How U.S. Cities Seek to Use 100 Percent Renewable Energy

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States have been labeled "laboratories of democracy" since at least Justice Brandeis's era. Today, cities increasingly are the incubators of new public policy experiments. A prime example is in the energy space, where, in the past few months, several American cities—including Chicago and Atlanta—have committed to consume 100 percent of their energy from renewable sources within the next few decades.

Cities like Atlanta, which has committed to go 100 percent renewable by 2032, do so at a time of significant change in the U.S. energy industry. In the last decade, the use of renewables has grown considerably, while the cost of renewable technologies—particularly wind and solar—has dropped precipitously. In 2016, the United States installed a record 22 gigawatts of renewable generating capacity, enough electricity to power more than 15 million homes. Likewise, renewables as a percentage of the U.S. energy mix have nearly doubled over the last decade, from 8 percent in 2007 to 15 percent in the first part of 2017. Within the last five years, the cost of constructing utility-scale solar facilities has dropped from $2.65 million per megawatt (m/MW) to only $1.14m/MW, and the cost of wind turbines has dropped from $1.34m/MW to $1.12m/MW over that same period. While fossil fuels still constitute the largest chunk of the country's energy portfolio, coal use has dropped steadily since the 1980s and now accounts for a smaller percentage of America's electricity, and energy-related jobs, than renewable resources.

City initiatives like Atlanta's also come at a time of political tension between federal, state, and local governments on issues such as climate change and the best way to achieve energy security and economic development. A few weeks after the presidential election in 2016, 71 mayors representing more than 38 million people wrote a letter to President-elect Trump, requesting that he "lead us in expanding the renewable energy sources we need to achieve energy security, address climate change and spark a new manufacturing, energy and construction boom in America." Mayors National Climate Action Agenda, Open Letter to President-elect Donald Trump on Climate Action at 3 (Nov. 22, 2016), *available at* https://medium.com/@ClimateMayors/open-letter-to-president-elect-donald-trump-on-climate-policy-and-action-33e10dcdcf8. The mayors stressed, however, that "we are prepared to forge ahead even in the absence of federal support[.]" *Id.* at 4.

The Trump administration, by contrast, has made the resurrection of the coal industry a central tenet of its energy policy. In the first 100 days of his administration, President Trump issued an executive order calling for agencies to identify and potentially rescind all regulations that overly encumber the fossil fuel industry. Exec. Order 13783, 82 Fed. Reg. 16,093 (Mar. 31, 2017). Additionally, Department of Energy (DOE) Secretary Rick Perry ordered a review of DOE and Federal Energy Regulatory Commission (FERC) policies to determine whether the "regulatory burdens introduced by previous administrations," which he argues have "destroyed jobs and economic growth" and are responsible for the premature retirement of coal- (and nuclear-) based power plants. Sec. Rick Perry, Memorandum to the Chief of Staff (Apr. 14, 2017). And most significantly, on June 1, 2017, President Trump withdrew from the Paris Climate Agreement, signed by a coalition of 194 countries to reduce greenhouse gases globally.

Whether due to declining technology costs, or policy differences with the White House, a growing number of cities—including San Diego, Rochester, Minnesota, San Francisco, San José, and Chicago—have adopted resolutions or administrative commitments to use 100 percent renewable energy in the next few decades. A wider group of cities—including Los Angeles and Miami Beach—have not yet committed to achieve 100 percent renewable energy as a matter of policy but have pledged their support for that goal. And still a wider group of cities have pledged to use their available tools to comply voluntarily with the Paris Climate Agreement.

This article focuses on three cities—Burlington, Vermont; Georgetown, Texas; and Greensburg, Kansas—and how they became 100 percent renewable. Each city's story is unique. Burlington attained the title of America's first all-renewable city through a combination of biomass and hydroelectric facility acquisitions, power purchase agreements (PPAs) with wind, solar, and hydroelectric developers and strategic buying and selling of Renewable Energy Credits (RECs). Georgetown relied more heavily on long-term PPAs with wind and solar developers, which were facilitated by Texas's recent investments in new transmission facilities. And Greensburg became 100 percent renewable by partnering with federal agencies and private companies to construct its own wind farm near the city limits.

The decision of more people to reside in cities, and of more cities to adopt significant renewable energy standards, will help shape the country's future energy profile. *See* U.S. Census Bureau, Growth in Urban Population Outpaces Rest of Nation, (Mar. 26, 2012). This article focuses on the specific strategies cities might use to achieve those renewable energy goals.

Burlington, Vermont: What Fuel Counts as Renewable?

Burlington, Vermont, population 42,000, has received positive media attention for being America's first 100 percent renewable city and for achieving this status without raising

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electricity rates. Colin Woodward, *America's First All-Renewable-Energy City: Burlington's Decades-long Commitment to Sustainability Has Paid Off with Cheap Electricity*, Politico Magazine (Nov. 17, 2016). In 2015, Vermont adopted Act No. 56, which required that 55 percent of all retail electricity sales in Vermont come from renewable energy by 2017. That level rises to 75 percent in 2032. 30 V.S.A. § 8004(d), *et seq*. The act defines renewable energy as "energy produced using a technology that relies on a resource that is being consumed at a harvest rate at or below its natural regeneration rate," which excludes energy from coal, oil, propane, and natural gas, and has been interpreted by the state Public Service Board as including energy from biomass, hydroelectric, solar, and wind resources. State of Vermont Public Service Board, Order Implementing the Renewable Energy Standard, Docket No. 8550 at 17–18 (June 28, 2016).

Vermont's Act No. 56 and Burlington's out-of-state sales have arguably undermined the central purpose of RECs, which is to incent construction of new, local, renewable energy facilities.

The laws of physics make it impossible to distinguish electrons produced by renewable and nonrenewable sources once they are comingled. Thus, entities obtaining energy from the transmission grid cannot be guaranteed that the actual electrons they purchase are from a wind or solar farm, for example, rather than from a coal or natural gas plant. RECs were created to bridge this gap by acting as a proxy for the environmental attributes associated with each megawatt hour (MWh) of renewable generation. Under Vermont state law, RECs are defined as representing "all of the environmental attributes associated with a single unit of energy generated by a renewable energy source where . . . those attributes are transferred or recorded separately from that unit of energy." 30 V.S.A. § 8006(26). Environmental attributes mean "any and all benefits . . . to the environment such as avoided emissions or other impacts to air, water, or soil that may occur through the . . . displacement of a nonrenewable energy source." Id. at § 8006(7).

Under the laws of at least 36 states, including Vermont, RECs can be unbundled from their associated electricity and either kept to show possession of the environmental attributes of renewable energy or sold to other entities to do the same. Todd Jones, *The Legal Basis for Renewable Energy Certificates*, 3, Ctr. for Res. Solutions (June 17, 2015). Thus, RECs rely on the accounting fiction that entities purchasing RECs obtain the environmental attributes of renewable energy sources even though the actual electrons they use may come from a coal or natural gas plant. Likewise, entities that sell their RECs are considered divested of the environmental attributes of renewable energy sources even though their actual electricity may come from a wind or solar farm.

The sale of RECs (either bundled with or separate from electric generation) can thus incentivize construction of renewable energy facilities by providing developers with an additional revenue stream beyond just the electricity produced. Because the output of renewable energy resources such as wind and solar facilities is variable—that is, dependent upon the wind blowing or sun shining—renewable facilities cannot provide the uninterrupted service most consumers expect. RECs allow utilities, individual consumers, corporations, and communities to secure the attributes of renewable energy, whether to comply with state renewable energy standards or make verified clams about the renewable content of electricity, while relying upon readily dispatchable generation like coal or natural gas plants.

Vermont (like other New England states) requires that electricity providers procure and retire RECs to demonstrate compliance with the renewable energy standard established by Act No. 56. In the first year of Act No. 56's implementation, Burlington reported that, before selling or purchasing any RECs, about 90 percent of its energy came from renewable sources. Burlington Elec. Dep't., Our Energy Portfolio, at 2, *available at* https://www.burlingtonelectric.com/our-energy-portfolio. Of this, 42 percent came from Burlington's McNeil biomass facility, a 50 MW facility that runs primarily on wood waste and cull material. After biomass, the next highest percentage of Burlington's electricity, 29 percent, came from hydropower, both purchased from large out-of-state hydroelectric facilities and generated by Burlington's own Winooksi One facility, a run-of-river small hydroelectric facility owned and operated by Burlington and located a few miles from the city. Around 20 percent of Burlington's energy came from electricity purchased from wind and solar developers in Vermont, and the remaining 10 percent came from nonrenewable sources purchased through the New England wholesale markets.

Vermont is the only state in New England to count electricity from large hydroelectric facilities as meeting its renewable portfolio standards. Although large hydroelectric facilities do not result in greenhouse gas emissions or rely on a nonrenewable fuel source, they are not recognized under most states' renewable portfolio standards because of their impacts upon local ecologies. Small, run-of-river hydroelectric facilities do not alter the natural flow of rivers, or disrupt fish and wildlife species, to the same extent as large hydroelectric facilities and thus are recognized under many state renewable energy standards. Act No. 56, however, does not distinguish between large and small hydroelectric facilities.

In 2015, Burlington sold its RECs from its wind, solar, small-scale hydroelectric, and biomass resources for between 5 to 6 cents apiece and replaced them with RECs from large-scale hydroelectric facilities for about 1 cent apiece. Through this arbitrage—or "greenwashing" as critics call it—Burlington recovered nearly $12 million in 2015, amounting to about 24 percent of its cost of service, which has offset any rate increases for its customers. Michael Bielawski, *Vermont's All-Renewable Claims Based on Uneven REC Market*, Vermontwatchdog.org (Nov. 28, 2016). Thus, Burlington fully complied with its renewable portfolio standard and became America's first all renewable city at no additional costs to its residents.

However, as discussed above, when an entity like Burlington exchanges its RECs rather than retiring them outright without replacement, that entity's fuel mix changes. Upon transfer, Burlington's final energy mix in 2015 effectively became around 99 percent large hydroelectric, which would not be recognized as renewable in nearly any other state. Burlington Elec. Dep't., Our Energy Portfolio, at 2. Moreover, Vermont's Act No. 56 and Burlington's out-of-state sales have arguably undermined the central purpose of RECs, which is to incent construction of new, local, renewable energy facilities. Indeed, because Burlington can meet its requirements by purchasing RECs from existing hydroelectric dams in New England, it need not construct any new facilities, and, if Burlington sells its wind and solar RECs to utilities in other states, those utilities have little incentive to build their own facilities.

Burlington has utilized RECs to great effect and benefited from Vermont's liberal renewable portfolio requirements. However, the percentage of renewable energy produced in Vermont is not as high as Burlington's 100 percent claim might suggest, with much of it unrecognizable as renewable energy in most other states. As such, Burlington's claim of being 100 percent renewable is more nuanced than it might appear at first glance.

Georgetown, Texas: Benefits of New Transmission Facilities

Texas is America's undisputed leader in wind energy. This is largely due to its investments in competitive renewable energy zones (CREZ) transmission facilities, which began in 2007 and 2008, and came online in 2014. These investments in transmission have had a dramatic effect on the state, and many communities in Texas are finding renewable energy less expensive than electricity from fossil fuel resources, even without a robust state renewable portfolio standard. This was the case for Georgetown, a community in central Texas, which became 100 percent renewable in 2017.

Until 2012, Georgetown obtained around 90 percent of its power through long-term PPAs that relied primarily on coal and natural gas. In 2012, Georgetown terminated its PPA with a nearby municipal cooperative and entered into a series of short-term contracts while it considered its long-term options. Georgetown ultimately settled on two PPAs: a 20-year agreement with EDF Renewables to purchase the output of 144 MW of the Spinning Spur 3 wind farm in the Texas Panhandle and a 25-year agreement with NRG Energy for the output of the Buckthorn solar plant in Southwest Texas. According to Georgetown, the wind PPA would supply most of the city's electricity needs and the solar PPA would meet the city's peak daytime loads. These facilities were expected to produce more electricity than needed, and excess electricity could be sold back to the grid through the Texas wholesale market. *See* Dale Ross, *Mayor: Why My Texas Town Ditched Fossil Fuel*, Time Magazine (Mar. 27, 2015), *available at* http://time.com/3761952/georgetown-texas-fossil-fuel-renewable-energy.

Georgetown never sought to become 100 percent renewable for policy reasons. Texas has a minimal renewable portfolio standard, around 5 percent of the state's summer net capacity, which it has long since met. Texas Renewable Portfolio Standard, Database of State Incentives for Renewables & Efficiency (Apr. 29, 2016), *available at* http://programs.dsireusa.org/system/program/detail/182. And in 2008 the city adopted a target of obtaining 30 percent of its electricity from renewables by 2030. Derek Prall, *Saving Green by Going Green*, American City and County (Oct. 3, 2016), *available at* http://americancityandcounty.com/renewable-energy/saving-green-going-green. Thus, Georgetown was not required to become 100 percent renewable by either state law or local rule or ordinance.

Rather, Georgetown chose to rely entirely on wind and solar resources because, on balance, they were cheaper than fossil-fuel-based resources, possess longer-term price stability—i.e., energy costs do not fluctuate based upon the price of natural gas—and use significantly less water than fossil-fuel-based generators. *See* Tom Dart, *Texas City Opts for 100% Renewable Energy—to Save Cash, Not the Planet*, The Guardian (Mar. 25, 2015). Thus, even in oil-rich Texas, renewables have become cost competitive with oil and natural gas supported resources and, in some cases, more economical.

A key factor in this transition has been Texas's development of the CREZ facilities. In 2008, the Public Utility Commission (PUC) of Texas approved an ambitious plan to construct thousands of miles of new transmission facilities to connect the wind- and solar-rich areas in west Texas with the population centers in east Texas. Specifically, the PUC of Texas approved rights-of-way and cost recovery for 13 companies to construct of 3,600 miles of new transmission at a price tag of around $7 billion. The CREZ facilities were completed in 2014 and will allow an additional 18,500 MW of wind power to be transported across the state, around 50 percent more than was previous available. *See* Jim Malewitz, *$7 Billion Wind Power Project Nears Finish*, Texas Tribune (Oct. 14, 2013) *available at* www.texastribune.org/2013/10/14/7-billion-crez-project-nears-finish-aiding-wind-po.

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With its wind farm roughly 500 miles away and its solar farm roughly 350 miles away, Georgetown relies on the CREZ transmission facilities to receive the electricity purchased under its PPAs. The new transmission facilities also allow Georgetown to sell any excess electricity from its PPAs into

the wholesale market and to rely upon that wholesale market if the wind is not blowing or the sun is not shining at the same time. Texas's investments in transmission infrastructure have thus enabled cities like Georgetown to "go green" in ways they could not have previously, while spurring investments in wind farms and solar farms with an assurance that their energy can be delivered to customers.

Greensburg, Kansas: Harnessing Local Renewable Resources

Unlike Burlington, which is subject to a generous renewable portfolio standard, and Georgetown, which has access to a robust transmission network, Greensburg has been able to go 100 percent renewable by constructing its own renewable facilities close to home. Patrick Quinn, *After Devastating Tornado, Town Is Reborn 'Green,'* USA TODAY Green Living (Apr. 25, 2015) *available at* https://www.usatoday.com/story/news/greenhouse/2013/04/13/greensburg-kansas/2078901. A small community of 1,900 in south central Kansas, Greensburg was ravaged by a tornado in May 2007. Nearly every home and municipal building was leveled, and the community's electrical distribution system had to be rebuilt from scratch. Prior to the tornado, Greensburg operated its own municipal utility and obtained electricity from a local electrical cooperative. Approximately 90 percent of this electricity came from fossil fuels, and 10 percent came from wind. Greensburg also owned and operated a 6.5 MW natural gas unit to meet peak demand and backup obligations. At that time, the overall price of electricity for residents was roughly 13 cents a kilowatt hour.

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After the tornado, Greensburg rebuilt its distribution system with assistance from FEMA and the state. Although it is a politically conservative community and not subject to Kansas's 20 percent renewable portfolio standard, which only applies to the state's investor-owned utilities and electric cooperatives, Greensburg established a strategic plan to become 100 percent renewable. *See* KS S.B. 91 (2015). Greensburg then worked with the National Renewable Energy Laboratory (NREL) to conduct feasibility studies before ultimately deciding to build its own wind farm. Because Greensburg is in a Class 4 wind corridor, it could construct a $23 million, 12.5 MW wind farm only four miles from the city. This project was financed through the combination of a $17 million loan from the U.S. Department of Agriculture, as well as the sale of the project's RECs to NativeEnergy, a Vermont-based company. The city also received an equity investment from John Deere, which manufactured and constructed the project's 10 wind turbines.

Greensburg expects to utilize only a quarter of the project's electricity and will sell the remainder to the Kansas Power Pool, a rural cooperative, which will provide Greensburg with hydroelectric power when the wind is not blowing. In addition, the residential electricity rate in Greensburg is now less than what it was before its transition to green energy, at about 12.9 cents per kilowatt hour. The same massive winds that once destroyed Greensburg now provide its citizens with all their energy needs and have enabled Greensburg to manage its own energy production and become 100 percent renewable without raising electricity rates.

Considerations for Other Communities

Burlington, Georgetown, and Greensburg stand out as the first U.S. cities to go well above their state requirements and become 100 percent renewable. Burlington achieved this status by maximizing the value of its RECs in the regional REC markets and exploiting differences in Vermont's and others' renewable portfolio standard requirements. Georgetown took advantage of Texas's rich renewable resources and significant infrastructure investments to transport that energy to load. And Greensburg, which had to rebuild its electric distribution system from scratch, achieved this goal by partnering with private companies, securing favorable federal loans, and benefiting from its location in a Class 4 wind corridor.

While these models can inform other cities seeking to become 100 percent renewable without incurring significant costs in the process, each reflects an intelligent leverage of local economic and geographic attributes. Burlington, for example, is situated in a state that has a more liberal definition of renewable energy than all of its neighbors. This has enabled the city to sell its own RECs at a high price and purchase out-of-state RECs at a lower price, and earn a significant offset in the process. But even without these specific conditions, the model of utilizing abundant local renewable resources, such as forestry biomass in New England, enhancing the value of those RECs, and selling them in the open market, while acquiring lower cost RECs from other states, is a cost-effective model for meeting city renewable energy standards.

Georgetown's example suggests that cities can more easily become 100 percent renewable when additional transmission facilities are added to connect cities to the best renewable resource areas. However, this is no easy task. In fact, it is remarkably capital intensive and usually requires the approval of multiple levels of government. For example, transmission facilities in the Northeast may have to cross several states' boundaries and thus confront significantly more regulatory and jurisdictional challenges than facilities constructed in large, single-jurisdiction states like Texas. Moreover, because Texas's grid has been designed to avoid federal entanglements, the CREZ facilities were not subject to regulation by the FERC, which normally exercises jurisdiction over the rates, terms, and conditions of service over interstate transmission facilities. Additionally, the CREZ facilities only needed approval from one state's regulatory and environmental commission, rather than several.

By comparison, in 2007–2008, a series of transmission facilities like the CREZ facilities were approved by FERC to transport wind energy from the Midwest to cities on the Eastern Seaboard. Ten years later these transmission facilities remain entangled in regulatory disputes over the appropriate allocation of costs for several regional transmission enhancement projects. *See* FERC Docket ER12-773. These facilities have been fought over by 13 state commissions in multiple proceedings at FERC and before the U.S. Court of Appeals for the Seventh Circuit. *Illinois Commerce Comm'n v. FERC*, 576 F.3d 470 (7th Cir. 2009), 756 F.3d 556 (7th Cir. 2014). The costs and uncertainty from such disputes can have a chilling effect on transmission development.

An additional model for cities to become 100 percent renewable is to construct or finance renewable resources near the load to be served. This obviously depends on a city's proximity to wind, solar, biomass, or other resources. Greensburg's location in Kansas enabled it to construct utility-scale assets. Other communities without such resources may consider smaller distributed generation, battery storage, and other technologies. However, these technologies remain expensive and are difficult to deploy at a meaningful scale.

Another model is the use of Community Choice Aggregators (CCAs), a practice employed by some communities in California. *See* Cal. Pub. Util. Comm'n, Community Choice Aggregation (2017), *available at* www.cpuc.ca.gov/general.aspx?id=2567. Notably, each of the three communities discussed in this article operate their own municipal utility, meaning the community owns and operates its own electrical system and can make its own planning and procurement decisions on behalf of its citizens. However, most people in the United States are served by investor-owned utilities, which are private companies that must earn a return for shareholders and are subject to state regulation but not local control.

Under the CAA model, however, a community assumes electricity supply responsibility from the investor-owned utility, while the utility remains responsible for maintaining the transmission and distribution equipment necessary for the reliable delivery of that supply. Several communities can then combine their purchasing power to obtain renewable energy at a lower cost. In this way, cities can obtain more renewable energy than is otherwise provided by utilities, and several small cities in California, such as Sonoma, have become 100 percent renewable in this way. However, few states besides California have adopted statutes permitting CCAs. Moreover, there is no guarantee that CCAs can provide renewable energy more affordably than utilities. In many of the existing CCAs, customers are provided a choice of electricity mix, with options that become more expensive depending upon the share of electricity supplied by renewables. Many utilities employ similar programs already.

Cities' Commitments to Transition to Renewables

A growing number of U.S. cities are committing to become 100 percent renewable. However, while the cost of renewable technologies has declined substantially in recent years, renewable electricity remains more expensive than electricity from fossil fuels in many parts of the country. Moreover, the examples discussed in this article suggest that a city's ability to transition to renewables in a cost-neutral manner depends on many factors outside of a city's direct control, including the particularities of state laws and geographic proximity to renewable resources.

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Nonetheless, in the wake of the 2016 election, several major American cities have committed to become 100 percent renewable and thus will need to discover ways to satisfy that commitment. Some cities, like Chicago, are mandating that all public buildings go 100 percent renewable by 2025. This will require the acquisition of roughly 1.8 million MW per year, or enough electricity to power around 300,000 homes. Press Release, City of Chicago, Office of the Mayor, Mayor Emanuel Announces City Buildings to Be Powered by 100 Percent Renewable Energy by 2025 (Apr. 9, 2017) *available at* https://www.cityofchicago.org/city/en/depts/mayor/press_room/press_releases/2017/april/RenewableEnergy2025.html. Other cities, like Atlanta, have resolved that "One Hundred Percent (100%) of electricity consumed in the City of Atlanta shall be generated through renewable energy resources and associated technologies by 2035." Atlanta City Council Resolution, 17-R-3510 at 1 (May 2017). This is a significant goal, given that in 2016, 39 percent of Atlanta's energy came from coal, 35 percent from nuclear, 23 percent from hydro, and only 3 percent from other renewables.

Cost-effective achievement of these ambitious targets will require innovative solutions. However, the trend of cities adopting such targets in the first place is a significant development, and one that will have important economic and policy impacts, both regionally and nationally, for years to come.