Smart City Use Cases and Examples

Glenn A. Pritchard
May 2019
Exelon at a Glance

ABOUT EXELON

$33.5 BILLION IN OPERATING REVENUE

$116.7 BILLION IN ASSETS

$5.3 BILLION INVESTED IN UTILITIES IN 2017

34,621 EMPLOYEES

ATLANTIC CITY ELECTRIC, BGE, COMED, DELMARVA POWER, DEL, AND PEPCO ACHIEVED BEST-EVER PERFORMANCE FOR RELIABILITY

8.9 MILLION ELECTRIC UTILITY CUSTOMERS

1.3 MILLION NATURAL GAS UTILITY CUSTOMERS

2 MILLION COMPETITIVE RETAIL CUSTOMERS

532 MW SOLAR GENERATION CAPACITY

961 MW WIND GENERATION CAPACITY IN 11 STATES

35,168 MW OWNED GENERATING CAPACITY

EXELON’S NUCLEAR FLEET PRODUCED A RECORD

157 MILLION MW HOURS

OUR UTILITIES WERE NATIONALLY RECOGNIZED FOR OUTSTANDING CUSTOMER SATISFACTION AND MOST TRUSTED BRANDS

ONLY UTILITY ON THE FORTUNE 100 LIST

DOW JONES SUSTAINABILITY NORTH AMERICA INDEX
Exelon Utilities: Overview

ABOUT EXELON UTILITIES

$21 BILLION
BEING INVESTED FOR CUSTOMERS
IN NEW TECHNOLOGY AND
INFRASTRUCTURE AT
UTILITIES THROUGH 2021

THREE OF EXELON’S SIX UTILITIES
RANKED IN THE 2017 AMERICAN
COUNCIL FOR AN ENERGY-EFFICIENT
ECONOMY REPORT OF THE
TOP 50 MOST ENERGY-EFFICIENT
UTILITIES IN THE NATION,
WITH TWO RANKING IN THE TOP 10

11,472
TRANSMISSION LINE MILES

25,590
SQUARE MILES COMBINED
SERVICE TERRITORY

10 MILLION
CUSTOMERS
Exelon Utilities - Service Territories

Atlantic City Electric (PHI)  
Delmarva Power (PHI)  
Baltimore Gas and Electric (BGE)  
ComEd  
PECO  
Pepco (PHI)

Link to Map:  
https://www.google.com/maps/d/viewer?mid=1Dh1slUja8Gw9o_TeWvuxS00bUs&hl=en_US

Confidential and Proprietary. For Exelon Internal Discussion Purpose Only
From Wikipedia:

“A **Smart City** is an urban area that uses different types of electronic Internet of things (IoT) sensors to collect data and then use these data to manage assets and resources efficiently. This includes data collected from citizens, devices, and assets that is processed and analyzed to monitor and manage traffic and transportation systems, power plants, water supply networks, waste management, crime detection, information systems, schools, libraries, hospitals, and other community services.”

“The smart city concept integrates information and communication technology (ICT), and various physical devices connected to the IoT network to optimize the efficiency of city operations and services and connect to citizens. **Smart City** technology allows city officials to interact directly with both community and city infrastructure and to monitor what is happening in the city and how the city is evolving . . . **Smart City** applications are developed to manage urban flows and allow for real-time responses.”
Stakeholders

✓ Municipality / State Departments
  • Streets
  • Transportation
  • Health Care

✓ Utilities
  • Electric, Gas, Water, Waste/Sewer

✓ 3rd Parties
  • Communications
  • System Management
  • Data Management
Use Cases

✓ Energy
✓ Mobility
✓ Health & Safety
✓ Connectivity, Culture, & Education
✓ Public Service & Administration
✓ Water
✓ Waste & Recycling
## Energy

Providing the tools to effectively manage energy production & use, while ensuring reliability & resiliency

<table>
<thead>
<tr>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advanced Demand Response</strong></td>
<td>• Automated Control of Appliances  &lt;br&gt; • Time Of Use Rates &amp; Price Signals  &lt;br&gt; • DR Load Aggregation</td>
</tr>
<tr>
<td><strong>Microgrid/ Nanogrid</strong></td>
<td>• Microgrid (Testing Platform for 3rd Parties around Energy Analytics, Energy Storage, And Grid Asset Management)</td>
</tr>
<tr>
<td><strong>Smart &amp; Energy Efficient Buildings</strong></td>
<td>• High-efficiency, Zone-specific Systems  &lt;br&gt; • Predictive Modeling of Energy Systems  &lt;br&gt; • Data Sharing Across Buildings &amp; Assets</td>
</tr>
<tr>
<td><strong>Energy Analytics &amp; Visibility</strong></td>
<td>• Advanced &amp; Predictive Analytics  &lt;br&gt; • Energy Dashboard</td>
</tr>
<tr>
<td><strong>Smart &amp; Energy Efficient Lighting</strong></td>
<td>• LED Public &amp; Commercial Lighting  &lt;br&gt; • Remote Control Lighting</td>
</tr>
<tr>
<td><strong>DER Integration</strong></td>
<td>• Renewable DER  &lt;br&gt; • Premium Power Offering  &lt;br&gt; • Peer-to-peer Energy Transactions  &lt;br&gt; • Energy Self-sufficiency</td>
</tr>
<tr>
<td><strong>Energy Services</strong></td>
<td>• Home Services (maintenance, warrantee, security)  &lt;br&gt; • Commercial Services</td>
</tr>
<tr>
<td>Description</td>
<td>Examples</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------</td>
</tr>
<tr>
<td>Smart Traffic &amp; Congestion Mgmt.</td>
<td>• Smart Signs &amp; Signal Control Mgmt</td>
</tr>
<tr>
<td>• Traffic Management Solutions</td>
<td>• Congestion tolling systems</td>
</tr>
<tr>
<td>Management of multiple vehicles to create efficiencies in operation and route while providing opportunities for new revenue streams based on current activities</td>
<td>• Dynamic Plow/Salt Management</td>
</tr>
<tr>
<td>• Smart Logistics Management</td>
<td>• Waste Collection Truck Routing</td>
</tr>
<tr>
<td>• Traffic Management Solutions</td>
<td>• Delivery &amp; Service Verification</td>
</tr>
<tr>
<td>Solutions that utilize connected &amp; autonomous technologies to provide safer and more efficient transportation options</td>
<td>• Driverless cars</td>
</tr>
<tr>
<td>• Connected Cars</td>
<td>• Connected Commercial Vehicles</td>
</tr>
<tr>
<td>Solutions that evolve and leverage the EV charging infrastructure and network systems to improve efficiencies and provide services to all citizens</td>
<td>• Advanced &amp; Predictive Analytics</td>
</tr>
<tr>
<td>• Energy Dashboard</td>
<td>• Energy Gamification</td>
</tr>
<tr>
<td>• Load Disaggregation</td>
<td>• Load Balancing</td>
</tr>
<tr>
<td>Solutions that evolve and leverage vehicle communications, charging infras/network, grid comms, etc to coordinate actions &amp; provide resources at the right time &amp; place</td>
<td>• Grid Optimization</td>
</tr>
<tr>
<td>• Backup Power</td>
<td>• Ticketing/Digital Meter/Demand Pricing</td>
</tr>
<tr>
<td>Solutions that evolve traditional parking to make it more efficient and streamlined</td>
<td>• Open Spot Notification</td>
</tr>
<tr>
<td>• EV &amp; Traditional parking reservations</td>
<td>• EV Charging Station Network</td>
</tr>
<tr>
<td>• Advanced &amp; Predictive Analytics</td>
<td>• EV Charging Station Network</td>
</tr>
<tr>
<td>• Energy Dashboard</td>
<td>• Load Disaggregation</td>
</tr>
<tr>
<td>• Load Balancing</td>
<td>• Ticketing/Digital Meter/Demand Pricing</td>
</tr>
<tr>
<td>• Grid Optimization</td>
<td>• Load Balancing</td>
</tr>
<tr>
<td>• Backup Power</td>
<td>• Ticketing/Digital Meter/Demand Pricing</td>
</tr>
<tr>
<td>Solutions that evolve traditional parking to make it more efficient and streamlined</td>
<td>• Open Spot Notification</td>
</tr>
<tr>
<td>• EV &amp; Traditional parking reservations</td>
<td>• EV Charging Station Network</td>
</tr>
</tbody>
</table>

Enabling & managing the efficient movement of people and products

Mobility

An Exelon Company
## Healthy & Safety

### Description

Solutions that provide information on pedestrian traffic including volume, routes, etc. and insights on how to help efficiently manage crowds and promote safety

### Examples

- Crowd control
- Alternative walking directions

---

### Smart Crowd Management

Security solutions that provide data to help monitor/detect, predict and prevent physical crimes within cities and cyber crimes against city systems

- Acoustic Sensors
- Security Kiosks
- Crime prediction

### Smart Security Systems

Solutions that provide rapid response techniques to help respond and resolve emergency and disaster situations

- Dedicated control network for critical infrastructure
- Alt. comms for safety personnel
- Restoration/Hazard Notification

### Disaster Mgmt. & Emergency Solutions

Sensor data and analytics that provide insights and solutions to help identify environmental issues and preemptively and real time respond to issues

- Air Quality Monitoring Sensors
- Environmental Sensors
- Pavement Temperature Sensors

### Environment Monitoring & Response Systems

Solutions that provide benefits to citizens related to their overall health and wellness, including access to fresh food, medical data reporting, etc.

- Hydroponic vertical farms in food deserts

### Wellness Services

Solutions that provide data to help monitor/detect, predict and prevent physical crimes within cities and cyber crimes against city systems

- Critical infrastructure monitoring
- Data Security & Cybersecurity
- Plate Reading

### Environment Monitoring & Response Systems

Solutions that provide rapid response techniques to help respond and resolve emergency and disaster situations

- Back Up Power Mobile/Comms Equipment Delivery & 911 dispatch
- Employee/Resident Safety

### Environment Monitoring & Response Systems

Solutions that provide benefits to citizens related to their overall health and wellness, including access to fresh food, medical data reporting, etc.

- Building Systems Sensors
- Underground Sensors

### Wellness Services

Solutions that provide benefits to citizens related to their overall health and wellness, including access to fresh food, medical data reporting, etc.

- Bio-Pharma
- Non-emergency medical data collection
## Connectivity, Culture, & Education

Support economic dev. and enrich the lives of both citizens and visitors by providing digital connectivity, services & information

<table>
<thead>
<tr>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Open Data &amp; Urban Info Systems</strong></td>
<td>Open and/or anonymized data that can be used to support increased quality of life, more efficient government services, better decisions, tourism and new businesses &amp; services.</td>
</tr>
</tbody>
</table>
|  | • Digitizing tourism & cultural attractions  
  • App-based civic engagement platforms  
  • Non-emergency services reported and requested through smart phone 
  • Smart City Applications for Public Safety/City Services |
| **Smart Retail Solutions** | Solutions and data that help local businesses make better decisions, promote their offerings and streamline transactions. |
|  | • iBeacons  
  • Smart Coupons  
  • Mobile Payments  
  • Smart payments and collections |
| **Connected Community** | Solutions that enable more digitally connected individuals, business and communities to allow for better transfer of information. |
|  | • Public Wi-Fi  
  • Smart Information Kiosks |
| **Virtual Learning** | Solutions that enable and promote learning for all citizens, from basic schooling to job training, etc. |
|  | • Virtual classroom environments  
  • Apps for Info/Education of Citizens |
| **Economic Development** | Solutions for low-income and underserved customer segments. Equitable application of all use cases. Focus on affordability, availability and applicability. |
|  | • Innovation hubs  
  • Hackathons  
  • Community Challenges  
  • Supporting Social Enterprises  
  • Brown-field site developments  
  • Value sharing with communities |
# Public Service & Administration

## Description

Streamlining front & back office processes and providing optimized citizen services & workforce mgmt.

<table>
<thead>
<tr>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Command Center</strong></td>
<td>Solutions that provide command center services on-demand based on city needs and events. • Command, Control and Communications (C3) center • Network operations center</td>
</tr>
<tr>
<td><strong>Infrastructure Planning</strong></td>
<td>Solutions that help cities catalog their assets, infrastructure and physical landscape and make decisions about projects, construction, repairs, etc, to spend efficiently and direct funds to where they are needed most. • Underground infrastructure Mapping, GIS • Above ground and over ground infrastructure mapping • Asset Management/Performance Monitoring</td>
</tr>
<tr>
<td><strong>Public Service Management</strong></td>
<td>Solutions that inform citizens and businesses of planned projects and potential disruptions. • Automated surveillance of contracted jobs and completion • Notification of closure, outage, break in provided public service</td>
</tr>
<tr>
<td><strong>Digital City Work Management</strong></td>
<td>Services and solutions that enable the city to be more efficient, streamlining work for employees and processes for citizens and businesses. • Digitizing city front-office communications and back-office processes • Optimizing workforce management</td>
</tr>
<tr>
<td><strong>Digital Citizen Self-Service</strong></td>
<td>Solutions that enable citizens to complete transactions with the city in a more seamless and digital way. • Digitize public/city citizen and business transactions</td>
</tr>
</tbody>
</table>
## Water

Water Reclamation

- Solutions that help make the most of a city’s water resources through efficient use and recycling efforts.
  - Waste and potable water separation
  - High water efficiency system recycles waste water and restores it for public use
  - Rain Water Harvesting
  - Reverse Osmosis (de-sal)
  - Grey Water Use

Water AMI

- Solutions that provide the full cycle of water use from leak detection to metering to billing and payment.
  - AMI data for leak detection
  - Remote water quality detection
  - Billing/Meter to Cash Services

Connected Water Monitoring & Response Systems

- Solutions to community water issues that leverage integrated and connected technologies to help respond effectively.
  - Storm water management
  - Sewer Systems Management
  - Systems/Sprinkler Systems
  - Smart Irrigation Systems

Smart Agriculture

- Solutions that enable more efficient production of agriculture products.
  - Soil sensors
  - Smart Commercial Irrigation systems
  - Weather monitoring
  - Equipment automation
  - Indoor/Urban Agriculture

Water Services

- Solutions that enable smart water services to help customers more efficiently use water
  - Commercial Services
  - Food & Food Processing

Monitoring and managing water usage while providing solutions for use reduction & problem detection
## Waste & Recycling

Enable the circular economy of waste collection, recycling & energy production

<table>
<thead>
<tr>
<th>Smart Waste Collection</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Solutions to streamline waste management, including monitoring, collection &amp; recycling</td>
<td>• Waste Collection Truck Routing</td>
</tr>
<tr>
<td></td>
<td>• Digital waste monitoring and collection</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Waste to Energy</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Solutions that generate energy from processing waste &amp; byproducts</td>
<td>• Anaerobic digestion and other waste-to-energy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Smart Recycling</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Advanced solutions to help reduce waste and efficiently sort recyclable materials</td>
<td>• Smart Waste Sorting and Recycling Solutions</td>
</tr>
<tr>
<td></td>
<td>• Extracting value from “waste material”</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Battery Second Life/ Recycling</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Solutions that make use of used batteries from cars and devices to provide new services and improve grid performance</td>
<td>• EV Batteries second life as grid scale storage</td>
</tr>
<tr>
<td></td>
<td>• Reclamation of rare earth materials</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Waste Diversion (Lifecycle Extension)</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Solutions that extend the life of goods through repurposing and repurchasing</td>
<td>• Reclaimed &amp; harvested materials</td>
</tr>
<tr>
<td></td>
<td>• Secondhand goods market</td>
<td></td>
</tr>
</tbody>
</table>
Role of the Utility

✓ Advanced Metering Infrastructure
  • Electric
  • Gas
  • Water
✓ Smart Streetlighting
✓ Reliability / Distribution Automation / System Control
✓ Asset Management / Mapping
✓ Data and Analytics
Challenges

✓ Regulatory
✓ Privacy
✓ Security
✓ Public Interest
✓ Cost
✓ Data Sharing & Integration
✓ Communications
✓ Workforce
Success Stories

Many cities have formally issued Smart Cities programs, they include:

✓ Columbus, Ohio
✓ Dubai
✓ New York City
✓ San Leandro, Ca
✓ Santa Cruz, Ca
✓ Shanghai
✓ Smart cities in India
✓ Singapore
✓ Stockholm
✓ Taipei
Philadelphia Pennsylvania has developed their approach to Smart Cities that includes a bundle of three strategies:

- **Strategy 1** – Build a strong foundation with policy and infrastructure
- **Strategy 2** – Create a process for engagement and partnership
- **Strategy 3** – Support and sustain implementation of projects and programs with funding
Smart Cities are emerging throughout the world
They promise to bring new services and improved quality of life to the greater communities
However, specific benefits continue to be elusive to the individual consumer
Continued development and increased maturity will bring the Smart City vision to reality
This work starts in your home community
Thank You
✓ Name 3 Use Cases/Attributes of a Smart City
✓ Name 3 issues in implementing a Smart City
✓ Who are the key stakeholders in a Smart City deployment?