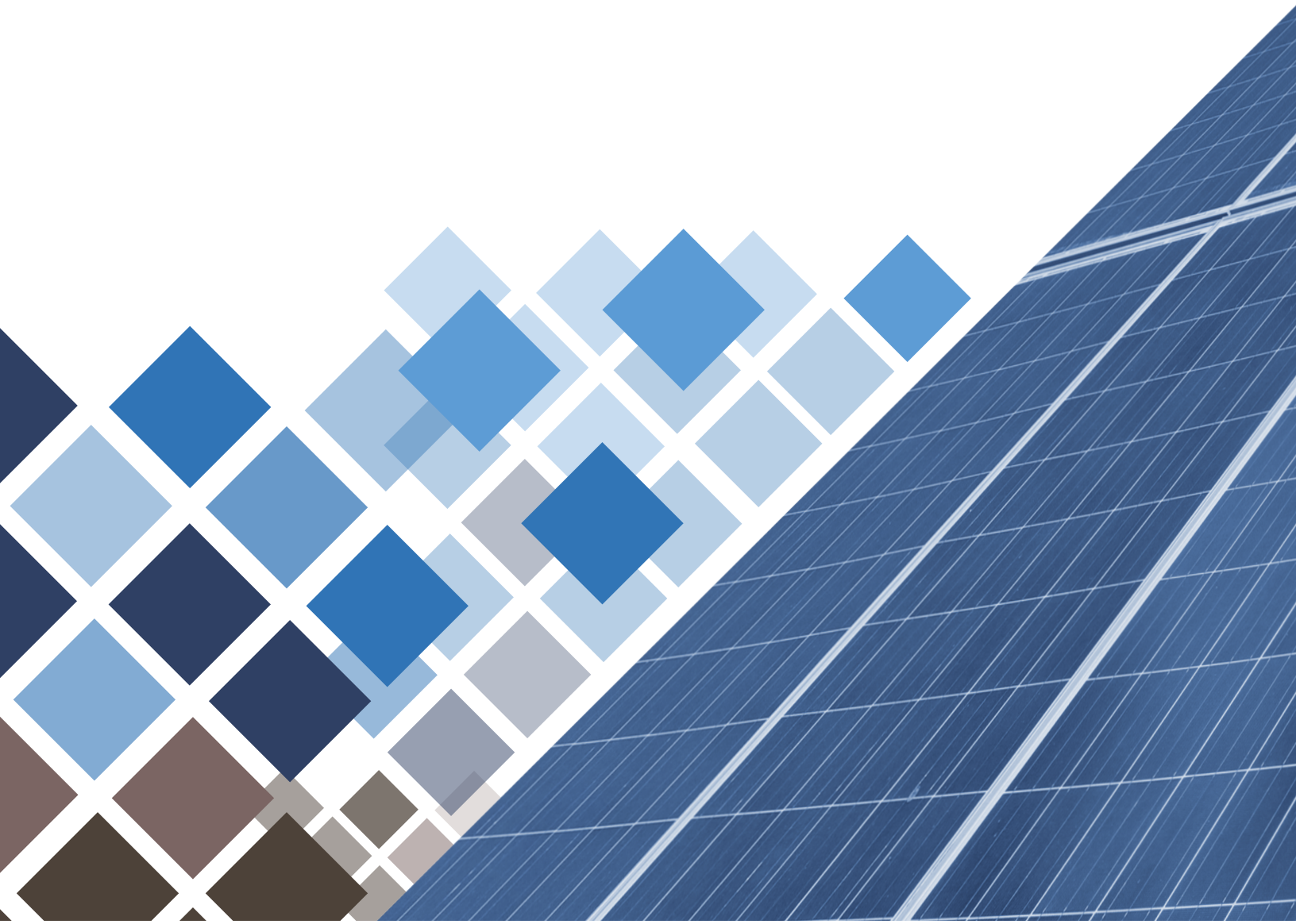
PATHWAYS TO 100

An Energy Supply Transformation Primer for U.S. Cities



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MEISTER CONSULTANTS GROUP

MCG is a Boston-based sustainability consulting firm specializing in renewable energy policy, strategy development, and climate change planning. Since 2008, MCG has supported local-level renewable energy policy, procurement, training, and engagement initiatives in over 200 communities across all 50 states, and has assisted state and national governments around the world with development of clean energy initiatives.

Innovation Network for Communities

The Innovation Network for Communities (INC) is a national non-profit organization whose mission is to develop and spread scalable innovations that transform the performance of community systems. INC works in three primary sectors: urban sustainability, high performing urban K-12 schools; and adult workforce development.

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INTRODUCTION

Organization of this Document

Pathways to 100 lays out a three-step process designed to help cities plan for and enable their unique energy supply transformation:
1) ***map the city's energy landscape****;*
2) ***identify available strategies****; and*
3) ***organize capacity, resources, and partnerships****.*

Defining the Energy System

A city's energy system includes many kinds of energy (natural gas networks, delivered heating fuels like fuel oil and propane, transportation energy such as gasoline, diesel fuels, and industrial generation). This guide focuses predominantly on the supply of electricity, but uses "energy" as an alternative and synonymous term.

Putting cities on a path to zero-carbon energy systems will require transformative changes in the way that electricity is produced, purchased, and consumed. To meet this goal, cities, their residents, and the utilities that serve them will need to procure electricity generated from carbon-free sources while substantially increasing local renewable energy generation.

The practice of transforming cities' energy supply systems is variable and complex. In the U.S., the vast majority of cities do not directly control their energy supply. Instead, policy and regulation is set at state, regional, and national levels. As cities strive to meet their deep decarbonization and renewable energy goals, they will need to act on and influence their energy systems in new and creative ways.

Pathways to 100 provides a high-level map of pathways for municipalities seeking to transform their energy supply, outlining strategies for both municipal operations and for all energy users within municipal limits. The document is organized around a three-step process that cities can use to identify an appropriate pathway forward. These are: 1) map the city's energy landscape, 2) identify available strategies, and 3) organize for energy transformation. These steps guide cities through the key factors that determine their level of influence over energy supply (e.g., state energy policies) and map out available strategies for energy transformation. These strategies range from interventions into energy supply management (e.g., community choice aggregation or utility municipalization) to more traditional forms of influence (e.g., active participation in formal energy regulatory proceedings). While *Pathways to 100* focuses on transforming *electricity* supply, it touches briefly on renewable heating and cooling, and energy efficiency where these topics intersect with electricity supply.

Pathways to 100 is designed for use by city policymakers, planners, and administrators, as well as funders seeking to support local level energy transformation. It enables local leaders to select pathways to meet ambitious decarbonization goals, whether through the development of energy plans, electric utility engagement, or prioritizing next steps for climate and energy initiatives. The document is intended to support a diverse range of stakeholders working to advance decarbonization and ambitious renewable energy goals at the city level.

PATHWAYS TO 100

EXECUTIVE SUMMARY

While many cities do not have full control over their energy systems, cities can deploy a range of policy tools and strategies to influence their energy supply. City leaders seeking to transition towards zero-emissions energy sources should understand the appropriate application of these tools.

This document provides a high-level map of pathways for municipal energy supply transformation, structured around a three-step process for cities to identify a pathway forward: 1) map the city's energy landscape, 2) identify available strategies, and 3) organize for energy transformation.

STEP 1: MAP THE CITY'S ENERGY LANDSCAPE

A city's options for energy supply transformation depend on the details of its energy landscape. Two factors are particularly significant: the utility type and the state's energy policies and regulations.

The type of utility serving the city. The type of utility serving a city is one of the strongest determinants of the city's influence over its energy supply, as it dictates which strategies can be leveraged. Cities are typically served by one of three utility types: 1) investor-owned utilities, 2) rural electric utility cooperatives, or 3) municipal utilities (see *Section 1* on page 9 for a discussion of the distinct characteristics of each utility type.)

Table 1 – State energy policies that enable city energy strategies

- Utilities are **deregulated**
- Tariffs are in place to compensate distributed renewable energy generation (e.g., **net energy metering**)
- **Community choice aggregation (CCA)** is permitted
- State enables **third-party ownership** (i.e., power purchase agreements)
- **A renewable portfolio standard (RPS)** is in place
- State requires **electric decoupling**

Note: State energy policies always apply to investor-owned utilities. Many states do not regulate municipal utilities, and rural electric utility cooperatives in the same way.

State energy policies and regulations. The state policy and regulatory landscape determine which strategies a city can use. Six key state energy policies that enable greater municipal control are listed in *Table 1* on page 5. Municipalities in different states will have differing degrees of authority in local decision-making (including enacting energy ordinances), as dictated by state law (e.g., Dillon's Rule vs. Home Rule states).[1]

STEP 2: IDENTIFY AVAILABLE STRATEGIES

Cities can use the *City Energy Supply Strategy Matrix* (see *Table 2* on page 7) to identify which strategies they can leverage for energy supply transformation. These city-level strategies are grouped based on the stakeholders they target:

- Consumer-oriented strategies include strategies cities can leverage to enable energy consumers, such as city residents and businesses, to procure renewable energy or generate their own renewable energy on-site. Cities can leverage most of these strategies regardless of utility type or state legislation, except for a few that depend on enabling state policies (strategies #7-9).
- Strategies targeting municipal operations include approaches for cities to procure renewable energy to meet the demand of municipal operations. Cities usually control the energy supply for their municipal operations, but the strategies cities can leverage depend on the utility type and on enabling state energy policies.
- Utility-focused strategies. Most cities have little direct control over the utility that serves them. However, cities with municipal utilities may have more direct decision-making authority over their utility, depending on the utility governance structure. As valued customers and large electricity users of the utility, cities can also use a number of strategies to influence the utility's energy supply by leveraging their buying power.

The legend below explains which strategies in the *City Energy Supply Strategy Matrix* a city can leverage based on its state policy and utility context:

LEGEND		
	Available strategy	Available strategies lie entirely within the city's jurisdiction.
	Potentially available strategy, depending on:	
	State legislation	Strategies that lie within a city's jurisdiction, but are dependent on enabling state legislation.
	Utility governance structure	Strategies that may lie within a city's jurisdiction depending on the city's level of jurisdiction over their municipal utility.
	Possible indirect influence	Strategies that a city may be able to indirectly influence through interventions in state policymaking or rural electric cooperative boards.
	Strategy not available or not applicable	

See Section 1 for further detail on these factors.

[1] For further information about Dillon's Rule and Home Rule, please refer to the National League of Cities: http://www.nlc.org/local-government-authority

Table 2 – City Energy Supply Strategy Matrix

CITY ENERGY SUPPLY STRATEGY MATRIX		Utility Type Serving the City		
#	City-Level Strategies	IOU	Coop	Municipal Utility
CONSUMER-ORIENTED STRATEGIES				
1	Engage the community in setting **energy goals**.			
2	Establish local **incentives** for on-site renewable energy (e.g., solar rebates).			
3	Establish **city mandates** for on-site renewable energy (e.g., solar mandate).			
4	Host a renewable energy **bulk purchasing** program (e.g., Solarize).			
5	Reduce **permitting, zoning, and inspection** time and costs for renewable energy.			
6	Lease **public land** for renewable energy.			
7	Establish **rates or tariffs** that compensate energy generated on-site (e.g., net-metering).			
8	Establish a **community-shared renewable energy program** (e.g., community solar).			
9	Establish a **community choice aggregation** program (municipal aggregation).			
STRATEGIES TARGETING MUNICIPAL OPERATIONS				
10	Establish renewable energy **purchasing requirements** for city buildings.			
11	Procure renewable energy from **retail electricity providers**.			
12	**Partner with the utility and/or third-party** to procure renewable energy.			
13	Purchase **renewable energy on-site** to supply city operations (e.g., on-site solar).			
UTILITY-FOCUSED STRATEGIES				
14	Engage the utility in setting **energy goals**.			
15	Establish a **local renewable portfolio standard** (RPS).			
16	Approve or influence the utility's long-term **energy generation plan**.			
17	Direct the utility to conduct a **feasibility study** for renewable energy procurement.			
18	Approve or negotiate utility **procurement contracts** for renewable energy.			
19	Approve or pilot a **utility-owned rooftop solar** program.			
20	Leverage **taxing authority** over utility.			
21	Renegotiate city-utility **franchise agreement**.			
22	Establish a **city-utility partnership** to share decision-making power.			
23	**Municipalize** the local electric grid.			
24	Appoint or approve **utility decision-makers**.			
25	Engage in state **public utility commission (or equivalent agency) proceedings**			

STEP 3: ORGANIZE FOR ENERGY TRANSFORMATION

Large-scale energy transformation will require engagement and contributions from city residents and small business organizations, local institutions, and industry in addition to the city government. City resources—which include staff capacity, technical expertise, and financial resources—are often limited. To successfully drive energy supply transformation, cities need to consider the required capacities and financial resources, and develop strategies to effectively leverage both internal resources and external partnerships.

Internally, cities should identify an implementation team to coordinate energy transformation initiatives. This role can be assumed by a dedicated citywide energy manager, a sustainability director, or an interdepartmental working group. Collaboration with external partners and stakeholders can complement coordination efforts, such as through a joint steering committee with members from the private, nonprofit, and public sectors. Cities can use partnerships with community-based, nonprofit, or private sector organizations to provide needed input, resources, and technical expertise to support city energy planning efforts, advance research and development, or create incentives to spur renewable energy investment. City networks can provide opportunities to share best practices and common strategies through peer-to-peer learning. These networks can also lead to coalitions of cities, which can more effectively advocate for state and federal policies.

SECTION 1
THE ENERGY LANDSCAPE

A city's options for energy supply transformation depend on the details of its energy landscape, including trends in energy markets, utility types, electricity market structures (e.g., regulated vs. deregulated states—see below), and state and federal energy polices and regulations. The following two questions serve as a simplified orientation for cities to understand where their sphere of influence lies, and thus which city-level strategies are accessible. These questions are:

1. Which type of utility serves the city?
2. Which state renewable energy policies apply to the city's utility?

1. WHICH TYPE OF UTILITY SERVES THE CITY?

Any city intending to transform its energy system must first identify the structure of its electric utility. Different types of electric utilities are subject to different regulations. The utility type determines the sphere of influence a city has over the utility, as well as which state renewable energy policies apply to the utility.

There are three major types of utilities: investor-owned utilities (IOUs), electric utility cooperatives (Coops or Rural Electric Cooperatives), and municipal utilities.[2]

Most cities are served by IOUs. This utility model serves over 68% of U.S. electricity customers (see *Table 3* on page 10).[3] Municipal utilities are the second most common, with over 2,000 municipal utilities in the U.S.

Historical Context

Investor-owned utilities and municipal utilities emerged in the early days of electrification, serving primarily urban dwellers. By the 1930s, 90% of urban dwellers had access to electricity, while 90% of rural residents did not. Depression-era electrification programs relied on rural electric utility cooperatives to expand service to rural areas.

[2] Other entities providing electric services in the U.S. include public utility districts (utility-only government agencies); Native American tribes; irrigation districts; mutual power associations; and other public and quasi-public entities. These utility types are outside of the scope of *Pathways to 100*.

[3] American Public Power Association. *2015-2016 Annual Director & Statistical Report*. Retrieved from: http://www.publicpower.org/files/PDFs/USElectricUtilityIndustryStatistics.pdf

serving mostly smaller cities and towns (over 50% of municipal utilities serve fewer than 10,000 customers).[4]

Table 3 – Electric utility types: prevalence, size, and governance

Key Characteristics		Utility Type		
		Investor-Owned Utilities	**Municipal Utilities**	**Utility Cooperatives**
Governance	Ownership	Privately owned.	Typically owned by the city.	Owned by the customers they serve.
	Governance Structure/ Management	Company issues stock and is responsible to shareholders. Heavily regulated at the state level.	Structure varies significantly, ranging from a department within a city administration to a municipal utility district operating independently of the city administration.	Each customer is a member-owner with one vote under the "one person, one vote" cooperative principle. Member-owners elect the board of directors who make decisions.
Prevalence and Size	Total number in the U.S.[5]	~200	~2,000	~900
	% U.S. customers served[6]	~68%	~15%	~13%
	Size of territory & customer base	Large service territories in multiple states, serving a few thousand to a few million customers.	Generally small to mid-size customer base.	Typically large and sparsely populated service territories, serving a small customer base.

[4] American Planning Association. 2014. *Planning for Solar Energy*. Retrieved from: https://www.planning.org/publications/report/9117592/

[5] American Public Power Association. *2015-2016 Annual Directory & Statistical Report*. Retrieved from: http://www.publicpower.org/files/PDFs/USElectricUtilityIndustryStatistics.pdf

[6] American Planning Association. 2014. *Planning for Solar Energy*. Retrieved from: https://www.planning.org/publications/report/9117592/

Key Implications for City Influence

Cities have varying levels of influence over each utility type. This largely reflects the differences in ownership and governance structure between utilities (see *Table 3* for comparison). Cities seeking to leverage strategies labeled in the *City Energy Supply Strategy Matrix* as "potentially available" or "possible through indirect influence" should be aware of the following:

- Investor-Owned Utilities – Cities generally have little direct control over an IOU State regulators determine most aspects of the utility's rates and services, including policies, programs, and incentives for renewable energy. Here, cities (as large and important utility customers) can influence a utility by intervening in state regulatory proceedings (see strategy #25). Cities can also directly influence an IOU by leveraging their buying power; taxing authority (strategy #20); the city's franchise agreement (strategy #21); and municipalization (strategy #23).
- Rural Electric Utility Cooperatives – Cities generally have as little formal jurisdiction over a Coop as they do an IOU. Unlike an investor-owned utility; however, rural electric utility cooperatives are governed primarily by the Coop's board of directors, with only minimal oversight from state regulators. Cities can collaborate with or lobby the board of directors for renewable energy programs and incentives. Alternatively, cities can lobby the member-owners who elect the board of directors.
- Municipal Utilities – Cities with municipal utilities have the highest degree of direct influence over their utility. Depending on the Muni governance structure, a city council may have full authority to appoint the utility's board members, direct or approve the utility's integrated resource plan, or secure procurement contracts.

Cities served by any utility type seeking to intervene in regulatory proceedings should familiarize themselves with the jurisdiction of key state and federal regulatory bodies (see *Table 4* on page 12).

Resource: Future Utility Business Models

The Smart Electric Power Alliance's (SEPA) 51st State initiative creates blueprints for electricity market reform including regulatory regimes, market structures and utility business models. The platform collects ideas and toolkits from over two dozen utilities, trade associations, industry analysts, tech-start-up entrepreneurs, and visionaries.[7]

[7] SEPA. *51st State initiative.* Retrieved from: https://sepapower.org/our-focus/51-state-initiative/

Table 4 – Key actors: State and federal regulatory bodies

		Jurisdiction by Utility Type		
	Regulatory Bodies	**Investor-Owned Utilities**	**Rural Electric Coops**	**Municipal Utilities**
State level	A Public Utilities Commission (PUC) or a Public Service Commission (PSC)	Full jurisdiction to regulate almost all aspects of the utility's rates and services.	Minimal jurisdiction, often exempting these utilities from state energy policies.	
Federal level	Federal Energy Regulatory Body (FERC)	Regulates utilities that operate in multiple states and regulates all wholesale power transactions across state lines.	Often not directly regulated by FERC other than some wholesale power transactions.	

2. WHICH STATE (RENEWABLE) ENERGY POLICIES APPLY?

State policies and regulations are one of the most decisive factors in determining which restrictions or incentives are in place for renewable energy.

The following questions provide an orientation on key state policies a city should be familiar with:

1. Is the state regulated or deregulated (restructured)?
2. Does the state establish net metering or other special rates/tariffs for distributed renewable energy generation?
3. Does the state enable community choice aggregation (or municipal aggregation)?
4. Does the state allow for third-party ownership of distributed renewable energy resources?
5. Does the state establish a renewable portfolio standard (or alternative portfolio standard)?
6. Does the state require electric decoupling?

The state policies highlighted in this section do not apply to all utilities equally. *Table 5* indicates how to navigate state energy policies depending on the utility type serving the city.

Table 5 – Navigating state energy policy by utility type

Utility Type Serving the City		
Investor-Owned Utility	Rural Electric Utility Cooperative	Municipal Utility
State policies and regulations **almost always apply** to investor-owned utilities.	State policies and regulations on renewable energy **only rarely apply** to rural electric utility cooperatives. Cities should first identify which of the policies apply to the utility. In cases where state renewable energy policies do not apply to rural electric cooperatives, rural electric cooperatives can establish programs for their utility territory.	State policies and regulations **only rarely apply** to municipal utilities. Cities should first identify which of the policies apply to the utility. In cases where state renewable energy policies do not apply to municipal utilities, **cities may be able to "opt-in" or establish comparable policies locally**.

I. IS THE STATE "REGULATED" OR "DEREGULATED"?

Regulated and deregulated are common terms that are more accurately phrased as states where utilities are vertically integrated and the utility owns all the power plants or states with retail competition, where the power plants are not owned by the utility. In vertically-integrated states, the utilities are permitted to maintain a monopoly over all utility functions (see *Box 1: Utility Functions* below). In states with retail competition (also referred to as "restructured states"), investor-owned utilities are not permitted to own and operate the power plants that generate electricity, and retail customers are generally free to purchase energy from competitive power suppliers. Utilities in these states are still responsible for delivering that energy to customers, and may be better understood as transmission and distribution companies. The map in *Figure 1* on page 15 indicates which states have adopted retail competition.

Historical Context: Utility Restructuring

Until the 1990s, all electric utilities were vertically integrated. Since the 1990s, a handful of states have passed laws to "deregulate" (or, more accurately "restructure") electricity markets, with the purpose of separating the generation of energy from its distribution to retail customers. The theory behind restructuring is that competition between electricity generators would ultimately lead to lower electricity rates.

In so-called "restructured states," electric utilities were legally obligated to divest from generation resources. As a result, most electric utilities in restructured states are "transmission and distribution companies"—they own and operate the power lines and poles to distribute electricity, but are not in the business of generating electricity. However; in recent years, some utilities operating in restructured markets have regained ownership of some generation resources.

Box 1: Utility Functions

Traditionally, electric utilities served all functions in the process from generating electricity to delivering it to their customers. These functions are typically divided in three categories:

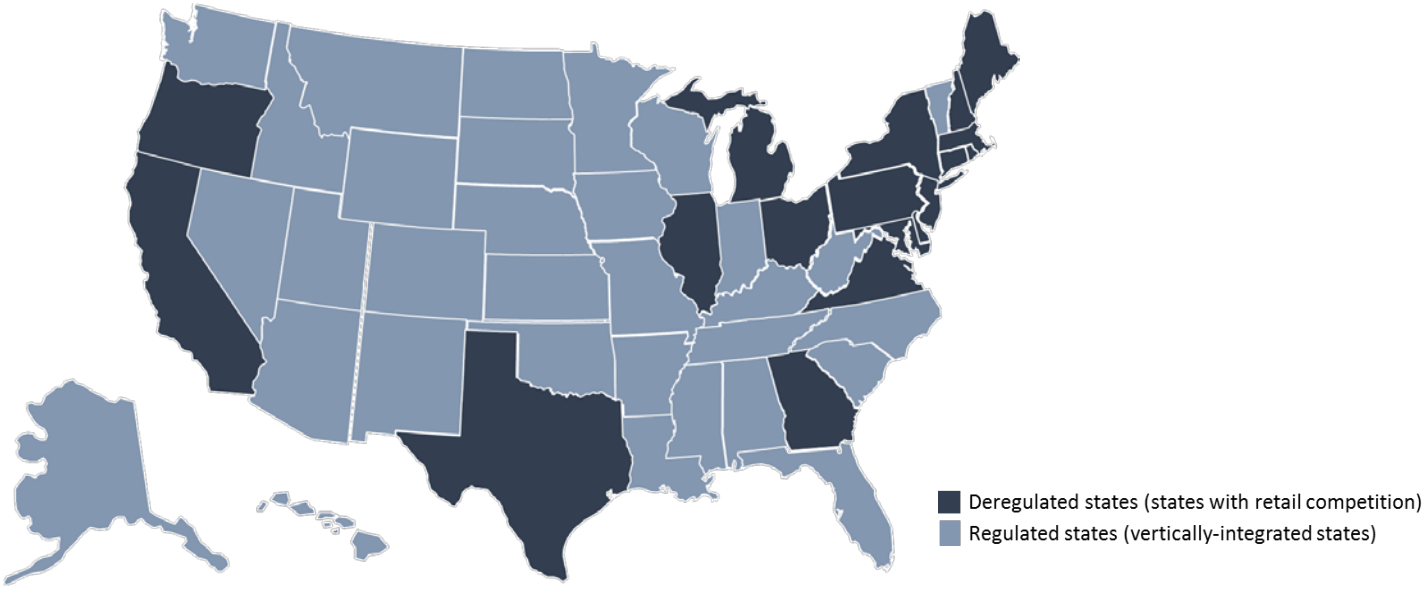
1. Generation—owning and operating facilities to generate electricity).
2. Transmission—owning and operating the power lines to carry electricity across long distances [e.g., large power lines].
3. Distribution—owning and operating infrastructure to distribute electricity to end-use customers [e.g., smaller power lines].

All electric utilities are recognized as a type of "natural monopoly" and electric utilities generally hold a monopoly over at least the transmission and distribution functions of an electric utility. This means that in each service territory (which can range in size from a large multistate region to a single municipality) one utility is given exclusive rights to sell electricity.

However; not all utilities hold a monopoly over all three functions. Utilities that do are known as vertically-integrated. A vertically-integrated utility does not necessarily generate all the power it sells, and may contract with other generators, but will be the sole option for retail energy customers to purchase electricity from.

Figure 1 – Map of Regulated and Deregulated States

American Coalition of Competitive Energy Suppliers.[8]



Key Implications for Renewable Energy

Retail competition has significant implications for an energy user's ability to purchase renewable energy from the utility:

- In states with retail competition (also referred to as "retail choice," "competitive markets," or "deregulated markets"), energy customers may select a retail electricity provider other than the utility. Customers in these states may have several options to purchase from retail electricity providers that could source from renewable energy either through contracts with renewable energy generators, or via renewable energy certificates (RECs). To better understand the differentiating characteristics of these options, see *Box 2: Understanding 'Green Power' Options* below. In cases where the electricity customer does not select a retail electricity provider, the transmission and distribution company in the given territory will typically "go to market" on behalf of customers and provide "basic" or "default" service.

Additional Resource

To identify the status of retail competition on a state-by-state basis, visit the American Coalition of Competitive Energy Suppliers website

[8] American Coalition of Competitive Energy Suppliers. Retrieved from: http://competitiveenergy.org/consumer-tools/state-by-state-links

What does buying "Green power" mean?

There are many options available to municipalities when procuring renewable energy. Depending on the pathway, the impact of the purchase in driving new renewable development (or "additionality") and associated pollution and carbon reduction impacts can vary significantly, and be ambiguous. However; there is no ambiguity that the ownership and retirement of Renewable Energy Certificates (RECs) is the legal foundation of any renewable energy claim, and a municipality needs to own and retire RECs to claim that they are purchasing renewable energy regardless of which purchasing pathway is selected.[9]

- In vertically-integrated states, energy customers have only one utility from which they can purchase electricity. This utility may offer the option to add a premium per unit of energy to a customer's electricity bill for renewable energy (also known as a "green power" option) that consists only of RECs, or offer a special utility renewable tariff (often refered to as a "green tariff") that includes both an electricity price and RECs, or the utility may not offer a special pricing option for renewable energy.

Box 2: Understanding Utility Renewable Energy Purchasing Options[9]

To understand utility-provided renewable energy purchasing options, it is helpful to understand the following differentiating characteristics:

- REC-Only-Based Green Power Programs - Some utilities offer premium "green power" rates to customers, in which customers purchase the environmental attributes of renewable energy generation RECs as a part of their normal utility bill.
- Power Purchase Agreements (PPAs) – In deregulated markets, power customers may negotiate direct contracts (PPAs) with independent renewable power generators, in which the customer purchases the output of a specific renewable energy project or portfolio of projects. The customer's utility continues to provide transmission, distribution, and load balancing services to the customer, and may integrate the price of renewable energy production from the PPA into the retail power price.
- Utility Renewable Tariffs (or Green Tariffs) – In traditionally regulated markets where customers do not have the options of negotiating PPAs directly, utilities may offer dedicated tariffs (often for large customers) where the utility develops or procures renewable energy resources specifically for that customer, and charges the customer under a special tariff (which may be higher or lower than the normal price of power). This is distinguished from REC-only-based purchasing, in which the price of just the REC is added as a premium to a customer's energy bill.
- Direct Access Tariffs – Also applicable to traditionally regulated markets, direct access tariffs allow certain classes of customers to purchase power from competitive suppliers (similar to customers in a restructured market), rather than from their utility. As with a PPA and unlike a Utility Renewable Tariff, Direct Access Tariffs allow customers to purchase power directly from independent renewable energy suppliers, with the utility continuing to provide transmission and distribution services.

[9] For more details see: http://www.greenribboncommission.org/wp-content/uploads/2017/03/Institutional-Renewable-Energy-Procurement-Guidance-1.pdf

II. DOES THE STATE ESTABLISH TARIFFS FOR DISTRIBUTED RENEWABLE ENERGY OWNERSHIP?

State regulators have jurisdiction over policies that enable compensation for energy customers who generate renewable energy on-site (referred to as distributed renewable energy generation). These policies are key for cities to assess what incentives are in place for residents, businesses, and municipalities to install and own renewable energy. While these state-level policies sometimes apply only to IOUs and Coops, cities served by municipal utilities have the option to adopt similar policies locally. This section highlights four key policies, or policy areas, for distributed renewable energy generation:

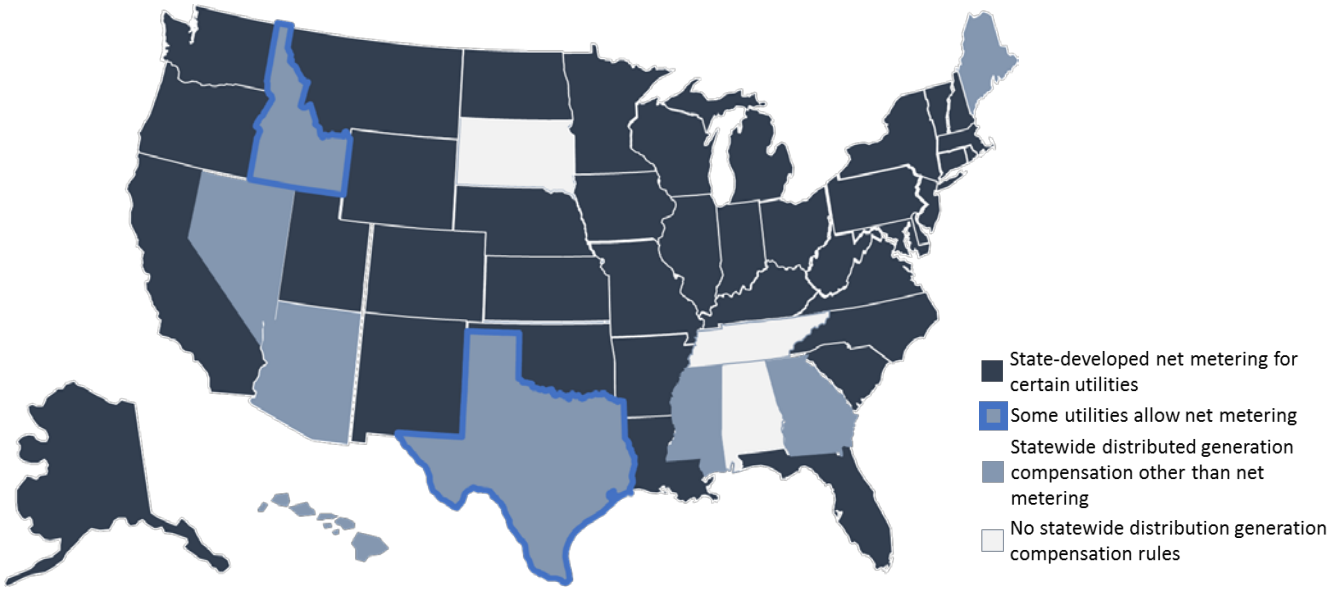
1. Net Metering
2. Aggregate Net Metering
3. Shared Renewable Energy
4. Feed-In Tariffs

1. Net Metering

Net metering is a state policy allowing customers who generate electricity on-site (e.g., through solar panels or wind turbines) to be charged by their utility only for the "net" energy consumption over the course of a month, after subtracting the amount of on-site energy generated. In many states, customers who generate an excess amount of energy in a month can carry over a credit to the next month's bill. *Figure 2* indicates which states have net metering policies as of October 2016.

Figure 2 – States with Net Metering Policies

Database of State Incentives for Renewables & Efficiency[10]



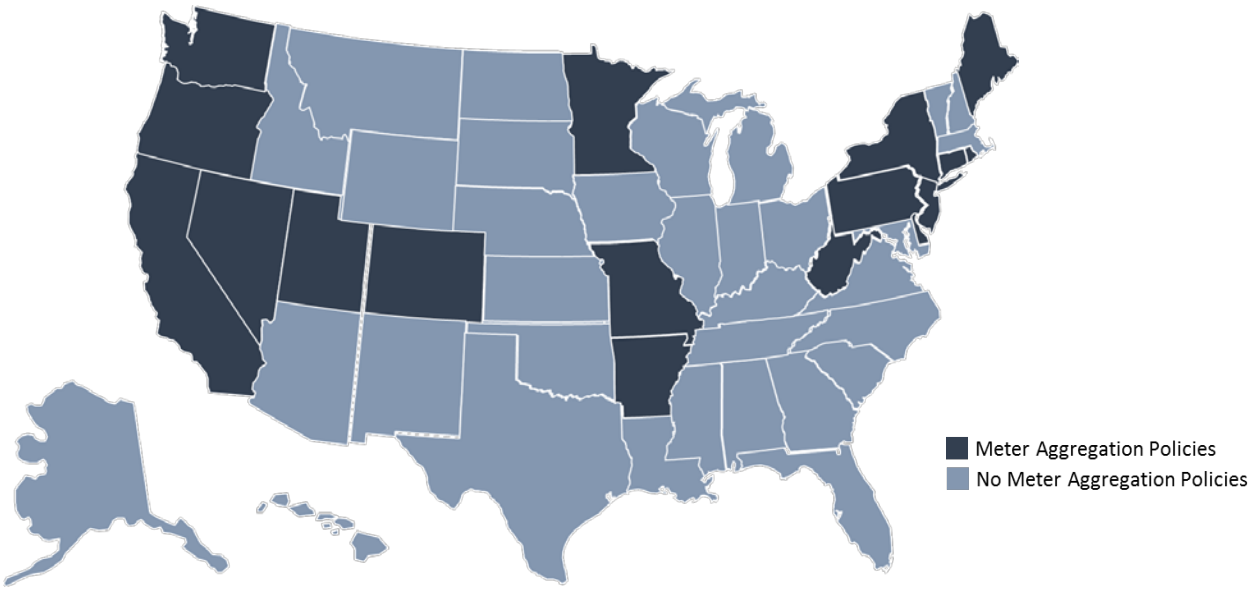
2. Aggregate Net Metering

Aggregate or virtual net metering are variations of net metering that allow a single customer to apply credits from excess generation from the site where the electricity is generated to another off-site account (with geographic and utility territory restrictions). This policy supports solar for customers with multiple meters (e.g., city-owned buildings) or for customers seeking to install renewable energy on a property with more suitable conditions (e.g., transfers net metering credits from a municipal landfill solar project to multiple municipal accounts). It also allows customers without space for solar on their building to purchase renewable energy through "community solar" arrangements. *Figure 3* indicates which states have meter aggregation or virtual net metering policies.

[10] Database of State Incentives for Renewables & Efficiency. April 2017. Retrieved from: http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2017/04/DSIRE_Net_Metering_April2017.pdf

Figure 3 – States with Aggregate Net Metering

Database of State Incentives for Renewables & Efficiency[11]



3. Shared Renewable Energy

"Shared renewable energy" is a term used to refer to a renewable energy installation that is owned by multiple customers. Shared renewable energy options can provide access to renewable energy for customers who are unable to install on-site renewable energy systems (e.g., multi-family residences or homes with roofs incompatible with solar).

A community renewable project (usually solar PV and called "community solar") is a renewable energy facility that allows multiple people to subscribe to and receive some form of benefit from the facility (e.g., bill credits, RECs, tax credits). State-level community solar legislation could, for example, require investor-owned utilities to offer a community solar project or solar garden program for energy customers within its service territory. Shared renewable energy projects often typically utilize a special tariff/rate, similar to aggregate or virtual net metering policies, that facilitate the utility's metering and billing of participating customers. *Figure 4* indicates which states have policies enabling multiple owners of one renewable energy installation.

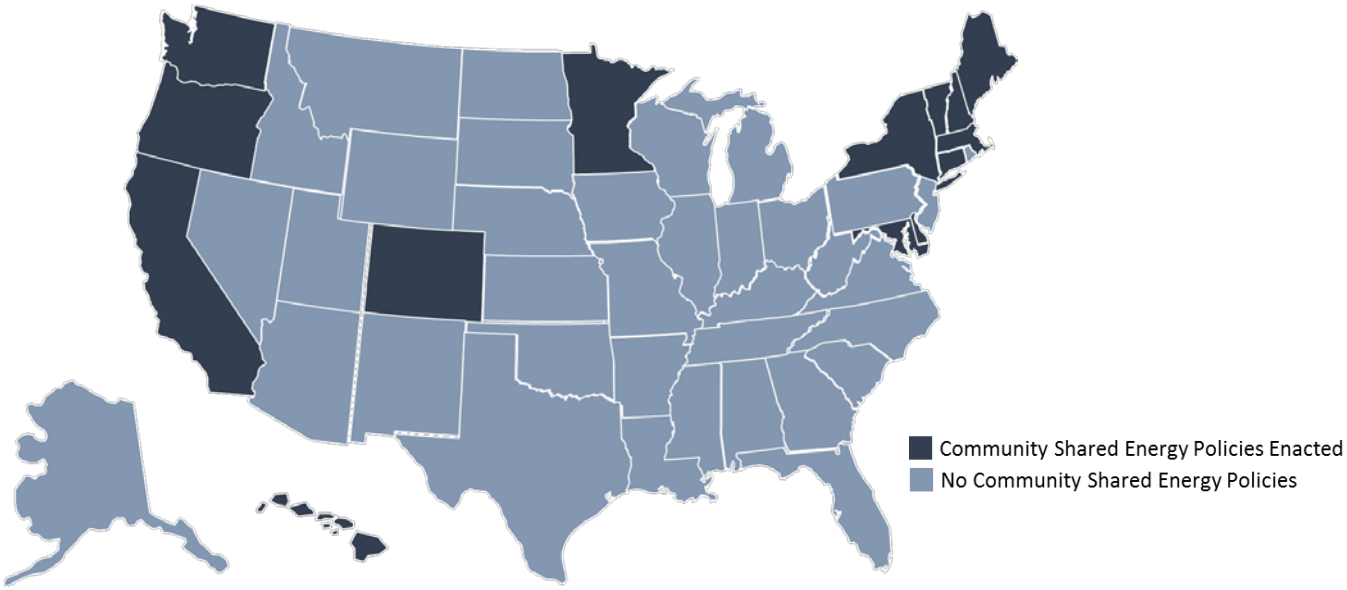
Additional Resource

For state-by-state information on shared community energy policies, visit the Shared Renewables HQ website.[11]

[11] Database of State Incentives for Renewables & Efficiency. October 2016. Retrieved from: http://www.ncsl.org/research/energy/net-metering-policy-overview-and-state-legislative-updates.aspx#sharedrenew

Figure 4 – States with Policies for Community Shared Renewable Energy

Shared Renewables HQ[12]



4. Feed-In Tariffs

A feed-in tariff is a policy that guarantees a long-term contract for renewable energy producers to sell all electricity generated back to the electric grid at a fixed price. Unlike net metering, where on-site generation is generally subtracted from a customer's monthly energy consumption, a feed-in tariff customer will have a separate arrangement with the utility to be paid for all electricity generated (which will be held separate from the customer's normal utility bill for consumed electricity). The feed-in tariff fixed price is typically set to be sufficient to recover costs, plus a reasonable profit. There are six U.S. states that have a variation of feed-in tariff California, Hawaii, Maine, Oregon, Vermont, and Washington). However; many have a cap on the total renewable energy capacity to be installed under the program that has already been met. Internationally, the feed-in tariff is the most common policy mechanism used to compensate renewable energy generators.

Several states have implemented, or are in the process of designing, a related type of policy called a value-of-solar tariff (VOST). Like a feed-in

[12] Shared Renewables HQ. Retrieved from: http://www.sharedrenewables.org/community-energy-projects/

tariff, a VOST provides a discrete payment to renewable energy generators (though so far these policies have only been implemented for solar energy), rather than a bill adjustment like net metering. Unlike feed-in tariffs, which are typically long-term, fixed price contracts that are priced to allow for cost-recovery, VOSTs are priced based on the various sorts of value provided by solar energy projects (including, for example, the value of generated electricity, peak capacity reduction, and environmental benefits). VOSTs have been implemented in Minnesota and New York, and are being considered in additional states including Maine and Arizona.

III. DOES THE STATE ENABLE COMMUNITY CHOICE AGGREGATION?

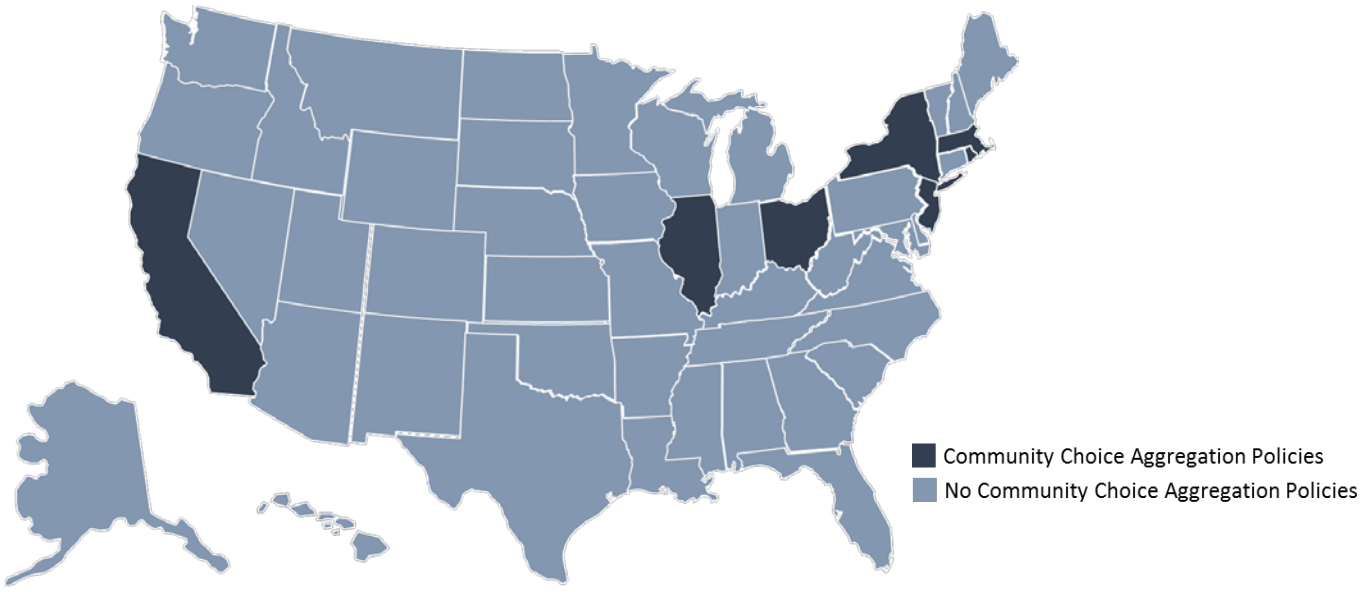
Community Choice Aggregation (CCA) (also referred to as municipal aggregation) is a state policy that allows municipalities to select an electricity provider on behalf of their residents, businesses, and municipal accounts. Not all CCAs incorporate renewable energy, and many are incorporated primarily for the purpose of providing a lower-cost alternative to the utility electricity service. Nevertheless, the concept of a CCA presents a unique opportunity for municipalities to choose the source of their electricity, and meet the electricity demand of their entire population with higher percentages of renewable energy. In some cases, cities can also leverage the aggregated demand to negotiate a lower electricity rate for renewable power generation. This can both drive a greater percentage increase in renewables citywide, and result in cost savings for individuals who might otherwise have invested in renewable generation independently. Some CCA administrators purchase unbundled RECs, which allows customers to make a renewable claim. Others enter into PPAs that support development of new electricity sources for the CCA. Only seven states have legislation permitting CCAs, as indicated in *Figure 5*.

Additional Resource

For state-by-state information on Community Choice Aggregation Programs, visit the U.S. Department of Energy's CCA webpage.[12]

Figure 5 – States enabling Community Choice Aggregation

U.S Department of Energy[13]



IV. DOES THE STATE ALLOW FOR THIRD-PARTY OWNERSHIP OF DISTRIBUTED RENEWABLE ENERGY RESOURCES?

Additional Resource

For a detailed state-by-state listing of third-party financing legislation, visit the DSIRE website.[13]

Some states allow third-party ownership of distributed renewable energy systems through power purchase agreements (PPA). A PPA enables a third-party, such as a renewable energy developer, to build, own, and operate a renewable energy system (e.g., solar PV, solar thermal, wind, or otherwise) on behalf of the host customer. In this model, the host typically purchases the electricity generated at a below-market rate while avoiding the upfront and operating costs of owning a renewable energy system. The host usually has the option to rent or lease the system back from the developer when the PPA contract expires. This model allows tax-exempt entities—such as governments and nonprofits—that do not have access to federal and state tax credits for renewable energy, to leverage these financial incentives to achieve electricity savings. These types of third-party ownership model PPAs[14] are only permitted in

[13] U.S Department of Energy. 2017. *Community Choice Aggregation.* Retrieved from: https://web.archive.org/web/20170315071225/http://apps3.eere.energy.gov/greenpower/markets/community_choice.shtml

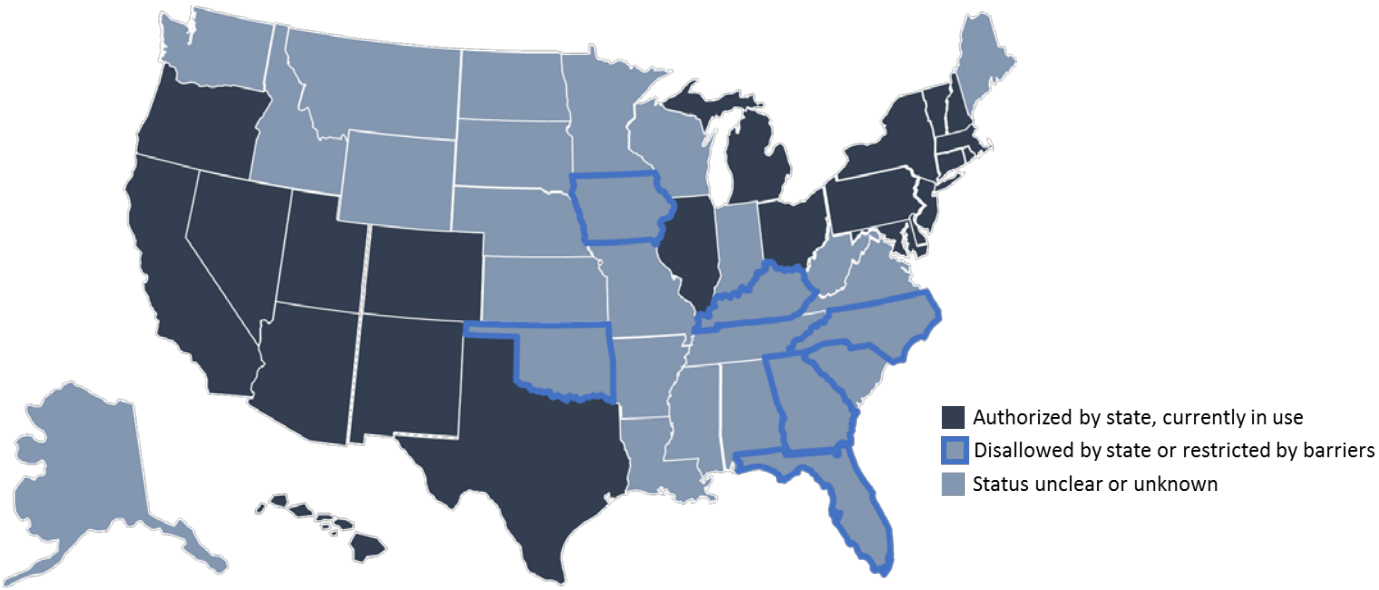
[14] Database for State Incentives for Renewables & Efficiency. Retrieved from: http://www.dsireusa.org/resources/detailed-summary-maps/

certain states (see *Figure 6*), but are one of the most popular models of financing solar PV project (approximately 60% of system sales between December 2014 and November 2015).[15]

This model is popular both for residential customers (as it provides a means to avoid the upfront cost of distributed renewable energy installation) and for municipal energy projects (because, as a tax-paying entitity, a third party owner is able to take advantage of federal tax credits for renewable energy capital costs where a municipality cannot, and can reflect the value of those tax credits through a lower PPA price).

Figure 6 – States Allowing Power Purchase Agreements (PPAs)

Database for State Incentives for Renewables & Efficiency[16]



[15] Solar Electric Power Association (SEPA). Retrieved from: http://www.utilitydive.com/news/survey-over-half-of-solar-installers-do-not-offer-tpo-financing-or-ppas/411413/

[16] Database for State Incentives for Renewables & Efficiency. July 2016. *3rd Party Solar PV Power Purchase Agreement (PPA).* Retrieved from: http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2014/11/3rd-Party-PPA.pdf

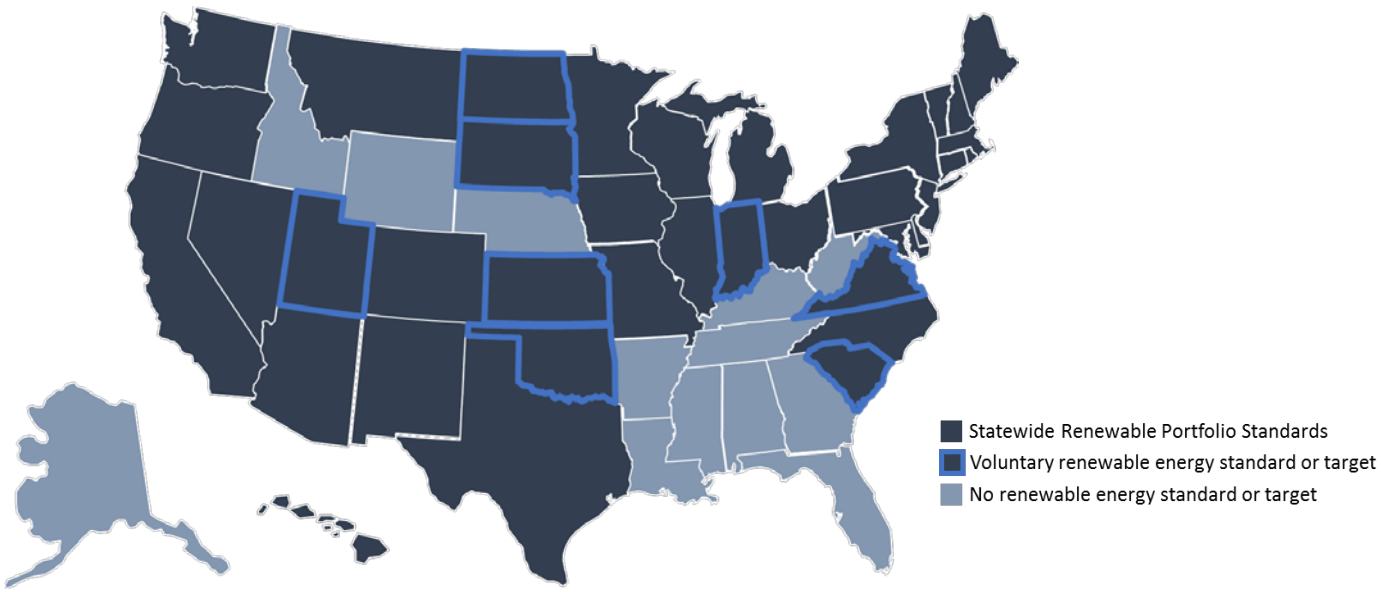
V. HAS THE STATE ESTABLISHED A RENEWABLE PORTFOLIO STANDARD?

Additional Resource
For a detailed state-by-state listing of renewable portfolio standards, visit the National Conference of State Legislatures website.

A renewable portfolio standard (RPS) requires utilities to meet a certain percentage of their electricity sales through qualifying renewable energy or RECs. A renewable portfolio goal is similar, but not mandatory. Although a state RPS does not directly determine which city-level strategies are available, utilities in states with an ambitious RPS have more of an incentive to take measures to further incorporate renewable energy into their electricity supply. The map in *Figure 7* indicates states with renewable portfolio standards as of December 2016.

Figure 7 – States with Renewable Portfolio Standards

National Conference of State Legislatures[17]



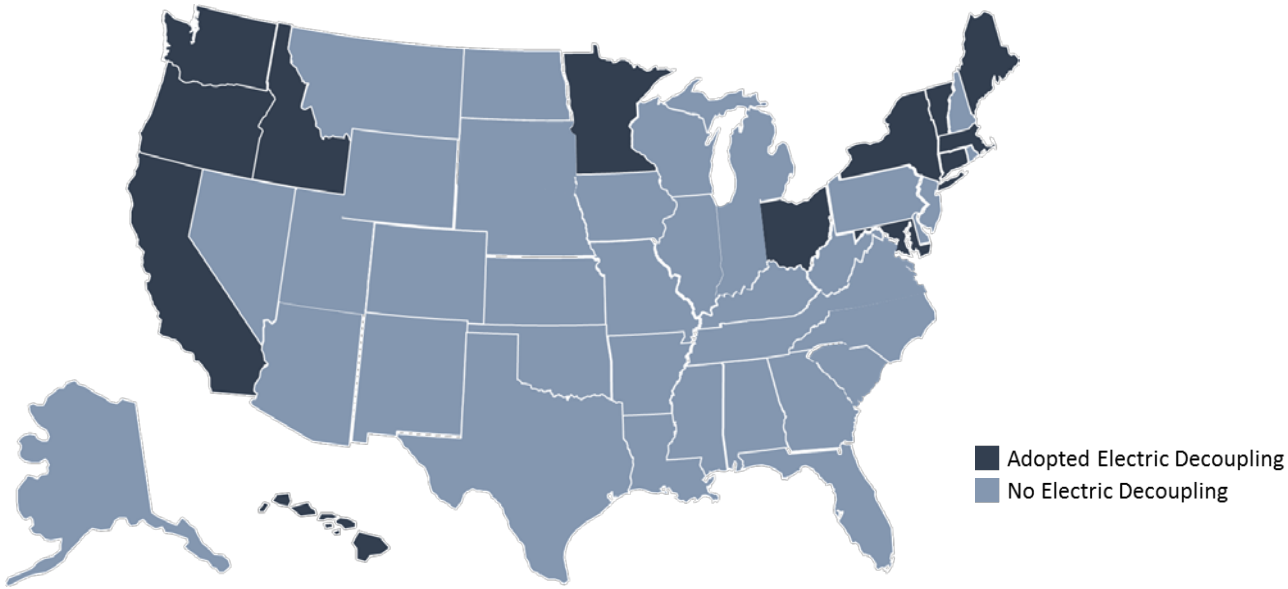
[17] National Conference of State Legislatures. 2016. *State Renewable Portfolios Standards and Goals.* http://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx

VI. HAS THE STATE REQUIRED REVENUE DECOUPLING FOR UTILITIES?

A customer's utility bill is divided into two main parts: 1) the cost of operating and maintaining the transmission, delivery, and distribution of electricy, and 2) the cost of the electricity generation. Traditionally, a utility's revenue is tied to direct electricity sales, which puts utility interests at odds with energy efficiency or other efforts that would decrease sales. Decoupling legislation removes this disincentive; it requires the utility to separate its profit from its electricity sales, and instead ties utility profits to the transmission and distribution portion of the electricity bill. By removing this disincentive, decoupling opens the opportunity for utilities to integrate energy efficiency, renewable energy, and energy storage programs as potential revenue streams. Electric decoupling does not directly determine which city-level strategies are available, but utilities in states with electric decoupling have a better incentive structure in place to collaborate on energy supply transformation. The map in *Figure 8* indicates which states require electric decoupling as of January 2016.

Figure 8 – States with Electric Decoupling

Natural Resources Defense Council[18]



[18] Natural Resources Defense Council. 2016. *Electric and Gas Decoupling in the U.S.* https://web.archive.org/web/20161207161322/https://www.nrdc.org/experts/samantha-williams/evidence-decoupling-spurs-energy-efficiency-investment

SECTION 2
CITY-LEVEL STRATEGIES

Using the City's Energy Landscape identified in Step 1, cities can begin to select available strategies towards energy supply transformation. Mirroring the *City Energy Supply Strategy Matrix* (see *Table 6* on page 27), city-level strategies in this section are grouped based on the stakeholders they target:

- Consumer-oriented strategies include strategies cities can leverage to enable energy consumers, including city residents and businesses, to procure renewable energy or generate their own renewable energy on-site or off-site.
- Strategies targeting municipal operations include approaches for cities to procure renewable energy to meet the electric demand of municipal operations.
- Utility-focused strategies include strategies for a city to either directly or indirectly influence the utility's energy supply.

LEGEND	
	Available strategy
	Potentially available strategy, depending on:
	State legislation
	Utility governance structure
	Possible indirect influence (through interventions in state regulations or rural electric cooperative boards)
	Strategy not available or not applicable

The legend to the left summarizes how to use this section to identify which strategies a city can leverage. Strategies are indicated as one of the following: 1) available strategy (these strategies lie entirely within the city's jurisdiction); 2) potentially available strategy, depending on state legislation (these also lie within a city's jurisdiction, but are dependent on enabling state legislation)-;, 3) potentially available strategy, depending on utility governance structure (here, the city needs to first identify their level of jurisdiction over the municipal utility); 4) indirect influence possible through interventions in state regulations or rural electric cooperative boards; or 5) strategy not available or not applicable. Note that any strategy dependent on state legislation also lends itself to indirect influence through regulatory intervention.

Table 6 – City Energy Supply Strategy Matrix

CITY ENERGY SUPPLY STRATEGY MATRIX		Utility Type Serving the City		
#	City-Level Strategies	IOU	Coop	Municipal Utility
CONSUMER-ORIENTED STRATEGIES				
1	Engage the community in setting **energy goals**.			
2	Establish local **incentives** for on-site renewable energy (e.g., solar rebates).			
3	Establish **city mandates** for on-site renewable energy (e.g., solar mandate).			
4	Host a renewable energy **bulk purchasing** program (e.g., Solarize).			
5	Reduce **permitting, zoning, and inspection** time and costs for renewable energy.			
6	Lease **public land** for renewable energy.			
7	Establish **rates or tariffs** that compensate energy generated on-site (e.g., net-metering).			
8	Establish a **community-shared renewable energy program** (e.g., community solar).			
9	Establish a **community choice aggregation** program (municipal aggregation).			
STRATEGIES TARGETING MUNICIPAL OPERATIONS				
10	Establish renewable energy **purchasing requirements** for city buildings.			
11	Procure renewable energy from **retail electricity providers**.			
12	**Partner with the utility and/or third-party** to procure renewable energy.			
13	Purchase **renewable energy on-site** to supply city operations (e.g., on-site solar).			
UTILITY-FOCUSED STRATEGIES				
14	Engage the utility in setting **energy goals**.			
15	Establish a **local renewable portfolio standard** (RPS).			
16	Approve or influence the utility's long-term **energy generation plan**.			
17	Direct the utility to conduct a **feasibility study** for renewable energy procurement.			
18	Approve or negotiate utility **procurement contracts** for renewable energy.			
19	Approve or pilot a **utility-owned rooftop solar** program.			
20	Leverage **taxing authority** over utility.			
21	Renegotiate city-utility **franchise agreement**.			
22	Establish a **city-utility partnership** to share decision-making power.			
23	**Municipalize** the local electric grid.			
24	Appoint or approve **utility decision-makers**.			
25	Engage in state **public utility commission (or equivalent agency) proceedings**			

GROUP 1. CONSUMER-ORIENTED STRATEGIES

Group 1 consists of strategies that cities can take to enable energy consumers, including city residents and businesses, to procure renewable energy or generate their own renewable energy on-site. Most of the strategies are directly within a city's jurisdiction and intersect with permitting, zoning, inspection, and planning processes, as well as other actions to incentivize, promote, or engage the community in renewable energy development. However, strategies #7-9 will depend on the status of state energy policies (e.g., legislation enabling distributed renewable energy tariffs, community renewable energy, or community choice aggregation), as indicated in *Section 1: The Energy Landscape*.

Example: Portland, OR

Portland's 2015 Climate Action Plan (CAP) release was accompanied by an equity integration guide, aimed at helping the city address the needs of low-income communities and communities of color in its climate and energy planning. The city considers equitable access to the services, resources, and opportunities outlined in the CAP essential to achieving energy transformation and carbon reduction goals. The guide and the integration of equity in the CAP was advised by an Equity Working Group made up of six community representatives over the course of two years.[19]

Example: San Francisco, CA

The City of San Francisco established an incentive program, GoSolarSF, that offers incentive payments for residents, businesses, and nonprofits installing solar within the City. The city offers a slightly higher incentive for residential installations within the City's "environmental justice zip codes," as well as other qualifying low-income residents.[20]

1. Engage the community in setting energy goals

Cities can convene, facilitate, or support public discussions with the community on the city's energy goals. This may be in conjunction with the city's strategic planning process and/or climate action planning process. From an energy supply transformation perspective, best practices in this area include: 1) incorporating community members and technical experts on technical committees or in a decision-making body, 2) establishing working groups to review and provide recommendations, and 3) soliciting direct input from community members, e.g., via public open houses, public hearings, online surveys, or formal comments.

2. Establish local financial incentives for on-site renewable energy

Cities can establish programs to incentivize renewable energy for residents and businesses. These programs employ financial incentives, such as rebates for renewable energy installations, tax credits, providing exemptions from property taxes, and zero-interest loans that can be repaid through tax assessments. Incentive programs may offer tiered incentives to support renewable energy for low- to medium-income households (see San Francisco example).

[19] City of Portland Bureau of Planning and Sustainability. "Climate Action Through Equity: The integration of equity in the Portland/Multnomah County 2015 Climate Action Plan." July, 2016. Retrieved from https://www.portlandoregon.gov/bps/article/583501

[20] San Francisco Water Power Sewer. *GoSolarSF*. Retrieved from: https://sfwater.org/modules/showdocument.aspx?documentid=6393

3. **Establish city mandates for on-site renewable energy (e.g., solar mandate or solar-ready mandate)**

   Cities can adopt legislation that requires renewable energy installations on-site. City mandates often support renewable energy in the new construction phase (or during a major renovation), when it is relatively cheap and easy to install. For example, a city may require certain new buildings to install solar PV or solar thermal on their rooftops (i.e., a "solar mandate"), or require new buildings to be constructed in a manner that would accommodate a future rooftop solar system (i.e., a "solar ready requirement"). Cities may also require that new buildings connect to an available district heating system.

4. **Host a renewable energy bulk purchasing program (e.g., Solarize campaign)**

   Cities can host or support group purchasing programs for renewable energy (e.g., Solarize campaigns). This strategy has multiple benefits. Customer acquisition costs represents a significant portion of the total cost of installing renewable energy (estimated at 9.2% of the total cost for a residential solar system).[23] Bulk purchasing can help cut these costs, while spurring market development and educating communities about renewable energy. "Solarize" campaigns have been the most successful renewable energy bulk purchasing examples, but the model can be applied to a variety of renewable technologies, including solar thermal, heat pumps, and electric vehicles.

Example: Somerville, MA

The City of Somerville, together with local volunteers, launched the Solarize Somerville campaign in 2016 and resulted in >500kW of new solar capacity installed by the end of the year.[21]

Additional Resource: The Solarize Guidebook

View the U.S. Department of Energy's Solarize Guidebook, a community guide to collective purchasing of residential PV systems.[22]

Example: Minneapolis, MN

The City of Minneapolis ran an extensive process to engage stakeholders in developing its Climate Action Plan, including designating community members to serve on technical committees and establishing an Environmental Justice Working Group to provide recommendations and review progress. The City's 2014 framework, "Minneapolis Energy Pathways," outlines its strategies for stakeholder engagement and working with its utility as part of the plans and policies that have shaped the City's current energy goals.[24]

[21] City of Somerville. 2016. *SustainaVille*. Retrieved from: http://archive.somervillema.gov/sustainaville/solarize

[22] Northwest Sustainable Energy for Economic Development (Northwest SEED). 2011. *The Solarize Guidebook: A community guide to collective purchasing of residential PV systems.* Retrieved from: http://www.nrel.gov/docs/fy12osti/54738.pdf

[23] National Renewable Energy Laboratory. 2013. *Benchmarking Non-Hardware Balance-of-System (Soft) Costs for U.S. Photovoltaic Systems, Using a Bottom-Up Approach and Installer Survey.* Retrieved from: http://www.nrel.gov/docs/fy14osti/60412.pdf

Box 3: Federal and State Incentives

Tax incentives are a common mechanism to financially incentivize renewable energy generation. Existing federal and state tax incentives can significantly shift the financial viability of a given renewable energy project.

- Federal Tax Incentives – The federal government offers an "investment tax credit," set to expire in 2021. This allows renewable energy generators to deduct 30% of the cost of installing a qualifying renewable energy system from federal taxes.
- State Tax Incentives – Many states offer tax incentives (including tax credits, property tax exemptions, etc.) for renewable energy systems.

Example: Seattle, WA

In 2012, the City of Seattle established rules requiring that commercial buildings have a small renewable (solar) energy system at the time of construction, and that they reserve a certain area of rooftop space as "solar-ready." The stated purpose is to "ensure that future larger-scale solar installations will be straightforward and economical.[25]

5. Reduce permitting, zoning and inspection barriers to renewable energy

Cities can support renewable energy development by streamlining permitting processes. Lengthy and complex permitting processes for renewable energy technologies present barriers to contractors, residents, and permitting officials. Unclear permitting applications and extensive permitting reviews increase costs by requiring more time and adding unnecessary overhead expenses. There are many ways that municipalities can mitigate these "soft costs." For example, streamlining permitting for small-scale solar PV systems that meet certain criteria removes a significant barrier for consumers hoping to install residential PV systems. Permitting can be streamlined for established technolgies, such as solar PV and solar thermal, as well as emerging technologies, such as storage (e.g., batteries).

Cities can also support renewable energy development by reducing inspection costs. Most municipalities require inspections for renewable energy systems, which involves paperwork, travel time, waiting time, and physical inspection time. Cities can minimize inspection costs by removing process redundancies, such as reducing the number of inspections required and coordinating inspections internally (e.g., between building and electrical inspection departments) and with the utility in order to reduce time and travel.

6. Lease public land for renewable energy

Municipalities can lease public facilities or public land for community-scale renewable energy development. Such devepments can help projects move froward where residents are seeking a site to develop a community-owned renewable energy project, or a utility would like to develop community renewable energy (e.g., a community solar garden).

[24] Center for Energy and Environment. 2014. *Minneapolis Energy Pathways: A Framework for Local Energy Action*. http://www.ci.minneapolis.mn.us/www/groups/public/@citycoordinator/documents/webcontent/wcms1p-121587.pdf

[25] Seattle Department of Construction and Inspections. 2015. Renewable Energy and Solar-Ready Roofs for Commercial Buildings. Retrieved from: http://www.seattle.gov/DPD/Publications/CAM/Tip422.pdf

7. **Establish tariffs or incentives for excess distributed renewable generation (e.g., feed-in tariff, net-metering, value-of-solar tariff)**

   Municipal utilities are frequently exempt from state regulations that require utilities to compensate residential or commercially-owned renewable energy project owners. Cities with municipal utilities have the unique opportunity to establish their own rules locally and implement policies such as net-metering, feed-in tariffs, or value-of-solar tariffs. Tariffs that fairly compensate the value of distributed generation can incentivize renewable energy generation and benefit the municipal utility. Cities served by investor-owned utilities and rural electric utility cooperatives cannot establish local tariffs, but they can lobby state regulators (such as the public utility commission, or department of energy) or the utility cooperative board of directors for such tariffs to be established.

Example: Philadelphia, PA

The City of Philadelphia, PA has implemented a streamlined permitting process for solar PV systems that are <10kW and meet certain criteria. This new process allows for an over-the-counter review of an electrical permit and does not require a building permit application.[26]

8. **Establish a community-shared renewable energy program (e.g., community solar)**

   Cities served by investor-owned utilities or rural electric utility cooperatives have relatively little direct control over community renewable energy, often defined as shared renewable energy systems, typically solar or wind, owned by or financially benefiting multiple people. However, where state policies are favorable, cities may host community renewable energy projects and promote community solar programs among residents.

   Cities served by a cooperative electric utillities can engage with the utility in exploring and developing a community renewable energy program for residents and business in its service territory (see *Resource: "The Community Solar Playbook"*). Communities served by municipal utilities can approve, support, or even initiate a municipal utility-provided community renewable energy program.

Example: Burlington, VT

The City of Burlington, VT coordinates its permitting and inspection process with Burlington Electric Department—providing the utility with the permit application as soon as it has been submitted.[27]

Resource: "The Community Solar Playbook"

The "Community Solar Playbook" from the National Rural Electric Cooperative Association (NRECA) is a guide for utility cooperatives on community solar business models and project implementation plans.[28]

[26] U.S. Department of Energy. 2016. Retrieved from: https://energy.gov/savings/city-philadelphia-streamlined-solar-permitting-and-fee-reduction

[27] Burlington, VT Public Works. *Requirements for Electric Permit Submittal.* Retrieved from: https://www.burlingtonvt.gov/uploadedFiles/BurlingtonVTgov/Departments/Public_Works/Construction_Permits/SolarPV_permit%20guidelines2012revision.pdf

[28] National Rural Electric Cooperative Association. In collaboration with Clean Energy Collective. 2016. *The Community Solar Playbook.* Retrieved from: https://www.cooperative.com/public/bts/renewables/Pages/community-solar-playbook.aspx

Municipalities served by any utility type may lease public land for project development, create and publish a permitting checklist, and remove zoning restrictions for community renewable energy.

9. Establish a community choice aggregation program (municipal aggregation)

   In states with enabling legislation, cities served by investor-owned utilities may seek to establish a community choice aggregation program in order to a) procure renewable energy on behalf of the entire community (with the option to opt-out), or b) gain control over local electricity rates and aim for a lower negotiated price for renewable energy. In practice, not all CCAs lead to lower electric rates for ratepayers or renewable energy options. Many CCAs rely only on renewable energy certificates (RECs) for their renewable energy, but do not also contract for the energy or offer any long-term price stability for customers. Enabling state legislation (see *Section 1: Energy Landscape*) is required for cities to pursue this strategy.

Example: Westchester County, NY

Westchester Smart Power Program became the first CCA in New York State and will serve 17 of the 20 municipalities in Westchester County that have joined the program. The CCA service came online in 2016.[29]

Example: Austin, TX

In 2011, the City of Austin met its goal to supply all city-owned buildings and facilities with 100% renewable energy (a goal established in its 2007 city council resolution). This was achieved through Austin Energy's GreenChoice program.[30]

GROUP 2. STRATEGIES TARGETING MUNICIPAL OPERATIONS

Group 2 consists of strategies for cities to procure renewable energy to meet the demand of municipal operations. Cities have a large sphere of influence over their own municipal operations, but the strategies a city can leverage will depend on the utility type and on state energy policies (e.g., status of retail competition, tariffs for distributed renewable energy, and third-party ownership).

10. Establish renewable energy purchasing requirements for city buildings

    Cities can adopt renewable energy purchasing requirements by formalizing a resolution, ordinance, bylaw, or alternative administrative action. This would establish the requirement that a

[29] Sustainable Westchester. 2016. *New York State's First Community Choice Aggregation Program Moves Ahead as Sustainable Westchester and 17 Municipalities Award $150M Energy Contract to ConEdison Solutions.* Retrieved from: http://www.prnewswire.com/news-releases/new-york-states-first-community-choice-aggregation-program-moves-ahead-as-sustainable-westchester-and-17-municipalities-award-150m-energy-contract-to-conedison-solutions-300233396.html

[30] Austin Energy. *Green Power Options.* Retrieved from: http://bit.ly/2nTjwiW (austinenergy.com)

certain portion of the energy a municipality procures be purchased from renewable sources.

11. Procure renewable energy from retail electricity providers

Cities in states with retail competition have more options to procure renewable energy than cities served by vertically integrated utilities. For example, cities in states with retail competition can solicit proposals from competitive retail suppliers to supply municipal operations with renewable energy. Some suppliers may offer options that include renewable energy at a fixed rate (see *Box 2: Understanding Renewable Energy Options*). Cities served by vertically-integrated utilities cannot leverage this strategy. This includes investor-owned utilities in vertically-integrated states, as well as municipal utilities and rural electric utility cooperatives.

Example: Washington, DC

Washington, D.C. established a large-scale Power Purchase Agreement (PPA) in 2015 with Iberdrola Renewables, LLC that will finance a 46 MW windfarm in southwestern PA. This wind farm will directly supply 35% of the District government's electricity demand for the next 20 years, and represents the largest wind power PPA by an American city to date.[31]

12. Partner with utility and/or third-party to procure renewable energy

Cities served by vertically-integrated utilities will need to partner with their utility to procure renewable energy on their behalf. Examples include establishing a "city-utility partnership" in which the utility agrees to match the municipal energy demand with energy from a renewable energy installation that is contracted for this purpose. Cities can work with independent renewable power producers to directly procure electricity through power purchase agreements (PPAs), depending on state legislation enabling third-party ownership. Where this is an option, PPAs can accelerate local renewable generation and stabilize municipal electricty prices due to long-term price contracts. Cities may also use their buying-power to negotiate for a special renewable energy option from their utility. Corporations such as Google and Facebook have successfully used this strategy and municipalities may be able to use this leverage as well.

Example: Georgetown, TX

The City of Georgetown, TX signed long-term contracts in 2014 and 2016 for wind and solar energy, making Georgetown Utility Systems one of the largest municipally-owned utilities in the U.S. to supply its customers with 100% solar and wind energy by 2017.[32]

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[31] Executive Office of the Mayor, District of Columbia. 2015. *Mayor Bowser Announces Groundbreaking Wind Power Purchase Agreement.* Retrieved from: https://mayor.dc.gov/release/mayor-bowser-announces-groundbreaking-wind-power-purchase-agreement

[32] City of Georgetown, Texas. 2015. *Georgetown Utility to Be Powered by Solar and Wind Energy by 2017*. Retrieved from: https://georgetown.org/2015/03/18/georgetown-utility-to-be-powered-by-solar-and-wind-energy-by-2017/

13. Purchase renewable energy on-site (e.g., on-site solar)

Example: Sacramento, CA
The City of Sacramento, a city with a municipal utility, leveraged a PPA in 2011 to install solar-powered electric vehicle chargers for city vehicles.[33]

Cities may also choose to install renewable energy systems directly on municipal buildings and facilities. For this option to be financially feasible, cities will likely rely on enabling state legislation, including: 1) tariffs that compensate distributed renewable energy generation (e.g., net-metering, value-of-solar tariff, etc.), and 2) a PPA with a third party. Cities should investigate the status of distributed generation tariffs and third-party ownership options with their utility and, if unavailable, lobby for policies that allow this type of arrangement.

GROUP 3. UTILITY-FOCUSED STRATEGIES

Example: Buffalo, NY
The City of Buffalo plans to host an annual city, state, and utility coordination meeting to improve energy supply planning and joint goal-setting.[34]

Cities generally have little direct control over the utility that serves them. Only cities with municipal utilities (depending on the municipal utility governance structure) have direct decision-making authority over their utility. Nonetheless, there are a number of strategies a city can take to either directly or indirectly influence the utility's energy supply.

14. Engage the utility in setting energy goals

Some cities may find that they can engage their electric utility directly in discussions on strategic planning and energy goals for the city. While not all utilities may be receptive to this, it can be an effective strategy to align goals for renewable energy targets, state policies (e.g., tariffs to compensate distributed renewable energy), community renewable energy programs, or processes where the city and utility intersect (e.g., interconnection and permitting processes).

Example: Columbia, MI
In 2004, voters in Columbia, MI approved a proposal to adopt a renewable portfolio standard for the city's municipal utility, which was revised in 2014 to establish a goal of 30% by 2028.[35]

15. Establish a local renewable portfolio standard (RPS)

RPS in most states apply only to investor-owned utilities, and rarely to municipal utilities or rural electric utility cooperatives. Cities served by municipal utilities can choose to adopt similar or more ambitious

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[33] Government Fleet. 2011. *City of Sacramento Fleet Installs Solar-Powered EV Chargers.* Retrieved from: http://www.government-fleet.com/news/story/2011/12/city-of-sacramento-fleet-celebrates-solar-powered-ev-chargers.aspx

[34] New York Power Authority. 2015. *BuildSmartNY: Five Cities Energy Plans.* Retrieved from: https://s3.amazonaws.com/nyclimatescience.org/BSFiveCities_Buffalo.pdf

[35] Database of Incentives for Renewables and Efficiency. 2016. *City of Columbia – Renewable Portfolio Standard.* Retrieved from: http://programs.dsireusa.org/system/program/detail/113

rules locally. Cities can adopt an RPS for the municipal utility through a city council resolution or a ballot initiative. Cities served by investor-owned utilities can lobby at the state level for a renewable portfolio standard or for higher RPS targets.

16. Approve the utility's long-term energy generation plan

Utilities regularly develop long-term energy plans (i.e., "integrated resource plans" or "energy generation plans"). A municipal utility's energy generation plan may require approval from the city council, depending on the utility's governance structure. Cities served by municipal utilities can leverage this influence and establish a collaborative strategic planning processes to ensure that renewable energy is integrated into utility resource plans. For investor-owned utilities, these plans typically require approval from the state regulatory body (Public Utility Commission or Public Service Commission). Cities served by investor-owned utilities can engage in state level proceedings, including rate cases, and lobby for renewable energy goals to be integrated into the utilities' generation plans.

Example: Minneapolis, MN

The City of Minneapolis became the first U.S. city to establish a city-utility partnership that shares power between the City and its investor-owned utilities. The City leveraged ongoing franchise agreement negotiations to begin negotiating such a partnership. The City-Utility Clean Energy Partnership established joint renewable energy goals for the City and its investor-owned utilities and corresponded to a new franchise agreement with terms (e.g., duration, fee structure, etc.) that are contingent on progress towards those goals.[36]

17. Direct the utility to conduct a feasibility study for renewable energy procurement

Many utilities can build and own renewable energy installations, and cities can lobby for utilities to conduct a feasibility study on renewable energy procurement. Cities with municipal utilities may be able to direct the municipal utility to conduct a feasibility study on a transition to renewable energy, particularly in cases where cities maintain jurisdiction over the municipal utility budget and can approve funding for a feasibility study. Cities can also faciliate renewable energy procurement for any utility type by leasing land or public buildings where renewable energy generation can be sited.

18. Approve or negotiate utility procurement contracts for renewable energy

As municipal utility procurement contracts expire, opportunities arise for cities to influence or approve new contracts from renewable sources. In many cases, the city council maintains authority over contracts above a certain threshold value. Contracts may be

[36] Community Power Minnesota. 2016. *The Minneapolis Clean Energy Partnership.* Retrieved from: http://www.communitypowermn.org/partnership

Example: Las Vegas, NV

In 2015, the City of Las Vegas and NV Energy (the investor-owned utility serving the City) announced a partnership in which the utility will supply 100% of the municipal energy demand with renewable energy from a local solar plant.[38]

Example: Los Angeles, CA

The Los Angeles' municipal utility, LADWP, is piloting its Solar Rooftops Program. The program brings solar benefits to customers who have previously been inhibited by the high cost of installing solar panels by requiring no up-front costs and designating priority enrollment to zip codes with lower rates of solar participation. Participating homeowners lease their roof space and in return receive a $360 check annually or $30 monthly utility credits on their power bill over a 20-year period.[39]

negotiated with wholesale power providers or through PPAs. Cities served by rural electric cooperatives do not have jurisdiction to approve or negotiate procurement contracts, but may be able to support the utility cooperative in exploring procurement options. For example, many rural electric utility cooperatives cite restrictions in long-term "Buy-all, sell-all" (also known as "all-requirements") contracts that have committed the utility to a certain power supplier for several decades and prevent them from procuring renewable energy. Utility cooperatives may not be aware of flexibility in these contracts with regards to distributed renewable energy generation.[37] For investor-owned utilities, decisions on energy procurement are heavily regulated by the state; cities can influence this processs by intervening in state-level utility regulatory proceedings.

19. Approve or pilot a utility-owned rooftop solar program

Certain utilities may be able to pilot utility-owned rooftop solar—a program in which the utility leases roof space from participating residents, and provides the homeowner a credit for the electricity generated. Utility-owned rooftop solar programs present opportunities to increase distributed generation and increase the share of renewable energy in a utility's energy supply. For cities served by municipal utilities, the city or town council may have the authority to approve such a program for the municipal utility, or in some cases, approval from the state's public utilities commission may be required. Cities served by investor-owned utilities and rural electric cooperatives do not have the authority, but may choose to lobby for such programs at a state level or for the utility's service territory. Utility-owned rooftop solar; however, can be a key point of

[37] Midwestern Energy News. 2016. *Small utilities more likely to seek out renewables after FERC ruling.* Retrieved from: http://midwestenergynews.com/2016/07/05/small-utilities-more-likely-to-seek-out-renewables-after-ferc-ruling/

[38] Utility Dive. 2016. *Nevada PUC greenlights Las Vegas, NV Energy partnership in plan to go 100% renewable energy*. Retrieved from: http://www.utilitydive.com/news/nevada-puc-greenlights-las-vegas-nv-energy-partnership-in-plan-to-go-100/414600/

[39] Los Angeles Department of Water and Power News. 2016. *LADWP Launches the Solar Rooftops Program Providing the Benefits of Solar Energy to More Angelenos.* Retrieved from: http://www.ladwpnews.com/go/doc/1475/2901302/

contention if the utility-ownership model does not allow for individuals to also own solar generation.[40]

20. Leverage taxing authority over the utility

Cities may have some taxing authority over investor-owned utilities (this is not true for municipal utilties or rural electric utility cooperatives, as these are tax-exempt entities). This authority varies by state: states determine which properties a municipality is permitted by law to tax. Cities should familiarize themselves with their taxing authority over utility property, which could include utility-owned power plants and utility infrastructure (e.g., poles and wires).

Cities with taxing authority over their investor-owned utility may wish to leverage this authority to raise revenue for clean energy programs. This process may involve reclassifying utility property into a separate property tax classification. Such actions may or may not be legal, depending on state and municipal authority, and specific reclassification. For example, it is not legal to discriminate against certain business property in favor of other business property in assessing property taxes.

21. Renegotiate city-utility franchise agreement

Cities served by investor-owned utilities may have utility franchise agreements, which are is long-term contracts that outline requirements for the utility to use the city's public rights of way. Cities with expiring franchise agreements have an opportunity to leverage this for energy supply transformation. Utility franchise agreements have typically been long-term contracts with a 20-year duration. City staff should investigate if such an agreement exists and if so, identify the terms and expiration date.

Expiring franchise agreements present an opportunity for municipalities to negotiate a number of terms. These include, for

Example: Boulder, CO

The City of Boulder has been researching and pursuing municipalization since 2010, in the context of an expiring franchise agreement. In 2016, five years after Boulder residents voted in favor of forming a municipal electric utility, the City continues to explore a more detailed plan to create one. This has included partnering with the utility on renewable energy goals. Even if the City remains with its IOU, the municipalization discussions have provided a point of entry and leverage into utility discussions on municipal energy priorities.[41]

[40] U.S. Department of Energy. *Utility Ownership of Rooftop Solar PV*. Retrieved from: http://solaroutreach.org/wp-content/uploads/2015/11/Final_UtilityOwnedRooftopSolar.pdf

[41] City of Boulder, Colorado. 2016. Boulder, Xcel Energy Acknowledge Settlement Discussions. Retrieved from: https://bouldercolorado.gov/newsroom/june-8-2016-boulder-xcel-energy-acknowledge-settlement-discussions

example: 1) shortening the contract duration, 2) allowing for early termination on certain conditions, and 3) altering the fee structure to help fund renewable energy or energy efficiency programs (see Minneapolis example).

22. Establish a city-utility partnership to share decision-making power

Cities may establish a city-utility partnership with their investor-owned utility to create a framework for shared city-utility renewable energy goals. Such a partnership could also establish a decision-making board with city and utility members and form an energy advisory committee. In tandem, cities can renegotiate a franchise agreement that includes meeting the city-utility partnership goals. Cities could establish a comparable partnership with rural electric utility cooperatives, or even with municipal utilities.

Example: Austin, TX

In 2012, Austin's municipal utility, Austin Energy, became the first utility in the U.S. to offer a "value of solar" tariff to residential electricity customers, which incorporates environmental compliance costs and has been designed to "reflect the value of local solar generation" Austin Energy customers with on-site PV systems receive a credit of 10.6 cents per kWh.[42]

23. Municipalize the local electric grid

Cities served by investor-owned utilities may seek to municipalize the local electric grid. This is a process in which a city establishes a municipal utility by purchasing the local electric grid from the utility. Cities may seek this route out of dissatisfaction with their utility's level of support for renewable energy; they may be enthusiastic about creating their own municipal utility and the options this would present; or they may seek to leverage municipalization to gain negotiating power with their investor-owned utility. Municipalization can also have three advantages in revenue requirements: (1) there would be no objective to earn a profit for shareholders (unlike IOUs), (2) the city would have access to tax-exempt debt for renewable energy facilities, and (3) there could be an option to take over inexpensive hydropower projects licensed by FERC (if within the service geography of the city) when their licenses expire. There are only a few select cases in the United States of cities pursuing municipalization of the electric grid, so the process is relatively uncharted.

[42] City of Austin. 2016. *Value-of-Solar Rider*. Retrieved from: http://austinenergy.com/wps/wcm/connect/c6c8ad20-ee8f-4d89-be36-2d6f7433edbd/ResidentialValueOfSolarRider.pdf?MOD=AJPERES

24. Appoint or approve utility decision-makers

In cities with municipal utilities, a city council may have the authority to directly appoint the utility's board members. Cities with this authority can leverage this influence to ensure that the key utility decision-makers prioritize renewable energy goals.

25. Engage in state public utility commission (or equivalent agency) proceedings

Where direct influence is not within a city's jurisdiction, cities can exert indirect influence at a state level through by engaging in state-level public utility commission proceedings. These proceedings define many of the nuances to rules governing utilities that impact a city's ability to meet its renewable energy goals. Rate cases determine the rates and returns that the utility can charge and cities should become more directly engaged in commenting and tracking these proceedings. While the vast majority of cities will not have staff expertise for this type of engagement there are non profits and other experts that can be engaged, and whose interests can align with a city's.

Cities should also seek to engage with the ratepayer advocate office or the attorney general's office. These offices serve the official role of intervening and participating in utility ratemaking proceedings on behalf of ratepayers. Historically, these agencies have taken the position that ratepayers should not be subject to undue increases in costs, sometimes arguing against renewable energy goals and programs for this reason. However, many cities are now developing goals for their energy supply that extend beyond keeping electricity rates low, and consider other priorities like sustainability. Cities should therefore engage with the ratepayer advocate offices and attorney general's offices involved in public utility proceedings in order to ensure that these offices represent the emerging interests of ratepayers, including advocating for renewable energy policies and programs.

Example: Albany, NY

Supported by the New York Power Authority, Albany, NY has added a Citywide Energy Manager position responsible for implementation of the Albany Energy Plan. The plan has a joint focus on improving energy efficiency and benchmarking, and on implementing the long-term energy supply strategy determined through Albany's current energy planning process.[43]

Example: San Diego, CA

To achieve the ambitious goal of transitioning to 100% renewable energy supply by 2035, San Diego created a new Sustainability Program Manager position. This staff member oversees an interdisciplinary team of staff from numerous city departments, and coordinates the implementation of the energy supply transition programs and policies, as well as other climate action plan objectives. Additionally, this team is responsible for amending policies, plans, and recommendations on an annual basis to keep pace with technological and strategic developments, and ensure that climate targets are met.[44]

SECTION 3 ORGANIZING FOR TRANSFORMATION

Large-scale energy transformation will require engagement and contribution from residents, small business organizations, as well as leadership from local institutions, industry, and government. To achieve this level of buy-in, municipal governments will need to consider strategies for building the knowledge and staff capacity necessary to drive change. Identifying core team members and critical local partners is therefore a crucial step in organizing for energy supply transformation.

A. CITY STAFFING STRATEGIES

Cities should identify the implementation team that will coordinate energy supply transformation studies and strategies, as well as maintain communication with stakeholders and project partners. In some cities, this role falls to a single staff member or a team of staff members. Other cities might convene a dedicated steering committee to advise city action, comprised of community representatives, business leaders, utility representatives, industry experts, and city staff. City staff must have the technical expertise to recognize key energy savings and supply transition opportunites, inform development of new city regulatory policies or incentives, understand and intervene in public utility commission proceedings, and be familiar with grid management processes. The required expertise varies depending on the actions a city decides to take. A steering committee composed of external stakeholders can be used to increase the technical capabilities among the group analyzing and providing advice about energy system transformation strategies.

[43] New York Power Authority. Retrieved from: http://www.nypa.gov/innovation/programs/five-cities-energy-program

[44] City of San Diego. 2016. *Climate Action Plan*. Retrieved from: https://www.sandiego.gov/sites/default/files/final_july_2016_cap.pdf

26. Invest in city staff for municipal energy transformation

When transitioning municipal energy supply, cities often choose to assess municipal consumption and on-site municipal generation opportunities internally. In most small cities, having a dedicated staff member serve as an energy manager helps ensure that this process is approached systematically, and that the municipality realizes maximum savings. Finding the resources to hire an energy manager can be a challenge, but this position often pays for itself through the implementation of energy-saving initiatives.

27. Expand staff for community-wide energy transformation

Cities considering community-wide energy transformation will need more than a single energy manager to oversee the transition. For some cities, this means forming an interdepartmental working group comprised of existing staff to jointly lead the effort, and for others it means building out a new department or section of an existing environment department to lead the energy transition process.

28. Establish a joint steering committee

Cities can form a joint internal-external steering committee to coordinate or advise the transition process. External members often include: 1) representatives of business associations, property managers or large land owners; 2) academic or other research and development institutions; 3) staff from regional or state levels of government; 4) representatives of community groups or neighborhood associations; and (5) utility representatives. Cities can also use steering committees as an opportunity to embed other important and related priorities into energy supply transformation.

Example: Minneapolis, MN

Minneapolis recently implemented a Clean Energy Partnership, which "will study, prioritize, plan, coordinate, implement, market, track, and report on progress on clean energy activities." Jointly staffed by municipal and utility decision-makers, this partnership sets renewable energy, energy efficiency, reliability, and equity goals, and provides planning, coordination, and accountability for meeting these goals. Funded in part through the franchise fee, the partnership has an operational budget and some dedicated staff to carry out these responsibilities.[45]

Example: California (statewide)

Comprised of nearly 40 cities, counties, associations, councils of government, special districts, and nonprofit organizations in California, the Local Government Sustainable Energy Coalition represents local interests on behalf of its members in regulatory proceedings and for program development for locally generated renewable energy and energy efficiency. The network provides collaborative learning opportunities and works together to shape long-term strategies for sustainable energy.[46]

[45] City of Minneapolis. 2016. *Minneapolis Clean Power Partnership*. Retrieved from: https://cleanenergypartnership.files.wordpress.com/2015/05/cep-15-16-final-work-plan-attachment-b.pdf

[46] Local Government Sustainable Energy Coalition. Retrieved from: http://www.lgsec.org/about

Example: Seattle, WA

The City of Seattle released its Equity & Environment Agenda in 2016, which identifies community-developed goals and strategies to address inequalities through sustainability efforts. As part of this work, the Seattle Office of Sustainability & Environment worked closely with nine major, historically white-led environmental organizations to develop "Ally Commitments," to help prioritize racial justice in their work. These commitments include efforts within each organization to rethink operating processes to advance racial equity, and external efforts to improve community engagement, communication, program design, and partnerships citywide.[47]

Example: Austin, TX

The City of Austin, along with its municipal utility, the chamber of commerce, and the Environmental Defense Fund, partnered with the Pecan Street Project to create an "Energy Internet" smart grid demonstration project on a 711-acre mixed-use development area. The pilot project tested smart grid systems including high density solar PV; home energy monitoring systems; a smart meter research network; energy management gateways; distributed generation; electric vehicles with Level 2 charge systems; smart thermostats; and other grid modernization systems.[48]

B. PARTNERSHIPS AND NETWORKS

Collaboration with external partners can provide resources, expertise, and staffing support for cities to achieve ambitious energy transformation goals. Nonprofit and private sector partnership, for example, can support energy planning, research and development, and pilot projects. Networks can provide opportunities to share best practices and common strategies through peer-to-peer learning. They can also help build coalitions and advocate for state and federal policy.

29. Partner for climate and energy planning

Cities may choose to partner with a nonprofit organization to develop citywide energy plans. When additional expertise and resources are needed, a representative from a nonprofit organization may be able to serve on a city energy task force or energy working group. Nonprofit partnerships can provide valuable support and networks to engage diverse community stakeholders. In some cases, a nonprofit organization representing stakeholders from private and public sectors may be established to collaborate with the city on climate and energy planning.

30. Partner to integrate equity into energy supply transformation

Many cities aim to move towards a clean energy supply while also improving equity for residents. When planning for energy supply transformation, cities can partner with community-based organizations to include neighborhoods and communities traditionally underrepresented in planning processes. Cities can provide financial or other support to these organizations to facilitate their participation in planning meetings and to help with stakeholder outreach. For further information on incorporating equity into energy supply transformation, see Appendix on page 52.

[47] City of Seattle. *Equity & Environment Agenda Ally Commitments*. Retrieved from: https://www.seattle.gov/Documents/Departments/OSE/EEA_Ally_Commitments.pdf

[48] Pecan Street Project. 2011. *Energy Internet Demonstration*. Retrieved from: http://www.pecanstreet.org/wordpress/wp-content/uploads/2011/02/RFI-Pecan_St_Project1.pdf

31. Partner to advance research and development

Cities can also partner with private firms to run pilot projects, such as testing new technologies and grid mechanisms. These partnerships enable cities to leverage private sector interests and resources while developing best practices around grid management and distributed generation, and ensure that consumers benefit in the process. Private sector partnerships can help cities stay up-to-date on best practices and new technologies for energy generation and management as the market grows.

32. Partner to spur renewable energy investment

Cities can encourage private sector energy procurement by raising awareness through energy-tracking ordinances, demonstrating public support for clean energy goals, or even encouraging innovative procurement arrangements through prizes and other incentives.

Example: Boston, MA

The City of Boston worked with a Boston-based philanthropic funder, The Barr Foundation, to assemble the Boston Green Ribbon Commission (GRC), which is co-chaired by the mayor and comprised of business, institutional, and civic leaders in Boston. Since its inception in 2007, the GRC has worked side-by-side with the City of Boston on its climate planning. The GRC recently structured a Renewable Energy Leadership Prize that spurred private sector investment in a number of new renewable generation projects.[49]

33. Join a city network and share lessons learned

Cities may seek support from city networks to share lessons learned and best practices in planning and implementing strategies for city-level energy tranformation. For example, city networks (e.g., the Carbon Neutral Cities Alliance, Urban Sustainability Directors Network, C40, and others) can provide support in developing tools and standards to measure progress towards energy goals; advocating for policies at the state, regional, and federal levels; or providing access to funding and resources for city-led projects.

[49] Barr Foundation. *Green Ribbon Commission*. Retrieved from: https://www.barrfoundation.org/partners/green-ribbon-commission

CONCLUSION

A rapidly growing vanguard of U.S. cities have committed to dramatically transforming their energy supply systems away from fossil fuel and toward zero carbon or renewable sources. A handful of cities have achieved a 100% renewable energy supply, and over two dozen more have committed to 100% renewable energy goals. Others have targeted deep greenhouse gas emissions reductions (e.g., "80% by 2050" and carbon neutrality) that will require dramatic transformation of energy supply systems to achieve.

Many more cities are just setting out on this pathway. As cities explore the available options, they will find that there is no one-size-fits all strategy for energy supply transformation. How each city should approach energy transformation depends on the details of its energy landscape: the type of local distribution utility and state energy policies, among other factors. Assessing the impact of these variables and charting the most effective path forward is complex, and can require a lengthy process requiring specialized expertise.

Pathways to 100 seeks to help cities understand their energy landscape and identify strategies that are applicable to their utility and state policy context. This essential first step allows cities to narrow the list of potential strategies and focus on those that will be most effective in their unique utility and regulatory context. This resource is designed to help cities plan strategically but also move quickly towards action by identifying some of the staffing strategies, partnership models, and support networks that can help operationalize municipal commitments to energy supply transformation.

This guide is also designed to facilitate knowledge sharing, peer learning, and strategic program development for funders, non-profits, community organizations, and network organizations that support or complement the actions of city governments. By providing a common framework and language on energy supply transformation planning, cities and their partners can more easily identify commonalities and differences in context and hone in on the insights most applicable to them.

The sense urgency over climate change and the need to transition to cleaner sources of energy continues to grow in communities around the country. Many communities wish to move quickly beyond pilot projects and small-scale programs to transformational initiatives that can drive deep reductions in emissions and provide cleaner energy. By drawing on proven models and offering clear planning frameworks, this resource can help accelerate this process and amplify the scale and impact of city leadership.

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GLOSSARY

Aggregate net metering: A state policy allowing a single customer to apply credits earned from excess generation at one site where electricity is generated towards the electricity bill for a second geographically distinct account, also sometimes referred to as Virtual Net Metering.

"Buy all, sell all" contracts: Legal arrangement common among rural electric cooperatives. These contracts generally require distribution cooperatives to purchase all their electricity from a designated power provider (typically a generation and transmission cooperative). It has been debated whether these contracts restrict the ability of distribution cooperatives to pursue distributed renewable energy projects.

All requirements contracts: See "Buy all, sell all" contracts.

City-utility franchise agreement: A legal contract that outlines requirements for a utility to use the city's public rights of way. This typically involves compensation paid to the city via a pass-through charge to ratepayers.

Community choice aggregation: A state policy that allows municipalities and counties to select an electricity provider (e.g., a renewable energy supplier) on behalf of their residents, businesses, and municipal accounts. Also known as municipal aggregation.

Community-shared renewables: A renewable energy facility that allows multiple people to subscribe and benefit from the energy output of the facility.

Community Solar: A variation of community shared renewables. *See Community-shared renewables*

Cooperative Utility: An organizational form for electricity utilities that are cooperatively-owned by customers. Each customer is a member-owner with one vote under the "one person, one vote" cooperative principle. Cooperative Utilities are governed by a board of directors, with only minimal oversight from state regulators.

Decarbonization: The transition from high-carbon emissions producing energy sources to low- or zero-carbon energy sources.

Decoupling: A state-level regulation that separates utility profits from the volume of direct energy sales. Utility revenue is instead predetermined by regulators, often based on recovery of fixed costs, and performance, and customer tariffs are set to meet this target. This regulation is designed to remove utility disincentives to adopting energy efficiency programs and other improvements that reduce customer demand.

Deregulated utilities: Utilities operating in a marketplace with retail competition. Many deregulated utilities provide either generation or transmission or distribution services, as opposed to Regulated Utilities (see below), which provide all three services in their territory.

Direct access tariffs: Allow large energy users in traditionally regulated energy markets to choose a supplier other than the distribution utility.

Distributed energy generation: Small-scale generation resources that feed directly into distribution portions of the electric grid (e.g., rooftop solar).

Federal Energy Regulatory Commission (FERC): The independent federal agency that regulates interstate electricity transmission and wholesale electricity trading. FERC is also responsible for regulating natural gas and oil transportation.

Feed-in tariff: A policy that guarantees a long-term contract for renewable energy producers to sell all electricity generated back to the electric grid at a fixed price.

Green pricing program: A retail energy offering made by utilities to customers in which a voluntary premium is added to energy bills to reflect the environmental assets of renewable energy generation.

Green tariff: See Utility Renewable Tariff.

Integrated resource plans: A long-term strategy adopted by a utility designed to ensure the provision of reliable and low-cost electricity services to customers. These are sometimes referred to as energy generation plans.

Investor-Owned Utility: Utility that issues company stock and is responsible to shareholders. Heavily regulated at the state level.

Member-owner: See Cooperative Utility.

Municipal Utility: Utility that is owned by a municipal government.

Municipalization: The purchase of privately owned property by a municipality (e.g., the purchase of a local distribution utility).

Net metering: A state policy allowing customers to be compensated for renewable energy generation via a reduction on or credit to their normal utility bill.

Power Purchase Agreements: A contract to buy electricity over a given term. More recently, it is used to refer to the financing mechanism enabling a third party (such as a renewable energy developer) to build, own, and operate a renewable energy system on behalf of the customer upon whose roof the project is located. The host avoids the upfront and operating costs of renewable energy, and purchases the electricity generated from the third-party owner.

Public Utilities Commission (PUC)/Public Service Commission (PSC): A state agency that regulates the rates and services charged and provided by intrastate utilities.

Ratepayer advocate: A state-appointed entity that is responsible for regulating investor-owned utilities and representing the interests of utility customers within the state.

Regulated utilities: Utilities with a monopoly over generation, transmission, and distribution services in their territory. Often referred to as vertically integrated utilities. This contrasts with deregulated utilities (see above).

Renewable energy bulk purchasing program: A campaign involving bulk purchasing of renewable energy systems to reduce costs for consumers.

Renewable Energy Certificates (RECs): A tradable commodity representing the environmental benefits of electricity generated from renewable sources. In states with an RPS, RECs are purchased and sold as a compliance mechanism.

Renewable Energy Procurement: The purchase of power generated by a renewable energy system.

Renewable portfolio standard (RPS): A policy (typically state level) mandating that a certain percentage of electricity provided by the utility must be generated by renewable resources by a target year.

Retail electricity providers: Companies that distribute electricity to consumers in deregulated markets with retail competition.

Solar mandate: Legislation that requires solar PV or solar thermal systems installations, usually for a subset of new construction.

Solar ready requirement: Legislation that requires certain buildings (usually a subset of new construction) to reserve roof space for solar and make construction choices that save time and money if solar is installed later.

Solarize: See Renewable energy bulk purchasing program.

Transmission and Distribution Utility: Utilities that do not own any electricity generation assets but maintain ownership of the "wires." See Deregulated Utilities.

Tariff: The conditions (including the rate) under which a customer is charged for the delivery and consumption of electric power, or the on-site generation of electricity. Tariffs are differentiated by customer class and types of energy service, including service for customers with on-site grid-connected energy generation.

Utility ratemaking proceedings: The process by which utilities and public utility commissions create utility tariffs.

Utility renewable tariffs: A special tariff offered by a traditionally regulated utility to allow customers to purchase energy from dedicated solar projects or portfolios of projects.

Value of solar tariff: A special tariff designed to compensate solar generation owners for the value of the energy they generate (similar to a Feed-in Tariff).

Vertically integrated: See Regulated Utility.

Virtual net metering: See Aggregate Net Metering.

Wholesale power transaction: The sale and purchase of electricity at the transmission level for delivery and resale to retail customers. Sellers of electricity are usually but not always generators. Buyers can be utilities, end users, commodity traders, or other parties.

APPENDIX: FRAMEWORK FOR EQUITABLE ENERGY SUPPLY TRANSFORMATION

BACKGROUND:

This framework can help cities embed equity in city energy supply system transformation to low- or zero-carbon sources. It presents a set of questions grouped by theme for city staff to consider when developing plans and policies for transforming their energy supply to meet their climate goals.

The framework is part of a larger project providing research-based solutions for cities in two areas: (1) developing an energy systems primer that characterizes processes and practices of city energy supply transformation for city staff and funders and (2) conducting a needs assessment to determine what forms of support would be most valuable to help cities accelerate their energy system transformation. This framework is meant to inform and support both aspects of the project and provide an accessible resource for cities and funders for incorporating equity and energy transformation.

Box 4: Four Types of Equity

The framework uses the Urban Sustainability Directors Network (USDN) definition of four types of equity for sustainability planning, decision-making, and program and policy design.[50] These four aspects of equity are often overlapping, but the different points of intersection between energy supply transformation and equity outlined in the framework will necessarily emphasize different types of equity. The USDN definitions are:

Procedural (Inclusion): inclusive, accessible, authentic engagement and representation in the process to develop or implement programs or policies.

Distributional (Access): programs and policies result in fair distributions of benefits and burdens across all segments of a community, prioritizing those with highest need.

Structural: decision-makers institutionalize accountability; decisions are made with a recognition of the historical, cultural, and institutional dynamics and structures that have routinely advantaged privileged groups in society and resulted in chronic, cumulative disadvantage for subordinated groups.

Transgenerational: decisions consider generational impacts and don't result in unfair burdens on future generations.

[50] Angela Park. "Equity in Sustainability: An Equity Scan of Local Government Sustainability Programs." USDN, September 2014.

FRAMEWORK: WHAT DOES EQUITABLE ENERGY TRANSFORMATION LOOK LIKE?

As communities across the country pursue aggressive renewables and greenhouse gas targets, the energy generation mix will evolve rapidly, driven by programmatic and policy shifts. The topics and questions below provide a framework for cities to use when planning for and implementing policies and programs to support their low-to no-carbon energy transition. The questions can help cities think through key ways to embed equity into a city's energy transformation.

Internal structure: How is equity defined within the city and department? Cities should begin by developing an understanding of their current context, and any internal and public-facing goals considering diversity, access, and inclusion. These existing objectives and values can be translated into larger programmatic efforts. Framing questions for internal discussions and dialogue can include:

- Is equity part of the internal workplace?
- Does the city have diversity and inclusion policies or goals for recruiting and retaining members of the workplace?
- Are staff encouraged – or required – to consider equity in their internal departmental processes?
- What equity training do city staff and partners have? What frameworks do they use for training?
- Are departments benchmarked based on their progress toward equity training and improving internal outcomes?
- Are internal equity frameworks or the training applied to the implementation of externally-facing programs for residents and businesses?

Decision-making: How does the city prioritize and make decisions about its energy policy and planning? Sustainability or environment department staff, other city departments, elected officials, and stakeholders may all have differing levels of power and influence on decisions surrounding energy supply policy. An understanding of these dynamics is crucial when setting new targets or goals. Considerations include:

- Is equity part of the city's decision-making process for energy transformation?
  - How is equity defined?
  - What are the city's goals and strategies for including equity, if any?
  - Is the city's leadership supportive of equity goals?
- Does the city have a comprehensive plan for energy transformation or climate? If yes, do these plans include equity?
  - Is equity or energy transformation part of broader city plans or priorities?
  - In cases where priorities may conflict (e.g. cost effectiveness vs. equitable access), does the city have a way to prioritize?
- What data or analysis does the city use to inform energy transformation decisions?

Participation in decision-making: Who can participate in decision-making processes? In addition to gaining an understanding of the public officials who influence decision-making, cities should also consider ways to engage the public and other key stakeholders. For example, stakeholders and community groups can be highly engaged and participatory in consultations throughout policy development, or informed through outreach after policy decisions are largely complete. Joint decision-making or consensus-based efforts can offer a more inclusive power dynamic, increase community buy-in for energy programs, and produce positive outcomes. This level of effort requires staff commitment, time, and resources. Key questions to consider include:

- What does community or stakeholder consultation for energy transformation look like?
- Are engagement practices and processes transparent, accessible, and iterative (i.e. show learning and incorporation of feedback)?
- Does the city use practices and resources to address participation challenges (e.g. accessible location and timing, providing transportation to event and childcare on-site, communicating in non-technical jargon, providing translation services, etc.)?
- At which phases of program or plan development is there engagement?
    - Is there a process for ensuring residents or representatives of all backgrounds, neighborhoods, businesses, and community organizations can participate?

Program and policy design: How are clean energy programs and policies designed and who has access to participate? Energy programs and policies (e.g. community choice aggregation or district energy) can enhance inclusivity and access through collaboration in design, public advisory committee(s) during implementation, targeted use of funding, or a variety of other mechanisms. Discussion questions include:

- What approach does the city use to design programs? (e.g. collaborative, top-down, or bottom up approach)
    - Does the city work with or provide direct funding to community organizations to co-develop programs around clean energy?
- Is land ownership part of determining program participation?
    - Can those who do not own land or property participate?
    - How does the city allocate its land for clean energy projects?
- What is the cost to entry or to participate in a clean energy program?
    - Are subsidies or financing available to help those with lower incomes to participate?
    - How are up-front costs considered in determining participation?
    - Are the costs of the program spread evenly across the entire rate or tax base or structured progressively?
- Are the policies or programs considered within the jurisdiction of the city?
    - Can coordination at the regional or state level improve equity outcomes?
    - Is there a role for public-private partnerships, and if yes, is the partnership structured to ensure equitable outcomes?

Beneficiaries: Who gets the benefits and are they distributed equitably? To support an understanding of project beneficiaries, cities can undertake a stakeholder mapping exercise to gain greater insights into how residents will interact with the proposed policy or program. The city can consider if environmental justice communities, communities of color, the elderly, low-income households, and other disadvantaged populations have been consulted and will benefit from the proposal, especially in cases where such action may be restorative from previous burdens. Questions to consider are:

- Does the program create local jobs, and if so how will people apply for and receive those jobs?
- Is workforce training or development part of a program?
- Who receives financial benefits of a program?
- Who receives environmental benefits and health benefits?
- Does the program consider and improve upon the location of past fossil fuel-based generation sources or other former harms?
- Are those who live near an energy source able to benefit from it?
- What is the reach of the energy benefits?
- Will the benefits change over time and if so, will this change who is impacted?

Burdens: Who bears the costs of energy generation and are they distributed equitably? To support an understanding of potential project burdens, the city can undertake a stakeholder mapping exercise to gain greater insights into how residents will interact with the proposed policy or program. A benchmarking exercise or interviews can also be completed with community organizations or city staff in jurisdictions with similar active programs. Questions to ask include:

- Who bears the financial costs?
- Who bears the health costs?
- Who bears the environmental costs?
- Does the program exacerbate or mitigate existing disparities such as the digital divide, gentrification, access to jobs, and income inequality?
- Will the burdens change over time and if so, will this change who is impacted?

Siting: Where are renewables or other generation sources or systems sited (generation, transmission, distribution, etc.), particularly larger projects? Cities should understand how and where energy and other infrastructure projects are sited, and where the benefits of such projects will flow within a community. Points of inquiry include:

- Does the city have processes that measure which neighborhoods host various municipal assets for power, as well as other environmentally impactful services (e.g. landfills, water sanitation facilities, major roadways and trucking routes)?
- What considerations are made in siting energy generation?
    - Is the highest and best use for the land considered? Over what timeframe?
- Can the local community directly access or make use of the generation?
- Who is consulted during the siting? Can impacted residents help inform the choice?

Communication: How are energy transformation priorities communicated? Education and outreach are crucial during both energy policy development and implementation. Cities need to consider the reach of marketing and outreach campaigns, as well as the accessibility of their program messaging:

- Are diverse perspectives, cultural, and educational contexts taken into consideration when developing communication materials?
- What channels are used to communicate with citizens?
- Are translators and translations of materials available?
- Are the messengers utilized strong, trusted community voices?

Metrics: What data or analysis is used to measure success? Data is necessary to measure program success, but also to justify program development. Equity-based programs may conflict with traditional cost-effectiveness tests for energy and with other political priorities. Collecting and designing methods to demonstrate the holistic benefits of more equitable decarbonization programs is key for program sustainability and adoption.

- What types of data does the city collect or have access to?
- What methodology is used to measure qualitative and quantitative outcomes? Does the city have equity indicators?
- What is the current cost-effectiveness framework for community or utility programs, and does it include equity or societal considerations in its cost-benefit calculation?
- How is program success defined? Are co-benefits considered?
- How are health, environmental, and other societal outcomes documented?

Case Example: Los Angeles Department of Water and Power's Solar Rooftops Program

The Los Angeles Department of Water and Power (LADWP) is the largest municipal utility in the country. In the first quarter of 2017, LADWP launched a new pilot program offering called Solar Rooftops.[51] The program provides owner-occupied single story homes with rooftop solar PV systems at no-upfront cost to consumers. In exchange, the LADWP grid benefits from solar energy production and the city makes progress towards the Mayor's goal of 35% renewable energy by 2020. Customers that allow the utility to lease their roof receive regular payments over a 20-year term.[52] The program is expected to support 300-400 installations. The program also includes a job training component for installing solar panels, designed to address LADWP's aging workforce. This case example explores how the program corresponds with the major themes of the equity framework.

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[51] Los Angeles Department of Water and Power. (2017) "Solar Rooftops." Retrieved from: https://www.ladwp.com/ladwp/faces/ladwp/residential/r-gogreen/r-gg-commsolarprogram?_adf.ctrl-state=3gl6quao7_4&_afrLoop=519051941283307

[52] Walton, Robert. (November 29, 2016). Utility Dive. "In push to 33% renewables, Los Angeles launched low-income rooftop solar program." Retrieved from: http://www.utilitydive.com/news/in-push-to-33-renewables-los-angeles-launches-low-income-rooftop-solar-pr/431229/.

Framework Element	Program Element
Internal Structure	The City of Los Angeles committed to link its climate work with efforts to alleviate poverty and improve equity. The City's Chief Sustainability Officer articulated that sustainability requires addressing the city's income inequality.[53] Program managers at LADWP shared that equity is something staff think about daily and they strive to help those in need while serving customers and meeting their renewable energy goals.[54]
Decision-making	LADWP has a five-member Board of Commissioners that votes on utility rates, renewable energy projects, and other items.[55] The City Council's Energy and Environment Committee provides oversight and policy guidance to LADWP.
Participation in Decision-making	The Board of Commissioners is appointed by the Mayor. These appointments are approved by elected City Council members. Thus, the Commissioners are not directly elected, but the Commissioners' meetings are public and allow for public input. The public interest is also represented by the Ratepayer Advocate, who supported pilot testing the program and thinking about new and innovative ways to serve customers. The program design process included consulting internal stakeholders, reviewing research on best practices from the Solar Electric Power Association (SEPA), and using surveys and focus groups to solicit customer opinions.
Program and Policy Design	The program is designed to serve the regions of the utility's service territory that have received less benefits from solar. External outreach helped staff determine the program needed to be straight-forward in its structure and enticing to those with less disposable income. As such, participants' utility accounts must be in good standing to participate, but the program requires no credit checks, up-front cost, or annual fees for participants. Customers are guaranteed compensation regardless of energy production and are not responsible for operations and maintenance of the panels. The utility maintains ownership of the solar system and leases roof space from the homeowner. The program was designed for owner-occupied single-family homes to ensure the benefits went directly to the occupants and streamlined local approval processes for rooftop PV on single-family homes.
Beneficiaries	The program is open to all residential customers, including customers on lifeline and low-income rates, with accounts in good standing. The utility has given priority enrollment status to zip codes that have low solar participation. The LADWP used its data to classify city zip codes into areas with low, medium and high participation. The program offers utility credits of $30 monthly, or a $360 check annually over a 20-year period. The utility owns and maintains the system.[56] The program also creates local jobs for the Los Angeles community.

[53] Dovey, Rachel. (April 2015) 100 Resilient Cities, cross-posted from Next City. "Why L.A.'s ambitious sustainability plan is different." Retrieved from: http://www.100resilientcities.org/blog/entry/why-l.a.s-ambitious-sustainability-plan-deserves#/-_/.

[54] Interview with David Castro, Henry Gallegos, and Michael Buck of LADWP's Community Solar Program. (April 14, 2017).

[55] LAWDP. (2017) Board of Commissioners – Who We Are. Retrieved from: https://www.ladwp.com/ladwp/faces/ladwp/aboutus/a-whoweare/a-wwa-boardofcommissioners

[56] Los Angeles Department of Water and Power. (November 2016). "Rooftop Solar Program Guidelines." Retrieved from:

Framework Element	Program Element
Burdens	The systems on homes in the Solar Rooftops program deliver all their energy to the grid, as opposed to offsetting participant bills through net metering. Thus, customers in the Solar Rooftops program are still contributing their share to the utility's rate base. However, there are cost implications for non-participating customers due to the operating costs of the program, but the size of the pilot and the targeting of zip codes with lower solar penetration likely minimize impact. The financial returns from the utility solar ownership model, however, are lower than other potential solar PV financing options. Participants may receive a lower return on investment than other pathways for going solar.[57]
Siting	The utility is prioritizing siting projects in neighborhoods with more limited access and participation in clean energy programs. It is pairing these efforts with offers for energy efficiency improvements. The utility also has provisions for the removal of systems at no cost to residents should they decide they no longer want to participate, move, or require roof upgrades.
Communications	The program collaborates with outreach efforts from a residential energy efficiency program to increase reach and leverage existing efforts. LADWP is tailoring marketing to reach target groups, leveraging community organizations as trusted messengers, and using emails and physical advertisements.
Metrics	The goal of the program is to, "expand access to solar savings for qualified LADWP residential customers who otherwise may not be able to use solar because of the high cost of installing panels."[58] The utility is also interested in improving its use of local solar energy as part of its carbon reduction strategy. The LADWP Commissioners approved an Equity Metrics Data Initiative in 2016 to track, measure, and report on how their programs and operations serve LA residents equitably by neighborhood.[59]

https://www.ladwp.com/cs/idcplg?IdcService=GET_FILE&dDocName=OPLADWPCCB549807&RevisionSelectionMethod=LatestReleased

[57] Estimates based on EnergySage analysis for a 4 kW system in Los Angeles for loan, PPA, and ownership models. Net savings ranged from $7,900 up to $21,000 for a best case scenario. This compares to $7,200 bill credits or cash over the 20-year term of the Solar Rooftops program. The Solar Rooftops program is for 2 kW to 3kW systems, meaning savings are also proportionately less based on system size than a 4 kW system.

[58] Los Angeles Department of Water and Power. (2017) "Solar Rooftops." Retrieved from: https://www.ladwp.com/ladwp/faces/ladwp/residential/r-gogreen/r-gg-commsolarprogram?_adf.ctrl-state=3gl6quao7_4&_afrLoop=519051941283307

[59] Los Angeles Department of Water and Power. (August 2016). "Board of Water and Power Commissioners Approves Initiative to Ensure Equity of Water and Power Services across Los Angeles." Retrieved from: http://www.ladwpnews.com/go/doc/1475/2875333/Board-of-Water-and-Power-Commissioners-Approves-Initiative-to-Ensure-Equity-of-Water-Power-Services-across-Los-Angeles