Moving Towards 100% Renewable Energy:

Drivers Behind City Policies and Pledges

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Abstract

As the United States federal government retreats from energy and environmental regulation, local and regional efforts across the U.S. are scaling up. Cities, in particular, are intensifying their commitments to fight climate change and are playing an increasingly important role in the sustainability of the planet. Energy is at the center of the sustainability challenge, as it is both central to modern life and causes environmental and socio-economic damages through our dependence on fossil fuels. Cities are beginning to understand the importance of a renewable energy economy to maintain a healthy living environment for their communities, as well as to ensure the future sustainability of these communities.

One way cities are demonstrating their energy priorities is by pledging to transition to 100% renewable energy by 2050 under the Sierra Club's 'Ready for 100' campaign. This paper will survey 56 cities that have made the community-wide commitment to 100% renewable energy, over half of which have pledged since just 2016, analyzing the primary motivations for these pledges, including but not limited to: financial and economic opportunity; public health; environmental preservation; climate goals and action plans; and lack of federal action. It will also examine the structure of these commitments, tools used for implementation, political challenges, and the importance of collective efforts in meeting environmental goals.

1. Introduction

As the U.S. federal government retreats from energy innovation and environmental regulation, local and regional efforts across the country are scaling up. Cities, in particular, are intensifying their commitments to fight climate change and are playing an increasingly important role in the sustainability of the planet. In recent years, many cities have developed and implemented their own climate action and sustainability plans, with goals for energy, waste, water, transportation, buildings, and much more. City-level sustainability initiatives have been integrated into local economic development efforts, often enjoying a high level of non-partisan support, and many local leaders have come to understand that sustainability drives economic growth (Svara et al., 2013). Cities have aggregated their efforts through coalitions like C40 Cities Climate Leadership Group, ICLEI Local Governments for Sustainability, and the Global Covenant of Mayors for Climate and Energy, to name a few.

The momentum has grown in the past year. When President Trump announced in June 2017 that the U.S. would exit the Paris climate accord, more than 250 U.S. mayors met in Miami Beach to discuss action on climate change to send a clear signal that they are eager to fill in the gaps created by the Trump administration's withdrawal from the agreement. Mayors from both sides of the aisle pledged their support to uphold the goals of the Paris Agreement, stating that: "the Mayors of the United States Conference of Mayors commit to partnerships and convening that strengthen ties between cities around climate change" (U.S. Conference of Mayors, 2017). In July 2017, former New York City Mayor Michael Bloomberg and California Governor Jerry Brown launched an initiative called America's Pledge, to aggregate and quantify the actions of non-national actors to reduce greenhouse gas emissions. In December 2017, Chicago hosted the North American Climate Summit, bringing together mayors from the

U.S., Canada and Mexico to further articulate the commitments to the Paris Agreement, and to encourage mayors to sign the Chicago Climate Charter, an international charter on climate change at the local level.

Local-level actions are critical in addressing climate change and sustainability issues. It is at the local level that many policies are generated and creative solutions tested (Schreurs, 2008). Cities are uniquely positioned to advance initiatives in transportation, buildings, and renewable energy. They have the population density and transportation networks to make green solutions that much more impactful. Local governments can impact climate change through measures to "foster green buildings, energy efficiency and renewable energy use in government operations and by the general population" (Sussman, 2008). Governments can also make impact through zoning and building permits, through their own operations, and through their control of vehicle fleets and other energy-intensive infrastructure. Local-level actions vary in form, type and scope, and most cities that aim for sustainability have some focus specifically on increasing renewable energy use. Energy is at the center of the sustainability challenge, as it is an indispensable ingredient of modern economic life. However, our long-term dependence on fossil fuels means a future of increased energy costs and greater environmental damage. To address the problem of climate change, we need to gradually replace fossil fuels with other forms of energy that are environmentally sustainable, such as wind and solar (Finley and Seiber, 2014; Wong and Pecora, 2015). The benefits of renewable energy range from helping cities reduce their greenhouse gas emissions and improving air quality, to saving money and creating skilled jobs.

The 'Ready for 100' campaign, launched by the Sierra Club, a grassroots environmental nonprofit organization, recognizes cities in the United States that have formally committed to transition to 100% renewable energy. Specifically, the campaign "recognizes community commitments as places where a city's leadership has established a goal to transition the entire community to 100% clean, renewable energy. This can be through a stand-alone Resolution or Proclamation, or integrated into a community's Climate Action Plan or Energy Action Plan" (Sierra Club, 2018A). By January 2018, 56 cities had adopted formal goals to transition to 100% renewable energy by 2050 or sooner under the Ready for 100 campaign (see Appendix A for the full city list). 2017 was a record year, with 30 cities in the U.S. making such a pledge.

What does it mean for a city to commit to 100% clean energy? The targets can vary by region, but a target must be both time-bound and measurable. A 100% goal is fully achieved when the amount of energy generated from renewable energy sources equals or exceeds 100% of the annual energy consumed within that territory. A city's 100% goal can cover multiple sectors, including electricity, heating and cooling, and transportation, or it can start by addressing just one of those. In addition, a target can either be community-wide or only cover municipal energy use (Sierra Club, 2018B).

Because of this explosive growth of city pledges in the absence of federal leadership on climate change, and the importance of renewable energy to climate and sustainability policy, this paper surveys the 56 cities that have committed to 100% renewable energy under the Sierra Club campaign.[1] The paper

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[1] At the time the authors began this review in January 2018, 56 cities had committed or reached their Ready for 100 campaign goal. As of March 2018, that number has increased to 63 cities. The seven additional cities are not represented in this paper.

begins by discussing the status of renewable energy in the United States, and offers a broad profile of the 56 cities on the Sierra Club's list. The authors reviewed texts of the resolution, statement, or ordinance that contained the pledge, examined city websites, press releases, and independent reports, and interviewed city government representatives where possible. We then assess the primary motivations for these pledges, including but not limited to: financial and economic opportunity; public health; environmental preservation; climate goals and action plans; and lack of federal action. We also examine the most common tools for implementation, looking at specific examples and cases, as well as the major challenges cities face in meeting their renewable energy goals. Finally, the paper concludes with a discussion of the role of state policy on local action, and insight on how our cities and country will make the transition to a renewable economy.

2. Renewable Energy in the United States

Worldwide, renewable energy generation and capacity is growing. Installed renewable electricity capacity represents 31% of the total global capacity. Renewable energy sources – solar energy, wind power, hydropower, biomass, and geothermal – accounted for nearly 26% of all electricity generation worldwide in 2016. Solar remains the fastest growing renewable electricity technology, with global capacity increasing by 33% in 2016 (US DOE, 2016).

These trends are consistent in the United States as well. According to the U.S. Department of Energy's 2016 Renewable Energy Data Book, U.S. renewable electricity has grown to 18.3% of total installed capacity and 15.6% of total electricity generation. In 2016, renewable electricity accounted for 67% of all U.S. electricity capacity additions, compared to 64% in 2015, while coal-fired generation accounted for nearly 80% (7.6 gigawatts [GW]) of *retirements* in 2016. Installed wind capacity increased by over 11% (8.2 GW), while solar electricity installed capacity increased by 52% (US DOE, 2016), largely led by growth in corporate and community markets (SEIA, 2018). According to the International Energy Agency, "[d]espite policy uncertainty, the United States remains the second-largest growth market for renewables" (IEA, 2018). A recent study found that if all solar and wind systems in the U.S. acted at full capacity, augmented by storage capacity, the United States could power 90-100% of its electricity (Caldeira et al., 2018).

Certain states are leading the way. In 2016, California continued to have the most installed renewable electricity capacity of any state (35 GW), followed by Washington (25 GW) and Texas (22 GW). Texas, the state with the greatest capacity of installed wind capacity in 2016, experienced a 15% growth of installed wind capacity (2.6 GW) and an increase of solar capacity of more than 126% (522 megawatts [MW]) (US DOE, 2016). The solar industry provided jobs to more than 260,000 people in 2016, with the U.S.'s largest solar power plants operating out of California and Nevada (Korosec, 2017).

Cities are active as well, and transitioning their energy systems for a wide range of reasons. Renewable energy sources are becoming more cost-competitive with traditional energy sources; in recent years solar prices have dropped 80% and wind prices have dropped 60% (Sierra Club, 2016A). Falling costs for wind and solar, combined with state and local policies that promote renewable energy, are helping to drive the shift to renewables. Technologies such as rooftop solar power generation, distributed energy

storage, and electric mobility are becoming an integral part of city power systems, with a key role in balancing the demand and supply of electricity (IRENA, 2016). As this paper will discuss, local and municipal government agencies are also recognizing the benefits of renewable energy: improved environmental quality, skilled job creation, economic development, financial savings, innovation, global competition, and energy independence, energy security, and resilience to external shocks. At a local level, the question of renewable energy systems and resources is less of a partisan issue than at the federal level, and most disagreement or controversy has more to do with the *type* of solution for community, city or region-specific challenges.

3. US Cities with a 100% Renewable Energy Pledge

The 56 cities that have made a formal pledge under the Sierra Club's campaign made pledges between 2004 and January 2018. 2017 was a record year with 30 cities making pledges; this is also the year that Trump pulled out of the Paris Agreement.
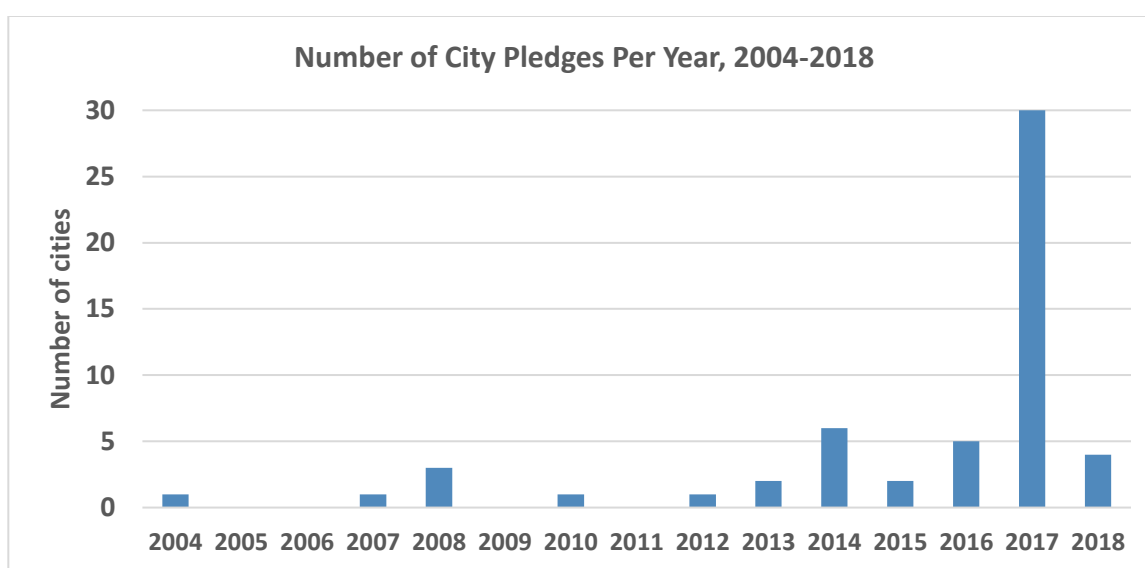

Figure 1. Number of cities that have pledged to go 100% renewable under the Sierra Club's campaign, per year.

The 56 cities come from 22 states: Alaska, Arkansas, California, Colorado, Florida, Georgia, Kansas, Louisiana, Massachusetts, Missouri, New Hampshire, New Mexico, New York, North Carolina, Oregon, Pennsylvania, South Carolina, Texas, Utah, Vermont, Washington, and Wisconsin. The state that contains the most number of pledged cities is California (15 cities), followed by Colorado (7) and New Mexico (6). Each other state only has 1-3 cities with pledges.

Collectively, the 56 cities represent 7.4 million people, which is roughly 2.29% of the U.S. population. Most of these cities are small; just over half have populations under 30,000. Only two cities on this list have populations greater than 1 million – San Jose and San Diego – both in California.
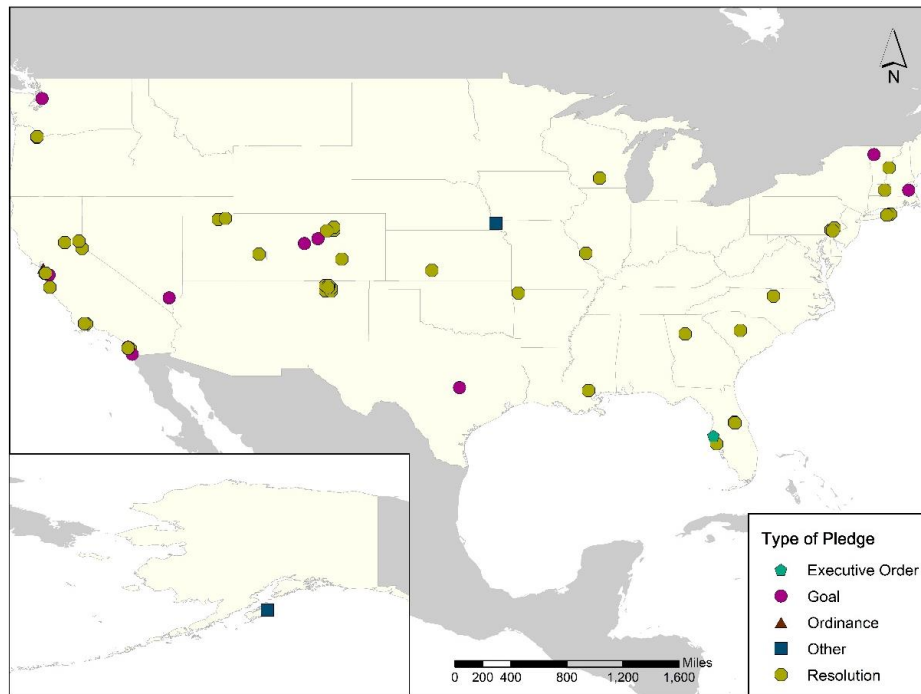

Figure 2. Map of the 56 cities that have pledged to go 100% renewable under the Sierra Club's campaign, between 2004 and January 2018.

These cities represent both ends of the political spectrum. Of the 56 cities, 59% have mayors who are affiliated with the Democratic Party and 14% have Republican mayors. The remainder have no or unknown affiliation. In Abita Springs, Louisiana, 75% of the voters voted for Trump in the 2016 U.S. presidential election; conversely, in Madison, Wisconsin, 70% voted for the Democratic nominee, Hilary Clinton. Both have now committed to achieving 100% renewable energy (Field, 2017).

Five of these cities have already achieved their target of transitioning to 100% renewable energy: Greensburg, Kansas; Aspen, Colorado; Kodiak Island, Alaska; Burlington, Vermont, and Rockport, Missouri. Each of these cities has a population less than 45,000 and boasts ample supply of renewable resources.

What does it mean to make a pledge? What form do these promises take? Most (73%) of these city pledges have taken the form of resolutions, passed by the city council and representing a formal intention or expression of opinion of the city. Only one city, San Francisco, California, passed a city ordinance in recognition of the pledge and another, St. Petersburg, Florida, has a pledge encompassed in an Executive Order. The remainder (23%) have set general goals, sometimes encompassed in a project or action plan, but not encompassed within a formal resolution or ordinance.
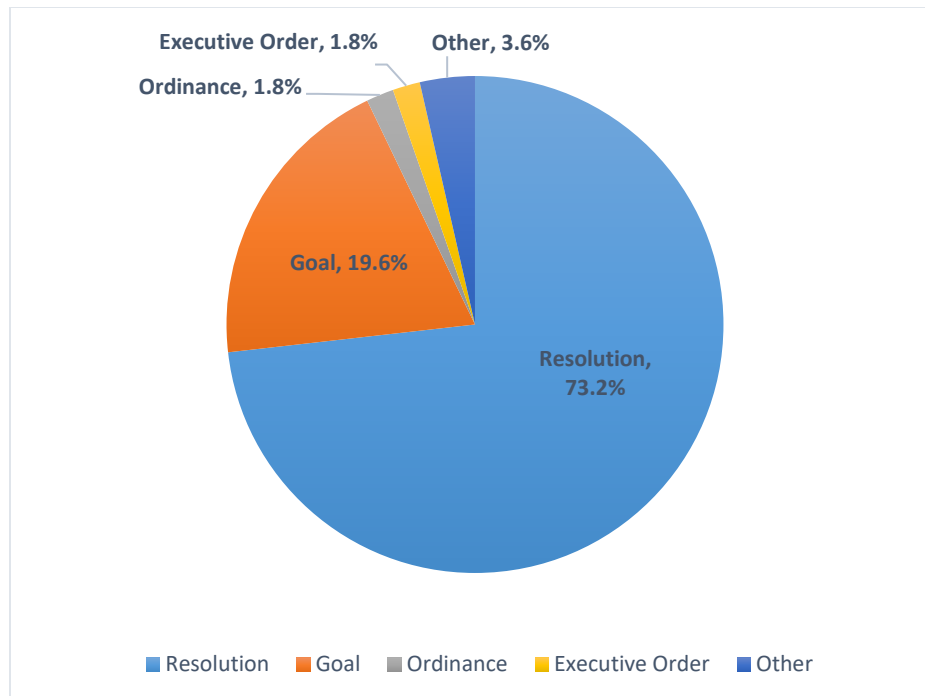
Figure 3. Breakdown of the different types of 100% renewable energy pledges made by cities.

San Francisco's goal of 100% renewable electricity by 2030 is encompassed in Ordinance 81-08, which outlines the city's climate change goals and action plan. Specifically, the law amends the San Francisco Environment Code by adding Chapter 9, sections 900-908 (City of San Francisco, 2008). Sec 907 of the ordinance urges the San Francisco Public Utilities Commission (SFPUC) to develop and implement an energy action plan that achieves the goal of San Francisco becoming fossil fuel free by 2030. It also urges SFPUC to set annual goals for generating electricity locally through renewable generation.

In St. Petersburg, the purpose of the executive order implemented in 2017 is to establish policies consistent with sustainability and resilient initiatives. The order states: "our sustainability goals are a 100% clean energy transition, zero waste, protection and enhancement of natural systems and preserves, the protection and enhancement of shade, urban forest and green space, sustainable built environment practices, safe and efficient multimodal transportation networks, improvements of our local economy, and a Healthy St. Pete" (Kriseman, 2017). Because this is an executive order, Mayor Rick Kriseman said: "This is more than just a guide. It's a directive" (City of St. Petersburg, 2016).

Other city pledges build upon or have been incorporated into prior energy, climate, or sustainability plans. Nevada City, California, for example, updated their city-wide Energy Action Plan, while two other cities in California – Encinitas and Chula Vista – incorporated the renewable energy goal into existing Climate Action Plans. Chula Vista, in particular, builds on a robust history of climate action planning; it produced its first CO2 Reduction Plan in 2000 and, most recently, published the fourth update of the city's Climate Action Plan (City of Chula Vista, 2017).

Most of the pledges only encompass and apply to the city's electricity generation – not heat or transportation. Only 29% of the cities include renewable heat or transport as part of their goal, with a target date that is generally later that their renewable electricity target. West Chester, Pennsylvania, Hanover, Hew Hampshire, and Portland, Oregon, for example, all have a 100% renewable electricity goal by 2035, with transportation and heating included in a 2050 goal.

4. Motivation and Drivers for City Pledges

Motivations for 100% renewable energy pledges differ from locale to locale based on a combination of diverse factors, such as physical location, historical precedent, community values, and population size. There is no one reason for cities to pursue this goal; in fact, there is a range of reasons driving cities to commit to these targets. Where some cities are motivated by fiscal gains, others are driven by public health concerns, and others by the direct threat of climate change. What is clear across all 56 cities, however, is that they view the transition from fossil fuels to renewable energy not as an obligation, but rather as an opportunity for socio-economic development. Each city is driven by the desire to provide less expensive, cleaner, and more stable energy to their communities. Cities committing to renewable energy goals not only want to reduce energy bills for residents and local economic players and reduce their dependence on polluting energy sources, but also want to show that they are leaders at the forefront of making a transition that many see as inevitable.

After surveying city government websites, press releases and pledge statements for each of the 56 cities, we established five categories of key drivers: economic, environmental, external, public health, and renewable resource supply. Below is a description of each category:

- **Economic**: local economic development, job creation, utility cost savings, and secure energy futures.

- **Environmental**: environmental consciousness, climate change concerns, natural disaster vulnerability, preservation of local environment and wildlife, and climate leadership.

- **External**: regional partnerships, existing state policies, existing or prior municipal policies and/or initiatives, and non-profit partnerships.

- **Public health**: clean air and water, and pollution-related illness.

- **Renewable resource supply**: availability and proximity of renewable energy resources to draw from.

Economic Drivers

Of the 56 cities, 63% cited economic reasons as a driver. This includes local economic development, job creation, utility cost savings, and a secure energy future. Many of these cities are looking to renewable energy as a way to reduce monthly energy bills and ensure the stability of their future energy supply. For Georgetown, Texas, which achieved 100% renewable energy in 2017, transitioning to renewables made economic sense; solar and wind prices don't fluctuate like oil and gas. That's particularly

appealing for a city like Georgetown, where a lot of retirees live on fixed incomes (Hood, 2017). For Pueblo, Colorado, revitalizing the economy and lowering electricity bills was what truly brought people to the table. In recent years, natural gas has driven up electricity bills and working-class homeowners in the former steel town have struggled to keep up with their sky-high electric bills. Frustrated by expensive power bills and frequent shut-offs, citizens of Pueblo lobbied the city council to abandon natural gas and switch to more affordable renewable energy (Shepard, 2017). City officials in Burlington, Vermont, say the ultimate motivation came down to economics, where a shift to renewables was the "cheapest long-term financial investment…with the least amount of risk" (Sierra Club, 2016A).

Mayor Greg Lemons of Abita Springs, Louisiana, a Republican, does not support some of the Sierra Club's politics, but he sees renewable energy as a way to save money now and in the future, when fossil fuels become scarcer and more expensive. "Transitioning to 100% renewable energy is a practical decision we're making for our environment and our economy… Clean energy just makes good economic sense. By establishing a 100% renewable energy goal, we have an opportunity to use solar power that we can control in our community, for our community," Lemons said (Pagones, 2017). The city of Georgetown, Texas, a predominately Republican city, committed to 100% renewable energy in 2015. Jim Briggs, Assistant City Manager and General Manager of Utilities, stated, "We didn't do this to save the world – we did this to get a competitive rate and reduce the risk for our consumers." Additionally, Briggs notes that switching to renewables will hedge against future fuel and regulatory risks (Dart, 2015).

Several cities are already seeing the cost benefits of transitioning to renewable energy sources. In Georgetown, the cost of 1,000 kilowatt-hours (kWh) of electricity is $114 per month, $5 less than what the average Texas customer pays, according to federal data (City of Georgetown, 2017). In Alaska, where many villages experience the highest cost of electricity in the country ($1/kWh versus the US national average of $0.12/kWh), Kodiak Island successfully transformed its grid to 100% renewable energy in 2014 and maintained the price of electricity since 2000, allowing residents to avoid high and unstable diesel fuel costs (Shaw, 2017). Burlington estimates it will save $20 million over the next 20 years by moving away from fossil fuels. And customers have seen a direct benefit, too – most of the country has been dealing with gradual rate increases while Burlington's rates have not gone up since 2009 (Sierra Club, 2016A).

Local control and local economic development are also key principles for many of these cities. Transitioning to 100% renewable energy is a way to stimulate local economic development, generate jobs, and keep capital in the region by reducing energy imports. San Diego's Mayor Kevin Faulconer sold the climate plan to the city's conservative business base by arguing that transforming the electrical grid would create jobs and drive the economy. In Rockport, Missouri, local landowners can make anywhere between $3,000 and $5,000 leasing their property for wind turbines (University of Missouri Extension, 2008). Cities across the country, including Atlanta, Georgia, Madison, Wisconsin, and West Chester, Pennsylvania, see this as a unique opportunity to create jobs in the emerging industry. The Atlanta City Council's resolution states: "The City's commitment to 100% clean energy will create good local jobs for Atlanta residents...reduce the strain on water resources and save consumers money" (Martinez, 2017).

Environmental Drivers

Of the 56 cities, 63% cite the environment as a key driver. This includes environmental consciousness, climate change concerns, natural disaster vulnerability, climate leadership, and preservation of local environment and wildlife. While each city who cited the environment, or climate change specifically, as a key driver had individual reasons for doing so, there was a general consensus and concern about the environment on a global level and the need to implement sustainability initiatives to preserve our world for future generations.

Many of the cities committed to 100% renewable energy are experiencing the impacts of climate change first hand, such as increasingly intense and frequent wildfires, declining snow packs, droughts, flooding, storms and other extreme weather events. Mountain towns, like Salt Lake City, Utah, South Lake Tahoe, California, and Aspen, Boulder, and Breckenridge, Colorado, rely on a stable climate and thriving natural environment for economic viability and quality of life. Salt Lake City, for example, is driven by urgent fears over worsening air quality and the effects of climate change on their biggest industry: winter tourism. The city's snow-capped peaks support a massive tourism sector that employs 1-in-10 residents. The city's resolution specifically notes the "scientific consensus regarding the reality of climate change and the connection between human activity, especially the combustion of fossil fuels that create greenhouse gases, and the warming of the planet" (Salt Lake City Corporation, 2016A). In 2005, Aspen created the Canary Initiative, which identifies Aspen and other mountain communities as "canaries in the coal mine" with respect to their sensitivity to the effects of climate change (Sierra Club, 2016A). Concerned about the future impact of climate change on their main economic base, tourism, these cities have committed to 100% renewable energy in an effort to protect "powder days."

East Hampton, New York, was driven to take this bold action following the impact of Superstorm Sandy, which affected the area with blackouts and damage in 2012. Larry Cantwell, Town Supervisor of East Hampton, says Sandy was the moment his administration realized they had to develop a sustainable energy vision to boost the resilience of their community, help safeguard their local economy and take climate action (Raacke, 2015). Similarly, a key driver for Columbia, South Carolina's commitment to 100% renewable energy is climate change vulnerability. In 2015, Columbia experienced a 1,000-year flood event that devastated the community, damaged roads and dams, and cost billions of dollars in damage (Bauer, 2017).

Some cities see the 100% renewable energy pledge as an opportunity to lead on the issue of climate change. Atlanta was driven in part by wanting to be a leader in the fight against climate: "Cities like Atlanta must lead the way in confronting the threat of climate change and accelerating the transition to 100% clean energy. Today's commitment will inspire bold, ambitious leadership from cities throughout the United States and pave the way for a healthier and stronger Atlanta," said Atlanta Councilman Kwanza Hall (Sierra Club, 2017). St. Louis, recognizing the growing number of cities across the nation that have made similar commitments, was motivated in part by a desire to remain a leader among its peer cities. Suzanne Jones, Mayor of Boulder, also noted that in the absence of federal regulation, it is more important than ever for cities to take the lead, stating that Boulder "can act as a model for cities across Colorado to craft a sustainable future by shifting our energy model from the dirty fossil fuels of the past to clean, renewable energy" (Environment Colorado, 2016).

Other city pledges, like that of Portland, Oregon, and Edmonds, Washington, were timed to make a stand against the Trump Administration; Portland announced their commitment to reach 100% renewables for municipal energy by 2035 on the very same day that Trump withdrew from the Paris Agreement. In a news release, David Van't Hof, Acting Oregon Director of the non-profit Climate Solutions, said, "Bold climate action is needed to prevent dramatic climate disruption, and we're proud to see Portland and Multnomah County leading the charge" (Sickinger, 2017).

External Drivers

This category encompasses a broad range of 'external drivers' motivating cities to pledge to 100% renewable energy goals, including regional collaboration, existing state policies, existing or prior municipal policies and/or initiatives, and non-profit partnerships. Of the 56 cities, 46% cited one of these factors as a key driver.

In several cases, collective regional partnerships have helped to push individual cities to commit to 100% renewable energy targets. For example, in San Diego County, there are 5 cities that have committed to 100% clean electricity – San Diego, Encinitas, Del Mar, Solana Beach, and Chula Vista – which is the highest number of cities in the same county to commit. Cities in this region are working together, sharing costs of feasibility studies and strategizing on approaches with the county's utility SDG&E. The San Diego Regional Planning Agency and the San Diego Regional Climate Collaborative have been key partners in this regional push for renewable energy. Chester County, Pennsylvania is another example of a regional partnership. In December 2017, the Downingtown Borough Council unanimously adopted a resolution establishing a goal of powering all electricity across the community with 100% clean energy by 2035 and all heat and transportation by 2050. Downingtown's commitment is part of a growing movement of Chester County communities that have made the pledge. Earlier in 2017, West Chester and Phoenixville also established goals of moving to 100% clean energy.

Non-profit and advocacy organizations have also helped play a role in motivating cities to make these commitments. In Sarasota, Florida, the 100% renewable energy effort was spearheaded by the Sarasota Climate Justice Coalition, whose petition received more than 2,000 signatures in favor of the initiative. In South Lake Tahoe, the 100% South Lake Tahoe coalition has played a pivotal role in pushing the community to support renewable energy goals. The coalition, which consists of community residents, businesses and organizations, organized letters of support from local businesses and organizations prior to the vote, and more than 1,000 people signed a petition supporting clean energy. Other organizations, like the Climate Reality Project's I AM PRO SNOW, Tahoe Climate Change Action Network, Sierra Nevada Alliance, and Climate Parents, all actively engaged in the Tahoe 100% renewable energy campaign. In East Hampton, the local nonprofit Renewable Energy Long Island (reLI) has helped drive the effort and generate grassroots support for plans to implement the goal, including the wind farm (Sierra Club, 2016A).

Another example is Taos County, New Mexico. Renewable Taos is a nonprofit dedicated to promoting and facilitating a full transition to renewable energy and energy efficiency in Taos County and the surrounding region. From 2013 through 2014, Renewable Taos approached every government in the area, requesting signatures for a joint resolution to develop local generation of 100% renewable energy by 2030. It was unanimously adopted by Taos County, supported by the towns of Taos, Questa, Red River,

Eagle Nest, Angel Fire, Taos Ski Valley, Taos Municipal Schools, the Kit Carson Electric Cooperative and the Intergovernmental Council of the Enchanted Circle. This stemmed from Renewable Taos' participation in the Rocky Mountain Institute eLab Accelerator, a national electricity innovation program. Renewable Taos was one of 12 U.S. teams to develop projects for solving energy transformation problems (Renewable Taos, 2015).

Other cities were motivated to adopt 100% renewable energy targets based on existing state policies encouraging renewable energy generation. In California, state policy and legislation guides many local-level activities; cities have legal obligation under California's assembly bill (AB) 398 to meet statewide greenhouse gas reduction goals of 80% reduction by 2050 (US EIA, 2018). In Atlanta, recent strides on the state level to commit to renewable energy sources, such as the Renewable Energy Development Initiative (REDI), helps support city targets. The city of Columbia has also stated that its commitment to renewable energy was buoyed by state policies. In 2007, South Carolina established energy standards for public buildings requiring the development of energy conservation plans, and more recently passed "Solarize South Carolina," a program that encourages the liberal use of solar panels on homes. For East Hampton, the New York State Executive Order to reduce greenhouse gas emissions across all sectors 80% by 2050 was part of the town's impetus to adopt a Comprehensive Energy Vision (NYS DEP, 2009). Georgetown's renewable energy transition was possible largely due to actions of former Governor Rick Perry, who approved the $7 billion Competitive Renewable Energy Zone initiative, a 3,600-mile network of transmission lines, in 2005 (Drouin, 2015).

Public Health Drivers

Of the 56 cities, 23% cited public health as a driver. This includes the desire for clean air and water, to prevent pollution-related illness, and ensure robust public health of their communities. St. Louis City Council President Lewis Reed, who sponsored the city's 100% renewable energy resolution, stated, "I suffer from chronic allergies and I have two kids with asthma," he says. "So I have always been a staunch advocate for having a cleaner environment and using more renewable sources of energy" (Charlton, 2018). For Atlanta, reducing air pollution and associated public health risks was a key consideration in adopting the 100% renewable energy target; the significant public health co-benefits of clean energy can also help address pressing environmental justice challenges in sensitive communities in Atlanta.

Protecting the public from harmful pollution was a motivation for the city of Amherst. In particular, Amherst noted that low-income communities and people of color feel the negative health impacts disproportionately. "Our reliance on dirty sources of energy like oil and gas is harming our health…we need to be doing more to protect our communities from harmful pollution and ensure a safe, livable climate for future generations," the city said in a statement (Environment Massachusetts, 2017). Similarly, "The people of West Chester have said loud and clear they want clean energy, because we care about our health, sustainable jobs, and our children's future," said Dianne Herrin, mayoral candidate and Chair of the Borough's Sustainability Advisory Committee, which initiated the resolution. "Here in West Chester, we are doing our part to shift the national tide toward a clean and livable future" (Heinze, 2017).

Renewable Resource Supply

Of the 56 cities, 18% cited supply of renewable resources as a driver. This refers to the availability and proximity of renewable energy resources that cities can draw from. For example, cities in states like Texas and Georgia have abundant access to existing renewable energy resources like wind and solar that have already been established through state directives. Texas is the number one producer of wind energy in the U.S.; Georgia is the third fastest-growing generator of solar power in the U.S. and the ninth-largest producer of solar energy, according to the Solar Energy Industries Association (SEIA, 2017). (See Appendix B for additional information on availability of renewable energy resources in the United States.)

Other cities are capitalizing on existing local energy infrastructure and/or abundance of local energy resources. Kodiak Island has built upon its already large availability of hydropower, adding additional hydro resources, wind turbines, and most recently a flywheel, to reach 100% renewable energy generation. Greenburg, Kansas, after being leveled by a tornado in 2007, took the opportunity to rebuild under a sustainability master plan, which included taking advantage of its large wind resources to achieve 100% renewable electricity (US DOE, 2009). There is excellent potential for sustainable wind power in Northwest Missouri (University of Missouri Extension, 2008). In this region, Rock Port has four wind turbines, located on agricultural lands within city limits at Loess Hills Wind Farm, supply all the electricity for the town of 1,300 residents; the turbines are connected directly into the city's high voltage line. The turbines produce about 16 million kWh annually, while Rock Port only uses 13 million. San Diego is hoping to exploit its abundance of sun and space. A 2010 study found that San Diego County has enough residential and commercial rooftop space to meet the peak energy needs of the city, and supply half its annual electricity needs (Black & Meisen, 2010).

Conclusion on Drivers

The five categories discussed here are broad, but do not encompass all of the drivers that lead cities to make the 100% renewable pledge. Availability of funding, for example, was a motivation for St. Petersburg to pursue renewable energy initiatives. The city received $6.5 million from the BP Settlement Fund, which has helped fund solar programs that will help the city reach its goal, like the Florida Solar United Neighborhoods (FL SUN) program (St. Petersburg City Council, 2017). And in Nederland, Colorado, the city credits the push to adopt a 100% renewable energy target to its community and individuals, not politicians or elected officials.

While no two cities have the same motivations, there are common threads and shared drivers across all of them. It is clear that many are pursuing renewables as a stable, inexpensive source of electricity over the long-term. A number of the cities are committing to 100% renewable energy as a way to manage risks associated with climate change and natural disasters. Others are driven by local economic development goals, such as job creation, others are pushed through regional collaborations, and others opt in due to the availability of local renewable resources. Regardless of *why* cities make a 100% renewable energy commitment, each must develop a unique and appropriate strategy to get there. The next section discusses *how* cities are implementing their goals.

5. Implementation

The cities in the Ready for 100 campaign are charting distinct paths to achieve their respective goals of 100% renewable energy. Every city has unique characteristics and is developing its own specialized implementation plan. The path towards 100% renewable energy will depend on the resources available, community values, the priority given to energy efficiency, and the input of key stakeholders and players. According to the International Renewable Energy Agency (IRENA): "While the potential for renewables is high, it varies greatly depending on each city's characteristics. Population density, growth prospects and demand profiles in cold versus hot climates all shape the opportunities to introduce renewables, including the vast growth potential for uses in urban buildings and transport. Accordingly, deployment strategies must be tailored to technology options and enabling policy frameworks for each city" (2016). This section looks at *how* cities are meeting or plan to meet these goals. What form do their implementation plans take? Do they have transparent planning processes? What tools are they using?

Given that over half of the pledges have been made within the past year, many cities are still in the vision-setting and planning stages, but attempting to have transparent, inclusive planning processes, soliciting community buy-in and expertise. For example, Sarasota approved its Climate Adaptation Plan in January 2018, but is still determining an implementation plan with specific actions and goals. So far, the city has held two of four meetings to gather public feedback on the plan. St. Louis is set to have an implementation plan by December 2018, which includes a transparent process for stakeholder inclusion. Cities are also looking for funding for the planning process. For example, in 2011 San Francisco received a $250K grant from the Sidney Frank Foundation to develop the San Francisco Renewable Energy Plan to lay out actionable steps to achieving 100% renewable energy (City and County of San Francisco, 2011). And St. Petersburg directed money from a BP Settlement Fund for the early stages of their sustainability action plan (Sierra Club, 2016B).

Broadly, many of the cities committed to 100% renewable energy are realizing that all new construction needs to be sustainable from the start and built with renewable energy. Some cities are passing local ordinances to ensure, for example, that all new buildings are net-zero buildings, or that they have solar installed when they are constructed, or that they have the infrastructure for electric transportation and electric vehicle charging stations, or all of the above. In cases where new building is not an option, e.g. when buildings and infrastructure are older or funding is limited, cities are looking for ways to reshape built infrastructure to make it more sustainable.

More specifically, we found that some of the most common modes of implementation across all cities are: energy efficiency measures; incorporating goals into sustainability or climate action plans; installing renewable energy; developing financing models; community choice aggregation; and cooperation with utilities. The following sections describe these themes and gives notable examples of cities within each of the categories.

Energy Efficiency

Energy efficiency is a key way that cities are planning to meet their sustainability goals, from requiring energy efficiency in buildings, to developing residential energy efficiency programs, to installing

energy efficient lights on city streets. Buildings account for one-third of greenhouse gas emissions, and that proportion is often greater in high-density cities (Lucon et al., 2014). Reducing the energy needed to heat, cool, light and maintain buildings will be a key complement to and enabler of renewable energy goals. The most energy efficient cities Sierra Club campaign are Portland, Oregon, and San Francisco, California, according to the American Council for an Energy-Efficient Economy (2016). In San Francisco, Mayor Ed Lee convened a renewable energy task force to develop recommendations on how the city can meet the goal. The task force developed three primary recommendations, one of which was to improve energy efficiency (Murray, 2012).

Cities have direct control over building and zoning codes, and small investments in amendments and review standards can have a large impact. In Atlanta, old buildings are required to be retrofitted with energy-efficient lighting and new buildings must be Silver-LEED certified. Legislation also requires all new buildings to have electric vehicle stations to incentivize driving electric cars. In San Francisco, the Commercial Buildings Energy Performance Ordinance requires energy benchmarking and energy audits for large commercial buildings over 10,000 square feet (SF Environment, 2017A). In November 2017, Amherst voted in favor of a binding bylaw mandating that new and improved municipal buildings must meet a new standard of zero energy. For example, a fire station for South Amherst and the new Department of Public Works headquarters will have to be built as zero-energy buildings. Buildings that are not town-owned are exempt (Town of Amherst, 2017). In Burlington, an estimated $30 million has been invested in energy efficiency in the last two decades through a voter-approved bond measure in 1990 and a state energy-efficiency charge (Sierra Club, 2016A).

Many cities are implementing municipal energy efficiency upgrades, a "low hanging" action item that can be completed in the near-term. For example, in 2017 San Diego installed 3,600 energy-efficient streetlights (City of San Diego, 2017). Abita Springs, Louisiana, has been working on making its Town Hall energy efficient, beginning with replacing lights, adding insulation and replacing an inefficient air-handling unit, and will replace its town sign by one run on solar power. Mayor Greg Lemons also plans to replace 256 streetlights with LED lights or solar-powered LEDs, and expects to make the change by 2019 (Town of Abita Springs, 2018; Pagones, 2017). Amherst became the first city in South Carolina to power all city council meetings by renewable energy in 2017, and the city has converted 95% of their traffic lights to LEDs (CityLab, 2017).

Other cities are promoting or providing incentives for energy efficiency upgrades in private homes and businesses, not just in municipal buildings. In addition to a number of municipal building upgrades, the city of East Hampton, for example, has prioritized reducing energy consumption by providing rebates and tax abatements for energy efficiency for residents (Town of East Hampton, 2015). In 2014, Lafayette, Colorado, developed a comprehensive Community Energy Efficiency Plan to accelerate the city's energy efficiency progress in the business sector. It was part of Xcel Energy's pilot program to identify strategies for the community to more effectively manage energy use and costs. Community stakeholders representing small and large businesses, non-profit organizations, Boulder County, Boulder Valley School District, the Boulder Community Hospital system, contactors, and interested citizens were invited to be a part of an advisory group to provide input, ideas, and feedback for the plan. The plan outlines three overarching strategies related to building permit processes, contractor training and mobilization, and a

recognition program for businesses that pursue energy efficiency. The plan quantified the benefits in energy and savings costs at 6,280,100 kWh, 48,000 therms, and $521,500 annually (City of Lafayette, 2013).

Sustainability and Climate Action Plans

As mentioned previously, a number of cities have incorporated their renewable energy goals and/or monitoring and reporting into their overall climate action or sustainability plan. This has the benefit of having a formal framework to track and measure progress, and having a dedicated office or group to oversee the process. Salt Lake City incorporates its 100% goal in its Climate Positive SLC plan, which is overseen by SLC Green, the city's sustainability department. San Diego includes monitoring and reporting on the 100% goal in its Climate Action Plan.

St. Petersburg developed an Integrated Sustainability Action Plan (ISAP), which encompasses its 100% goal, made possible by funds from the BP Settlement Fund. ISAP will serve as a blueprint for integrating sustainability and resiliency across municipal departments, using the STAR Communities framework to prioritize policies and projects (City of St. Petersburg, 2018). ISAP data collection began in September 2017. The final deliverable will be a 5-year implementation plan, with strategies, cost estimates, implementation steps, etc. It will become the roadmap of activities for the city's Office of Sustainability, which will be the lead department in implementing ISAP.

Fayetteville has an Energy Action Plan that was just passed in January 2018 – the first of its kind in Arkansas (City of Fayetteville, 2018). The plan has been in development for some time, and includes a community sustainability report card and energy usage report.

In 2007, the San Jose City Council adopted Green Vision, a 15-year plan with 10 ambitious goals to foster cleantech jobs, energy use reduction, renewable energy, green building, waste reduction, water reuse, sustainable development, clean fleet, trees, energy-efficient streetlights, and interconnected trails (Maguire & Romanow, 2016). In 2016, the City Council asked its Environment Services Department to update the Green Vision plan with more focus on energy, water consumption and mobility, and tie it to the city's general plan (Smith, 2017). This new plan development and the hiring of a chief sustainability officer were made possible by a grant from the utility PG&E.

Since 2000, the city of Chula Vista has been implementing a "climate action plan to address the threat of climate change impacts to the local community. The most recent iteration is the 2017 Climate Action Plan, which was adopted by the city council on September 26, 2017. It includes ambitious new goals and policies to strengthen the city's climate action efforts, including its goal to achieve 100% renewable energy generation (City of Chula Vista, 2018).

Southampton, New York, which committed to the 100% renewable energy pledge in early 2017, has a component of the Town of Southampton Comprehensive Plan (2013) dedicated exclusively to guiding sustainable growth, called "Southampton 400+." The 'Energy and Carbon' section of the plan sets out specific energy-related goals to reduce the town's carbon footprint, listing over 20 different actions, modes of implementation, and supporting entities/departments. The town also created the Office of

Energy and Sustainability to work with the Sustainability Southampton Advisory Committee to advise the town, and assist in implementing, environmentally sustainable practices (Town of Southampton, 2018).

Perhaps most notably, after a tornado leveled the city of Greensburg, Kansas, in 2007, destroying 90% of its building stock, the city created a Sustainable Comprehensive Master Plan to serve as the vision for redevelopment and future development. In addition to discrete phases, a comprehensive vision, and actionable strategies for hazard mitigation, sustainable economic development, housing, transportation, and many others, this plan included the goal of being powered by 100% renewable energy, which the city met in 2013 (City of Greensburg, 2008).

Renewable Energy Installation

Roughly 75% of power is consumed in cities globally, and generating energy at the site of use could contribute greatly to urban sustainability (Kammen and Sunter, 2016). Many cities seeking to meet renewable energy targets are installing renewable energy technology within or near city limits, on municipal facilities, as well as in commercial and residential space. Salt Lake City, for example, has installed solar panels on seven existing city government facilities, totaling over 1,000 solar panels. The city also has a solar farm that includes 3,000 solar panels just west of downtown. These panels produce over 1.2 million kWh of electricity each year (Salt Lake City, 2018). Columbia has installed enough solar panels on homes and businesses across the city to generate about 8.2 million kWh of electricity over a guaranteed lifetime of 25 years (CityLab, 2017). Lafayette has installed solar on its properties with a total of 481 kW and $76,000 in annual savings. This is in addition to a 1 MW solar garden (City of Lafayette, 2018). Santa Barbara, California, has installed 2,330 residential and 66 non-residential renewable energy systems, which is 318% over their 2020 target as defined in their Energy and Climate Action Plan. And the county's Planning and Development Department now offers an expedited review process for qualified small roof-mounted residential solar energy systems (County of Santa Barbara, 2016).

Other cities with 100% renewable energy targets are in the process of securing solar contracts or passing laws to encourage solar. Abita Springs recently finalized a contract with PosiGen, a solar energy installation company based in Albany, New York, for a leased solar array for the city's Town Hall (Abita Committee for Energy Sustainability, 2018). In 2017, city policymakers in San Francisco passed the Better Roofs Ordinance, making San Francisco the first major U.S. city to require rooftop solar generation on most new buildings, covering all residential and commercial buildings up to 10 stories. An estimated 15%-30% of roof space on new projects will incorporate either solar, living roofs, or both (SF Environment, 2017B). Encinitas, California, adopted a Climate Action Plan that encompasses a number of strategies to reach the city's 100% goal. One action is to require new homes to install solar photovoltaic (PV) systems; the plan lays out a target of 400 kW of solar PV on new homes by 2020 and 1,000 kW by 2030. Another action is to require solar PV on commercial buildings, with a targeted 200 kW of solar PV on new commercial spaces by 2020 and 800 kW by 2030 (Najera, 2018).

Cities are also taking steps to provide additional regulatory assistance for citizens to install solar PV systems themselves. For example, in San Jose, the city simplified its permit application requirements for solar installations and significantly reduced individual permit costs. Southampton is working to make it possible for communities to install ground-based solar arrays. They are also working towards amending

the zoning code to allow for solar farms and other commercial-scale renewable energy installations (Perkins+Will, 2013). Some cities are amending other local rules such as zoning ordinances and building codes to remove barriers to solar development. For example, zoning ordinances may be amended or established to allow for setbacks or building height restrictions that will help promote the installation of rooftop solar. Boulder's city code establishes "solar access zones" which prohibit the construction of structures that would obscure existing or future solar panels (Southern Environmental Law, 2015).

As mentioned previously, cities in states with ample wind resources and infrastructure are benefiting from local wind energy. The city of Rock Port is completely powered by four wind turbines that are located within city limits. The Kodiak Electric Association created a strategy for Kodiak Island to lower their reliance on expensive diesel fuel through developing existing hydro and installing wind power, hoping to be 95% powered by renewable energy by 2020. They reached their goal 6 years ahead of schedule in 2014, after the local electric utility installed their first three wind turbines in 2009, followed by a battery bank to manage wind power and a flywheel for powering the town's major shipping crane, which has been referred to as a "cascading energy storage system" (Waldholz, 2017) However, not all cities have the capacity or ability to generate renewable energy locally. With solar in particular, taller buildings can increase the risk of obstruction and shading, and building codes may not allow for installation of solar panels. Installing renewable systems on rental housing is also a challenge. Wind energy has not been widely adopted in urban areas, due to challenges with space, noise, safety and aesthetics (Kammen and Sunter, 2016).

Financing Models

Many cities are including financial mechanisms in their implementation plans in order to achieve their 100% renewable energy targets. Power purchase agreements (PPAs) are one of the primary contracting mechanisms that cities are using to meet their renewable energy targets. In a PPA, a municipality allows a third-party owner to install solar panels on municipal buildings or property that will receive the solar power. The municipality then pays the system owner for the power generated by the solar panels. PPAs provide municipalities with fixed, long-term rates, which make costs predictable. Cities often favor PPAs because they allow the city to obtain solar power with little to no upfront cost. Additionally, third-party owners design, install, and maintain the PV system, further simplifying the process for the city (Southern Environmental Law Center, 2015).

Taos County in New Mexico signed a land lease agreement along with a 30 year solar PPA for a 4MW solar array at the Taos Regional Wastewater treatment plant, which will power 1,500 homes (Green Fire Times, 2018). Lafayette, Colorado, has a PPA with Bella Energy, which enabled them to build a solar garden at City Hall. The solar garden program allows subscribers to sign up for a share of the garden, and receive a credit on their bill each month based on how much energy their share produces. They have one solar garden up and running at 1MW. The city donated land for the garden, which made it possible to dedicate a portion of the output to low-income subscribers at no cost (City of Lafayette, 2018). In April 2009, Greensburg entered into a PPA with Kansas Power Pool, a green power provider that promised "100% renewable electricity, 100% of the time." Greensburg and Kansas Power Pool, in collaboration with the U.S. Department of Agriculture and John Deere Renewable Energy, built a 12 MW wind energy system

to meet the pre-tornado energy needs of the community. NativeEnergy, which helped finance the project, signed on to market the excess energy the wind farm produced as renewable energy credits (RECs) (US DOE, 2012). Palo Alto approved four long-term power purchase agreements for solar PV plants, which have enabled them to get more of their electric supply directly from renewable energy facilities and reduce our reliance on unbundled RECs (City of Palo Alto, 2018).

Several of the cities in this group have opted to purchase renewable energy from elsewhere in order to meet their clean energy goals. For example, Salt Lake City has a Subscriber Solar program that includes a 20MW solar farm in a different county in Utah. Customers can subscribe to solar to offset their energy bills. 3MW of the farm is dedicated to municipal operations (SLC Green, 2016). Aspen signed a 2015 contract with the Municipal Energy Agency of Nebraska to buy wind power from Nebraska and South Dakota to replace the remaining coal that was on the electricity grid. That allowed wind to take the place of the remaining coal on the grid and hit the 100% mark. Aspen's mix is now approximately 50% wind, 45% hydropower, and the remaining 5% from solar and landfill gas (Sierra Club, 2016A).

Cities are taking other steps to facilitate solar energy growth within their communities in order to reach their 100% renewable energy goals. There are two main tools to do this: Property Assessed Clean Energy (PACE) financing and community solar.

PACE financing is a tool that allows property owners to finance the cost of renewable energy, energy efficiency, and other building upgrades through PACE programs, where municipalities provide funding to property owners for renewable energy or energy efficiency projects, and that sum is repaid through an assessment on their property tax bill over time. Before a city may create a PACE program, the state must have enabling legislation. Currently 34 states and D.C. have PACE enabling legislation (PACENation, 2018). The city of Del Mar, California, is a participant in several PACE programs to finance a low-cost energy upgrades program, and the Santa Barbara also recently passed a PACE program. In Southampton, New York, the Applied Energy Group is working with the Long Island Power Authority (LIPA) and PSEG-Long Island on market-based consumer programs, such as NEST thermostats and ThinkEco air conditioner modules, and other technology that will be available for free and save customers money (Young, 2017).

Community solar takes place through the development of solar energy projects that provide power to multiple community members. Community solar allows participating customers to obtain solar energy and its benefits even if they are unable to install a PV system on their own roof. Community solar projects are usually developed by utility companies or third-party companies specializing in these types of projects (Southern Environmental Law Center, 2015). In Boulder, a Superfund site was used to build a 500 kW solar project that will be part of a community solar project serving Xcel Energy customers (City of Boulder, 2017).

Community Choice Aggregation

Another option that many cities are exploring is community choice aggregation (CCA). CCA allows local governments to purchase and/or develop power on behalf of the community. This offers residents an option beyond utilities, at a competitive rate, and gives cities more control over purchasing decisions.

Cities can decide where the energy comes from, at what cost, and how much clean energy is in the mix, while transmission and distribution services still happen through the utility. Regulation supporting CCAs has passed in California, Massachusetts, Illinois, New Jersey, New York, Ohio and Rhode Island. CCA is particularly common in California, where there are eight operational CCAs with dozens more planned, representing 1.85 million customer accounts (St. John, 2018).

San Francisco is the only city we surveyed that has a program in place, though many others are assessing CCA feasibility. San Francisco's CleanPowerSF program began in May 2017; however, there were years of political gridlock and resistance from the utility PG&E. Program development began as early as 2004 and the program was approved via a resolution in 2012, but not fully implemented until 2017 (City of San Francisco, 2012). CleanPowerSF is structured as a nonprofit, working with PG&E to deliver clean energy to residents and businesses. Ratepayer funds are reinvested locally in energy efficiency programs and renewable energy facilities. Customers are automatically enrolled in a program that provides 40% renewables, but can choose the 'SuperGreen' level, which is the 100% renewable energy option that costs an additional 1.5 cents per kWh for residents (San Francisco Public Utilities Commission, 2017). CleanPowerSF is projected to provide 400 MW of power by 2019 — enough electricity to power 320,000 homes and businesses (Johnson, 2017).

In May 2017, the San Jose city council approved the formation of San Jose Clean Energy (SJCE), which offers residents a choice for renewable energy at competitive rates. On August 8, 2017, the city council approved an ordinance establishing SJCE and amending the San Jose municipal code to add a new Community Energy Department within the City (City of San Jose, 2017). SJCE will be adopted in spring 2018, and will make San Jose the largest jurisdiction in California to operate a community choice program. An economic analysis showed that under the highest level of local solar deployment, 2,000 jobs per year will be created regionally from community choice energy activity, with $1.25 billion of economic activity expected between 2018 and 2023. $425 million of that economic impact would be within the city of San Jose itself (Center for Climate Protection, 2016).

San Diego and its neighboring cities are also exploring CCA programs. Willdan Financial Services (2017) completed a feasibility report that found that a CCA program in San Diego would be solvent and financially feasible. The city is hiring a consultant to develop a full business plan, and has set a deadline of December 2020 for final approval of the program by the city council. According to an analysis by California Clean Power, a 100% renewable energy transition made possible by CCA in Solana Beach could save the city $1.4 million for its ratepayers annually, or $8.5 million over a 5 year period (2016). The neighboring city of Encinitas is pursuing a study in partnership with three other cities (Del Mar, Carlsbad, and Oceanside) to determine CCA feasibility. The $100,000 cost of the study has been divided up between the cities and is expected to be completed in mid-2018 (Diehl, 2018).

California is not the only state that has cities considering community choice. Amherst, Massachusetts, will soon vote on a plan to commence with a CCA program in joint action with other municipalities and Salt Lake City, Utah, Madison, Wisconsin, and Orlando, Florida are among the other cities exploring a CCA model.

Cooperation with Utilities

Although a number of cities are exploring CCA and other ways to work *around* utilities, some cities are choosing to achieve their goal by partnering with their electric utility to bring more renewable energy onto the grid. Much of the variation regarding this strategy depends on state-level policies and regulation: in the US much of our energy policy is set at the state level and not at the federal level. In this context, each city is working with a different set of state policies that dictates what options and pathways are available to them.

San Diego, although exploring CCA, is also looking at another plan proposed by its primary utility SDG&E, which would increase the renewable energy mix over time, eventually reaching 100%. South Lake Tahoe recognizes that an important first step is to negotiate with the city's energy provider, Liberty Utilities, when its contract is up in 2018, to secure more renewable energy sources (Cudahy, 2017). Abita Springs is in ongoing conversations with Cleco Power about net metering so that the town can generate its own power through a solar grid, as well as utility scale solar. Cleco also offers programs to help homeowners make their homes more energy efficient (Abita Committee for Energy Sustainability, 2018). Southampton is working with its utility LIPA to improve the electrical grid and assessing the feasibility of installing microgrids (Perkins+Will, 2013).

Some cities have entered into formal agreements with their utilities. Salt Lake City, which committed to reaching 100% renewable energy by 2032, signed a clean energy cooperation statement with its public utility Rocky Mountain Power in August 2016 in recognition of working together towards the 100% renewable energy goal. They also published the Salt Lake City-Rocky Mountain Power (SLC-RMP) Clean Energy Implementation Plan in spring 2017, and will publish annual reports each year detailing progress (Salt Lake City Corporation, 2016A). This includes measures like RMP's Subscriber Solar project, a 20 MW solar farm. Similarly, the city of Sarasota entered into a "Renewable Energy, Energy Efficiency, and Energy Sustainability Agreement" with Florida Power and Light (FPL), as part of the 2010 Franchise Renewal. This agreement outlined ways the city and FPL will work together to provide sustainable energy to the community, such as through solar generation facilities, LED streetlight pilot programs, electric vehicle charging stations, and home energy makeovers, to name a few (City of Sarasota, 2010). The sale of a 154 MW photovoltaic solar project to NRG Energy moves the City of Georgetown electric utility a step closer to a 100% renewable energy supply. The PV solar electricity plant will supply energy to Georgetown through a 25-year purchased-power agreement that starts in July 2018. That electricity comes from an EDF Renewables wind farm 50-miles west of Amarillo (City of Georgetown, 2016).

6. Major Challenges

Cities face a complex and varied array of challenges in meeting 100% renewable energy goals, ranging from physical to political, administrative to financial. A common barrier is that many cities lack direct control over their energy supply, and many policies are set at the state, regional and national levels. Additionally, on a broad scale, the limited predictability of renewables, due to the inherent natural variations of its sources, can be a problem when matching supply and demand in the energy system (Ueckerdt, Brecha, & Luderer, 2015). Although Kodiak Island has met 100% of their electricity needs with

renewables including variable wind, they are largely dependent on more stable hydroelectric power and an innovative use of flywheel energy storage technology. Adequate storage capacity is necessary in order to consistently meet electricity demands, and while technology has improved, storage remains a major barrier for many larger cities (Klass & Wilson, 2012). Various studies have calculated that a range of eight to sixteen weeks' worth of electricity consumption in storage capacity would be required to reach 100% renewable electricity scenarios in the U.S., and that current capacity is only around 1 hour of U.S. consumption (Roberts, 2018).

Other challenges include a lack of political support on the regional and federal levels and other political pressures from outside the cities. Many cities lie in the heart of oil and gas or fracking country. Although Longmont, Colorado, for example, is currently at 32% renewable energy, public sentiments for oil and natural gas run deep. Other cities in rural or Republican-leaning states or counties like West Chester, Pennsylvania, must shy away from using words such as "sustainability." Florida's Republican governor is a climate change denier and has consistently cut environmental regulation in favor of business interests, and cities in Florida cannot use the term "climate change" in their plans.

As stated previously, the majority of the cities that have made the Sierra Club pledge are under 1 million in population, some with populations under 1,000. Even with public support, these smaller cities often don't have the capacity to undertake large, expensive complex projects, or lack the technical or administrative expertise, and/or financial resources to even map out a plan toward reaching their goal. West Chester does not have a sustainability department or any other overseeing body to take on the work, and although South Lake Tahoe, California, has a good deal of community-driven effort, the city lacks technical expertise to perform analyses needed.

Many cities also lack a dedicated funding source. Despite the fact that renewable energy was the cheapest source of new electricity in 2017 (Marcacci & O'Boyle, 2018), for cities that do not have access to renewable sources of energy from their utility companies, the upfront capital costs of building or installing renewable energy is a major barrier. The average cost to install a solar system in 2017 was over $2,000 per kW for a large-scale system, to almost $3,700 in a residential system. Wind costs around $1,200 to $1,700/kW; in comparison, a natural gas plant costs around $1,000/kW (Union of Concerned Scientists, 2017). Furthermore, there is the risk of electricity rates increasing for customers, disproportionately affecting low-income residents. Despite having a sustainability department and community support in Salt Lake City, for example, a study by Energy Strategies LLC estimated that rates would be 9%-14% higher in 2032 if Salt Lake replaces traditional fuel sources with 100% renewables (2017). And though Community Choice Aggregation (CCA) seeks to reduce the cost of purchasing renewables, as described earlier, a study done for Encinitas, California, concluded that to develop a CCA with 100% renewable options might be feasible but would cost up to $3 billion (FBEI, 2017).

Finally, even with community and financial support, perhaps the greatest challenge for cities trying to reach their renewable energy goals is the complex energy regulatory structure throughout the United States. States have one of two types of energy markets: deregulated or regulated. Deregulated markets allow customers to select a retail electricity provider other than the utility, which provides more options in regards to the inclusion of renewable energy within the market. Regulated markets, on the other hand, only provide customers with one utility from which they can purchase electricity (Meister

Consultants Group, 2017). As of 2018, over 40% of states do not have a competitive supplier of renewable energy, and cities are therefore dependent on the energy portfolio of their major utility companies (ACCES, 2018). Cities such as Moab, Utah, and St. Louis, Missouri, rely on providers that source much of their energy from coal; two of the nation's largest coal companies are headquartered in St. Louis. Due to state regulations, Atlanta is required to buy its electricity from the state utility company, Georgia Power, barring the city from purchasing solar and wind from another provider. It is often the case that cities do not have much flexibility with their utility companies, or are locked into future contracts with regional or state energy providers that do not offer a portfolio with many renewable energy sources.

Investor-owned utilities, or privately-owned large-service companies, serve around 68% of electricity customers in the U.S. and are heavily regulated by states, which means cities have little direct control over them (Meister Consultants Group, 2017). State investor-owned utilities often oppose and impair the creation of CCAs because they threaten the utility business model. Although regulation supporting CCAs has passed in California, Massachusetts, Illinois, New Jersey, New York, Ohio and Rhode Island, utilities argue that CCAs take away customers, "while leaving them with the burden of managing the power lines, maintenance crews, and the customer service platforms that keep the system running" (St. John, 2018).

Cities also face the issue of a lack of jurisdiction over renewable energy sources, as they may not have sufficient access to renewable energy sources within the city boundary or control over renewable energy supply, which commonly resides at a regional or national level (ICLEI, 2015). Some cities face barriers at the state or regional level that limit the accessibility to renewable resources and the ability to maximize resource potential. In these cases, the direct influence of city governments on local renewable energy policies is limited. This is why many urban initiatives are driven by national or subnational governments through the implementation of intergovernmental policies (Hoppe & van Bueren, 2015).

State and regional governments are crucial stakeholders in cities meeting their renewable energy goals, as they can enact policies that promote the creation and adoption of renewable energy. They have the power to establish, for example, power sector regulations, investment and financing conditions, suitable electric grid infrastructure, and technical capacity (Zamfir, 2013). However, effective and appropriate laws that would encourage a wider adoption by utilities are generally lacking (Timilsina, Kurdgelasvili, & Narbel, 2012). 17 of the 22 states with cities pledged to 100% renewable energy do have renewable portfolio standards (RPS), which are requirements by states to increase the production of energy from renewable sources. Vermont has the most aggressive RPS of 70% by 2032, followed by California and New York, requiring 50% by 2030. However, most other states have set goals under 20%, making it harder for cities to reach their goals.

7. Conclusion

The 56 cities that have pledged to transition to 100% renewable energy under the Sierra Club's Ready for 100 campaign show an intensifying commitment at the local level to advance renewable energy and fight climate change across the United States. Cities large and small, in both red and blue states, understand the importance of a renewable energy economy to maintain a healthy living environment for

their communities, as well as to ensure the future sustainability of these communities. These 100% renewable energy pledges are just one way that demonstrate cities' growing clean energy priorities. Although these pledges only represent a small portion of the U.S. population, the commitment is meaningful and signifies that cities are willing to chart their own path in the absence of strong federal leadership. Motivations for adopting this pledge differ from city to city, but all share common drivers – economic, environment, external influences, public health, and renewable resource supply – that stem from the view that the transition from fossil fuels to renewable energy is not an obligation, but an opportunity for socio-economic development, leadership and innovation.

Regardless of motivations, each city must develop a unique and appropriate strategy to meet their goal that addresses specific challenges and opportunities; there is no one-size-fits-all approach. Many of these cities are still in the vision-setting and planning stages; others have made progress through energy efficiency measures; incorporating goals into sustainability or climate action plans; installing renewable energy; developing financing models; community choice aggregation; and cooperation with utilities.

The path towards 100% renewable energy will depend on the resources available, community values, the priority given to energy efficiency, and the input of key stakeholders and players. According to researchers Kammen and Sunter in *Science*: "Achieving a sustainable urban energy system will require a dramatic rethinking of our infrastructure, information systems, and critical social and environmental justice issues" (2016). Cities do face a number of complex challenges in pursuing these goals, including gaining adequate administrative and financial resources, and overcoming the complex energy regulatory structures and fossil-fuel focused utility companies. Nevertheless, cities appear confident in their ability to overcome these challenges and reach their goals. And if 2018 is anything like 2017, more cities will be added to this Ready for 100 list. Cities that are considering making this transition can learn from the cities that have already begun the transition, and from the cities that have already achieved their goal. A few key lessons are summarized here (and see Appendix C for a list of resources for cities).

- **Energy efficiency is a key first step.** Cities can design new buildings with the latest energy efficiency technology, or focus on modernizing and retrofitting the existing building stock. The 100% renewables goal is easiest to achieve for cities that use less energy—which could be the result of smaller size or policies that promote energy efficiency. Burlington meets both criteria, where an estimated $30 million has been invested in energy efficiency in the last two decades through a voter-approved bond measure in 1990 and a state energy-efficiency charge.

- **Community and stakeholder inclusion will help cities succeed in meeting clean energy goals. A focus on advocacy and education through community engagement, stakeholder consultations and dialogue facilitation is important.** Many cities in this review, especially smaller ones, have seen successful processes that were driven through grassroots efforts. The campaigns to get cities to go 100% have included a broad mix of students, businesses, parents, local organizations, and community members. Not only does this make communities more accountable and help develop a transparent process, but community-driven efforts may also be better at including the perspectives and needs of low-income communities.

- **Cooperation and knowledge-sharing cannot be overstated.** Even though cities must chart their own path, cooperation is especially important for neighboring cities that may have similar characteristics and work with the same utilities. For example, efforts in Taos and San Diego County show the power of aligning strategies for a common effort. Cities should consider cooperating and sharing knowledge, resources, and technical expertise with neighboring cities with similar goals.

- **Cities should build on existing regional/state norms, regulations and policies.** In California, cities have legal obligation under state law to meet statewide greenhouse gas reduction goals; in New York, a state-wide executive order to reduce reductions has buoyed climate actions at a local level. Building on and coordinating policies and initiatives across different levels of government is key to establishing robust clean energy policies for the future. State and regional governments therefore have an important role to play in the transition to a renewable-resource based economy.

The transition to 100% renewable energy is an opportunity to build a more affordable, democratic and locally-controlled energy system. While it's true a more robust response from the U.S. federal government would greatly beneficial, these cities are showing that it is possible to make an impact at the local level and drive systemic change across the U.S. in absence of federal regulation. Since many of these pledges only happened in the last year, it will be interesting to see how cities build and modify their implementation plans, and if and how they will include transparent reporting processes. Will cities be able to achieve their goals on the stated timeline? If they don't achieve them, what are the consequences? Cities have taken the first step of making the commitment, but the next, much more difficult step of making this transition has yet to happen for most cities under this campaign.

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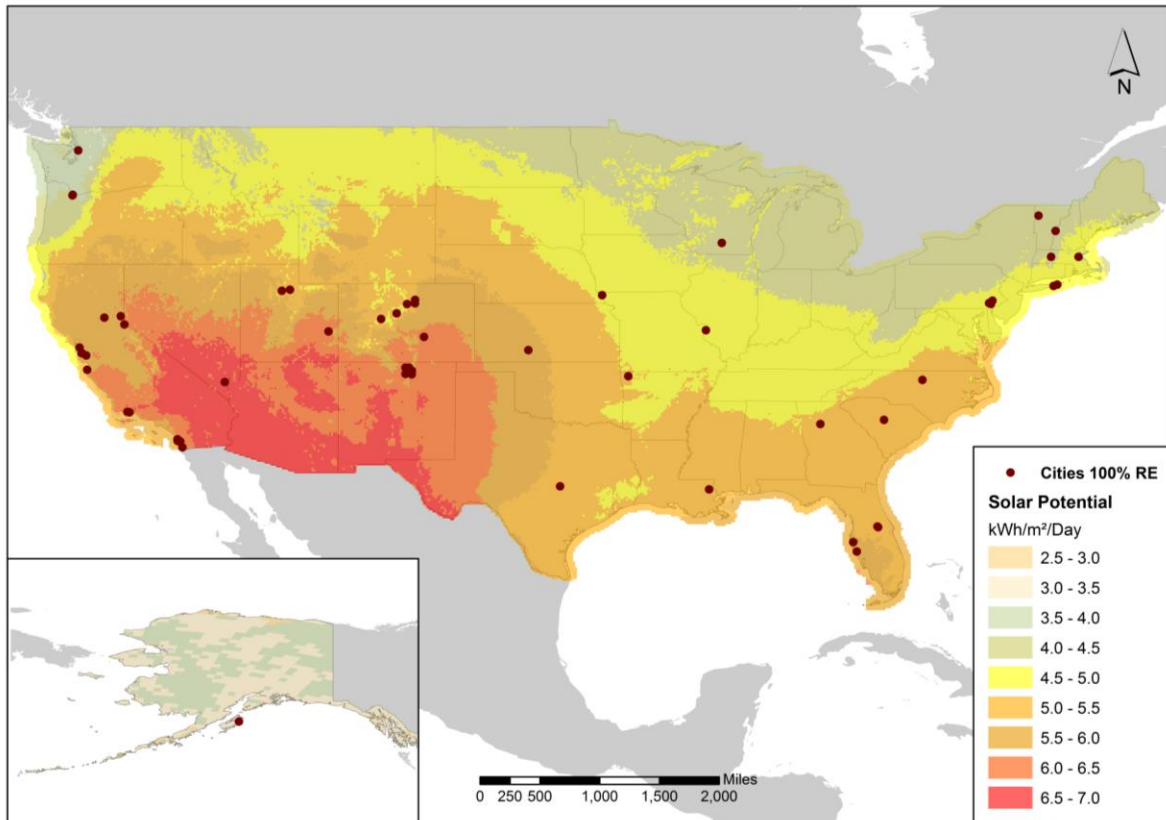## Appendix A: Cities Committed to 100% Renewable Energy Under the Sierra Club's Ready for 100 Campaign

City/Town	State	Population Size (2016)	Pledge Date	Pledge Type	Year of Targeted Completion
Aspen	Colorado	6,871	2004	Bill / action plan	2015 (achieved)
San Jose	California	1,025,350	2007-10	Goal	2022
Kodiak Island	Alaska	13,732	2008-01	N/A	2020 (achieved 2014)
Rockport	Missouri	1,227	2008-04	N/A	2008 (achieved)
Greensburg	Kansas	771	2008-05	Resolution	2013 (achieved)
San Francisco	California	870,887	2010-12	Ordinance	2030
Georgetown	Texas	67,140	2015-03	Goal	2017
Burlington	Vermont	42,522	2012-07	Goal	2014 (achieved)
Palo Alto	California	67,024	2013-03	Resolution	2013
Taos	New Mexico	5,763	2013-10	Joint resolution	2030
Questa	New Mexico	1,754	2014-01	Joint Resolution	2030
Eagle Nest	New Mexico	257	2014-01	Joint resolution	2030
Taos Ski Valley	New Mexico	69	2014-02	Joint Resolution	2030
Red River	New Mexico	477	2014-03	Joint Resolution	2030
Angel Fire	New Mexico	1,113	2014-04	Joint resolution	2030
East Hampton	New York	21,457	2014-05	Resolution	2020
San Diego	California	1,406,630	2015-12	Resolution	2035
Del Mar	California	4,365	2016-06	Goal	2035
Salt Lake City	Utah	193,744	2016-11	Resolution	2032
Park City	Utah	8,299	2016-10	Resolution	2032
St. Petersburg	Florida	260,999	2016-11	Executive Order	Undeclared
Boulder	Colorado	108,090	2016-12	Goal	2030
Pueblo	Colorado	110,291	2017-02	Resolution	2035
Moab	Utah	5,242	2017-02	Resolution	2032
Abita Springs	Louisiana	2,529	2017-03	Resolution	2030
Madison	Wisconsin	252,551	2017-03	Resolution	none

South Lake Tahoe	California	21,717	2017-04	Resolution	2032
Cambridge	Massachusetts	110,651	2017-04	Goal	2035
Atlanta	Georgia	472,522	2017-05	Resolution	2035
Southampton	New York	3,280	2017-05	Resolution	2025
Hanover	New Hampshire	11,401	2017-05	Resolution	2030 / 2050
Santa Barbara	California	91,930	2017-06	Resolution	2030
Monterey	California	28,454	2017-06	Resolution	2040
Portland	Oregon	639,863	2017-06	Resolution	2035 / 2050
Sarasota	Florida	56,610	2017-06	Resolution	2045
Columbia	South Carolina	134,309	2017-06	Resolution	2036
Edmonds	Washington	41,840	2017-06	Goal	2025
Menlo Park	California	33,888	2017-07	Resolution	2030
Orlando	Florida	277,173	2017-08	Resolution	2030 / 2050
Nevada City	California	3,145	2017-08	Resolution	2030 / 2050
Nederland	Colorado	1,534	2017-08	Resolution	2030
West Chester	Pennsylvania	19,928	2017-09	Resolution	2035 / 2050
St. Louis	Missouri	311,404	2017-09	Resolution	2035
Phoenixville	Pennsylvania	16,885	2017-09	Resolution	2035
Chula Vista	California	267,172	2017-09	Goal	2035
Downingtown	Pennsylvania	7,905	2017-09	Resolution	2035 / 2050
Hillsborough	North Carolina	6,568	2017-11	Resolution	2050
Amherst	Massachusetts	39,724	2017-11	Resolution	2050
Breckenridge	Colorado	4,896	2017-11	Goal	2025 / 2035
Solana Beach	California	13,449	2017-11	Resolution	2035
Truckee	California	16,391	2017-11	Resolution	2020 / 2030 / 2050
Goleta	California	30,850	2017-12	Resolution	2030
Lafayette	Colorado	28,261	2018-01	Resolution	2030
Fayetteville	Arkansas	83,826	2018-01	Resolution	2030 / 2050
Longmont	Colorado	92,858	2018-01	Resolution	2030
Encinitas	California	63,131	2018-01	Goal	2030

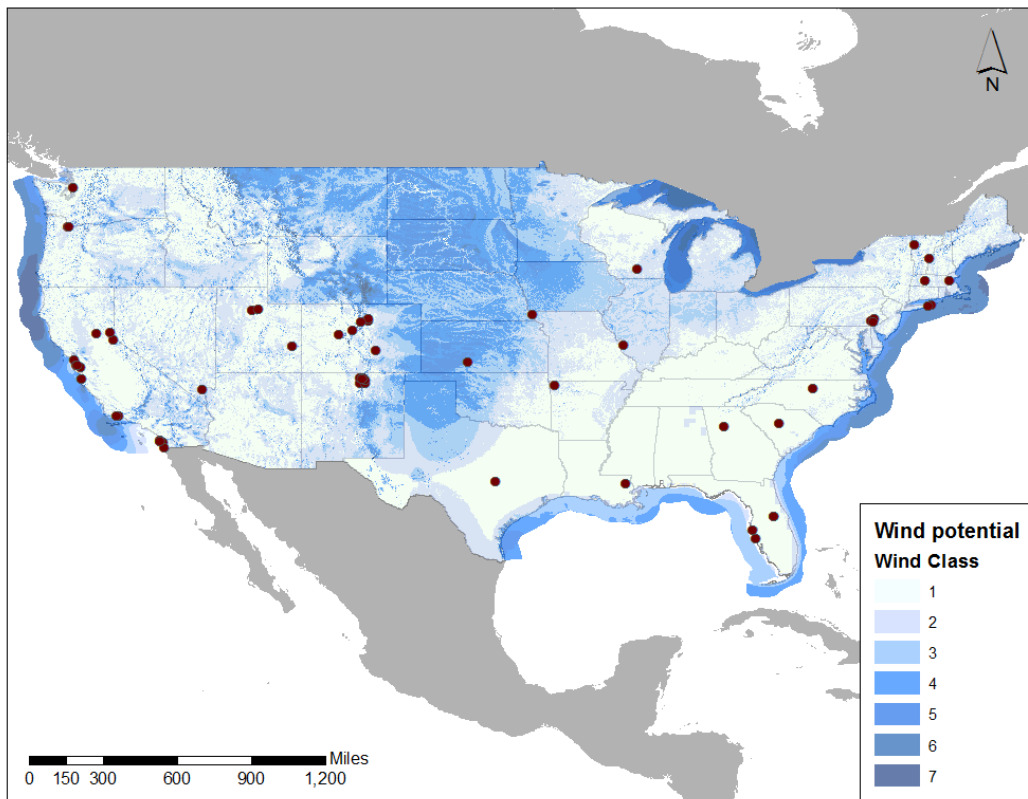# Appendix B: Renewable Energy Potential Maps

The following maps represent renewable energy potential in the United States, according to the National Renewable Energy Laboratory.[2] The 56 cities taking part in Sierra Club's campaign are shown on each map.

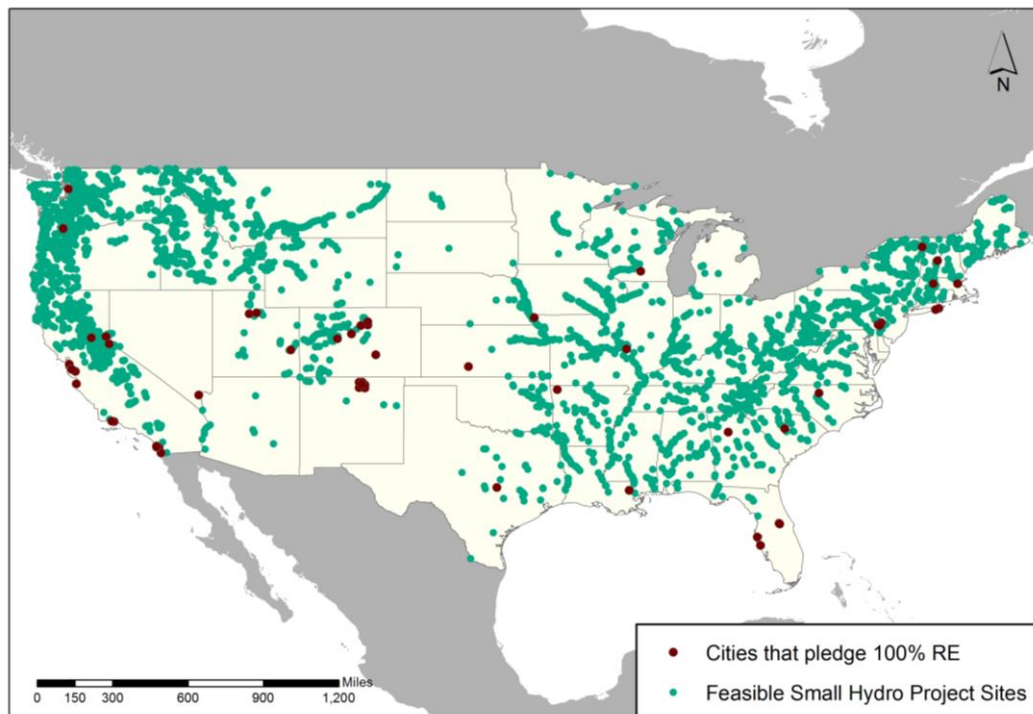*Map 1:* *Solar photovoltaic potential in kWh/m2/day*

[2] NREL RE Atlas: https://maps.nrel.gov/re-atlas/?aL=zpcfmf%255Bv%255D%3Dt&bL=clight&cE=0&lR=0&mC=40.21244%2C-91.625976&zL=4

Map 2: *Onshore wind potential based on power class*

Map 3: *Hydroelectric potential based on feasible small hydro project sites*

Appendix C: Resources for Cities

100% Clean and Renewable Wind, Water, and Sunlight All-Sector Energy Roadmaps for 139 Countries of the World
Mark Z. Jacobson, Mark A. Delucchi, Zach A.F. Bauer et al., Joule
http://web.stanford.edu/group/efmh/jacobson/Articles/I/CountriesWWS.pdf
This article outlines a roadmap to transform the all-purpose energy infrastructures (electricity, transportation, heating/cooling, industry, agriculture/forestry/fishing) of 139 countries to ones powered by wind, water, and sunlight.

100% RE Building Blocks: A practical toolkit for a sustainable transition to 100% renewable energy
The Global 100% Renewable Energy Campaign
https://go100re.net/wp-content/uploads/2017/05/100RE-Building-Blocks.pdf
This report proposes a comprehensive collection of building blocks, which help realize and evaluate a sustainable transition towards 100% renewable energy. The ultimate ambition of this report is to create a living document that can serve as an interactive tool box for stakeholders worldwide. This means creating a set of workable building blocks that can be adapted and modified as appropriate to fit particular local contexts. These building blocks serve as guidance when developing 100% RE roadmaps and strategies as well as a monitoring and benchmarking tool for mapping progress towards the achievement of the 100% RE goal.

100% Renewable Energy Campaign-Starter Guide
Climate Action Network (CAN)
https://climateaccess.org/sites/default/files/Climate%20Action%20Network_100%20Renewable_Energy%20Campaign-Starter%20Guide.pdf
This campaign-starter guide provides ideas and inspiration for people considering joining the global movement helping to achieve a world powered by 100% renewable energy. It is designed to help you run your own campaigns to that ensure that more and more businesses and public institutions are adopting 100% renewable energy targets by getting you started with ideas, case studies and language for discussing the co-benefits of taking action.

100% Renewable Energy Network
ICLEI: Local Governments for Sustainability
http://icleiusa.org/programs/energy/100-renewable-energy-network/
The 100% Renewable Energy Network aims to assemble, assist, and advance a network of communities powered by, transitioning to, or aspiring to reach 100% renewable energy through provision of cutting-edge tools and resources, expert guidance, peer-to-peer exchange opportunities, leadership recognition, and global visibility.

The Carbon-Free City Handbook
Rocky Mountain Institute
https://www.rmi.org/carbonfreecities/
The Carbon-Free City Handbook reveals 22 actions—and associated resources—for cities globally to move toward climate-neutrality and see results within a year.

Cities Heading Towards 100% Renewable Energy by Controlling Their Consumption: Food for Thought and Action

CLER, Energy Cities, Réseau Action Climat

http://www.energy-cities.eu/IMG/pdf/publi_100pourcent_final-web_en.pdf

This report provides guidance and solutions to cities and metropolitan areas anxious to embark on a 100% renewable energy path. The report contains five theme-specific factsheets illustrating the path towards 100% renewable energy, with examples of projects in France.

Community Resources

Transition Twin Cities

https://transitiontwincities.org/community-resources/

The Twin Cities has many resources to help you make the transition away from fossil fuels and toward a more resilient household and connected community. This website contains a number of resources related to energy, climate, economy, transit, food, waste and community-buildings.

Energy Transition Initiative

U.S. Office of Energy Efficiency & Renewable Energy

https://www.energy.gov/eere/about-us/energy-transition-initiative

Through the Energy Transition Initiative (ETI), the U.S. Department of Energy and its partners work with government entities and other stakeholders to establish a long-term energy vision and successfully implement energy efficiency and renewable energy solutions. ETI provides a proven framework and technical resources and tools to help islands, states, and cities transition to a clean energy economy and achieve their clean energy goals.

How to Achieve 100% Renewable Energy

World Future Council, 100% Renewables

https://www.worldfuturecouncil.org/file/2016/01/WFC_2014_Policy_Handbook_How_to_achieve_100_Renewable_Energy.pdf

This policy handbook takes a closer look at early pioneers in renewable energy transitions to provide inspiration and concrete examples to other jurisdictions that are aiming to embark on the same transformation. It analyzes case studies to identify drivers, barriers as well as facilitating factors and, from these, it derives policy recommendations to finally enable their transfer to other jurisdictions around the world.

Innovations in City Clean Energy & Equity Planning

Meister Consultants Group

http://www.mc-group.com/wp-content/uploads/2017/08/MCG_Innovations-in-City-Clean-Energy-and-Equity-Planning.pdf

This report summarizes the emerging strategies of city leaders to transform their energy supply to renewable and low-carbon sources, and improve social equity in the process. The purpose of this research is to draw on existing sources to establish a baseline understanding of the current state of practice in municipal energy supply transformation. This report complements the Meister Consultants Group resource *Pathways to 100: An Energy Supply Transformation Primer for U.S. Cities*. Together, these resources provide insight into how municipal governments can and are acting on strategies to transform local energy systems.

Just Energy Policies and Practices Action Toolkit

NAACP Environmental and Climate Justice Program

http://www.naacp.org/climate-justice-resources/just-energy/

The Just Energy Policies and Practices Action Toolkit contains 8 modules of practical, user-friendly guidance on how you can phase out toxic energy like coal, nuclear, and oil facilities and bring in clean energy like wind and solar. Designed to be downloaded as an entire toolkit or as individual modules, you can start planning energy justice plans to best fit the needs in your community.

Lifting the High Energy Burden in America's Largest Cities: How Energy Efficiency Can Improve Low Income and Underserved Communities

American Council for an Energy-Efficient Economy (ACEEE)

https://drive.google.com/file/d/0B2w0sO4TtfpTSFNiU0V2Y2gxMms/view

This report provides a snapshot of energy burdens in cities across the US, focusing on the high home energy burdens faced by select groups in major metropolitan areas. Years of analysis by the firm of Fisher Sheehan & Colton determined that low-income households pay proportionally more than the average household for energy costs. The first half of this report assesses data from the US Census Bureau's 2011 and 2013 American Housing Survey to determine energy burden values for 48 of the largest US cities and specific households within each city. The second half discusses strategies for alleviating high energy burdens, with a focus on policies and programs to increase the impact of energy efficiency initiatives in these communities.

PATHWAYS TO 100 An Energy Supply Transformation Primer for U.S. Cities

Meister Consultants Group

http://www.mc-group.com/wp-content/uploads/2017/05/MCG-Pathways-to-100-Energy-Supply-Transformation-Primer-for-Cities-1.pdf

This report lays out a process to help cities plan for their 100% renewable electricity transition. The process involves: mapping the city's energy landscape; identifying available strategies; and organizing capacity/resources/partnerships.

Renewable Energy in Cities

International Renewable Energy Agency (IRENA)

http://www.irena.org/publications/2016/Oct/Renewable-Energy-in-Cities

By highlighting the best practices from cities around the world, this report examines the policies and technologies by which cities can bring about a renewable energy future. It provides concrete examples of how municipal leaders and administrators can accelerate the switch to renewable energy at the local level by acting as planners, regulators, financiers and operators of urban infrastructure.

Renewable Heating & Cooling: Thermal Decarbonization of Residential Buildings
Carbon Neutral Cities Alliance

https://www.usdn.org/public/page/91/CNCA-Innovation-Fund-Products#BoulderThermal

This guide provides options and actionable steps for cities interested in completing analyses to guide the development of approaches to transitioning away from fossil fuel-based heating. In particular, this guide discusses key steps and best practices to: (1) Establish goals and parameters for a thermal decarbonization initiative within the local context; (2) Identify and collect data from publicly-available data sources; (3) Conduct a market analysis of the local building stock; and (4) Leverage market analysis to engage key stakeholders and develop policies and programs for scaling the local RH&C market.

The Solutions Project

http://thesolutionsproject.org/

With over 200 businesses, cities, and countries committed to 100% clean, renewable energy, momentum is building. Solutions Project is here to support that momentum and accelerate the transition to clean energy for all. The Solutions Project honors clean energy leaders, invests in promising solutions, and builds relationships between unlikely allies.

Sustainable Cities
Let's Go Solar

https://www.letsgosolar.com/consumer-education/sustainable-cities/

This guide offers resources on how individuals and organizations can help their cities become more sustainable. See how municipal governments are developing new policies and programs and engaging their residents in innovative ways to create positive change for everyone.

Ready for 100: 100% Resources
Sierra Club

https://www.sierraclub.org/ready-for-100/100-resources

The Sierra Club lists implementation tools and programs, feasibility studies, research tools, and Organizations that can all assist in a city's transition to 100% renewable energy.

Ten Ways Your City Can Go Solar
Environment America

https://environmentamerica.org/sites/environment/files/resources/AME_Solar-factsheet_Feb2018_PRINTv1b.pdf

This fact sheet gives a broad and brief overview of ways that cities can move towards solar energy.