CREATING A SMART CITY ROADMAP FOR PUBLIC POWER UTILITIES

AMERICAN PUBLIC POWER ASSOCIATION™

Powering Strong Communities

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a Division of SmartMark Communications

www.PublicPower.org

AMERICAN PUBLIC POWER ASSOCIATION™
Powering Strong Communities

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The American Public Power Association is the voice of not-for-profit, community-owned utilities that power 2,000 towns and cities nationwide. We represent public power before the federal government to protect the interests of the more than 49 million people that public power utilities serve, and the 93,000 people they employ. Our association advocates and advises on electricity policy, technology, trends, training, and operations. Our members strengthen their communities by providing superior service, engaging citizens, and instilling pride in community-owned power.

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I. DEFINING SMART CITIES AND THE ROLE OF PUBLIC POWER UTILITIES

INTRODUCTION

Advancements in connected technologies, particularly communications networking and the Internet of Things (IoT), have transformed our lives and business. Across the board, industries are undergoing digital transformation, and the utilities industry is no exception. This transformation is happening on a macro scale as an industry, and on a micro scale at the utility level.

With the wide deployment of advanced meters throughout the country, utilities now have their own platform by which they can design future applications and programs.

Grid modernization is often discussed in terms of automation and security — how will the utility of the future leverage new technologies to enhance grid resilience, integrate more distributed energy resources, and improve customer experience? In addition, what role will the utility play in smarter cities, with its critical infrastructure and services at the core of city operations?

As the leading resource for public power utilities nationwide, the American Public Power Association is guiding its members through this critical digital transformation process by laying out this roadmap for the Utility of the Future in smart cities. This roadmap is derived from the essential mission of public power utilities to provide safe, affordable, and reliable electric service to its communities, and is developed as part of the Association's Public Power Forward initiative.

This paper offers guidelines and recommendations for public power utilities, while recognizing that each utility is as unique as the community it serves. While each path towards smart city may be different, the fundamental goals are the same: to leverage the latest technologies and business practices for improved operational and energy efficiency with the mission of improving customer experience and benefiting the community at large.

WHAT IS A SMART CITY?

To begin to scratch the surface of what a smart city is, it's critical to fully understand the term "smart." The term has come to be known as the de facto label on all things digital. Nearly anything with wireless connectivity has been labeled "smart." That's because new technology enables users to collect and track vast amounts of data in real-time. This data is then used to help businesses make "smarter" decisions. Yet, data collection and data application are not always in sync. Just because one has data does not always mean that they know what to do with it. For example, many utilities are still grappling with what to do with the vast amounts of data coming in from advanced metering infrastructure (AMI).

So, when we define the term "smart city", particularly for utilities, we must consider the essential meaning of the word smart — to have knowledge or intelligence[1] — with the modern term, which has come to mean data-driven and connected. In this paper, we will define smart as the intersection of digital with intelligence. Smart city, therefore, will refer to a city that leverages digital connectivity and data analytics to drive intelligent decision making.

Today, the definition of "smart cities" is not universally agreed upon. It can refer to a city that focuses on carbon reduction or is introducing electric vehicles. It could also refer to a city that has implemented municipal Wi-Fi or integrated solar and distributed energy resources. Cities across the globe that do any one of these things define themselves as smart.

An article from September 2018 that identified the top 10 smart cities in the world called out

[1] Merriam-Webster Dictionary; Oxford English Dictionary

Amsterdam for its advancements in urban planning, while recognizing Vienna for excellence in green energy for having its southern districts 100% dependent on renewables since 2015.[2] Closer to home, Boston is recognized for its emphasis on public management systems and advanced business ecosystems as well as its high-speed Internet. The article argues that "since transport and mobility can't be easily adjusted, it is connecting its citizens through more technological efforts."[3]

The point here is that each of these cities leverages technology to address specific community needs, and these communities are vastly different. But all of these cities have embodied the holistic term "smart" to apply technology to solve unique problems for its residents.

As a public power utility, this definition of smart city is the fundamental stepping stone to building a roadmap into the future. There will always be newer technologies, faster Internet speeds, more efficient transportation models, etc. Yet, taking the first step to identify the needs of the community is the foundation for a public power company's smart city roadmap.

The reality is that many utilities identify smart city initiatives as the next phase of smart grid efforts, piggy-backing on AMI investments and deployments.

A good example is CPS Energy, a public power utility based in San Antonio, which has been working with city leadership and other partners to develop a strategic plan for the community, called SmartSA. CPS Energy is leading the conversation around how the utility and its partners can bring new efficiencies into the community.

According to Paula Gold-Williams, CPS Energy's President and CEO, there is a direct connection between the smart grid and smart city conversation.

> "Since 2014, CPS Energy has been implementing our Smart Grid Initiative—a major upgrade to our electric and gas grid that supports reliability, boosts efficiency and reduces costs. The new mesh network is fully operational, and we are now 100 percent complete with the project goals.
>
> "We are also committed to meeting with as many different partner entities involved in the smart city dialogue…We want to learn and leverage opportunities to position of our community, so we can bring new efficiencies, offer new products and services, and improve the quality of life in our community."[4]

[2] Spiro, James. "Top Ten Greatest Smart Cities in the World," Editor's Choice, September 8, 2018."

[3] Spiro, James. "Top Ten Greatest Smart Cities in the World," Editor's Choice, September 8, 2018."

[4] Correspondence from CPS Energy, Jonathan Tijerna, October 11, 2018.

The Association recognizes the unique role of public power utilities in smart city efforts. The Public Power Forward initiative is designed to help public power utilities prepare for a new era in electricity.[5] The Public Power Forward initiative helps public power utilities to address changing customer preferences, rate design considerations, technologies, regulation, and market forces.[6] In this spirit, APPA is defining a smart city in this white paper as a city that betters the lives of residents and businesses through mindful investments and deployments of advanced technologies. Specifically, these efforts can improve energy efficiency, reduce carbon emissions and improve reliability and customer service.

These advanced technologies may include advanced network communications, adoption of IoT and applications, and the integration of distributed energy resources that will provide communities with improved automation and meet low carbon emission goals.

THE ROLE OF PUBLIC POWER UTILITIES IN SMART CITY

As we begin to understand the fabric of what makes a city smart, the question becomes, what role does the public power utility play in the design of smart cities?

As the provider of electric services to more than 2,000 towns and cities, public power utilities are the cornerstone of more than 49 million peoples' lives in the United States. This power fuels baby monitors and life-saving medical equipment, keeps homes warm in blizzards and the lights on during hurricanes. It keeps cars moving, restaurants open and our first responders equipped to do their job. It is by understanding the critical role of the utility and how it intersects with all aspects of everyday life that we can fully appreciate the responsibility public power has to lead smart city initiatives.

According to Sacramento Municipal Utility District (SMUD), an APPA member and public power utility in Sacramento, California:

> "Participating in the City of Sacramento's programs is a reflection of SMUD's vision statement—to be the trusted partner with our customers and community, providing innovative solutions to ensure energy affordability and reliability, improve the environment, reduce our region's carbon footprint, and enhance the vitality of our community."[7]

SMUD's participation in Sacramento smart city initiatives include 5G collaboration, green transportation solutions and clean grid initiatives.

"With SMUD's clean grid, electricity reduces greenhouse gas emissions by 70% right off the bat versus fossil fuels, and we are developing new ways to bring 100% renewable electricity to the transportation sector which will further reduce emissions and promote sustainability," said Bill Boyce, SMUD Electric Transportation Manager.

According to CPS Energy, through their partnership with New Energy Economy Partners, the utility is leveraging low carbon and renewable energy resources to stimulate economic and educational development within the community.[8] This is being achieved through a number of key activities including deploying smart meters, rebalancing its portfolio towards natural gas and renewables (including a commitment to use 20% renewables by 2020), and committing to a strategy that will reduce power plant emissions by tens of thousands of tons per year.

The appendix of this paper provides more detail on the smart city pilots and programs currently underway at SMUD and CPS Energy.

[5] https://www.publicpower.org/public-power-forward

[6] https://www.publicpower.org/public-power-forward

[7] Correspondence with Chris Capra, SMUD News Media Services, November 2, 2018

[8] Excerpted from an interview with CPS Energy President and CEO, Paula Gold-Williams, October 17, 2018.

SEEING THROUGH THE BLUR OF TECHNOLOGY

If one agrees that the first step for public power utilities is to recognize the importance of investments that transform and better a community and its residents, then the focus can shift to the technology that makes this transformation possible.

For utilities, the foundation of smart cities and a more connected, automated future, is the grid itself — the "smart grid." Utilities that have deployed AMI and can now connect to customers in real time have a platform and means of collecting important data. This data provides insight into load management and energy usage patterns. But smart grid infrastructure extends past AMI into automation and resiliency. Utilities are already feeling the challenges of grid transformation, from resource planning to ongoing maintenance and support.

The question facing many utilities today is how to take on more technology investments. What other technologies should utilities consider in laying out a roadmap for a smarter energy future and smart cities? What barometer should public power utilities use to determine which technologies or applications to begin with?

The industry is already swarming with millions of applications and solutions providers offering up answers to smart city adoption. Because the public power utility is owned and governed by citizens of the community, it is only natural that these customers be the focus of benefits and technology investment.

For public power utilities, this means asking, "Will this investment improve the community and the lives of the people in it?" Going back to the original definition of "smart," it also means asking if each technology decision is an intelligent and meaningful investment for customers and the community.

As a public power utility, you must understand your responsibility to the community to help guide the decision-making process. Keeping customer benefits front and center is likely to result in success, with both customers and stakeholders supporting your efforts.

The bottom line is that if the technology does not improve the lives of consumers, then the rationale behind investment is undermined. This is critical for public power utilities building the business case for large-scale technology transformation. In an environment governed by community stakeholders, the technology experts building the roadmap for a smarter future must be able to articulate the technology investment for customers—residential, commercial and industrial. This will not only dictate approval of such a plan and investment, but assure the support needed to undergo business, cultural, social and technological transformation.

WHERE DOES THE PUBLIC POWER UTILITY FIT IN?

Third party service providers are all throwing their hats into the smart city ring, seeing an opportunity to monetize the smart city transformation effort. Many of them are willing to work with public power companies to develop new technologies and services. But this investment, which is critical to advancement of smart cities, is challenged by the limited funds available through local government efforts.

According to the "Smart Cities Financing Guide," put out by the Smart Cities Council in conjunction with the Center for Urban Innovation at Arizona State University, smart city initiatives face major capital challenges. According to the report, the projects can expect to be funded through a mixed bag of investments including "Government-based financing tools, development exactions, public-private partnerships, and private fund leveraging options."[9]

The Association sees this overall industry challenge as an opportunity for public power utilities. Already the heartbeat of their communities, public power utilities are well-positioned to understand where cities need to go and how to take them there. The advantages to helping design the roadmaps for their own communities are:

- Control over strategic decisions in planning
- Reduced risk of monetary opportunity loss
- Reduced risk of core business loss
- Improved operational benefits to public power utility where they can identify synergies between grid modernization efforts and multi-use applications of existing technology investment
- Potential for seeking out future investment channels once utility blueprint and core direction is designed

There is risk for public power utilities not actively engaged in smart city conversations. These risks involve outside parties lobbying local government for new infrastructure guidelines and business strategies that may interfere with the day-to-day operations of the local utility. For example, telecommunications or cable companies are building new wireless networks or municipal Wi-Fi networks that can interfere with AMI.[10] Collaborative partnerships and communicating with local government can mitigate these types of risk. Therefore, SMUD's partnership with the City of Sacramento on 5G made sense, as there was a common need and synergies.

According to Bobbie Harris, SMUD Grid Planning and Operations Senior Project Manager, "SMUD worked collaboratively with the City of Sacramento to allow the City to directly connect small cells into their own wiring, while SMUD took care of wireless carrier billing. Due to this innovative arrangement, it assisted the City of Sacramento to quickly deploy 5G assets and become one of the first cities in the US to offer 5G Internet services to customers."

CPS Energy's partner engagement is another a good example of how close coordination with stakeholders is coupled with the desire to explore new products and services. The utility meets monthly with the city of San Antonio to discuss planning and product pilot opportunities under the SmartSA umbrella.[11] Recently, the utility established "innovation zones" throughout various parts of the community that Gold-Williams said serve as "a real-world testing ground to pilot smart city technology."

Another risk for utilities not engaging with the public and private sector on smart city initiatives is potential restriction from future business models. Therefore, public power utilities need to engage in conversations early in the process to make sure there is proper coordination, as well as to ensure their interests are not superseded.

[9] Burst, Jesse. "Smart Cities Financing Guide." Developed by the Center for Urban Innovation at Arizona State University.

[10] PG&E's final Electric Program Investment Charge (EPIC) report references the specific challenges of the states that the utility "does not have technology to continuously monitor, analyze/diagnose and identify RFI that may impact the 400 MHz, 900 MHz, and 2.4 GHz AMI networks. This is a key risk and obstacle as network utilization grows and the need for monitoring communication paths and identifying radio communication interferences becomes more time and cost pressuring."

[11] Excerpted from an interview with CPS Energy President and CEO, Paula Gold-Williams October 17, 2018

One area of contention and competition is the smart home. While it is common for utilities to offer demand response or smart thermostat programs, it is entirely possible that the local communications providers have competing smart home programs. These new in-home set top boxes or communications lines may interfere with expensive AMI investments. These products also compete with new electric infrastructure in the city. Whose pole goes in where and what will be connected to it?

Of course, there is the continued debate around who will own and monetize electric vehicle infrastructure and how much can be installed without interfering with load patterns. A utility's dynamic pricing programs should also correspond with electric vehicle mass adoption in urban areas. In a smart city, all these factors must be considered.

Again, SMUD, has been proactive in electric vehicle discussions with the City and other stakeholders.

SMUD was instrumental in forming the Sacramento Plug-in Electric Vehicle Collaborative which brings all the electric vehicle stakeholders together in the region to promote and plan for the use of electricity as a transportation fuel. The Sacramento PEV Collaborative includes: SMUD, City of Sacramento, County of Sacramento, SACOG, SMAQMD, Valley Vision, Universities and the Sacramento Electric Vehicle Drivers Association.[12]

In a smart city environment, the public and private sectors must align, and stakeholders - sometimes with opposing interests - must communicate and coordinate with each other. Given the role of local government in the design of the smart city, the public power utility must therefore play a critical role early on, well before the race for opportunity among third parties begins.

As the power utility is owned by its customers, it is imperative that public power utilities shape the vision for their service territories and their customers' experience. That means thinking about the future of smart technology holistically—and

not just in terms of electric, water, or gas service delivery. That is because public power utilities, along with all utilities, must tackle the daunting task of asking what they will look like in the future.

Innovation and forward thinking also play an important role in evaluating which new technologies and applications that are central to smart city planning. One example is how SMUD has taken part in Autonomous Vehicles in Sacramento. By working with the City and other stakeholders, they are promoting Sacramento as an Autonomous Vehicle certification center. According to Bill Boyce, SMUD Transportation Manager, "Since many if not most of the autonomous vehicle concepts are baselining electricity for the propulsion fuel, SMUD has a natural role in promoting AV's in our region. AV's are at the heart of many advanced smart city mobility concepts and we see this as a way to help improve the Sacramento region into the future."[13]

Again, as each public power utility serves a different and unique market, determining which innovative technologies make sense for their smart city roadmaps will become a more personalized decision. That decision, most likely will be determined jointly by the utility, the City and its relevant stakeholders.

[12] Correspondence with Chris Capra, SMUD News Media Services, November 2, 2018

[13] Correspondence with Chris Capra, SMUD News Media Services, November 2, 2018.

II. BECOMING PART OF THE SMART CITY CONVERSATION

This paper began by talking about macro and micro-transformation efforts necessary to advance smart cities.

On the macro-level, the industry must unite in terms of identification of roles and responsibilities in the smart city development process. This means getting buy-in from leadership across the industry around defining the role of public power utilities in smart city advancement. It also means communication as an industry with key stakeholders at the national level to understand the importance of public power leadership in these efforts.

Then, on an individual level, public power companies must determine what specific criteria make up our independent smart city blueprints. On the micro-level, stakeholder engagement is critical. Communications and planning with other key infrastructure and service providers on the local level will ensure that all paths are unified and resources aligned. There is a strong chance that these sources will become critical supporters, if not necessary allies in the smart city development process.

Where does the public power utility begin in these dialogues? What key requirements must they develop to facilitate these conversations and ultimately change?

To communicate on the micro and macro-level, section IV of this paper outlines an initial set of questions that can help lead these conversations to a preliminary smart city blueprint. By creating a template for key criteria, The Association is helping public power utilities communicate their role and important requirements to national and local stakeholders as well as the community. The template will also serve as a guide for the development of internal processes at the public power utility to ensure a smooth transition into the smart city future.

III. SECURITY PLANNING

In the smart city ecosystem, public power companies are inviting new strategic partnerships and new connectivity options into the traditional utility network. With the introduction of advanced metering and network-connected grid operations devices (e.g., SCADA), as well as the overall adoption of wireless and Internet-based connections into utility communications, security has become front and center. How can utilities open their minds and innovate without the risk of compromising this new ecosystem?

As new complex digital ecosystems like smart cities emerge, utilities must consider cyber and physical security a top priority and assume these considerations into its strategic plan. For this reason, the Association is authoring a separate guide for public power utilities. The guide breaks down security concerns into four critical areas:

- **Protection** of utility assets
- **Detection** against intrusion
- **Intrusion** response
- **Recovery** and return of system to operation

While physical threats to the utility may appear more overt, cyber threats offer an additional layer of concern for public power utilities, particularly those considering smart city initiatives and new out-of-industry partnerships. All parties in these partnerships need to be aware of cyber risks and develop a culture of cybersecurity to protect the smart city ecosystem.

How do utilities prepare for the cybersecurity threats that are being introduced to new complex smart city networks?

The Association's Cybersecurity for Energy Delivery Systems (CEDS) program, funded through a cooperative agreement with the Department of Energy, helps advance cyber resiliency through security assessments, education, outreach, and introduction of new technology.

As part of this effort, public power utilities can use the separately created Public Power Cybersecurity Scorecard, which assesses a utility's capabilities and progress in the following domains:

- Cyber Asset Inventory
- Configuration Baseline
- Access Control
- Vulnerability Management
- Threat Management
- Cyber Risk Management
- Cyber Event Detection
- Cyber Incident Response
- Operational Resiliency
- Monitoring Cyber System Activity
- Cyber Threat and Event Information Sharing
- Supply Chain Risk
- Workforce Management and Cybersecurity Training
- Cybersecurity Program Management

The Public Power Cybersecurity Scorecard can be found at www.publicpower.org/resource/cybersecurity-scorecard.

Detailing the best practices and methodologies around utility cybersecurity far exceeds the space limited to this white paper. This topic should be top of mind for utility leadership and the IT and security experts designated as part of the smart city project management office (PMO) proposed in this white paper. The one thing to take away is that the smart city invites new partners into the utility network and communications supply chain, and these partner relationships must be underlaid with trust and strong data sharing and security processes in place, all while utilities protect the privacy of customer information.

An important consideration for utilities looking to adopt smart city models will be the allocation of often limited information technology resources. Recently there has been a trend within utilities to better align IT and operational technology (OT) resources. As public power utilities digitally

transform and prepare to work in more complex connected environments, there is a greater need to think about technology and connectivity holistically and improve collaboration between different IT and technology resources within the utility. This means not only including central IT in any kind of PMO, but also leveraging IT from other departments like water, public safety, transportation, etc. [14]

In the context of smart city, this is not only important for security purposes but also to better leverage innovation, resources and synergies throughout the municipality.[15]

While today's public power utility may already be conducting grid security exercises and information sharing with local, state and federal government agencies, there may be an opportunity to improve data sharing with new ecosystem partners as part of smart city initiatives. While information sharing agreements are not uncommon from utility to utility, smart city environments which invite in other sophisticated communications networks (e.g., transportation and communications) may also offer up an opportunity not just to accelerate a more convenient and automated lifestyle, but hopefully a safer and more secure one.[16]

As public power utilities work through their smart city roadmaps, such partnerships and data sharing plans should be critical parts of the conversation.

[14] Christopher Kelley, PMP, Vice President, Beam Reach Consulting Group, LLC

[15] Christopher Kelley, PMP, Vice President, Beam Reach Consulting Group, LLC

[16] Christopher Kelley, PMP, Vice President, Beam Reach Consulting Group, LLC

IV. WHAT STEPS MUST UTILITIES TAKE?

It is time to break down what, specifically, public power utilities must do to engage and lead the smart city conversation.

The first step in the development of the smart city roadmap for public power utilities is to answer the following questions that identify critical information:

PEOPLE, STAKEHOLDERS AND PROCESSES

1. Which person at the public power utility is best poised to lead the smart city effort (CEO, CTO, CIO)?

a. Person must have control over people and processes at the utility
b. Person must have strong leadership and management skills
c. Person must have strong stakeholder communications skills
d. Is this the same person that will manage internal and external relations?
e. Can this person create and manage a project management office?

2. What does a smart city project management team or project management office look like?

a. Project lead (Reports to CEO, CTO or CIO depending on size of utility)
b. Process lead – responsible for development of schedules and core functions and processes
c. Regulatory/stakeholder contact – who can manage external communications with key stakeholders
d. Communications support – to develop public-facing materials and manage public relations as necessary
e. Representatives from energy efficiency, grid modernization, IT security, fleet management, reliability, security, metering, customer care and innovation

3. Identify the external stakeholders this group needs to engage and ask the following questions:

a. What does that engagement look like?
b. Is this a formal engagement or informal?
c. How frequently are they engaged?
d. What level of engagement is recommended and when?

MATERIALS

1. What materials must be developed to support the project management office and smart city efforts?

a. Smart city mission statement with goals as identified by utility that align with grid modernization efforts
b. Identification of clean energy and reduced carbon emission goals
c. Identification of key stakeholders in the community necessary to advance efforts
d. External communications plan to support community buy-in
e. Initial projected timeline by phases
   This is a living document that starts with the utility's operating plan and budget and then is reviewed by the project management office to overlay smart city considerations
f. Outline of project costs and funding plan
g. Identification of key milestones and metrics for the next 5-10 years

OPERATIONS: KEY IMPACTS

1. What are the key considerations across the utility for smart city activity?

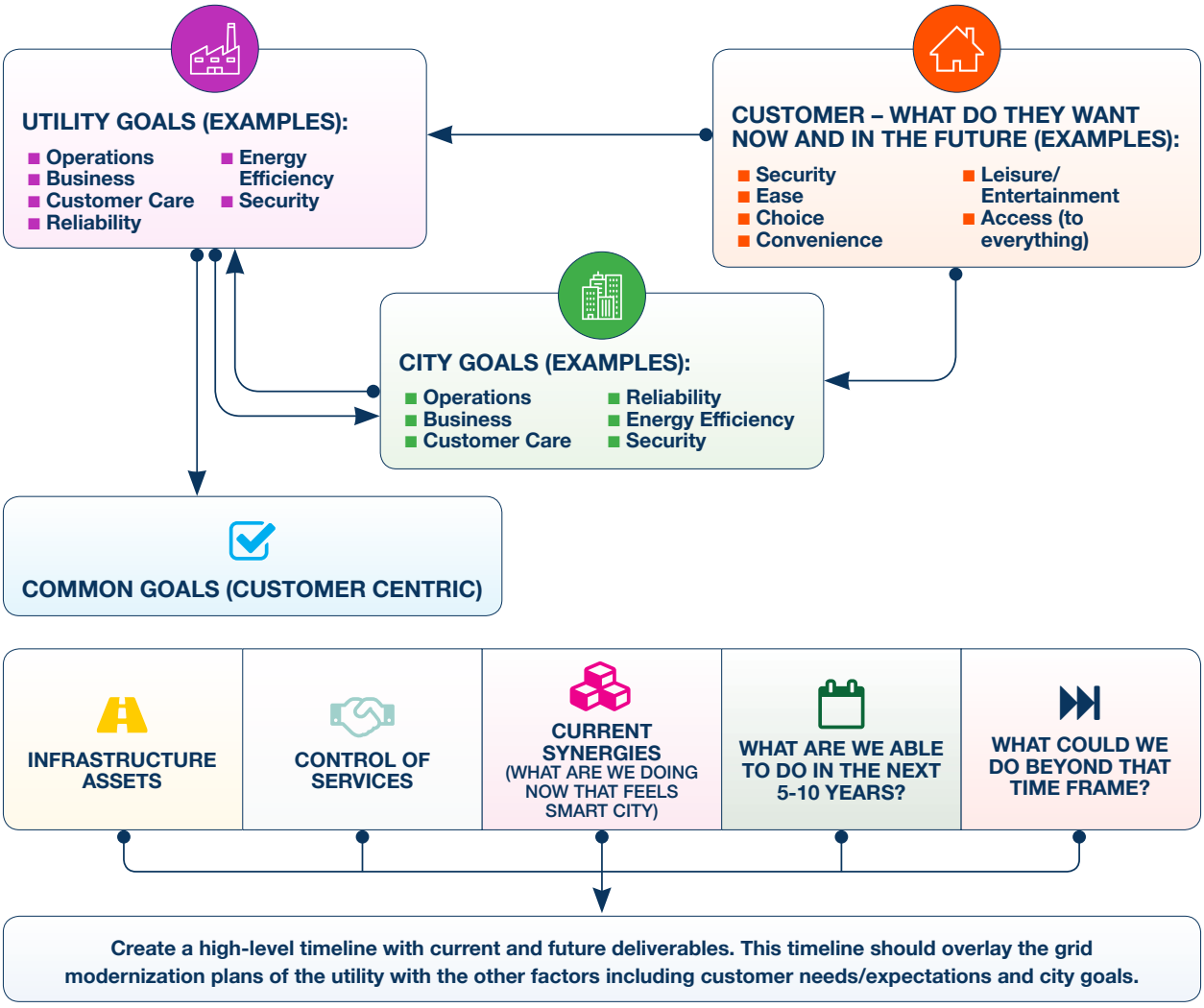
a. Identify top security concerns and process for development of smart city security plan
b. Identify areas within current energy efficiency group that map well to goals of smart city project. Identify exploratory future programs that may align with strategy
c. Identify key areas of automation that are currently part of grid modernization efforts and any alignments with smart city model; Identify opportunities to leverage current and future infrastructure for smart city efforts
d. Identify current synergies in disaster response policies and new areas for consideration
e. Look at overall goals of smart city and see where the utility can contribute in areas of lifestyle and convenience (in current service territory)
f. Identify key utility goals for operational efficiency and consider what smart city actions can help facilitate these goals
g. Identify what accounting and financial efficiencies may be achieved through smart city efforts

V. BUILDING THE ROADMAP

Now that the public power company has assembled the information necessary to start developing a roadmap, it can begin to think about an outcome and the path to get there.

Below is a proposed "map" to begin laying information down into a shareable internal and external document to help communicate internally and to stakeholders the public power company's smart city plan.

It is important to remember what was said in the beginning of this paper: Smart is the intersection of knowledge and connectivity, and the public power utility should focus on the customer. How will the utility make their lives and their communities better smart technology investments and applications?



Once this has been roughly thought through, the next steps are to:

1. Summarize this into a few slides to share externally
2. Identify other companies, partners, and service providers can help build this picture
3. Begin to share the story
4. Seek out support financially and through regulations where needed
5. Summarize and highlight customer benefits on dedicated slides

VI. SUPPORTING THE UTILITY OF THE FUTURE AND SMART CITIES

WHAT DOES THE PUBLIC POWER "UTILITY OF THE FUTURE" LOOK LIKE?

Across the industry, utilities are considering how to define the Utility of the Future. Yet, there are no standard guidelines or recommendations for utilities to set a future path. However, some aspects of the utility of the future are definite.

- The future is smart, and the utility must be as well
- The grid should evolve to adapt to changing technology
- The electric utility industry is undergoing digital transformation
- Future utility leaders and customers expect technology to drive convenience
- Customers are playing a more critical role in shaping the utility of the future – because they can
- Technologies and applications will disrupt the current environment and utilities must be prepared to embrace them
- The digital age is causing unprecedented challenges and opportunities for the electric grid and the grid must adapt

These themes will shape how public power utilities begin to define what the Utility of the Future. It will also help utilities understand the steps they need to take to evolve and become critical components of smarter cities. But, one size does not fit all. Each path forward will be unique – focused on the people and communities they serve.

As utilities begin to undertake the task of leading smart city development, they must consider that they are already in this role. As owners of much of the supply and demand for cities and towns around the country, public power utilities are helping to lead grid transformation efforts. It is not a stretch to think how these efforts will impact other facets of society, particularly when you put the customer in the middle of the conversation.

The Association supports public power utilities as they undergo their individual and collective transformation to utilities of the future and leaders in smart city efforts.

This roadmap serves as a first step in educating public power utilities as they begin adopting smart city programs. The Association will continue to work with its members to provide additional resources on smart cities, including webinars and other opportunities for public power utilities to share insights and lessons learned. Public power has always been at the forefront of promoting change in the electric industry, and the Association will work with its members to facilitate that change and development in the future.

APPENDIX

CPS ENERGY LONG TERM STRATEGY AND PILOT OVERVIEW

According to CPS Energy, in addition to their SmartSA efforts described in the paper, they are also having a public discussion around our **Flexible Path**. The **Flexible Path** is a new look at power generation planning for the community. CPS Energy explains as follows:

According to Paula Gold-Williams, CPS Energy's President and CEO, being proactive about leveraging new technology is central to the utility's vision for the future. "Traditionally, as our community grew, we would build generation for it. Looking forward, we want to implement new strategies around embracing and enabling new technology while leveraging our community owned generation assets to achieve a future with more renewables and new technology like energy storage."[17]

Below is a list of what some of their current pilots look like.

Microgrid at Joint Base San Antonio-Fort Sam Houston. The microgrid generates and releases energy, as needed, by pairing solar systems with battery storage technology.

Air Quality Data Collection. CPS Energy is collecting ozone and weather data from six stations in Bexar, Comal and Guadalupe counties previously maintained by the Alamo Area Council of Governments (AACOG). By combining the six stations with the two stations CPS Energy currently maintains, the region will get efficiencies while still maintaining the quality and integrity of the data.

Solar Host Program. A no-cost solar program where PowerFin, a CPS Energy partner, installs a rooftop solar system on a customer's home at no cost. The customer then sells the generated power back to CPS Energy, resulting in a 20-30 percent savings for the customer.

LED Streetlights. Current pilot project in one of San Antonio's City Council districts. The new LED solution is giving control to park administrators, so they have the ability to reduce and raise the LED output. This is a great public safety initiative, while also reducing costs and electricity generation.

Solar & Energy Storage. Ground breaking for this project was October 8, 2018. In partnership with Southwest Research Institute, this will be a first of its kind project for our region as we will use renewable power (solar) with battery technology to supply generation during high energy use time during the day.

Electric Vehicles. We currently have 150 level 2 public chargers throughout our community. Additionally, we are in the process of creating a new pricing signal for 3rd party vendors looking to install EV super chargers to enable the adoption of electric vehicles.

[17] Correspondence from CPS Energy, Jonathan Tijerna, October 11, 2018.

A LOOK AT SMUD'S CURRENT SMART CITY PROJECT PARTICIPATION[18]

The City of Sacramento's Smart City program is a collection of projects and policies that the City has identified as "the opportunity for information and technology as a tool to provide services its citizens: including accessibility, affordability, choices, coordination, and efficiency."

Whether part of the City of Sacramento's Smart City program or projects and policies of any of their local agencies partners, SMUD staff offers expert background information so that the community and customers can embrace a sustainable low-carbon future while still balancing affordability, reliability and customer choice in their electric service.

Below is a list of ways SMUD works regularly with the City of Sacramento on smart city initiatives.

- Developed application and billing processes to allow for wireless small cell devices to be mounted on unmetered city-owned street lights;
- Provides 13 megawatts of solar power for the City buildings through the SMUD SolarShares program;
- Provides solar-power programs and energy efficiency operations at the Golden 1 Center;
- Provides energy efficiency programs and incentives for community residents and businesses;
- Offers plug-in electric vehicle charging incentives;
- Promotes the city's use of electric vehicle fleets through pilot programs and charging infrastructure incentives;
- Serves as a resource for development of curbside electric charging ordinance language now being prepared for city council review;
- Supports infrastructure development for electric buses for micro-transit and commuter use;
- Offers expert reference support on development streamlined building permit checklists for rooftop solar and for electric vehicle charging; and
- Acts as resource on autonomous vehicle testing programs being considered by the City.

[18] Correspondence with Chris Capra, SMUD News Media Services, November 2, 2018

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