Realizing the Potential of Smart Cities

BY JESSE BERST

There's been a lot of buzz about smart cities of late, and with good reason. Just as utilities increasingly feel the pressure to modernize, so do city leaders around the world.

Those leaders want to bring smart city benefits—better livability, workability, and sustainability—to their residents. One of the most effective ways to do that is to implement information and communications technology throughout a city's infrastructure.

In the simplest terms, there are three parts to the job: collecting, communicating, and crunching. First, a smart city collects information about itself through sensors, monitoring devices, and existing systems. Next, it communicates those data using wired or wireless networks. Third, it crunches (or analyzes) those data to understand what's happening now and what's likely to happen next.

Thus, a smart city knows about itself in real time. No longer do city personnel have to wonder if a street is congested—the street reports its condition. Rather than responding to water leaks after they happen—the smart water network detects and reports leaks as soon as they occur. Instead of guessing the progress of the city's garbage trucks—the trucks report where they've been and where they are headed.

Cities cannot become smart or sustainable without a utility partner. Energy plays a critical role in almost every aspect of a city. It pumps the water people drink and processes the waste they create. It lights and heats homes, schools, and businesses. It fuels cars, light rail, and subways, and powers the technologies that are the foundation of a smart city.

Energy (especially electricity) is one of the two pillars of a smart city. The other pillar is telecommunications. It's not that these two things are more important than other issues, such as transportation, economic development, and education. But the solutions to those other issues inevitably rely upon electricity and telecommunications.

It is important to consider why smart cities are inevitable, what the smart city label really means, and why utilities need to be a part of the discussion right from the beginning.

Smart Cities Are Inevitable

People are moving to urban centers today in staggering numbers. The World Health Organization (WHO) reports that the number of urban residents is growing by 60 million every year. By 2030, WHO believes six out of every 10 people will live in a city, and by 2050, the proportion will increase to seven out of 10. Put another way, urban populations will almost double over the next 40 years, increasing from approximately 3.4 billion in 2009 to 6.4 billion in 2050.

It's easy to imagine the impact that kind of growth is already having on city infrastructure—particularly in the developing world where infrastructure may be missing or woefully inadequate to keep pace with surging populations. For many, a real eye-opener was the massive 2012 blackout in India that left more than 600 million people without electricity.

Cities will never be able to handle this growth and solve these problems through manual means. They have no choice but to harness the power of computers to help them.

Today there is some real momentum in pioneering cities around the world. Just as electric utilities are deploying sensors, smart meters, and other intelligent devices to build more reliable and resilient electric grids, cities are starting to add intelligence to infrastructure they are responsible for—such as transportation systems, buildings, and public safety operations.

For example, some cities are crunching data sent from roadway sensors and rolling stock to provide situational awareness that gives their transit-system operators a real-time, big-picture view of what's going on around the city. This enables them to spot problems early and act quickly to mitigate them. If an accident has a major thoroughfare blocked, knowing about the accident in real time gives

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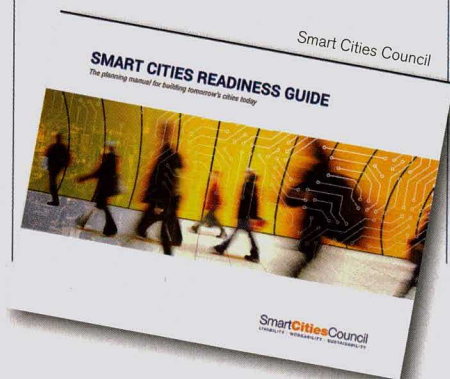
Urban populations will almost DOUBLE over the next 40 YEARS

FROM

2009 **3.4 BILLION**

TO

2050 **6.4 BILLION**

transit operators a chance to reroute buses. Places like Singapore are going one step further: They are predicting with great accuracy when and where congestion is likely to occur and taking steps to mitigate the problem.

A System of Systems

It's important to understand that a smart city isn't simply one that has invested in an intelligent transportation system or deployed a smart electric grid, nor is it simply one that builds out a smart street light network. A truly smart city is a system of systems where water, power, transportation, emergency response, and the entire built environment—which encompasses all human-made infrastructures—all affect one another.

When the individual components of that system of systems are connected via citywide communications, the advantages pile on. As the earlier traffic example illustrated, knowing about the blockage will certainly help transit operators reroute buses. But what about emergency responders? Having that same information in real time could be a

life or death matter if they are responding to a call using that same thoroughfare. Perhaps the accident was the result of a storm that darkened traffic lights. Getting that information to utility repair crews in real time also is essential.

The city of Nice, France, has teamed with Cisco to pilot a next-generation smart street called "Connected Boulevard." The project is testing a whole host of technologies and using some 200 different sensors and detecting devices in the process. Data captured through the devices are processed and analyzed to offer the city and its residents invaluable context-aware information on parking, traffic, street lighting, waste disposal, and real-time environmental quality. Early projections from pilot tests suggest a 30-percent decrease in traffic congestion and significant air pollution reductions, combined with an increase in parking revenues. Cities that make themselves more livable while simultaneously putting more money in their coffers are pretty smart indeed.

Utility Executives at the Table

Public and investor-owned utilities—electric, gas, and water—all need to be at the table when city leaders start planning smart infrastructure improvements. There are obvious, inescapable synergies between utilities and the cities they serve, and as evidenced in some pioneering initiatives, there are mutual benefits as well. Let's consider just a few ways cities are realizing those benefits:

▶ **Bringing energy efficiency to Main Street.** In 2013, National Grid opened the doors of New England's first-of-its-kind Sustainability Hub in downtown Worcester, MA. The hub offers hands-on education about energy efficiency and emerging energy technologies for the utility's customers and the community at large. The intent is to help them learn how to maximize their energy savings with a better understanding of smart energy solutions. Through the hub's exhibits and demonstrations, people can learn about everything from smart thermostats to smart meters to energy efficiency treatments.

▶ **Developing energy pro-sumers.** To illustrate how smart grids shape smart cities, an Électricité de France (EDF) pilot in Carris, France, intends to turn passive residential and business consumers into active pro-sumers—or producer-consumers. They're participating in what is being billed as Europe's first smart solar district demonstration. Leveraging a variety of smart technologies from Alstom Grid, EDF's customers will play an active role in the production of renewable energy and in the regulation of power consumption.

▶ **Smart grid bonus: ultra-fast broadband.** Residents of Chattanooga, TN, can browse 10 to 100 times faster than in most American cities. That's because the city's public utility, EPB, needed citywide communications to accomplish its grid modernization goals and agreed to put in a state-of-the-art broadband network that could serve its needs and those of Chattanooga residents and businesses. Bottom line, the smart grid helps subsidize consumer internet access. In fact, EPB makes about $50 million per year by selling internet access to residents.

▶ **One network runs three meters.** Itron deployed water, heat, and gas meters, as well as a wireless fixed network and software, for the Eco-City in Tianjin, China. It is China's only unified platform that manages

When fully completed in 2020, the Eco-City in Tianjin, China, will have a population of 350,000 residents.

water, heat, and gas data together under one system. The network allows the city to achieve its vision of energy and water resource conservation by providing actionable data, such as high accuracy readings and reading rates, automatic meter reading, and graphical data analysis to educate residents about their energy and water usage.

Granted, it may be much easier for municipal utilities to take a seat at the smart city planning table. But with many regional investor-owned utilities looking for ways to finance grid modernization, teaming with cities to provide broadband access could create another much-needed revenue stream. Likewise, utilities that own and operate street lights may be able to turn them into even bigger revenue streams by using them to carry communications networks, video cameras, microphones for gunshot detection, and other technologies of value to cities.

Grid modernization efforts have dependencies under the purview of city hall that can't be overlooked. A smart grid is by definition a specialized communications network that moves electricity and data to balance supply and demand and maintain reliable service. The distribution lines and underground cables that are part of the energy grid often follow the layout of city streets (part of the built environment), creating dependencies between utility services and the various transportation systems that also rely on streets.

The built environment is a major consumer of electricity and natural gas—and potentially a producer of electricity, too. As distributed generation evolves and building owners adopt solar, fuel cell, and related technologies, utilities and city governments will form even closer alliances. **EP**

National Grid