RE commitments have been pursued in politically liberal communities, though a variety of cities with different demographic compositions and ideologies have adopted 100RE (Adesanya et al., 2020; Martinez et al., 2018), including in Republican dominated cities and states (Long & Kincaid, 2018; Skill et al., 2020).

Local institutions and resources also impact sustainability policymaking. Prior studies have found that cities with municipal utilities are more likely to adopt energy policies (Homsy, 2016). This indicates that locally owned utilities provide expertise and capacity for implementing energy policies, though less than 15% of US customers are served by municipal utilities (Homsy, 2016; Krause, 2011). Research on 100RE policies also finds that having a university as a major industry can be an enabling factor (Hess & Gentry, 2019; Long & Kincaid, 2018). City governmental institutions also affect policy adoption. Some studies find that sustainability action is positively correlated with mayor-council governments (Krause, 2011; Kwon et al., 2014; Yi et al., 2017). Other research finds that town leader engagement is more important, regardless of city government structure (Bayulgen, 2020). The presence of dedicated sustainability staff and resources also impacts the breadth and depth of policies implemented (Hess & Gentry, 2019; Krause, 2011; Salon et al., 2014; Skill et al., 2020, 2021). Lack of financial resources and staff time hinders progress on climate action and creates conflicts with other budget priorities (Salon et al., 2014).

In addition to demographic and institutional factors, local issue framing is critical to successful adoption of local climate action (Bassett & Shandas, 2010; Betsill & Bulkeley, 2007; Foss, 2018; Salon et al., 2014). Within cities that generally support climate and sustainability action, policies were often framed in terms of environmental goals (Salon et al., 2014). Other cities tended to focus more on local benefits, such as reducing air pollution, green jobs, or reducing climate impacts on local industries in beach or ski towns (Hess & Gentry, 2019; Salon et al., 2014; Skill et al., 2020, 2021). Economic concerns were also significant (Martinez et al., 2018), and included potential costs for citizens and lost jobs in the fossil fuel industry (Hess & Gentry, 2019). These results are similar to those found in urban energy policy (Bayulgen, 2020; Chmutina et al., 2014; Pitt & Bassett, 2013). Finally, while policy adoption showed broad success, implementation has proven far more challenging (Stokes & Breetz, 2020).

2.2 Institutional Challenges for Policy Implementation

100RE commitments face a variety of implementation challenges. First, many cities adopt 100RE policies without having operational control over their electricity. Cities that have achieved their 100RE goals have done so through locally controlled utilities (Adesanya et al., 2020). Most cities with 100RE goals, however, are served by investor-owned utilities (IOUs); these cities are setting goals that they cannot achieve on their own. They will need to figure out how to gain control over electricity procurement, whether by municipalizing their energy operations, partnering with IOUs, creating or joining a CCA, purchasing sufficient renewable electricity certificates, or innovating with other institutional arrangements. Given the challenges of municipalization, it is likely that cities will pursue institutional change through some form of "layering"—adding rules and regulations to existing institutions—rather than replacing IOUs entirely (Laird, 2016). For example, CCA legislation, which has been passed in 10 states, grants cities the ability to procure electricity for their residents while the IOU continues to provide delivery (Burke & Stephens, 2017).

Unsupportive or oppositional state policies can create additional barriers. Some states have policies that help facilitate 100RE implementation, such as enabling legislation for local energy action (e.g., California's CCA authorization or Utah's 100RE program) or complementary utility regulations such as Renewable Portfolio Standards (Adesanya et al., 2020). In other states, there are few pathways for cities to gain greater control over electricity procurement and few incentives for IOUs to take action on renewables. In some cases, states may even reactively ban cities from setting their own energy policies—a trend spreading across the US. For example, after municipalities' sought to regulate natural gas infrastructure through land use regulations, Pennsylvania legislators banned such local action (Negro, 2012). Similarly, in Florida, state legislators have now preempted any restriction of utility services, which includes cities' non-binding commitments to 100RE (Pontecorvo & Rivers, 2021).

Another challenge is that transitions to localized control of energy decisions often face resistance from incumbent electric utilities (Burke & Stephens, 2017; Hess, 2018, 2019a). Utilities are well-established, politically connected, and in control of information about the electrical grid, making it difficult for local governments to adequately analyze the potential for transition (Brisbois, 2019). These characteristics also make incumbent utilities more likely to attempt to delay or avoid the transition, particularly when it may reduce their control or legitimacy, and when the pressure to change is minimal (van Mossel et al., 2018). Given that many cities depend on IOU partnerships for 100RE implementation, these conflicts can strongly influence the success of these policies.

Finally, ambiguous policy design has left many cities without a clear direction for implementation. 100RE commitments often focus on policy goals, without specifying policy instruments to achieve those goals (Burke & Stephens, 2017). This approach to policymaking reduces barriers to adoption and allows for more flexible implementation, but still requires local resources and capacity for policy design (Voß et al., 2009). Cities' approaches may vary broadly based on local context, even across a single solution, such as municipal utility design (Roelich et al., 2018).

These challenges suggest that many cities lack off-the-shelf pathways to achieving 100RE. Cities served by IOUs in particular, will need to develop new institutions or pathways for implementation. Potential backlash from state policymakers and utilities may also need to be navigated. Overcoming these barriers will be challenging and will require a high level of capacity and leadership from cities.

3. Methods & Data Sources

3.1 Model Specification

Our multivariate regression model is informed by prior studies using the International City and County Management Association (ICMA) surveys to understand urban policy adoption (Hawkins et al., 2016; Homsy, 2016; Kwon et al., 2014; Osgood et al., 2017; Salon et al., 2014). We use a standard linear probability model to assess how the adoption of 100RE policies (*RE*) is correlated with demographics (D_i), institutional arrangements (I_i), and prior sustainability actions (S_i), along with associated coefficients (β) and the error term (ϵ). We estimate this regression model using ordinary least squares (OLS), with heteroskedasticity-robust standard errors (Wooldridge, 2016).

$$RE_i = \beta_0 + \beta_D' D_i + \beta_I' I_i + \beta_S' S_i + \epsilon_i$$

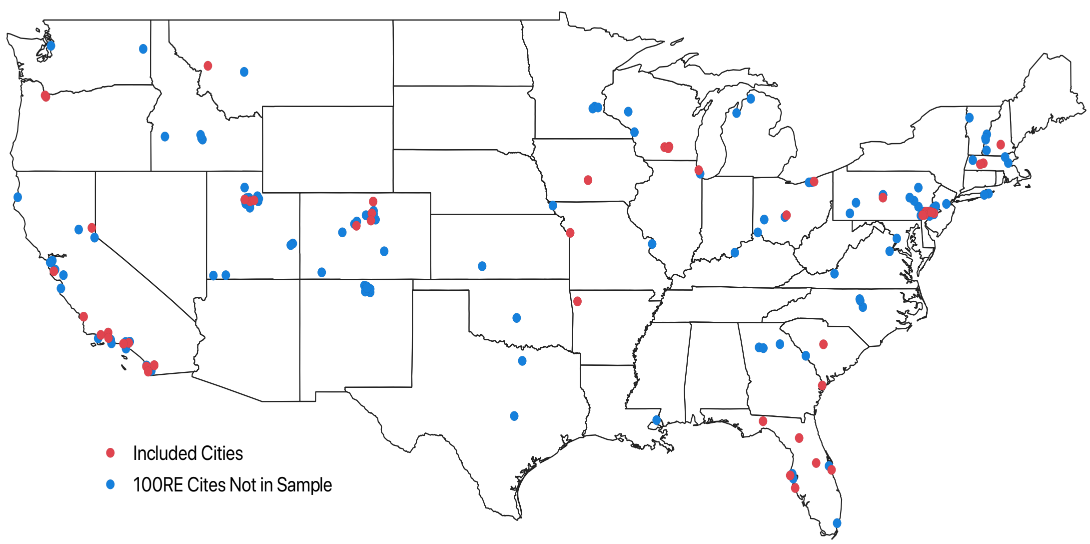
3.2 Variables and Data Sources

The dependent variable is the presence of a 100RE commitment by June 30, 2021 (Sierra Club, 2022). Independent variables, which vary across models, are drawn from the 2015 ICMA Sustainability Survey and the 2014 American Community Survey (ACS), and Carnegie Classifications of Universities (Table 2). Since most 100RE commitments were made after the Sierra Club's "Ready for 100" campaign launched in 2016, the 2015 ICMA survey functions as a pre-test of cities' sustainability actions.

The ICMA Sustainability Survey was sent to over 8,500 US cities and counties and received almost 1,900 responses (22.2%), including 49 100RE cities (Figure 2). While not representative of all 100RE cities, it enables an initial analysis of this emerging policy trend. For the regional distribution of cities in the ICMA survey, see Appendix B, Figure 20.

Figure 2

All 100RE cities through June 2021



Note: Kodiak, AK not pictured.

The ICMA survey had 39 questions, including questions on sustainability plans, municipal utilities, and energy conservation programs. We use the nine questions about energy or general sustainability actions (Appendix A). Questions about water, air quality, and natural disasters were excluded as outside of the scope of urban energy transitions. Key questions on sustainability and energy include:

- Has your jurisdiction adopted a sustainability plan?
- Does your local government own a municipal electric utility?
- Which of the following energy actions has your jurisdiction taken in the last five years? (Ex: fuel efficiency target, efficiency audits, energy retrofits, building certifications, etc.)

Demographic variables were selected based on prior literature, as discussed above. Variables are described in Table 2. Additional factors were considered but dropped in the final analysis, including whether a city is a member of the International Council for Local Environmental Initiatives (ICLEI) (Kwon et al., 2014; Salon et al., 2014) or in a state with historically strong environmental action or a Renewable Portfolio Standard (RPS). These were tested with dummy variables but removed from the final model as they were consistently insignificant.

Table 2

Description of Variables for ICMA Sample

Variable	Description	Operationalization	Mean	Standard Error	Source
100RE	City adoption of pledge to transition to 100% renewable electricity	Adopted = 1; Not adopted = 0	0.0298	0.1701	Sierra Club, Ready for 100
Population	City population as of 2015; Min = 97, max = 3.9mil, mean = 45.7k	Local population, normalized by max pop. in sample	0.0106	0.0374	ACS 2014
Median Income	Median household income in the city as of 2015; Min = $4,268, max = $92,702, mean = $28,180	Median income, normalized by max income in sample	0.3040	0.1094	ACS 2014
Percent White	Percentage of population identifying as white only	Population of white residents, divided by total local pop.	0.8111	0.1682	ACS 2014
Percent Bachelor's	Percentage of population with a bachelor's degree	Residents with bachelor's degrees, by total local pop.	0.1222	0.0618	ACS 2014
Percent Below Poverty Line	Percentage of population with median income below the poverty line	Population of residents below the poverty line, divided by total local pop.	0.1452	0.0804	ACS 2014

University Binary	Presence of a Doctoral University	Has University = 1; No University = 0	0.0278	0.1644	Carnegie Classifications
Sustainability Staffing	“Which scenario best describes your jurisdiction's staffing on sustainability?”	Dedicated staffing = 1; No dedicated staffing = 0	0.7722	0.4195	ICMA 2015 Sustainability Survey
Form of Government	Form of City Government; only includes Mayor-Council and Council-Manager	Mayor-Council = 1; Council-Manager = 0	0.2732	0.4458	ICMA 2015 Sustainability Survey
Municipal Utility	“Does your local government own any of the following municipal utilities?”	Electric utility selected = 1; No response = 0	0.1280	0.3343	ICMA 2015 Sustainability Survey
Electric Cooperative	“Is any part of your community served by an electric cooperative?”	Yes = 1, No = 0	0.2748	0.4466	ICMA 2015 Sustainability Survey
Sustainability Plan	"Has your jurisdiction adopted a sustainability plan?"	Yes = 1, No = 0	0.3040	0.4601	ICMA 2015 Sustainability Survey
Sust. Plan w/ Energy Conservation	"If yes, please indicate if the plan contains goals or strategies for any of the following. (Check all	Contained in Plan = 1, Not in Plan = 0	0.1917	0.3938	ICMA 2015 Sustainability Survey

	that apply)" – Energy Conservation				
Sust. Plan w/ Green Energy	"…" – Green Energy Production	Contained in Plan = 1, Not in Plan = 0	0.1226	0.3281	ICMA 2015 Sustainability Survey
City Energy Actions	"Which of the following energy actions has your jurisdiction taken in the last five years? (Check all that apply)"	Count of all selected, normalized by total options (15).	0.2851	0.2130	ICMA 2015 Sustainability Survey
Community Energy Actions	"Does your government provide or support any of the following programs to the community? (Check all that apply)"	Count of all selected, normalized by total options (10).	0.1216	0.2327	ICMA 2015 Sustainability Survey
Party of Highest Elected Official	"The highest elected official in my jurisdiction is"	Republican = 0, Democrat = 1, Other and no response removed	0.3994	0.4902	ICMA 2015 Sustainability Survey
Party of Governing Body	"The governing body in my jurisdiction is majority"	Republican = 0, Democrat = 1, Other and no response removed	0.4015	0.4907	ICMA 2015 Sustainability Survey

3.3 Case Study Analysis

The regression raised possible concerns for implementation, particularly for cities that adopt 100RE commitments without locally controlled utilities or sustainability staff. We therefore follow up with case studies to examine how these factors are affecting implementation. We conduct these case studies at the state level, as both the implementation literature and our regression results identified the importance of state-level factors. We selected the six states in the ICMA sample with more than two 100RE cities (California, Colorado, Florida, Pennsylvania, Utah, and Wisconsin) to allow for both intrastate and interstate comparison.

Case study data is from 26 semi-structured interviews with policy stakeholders, supported by documents and media. Interviews were conducted with a central implementor of a city's 100RE policy—typically a current or former city government or utility employee—with a minimum of three interviews per state. Their roles included city planner, sustainability coordinator, public works project manager, clean energy plan manager, director of climate initiatives, associate director of infrastructure, special projects manager, AmeriCorps fellow, and arborist. Interviewees were contacted via email, with interviews conducted over the phone or via Zoom. They included questions about the process and motivations for 100RE adoption, progress on implementation, as well as challenges and supportive factors.

Prior qualitative research on municipal 100RE policies has largely focused on adoption (Adesanya et al., 2020; Hess & Gentry, 2019; Long & Kincaid, 2018; Martinez et al., 2018; Skill et al., 2020, 2021). Our case studies extend this literature by focusing on implementation pathways and barriers, rather than adoption alone. In addition, these case studies are intended to be compared across states to determine a more generalized understanding of how large-scale dynamics influence local policymaking.

4. Regression Results

4.1 Summary Statistics

To assess the representativeness of the sample, Table 3 presents summary statistics on demographic data for four samples: all US cities (N = 52,826), the ICMA survey sample excluding 100RE cities (N = 1,427), all US cities with 100RE resolutions (N = 179), and 100RE cities within the ICMA sample (N = 49). Cities responding to the ICMA survey are larger, wealthier, more diverse, and more educated than the US average. The 100RE cities are even more pronounced on these factors, consistent with prior research on urban environmental policy (Lubell et al., 2009). Overall, this indicates that the ICMA sample is not fully representative of US municipalities. In particular, there are many small towns in the US, including dozens with 100RE commitments, that are not captured in this dataset.

Table 3

Summary Demographic Statistics of the ICMA Sample.

	All US (N = 52,826)	All ICMA (N = 1,427)	All 100RE (N = 179)	100RE in Sample (N = 49)
	Mean, (S.E.)	Mean, (S.E.)	Mean, (S.E.)	Mean, (S.E.)
Population	8,623 (62,193)	33,234 (82,779)	135,911 (400,600)	210,169 (588,087)
Median Income	$ 26,489 ($ 10,169)	$ 29,310 ($ 10,529)	$ 30,220 ($ 12,522)	$ 29,917 ($ 11,864)
% White	87.17% (19.18%)	82.20% (16.44%)	79.25% (16.13%)	77.84% (14.73%)
% Bachelor's	9.46% (7.25%)	12.48% (6.09%)	16.84% (6.74%)	16.88% (5.58%)
% Below Poverty Line	14.33% (11.73%)	13.42% (7.86%)	14.40% (9.31%)	15.77% (8.50%)

Note. Includes median value and standard error. Source: 2015 American Community Survey.

We also want to mention the ICMA survey's two questions about political partisanship, which could not be included in the regression due to low response rates. Out of the 49 100RE cities in the ICMA sample, four have a Republican as the highest elected official, and 21 have a Democrat (20 marked no party affiliation, and four declined to answer). In their governing bodies, one has a Republican majority and 23 have a

Democratic majority (the remainder marked no party affiliation, other, or declined to answer). In contrast, among non-100RE cities in the survey (N = 1,427), 26% have a Republican as the highest elected official and 16% have a Democrat, while governing bodies are 22% Republican-led and 14% Democrat-led. This data, while partial, suggests that 100RE adoption may be more common in cities led by Democrats. Responses are consistent with prior findings that governments led by Democratic officials are more likely to adopt sustainability policies (Lubell et al., 2009).

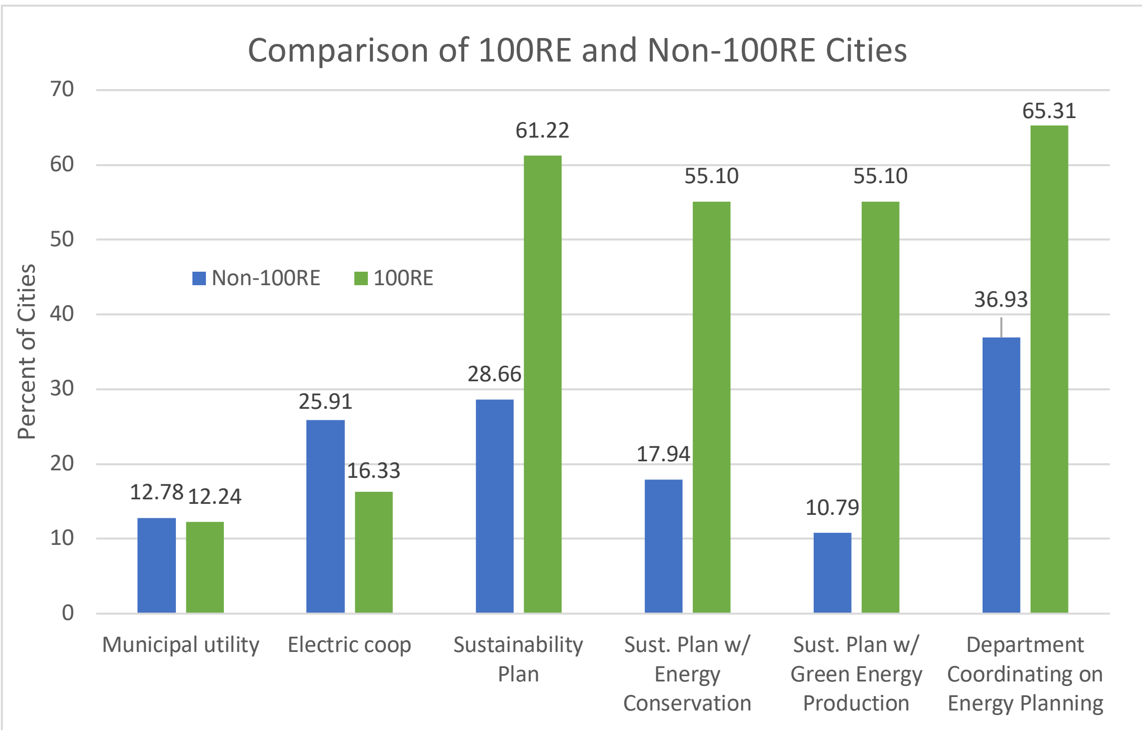
4.2 Univariate Comparisons

A series of contingency tables were calculated comparing 100RE cities with each of the discrete variables listed in Table 2 (see Appendix B Table 10, for these full results). Pearson's chi-squared tests found that the presence of a sustainability plan was a significant predictor of 100RE commitments ($p<0.01$). This relationship also holds for plans with provisions for energy conservation and green energy production ($p<0.01$). The chi-squared results for these categories of sustainability plans were 22.77, 42.22, and 86.45, respectively. Dedicated sustainability staffing was also significant ($p<0.01$), with a chi-squared of 14.28.

Comparisons of key institutional and policy variables (Figure 3) show that 100RE cities have slightly lower prevalence of municipal utilities, lower prevalence of electric co-ops, and greater prevalence of sustainability plans. These findings are similar to regression results, though not all sustainability plans were statistically significant (Table 4). The survey also asked if cities had departments for specific sustainability issues. This question was excluded from the regression due to missing data, but among the responding cities, cities with an energy planning department were more likely to adopt 100RE commitments. While these results show that many 100RE cities have experience with and capacity for sustainability planning, nearly half lack these resources, suggesting that they may struggle to implement new 100RE commitments.

Figure 3

Comparison of Key Energy Institutions and Policies in 100RE & Non-100RE Cities



4.3 Multivariate Regression Models

The regression models (Table 4) progressively analyze factors in 100RE commitments. Model 1 focuses on demographics, Model 2 adds institutions, and Model 3 adds sustainability survey responses. Model 4 removes demographic variables for two reasons. First, as previously discussed, relationships between demographics and urban sustainability actions have been widely studied, while studies of sustainability actions as predictors are limited. Next, demographic factors may be strong correlates of both 100RE decisions and other sustainability actions; this collinearity may limit our ability to discern the influence of sustainability actions on 100RE commitments if demographics are retained as covariates.

Demographic variables had mixed results, and significance declined as further variables were added to the regression. In Model 1, consistent with prior literature, population and college education had significant positive relationships with 100RE commitments ($p<.01$), with large magnitudes of effect. Contrary to prior literature, 100RE commitments were more likely in cities with lower median income and higher poverty rates ($p<.05$, $p<.01$), though median income loses significance after Model 1. The percent of white residents was positive and significant only in Model 3 ($p<.10$). These relationships are robust to an expanded sample of all US cities (N = 52,826) and all 100RE cities (N = 179) (Appendix B, Table 9), though the ICMA sample results show stronger magnitudes of effect than the all-US sample.

Including institutional variables reveals several counterintuitive results. Presence of a research university was consistently significant and positive (Model 2: $p<.05$, 3: $p<.10$, 4: $p<.01$), with a large magnitude of effect, consistent with Hess & Gentry (2019). Dedicated sustainability staff, city managers, or locally controlled electric utilities were also expected to increase the likelihood of adoption; we found, however, that none were positively correlated with adoption. Cities with dedicated sustainability staffing were significantly less likely to adopt a 100RE commitment (Model 2: $p<.01$, 3, 4: $p<.05$). Cities with municipal utilities or electric cooperatives were also less likely to adopt

100RE commitments, albeit with limited significance. Electric cooperatives have no significant effect, while municipal utilities are negatively correlated with 100RE commitments (Model 3: $p<.10$). Form of government was not found significant, adding to the mixed results of prior research (Bayulgen, 2020; Homsy, 2016; Krause, 2011).

For policy variables, the presence of a general sustainability plan, a plan with energy conservation provisions, or community energy actions had no statistically significant effect. While all sustainability plans were found significant in univariate analysis, multivariate models show that only cities whose sustainability plan includes a green energy provision are more likely to have adopted 100RE commitments ($p<.01$). Additionally, 100RE commitments are positively correlated with the count of green energy actions for municipal operations (Model 3: $p<.05$, 4: $p<.01$). This has the largest magnitude of effect of the policy variables (Model 3: 0.082, Model 4: 0.103), followed by sustainability plans with green energy provisions (Model 3: 0.068, Model 4: 0.089). These results suggest that 100RE commitments are correlated with specific, internal energy policy experience, but not with energy or sustainability policy in general.

While the R-squared values are small, these results are consistent with prior research using ICMA surveys (Hawkins et al., 2016; Kwon et al., 2014) as well as the lower R-squared values often observed in models with binary dependent variables. As an additional robustness check, each model was recalculated based on the most restrictive sample (N = 1,244), revealing that sample size variation from missing data for particular regressors does not affect the results, beyond a small reduction in significance from the third and fourth models (Appendix B, Table 8).

Table 4

Linear Probability Models of 100RE Policy Adoption vs Non-Adoption

	Model 1 Demographics Only	Model 2 Demographics + Institutions	Model 3 Full Model	Model 4 Full w/o Demographics
	N = 1,462	*N = 1,261*	*N = 1,244*	*N = 1,255*
Population (normalized)	1.049***	0.719***	0.571**	
	(.023)	(0.22)	(0.24)	
Median Income (normalized)	–0.224**	-0.159	–0.148	
	(0.09)	(0.10)	(0.10)	
Percent White	0.025	0.037	0.058*	
	(0.03)	(0.03)	(0.03)	
Percent Bachelor's	0.869***	0.747***	0.632***	
	(0.17)	(0.17)	(0.16)	
Percent Pov. Line	0.275***	0.222**	0.218**	
	(0.10)	(0.10)	(0.10)	
University Binary		0.157**	0.134*	0.180***
		(0.07)	(0.07)	(0.07)
		–0.048***	–0.031**	–0.034**

Sustainability Staffing		(0.02)	(0.01)	(0.02)
Form of Government		0.006	0.015	0.015
		(0.01)	(0.01)	(0.01)
Municipal Utility		–0.010	–0.021*	–0.017
		(0.01)	(0.01)	(0.01)
Electric Cooperative		–0.011	–0.011	–0.014
		(0.01)	(0.01)	(0.01)
Sustainability Plan			–0.020	–0.025*
			(0.01)	-0.01
Sustainability Plan w/ Energy Conservation			–0.015	–0.014
			(0.02)	-0.02
Sustainability Plan w/ Green Energy			0.082***	0.096***
			(0.03)	-0.03
City Energy Actions			0.073**	0.113***
			(0.04)	-0.04
			0.027	0.017

Community Energy Actions			(0.03)	-0.03
Constant	–0.075	–0.042	–0.087*	0.020
	(0.05)	(0.05)	(0.05)	(0.02)
R-Squared	0.1721	0.1747	0.1446	0.116

* p<0.10 ** p<0.05 *** p<0.01

Heteroskedasticity-robust standard errors in parenthesis.

5. Case Study Results

The quantitative results raised several concerns for implementation capacity, particularly for cities without locally controlled utilities and sustainability staffing. To understand how cities are addressing these institutional gaps, we conduct case studies of six US states, focusing on patterns in implementation.

Table 5

Description of State Case Studies

State	Total Adopting Cities	Adopting Cities in ICMA Sample	Total Cities in ICMA Sample	Number of Interviews	State Renewable Standard[1]
California	30	12	102	6	100% by 2045
Colorado	13	4	26	4	100% by 2050
Florida	11	6	78	3	None
Pennsylvania	31	7	95	4	18% by 2021
Utah	21	3	16	5	20% by 2025[2]
Wisconsin	5	3	42	3	10% by 2015

Note: One interview with a national Sierra Club employee was also conducted.

[1]Several states have standards that increase over time. This table only includes the latter date (National Conference of State Legislatures, 2021).

[2]Voluntary commitment

5.1 California

California's 100RE cities have made the most progress on implementation, largely through Community Choice Aggregators (CCAs). CCAs offer a codified pathway for cities of nearly any size in California to pursue 100RE. CCAs are proving successful and popular, with adoption broadening past typical sustainability leaders (Armstrong, 2019), though there are still some participation barriers and implementation details that cities must address to achieve their 100RE goals.

The CCA movement began in the 1990s to increase local control over electricity during state-level restructuring, as cities sought to enhance cost savings, governance, and sustainability (Hess, 2019a). While authorized in 10 states (LEAN Energy US, 2021), the CCA model is most fully developed in California (Hess, 2019a). Although they were not created for the purpose of implementing 100RE commitments, CCAs have been critical to California cities realizing these goals. In fact, every 100RE city in California either has a municipal utility, a CCA, or lies within a county that is working towards a CCA (CalCCA, 2022b). By the end of this year, around 30% of California's IOU load will be served by a CCA, largely within highly populated coastal areas (Micek, 2021).

While CCAs typically expand access to increased renewable electricity, they do not guarantee 100RE achievement. California CCAs are opt-out, meaning that they do not necessarily serve the total population, as residents can choose to unenroll. With costs generally comparable or slightly cheaper than utilities (Armstrong, 2019), CCAs see an average of 7% of customers opt-out (CalCCA, 2022b). While this is modest, it may still factor into 100RE accounting. In addition, not all offer a 100% renewable option, and customers may need to opt-up to this higher percentage. Finally, CCAs offer net renewable shares balanced annually or monthly, though some hope to shift towards real-time renewable electricity.

A significant financial challenge remaining for California CCAs is the Power Charge Indifference Adjustment (PCIA). This fee ensures that CCAs pay all costs that would be incurred by the remaining utility ratepayers when CCA customers exit the incumbent utility. Many interviewees described this charge as a highly contested issue. While the PCIA will decrease over time as energy procurement contracts end, it currently adds to CCA cost concerns. Costs to low-income individuals are another concern noted by interviewees, though these costs will continue to be mitigated through IOU distribution programs, even as CCAs expand.

As in other states, California communities with fewer financial and staff resources can still struggle to engage on energy issues. To overcome these challenges, communities developed collaborative networks to share resources and provide mutual assistance. For example, smaller communities that find it cost prohibitive to form their own CCA, due in part to the PCIA, may opt instead to join larger, existing CCAs. CCAs therefore do not necessarily mean the community has sole control over their energy decisions, although decision making is more localized than with the former IOU.

CCAs are a significant institutional innovation that emerged over the past decade, allowing California cities to make the most progress toward 100RE implementation. Creation of early CCAs in California required significant time and effort to wrest control of energy procurement from incumbent utilities. Now that the model is fully developed, CCAs offer increased decision-making that was previously only available to communities with locally controlled utilities. Although barriers remain for smaller communities with staff and financial constraints, CCAs are a relatively straightforward pathway to increased renewable electricity procurement. California is the only state in this study that has authorized CCAs; cities in other states have faced more challenges in devising their implementation strategies.

5.2 Colorado

Progress towards implementation in Colorado varies with utility type. For 100RE communities with a municipal utility or local cooperative (e.g., Fort Collins), implementation is relatively straightforward, though these communities still face concerns about grid reliability and costs. While most of Colorado's area is served by electric cooperatives or municipal utilities (Colorado Energy Office, 2021), 100RE commitments are more common in the more populated areas served by IOUs. Most Colorado cities with 100RE commitments therefore rely on IOUs for implementation. As such, innovation for 100RE implementation in Colorado has focused on finding new ways to work with IOUs, while simultaneously pushing for supportive state-level sustainability policies.

A few cities in IOU territory have been successful in crafting new agreements with the utility towards increased renewable energy. One of the leaders is the City of Boulder, which battled with Xcel Energy in a decade-long attempt to form a municipal utility. Eventually, instead of municipalizing, Boulder negotiated an updated franchise agreement with Xcel. Departing from the typical 10-20-year contract, Boulder and Xcel agreed to an innovative 1-2-year cycle with opt-out windows tied to emissions reductions, renewables, and innovation. This agreement could serve as an example to other communities that want sustainable change but are unable to leave their electric utility—likely the case for many cities in the US. On the other hand, not all cities have the political and legal resources to negotiate these innovative contracts. No other communities in Colorado have followed Boulder's franchise agreement, though some negotiated memorandums of understanding with their utility for an informal, but written, shared commitment to increased renewable electricity.

Broader efforts towards an enabling state policy environment are led by a collaborative policy group, Colorado Communities for Climate Action (CC4CA). This group includes a diverse set of 37 cities and counties, representing a quarter of Colorado's population, with each community as a voting member. It funds a group lobbyist and executive director through community dues, providing shared voice for its policy agenda at the state legislature and Public Utilities Commission (PUC). Their current work impacts nearly 40 bills in the state legislature, including helping to stop the passage of laws preempting city bans of natural gas infrastructure (CC4CA, 2021). While CC4CA does not specifically focus on 100RE implementation, their advocacy may encourage IOUs and the PUC to cooperate with cities pursuing 100RE and could increase city confidence to approach these entities for support.

CC4CA is the most robust collaborative effort across the six states in this study, and it shows how state-level networks can support city-level policymaking. In particular, it shows how larger cities can help address capacity gaps in smaller or less resourced cities. CC4CA was established and is led by large, progressive cities with significant staff and financial capacity. Smaller cities sometimes still struggle to participate, especially if they rely on volunteer capacity for sustainability projects. The formalized structure of this collaborative, however, ensures smoother personnel turnover regardless of city size and capacity. Nevertheless, while CC4CA has increased advocacy from communities on climate issues in the state legislature, local policies are not a focus. Further, the state legislature has fluctuated in its commitment to environmental issues as political leadership has changed, though liberal government administrations recently spurred progress on these issues.

The overarching challenge is that many Colorado cities passed 100RE commitments as aspirational and symbolic goals, without plans for implementation. The Sierra Club pitched the commitment as an ambitious goal that would push policy change at the state and utility scale. In one city, the sustainability advisory board recommended against the resolution, but Sierra Club advocates swayed the votes in favor of adoption, arguing that future technology and cost changes would make 100RE more achievable. After adoption, however, the Sierra Club was not involved in this community to aid with implementation, and the city has struggled to develop a plan to achieve their goals. While collaborative efforts and examples from prominent cities like Boulder provide some assistance, cities lack a codified pathway to 100RE implementation. It remains a challenge for each city to determine their individual implementation plan.

5.3 Florida

Progress on 100RE implementation in Florida is dependent on utility type and complicated by an oppositional state legislature. Given the lack of a statewide RPS, liberal cities took a stand with their 100RE policies—the political response from state legislators was a recent ban on city-level regulation of energy sources (HB919), specifically responding to and voiding city 100RE commitments (Pontecorvo & Rivers, 2021; Preemption Over Restriction of Utility Services, 2021). Cities with locally controlled utilities have begun implementation and are more insulated from state opposition. Conversely, cities with IOUs have made minimal progress, with no clear implementation pathway and now challenging legal circumstances.

The tension between liberal cities and the conservative-dominated legislature has played out in numerous sustainability policy issues. State legislators have used preemptive bans to oppose city-level sustainability policies, including on plastic bags, natural gas infrastructure, and the recent regulation of energy sourcing (HB919). These preemptive state policies have been adopted in several Republican-led states in recent years. The ban on municipal regulation of energy sourcing (HB919) may not fully block 100RE commitments, as it does not prevent utilities from regulating energy sources. Nevertheless, HB919 is likely to cool 100RE efforts as cities seek to avoid potential court cases.

Local utility control in Florida facilitates collaborative projects, provides a pathway to 100RE, and offers insulation from some oppositional state policies. Not all of these are municipally operated, however, leading to slight misalignment in goals. The Orlando Utilities Commission (OUC), for example, has a net zero carbon goal for 2050, which is different than the city's goal of 100RE by 2050. It is unclear if OUC—which also serves areas beyond the City of Orlando—will fulfill the city's goal. Municipal utilities can receive some state and federal funding, while remaining insulated from some state regulation (e.g., HB919). A Department of Energy grant program, for example, supported research for municipal utilities to investigate the grid effects of significant solar adoption.

There are some collaborative efforts across Florida on energy and sustainability both within and across cities, though they have not yet had a large impact. One example within a city is Largo's Sustainability Resilience Action Team, which increases collaboration across city departments. This addresses a critical issue in municipal sustainability planning: implementation of multifaceted sustainability goals requires collaboration across departments, and often cannot be addressed by a single department alone (Krause & Hawkins, 2021). Collaboration across cities also exists, including some county and regional groups. These efforts, however, have not increased city capacity for sustainability and energy projects beyond some information sharing. Consultants and external experts are another way to build city sustainability capacity for communities that can afford it. University presence can also provide support, including lobbying from student groups, a supportive and engaged population, and collaboration on special projects such as electric buses to serve the university campus.

Overall, Florida has several communities seeking to make progress on sustainability in an oppositional state environment. Cities with locally controlled utilities, especially municipal utilities, have a clear pathway to implementing 100RE and have been making progress. The remaining cities, however, do not have an identified pathway to implementation, and collaborative efforts to overcome state and utility barriers have not had a substantial impact.

5.4 Pennsylvania

Pennsylvania has the most 100RE adopting cities of any state but the least progress on implementation. This disconnect can be attributed to the lack of staffing in

100RE adopting communities and a paused collaborative effort due to Covid-19. Further, the state is served by a large, uncooperative IOU and a disinterested state legislature; 100RE adopting cities have not organized to engage either entity. Progress has been limited to local actions, such as: increasing energy efficiency in municipal operations, easing solar permitting processes, increasing access to EV charging, and increasing stringency of local building codes.

A campaign by the Sierra Club chapter in Montgomery County encouraged widespread 100RE adoption, including among towns that are not typically leaders in urban sustainability. The Sierra Club chapter has not remained involved beyond adoption, and the surprising nature of 100RE adoption in these communities has led to challenges in implementation. For example, adopting cities tended to be lower income, with high percentages of renters, and staff find it challenging to engage the community on environmental efforts. Some interviewees suggested that one barrier, in addition to economic concerns, is residents' low concern about climate change. This may reflect that Pennsylvania towns experience less dramatic effects of climate change compared to mountain or coastal towns. Many of these towns' prior sustainability efforts have therefore focused on beautification and waste management in a localized, less political approach to environmental issues.

Staff capacity is another challenge for many 100RE communities in Pennsylvania. Most adopting communities are small—under 50k residents—including some with as few as four city staff members. Almost none have sustainability staff, meaning that 100RE or sustainability efforts are added to a staff member's existing responsibilities. While some grants are available to support energy projects, cities lack the staff capacity to submit these applications, and often rely on volunteers. Volunteer capacity can be difficult to maintain and volunteers have widely varying expertise on environmental issues. Many Pennsylvania communities have volunteer Environmental Advisory Boards (EABs), which have served as the driving force for adopting 100RE commitments. One interviewee noted that they had tried to start an EAB but could not find enough volunteers to create one in their community.

Beyond these capacity challenges, interviewees described several issues that contributed to a disconnect between 100RE adoption and implementation pathways. Several 100RE commitments in Pennsylvania were spearheaded by individuals no longer working with the township. In several cases, the staff member charged with implementation is solely focused on municipal operations, despite the resolution committing to community-wide action. Staff members do not have the legal authority to transition to 100RE community-wide—a frustration also felt by staff in other states. In Pennsylvania, however, there is no known effort among 100RE adopting cities to influence broader change through state policy or the utility. One interviewee noted: "I mean we're not trying to change the electrical grid…there's no reason for us to." Further, neither the IOU nor Pennsylvania state legislature have shown intent to transition towards renewable energy on their own. Without greater control over local energy issues, cities are left with few levers to influence progress towards a 100RE goal.

A county-wide collaborative effort—the Resiliency Partnership—intended to support sustainability efforts but was put on hold due to Covid-19. The Resiliency Partnership focuses broadly on the green energy transition, climate change, and resiliency. It includes 13 of the 62 communities in Montgomery County. It also engages with the Montgomery County Planning Commission and Delaware Valley Regional Planning Commission in an advisory capacity and employs a sustainability planner. While this group shows promise in advancing sustainability projects in the county, little implementation action has been seen to date.

In general, sustainability capacity and environmental concern are minimal in Pennsylvania. Though this appears to be growing, Covid-19 has halted many nascent efforts at broader progress. Without local control over energy issues, or broader institutional innovation to address sustainability at a larger scale, Pennsylvania communities have functionally no progress towards these 100RE commitments.

5.5 Utah

Utah is an unexpected leader in 100RE policy. It has the third most 100RE commitments of any state and has major progress towards implementation with utility-supported, state-legislated institutional innovation. Utah's leadership on 100RE is surprising for several reasons. Coal generated over 60% of electricity in the state in 2020 (U.S. Energy Information Administration, 2021), and coal is the state rock. Cities are restricted in their ability to make energy policy because Utah is a non-home rule state, and recent municipal attempts to ban natural gas infrastructure were met by a new state ban on local energy infrastructure policies (Climate Change Joint Resolution, 2010). The legislature is highly conservative, and its agenda is limited by the shortest legislative session of any state—45 days. Despite these challenges, a small group of sustainability staff from wealthier, liberal communities successfully proposed legislation enabling cities to partner with the IOU (Rocky Mountain Power, RMP) on 100RE commitments. The

Utah Community Renewable Energy Act of 2019 (HB411) provides a pathway for RMP to provide net 100% renewable electricity, balanced annually, for cities and counties that made a 100RE commitment by the end of 2019 (Community Renewable Energy Act, 2019).

In this rare case, cities with substantial capacity—staffing, financial resources, and community support—were able to overcome their lack of local control of energy decisions to develop a wholly new institutional agreement with the state and utility. This process opened an opportunity for smaller, less resourced to participate as well, codifying a pathway for all committed UT communities to implement 100RE. In total, 20 cities and townships, as well as three counties passed 100RE resolutions. While the unique strength of this program is its broad diversity, in some ways it also makes progress more challenging. Some feel that larger cities lend capacity to cities with insufficient staff, while others feel that this functionally leads to small cities having less of a voice in the process. Some smaller cities have pooled resources to hire a shared sustainability analyst. This unique arrangement offers these cities access to sustainability staff, while remaining within their limited budgets.

The most widely discussed benefit of HB411 is its ability to increase customer choice—framing that was critical in securing conservative support through the legislature. The program is proceeding in phases, with several opportunities for cities to withdraw throughout. First, communities adopted 100RE resolutions by 2019, making them eligible for the program. Next, eligible communities may sign the governance agreement to join the Community Renewable Energy Agency (CREA), which will work with RMP to develop a 100RE rate case. Communities may join CREA either as an "anchor"—serving as a financial backstop, ensuring that the program will proceed—or as a participant. Initial costs are approximately $700,000 over two years, to be shared across CREA communities based on their population, electrical load, and participant status. Decision-making on program design began in August 2021, with each CREA community as a voting member. Cities must first sign the CREA governance agreement to vote in these decisions, though cities can join through January 2022. Following program design, communities must pass an ordinance enabling the program, offering a final opportunity for cities to exit the program. Once implemented, HB411 will be a customer opt-out program—all residents in participating communities will be automatically enrolled, with a window to opt-out of the 100RE component of their utility bill. This ensures individual customer choice, beyond the city's initial blanket choice to participate.

Financial impacts are a key concern. Initial program costs have been a significant factor in communities' decisions to join as an anchor or participant, as the financial share is higher for anchor communities. Once implemented, many are concerned with how costs will impact low-income households. The program ensures that both costs and benefits accrue only to program participants. With costs currently unknown, customer bills could include either a charge or a credit, with flexibility to change over time. Interviewees expect rate impacts to be less than 3-5%; if predictions change to exceed 10%, a supermajority vote of participating communities will be required to proceed. In addition, the utility's low-income programs will remain in place. Low-income plans will be created on a community-by-community basis, though CREA includes a committee to collaboratively develop ideas. Some feel that this leaves cities in charge of a difficult aspect of program design, which may lead to worse design or slower implementation.

Some have discussed automatic opt-out for residents below certain income thresholds, but fear this would unfairly discriminate against people that may want to be involved. Currently, the most popular low-income plan among interviewees is increased education on program costs and the opt-out process, ensuring each household can make the best choice for their financial situation.

Utah is a case of institutional innovation that is paving the way for 100RE implementation, without the need for cities to form CCAs or municipalize. This policy was initiated by leading cities with the capacity to champion new legislation. Developing a new arrangement with a diversity of communities will take time to implement well, but it demonstrates an innovative approach for implementing 100RE in partnership with the IOU.

5.6 Wisconsin

Progress on 100RE in Wisconsin has been bolstered by collaborative efforts and public utility ownership, even during years of an unsupportive state environment. Grassroots collaboration has allowed cities to increase their influence on energy decision-making through shared comments at the Public Service Commission (PSC). The key factor for Wisconsin 100RE cities in our sample, however, is that they are served by a publicly owned utility (Madison Gas and Electric, MG&E), providing a straightforward pathway for implementation. While there is a pathway to achieve 100RE, communities are reliant on MG&E to cooperate in pursuit of these goals. Sustainability staff continue to work closely with the utility to ensure renewable energy projects are developed on their behalf. Some cities signed Memorandums of Understanding with MG&E to facilitate progress through increased communication.

Regional collaboration has enabled progress on 100RE commitments and other sustainability issues. Cities began this grassroots collaboration in response to an unsupportive state government under Governor Scott Walker, a conservative Republican who held office from 2011–2019. During this time, the state government removed mentions of climate from the state website and halted sustainability efforts. Cities are also banned from implementing stricter building codes than the statewide code, which is inefficient and out of date. This period of inaction caused Wisconsin to fall behind surrounding states on sustainability. During this time, cities began to collaborate on issues being ignored at the state level. One focus was on adoption of 100RE commitments, which were mostly drafted by volunteers to align local communities with the Paris climate agreement.

Another focus that developed was collaborative interventions at the PSC, signifying the larger institutional change that can be pursued by cities. Several cities became involved with energy issues in 2014 after MG&E submitted a rate case to the PSC to charge a higher flat fee and lower usage fee for energy consumption. These cities argued that such rates would disincentivize energy efficiency and disproportionately burden lower-income households. An ongoing debate in the PSC is determining if third parties that finance solar installations should be treated as utilities. This complicates solar ownership and slows development, while forcing greater reliance on the utility for renewable procurement. Cities and collaborative groups are working to submit comments throughout this process.

In 2019, the election of a liberal governor, Tony Evers, ushered in a more enabling state environment. Evers established a state-wide 100% clean energy goal for 2050 through executive order—though this would need to pass through the legislature to be considered a state RPS. Additional state actions on climate and energy include newly appointed commissioners to the PSC, increased funding for energy grants from the state, and formation of a climate task force. The State Office of Energy Innovation has been a useful partner, issuing grants to cities for energy planning. Seven of Dane County's smaller cities collaborated to write and receive two grants from this office, which they used to hire a consultant to write individualized energy plans and aid implementation.

Financing sustainability initiatives is challenging for cities in Wisconsin, due to tax levy limits. These require cities' tax increases to be approved through voter referendums, which are often difficult to pass. City budgets therefore tend to stay constant despite inflation. This encourages cities to focus on programs with faster returns on investment, such as LED lighting and energy efficiency. Implementation is therefore gradual as money becomes available for each project, such as through the State Office of Energy Innovation. A local Sustainability Leadership Collaborative has facilitated identification of shared, regional uses of stimulus funds though Covid-19.

Lastly, cities with 100RE commitments benefit from sustainability staff, as well as experience on energy issues from MG&E rate cases. Some communities have small sustainability offices, while others have identified a sustainability champion from existing staff. Some collaborative groups in Wisconsin require member cities to have dedicated staff members to join, given the challenges of working with communities that are reliant on volunteer capacity. Overall, these Wisconsin cities have capacity and experience with sustainability issues, though these continue to develop. This capacity is enhanced by a publicly owned utility and a newly supportive state environment.

6. Discussion

6.1 Factors in 100RE Adoption

We began this study with a multivariate regression to examine factors in 100RE adoption, beginning with demographic variables. Population and higher education were significant and positively correlated with 100RE commitments, as expected from prior research. Median income and poverty rate were also significant, but adoption was correlated with lower incomes and higher poverty rates. This was unexpected both based on prior studies of urban sustainability policy, and because achieving 100RE goals may have costs that poorer cities are less able to bear. Some stakeholders expect 100RE commitments to reduce energy costs, which could explain why they are attractive in lower-income cities. For example, environmental advocates have framed these policies as saving money based on renewables' low marginal cost of generation (Patterson, 2015). Interviews suggest, however, that many communities are concerned about costs, and are working to protect vulnerable populations. It is unclear whether these concerns are based on cost projections or reflect uncertainties for cities with less experience with energy projects. Future research that delves into the economic narratives of 100RE policies would be useful for explaining these relationships.

Regarding prior sustainability policies, we found that only some energy policies were predictive of 100RE commitments. A sustainability plan with green energy provisions and counts of municipal energy actions were positively correlated with 100RE adoption. General interest in sustainability or energy efficiency, however, were not correlated with 100RE. This suggests that renewable energy policies have different adoption dynamics than other sustainability policies, and that energy projects may provide experience and networks that facilitate 100RE adoption. Communities' first actions in implementation have similarly focused on municipal operations and efficiency projects. Additionally, communities that previously implemented energy efficiency measures may be more likely to think of further energy policy in terms of cost savings, potentially explaining counterintuitive financial results.

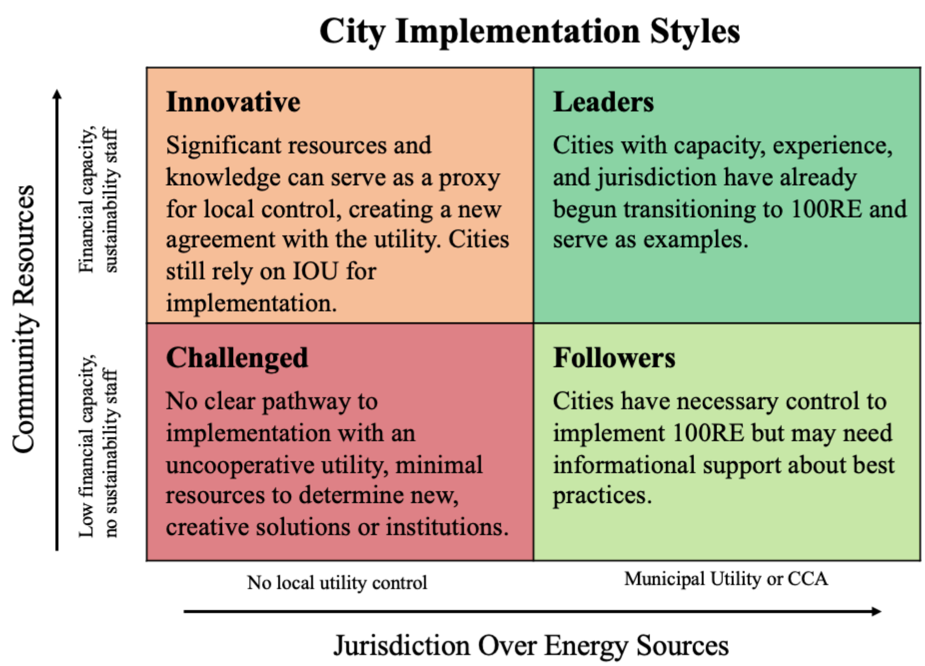
Institutional variables raised questions about cities' capacity to implement these ambitious goals, which was the motivation for following up with case studies. Adoption of 100RE commitments was negatively correlated with sustainability staff and locally controlled utilities, though with minimal significance. Interviews found that sustainability staffing was critical to 100RE implementation, particularly when there is no locally controlled utility to provide technical and administrative expertise on energy issues, highlighting the interconnection of these institutional capacity variables. Some communities leveraged the 100RE commitment to hire sustainability staff, but many still rely on volunteer capacity or part-time staff. The findings about utilities are surprising, as locally controlled utilities have been prominent in successful implementation to date. Four of the first five cities to achieve 100RE commitments each have locally-controlled utilities (Adesanya et al., 2020), while cities in California have increased local control through CCAs. Cities without these options will require new institutional arrangements to achieve these goals. As one interviewee summarized: "For 100% renewable energy to work in any kind of community, community-wide, there's not a lot that a municipality can do unless they run their own utility."

6.2 Pathways to 100RE Implementation

Though implementation pathways varied by state, two factors appear to be the most important: local control of energy procurement and community financial and sustainability resources. Cities can be categorized into four types depending on the interaction of these factors (Figure 4).

Figure 4

Relative Difficulty of Various Implementation Pathways to 100RE



The simplest pathway to implement 100RE commitments is through a locally controlled utility or CCA. Increased jurisdiction over power sourcing and program design allows cities of nearly any size or resource level to successfully pursue 100RE, though lower-resource cities may require additional support. Los Angeles, California exemplifies the progress that can be made when cities have a municipal utility and significant administrative capacity. This includes the resources to fund a multi-year study with the National Renewable Energy Lab on pathways to 100% renewable energy. Participation in CCAs can similarly allow cities to lead on 100RE implementation, though only well-resourced cities may have the capacity to form their own CCA. While only California has used CCAs as a tool to achieve 100RE, this model is beginning to spread across the US. Some cities with municipal utilities may not have the resources to lead on 100RE implementation, however, and require additional support. This can be as simple as information sharing with municipal utilities that are leading on 100RE implementation. Similarly, cities with fewer resources in California may join an existing CCA rather than starting their own. This provides reduced local voice in energy planning, but still allows access to straightforward 100RE implementation.

When cities do not have a municipal utility or CCA, they must develop new pathways to implementation, requiring creativity and increased reliance on local resources. Boulder, Colorado serves as an example of a city with innovative, complex implementation. Boulder does not have a locally controlled utility but does have some of the most significant sustainability capacity of any city in this study. They have therefore been able to redesign their franchise agreement with the IOU to a 1-2-year cycle, with opt-out windows tied to emissions reductions, renewables, and innovation. This improves

Boulder's ability to control a shift towards 100RE but was a highly complex, multi-year process and still relies on the IOU to uphold the agreement.

Implementation approaches are still more difficult for small cities with limited resources and no local utility control. These cities have little to no sustainability staff, small to modest budgets, and often little experience with energy issues. These cities need ready-made solutions appropriate to their scale and capacity. Hiring consultants is a popular approach that can be highly informative but can be a trap for small cities. Consultants are expensive, conduct long-term studies, and often recommend solutions that are already known in more experienced cities. Rather than using several years sustainability budget on consulting, this time and money could be put towards implementation of projects identified through peer-to-peer mentoring across cities. Some cities have been unable to afford consultants and are instead using volunteer support to review other cities consultant results for implementation ideas.

Beyond the factors mentioned in Figure 4, state influences can also significantly impact city progress. State legislatures that are generally opposed can inspire greater responsibility for sustainability issues at the city scale, while aggressive and oppositional state legislatures can squash city efforts. Conversely, states with consistently progressive state legislatures appear to encourage cities to begin making progress at their own pace, while fostering knowledge and experience with energy issues. CCA enabling legislation at the state level, for example, allows motivated and well-resourced localities to pursue local control of electricity sourcing, providing access to a complex implementation pathway.

The smaller size of local government can limit the capacity for progress and increases volatility. While a highly motivated individual can create significant sustainable change throughout the city, hesitancy from one person or department can considerably slow progress. In addition, turnover can cause delays and losses of institutional knowledge. In cities without sustainability staff, these projects may be assigned to staff members without experience or interest, let alone available time. Many communities are reliant on volunteers to make progress on sustainability, further increasing volatility in progress. In some cities with universities, national labs, and other highly educated, technical residents, this volunteer community can be robust. Not all cities have this type of community, however, and even knowledgeable volunteers can be more difficult to coordinate with than hired staff.

100RE policy design can also cause inherent challenges for implementation. These commitments are non-binding and serve as an aspirational goal, often to signal to higher levels of government that this is a desired transition. These communities intended to assess implementation options after committing, with varied results to date. Other cities declined to adopt 100RE due to the lack of plan, showing that 100RE adoption alone does not indicate progress on sustainability issues. Communities are hoping that these goals will increase available resources and ease cost constraints. Most cities have mitigated costs through energy efficiency improvements but require support for broader change. Cities with 100RE implementation plans may be more prepared to receive funding on energy and sustainability projects, including Covid-19 stimulus funds, as projects have been pre-identified. Even the potential for future funding gave cities confidence to write more detailed implementation plans than had been previously worthwhile.

This will be a challenging transition, and not all the challenges are even known yet. Cities that have done significant research into this transition often cited identifying more questions throughout the process, including questions that cannot yet be answered, such as the need for further technology development or cascading costs and reliability concerns with high renewable percentages on the grid.

7. Conclusion and Policy Implications

City commitments to 100% renewable electricity are rapidly expanding across the US. Adopting 100RE has been a rapid process for many cities, yet implementation is proving to be more challenging. In this paper, we combine quantitative and qualitative methods to understand the predictors of adoption and the pathways that cities are pursuing for implementation. The ICMA Sustainability Survey captures city sustainability actions immediately prior to this trend, enabling us to examine how 100RE policies are correlated with previous sustainability policies.

Through the regression, we found that cities with prior green energy actions are more likely to adopt 100RE commitments. The unexpected positive correlation between poverty rates and 100RE adoption also raises the possibility of economic challenges in implementation, particularly for lower income communities. The significant negative correlation with the presence of sustainability staff and slight negative correlation with locally controlled utilities, however, raises questions regarding the feasibility of these commitments, as cities pursuing these policies may not have the administrative capacity or operational control needed to successfully implement 100RE policies.

Case study results confirm this gap, as cities lacking locally controlled utilities were far less likely to show progress on implementation. Cities that additionally have low administrative capacity are particularly challenged in translating their goals into actionable policy instruments. In some states, such as Utah and Colorado, cities with high administrative capacity have spearheaded state-level legislation and collaborative networks that provide some support for less resourced cities. In other states, such as Pennsylvania, or cities many without municipal utilities, cities are floundering to develop implementation strategies on their own. The lack of expertise within many adopting cities shows a clear need for improved communication and support across this developing network of 100RE cities. Researchers, national labs, governments, and non-profits may be able to step into this new role, providing this 100RE movement the support it will require to achieve these ambitious goals.

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CHAPTER 3

LOCALIZING ENERGY DECISION-MAKING THROUGH COMMUNITY CHOICE: THE UTAH COMMUNITY RENEWABLE ENERGY ACT

Abstract

City commitments to 100% renewable electricity (100RE) have been rapidly spreading across the US, with concentrations in a few states. Unexpectedly, Utah has the third most 100RE adopting cities of any state, and some of the most significant progress to date. This has been through the Utah Community Renewable Energy Act—a statute committing the major utility to fulfilling any city 100RE resolution passed through 2019. Now 23 diverse communities are eligible to join the program and reach 100RE by 2030.

This paper uses case study analysis to examine this legislation and the involved communities. Process tracing methods identify causal factors in enacting this legislation at the state level and resolutions at the local level. Results show that utility support was leveraged through franchise agreement negotiations in major communities. Together, these cities and utility created a pathway to 100RE for communities of any size to join, functionally sharing their capacity. The Utah Community Renewable Energy Act serves as a replicable example to cities that wish to pursue renewable electricity without transferring control of energy sourcing or delivery. This policy is the first of its kind, exemplifying ground up institutional innovation, and a shift towards more localized energy decision making.

1. Introduction

Approximately 180 cities in the US have adopted commitments to 100% renewable electricity (100RE). This trend took off in 2017, after the Sierra Club launched its Ready for 100 campaign urging communities to adopt these commitments (Sierra Club, 2022). Utah cities are currently developing a new pathway for cities to implement 100RE goals, through a unique partnership with the utility and state legislature—the Utah Community Renewable Energy Act of 2019 (HB411) (Community Renewable Energy Act, 2019). Utah is an unlikely place for sustainable transition innovation to occur, as it is a conservative state with significant fossil fuel interests. Further, HB411 was driven by larger cities with significant financial and staff capacity but was later expanded to include additional communities (Kunkel et al., 2022). This case therefore involves a different set of actors than is typically described in sustainable transition literature (Armstrong, 2019; Bayulgen, 2020; Huang et al., 2007; Krause, 2011; Lubell et al., 2009; St. Louis & Millard-Ball, 2016; Yi, 2013). Finally, this case involves a new approach to local control of energy decision-making: a partial form of community choice in which energy procurement remains with the existing utility. HB411 can serve as an example to other communities that lack the capacity or do not desire to leave their incumbent utility in pursuit of increased renewable energy.

This paper will first review research on energy transitions in the US at the local levels, focusing on urban energy policies and energy democracy. Next the paper will discuss the study area, providing context on both the state of Utah and the investor-owned utility, Rocky Mountain Power (RMP). Following a discussion of case study methods, the case will be presented chronologically, and conclude with policy implications.

1.1 Urban Energy Policy and 100% Renewable Electricity

At the city scale, quantitative research consistently finds that larger, wealthier, and better educated cities are more likely to adopt energy and sustainability policies (Armstrong, 2019; Bayulgen, 2020; Huang et al., 2007; Krause, 2011; Lubell et al., 2009; St. Louis & Millard-Ball, 2016; Yi, 2013). Policy champions are critical to advocate for a given policy, and can include government staff, local residents, or groups like non-profits (Bassett & Shandas, 2010; Bayulgen, 2020). City governments can also be reliant on outside actors for information and implementation of policies that require administrative capacity beyond typical city government capabilities (Berry & Portney, 2013). The presence and influence of various interest groups can also affect specific provisions of policy adoption, such as technology preference (Bayulgen, 2020).

Compared with prior urban energy policies, 100RE commitments have been pursued in a broader variety of communities with different demographic compositions and ideologies (Adesanya et al., 2020; Martinez et al., 2018), including in politically conservative areas (Long & Kincaid, 2018; Skill et al., 2020). Consistent with literature on local issue framing (Bassett & Shandas, 2010; Bayulgen, 2020; Foss, 2018; Hess, 2019b), 100RE cities were motivated by local concerns, such as air pollution or the impact of climate change on local industries, particularly tourism in beach or ski towns (Hess & Gentry, 2019; Skill et al., 2020, 2021). Economic concerns were also significant (Martinez et al., 2018), including the potential costs for citizens and the impact on local jobs in the fossil fuel industry (Hess & Gentry, 2019). Despite some demographic diversity, adopting communities were largely politically liberal (Martinez et al., 2018), often with a university as a major industry (Breetz et al., 2022; Hess & Gentry, 2019; Long & Kincaid, 2018). Support of local environmental groups and local government capacity—such as presence of a sustainability advisory committee or staff—were highly supportive factors (Hess & Gentry, 2019; Skill et al., 2021).

1.2 Implementation Challenges

Implementation of 100RE commitments is challenging due to resistance from state legislatures and a lack of local energy control (Kunkel et al., 2022). Implementing these commitments would decentralize energy and increase local control of energy decisions—known as energy democracy (Burke & Stephens, 2017). In some cases, these attempts to increase local control have been challenged by the state government. For example, in Pennsylvania, city policies to regulate natural gas infrastructure were quickly followed by state bans (Negro, 2012). Likewise, the Florida legislature preempted city policies to ban energy infrastructure or sourcing as a direct response to city 100RE commitments (Kunkel et al., 2022; Pontecorvo & Rivers, 2021).

Further, most cities lack control of their energy procurement (Homsy, 2016). Cities with locally owned utilities are one exception to this, as they have clear pathways to implement 100RE and have begun making progress (Adesanya et al., 2020). Many cities in California offer another exception, as Community Choice Aggregation (CCA) has provided cities with control over energy procurement, though the investor-owned utility (IOU) continues to provide energy delivery (LEAN Energy US, 2021). Most cities across the US lack these options, however, leaving 100RE implementation dependent on the city's financial and staff capacity, and their ability to negotiate with their utility (Kunkel et al., 2022). The most likely implementation pathway will be through layering—or adding rules and regulations to shift the existing utility in a desired direction, rather than replacing the utility with a wholly new institution (Laird, 2016).

Research on other state energy policies highlight utility influence within state policymaking, potentially complicating local energy transitions. In Oregon, environmental groups had proposed ballot initiatives with a variety of energy goals, including several opposed by the utility. To avoid these measures, the utility instead worked with the environmental groups to compromise on legislation (Gray & Bernell, 2020). In Colorado, the utility's request for proposals showed favorable economics for renewables. While the utility did not offer outright support for a policy to increase the statewide renewable energy standard, its lack of opposition was enough for the measure to pass (Betsill & Stevis, 2016). These cases show that while the economic advantages of renewables are leading utilities to increase their investment, additional pressure may be needed to gain their active support.

Case studies of Utah's HB411 process similarly highlight the importance of utility support in the process to develop a pathway to 100RE, particularly through the oppositional state legislature (Kunkel et al., 2022; Skill et al., 2020, 2021). This study builds on this research in Utah, broadening the sample to include all adopting cities, and examining the governance process to date. This research identifies key leverage points for cities to gain the support of their utility, as well as policy design that could be replicated elsewhere.

2. Study Area

2.1 Utah

Utah is a state known for its natural beauty. Southern Utah—native Puebloan and Navajo land—includes desert and canyon landscapes area with national park gateway communities, while northern Utah—native Ute land—includes the Wasatch Mountain Range area with wealthy ski towns. The Salt Lake Valley region is home to most of the state's population, but also struggles with air quality issues due to a winter inversion layer. This traps exhaust and wildfire smoke in the valley, causing health impacts particularly for elderly or lower income residents. For many throughout Utah, these features have contributed to strong attitudes of environmental protection. Mountain towns, for example, have already seen the impacts of climate change on snowfall patterns. Utah's politics dictate that environmental protection is not discussed in terms of climate change. This is exemplified by a resolution urging the federal Environmental Protection Agency to halt carbon dioxide emission reduction based on "questionable" and "manipulated" climate science (Climate Change Joint Resolution, 2010).

Utah is a conservative state, with significant Republican majorities in both the House and Senate, and both majority and minority whip positions held by Republicans. Further, the legislative session is only 45 days, the shortest in the country. Utah has a unique set of politics that can be supportive of compromise, however. Known to some as the Utah Way, politicians in Utah value conversation, compromise, and benefit-of-the-doubt for their peers (Canham, 2021). Further, Utah politics also favor free market ideals and oppose mandates. Any policy that is perceived as a mandate is likely to receive staunch opposition, regardless of the program or goal. Additionally, Utah is a non-home rule state—cities cannot make policies above what is required by the state, such as with energy efficiency code. Cities can, however, municipalize their electricity.

2.2 Rocky Mountain Power

Rocky Mountain Power (RMP) is an investor-owned, vertically integrated, monopoly utility. RMP is the only IOU in Utah and serves roughly 80% of the population, but also serves portions of Wyoming and Idaho. RMP is one of two business units making up PacifiCorp, which is in turn owned by Berkshire Hathaway. This broader corporate structure means that RMP is connected to significant transmission capacity, easing the process of adding additional renewables to their portfolio. Further, PacifiCorp plans to close 20 of their 24 coal plants by 2038 and reduce emissions to near net zero by 2060. While 75% of RMP's electricity was coal-based in 2015, this is now down to 60% (U.S. Energy Information Administration, 2021). RMP is known as a comparatively low-rate energy provider in the West and is prioritizing keeping rates low throughout this transition.

RMP also has programs that facilitate sustainability throughout the state. The Blue Sky Grant program allows customers to purchase renewable energy credits to offset their consumption (Rocky Mountain Power, n.d.). Funds from these purchases provide grants to other customers for renewable energy and efficiency projects. Another program is Cool Keepers, which offers customers a credit in exchange for allowing RMP to cycle their air conditioning unit for grid balancing (Rocky Mountain Power, n.d.).

3. Methods

In order to fully understand why 100RE adoption in Utah varies from established energy and sustainability policy trends, this paper will use a variety of sources to create a holistic case study (Yin, 2017) of the Utah Community Renewable Energy Act of 2019. This study will apply process tracing methods (Mahoney, 2015) to answer the question: Which conditions led to the adoption of HB411 at the state level and 100RE commitments at the local level? This analysis will examine how previously identified causal factors in urban energy policy literature impact this case. Further, identifying unique causal mechanisms will provide greater understanding of necessary conditions for increasing community control of energy decisions in collaboration with an incumbent utility.

This study is based on 28 interviews (Table 6), observation of public meetings, and document review. Interviewees were selected via both purposeful and snowball sampling methods until saturation of responses was reached (Creswell & Poth, 2018; Noy, 2008). Purposeful sampling focused on reaching a central individual from each of the 23 eligible communities and reached 17 communities. Individuals were identified for interviews from their city websites, news publications, and energy-related meetings in the area. These interviews were semi-structured, conducted remotely, recorded, and transcribed. Interviewees are not identified by name or affiliation to preserve confidentiality, consistent with IRB approval (Appendix C). Interview questions included:

- What was your role throughout the 100RE adoption process? Which groups were the most involved and influential?

- What were the main arguments you heard for and against 100RE adoption? How were economic issues, including potential rate increases, discussed throughout this process?
- What do you think were influential factors in your community's adoption of 100RE?
- What challenges have come up during this process and what are concerns going forward?

Table 6

Interviewed Stakeholders by Group

Stakeholder Group	# of Interviews
Participating City and County Actors	14
Non-Participating City and County Actors	5
State Legislatures and Regulators	4
Utility	2
Non-Profits	3

4. Utah Community Renewable Energy Act

4.1 Pre-Legislation

Several years before the Utah Community Renewable Energy Act was created, key communities were beginning to examine potential pathways to increased renewable energy. In particular, Salt Lake City's franchise agreement was due to expire in 2016, providing a window of opportunity to negotiate with RMP. Further, Salt Lake City represents around 10% of RMPs market in Utah, giving the city added leverage in discussions. Mayor Becker refused to sign the franchise agreement with RMP until they created a plan together to transition the city to 100RE. Several interviewees credit this key leverage point and Mayor Becker's steadfast willingness to "press the red button" with initiating RMP's cooperation. Negotiations lost some momentum due to mayoral turnover, but Mayor Biskupski signed the Joint Clean Energy Cooperation Statement with RMP in 2016 to transition the city to 100RE by 2030. Interviewees note that the public nature of this deal helped secure RMPs continued involvement, as failing to maintain a publicly agreed commitment would damage their public image. Salt Lake City agreed to not pursue the formation of a municipal utility or CCA during the lifetime of the agreement, which had a deadline of March 2017 to create an implementation plan. The statement was tied to the franchise agreement, which was shifted from a 25-year to a 5-year schedule to ensure increased discussion and flexibility over time.

During this time, Park City, Salt Lake City, and Summit County (founding communities) jointly hired a consultant to examine existing pathways to 100RE for their communities to inform their discussions with RMP. Identified pathways included a utility-based renewable energy tariff option or a CCA. Municipalization was also informally discussed. Further, CCA legislation had previously been introduced in the Utah legislature but failed to even pass a committee hearing due to opposition from RMP, regulators, and industry advocates (Renewable Energy Amendments, n.d.). Each of these options were complex, expensive, and highlighted the importance of the utility's support in implementing 100RE goals. Further, implementation could be simplified if the utility remained in control of electricity, avoiding significant increases in city staffing needs for renewable procurement, though this approach reduces local voice in the process.

RMP also offers various rate schedules that helped pave the way for the development of HB411. In particular, under Schedule 34: Renewable Energy Tariff, RMP procures renewable energy resources for large customers at long term fixed prices, and the customer receives Renewable Energy Credits (Rocky Mountain Power, 2021). Salt Lake City, Park City, and Summit County—as well as a university and two ski resorts—partnered together to procure solar energy under Schedule 34. This would cover these communities' 100RE goals for government operations, but even this was a multi-year process that required significant learning and capacity. Interviewees noted that this experience gave them confidence in developing HB411, but highlighted the challenge smaller, less-resourced communities would face in pursuing renewable energy. This was confirmed by interviewees from less wealthy communities that had tried and failed to procure renewable resources through RMP on their own. Further, Schedule 34 serves individual customers; nothing had yet been developed for community-wide renewable energy. This example highlights the importance of city capacity in pursuing 100RE, the critical role of these powerful communities in negotiating with RMP, and the need for an established pathway to pursue community-wide goals.

4.2 Legislation

To address this gap, an interim committee of the founding communities, RMP, and legal counsel developed House Bill 411 of 2019: The Utah Community Renewable Energy Act (HB411). This bill would provide a pathway to 100RE by 2030 for any Utah community served by RMP that passed a committing resolution by the end of 2019. Even with utility support, including through development, HB411 faced opposition in the state legislature.

With approximately two weeks remaining in the 2019 legislative session, HB411 was brought before the House Public Utilities, Energy, and Technology Committee, but received a tie vote and did not pass out of the committee. Following this vote, representatives lobbied the chair of the committee to reintroduce the bill. One representative with significant solar investment in his district was persuaded by a solar developer who emphasized the significant job and tax benefits his district had seen because of solar development. Given these conversations, the bill was reintroduced and narrowly passed out of committee to the House despite minimal changes from the prior version. As this was now late in the legislative session, not all committee members were present for the vote, which one representative noted may have changed the outcome.

A key debate focused on the opt-out provision. The founding communities stated that if this was not an opt-out program, they would pursue municipalization. Prior research has shown that participation rates are extremely low when residents are required to opt-in to a program, and that even residents that would like to be involved do not take the steps necessary to join (Hess, 2019a). Opt-out structures receive higher rates of participation, making the program more effective overall. Opt-out structures, however, have not been supported in the Utah in the past. For example, transitioning the Cool Keepers program to opt-out was vetoed by former governor Herbert (Electrical Utility Amendments - Efficiency and Conservation Tariff, 2010). Interviewees noted that any policy that appeared to mandate an action, including automatically opting customers in to HB411, would receive opposition.

Another debate focused on the definition of renewable energy and resources that would be considered in the program. These resources included standard renewable energy sources as well as energy efficiency, energy storage, demand side management, and flexibility to consider additional resources in the future. Dominion Energy asked to include "renewable natural gas" but was not included. Nuclear was also not included as a resource under HB411 and is not currently part of Utah's energy mix. Further, Utahns have a general distrust of nuclear, following fights against disposal of radioactive waste and nuclear weapon destruction in the area (HEAL Utah, n.d.).

Support for HB411 focused on customer choice, which leveraged Utahn values of free-market ideology and self-determination to capture bipartisan support. This includes a community's initial choice to join and remain in the program, as well as the individual customer's choice to opt-out of the renewable rate and remain on the RMP base rate. Some support, however, was determined based on the involvement of certain actors. For example, some legislators were opposed largely because this was proposed by liberal areas of the state. Other legislators supported the bill due to the involvement and support of key energy agencies such as regulators and RMP.

Air pollution issues in the state were also leveraged to garner support of HB411. While this program will contribute to a decreased use of polluting fossil fuel generating stations in general, none of the planned power plant closures are local. This policy will likely not lead to measurable local improvements in air quality, despite this being used as a common selling point. Environmental advocates described walking a fine line in discussing air pollution impacts as a more accepted form of environmental discussion in Utah politics, while also not claiming that the program would have local health benefits.

Finally, a key definition in HB411 is that this is a "net" 100RE program. Some considered this a misnomer, noting that the involved communities would be reliant on a fossil fuel-based system for reliability. This program, however, will ensure that RMP procures enough renewable assets throughout each year to equal the annual electricity consumption of the involved communities. Further, the goal will be met with new renewable procurement, not renewable energy credits. RMP can choose to own these resources and profit off the investment—potentially a factor in their cooperation—or contract with other providers.

Despite these concerns, HB411 passed from the House with a final vote of 48-24. Finally, HB411 moved to the Senate, where it was passed on the last evening of the 2019 session with a final vote of 23-6. Advocates have noted that while many moderates voted for this measure, this was considered a major, rare win for sustainability in Utah. Further, this policy serves as a replicable example to other states seeking implementation pathways for cities' 100RE goals.

4.3 State-Wide Adoption

Following the adoption of HB411, the next phase required communities to pass resolutions committing to 100RE by 2030. These resolutions needed to be passed by the end of 2019, providing advocates with little time to lobby cities. Non-profits focused their efforts on communities where they had existing relationships and where they thought the program was likely to receive support. In total, 23 communities across Utah passed these resolutions, representing a quarter of Utah's population and 40% of RMP's Utah load (Figure 5). This group includes several cities with less than 400 residents, Salt Lake City with over one million residents, and three counties. This diversity strengthens the program, making it unique in comparison with typical sustainability adopters identified by academic literature (Armstrong, 2019; Bayulgen, 2020; Huang et al., 2007; Krause, 2011; Lubell et al., 2009; St. Louis & Millard-Ball, 2016; Yi, 2013).

Interviewees also heard about the program through non-profits, utility and county representatives, as well as personal contacts. County participants represent only the unincorporated portions of the county, though some helped lobby cities and townships within their boundaries to join the program as well. Smaller communities expressed pride in being involved and were working to ensure their voices would be heard throughout the process. More conservative and rural communities similarly felt that their participation and opinion were important for program development.

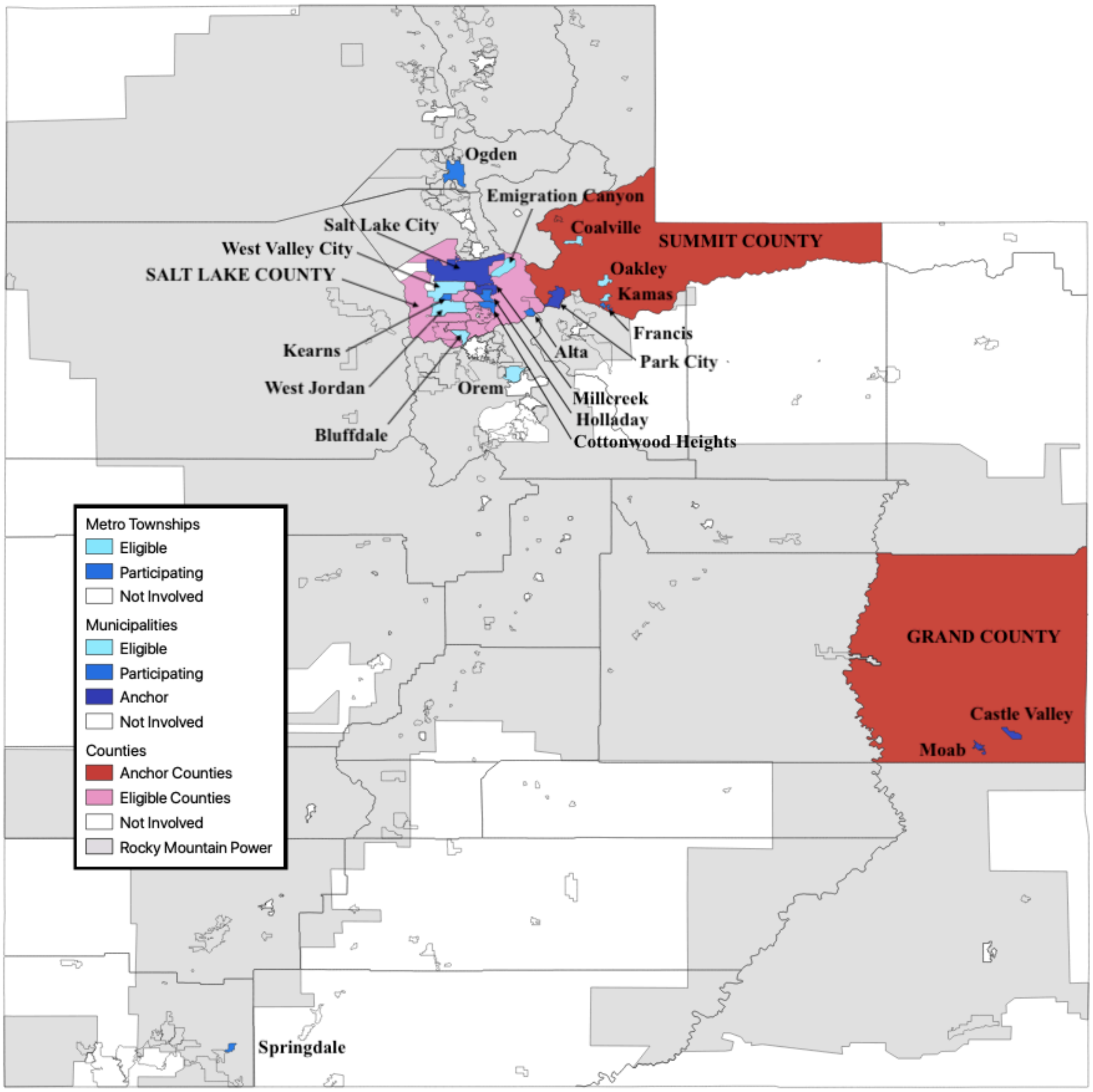
For many cities, the 100RE resolution was passed by a unanimous vote. Several key design elements made such overwhelming support of this possible. In particular, the program design allows cities to exit the program at any point in development. Many community interviewees noted that they were able to pass these resolutions as it provided the opportunity to "investigate the options" in the program but included several windows to exit the process as more information became available. Passing a resolution was therefore risk-free and non-binding. This process has been described as a community-wide and state-wide effort focused on coalition-building. Millions of residents across the state could choose to take this step together through unique bipartisan, state-enabled legislation.

Other communities, however, found barriers to entry. Some felt that this policy would be viewed as a mandate—particularly in conservative areas—or that it moved too fast. Some communities noted significant political pressure to adopt the 100RE resolution. In at least one case, this pressure appears to have lapsed, and the community does not intend to proceed through participation. Other communities mistakenly believed that they could join later, or that they could start their own agreement with RMP on their terms. This program does not include a way for new cities to join the program if they failed to pass a resolution by the end of 2019. While some discussed that they would like to see this happen later, interviewees noted that it would have to be after the program was well established and would require state legislation.

Misinformation and speculation about costs to customers has been common throughout this process. Some pointed to California's higher electricity prices as evidence that an increasingly renewable grid would increase costs. One interviewee noted that HB411 is a complex process, with significant unknowns throughout; it was relatively easy for opponents to sow doubt about the program by speculating about unknown factors. This was frustrating to supporters, as communities could exit the program as information became available. Several interviewees also noted a concern about potential hidden or changing costs. Many pointed to net metering as a poignant example in which RMP reduced solar credits to customers, causing mistrust.

Figure 5

Map of Eligible Communities and Current Participation



4.4 Governance Agreement

Following these resolutions, the 23 eligible communities began to write the Governance Agreement (Figure 6), which forms and provides operational rules for the Community Renewable Energy Agency (CREA). Many interviewees also believe that the number of eligible communities came as a surprise to the utility and founding communities. In a stark example, the first Governance Agreement meeting was held in a room with only enough seating for the founding communities. One interviewee believes those communities did not expect others to attend, while others felt excluded as they "literally did not have a seat at the table." These issues improved significantly as the program development continued, with cities participating to the extent their community capacity allowed. Writing the Governance Agreement was slowed due to COVID-19 and took about one year.

Figure 6

Key Dates in Governance Development

The scale and diversity of the program has also required a slower process to accommodate different capacity levels and to ensure the program is designed to serve all eligible communities. Larger communities had the staffing and capacity to attend every meeting and were perceived by some to be dominating the conversation. On the other hand, interviewees from cities without available staff felt left out, but were unable to attend meetings to contribute their opinions. Some communities developed informal relationships with regular attendees to receive updates and information throughout the process. Interviewees noted that communities have been very responsive and open to regularly sharing information, including by attending other city's council meetings to provide presentations and answer questions. Cities also received presentations and assistance from the utility and non-profit groups, such as the Sierra Club, Utah Clean Energy, HEAL Utah, and Western Resource Advocates. One interviewee noted support from the local university, though few eligible communities have universities.

Communities join CREA across two tiers—anchor or participant. Anchor communities pay a higher fee to join the program and commit to pay the full program costs regardless of how many participating communities join, to increase predictability for other communities' budgets. Each community receives one vote in governance decisions, though if weighted voting is used for a decision, anchor community votes receive a greater weight. Voting decisions and program design began after July 31, 2022. Eligible communities may still join after this date, though they will have missed any voting decisions prior to their commitment. The final date for eligible communities to join CREA as participants is January 31, 2022, after which the program will be finalized for filing with the Public Service Commission (PSC). This schedule allows participating communities to move forward with program design, while others can wait to join and commit funding when more details are available. To date, 15 cities have joined CREA, with seven of those signing on as anchor communities (Figure 5).

One concern in this process has been the financial commitment required. CREA will hire legal and technical consultants to estimate rate impacts and finalize rate structure. Total costs of these consultants, regulatory proceedings, and program filing fees are expected to be approximately $700,000, to be shared across participating communities based on their population and energy consumption. While this enables small communities to join for less than $1,000 over two years, larger cities with less wealthy residents feel constrained by their higher fees. COVID-19 has further strained city budgets, meaning that while some initially felt comfortable participating, their budget can no longer accommodate program costs. Interviewees noted that while this program does come with costs, that it is less expensive than acquiring their own renewable resources.

Many communities found support to join the program, but opposition to the additional cost to be an anchor community. In one case, a private citizen donated the funds necessary to increase the community's participation level to an anchor community. Some communities did not believe that the increased voting power as an anchor warranted the extra cost, though they were excited about being a participating community. In another case, council turnover lost the supportive votes necessary to participate as an anchor community, though the community was able to join as a participant.

CREA's structure requires two representatives from each community. The primary representative must be an elected official, while the alternate can be staff. Communities have selected council members, mayors, city managers, community development directors, or sustainability staff. Of the 23 eligible communities, 15 do not have sustainability staff. This is another indication of the divide in communities' participatory capacity, as other representatives have less experience in this area. Three smaller communities hired a shared sustainability staff person, increasing city capacity while remaining within their more limited budgets. Other communities have selected city council members with prior energy or legal experience. Interviewees noted the importance of small communities' participation in this process and welcomed their input despite the challenges from their inherent reduced capacity. While these communities may participate less regularly, CREA provides a pathway to 100RE that these cities could not have achieved otherwise.

While these decisions are ongoing, not all 23 communities are planning to participate. Several communities have been concerned with the questions remaining to be answered in program design. Communities must contribute funding to the program before knowing if they are comfortable with the rate changes for their residents. This has caused a "chicken and egg" scenario in which communities will not join the program until all questions have been answered, but that questions cannot be answered until a given number of communities have agreed to participate in the program. Some communities are comfortable with this uncertainty and in fact feel it is their duty to participate in a program to learn how this would work for their residents. Other communities have declined to participate due to the lack of information available, even though they like the general concept.

Across the board, interviewees noted that RMP has been an important and supportive partner throughout the process, though many had concerns from prior experience. Interviewees expressed concern that the balance of power could easily shift in the utility's direction as their resources greatly outweigh other involved parties.

Interviewees also noted that RMP's large structure leads to a disconnect; decisions made with one representative may not be later supported by the corporation at large. So far, HB411 is developing in a way that should benefit the utility overall, keeping them engaged and supportive as partners, while also providing a desired transition to involved communities. Organizers have done well balancing key utility needs in each stage of the process.

4.5 Next Steps

Over the next several months, CREA will develop the rate structure and write the Utility Agreement. Development will proceed through three committees. The communications and low-income plan committees are open to any interested community representatives. Interviewees from lower-income communities expressed excitement about participating on these committees to ensure they could minimize potential harm to their low-income residents through planning. The third committee is tasked with program design and meets weekly with RMP and hired consultants. This committee was designed to be smaller than a quorum (7 participants) to allow for efficient discussion but will not finalize any decisions. This committee will bring recommendations to the full CREA body for discussion and approval. Most participants on this committee have specific energy or legal expertise, and these participants represent the range of community sizes in the program.

Each participating community must then sign the Utility Agreement to remain in the program. The Utility Agreement will then be jointly filed with the PSC for approval. PSC decisions on average take six to nine months, which includes a public comment period and time for testimony. If CREA and RMP reach a settled docket, interviewees anticipate that regulators will approve it. If the docket is litigated, however, the decision is less clear. Interviewees expressed that the regulatory bodies must find this program is in the public interest and that stranded asset costs are adequately considered—among other considerations on cost and benefit accounting. The decision is anticipated to be around September 2022, though this timeline is an estimation and may change as the program continues to develop.

Assuming the program is approved, communities must pass an ordinance enabling the program—providing a final opportunity for cities to decline further participation. An RFP for renewable sources will be issued. Resource costs from the RFP will determine finalized costs to customers, though these will have been researched in advance. There will then be a three-month window before the program takes effect in which communities must send a minimum of two notices to their residents. These notices will provide a program overview and estimated rate impacts for each household, informing customers of the opt-out process. Any customer with consumption over 1MW will meet with RMP to discuss their specific rate impacts. Once the program takes effect, households will be able to exit the program anytime in the first three months of receiving the new rate, after which there will be a termination fee. This fee is to disincentivize rate hopping, but the amount has not yet been determined.

The largest remaining question for many interviewees is that costs to customers are still unknown. This program is designed so that all program costs and benefits accrue only to the participants of the program. The program design process will determine how the rate case is structured, including which factors are included as costs and benefits.

These definitions could be broad to include grid-wide effects, or relatively narrow. For example, a key debate is how costs of coal plant shutdowns will be distributed from the broader PacifiCorp grid, particularly if these closures occur after the program is in effect. Interviewees hope that program benefits will also include avoided volatility of fossil fuel costs, or even a future carbon price, but it remains to be determined how that compensation would be calculated. RMP has included sensitivity analysis for future carbon pricing in their IRPs, but it's unclear if insulation from these costs will be included as a benefit in this program.

While most anticipate that costs to customers will be slightly higher than the base rate, the program design does allow for program costs to be lower. In this case, customers opted in to the 100RE program would receive a credit on their bill rather than added cost. Program costs are designed to be flexible over time as energy costs change, though there are measures to prevent shocks to the system. Further, if program costs are estimated to exceed a 10% rate increase from the base case, a super majority of CREA members is required for the program to proceed. One interviewee noted that they hoped to participate in the program regardless of costs, as some residents in their community would be comfortable paying high premiums for renewable energy.

Finally, each community will be required to write a plan to accommodate low-income residents. Some frame this process as an exciting way to develop and share ideas, while creating a program tailored to their community. Others, however, believe this individualized process will lead to poor, hollow plans. Suggestions for these plans have focused on increased program noticing for lower-income neighborhoods. This is a relatively inexpensive option, which shifts responsibility to the customer by providing additional notice to opt out. Some proposed automatically opting out households below a certain income level but felt that this would be discriminatory. Cities may choose to subsidize participation costs for low-income households, though not all cities have adequate funding for this approach. Even with the program noticing requirements, interviewees were concerned that residents would be caught unaware of the program or that there may be language barriers in program noticing. RMP will continue to offer their low-income assistance programs to customers whether they opt out of the program or not, easing cost concerns.

5. Conclusion and Policy Implications

The Utah Community Renewable Energy Act is the first legislation of its kind, enabling increased community choice provided by the IOU. This process has led to the formation of CREA, and it will enable up to 23 Utah communities to reach 100RE by 2030. The leadership of several well-resourced communities with experience in sustainability policy was critical to the success of this legislation—even with this capacity, the process took several years to develop. These communities were able to use a key leverage point—franchise agreement renewal—to begin negotiations with the utility. Getting the support of the utility was critical to the program's continued development. Further, while smaller communities lack the capacity to create this change, this process developed a pathway for communities of any size across Utah to join the energy transition. Utah is now a leader in 100RE implementation, providing an example of an alternative pathway to 100RE implementation.

For other states or communities looking to replicate this, interviewees pointed to several key components of the program that contributed to its success. First, the time lag between initial city resolutions and the first financial commitment allowed more communities to pass the resolution than may have otherwise. The anchor community concept held predicted program costs relatively constant and reduced costs for other communities to participate. Interviewees noted the importance of organizing with a broad coalition of support, including through external stakeholders like non-profits, businesses, and industry advocate groups. Issues in program development included the speed of the process and lack of information. One community that did not pass the resolution noted that more program information was announced soon after the adoption deadline. This interviewee felt that having more program details would have assured their city council enough to pass the resolution. Additionally, despite significant organizing by non-profits and communities alike, some interviewees thought more time would have allowed additional communities to participate—particularly if more information was released in the meantime. In the future, states will be able to point to Utah as an example in program design and use data from its operation to predict their own costs.

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CHAPTER 4

COMMUNITY CHOICE ADVANTAGES: HOW CALIFORNIA CCAS DEFINE AND DELIVER ON PROMISES

Abstract

Community Choice Aggregators (CCAs) are a rapidly growing alternative to investor-owned utilities (IOUs) in many US states, with the most rapid growth in California. Local governments have used CCAs to fulfill their climate and sustainability goals, including commitments to 100% renewable electricity (100RE). CCAs are pitched as offering lower prices, increased access to renewables, and increased local control. Few studies have quantitatively examined their progress or ability to deliver stated benefits or analyzed how CCAs self-describe their benefits. As more communities consider adopting CCAs, it’s important to understand what benefits they offer and how benefits are communicated to customers. This paper therefore quantitatively compares CCA and IOU costs and renewable content. While cost savings to CCA customers are small, CCAs do offer a broader array of renewable energy sources to customers. IOUs are also required to offer a 100RE rate to customers, however, limiting the increase in customer options with CCAs. Textual analysis is then used to examine how California CCAs discuss these and other advantages, to understand if limited cost and renewable benefits undercut motivations for communities to join CCAs. Beyond discussion of costs and renewables, CCAs tend to discuss increased customer choice and voice, as well as increased locality of options, operations, and investment. These findings indicate that normative values like localization are a central benefit for CCAs, even beyond costs in some cases.

1. Introduction

Community Choice Aggregators (CCAs) are government entities that provide power procurement while the investor-owned utility (IOU) continues to provide power delivery and grid maintenance. CCAs are considered easier for cities to form than a municipal utility, while still giving cities increased control and decision-making in the electricity system. CCAs are currently authorized in ten states with several more under consideration. Given this growing interest in CCA legislation, it is important to learn from existing CCAs and understand their ongoing benefits and challenges. Research has not yet caught up to this rapid expansion, however, with few studies examining a large cross section of CCAs. This paper uses a mixed-methods, cross-sectional analysis to evaluate the economic, environmental, and other benefits of CCAs in California.

Academic literature on CCAs is limited; this analysis therefore builds on a foundation of grey literature, particularly feasibility studies conducted by cities considering CCA adoption (Fuentes, n.d.; Hampton et al., 2014; Landau, n.d.; Murtishaw et al., 2010). Feasibility studies most commonly cite three motivations for joining or forming CCAs. First, many cities pursue CCAs to reduce customers' electricity costs. Cost reductions may come from eliminating the need for corporate profits, as well as by accessing the newest, least expensive renewable power contracts (Faruqui et al., 2020). Second, CCAs can be used to increase access to renewable energy and implement climate and sustainability goals (Gunther & Bernell, 2019), such as commitments to 100% renewable energy (Kunkel et al., 2022). Third, many communities are interested in CCAs to increase local control of electricity decisions while reinvesting profits in the community. Communities are able to achieve co-benefits such as job creation and local renewable energy through development of local projects (Armstrong, 2021). Finally, in California specifically, anti-IOU sentiment is an added factor for CCA support, following several cases of wildfire mismanagement and IOU bankruptcy (Faruqui et al., 2020; Hsu, 2022).

The extent to which CCAs are delivering these proposed benefits is unclear. Quantitative, academic analyses of CCAs are limited, and tend to focus in-depth on a single CCA (Fikru & Canfield, 2022; Xia, 2017), or a higher level overview of a few CCAs (Armstrong, 2019; Gunther & Bernell, 2019; Kennedy & Rosen, 2021). Research has, however, highlighted potential cost concerns, particularly the long-term viability of cost savings (Faruqui et al., 2020; Hsu, 2022). CCAs in California are expected to exceed the state's Renewables Portfolio Standard (RPS) (Armstrong, 2019), though there are indications this may be correlated with a 'shuffling' of excess renewables from IOUs rather than spurring development of new generation sources (Gunther & Bernell, 2019). If CCAs are not delivering substantial cost or renewable improvements for customers, further research is needed to understand if CCAs are accurately describing these benefits, as well as understand which other benefits may motivate communities to form or join a CCA.

This study addresses this gap by examining the potential and achieved benefits of CCAs in California, where 25 CCAs have been established since 2010. Specifically, this study aims to answer the following questions: (1) are CCAs meeting goals of cost effectiveness and increased access to renewables? And (2) how do CCAs define these or other benefits to the communities they serve? These questions are answered with a quantitative comparison of CCA and IOU electricity rates and generation mixes, followed by qualitative content analysis of CCA websites, examining how CCAs describe their goals and intended benefits.

This analysis finds that CCA base rates are competitive with IOUs, but typically do not produce significant savings for customers. In 2022, CCA base rate customers saved an average $0.87 per month compared to IOU rates. Overall, 15 of 23 active CCAs offered less expensive base rates than the IOU, while 16 CCAs offered less expensive 100RE rates. This study also finds that CCA base rates offer approximately 9% more renewable energy than IOU base rates and CCA 100RE rates use a more diverse mix of renewable energy than IOUs. Textual analysis of CCAs self-described benefits revealed that CCAs emphasize goals beyond the minimal cost savings and increased renewables found in the quantitative analysis; CCAs instead have a significant focus on local co-benefits and local decision-making. This shows that CCAs may still be worthwhile for communities even if costs and renewable options are more similar to IOUs than initially believed.

This study will begin with an overview of CCA adoption in California, discussing the ways CCAs may reduce costs while increasing renewable energy (Section 2). Section 3 then describes research methods and data sources for the quantitative cost comparison and qualitative textual analysis. Section 4 presents the results, while Section 5 provides a discussion. Finally, Section 6 concludes with policy implications.

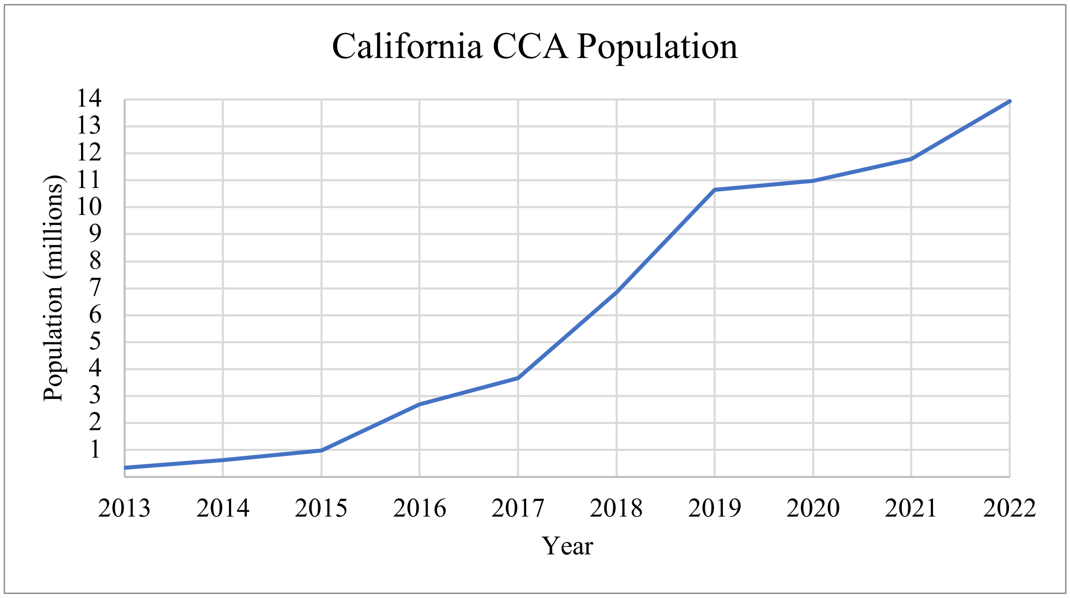
2. Overview of CCAs in California

2.1 CCA Adoption

CCA enabling legislation was passed in California in 2002. The first California CCA—Marin Clean Energy—did not launch until 2010, following years of research, public meetings, and IOU resistance (Gunther & Bernell, 2019; Ruppert-Winkel et al., 2016). Initial CCA growth in California was slow, as formation required significant time, effort, and financial capital to wrest control of energy procurement from incumbent utilities (Armstrong, 2021; Xia, 2017). As CCAs become a more proven concept, however, adoption has taken off rapidly (Figure 7) (Armstrong, 2019).

Figure 7

Residential Population Served by CCAs in California

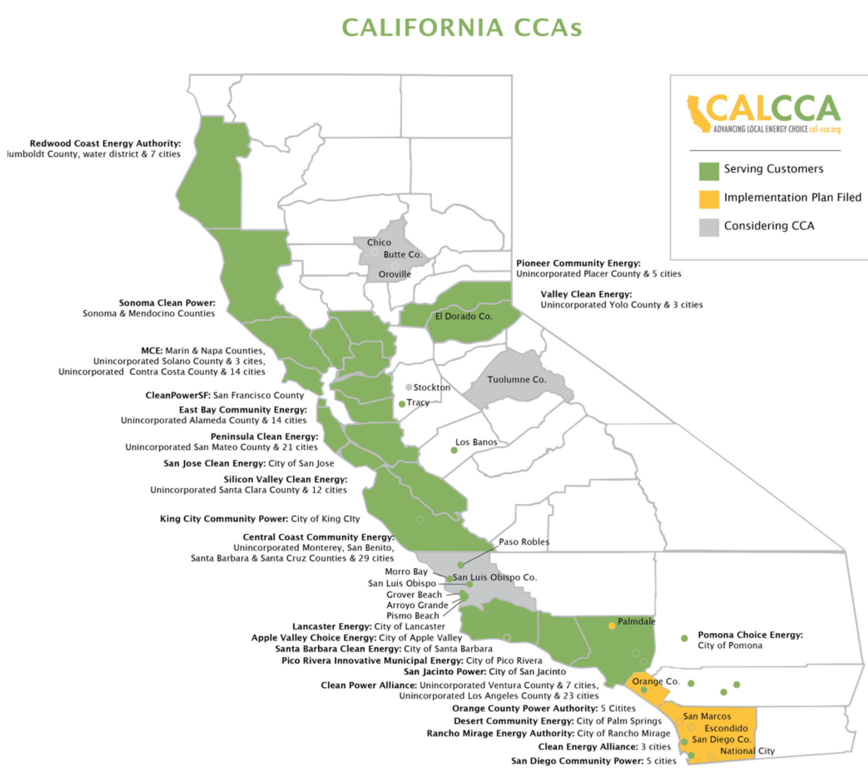


Note. Census population data from 2020 was used for 2021 and 2022.

CCAs now serve nearly 30% of IOU load in the state (Micek, 2021). This population is served by 23 CCAs, 11 of which serve a single city. The newest CCA—Orange County Power Authority—will begin serving customers in the fall of 2022 and is not included here. CCAs operate as 'opt-out' entities; when a city joins or forms a CCA, all the residents are automatically enrolled in the CCA. Residents have the option to opt-out and return to the IOU if they prefer. On average, only 7% of customers opt-out (CalCCA, 2022b), typically during the 60 day enrollment window before CCA service begins (Kennedy & Rosen, 2021). Customers also have the choice to opt-up to a higher percentage of renewable energy, including 50%, 100%, or carbon free options, though low percentages of customers choose to do so. For example, Clean Power Alliance has opt up rates below 1% and Peninsula Clean Energy has an average opt up rate around 2% (Clean Power Alliance Board of Directors, 2022; Peninsula Clean Energy Authority Board of Directors, 2022). Many communities have chosen to set the CCAs 100RE option as the default (Trumbull et al., 2019), though it is unclear if all CCAs allow this option.

Figure 8

CCA Implementation in CA as of January 2022 (CalCCA, 2022b)



Adoption is largely concentrated in coastal counties (Figure 8). Given the significant effort and government resources required to launch an early CCA, it is not surprising that early adopters tended to be wealthier communities with demographics that are correlated with high environmental motivation (i.e., more liberal, highly educated areas) (Krause, 2011; Lubell et al., 2009; Salon et al., 2014). Adoption has become more accessible and diversified over time, particularly as cities can now join existing, larger CCAs, rather than forming their own—a cheaper and more desirable option for many communities. Still, communities with CCAs still tend to be larger, wealthier, more diverse, and higher educated than the state average (Table 7). These demographics are in line with prior research (Armstrong, 2019; Krause, 2011; Lubell et al., 2009; Salon et al., 2014) and similar to adoption of 100RE commitments (Breetz et al., 2022; Kunkel et al., 2022). Averages are skewed by a few big cities; the majority of communities served by CCAs or with 100RE commitments are quite small (Figure 9).

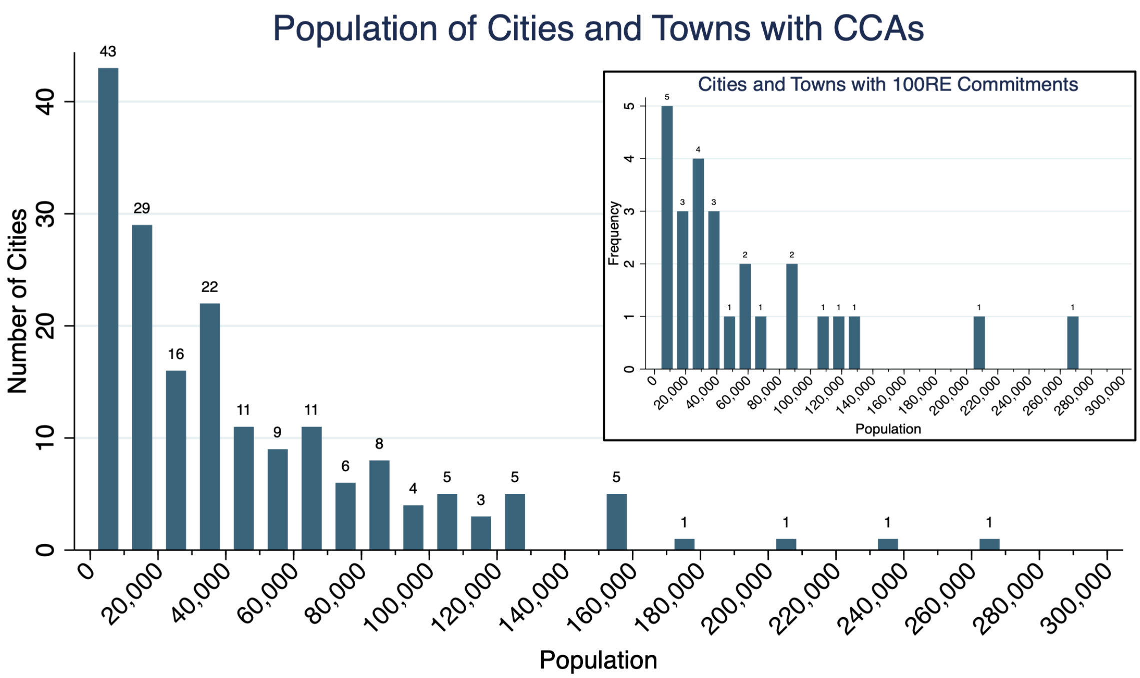
Table 7

Summary Demographic Statistics of CCA Cities

	All CA (N = 1,490)	CA CCA Cities (N = 517)	CA 100RE Cities (N = 44)
	Mean, (S.E.)	Mean, (S.E.)	Mean, (S.E.)
Population	24,983 (122,525)	27,061 (92,744)	202,053 (646,048)
Median Income	$ 34,283 ($ 16,650)	$ 42,868 ($ 19,839)	$ 44,776 ($ 18,759)
% White	75.32% (19.80%)	72.75% (21.19%)	76.83% (13.42%)
% Bachelor's	12.28% (9.84%)	16.84% (9.44%)	19.35% (7.54%)
% Below Poverty Line	14.26% (13.10%)	9.93% (8.59%)	9.56% (5.98%)

Figure 9

Population of California Cities and Towns with CCAs



Note. Four cities with CCAs—San Diego, San Jose, San Francisco, and Oakland—each have populations over 300,000 but were dropped from this figure for clarity. San Diego, San Jose, and San Francisco also have 100RE commitments.

2.2 Financial Impacts

CCAs are structured as non-profit government entities (Xia, 2017), and therefore have reduced marketing and overhead compared to IOUs (Faruqui et al., 2020). CCAs also benefit from 'cost bypass,' by signing newer, cheaper renewable contracts, though these tend to reduce over time as IOUs reach the end of older and more expensive renewable contracts (Faruqui et al., 2020). CCAs may also struggle with creditworthiness; only seven California CCAs currently have investment-grade credit ratings (CalCCA, 2022a). As CCAs establish better credit ratings over time, they are able to secure longer term contracts and reduce price volatility (Baron et al., 2021).

The Power Charge Indifference Adjustment (PCIA) is a line item on customer bills that aims to ensure CCA customers cover their share of IOU procurement costs that had been planned prior to their departure. These procurement costs also include IOUs lost capital investment costs for generation assets that are no longer needed for the reduced IOU customer base (Baron et al., 2021). IOU customers similarly cover their share of procurement costs, such as in the PG&E Solar Choice rate (Figure 10), but this is not always separated out as a separate surcharge. The purpose of this charge is to ensure remaining IOU customers do not pay a proportionally greater share of IOU procurement costs due to departing load as CCAs expand. If CCAs are able to save customers money, it is critical that remaining IOU customers do not face cost increases as a result. Further, most California CCAs have been formed in wealthier, coastal areas; the PCIA is intended to prevent these communities from realizing cost savings at the expense of the remaining IOU customers in less wealthy, rural, inland communities.

The PCIA is set through a complex California Public Utilities Commission (CPUC) process known as the Energy Resource Recovery Account proceedings. The PCIA is determined through a complex calculation, which has received significant debate from both IOU and CCA stakeholders. Future research could examine these dynamics; an impartial quantitative analysis of the equity of cost distribution would be particularly revealing. While the PCIA is expected to decrease over time as energy procurement contracts end or are sold, it currently adds to CCA rates and limits customer savings.

Research indicates that even with the longer lasting forms of cost savings, CCAs reduced costs may not last beyond the first few years of operation (Faruqui et al., 2020; Hsu, 2022; O'Shaughnessy et al., 2019; Xia, 2017). In Illinois, for example, CCAs initially captured significant market share with lower prices, but CCA contracts with municipalities later lapsed when IOUs signed newer, cheaper wholesale contracts (Faruqui et al., 2020; Hsu, 2022; O'Shaughnessy et al., 2019). Two California CCAs—BPROUD from Baldwin Park and Western Community Energy—closed in 2021 for financial reasons after operating for only two years. Research has called for further quantitative analysis into CCA cost trends to examine these potential issues (Hsu, 2022; O'Shaughnessy et al., 2019).

2.3 Renewable Energy Impacts

Communities are also using CCAs to advance their climate and sustainability goals. One such goal is city commitments to 100% renewable electricity (100RE). This policy was promoted by the Sierra Club starting in 2016 and has since been passed as a non-binding resolution in nearly 200 cities across the US (Breetz et al., 2022; Kunkel et al., 2022). Formation of CCAs has been critical in granting California cities the jurisdiction to realize 100RE goals—every 100RE city in California either has a locally-owned utility, a CCA, or lies within a county that is working towards CCA implementation (Kunkel et al., 2022). All but two CCAs offer an additional option for 100% renewable electricity. Desert Community Energy offers a carbon free option instead, while King City Community Power has only a base rate, though it is often 100% renewable.

The earliest CCAs, Marin Clean Power and Sonoma Clean Power were each offering 100RE options from their inception. IOUs, however, only began offering 100RE options in 2016. This was required by Senate Bill 43, the Green Tariff Shared Renewables Program, which required each of the three CA IOUs to develop 100RE options for customers. This was approved by the CPUC in 2015, leading to the development of IOUs 100RE options. This program was originally written to terminate in 2019, and SCE applied for termination in 2019, prompting the CPUC to extend the program indefinitely. SCE claimed that program costs, primarily administration and information technology in the first year of development, were outpacing revenue (*Resolution E-5028*, 2019).

CCAs have been found to consistently procure renewable energy beyond state Renewable Portfolio Standards (Armstrong, 2019), though the marginal impact on the state grid is reduced in a high renewable market like California (O'Shaughnessy et al., 2019). CCAs also appear to use Renewable Energy Credits to reduce prices, then shift away from them over time as the CCA matures (Kennedy & Rosen, 2021).

One remaining question is whether the formation of CCAs has led to additional renewables generation, beyond what IOUs would have procured otherwise, or if this generation is being "shuffled" from IOUs to CCAs. The CPUC certified that all providers met or exceeded the 2018 Renewables Portfolio Standard requirement of 29% as well as the 2020 target of 33%. The CPUC also shows CCAs exceeding the RPS requirement by a greater margin than IOUs—in 2020, the aggregated actual RPS percentages for IOUs was 35%, compared to 47% for CCAs (Tarnow et al., 2021). One indication of renewables "shuffling" from IOUs to CCAs is that while IOUs continued to meet RPS targets, all three IOUs percent of eligible renewables procurement decreased between 2018–2020, which is in line with prior research (Gunther & Bernell, 2019). This means that CCAs increased renewable content may simply be shifted from IOUs and not additional renewable energy, particularly in-state generation (Kennedy & Rosen, 2021). These changes could be due to causes other than or in addition to CCA expansion, including changing energy costs or other factors, though these relationships will need to be examined in future research.

3. Research Design

This paper uses cost and energy data for California CCAs and IOUs to quantitatively assess the potential benefits of CCAs, namely: (1) whether CCAs offer lower electricity rates and (2) whether CCAs offer more renewable energy. This is followed by a qualitative analysis of CCA websites, to understand how CCAs describe their own benefits. The methods for each stage of this analysis are described here.

This paper examines all 23 CCAs in California, as well as two CCAs that have ceased operations due to financial reasons. These CCAs operate across three IOU territories: Pacific Gas and Electric (PG&E), San Diego Gas and Electric (SDG&E), and Southern California Edison (SCE). Quantitative data is gathered for each year of these CCAs existence, beginning in 2013. This offers the most comprehensive analysis of CCAs in California to date while also making this data more readily available for future research.

3.1 Analysis of CCA Costs

Electricity rate data comes from Joint Rate Comparison (JRC) documents. JRCs compare CCA and IOU costs for each rate plan, with the purpose of helping customers make informed decisions about their power provider. CCAs and IOUs are required to publish this information each time either of their rates change. These releases are therefore not on fixed schedules and the frequency of updates varies.

JRCs were gathered from each CCA individually, with varying degrees of difficulty. While these documents are public information and required disclosures (*Decision 12-12-036*, 2012), few are centrally compiled or archived. A significant contribution of this study is to provide all historical JRC documents in a central folder for increased access to information and to support future research into CCA rate trends.

In total, 161 JRCs were gathered for this analysis. At least three JRCs were gathered from each operating CCA, apart from San Diego Community Power and Santa Barbara Clean Energy which only began serving customers in 2021. JRCs include multiple rate schedules, which are not always uniform across IOUs or over time. Figure 10 shows the standard layout of this information for one rate schedule. For comparability, this analysis focuses on the base schedules from each IOU: D for SCE, E-1 for PG&E, and DR for SDG&E. Across these schedules, this analysis focuses on (1) the base rate and (2) 100% renewable rate, if available. The two CCAs without separate 100RE options were excluded from 100RE analysis. IOUs are required to offer a 100RE option, but those rates were not always listed in the JRCs and are therefore missing from some of the figures below.

The total cost of electricity includes several components. These include generation, delivery, surcharges, and occasionally a flat fee for an increased share of renewables. CCAs control the generation sources and can adjust the generation cost by choosing more or less expensive sources. Locally deployed solar would tend to be more expensive than renewable energy credits, for example. The delivery rate is controlled by the IOU and is the same for the IOU and CCAs in their territory. Surcharges include the PCIA (described in Section 2.2) or Franchise Fees (FF). Franchise fees cover the cost of the utilities use of public spaces for energy infrastructure. IOUs are not required to list fees separately and often bundle fees into the generation rate, as seen in the "PG&E" column below. This study will compare each of these components over time to understand the sources of price variation.

Figure 10

Example of a Joint Rate Comparison from East Bay Clean Energy (EBCE)

Tiered Rate Plan E1

Residential: E-1	PG&E	PG&E Solar Choice (100% Renewable)	EBCE Bright Choice	EBCE Brilliant 100 (100% Carbon-free)	EBCE Renewable 100 (100% Renewable)
Generation Rate ($/kWh)	$0.11313	$0.09436	$0.07738	$0.07908	$0.08908
PG&E Delivery Rate ($/kWh)	$0.13410	$0.13410	$0.13410	$0.13410	$0.13410
PG&E PCIA/FF ($/kWh)	N/A	$0.03346	$0.03405	$0.03405	$0.03405
Total Electricity Cost ($/kWh)	$0.24723	$0.26192	$0.24553	$0.24723	$0.25723
Average Monthly Bill ($)	**$88.37**	**$93.63**	**$87.77**	**$88.37**	**$91.83**

Monthly usage: 357 kWh

This paper does both a state-level analysis of all CCAs and IOUs in California, as well as sub-regional analysis of CCAs within the same IOU territory. This analysis is conducted from several angles. First, CCA and IOU rates are examined over time for longitudinal trends, including base and 100RE rates. This also includes examination of the variation in the Power Charge Indifference Adjustment (PCIA) and other fees over time. Next, the difference between CCA and IOU rates is calculated for both the base and 100RE rates over time. The CCA cost was subtracted from the IOU cost, with a positive value indicating a CCA meeting their goal of less expensive costs. This includes separate analysis of differences in generation and total costs, to understand where in a customer's bill costs have changed.

3.2 Analysis of Renewable Content

Power Content Label (PCL) data details the energy sources for each provider, including renewable energy sources. This paper examines how sources have changed over time for both the base and 100RE rates from IOUs and CCAs. PCL data are currently only available through 2020, however, limiting the analysis.

3.3 Analysis of Additional CCA-Claimed Benefits

The quantitative analysis found that CCAs offer found minimal cost savings to customers. Further, CCAs do not necessarily offer increased access to renewable energy options, given that California requires IOUs to offer 100RE plans. To understand whether this undercuts the motivation for CCA adoption, this study subsequently examines how CCAs describe their own benefits. This provides insights into how cost and renewable energy findings are described and which additional benefits are discussed.

Data on the intended benefits of CCAs were gathered from each CCA website. Data gathering was focused on readily available descriptions of CCA benefits, focusing on ‘About Us,’ ‘Benefits,’ and similar descriptive pages as though a customer was investigating the benefits of their CCA. These were downloaded from each of the 25 CCAs in California, including using a web archive to examine the two CCAs that are no longer active. The descriptions of benefits were analyzed with both deductive and inductive coding. Deductive coding began with codes based on benefits described in prior research and feasibility studies. Inductive codes were added throughout the analysis as new, consistent groupings of language became apparent.

Textual analysis results were cross-referenced with other CCA characteristics to examine potential trends. For example, if use of ‘local’ statements correlated with CCA size or how descriptors of price correlated with actual differences in CCA and IOU prices. This allows investigation into the accuracy of CCA website’s claims as well as comparison across websites to examine the uniqueness and breadth of discussed benefits.

4. Results

4.1 Analysis of CCA Costs

Figure 11 shows the difference in CCA and IOU base and 100RE rates over the past decade. A positive value indicates savings for CCA customers. The average difference in base rate costs is 0.4¢ per kWh and 1.3¢ per kWh for 100RE rates, or savings of roughly \$2.23 and \$6.73 per month for an average household.

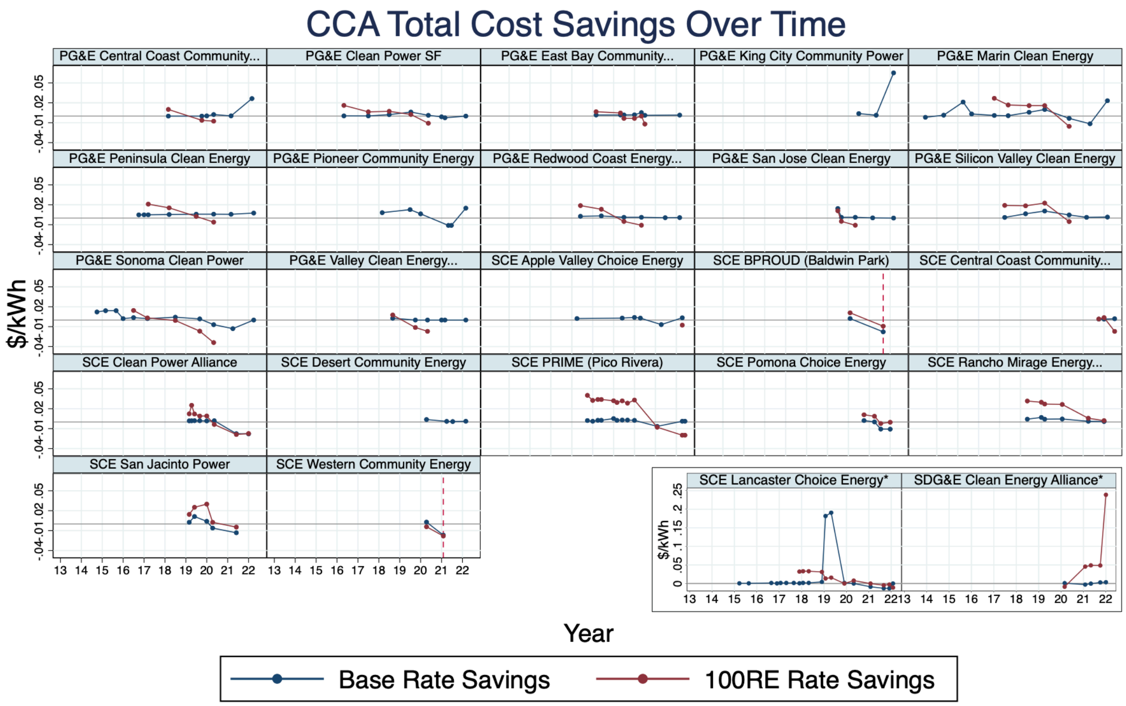
This comparison shows that CCAs and IOUs offer very similar base rates, though CCAs are slightly cheaper in most cases. Of the 161 JRCs included in this study, CCAs had a cheaper base rate than the IOU in 124 instances, the same base rate in 12 instances, and more expensive base rate in 25 instances. When CCAs were cheaper than the IOU, average base rate savings were only 0.7¢ per kWh, roughly $4 per month for an average household.

Of the 25 times that CCAs were more expensive than IOUs, 17 were in 2021. This occurred across all IOU territories and represented 13 of 25 CCAs considered in the study. Two of these 13 CCAs closed in 2021 due to cost increases. Most CCAs have been able to reduce customer costs in 2022, with now only 3 of 23 active CCAs showing higher costs than IOUs.

Differences in 100RE rates are more likely to have shifted. Many CCAs started out with cheaper 100RE rates, but their rates surpassed the IOUs 100RE rates over time. In the most recent JRCs, seven CCAs have more expensive 100RE rates than the IOU, while 16 have less expensive rates. Of 104 JRCs that listed 100RE rates for both the IOU and CCA, CCAs had cheaper rates in 64 instances, the same 100RE rate in one instance, and more expensive 100RE rates in 39 instances. It is important to note, however, that 100RE costs are not necessarily reflective of generation costs, as some CCAs set 100RE rates as a set price above the base rate. Central Coast Community Energy, for example, charges a flat 0.8¢ per kWh more for 100RE compared to their base rate (3CE, n.d.; Fikru & Canfield, 2022). This equates to roughly $4-5 per month for an average household. Other CCAs charge a flat premium rate for 100RE power, ranging from $2-11 per month. Interestingly, CCAs that charged flat fees had more expensive 100RE rates in 2022 than the IOU; these flat fees therefore do not currently cut into customer savings but rather exacerbate existing costs.

Figure 11

Difference in Total Cost Over Time for IOUs and CCAs



Note. CCA cost is subtracted from IOU cost; positive values indicate cost savings for CCA customers compared to IOU costs. Vertical lines indicate CCAs end of service, where applicable.

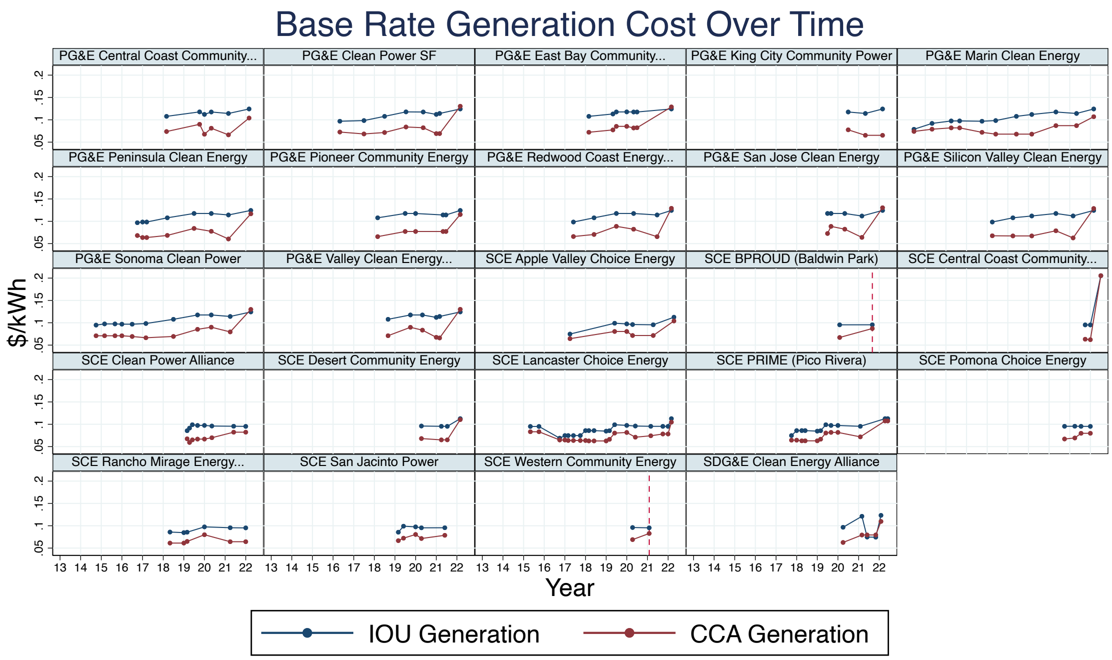
*For clarity, Lancaster Choice Energy and Clean Energy Alliance are presented here on a different scale than other CCAs as they had more significant cost savings than other CCAs.

Figure 12 begins to break down these total costs by showing base rate generation costs between each CCA and their respective IOU. This is the only segment of cost that CCAs can control and would therefore be where a CCA could work to deliver cost savings. Some CCAs tie their generation cost to the IOU cost, to remain a set percentage below the IOU. This can lead to financial issues, however, as in the case of Baldwin Park, which closed due to cost increases in 2021.

In general, CCAs have lower generation costs than IOUs. The average difference in base rate generation costs across all JRCs was 2.5¢ per kWh. The similarity in total costs therefore indicates that CCA generation savings are offset by the PCIA or other surcharges. Generation costs have increased for many providers in 2022, though this is more dramatic for CCAs. These cost increases have brought many CCAs generation costs closer to IOU costs, even surpassing them for seven CCAs, all in PG&E territory. PG&E added a new surcharge on their base rate in 2022—though the reason for this charge is unclear—meaning that all but one of these CCAs still have lower total costs.

Figure 12

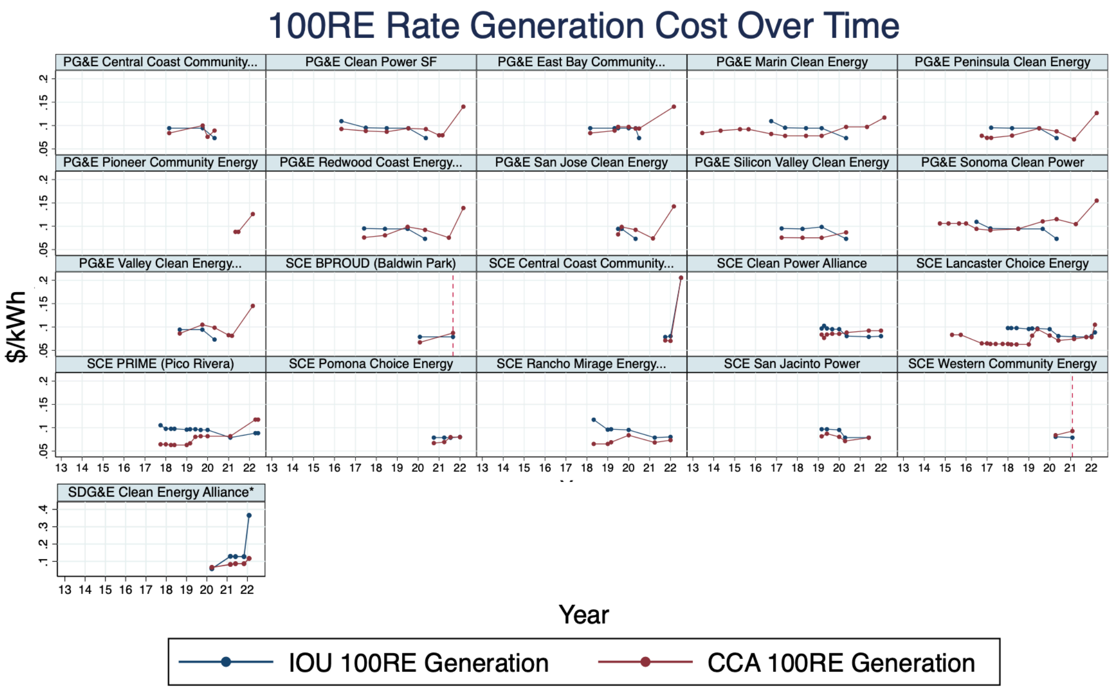
Base Rate Generation Cost Over Time for IOUs and CCAs



Generation costs for 100RE rates have been similar between CCAs and IOUs over time (Figure 13). One hypothesis is that energy sources in 100RE plans are more similar between IOUs and CCAs than the base plan (Section 4.2), so the costs will also be more similar. Further, IOUs charge customers a franchise fee on 100RE plans that is typically not included as a separate item on base plans.

Figure 13

100RE Rate Generation Cost Over Time for IOUs and CCAs

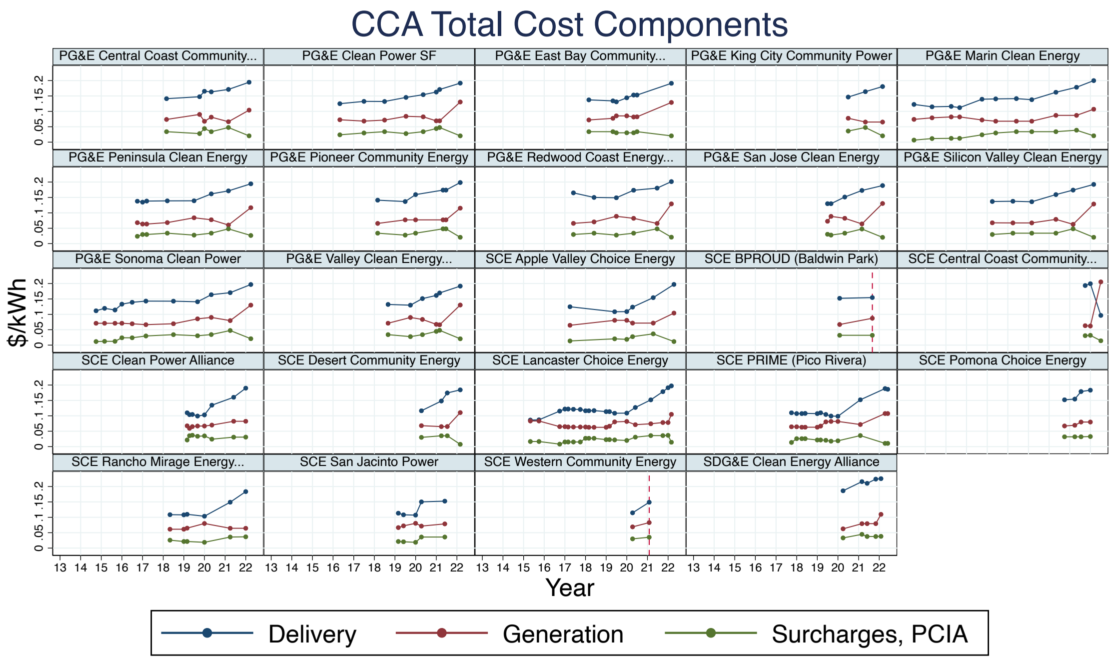


*For clarity, Clean Energy Alliance is presented here on a different scale than other CCAs as SDG&E 100RE generation costs increased more than other IOUs in 2022.

While costs in general have increased over time, these changes vary across the components of total cost. Figure 14 shows how each component changes over time for each CCA. Generation cost, the one aspect of total cost that CCAs control, appears to mirror changes in delivery or PCIA. Future research will need to analyze if CCAs intentionally change their generation sources to more or less expensive (or desirable) options to account for other changes in price. This may be one way that CCAs maintain stability in rates—a regularly discussed benefit.

Figure 14

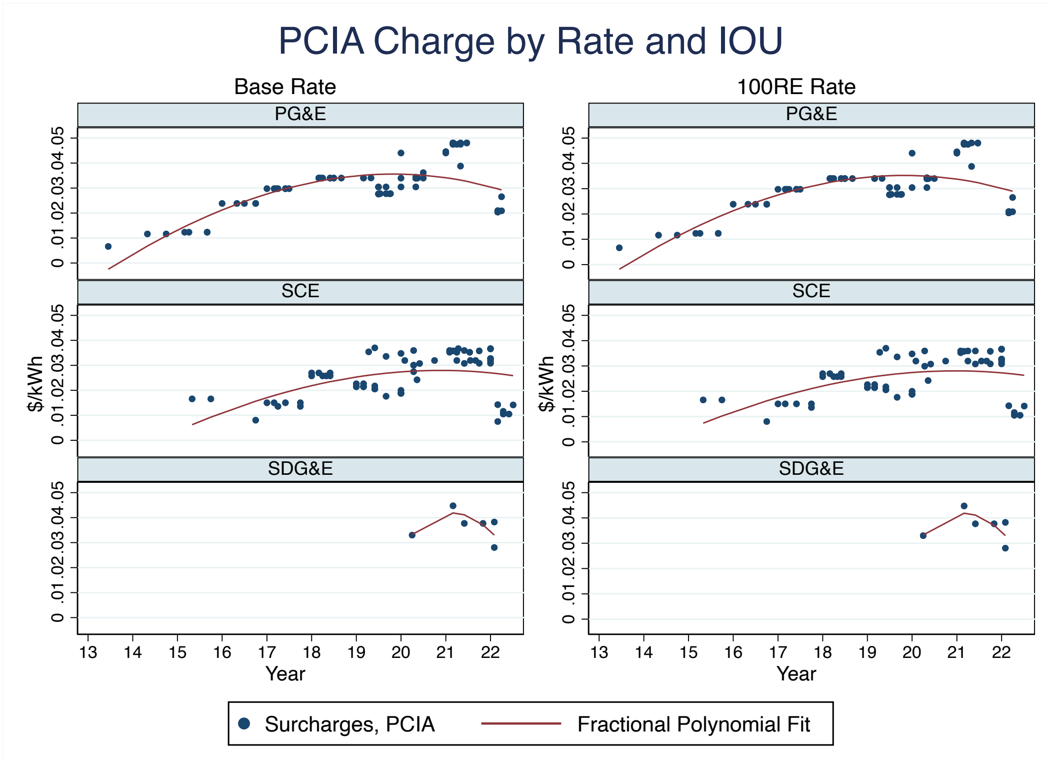
CCA Cost Components Over Time



While more complicated than this, the PCIA generally covers the cost of power contracts that the IOU will no longer use as customers move to CCAs. The PCIA is expected to increase while CCAs are continuing to expand and serve a growing share of former IOU customers. As IOU energy contracts begin to expire or are sold, however, this fee is expected to decrease. Using a fractional polynomial fit on PCIA charges for base and 100RE rates, this trend appears to already be happening (Figure 15). Higher energy prices in 2022 have allowed IOUs to sell more of their contracts, which may contribute to recent reductions in PCIA fees.

Figure 15

PCIA Charge Over Time for Base and 100RE Rates by IOU

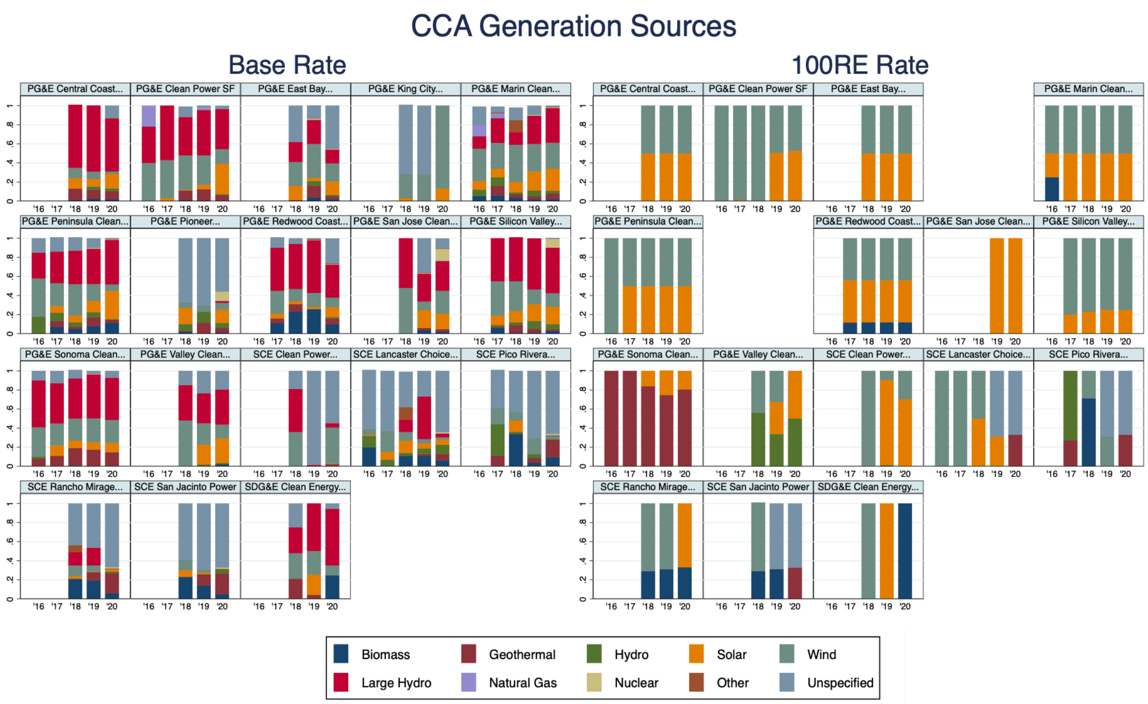


4.2 Analysis of Renewable Content

These results compare the generation mixes for CCA (Figure 16) and IOU (Figure 17) base and 100RE rates. Coal is not included here as none of the providers examined use coal in their generation mix. 'Unspecified' power indicates a generation source that could not be traced according to California Power Content Label rules, e.g., electricity market purchases without a purchase agreement in place beforehand or the use of unbundled Renewable Energy Credits (RECs). Biomass, geothermal, (small) hydro, solar, and wind are all Renewables Portfolio Standard (RPS) eligible renewables, though RPS compliance is calculated separately and may include additional sources such as other or unspecified power.

Figure 16

Percentage of CCA Base and 100RE Plan Generation Sources



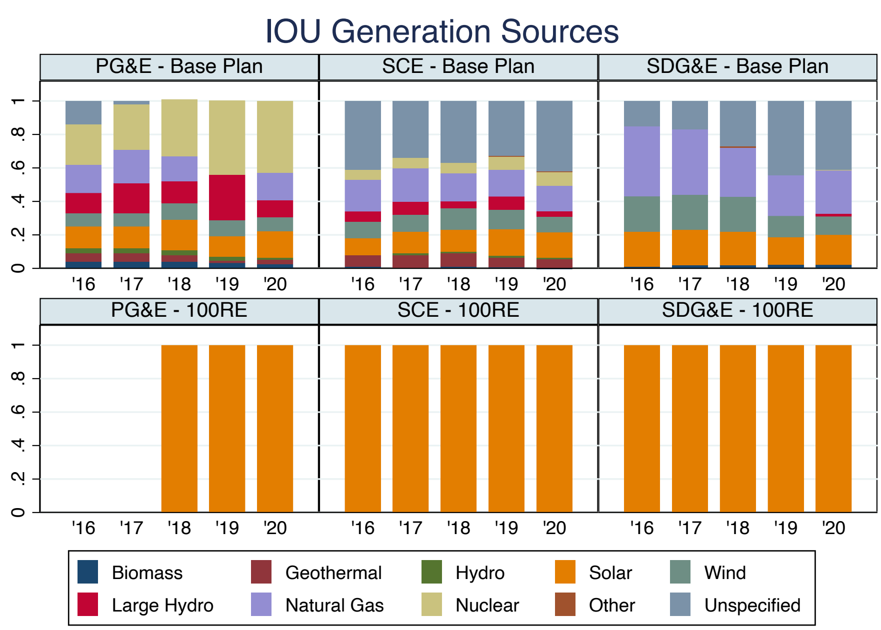
For base plans, IOUs include more fossil fuels than CCAs. IOU base rates include an average 34.56% eligible renewable energy, compared with 43.64% in CCA base rates. Across IOUs, the most significant differences are the amount of nuclear energy and unspecified power. PG&E no longer uses unspecified power sources, while SCE and SDG&E each use an average 37.32% and 28.82%, respectively. SDG&E has increased their use of unspecified power over the last several years, potentially to reduce costs through market transactions. PG&E also uses an average 34.42% nuclear power and

16.06% large hydropower in their generation mix, far above SCE's usage of 6.92% and 5.84% respectively, while SDG&E hardly uses either source. PG&E's significantly higher use of nuclear energy can be attributed to their ownership of the Diablo Canyon Power Plant, the only operational nuclear plant in California.

By contrast, IOU 100RE rates exclusively use eligible solar energy, compared to a mix of 91.55% eligible renewables in CCA 100RE rates. This broader mix in CCA 100RE rates includes an average of 42.75% wind, 29.85% solar, 9.13% geothermal, 8.45% unspecified, 6.41% biomass, and 3.43% small hydropower. Use of unspecified power in 100RE rates is skewed by a few CCAs using a significant amount of unspecified power, with an average of 65% unspecified power when used in a 100RE rate.

Figure 17

Percentage of IOU Base and 100RE Plan Generation Sources



4.3 Analysis of Additional CCA-Claimed Benefits

Quantitative analysis found that CCAs are typically able to deliver small cost savings to customers, as well as more renewable energy in their base plan compared to IOUs. Both CCAs and IOUs offer 100RE options, however, limiting the difference in customer choice. While these are important benefits, they are somewhat limited, and they may not be the only reasons for communities to adopt CCAs.

Given minimal cost and renewable benefits, this next stage of analysis surveyed CCA websites to examine the ways that CCAs self-describe their benefits to understand if CCAs are accurately discussing the scale of cost and renewable benefits as well as understand any additional motivating factors in CCA adoption. This exercise revealed a total of 1175 key words or phrases, distilled into 484 unique codes. Use of inductive and deductive coding resulted in a total of eight overarching categories: customer economics, community economics, community participation, customer choice, marketing, social benefits, stability, and sustainability.

4.3.1 Qualitative Codes by Category. Economic issues were separated by discussion of benefits to customers or the broader community. Costs to customers were discussed with the most consistent language; the vast majority of CCAs described costs as ‘competitive.’ This included 52 of 151 total mentions counted in this category. The next most common codes were ‘affordable’ and ‘savings,’ with 17 counts each. Discussion of ‘lower’ rates or bills were less common (14); some CCAs specified ‘slightly’ lower prices or ‘often cheaper’ rates. CCAs seemed to avoid outright claims of significant financial benefits to customers. Silicon Valley Clean Energy was the only

CCA to use the phrase ‘lower generation rates,’ which would likely confuse customers as this does not necessarily mean lower total costs. ‘Rebates’ and ‘incentives’ were discussed generally (7), and some CCAs also specifically mentioned providing better net metering rates for customers with solar (4).

Discussion of community economic benefits covered a wider range of topics. The most common benefit described in this category was reinvestment of revenues into the community, with a total 45 mentions of the 153 in this category. Beyond this general discussion of reinvestment, there were also specific references to funding local programs, donating to non-profits, and forming grants or scholarships (11 total). Closely related to these codes were mentions of CCAs not-for-profit structure (20) and lack of corporate shareholders (11), typically referencing this as a way the CCA has reduced costs or can redirect money from shareholders to the community. Job creation was mentioned a total of 21 times, with specific references to ‘local,’ ‘good paying,’ and ‘high-quality’ jobs. Finally, development of local or regional renewable energy projects was mentioned a total of 20 times.

Community participation was a broader category with 202 mentions across 66 codes. Most codes here focused on ‘local control’ (25), ‘local operation’ (16), or ‘community-owned’ (11). This included discussion of the CCAs formation as ‘created by the city’ or local communities (9). Local leadership was also important, with discussion of the CCA as ‘overseen by City Council’ (9), ‘Community Advisory Committee’ (8), or comprised of ‘local elected officials’ (8) and ‘local staff’ (6). CCAs described themselves as a ‘public agency’ (7) with a ‘public process’ (7) that allowed for ‘public comment’ (3). An odd phrase used on four different CCA websites was, “Since [CCA] is governed by the [Town/City] Council, there is no need to travel to the Public Utilities Commission … to have your voice heard." It is unclear if many customers had been traveling to the CPUC to make public comments in person.

Customer choice specifically focused on options to customers and had a total of 91 mentions across 44 codes. The majority of codes focused on general customer 'choice' in energy, power, and provider (30 total). A common phrase used was "offers the community a choice where there wasn't one before" (4). There were 20 mentions of 'cleaner,' 'renewable,' or 'green' options, with another eight mentions of 'opting up' to the premium rate, which is typically 100% renewable. CCAs described customer choice as an 'opportunity' (3), that they were offering customers the 'power' (3) to choose, or that CCAs were a 'smart choice' (2).

The marketing category centered around descriptive buzzwords that would be difficult to measure or prove. This was the smallest category, with a total of 86 mentions across 43 codes. This includes mentions of being 'innovative' (13), 'forward-thinking' (3), 'dynamic' (3), 'proactive' (3), 'ingenious' (2), or 'ambitious' (2). Other common codes were descriptions of a 'transparent' process (10) or CCAs as 'modern' providers (8). CCAs operating in a single city also discussed that the CCA was 'exclusively available' (8) to members of that community.

The social benefits category included broader community benefits beyond economics or participation, with 90 mentions across 54 codes. This included 18 general references to community benefits without specific examples. Specific benefits included advocacy on the customers behalf (4), such as to the CPUC, improved air quality (5), and locally focused programs (12). A common phrase here was that the CCA or it's programs were ‘unique’ to the community (8) or created ‘specifically for the community’ (4). Equity (8), justice (3), and diversity (3) were also discussed by several CCAs, though rarely with significant depth. Valley Clean Energy stands out with a full page discussing environmental justice, though it is unclear how this discussion may or may not have translated into action.

Stability largely centered around trust-building in the CCA as an entity, with 142 mentions across 78 codes. The most common keywords in this category were ‘reliable’ (29), ‘stable’ (16), and ‘resilient’ (10). Reliability was used to describe delivery, maintenance, service, and the system as a whole, while resiliency generally referred to the city or grid. The electrical grid and power delivery are still maintained by IOUs, so these phrases seemed designed to build trust in continued reliable operation even with the introduction of CCAs. This does mean, however, that communities would likely not see a change in the frequency or duration of blackouts, as delivery is still maintained by the IOU. Stability, by contrast, referred specifically to rates, including promises to ‘set rates annually’ for more ‘predictable bills.’ This may be misleading to customers, however, as their total costs may still vary as IOU delivery costs change. Further, costs were described as based on ‘long-term contracts’, indicating that CCAs believe in economic benefits beyond reduced costs, or that IOU costs were seen as volatile. CCAs were described as a ‘proven concept’ or ‘track record,’ as well as discussions about the legal and financial structure as separate from the city. Several used the phrase ‘low impact to implement’ (3), likely to alleviate any customer concerns about transitioning electricity providers.

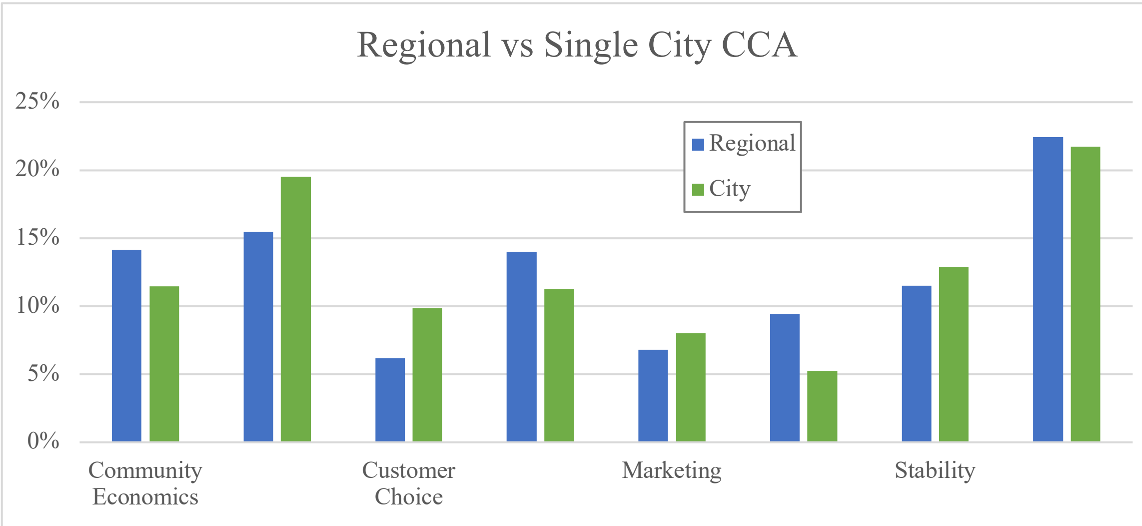
The sustainability category focused on environmental benefits and renewable energy and was the largest category with 260 mentions across 105 codes. This included discussion of the CCAs ability to offer ‘clean’ (63) or ‘renewable’ (32) energy as well as broader environmental benefits like ‘reducing greenhouse gas emissions’ (26) and increased ‘energy efficiency’ (19). CCAs also mentioned their ability to meet state and local sustainability or climate goals (20) and generally address climate change (14).

4.3.2 Comparative Analysis of Codes. The prevalence of codes in each category were next compared with a variety of variables to examine potential trends in CCA language choices. These figures use the percentage of total mentions rather than the count, to normalize the values for more accurate comparison.

First, regional CCAs are compared with CCAs that operate within a single city (Figure 18). Regional CCAs were more likely to discuss community and customer economic benefits, while single city CCAs were more likely to mention community participation and customer choice. Offering increased local voice may be more important or accurate to emphasize in smaller CCAs, even above economic benefits.

Figure 18

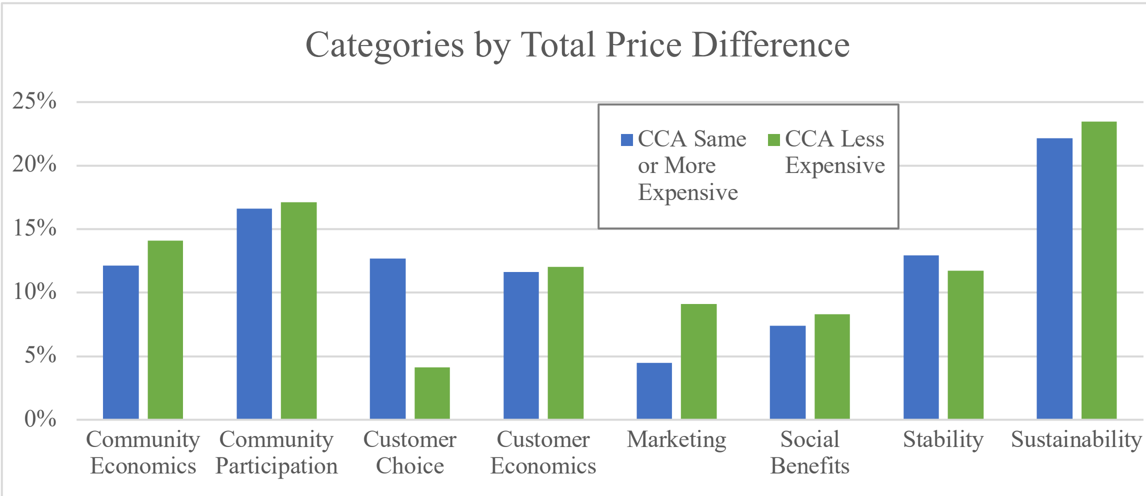
Prevalence of Codes by CCA Territory Size



Next, code prevalence is compared with a binary cost difference variable. The most recent total cost difference for each CCA in operation was converted to a binary variable representing whether the IOU offered the same or lower cost, or whether the CCA was cheaper. Most categories showed similar usage of codes regardless of the price difference. Customer choice was discussed far more by CCAs that are the same or higher cost than the IOU, indicating that this may be a key selling point in lieu of improved costs to customers. By contrast, the marketing category was used more by CCAs that were less expensive than the IOU. CCAs that were more expensive only used 10 of the 37 codes in the marketing category, including exclusive use of 'agile,' 'ambitious,' 'first of its kind,' 'logical step,' and 'public service culture.' 'Innovative organization' was also only used by more expensive CCAs, while less expensive CCAs mentioned innovation in a wider variety of ways including 'innovative programs' and 'innovative technology.'

Figure 19

Prevalence of Codes by Total Price Difference



5. Discussion

5.1 Benefits of CCAs

The majority of CCAs in California are able to deliver electricity at the same or slightly reduced cost compared to the IOU. Given these modest savings, CCAs tend not to describe their energy options as less expensive, however, and instead describe them as 'competitive.' Rates were also discussed as 'reliable' and 'stable,' offering 'peace of mind' to consumers. Economic discussion instead focused on reinvestments of revenue into local projects, development of good-paying local jobs, and the elimination of shareholders from the new utility model.

Rather than focusing on direct cost savings to customers, CCAs often described their benefits in other ways. Local participation and control were key benefits discussed, particularly in single city CCAs. This included increased accountability and oversight through locally elected officials as well as emphasis on the options available to customers through various energy plans. Local control, however, is challenging to measure and compare quantitatively (Faruqui et al., 2020). CCAs remain more decentralized than IOUs, though not all CCAs operate at the city scale. In many cases, it is cheaper for a community to join a larger, regional CCA than to form their own (Kunkel et al., 2022), which may limit the extent of local control available to less wealthy cities.

Given that IOUs in California are required to provide a 100RE option to customers, CCAs renewable energy offerings are less unique than they had been initially. All CA electricity customers—excluding those served by municipal utilities—could choose to have their electricity switched to 100RE sources. IOU 100RE options are capped at a certain volume of renewable energy, however, meaning that not all CA customers could opt-in at once. By contrast, CCAs are not required to offer a 100RE option, but nearly all do.

This study did find, however, that CCA base plans tend to offer a higher share of renewables than base IOU plans. CCAs also utilize a more diverse set of renewables in both their base and 100RE plans than IOUs. Some CCA-served cities have chosen the 100RE plan as default, meaning that customers in these areas would automatically receive increased access to renewables without needing to take any action. In line with these findings, CCAs describe their energy as 'cleaner,' 'greener,' and emphasize their ability to support pursuit of climate and sustainability goals.

5.2 Study limitations

Data availability and inconsistency were significant limitations to further analysis in this study. The CCAs in this study are within a shared state and have similar goals, yet their data availability and processes are different enough to make comparison difficult. By disaggregating this part of the energy sector towards the city scale, information must be gathered individually, is less consistent, and is more difficult to compare across groups. For example, it is unclear when data is unavailable compared to if the CCA doesn't offer the option, such as with cities opting up to the 100RE rate as a default. Creating more localized CCAs is intended to offer increased control and participation to communities, though this can reduce data availability and limit potential research.

One aim of this study was to improve data availability for future researchers through compilation of JRC documents. Only three CCAs were still missing some years of JRCs, for a total of five missing documents. JRC documents were found in a variety of places, as they were not posted consistently with each CCA. The majority of active CCAs (16 of 23) included only the most recent JRC on their website. Similarly, all three IOUs posted only the most recent JRCs for the CCAs in their territory. The CPUC started a rate comparison site in July 2022 to increase access, but it only provides the most recent JRC and is still missing several CCAs. The CPUC does, however, archive customer notices including some JRCs through 2020. Other barriers to access included emails to "info" or "contact" addresses bouncing, long wait times, and lack of response. Several CCAs that operate within a single city required public data requests from the city. In some cases, the CCA pointed to the city for JRC data, while the city recommended the CCA, and still others recommended contacting the IOU.

Additional sources, such as the power content label, are centrally compiled, but released slowly. The 2021 power content label data, for example, will be released in the fall of 2022. Further, cost increases in 2021 cannot be analyzed against power source data until fall 2022. Trade organizations such as CalCCA provide support and organization to CCAs, but only maintain limited document archives such as with Integrated Resource Plans. Additional data sources are limited by the fact that IOUs still provide billing and delivery, meaning that some data is compiled at the utility level instead of by CCA.

6. Conclusion

This study examined the central claims that CCAs can offer lower energy prices and increased access to renewable energy. Quantitative analysis showed only moderately lower prices, though these varied over time and by IOU territory. Further, steep price increases were observed in 2021 that limit recent savings. CCAs offer increased access to renewable energy in their base product, but with IOUs required to offer a 100RE option, the difference in renewable access is significantly reduced in California. For the 100RE options, IOUs use only solar power, while CCAs provide more varied options. In addition, IOU 100RE plans require customers to opt up, while several CCA cities have chosen 100RE as the default option, significantly increasing use of renewable energy in their areas. On the whole, these findings suggest that CCAs provide relatively modest economic and environmental benefits in California, though their benefits may be greater in states with lower surcharges on CCAs or in states that do not require utilities to offer 100RE plans.

Moreover, it is important to recognize that CCAs describe a far broader array of benefits beyond cost and renewable energy access, and that these may be additional or alternate motivating factors for adopting communities. In particular, CCAs emphasized their locality through increased participation and the reinvestment of revenues into local projects and jobs. Stability and reliability of both rates and power delivery were strongly emphasized, but also balanced by discussion of positive change through innovation and pursuit of sustainability. Messaging varied with cost differences, with more expensive CCAs focusing on participation as opposed to less expensive CCAs that discussed their economic benefits to customers and communities. Claims also varied by CCA size, with single city CCAs focusing more on local benefits and regional CCAs emphasizing innovation and stability. These findings suggest that the benefits of CCAs, as self-described, extend beyond cost and electricity sources. Communities may be willing to bear higher costs for increased participation, and some communities may decide that the local reinvestment of revenue outweighs some increased cost burdens for customers.

Future research is needed to determine the expense of the process of developing or joining a CCA. This is particularly important if CCAs are able to reduce costs for customers, even modestly as found here. Delivering cost savings only in areas that could afford a transition to a CCA disproportionately benefits wealthy communities. CCAs focus on local reinvestment of revenue would further be localized to already wealthy areas, rather than where those investments would be needed more critically. CCAs are continuing to expand in California and across the US, hopefully increasing access to their varied benefits as explored here.

CHAPTER 5

CONCLUSION

This dissertation has shown that a broader range of cities are becoming more interested in participating in the electricity system, and in some cases are having success increasing their local control of energy decision-making. The cases discussed here highlighted cities pursuing local control to advance renewable energy policy, though the benefits of increased local participation also include advances in social, economic, and environmental sustainability. Time will tell what cities will do with this advancement of control, including if communities in other states will follow in the footsteps of cities like those from California and Utah. The research presented here should inspire hope for sustainable change through the power found with individuals and improved outcomes due to sharing of resources and ideas. Further, the 100RE policy trend has contributed to broadening the range of communities making sustainable change, and even where 100RE implementation is unlikely, has contributed to increased environmental action.

There are several examples throughout these studies of a single person making significant, lasting change in creating a more sustainable electricity sector. In many communities, including those in Pennsylvania, Florida, and Wisconsin, it was the ambition of a single city council member or resident lobbying their community that led to adoption of a 100RE commitment. In another case, one mayor in Utah was able to kick off a chain of events that opened opportunities for communities with as few as 400 residents to have the option of 100RE. Within that 400-person community, Castle Valley, the passion of a single council member convinced the community to participate as an 'anchor community,' committing a higher financial contribution to stabilize the program and receive a weighted vote in decision-making. These stories show that while no one can accomplish this change alone, the dedicated work of passionate individuals is required for forward progress on these issues.

Key breakthroughs in both adoption and implementation were possible thanks to the resource sharing of groups and communities. This includes the sharing of ideas through collaborative partnerships, providing financial support, and sharing staff capacity. Cities in Colorado and Wisconsin, for example, developed coalitions of local actors that work together to lobby the state government and utility regulators. Cities with more staff capacity help represent the interests of smaller communities to these larger bodies. Three cities in Utah pooled their resources to hire a shared sustainability staff person, as smaller cities often struggle to hire dedicated sustainability staff. In California and Utah, cities with staff and financial capacity led the way in forming CCAs and passing state policy. These actions created openings for smaller communities to join more easily, spreading the benefits of these advancements to more areas. Similarly, financial contributions for communities in the Utah Community Renewable Energy Agency are calculated based on city size and energy consumption, to ensure all cities can participate with equal voice with proportional financial contributions. These communities have shown that in order to make significant change, progress must be made together.

Even in communities that did not progress toward implementation, 100RE adoption led to adjacent sustainability projects or policies and generally increased discussion about climate and sustainability issues. This includes the development of collaborative networks within and across communities, and capacity building in communities that previously had minimal interaction with energy or sustainability issues.

These changes have contributed to an expanding network of local policymakers that are invested in and pursuing sustainable change, accelerating progress in local policy venues. Therefore, the success of 100RE commitments should not be solely judged on its implementation, but on the broader increase in sustainable change and increase in local capacity and local voice.

While the 100RE policy adoption trend has largely concluded, this process drew a broader range of communities into energy policymaking than had been previously seen in sustainability transitions research. This range of 100RE adopting cities shows that interest in pursuing sustainable change is spreading beyond the 'likely adopters,' an encouraging sign in furthering a sustainable transition. Research and community support will need to be expanded to accommodate this new breadth in sustainability and energy policy adopters. Through the novel policymaking of 100RE commitments, cities are harnessing their power to create truly sustainable change, building momentum that lifts up communities of all sizes.

"Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has" – Margaret Mead

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APPENDIX A

SELECT SURVEY QUESTIONS FOR ANALYSIS

2. Has your jurisdiction adopted a sustainability plan? ☐ Yes ☐ No

2a. If yes, please indicate if the plan contains goals or strategies for any of the following. (Check all that apply.)

☐ 2. Energy conservation ☐ 8. Green energy production

6. Do the departments in your jurisdiction coordinate on the following programs or policies?

f. Energy planning ☐ Yes ☐ No

8. Does your local government own any of the following municipal utilities? (Check all that apply).

☐ a. Electric utility

9. Is any part of your community served by an electric cooperative? ☐ 1. Yes ☐ 2. No

11. Which scenario best describes your jurisdiction's staffing on sustainability?

☐ a. Dedicated staffing in chief elected/appointed official's office

☐ b. Dedicated staffing across multiple departments

☐ c. No dedicated staffing, but goals recognized across departments

☐ d. Dedicated staffing within a single department

☐ e. No dedicated staffing, but a task force / committee

☐ f. No staffing, goal recognition, or task force / committee

14. Which of the following energy actions has your jurisdiction taken in the last five years? (Check all that apply.)

a. Established a fuel efficiency target for the government fleet of vehicles

b. Increased the purchase of hybrid, plug-in hybrid, electric, or other fuel-efficient vehicles

c. Installed charging stations for electric vehicles

d. Conducted energy audits of government buildings

e. Established a policy to only purchase energy star equipment when available

f. Upgraded or retrofitted government facilities to higher energy efficiency of office lighting

g. Upgraded or retrofitted traffic signals to increase efficiency

h. Upgraded or retrofitted streetlights or other exterior lighting to improve efficiency

i. Upgraded or retrofitted government facilities to more energy efficient heating or air conditioning systems

j. Upgraded or retrofitted facilities to higher efficiency pumps in the water or sewer systems

k. Installed solar panels on a government facility

l. Installed a geo-thermal system in a government facility

m. Generated electricity through refuse disposal, wastewater treatment or landfill operations

n. Required all new government construction projects be certified green (e.g., LEED, Energy Star, etc.)

o. Required all government renovation projects be certified green (e.g., LEED, Energy Star, etc.)

16. Does your government provide or support any of the following programs to the community? (Check all that apply.)

a. Energy audits for individual residences

b. Weatherization for individual residences

c. Heating/ air conditioning upgrades for individual residences

d. Purchase of energy efficient appliances in individual residences

e. Installation of solar equipment on individual residences

f. Energy audits for businesses

g. Weatherization for businesses

h. Heating/air conditioning upgrades for businesses

i. Purchase of energy efficient appliances for businesses

j. Installation of solar equipment on businesses

37. The highest elected official in my jurisdiction is:

☐1. Republican ☐ 2. Democrat ☐ 3. Other ☐ 4. No party affiliation

39. The governing body in my jurisdiction is majority:

☐ 1. Republican ☐ 2. Democrat ☐ 3. Evenly split ☐ 4. No party affiliation

APPENDIX B

ADDITIONAL TABLES AND FIGURES

Table 8

Regression Models of 100RE Cities with Sustainability/Energy Variables, Held to Smallest Sample Size

	Demographics Only	Demographics+ Institutions	Full Model	Full Model w/o Demographics
	N = 1,244	*N = 1,244*	*N = 1,244*	*N = 1,244*
Population (normalized)	0.979***	0.718***	0.571**	
	(0.22)	(0.22)	(0.24)	
Median Income (normalized)	–0.202*	–0.160	–0.148	
	(0.11)	(0.10)	(0.10)	
Percent White	0.023	0.038	0.058*	
	(0.03)	(0.03)	(0.03)	
Percent Bachelor's	0.910***	0.758***	0.632***	
	(0.19)	(0.18)	(0.16)	
Percent Pov. Line	0.303**	0.227**	0.218**	
	(0.11)	(0.10)	(0.10)	

University Binary	0.156**	0.134*	0.180***
	(0.07)	(0.07)	(0.07)
Sustainability Staffing	–0.049***	–0.031**	–0.034**
	(0.02)	(0.01)	(0.02)
Form of Government	0.006	0.015	0.015
	(0.01)	(0.01)	(0.01)
Municipal Utility	–0.010	–0.021*	–0.017
	(0.01)	(0.01)	(0.01)
Electric Cooperative	–0.011	–0.011	–0.014
	(0.01)	(0.01)	(0.01)
Sustainability Plan		–0.020	–0.025*
		(0.01)	(0.01)
Sustainability Plan with Energy Conserv.		–0.015	–0.014
		(0.02)	(0.02)
		0.082***	0.096***

Sustainability Plan with Green Energy			(0.03)	(0.03)
City Energy Actions			0.073**	0.113***
			(0.04)	(0.04)
Community Energy Actions			0.027	0.017
			(0.03)	(0.03)
Constant	–0.086	–0.044	–0.087*	0.020
	(0.06)	(0.05)	(0.05)	(0.02)
R-Squared	0.0866	0.1216	0.1446	0.1158

* p<0.10 ** p<0.05 *** p<0.01

Heteroskedasticity-robust standard errors in parenthesis.

Table 9

Demographic Regressions of All US and All ICMA

	All US and All 100RE	ICMA and 100RE (Table 4, Model 1)
	N = 52,826	*N = 1,462*
	β, (se)	*β, (se)*
Population (normalized)	.731***	1.049***
	(0.27)	(.023)
Median Income (normalized)	–0.012	-0.224**
	(0.01)	(0.09)
Percent White	–0.003**	0.025
	(0.00)	(0.03)
Percent Bachelor's	0.057***	0.869***
	(0.01)	(0.17)
Percent Poverty Line	0.009***	0.275***
	(0.00)	(0.10)

Constant	0.000	–0.075
	(0.00)	(0.05)
R-Squared	0.0288	0.1721

* p<0.10 ** p<0.05 *** p<0.01

Heteroskedasticity-robust standard errors in parenthesis.

Table 10

Contingency Table Results with Pearson Chi Squared Tests

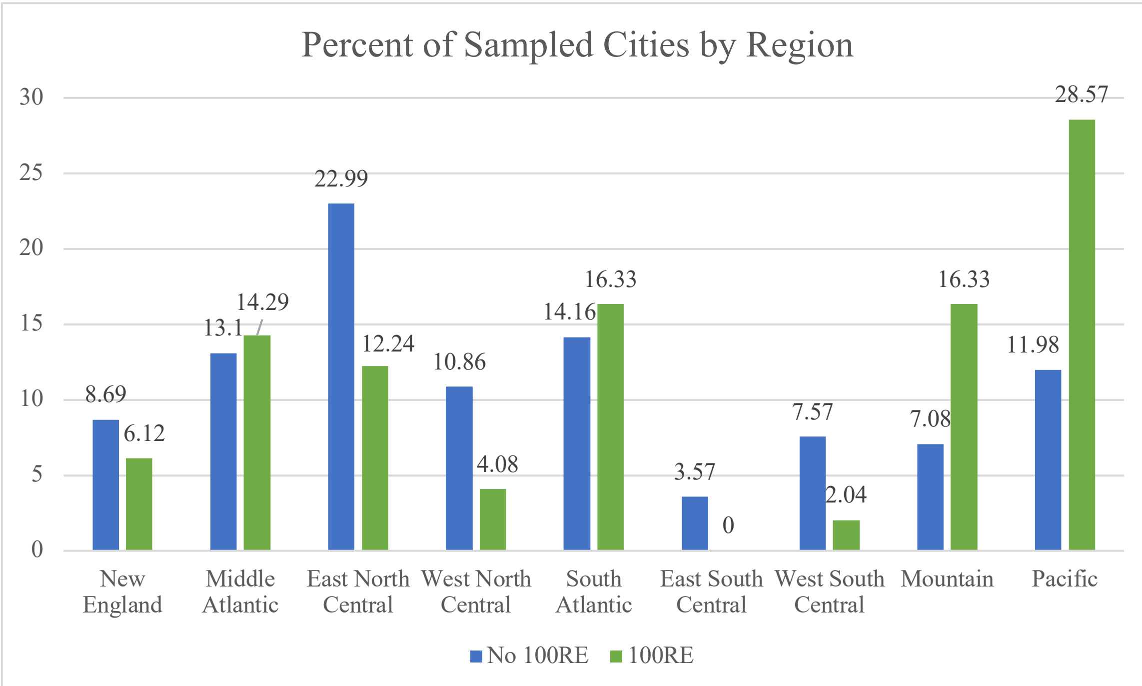
	No RE	100RE	Chi^2
	count/%	count/%	
No Sustainability Plan	986	19	22.7739***
	98.11%	1.89%	
Sustainability Plan	409	30	0.000
	93.17%	6.83%	
No Sustainability Plan w/ Energy Conserv.	1,171	22	42.2168***
	98.16%	1.84%	
Sustainability Plan w/ Energy Conserv.	256	27	0.000
	90.46%	9.54%	
No Sustainability Plan w/ green energy prod	1,273	22	86.45***
	98.3%	1.7%	
Sustainability Plan w/ green energy prod	154	27	0.000

	85.08%	14.92%	
No Dep Coord on Energy Planning	742	14	14.2777***
	98.15%	1.85%	
Dep Coord on Energy Planning	527	32	0.000
	94.28%	5.72%	
No municipal utility	1244	43	0.0142
	96.66%	3.34%	
Municipal utility	183	6	0.905
	96.83%	3.17%	
No electric coop	961	39	2.6725
	96.1%	3.9%	
Electric coop	371	8	0.102
	98.42%	1.58%	

* p<0.10 ** p<0.05 *** p<0.01

Figure 20

Regional Distribution of Sampled Cities



APPENDIX C

IRB APPROVAL LETTER

EXEMPTION GRANTED

Hanna Breetz
GFL-SOS: Faculty and Researchers
480/727-0408
Hanna.Breetz@asu.edu

Dear Hanna Breetz:

On 2/10/2020 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	The Political Economy of Deep Decarbonization
Investigator:	Hanna Breetz
IRB ID:	STUDY00011164
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	• Politics of Decarbonization IRB protocol.docx, Category: IRB Protocol; • Sample interview questions.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Sample recruitment email.pdf, Category: Recruitment Materials; • Sample verbal consent script.pdf, Category: Consent Form; • Study Information Sheet.pdf, Category: Consent Form;

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 on 2/10/2020.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

cc:

Hanna Breetz
Leah Kunkel
Sushil Rajagopalan Nolastname

APPENDIX D

PERMISSION TO USE PREVIOUSLY PUBLISHED WORK

November 14, 2022

To Whom It May Concern:

The second chapter of this dissertation, titled “100% Renewable Electricity Policies in U.S. Cities: Mixed Methods Analysis of Adoption and Implementation” was previously published in the Energy Policy Journal in 2022. This article was co-authored with Hanna L. Breetz and Joshua K. Abbott, who each have provided their permission that it be included here.

The third chapter of this dissertation, titled “Localizing Energy Decision-Making Through Community Choice: The Utah Community Renewable Energy Act” was previously published in The Electricity Journal in 2021. I am the sole author of this publication and permit it to be used in this dissertation.

The original citations from each publication were included with the chapter.

Signed,

Leah C. Kunkel