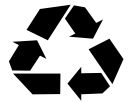


Smart City Use Cases and Examples

Glenn A. Pritchard
May 2019



Exelon at a Glance

ABOUT EXELON

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

\$33.5
BILLION IN OPERATING REVENUE

\$116.7
BILLION IN ASSETS

\$5.3
BILLION INVESTED IN UTILITIES IN 2017

34,621
EMPLOYEES

532 MW
SOLAR GENERATION CAPACITY

961 MW
WIND GENERATION CAPACITY IN 11 STATES

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

35,168 MW
OWNED GENERATING CAPACITY

EXELON'S NUCLEAR FLEET PRODUCED A RECORD

157 MILLION MW HOURS

ONLY UTILITY ON THE FORTUNE 100 LIST

DOW JONES SUSTAINABILITY NORTH AMERICA INDEX



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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**



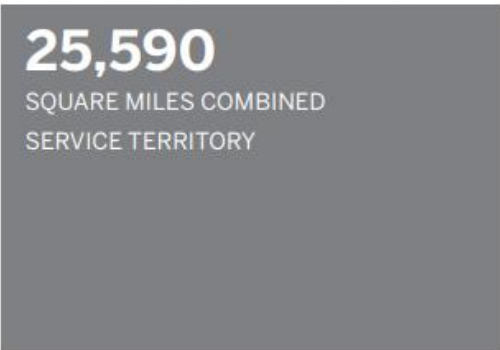
11,472

TRANSMISSION LINE MILES



25,590

SQUARE MILES COMBINED SERVICE TERRITORY



10 MILLION

CUSTOMERS



PECO[®]

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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=1D11xlUja8Gw9o_TeWvuwXSO0yUw&hl=en_US



Definition – Smart City

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. ”*

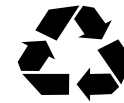


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Stakeholders

- ✓ 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

Description

Examples

Advanced Demand Response	Solutions that signal, integrate and/or aggregate the actions of multiple devices or DERs to help smooth and shift load	<ul style="list-style-type: none"> Automated Control of Appliances Time Of Use Rates & Price Signals 	<ul style="list-style-type: none"> Connected Home / IoT DR Load Aggregation
Microgrid/ Nanogrid	Localized solutions that synchronize local resources and loads, and can disconnect from the grid and function autonomously as needed	<ul style="list-style-type: none"> Microgrid (Testing Platform for 3rd Parties around Energy Analytics, Energy Storage, And Grid Asset Management) 	
Smart & Energy Efficient Buildings	Solutions that make buildings smarter & more efficient through analytics and power needs coordination & integration	<ul style="list-style-type: none"> High-efficiency, Zone-specific Systems Predictive Modeling of Energy Systems 	<ul style="list-style-type: none"> Data Sharing Across Buildings & Assets
Energy Analytics & Visibility	Analytics and visualized data solutions that provide insights into energy uses and usage at various levels to nudge or incent the right behaviors	<ul style="list-style-type: none"> Advanced & Predictive Analytics Energy Dashboard 	<ul style="list-style-type: none"> Energy Gamification Load Disaggregation
Smart & Energy Efficient Lighting	Solutions that evolve and leverage lighting infrastructure to reduce energy use and provide services.	<ul style="list-style-type: none"> LED Public & Commercial Lighting 	<ul style="list-style-type: none"> Remote Control Lighting
DER Integration	Solutions that integrate and leverage DERs to provide new and different services to customers.	<ul style="list-style-type: none"> Renewable DER Premium Power Offering 	<ul style="list-style-type: none"> Peer-to-peer Energy Transactions Energy Self-sufficiency
Energy Services	Services that enhance the operation and customer experience related to energy products	<ul style="list-style-type: none"> Home Services (maintenance, warrantee, security) 	<ul style="list-style-type: none"> Commercial Services





Mobility

Enabling & managing the efficient movement of people and products

Description

Examples

	Description	Examples
Smart Traffic & Congestion Mgmt.	Solutions that help manage the flow of vehicles based on direction, speed, timing, weather, events etc.	<ul style="list-style-type: none"> • Smart Signs & Signal Control Mgmt • Traffic Management Solutions • Congestion tolling systems • Traffic direction or allocation
Fleet Management	Management of multiple vehicles to create efficiencies in operation and route while providing opportunities for new revenue streams based on current activities	<ul style="list-style-type: none"> • Dynamic Plow/Salt Management • Smart Logistics Management • Waste Collection Truck Routing • Delivery & Service Verification
Connected Vehicles & Transport	Solutions that utilize connected & autonomous technologies to provide safer and more efficient transportation options	<ul style="list-style-type: none"> • Driverless cars • Connected Cars • Connected Commercial Vehicles
EV Charging Station Network	Solutions that evolve and leverage the EV charging infrastructure and network systems to improve efficiencies and provide services to all citizens	<ul style="list-style-type: none"> • Advanced & Predictive Analytics • Energy Dashboard • Energy Gamification • Load Disaggregation
Vehicle to Grid	Solutions that evolve and leverage vehicle communications, charging infras/network, grid comms, etc to coordinate actions & provide resources at the right time & place	<ul style="list-style-type: none"> • Grid Optimization • Backup Power • Load Balancing
Smart Parking Management	Solutions that evolve traditional parking to make it more efficient and streamlined	<ul style="list-style-type: none"> • Open Spot Notification • EV & Traditional parking reservations • Ticketing/Digital Meter/Demand Pricing



Healthy & Safety



Health & Safety

Improving public health & safety by monitoring the urban environment to provide notifications, digital responses & analytics

Description

Examples

Smart Crowd Management

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

- Crowd control
- Alternative walking directions

- Event/Security alert system

Smart Security Systems

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

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

Disaster Mgmt. & Emergency Solutions

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

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

Environment Monitoring & Response Systems

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

- 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.

- Hydroponic vertical farms in food deserts

- Bio-Pharma
- Non-emergency medical data collection



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Connectivity, Culture, & Education



Connectivity, Culture, & Education

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

Description

Examples

Open Data & Urban Info Systems

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 & services.

- 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



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Public Service & Administration



Public Service & Admin.

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

Description

Examples

	Description	Examples
Command Center	Solutions that provide command center services on-demand based on city needs and events.	<ul style="list-style-type: none"> • Command, Control and Communications (C3) center • Network operations center
Infrastructure Planning	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.	<ul style="list-style-type: none"> • Underground infrastructure Mapping, GIS • Above ground and over ground • infrastructure mapping • Asset Management/Performance Monitoring
Public Service Management	Solutions that inform citizens and businesses of planned projects and potential disruptions.	<ul style="list-style-type: none"> • Automated surveillance of contracted jobs and completion • Notification of closure, outage, break in provided public service
Digital City Work Management	Services and solutions that enable the city to be more efficient, streamlining work for employees and processes for citizens and businesses.	<ul style="list-style-type: none"> • Digitizing city front-office communications and back-office processes • Optimizing workforce management
Digital Citizen Self-Service	Solutions that enable citizens to complete transactions with the city in a more seamless and digital way.	<ul style="list-style-type: none"> • Digitize public/city citizen and business transactions



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Water

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

Description

Examples

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



Waste & Recycling



Waste

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

Description

Examples

Smart Waste Collection

Solutions to streamline waste management, including monitoring, collection & recycling

- Waste Collection Truck Routing
- Digital waste monitoring and collection
- Pneumatic Waste Conveyance Systems

Waste to Energy

Solutions that generate energy from processing waste & byproducts

- Anaerobic digestion and other waste-to-energy
- Gasification and Plasma

Smart Recycling

Advanced solutions to help reduce waste and efficiently sort recyclable materials

- Smart Waste Sorting and Recycling Solutions
- Waste Minimization
- Extracting value from “waste material”

Battery Second Life/ Recycling

Solutions that make use of used batteries from cars and devices to provide new services and improve grid performance

- EV Batteries second life as grid scale storage
- Device battery recycling
- Reclamation of rare earth materials

Waste Diversion (Lifecycle Extension)

Solutions that extend the life of goods through repurposing and repurchasing

- Reclaimed & harvested materials
- Secondhand goods market
- Modular product design



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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



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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

SmartCityPHL Roadmap

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



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Conclusion

- ✓ 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



Questions

- ✓ 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?