THE STATE OF UTILITIES
in Smart Cities and Energy Innovation

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INTRODUCTION

We hear a lot about smart cities and new innovations in energy today—but not enough about how utilities can drive significant change in these areas. How involved are utilities really in these efforts? We decided to find out.

This project zeros in on the participation of utilities in building smarter, more innovative communities. We studied:

- **Utility roles in implementing smart city strategy and technologies**
- **Utility roles in supporting/driving energy innovation in their communities**

We measure large U.S. utility companies in terms of how they are driving change within large metropolitan areas. We focus on the largest metropolises in the U.S. and the primary utility serving each one. Where are our largest utilities and metropolitan areas in terms of smart city development? How much are utilities really driving energy innovation—beyond just deploying new technologies? That's what we're here to discuss.
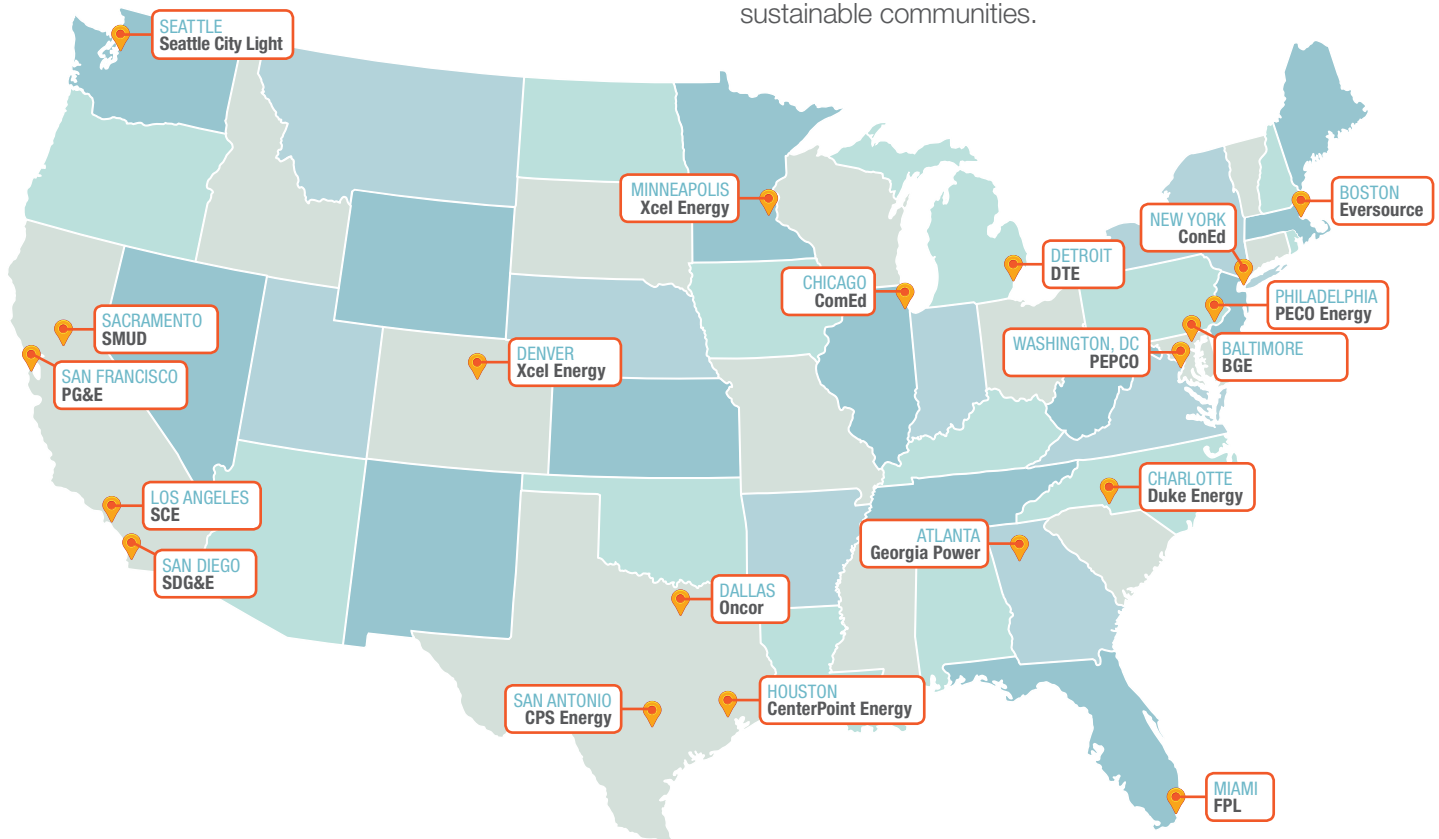
METHODOLOGY

We selected the 20 largest Metropolitan Statistical Areas (MSAs) in the U.S. by population, and then selected the largest utility companies serving them. We gathered secondary research for all 20 MSAs, and additional primary research for the top 10 MSAs based on our initial findings.

We identified key areas to assess for each metro area and utility, including:

- **Smart City Progress**
- **Energy Innovation Progress**
- **Community Impact**

We scored each area based on a variety of data points under these categories, and the data points are weighted based on their importance in building smarter, more sustainable communities.

U.S. map with metropolitan areas and their primary utilities:

- SEATTLE — Seattle City Light
- MINNEAPOLIS — Xcel Energy
- BOSTON — Eversource
- NEW YORK — ConEd
- DETROIT — DTE
- CHICAGO — ComEd
- PHILADELPHIA — PECO Energy
- SACRAMENTO — SMUD
- SAN FRANCISCO — PG&E
- DENVER — Xcel Energy
- WASHINGTON, DC — PEPCO
- BALTIMORE — BGE
- LOS ANGELES — SCE
- CHARLOTTE — Duke Energy
- SAN DIEGO — SDG&E
- ATLANTA — Georgia Power
- DALLAS — Oncor
- SAN ANTONIO — CPS Energy
- HOUSTON — CenterPoint Energy
- MIAMI — FPL

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KEY MEASUREMENTS

A smart city isn't just about technology. We considered three important factors for developing robust, vibrant communities.
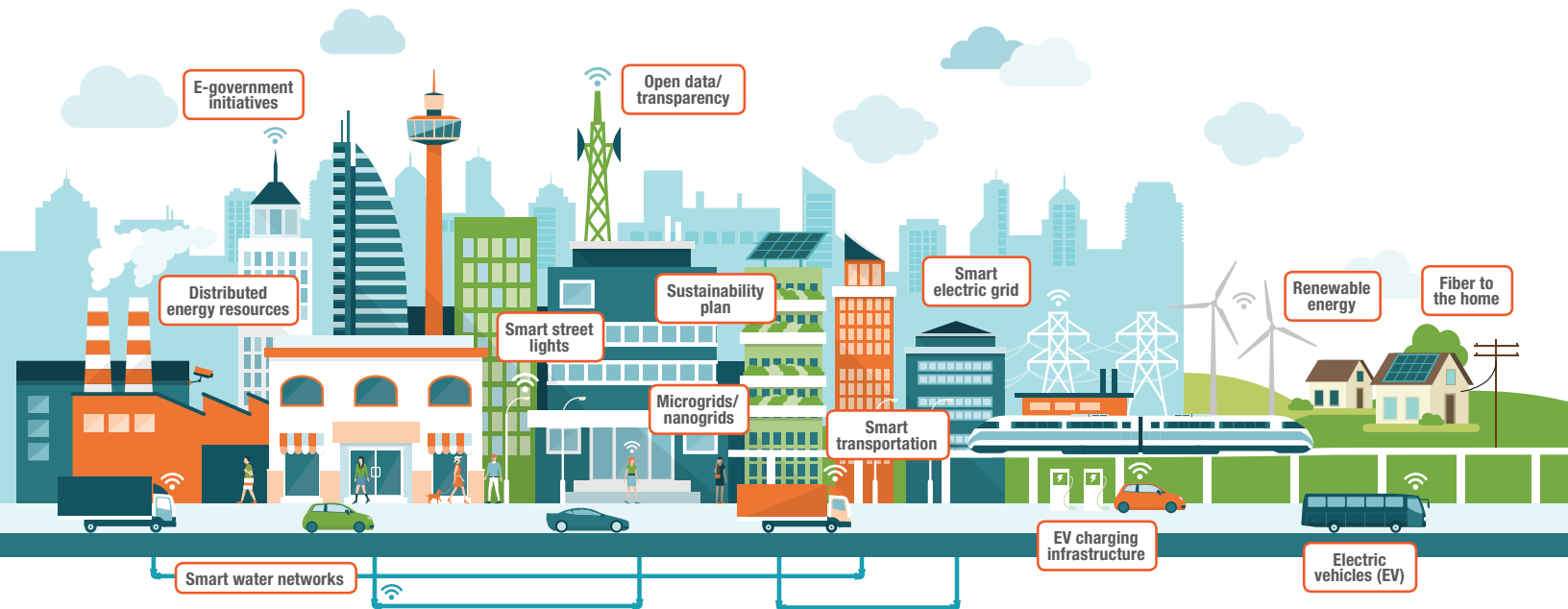
- **SMART CITY**
  How much smart city work is happening in a metropolitan area? How active are utilities, including their digitalization/ Utility of the Future efforts?

- **ENERGY INNOVATION**
  How much energy innovation is happening in the metropolitan area? How active are utilities in driving this change?

- **COMMUNITY IMPACT**
  What impacts are the combination of utility, smart city and regional innovation efforts having on the metropolitan area?

This section explores each of these areas in more detail.

SMART CITY

Smart city work is happening around the U.S., but it is important to understand how much utilities are participating in those efforts and driving them. Smart grid programs—and more broadly Platform of the Future initiatives by utilities—ultimately contribute to smart city efforts, but we want to also understand how involved each utility is in larger, more formal smart city efforts.

EXAMPLES OF SMART CITY INITIATIVES

EXAMPLES OF UTILITY OF THE FUTURE INITIATIVES
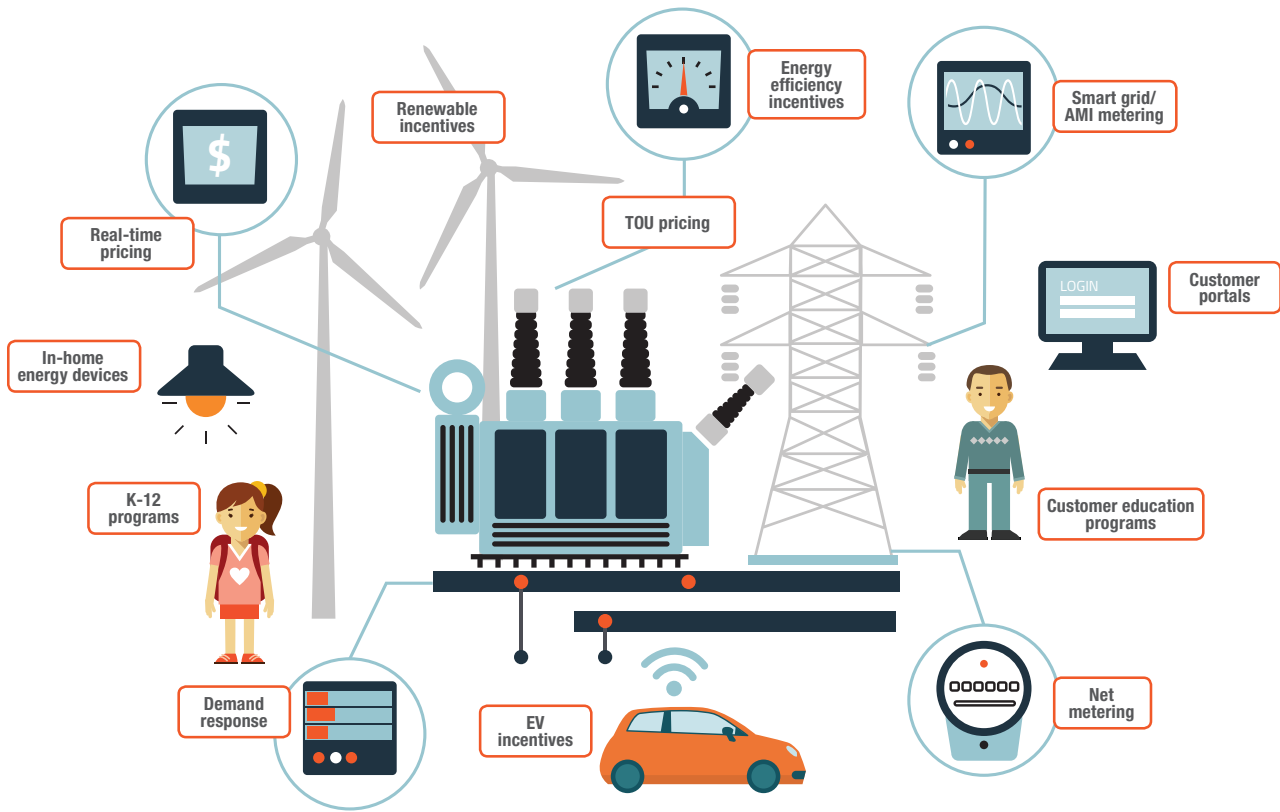
As we assessed each utility and metropolis, we considered the following factors:

Smart City Work	
Smart city plans	Does the metro have a smart city plan in place? If so, what's the progress?
Smart city participants	How many groups are participating? Who are these groups? How respected/well-known are they?
Key smart city components	How far along are specific projects overall? If there isn't a formal plan, smart city projects may still already be underway.
Regulatory support	Regulatory support is important, and we look across the efforts.
Utility involvement in formal programs	How much is the utility participating in the smart city efforts? How much are they supporting smart city programs in general? Are they the leading organization in these efforts?
Utility of the Future Work	
Key components	How many and what types of projects are going on at the utility? What are hotbeds within a certain community?
Program maturity	Overall, how far along are these programs?

ENERGY INNOVATION

Energy innovation at the regional level really looks at how to drive energy research and development within a community. Here, we're looking at opportunities to drive new ideas, new growth, and ultimately drive economic development for a community. For example, a startup company that develops a new energy-management app, or research that leads to a breakthrough in energy storage. This requires partnerships among research institutions, universities, startups, government—and of course utilities. How engaged are utilities in driving these types of innovation?

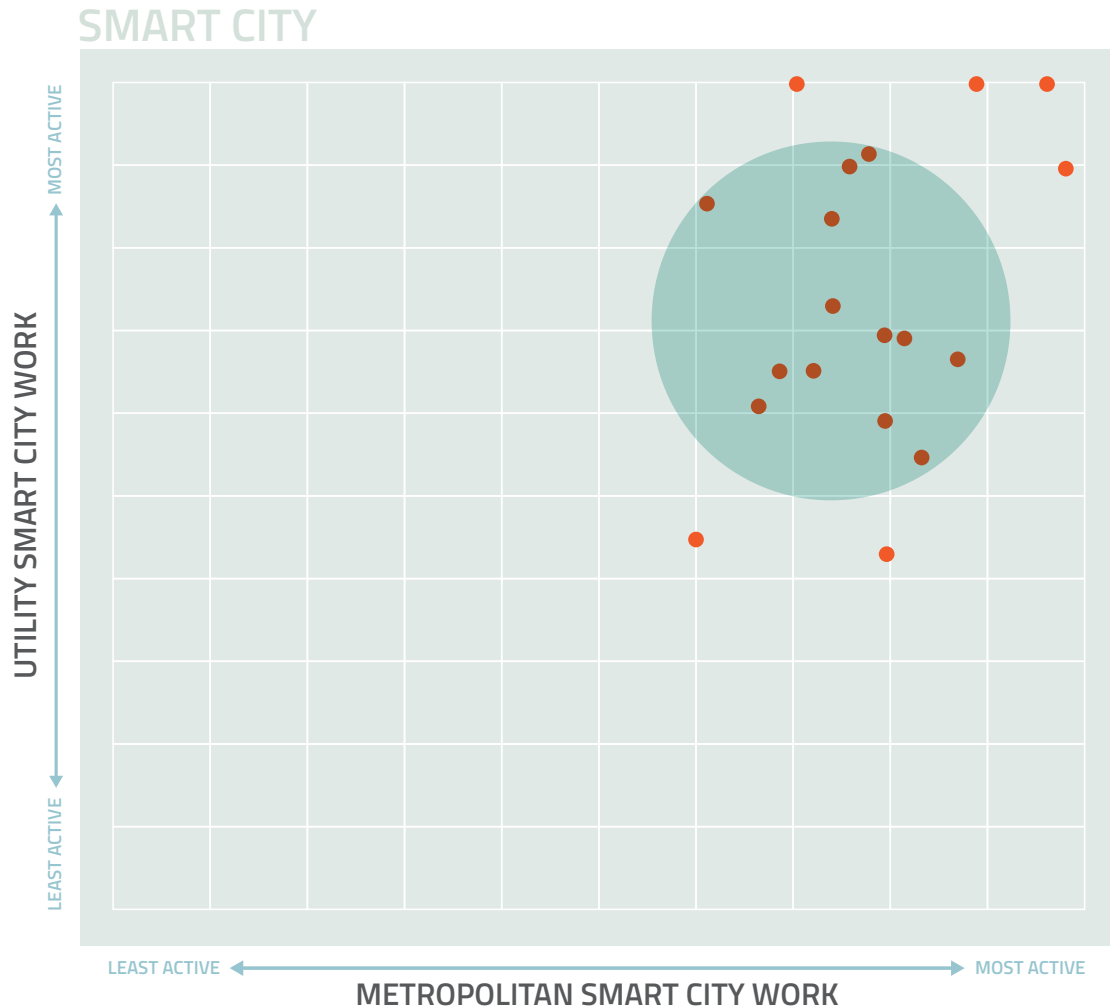| Regional Energy Innovation	
Universities + smart energy/cities	For each of these groups, what programs are going on in the region, and how influential are these programs?
Research institutions + smart energy/cities	
Startup incubators + smart energy/cities	
Other efforts + smart energy/cities	

COMMUNITY IMPACT

So, great work is happening in many cities, but what does it really mean for the community and its citizens? We also want to consider the impacts that these smart city and energy innovation efforts have on their communities. For this measurement, we look at the scores of utility efforts and how they compare with key measurements of community health—from customer satisfaction with a utility to job growth due to regional economic influences.

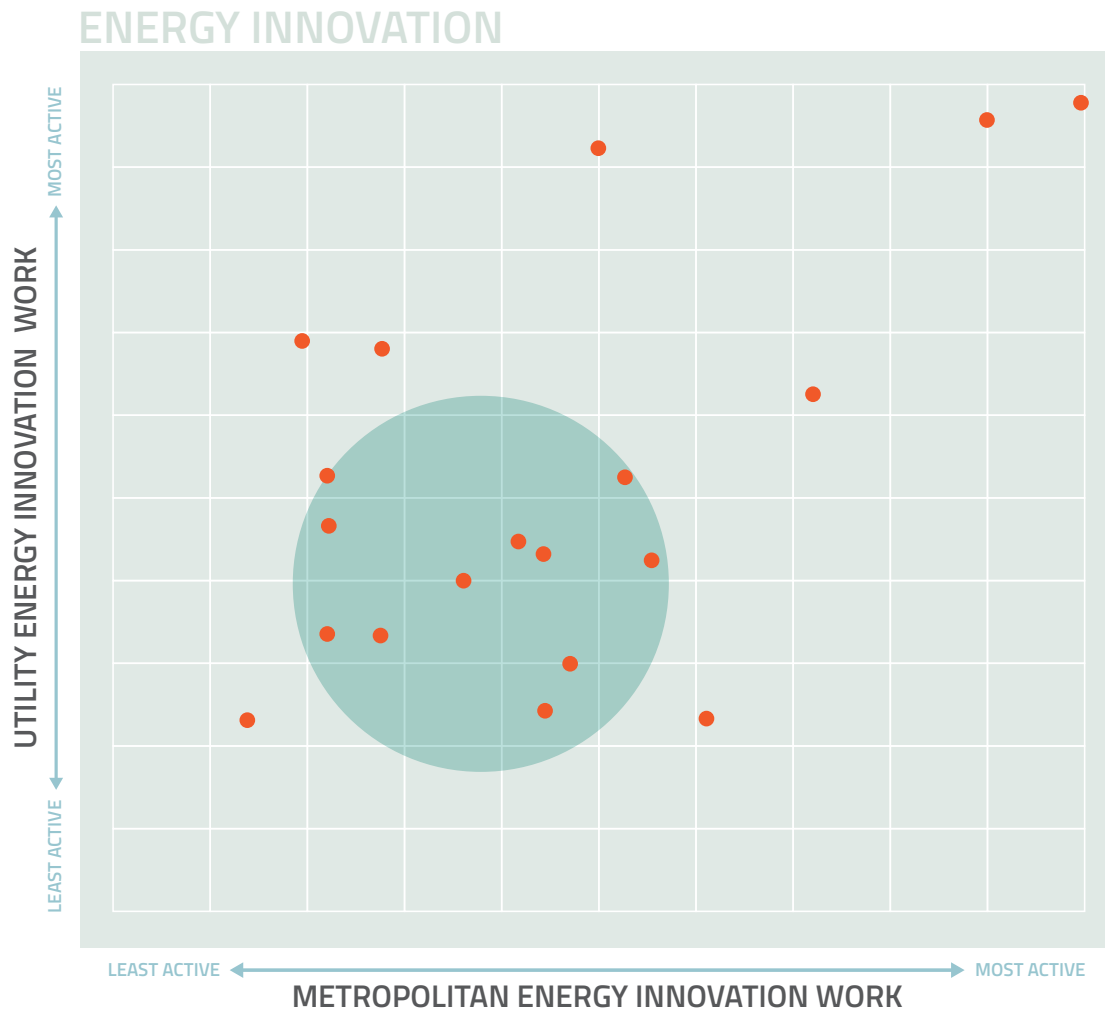| Community Impact	
Customer satisfaction	Utility customer satisfaction indicators, and changes in satisfaction.
Shift-share analysis	A look between 2005 and 2014.

ANALYSIS AND PROGRESS

Alright, so we've covered what we used to assess our metros and utilities. Let's see how things look.

SMART CITY

UTILITY SMART CITY WORK (vertical axis: MOST ACTIVE → LEAST ACTIVE)

METROPOLITAN SMART CITY WORK (horizontal axis: LEAST ACTIVE → MOST ACTIVE)

ASSESSMENT:
WORK IS BEGINNING, BUT WE NEED TO BETTER INTEGRATE CITY AND UTILITY EFFORTS

Smart cities are taking off across the U.S., and many cities have multiple programs underway. These programs often could use more collaborators from different sectors, as many are still led by technology companies, but cities and other agencies are starting to get more involved. Many utilities are finding success with smart cities via their grid digitalization efforts, however, in many cases, utilities don't see their digitalization efforts as a part of smart cities. Currently, the efforts are often viewed and treated as separate endeavors. There are definitely opportunities for utilities to better integrate their grid digitalization/Utility of the Future efforts with more formal smart city efforts.

ENERGY INNOVATION

UTILITY ENERGY INNOVATION WORK

MOST ACTIVE

LEAST ACTIVE

LEAST ACTIVE → MOST ACTIVE

METROPOLITAN ENERGY INNOVATION WORK

ASSESSMENT:
TECHNOLOGY INVESTMENTS HAPPENING, BUT NOT NECESSARILY INNOVATION INVESTMENTS

Overall, communities aren't as focused on this area as they are with smart city efforts. This is really the next level of encouraging growth within communities, and encouraging the development of energy innovation ecosystems and businesses that develop next-generation energy technologies. It is one thing to install a technology that has been developed elsewhere; it is another to develop the technology in your community which is then sold to others. A big question is: Who drives the focus on innovation and economic development around energy for a community? Is it the city? Is it universities? Could it be utilities?

COMMUNITY IMPACT

SMART CITY + ENERGY INNOVATION WORK

MOST ACTIVE

LEAST ACTIVE

LEAST POSITIVE ← → MOST POSITIVE

COMMUNITY IMPACT

ASSESSMENT:
WORK IS BEING DONE, AND WE'RE JUST STARTING TO REAP THE BENEFITS

There are a lot of "smart" and innovative efforts out there, but many are still young, and the significant impacts are yet to be seen. Customer satisfaction is growing among many utilities, but the growth in jobs in many cases has yet to materialize. We expect this to pick up as more of these projects grow and become established.

RECOMMENDATIONS

Things are moving along, but for the most part, we're still dreaming about the more digital world envisioned by the smart city movement. Making the true digital dream a reality is still a ways off, but we're talking about huge changes in infrastructure and the way communities operate—and that will take time. Projects are going on, but the scale and size of the projects still need to increase significantly to institute true digital change and innovation in cities and utilities. Utilities can play a significant role in driving forward change, but how? Here are some considerations:

MAKE THE GRID LESS INVISIBLE

Utilities think about the grid a lot, and work feverishly behind the scenes to produce incredible reliability. But electricity is so invisible that most people don't fully appreciate the complexity of the grid, and what it takes to deliver that reliability. Helping people outside the utility industry comprehend the complexity of the grid as we move toward more digitized infrastructure is critical to understanding how different parts of the smart city ecosystem can begin to work together.

BUILD THE TABLE FOR EVERYONE TO GATHER AROUND, AND THEN INVITE THEM

There are things like regulations, policies—and lawyers— that limit the involvement of organizations and encourage industries to remain in their silos, but that doesn't mean people can't be talking and building a vision together for the future of cities. There is a need to envision what this future looks like together, and then asking "Okay, how do we get this done?" Everyone must come to the table and understand one another. Utilities sending a government affairs person to work with communities isn't enough—cities need partnerships with utility leadership to be successful. Ambitious utilities can even help set the stage for the conversation and invite other key parties to participate. At the same time, those who aren't in the utility industry need to understand the complexity of delivering power and the unique challenges facing utilities, and invite utilities to their conversations with open arms and open minds.

RESET YOUR THINKING ABOUT WHAT MAKES A SMART CITY

Sometimes it can be as simple as terminology. Utilities are already doing a lot of activities that fall under smart cities, but they just classify it another way. Digitalization, electric vehicles, machine learning, grid edge technologies—they all contribute to smarter communities. However, often very progressive utilities don't view themselves as contributing to smart cities just yet.

GROW NEW TECHNOLOGIES

In terms of the more elusive idea of "energy innovation" utilities can provide a great path for cultivating innovation within their own communities. The complexity of solutions needed for the electrical grid makes it critical to test them at scale on a larger system. Many utilities have the opportunity to provide testbeds for new technologies. Utilities such as Sacramento Municipal Utility District (SMUD), Duke Energy, and ComEd are leaders in cultivating the energy innovation ecosystem by opening their grids to new technologies.