Panasonic

The City of Colorado Springs
&
Colorado Springs Utilities
Smart City Strategy

Defining a Smart City Vision and Strategy for Olympic City, USA

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1. Executive Summary

The Colorado Springs Smart City Initiative, known as SmartCOS, identifies a series of complementary smart city concepts that align with the core values and mission of the City of Colorado Springs (City) and Colorado Springs Utilities (Utilities). This effort advances existing priorities while recognizing that the future of the city and region will be shaped by rapid technological innovation and change. SmartCOS builds ideas around the concepts which are defined by resources, partnerships, and available technologies to provide a strong foundation that will enhance the quality of life, efficient delivery of services, and user experiences.

The concepts identified in this report are a result of a collaborative effort between the City, Utilities, stakeholder engagement, and Panasonic's CityNOW team. The CityNOW team provided the Pillar Process which supplied a framework based on *pillars* or areas of focus designed to generate ideas, identify resources, and create consensus around shared goals for the City and Utilities. Input was received from subject matter experts as well as stakeholders representing private, public, academic, and non-profit institutions in the region. More than 100 participants engaged in various activities including: one-on-one interviews, a day-long ideation summit, regularly-scheduled working group meetings, co-chair meetings and more.

As a result, the City, Utilities and community stakeholders determined 11 concepts that can afford both the City and Utilities the opportunity to leverage existing priorities. While some of the ideas were a direct result of the ideation and refinement stage of the Pillar Process, others were already in initial development stages when the Pillar Process started. These suggested topics directly reflect not only the members that engaged in the process but the core values of the City and Utilities as a whole. Each possible solution will be discussed in further detail in the sections to follow.

Following is the list of 11 concepts[1]:

•	**Advanced Metering Infrastructure**
•	**Connected Vehicle Platform**
•	**Microgrids**
•	**Open Data Program**
•	**Smart Building Management System**
•	**Smart Kiosks**
•	**Smart Parking**
•	**Smart Payment Solutions**
•	**Smart Security Solutions**
•	**Smart Streetlights**
•	**Smart Transportation**

2. The Vision, Mission, and Core Values

2.1 The City of Colorado Springs

Colorado Springs is Olympic City USA, where a timeless culture of achievement, national pride, and dedication sits comfortably alongside awe-inspiring beauty and unparalleled natural training grounds. The mission of Colorado Springs is to serve its citizens effectively, efficiently, and courteously while wisely managing its limited resources.

Upholding the vision that the City's founding fathers developed, and carrying forward the spirit of Olympic City USA, Colorado Springs will be a city that matches its scenery by building on the following strategic goals: Promoting Job Creation, Investing in Infrastructure, Building Community and Collaborative Relationships, and Excelling in City Services.

Colorado Springs strives to continuously improve the quality of services and processes through a citizen – centered approach. The Core Values of the City are to exhibit integrity, accountability, transparency, leadership, innovation, and persistent community engagement. These fundamental values alongside those of Utilities are what make Colorado Springs an ideal city for a Smart City Strategy.

2.2 Colorado Springs Utilities

Colorado Springs Utilities (Utilities) is a community owned enterprise with a 100 year reputation of excellence. They are a pioneer in offering four utility services (electric, gas, water, and wastewater) to their customers. What makes Colorado Springs Utilities unique is that while they are a separate enterprise they work closely with the City and embrace similar ideals and values. The vision of Colorado Springs Utilities is to be a treasured community asset. They are a welcome partner well-known for responsible and dependable service which makes them an invaluable asset to the future of the region.

[1] In alphabetical order, these are the concepts determined through the Pillar Process.

The mission of Utilities is to provide safe, reliable, competitively-priced electric, natural gas, water, and wastewater services to the citizen owners and customers of Colorado Springs Utilities. It is this viewpoint that has shaped their values in safety, people, trust, responsibility, collaboration, and continuous improvement.

Collaboration, innovation, and sustainability are vital aspects for the City and Utilities which reinforces the idea that Smart City concepts could offer enhanced quality of life, efficient delivery of services, and greater user experiences.

3. Why is Colorado Springs Positioned for a Smart City Strategy?

Colorado Springs is an ideal Smart City for many reasons including its values, raw beauty and continuous commitment to improvement. Located at the eastern foot of the Rocky Mountains at an elevation of 6,035 feet, Colorado Springs offers breathtaking views, outdoor recreation and rich culture.

Colorado Springs is the largest city, geographically, in Colorado with 265 miles of trails and 9,000 acres of parkland. It is home to the United States Olympic Committee, U.S. Paralympics, the headquarters for 23 Olympic National Governing Bodies of Sport, and nationally-recognized natural landmarks such as Garden of the Gods. Colorado Springs and the Pikes Peak Region have a strong military presence with the United States Air Force Academy, Peterson Air Force Base, Fort Carson Army installation, Schriever Air Force Base and Cheyenne Mountain Air Force Station. These assets bring people from all over the world to Colorado Springs and it is vital that the City continues to improve as it grows.

Not only does the City offer a plethora of things to do, but its commitment to citizens and a focus on economic development are also driving forces behind why adopting Smart City solutions is so important. Communities across the globe are facing challenges such as an increase in urban population, aging infrastructure and strained public finances. SmartCOS initiatives will allow for the City to address these challenges not only proactively but productively.

With a joint SmartCOS proclamation signed January 5, 2018, by the Mayor, City Council, and Utilities, the City has determined priorities in connectivity, energy and resiliency. These priorities will guide efforts to find forward-thinking solutions and tools that will improve services, quality of life and user experiences while maintaining fiscal responsibility.

As the world becomes more technologically-driven the City and Utilities will have the opportunity to provide better services through smart solutions. With the Internet of Things (IoT), smart devices, real-time analytics and artificial intelligence (AI), the full potential lies in the ability of “Things” to seamlessly communicate with each other and respond to real world events as they occur, making lives easier, safer and more convenient.

Through SmartCOS, the City is poised to implement a strategy that can achieve strong results with a variety of solutions helping the City and Utilities become more resilient and better able to serve citizens, customers, businesses and visitors.

4. The Pillar Process

The *Smart City Pillar Process*, delivered by the Panasonic CityNOW team, is an important aspect in developing the SmartCOS strategy for the City of Colorado Springs and Colorado Springs Utilities.

The Smart City Pillar Process is the approach by which the Panasonic CityNOW team helped to generate the list of Smart City concepts. At its core, the process is an explorative and inclusive effort to systematically engage stakeholders by identifying challenges and collaborating on solutions.

Over a period of six months, this process involved a wide breadth of people tackling an expansive range of topics organized into four Pillars:

- Energy and Utilities
- Transportation and Mobility
- City Services
- Buildings and Sustainability

During this process, the Pillars served as the overarching themes that helped to structure the ideas. With the Pillars in place, there were then additional phases of refinement including: Contribution, Articulation, Assessment, and finally Proof of Concept. The contribution phase of the refinement process is to brainstorm ideas and determine value. In the articulation phase of the refinement process, the project idea is vetted with further detail by looking at deployments in other cities and contexts such as technical architecture, governance structure, financial structure, and other key elements of the solution. During Assessment, technical, legal, financial, organizational, or political considerations are reviewed and consensus is built. Finally, during the Proof of Concept phase, frameworks are built for potential pilot projects with the intent to scale if the pilot is successful.

To better understand this process, the following is a list of steps that were taken by the City and Utilities:

- Interviewed one-on-one with 25 key decision-makers and subject matter experts across both the City and Utilities.
- Refined ideas in a day-long Ideation Summit with participants representing the military, higher education, energy research and other key regional stakeholders.
- Generated over 50 suggested concepts and narrowed down to 15 for further development.
- Issued a joint SmartCOS proclamation signed by Mayor John Suthers, City Council President Richard Skorman, and Colorado Springs Utilities Board Chair Tom Strand.
- Held working group and co-chair meetings to further develop ideas.
- Resulted in 11 final concepts.

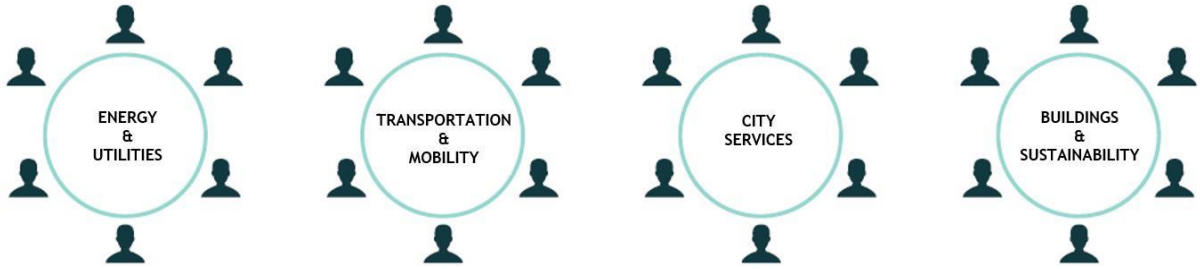

Figure 1: The Pillar Process is designed to alleviate complexity and empower cross-agency, high-level decision makers, so called Co-Chairs, to drive impactful project ideas towards pilots and full-scale implementation.

"The largest hurdle to smart city progress is not technology, but bringing together large, complex organizations and finding ways to gain agreement on shared objectives, and ways to achieve them. It's like a seven-legged race: we are all equally tied at the hip and we only make progress together."

Jarrett Wendt, Executive Vice President

Panasonic Enterprise Solutions Company

5. Smart City Tactics and How to Best Approach a Smart City Initiative

5.1 Process

Stakeholder participation and alignment is at the core of a successful Smart City Initiative. Alignment is achieved through transparency, consistency of process, clear vision and cooperation in relation to project ideas. A Smart City is not about short-term results or built merely from a handful of project ideas, it is about the thoughtful implementation of projects over time that makes the city more efficient by providing value. While a Smart City requires innovative ideas and technologies, it also requires basic fundamentals such as collaboration. In order for a Smart City to work, there needs to be inter-city, interdepartmental and stakeholder collaboration.

5.2 Creating Value

A Smart City approach requires project ideas to be articulated in terms of value for the City and its citizens. Value can be characterized by increased efficiency, lower operational and maintenance costs, increased safety, increased resilience or creating a better experience for residents and visitors.

Project ideas should be prioritized by how much value they add to the City's vision, support its mission and uphold its core values. The more the ideas work to achieve these three criteria, the easier they are to communicate internally and externally.

5.3 Roadmap

Through the Pillar Process, the City has developed a framework for evaluating and implementing smart technologies. This roadmap will assist the City in knowing what investments will result in the greatest efficiencies and largest benefits to the community.

Cities that make a long-term commitment to plan for technology will be better prepared to make strategic investment and implement smart projects that align with missions and values. Colorado Springs is a leader in realizing this and taking action.

5.4 Leveraging Opportunities

Knowing when to invest is difficult but the benefit of innovative technologies for creative problem solving potentially allows for long term cost savings. Innovative technologies offer the possibility of bypassing the problems of today and creating for the future of tomorrow.

Through the collaboration with Panasonic and the SmartCOS initiative, the City has developed Smart City goals. In order to implement these ideas the City will need to leverage grant opportunities and continue to explore means of funding.

5.5 Program Management

The City's commitment to SmartCOS and the continued exploration of these concepts will enable Colorado Springs to thrive as a Smart City and create connections across initiatives. While each individual concept provides the potential for significant benefit on its own, it is their complementary and cross cutting nature that provides opportunity for ongoing transformation as new challenges, solutions and partners emerge.

To further understand the Smart City concepts that were developed during the six month engagement, each idea will be further discussed in the following section.

6. The 11 Smart City Concepts

To reiterate, the following concepts were developed through the Pillar Process and are a result of the engagement between City, Utilities, stakeholders, and Panasonic. Following is an overview of all of the concepts and a more detailed description of each in alphabetical order.

Smart City Concepts	Brief Description of Concept
Advanced Metering Infrastructure	Integrated system of smart meters, communications networks and data management systems.
Connected Vehicle Platform	Enabling the adoption of Connected vehicles in urban environment.
Microgrids	Integrated power delivery system.
Enhanced Engagement	Publish city-owned data & modernize citizen request process.
Smart Building Management System	Making buildings more efficient through automation and integration.
Smart Kiosks	Integrating wayfinding and other user-friendly information in the downtown core.
Smart Parking	Improving the efficiency and customer interaction with parking.
Smart Payment Solutions	Payment integration system for various modes of transportation.
Smart Security systems	Adopting cutting edge technologies for the benefit of public safety.
Smart Streetlights	Converting existing streetlight infrastructure with sensor-capable LED lighting.
Smart Transportation	Integrating smart technologies into long term transportation planning.

6.1 Advanced Metering Infrastructure

Advanced Metering Infrastructure (AMI) is an integrated system of smart meters, communications networks and data management systems that enable two-way communication between Utilities and customers. These systems provide important capabilities such as the ability to automatically and remotely measure electricity use, connect and disconnect service, detect tampering, identify and isolate outages and monitor voltage. The system, on a basic level, increases efficiency and accuracy while simultaneously improving customer experience.

Utilities is well on its way to implementing Advanced Metering Infrastructure program for energy, gas and water. AMI brings a host of benefits for a utility and its customers. Granular data collection, two-way control, and communication capabilities are at the core of the solution bringing efficiency and control to the customer. The AMI data and control network will cover Utilities' entire service area within and around Colorado Springs and could potentially share some infrastructure resources with the City.

6.2 Connected Vehicle Platform

Vehicles are no longer individual transportation devices that get people from destination to destination. Vehicles are becoming sophisticated, internet-connected endpoints with potential for two way-communication, personalization and autonomy.

Connected vehicles are among the most innovative technologies within the transportation and mobility sector. The technology is based on national standards issued by the US Department of Transportation that have already been adopted by the automotive industry. The future of connected vehicles is not only on the horizon, it is already happening in the State of Colorado through the partnership between Panasonic and the Colorado Department of Transportation.

A Connected Vehicle Platform is a cloud-based system that harnesses connected car data to deliver greater value and insight through a solution that provides reliability, openness and ensures security and compliance. Some of the possible benefits of a connected vehicle platform include predictive services, improved user-experience, Connected Advanced Driver Assistance Systems (ADAS), increased safety, delivery of real-time information to the driver or autonomous system and vehicle to vehicle (V2V) communication.

6.3 Microgrids

With the future decommissioning of the Martin Drake Power Plant, the City's central coal plant, Utilities will need to implement new transmission infrastructure for electric distribution. One possible solution is microgrids. A microgrid is an integrated power delivery system consisting of interconnected loads and distributed energy resources that can operate independently and/or connected to other grids. Each microgrid is still obligated to balance its own load but any excess energy can be stored or consumed by connecting multiple microgrids together.

Every city needs a solid foundation that is capable of supporting an increase in power demand. Microgrids can be a powerful transformation tool to modernize the centralized architecture of the energy grid in Colorado Springs and gradually convert the current grid to a more distributed generation model. Other benefits of a microgrid strategy include enhanced livability and workability through resiliency and reliable electricity as well as enhancing sustainability through renewable energy.

6.4 Enhanced Engagement: Open Data & Citizen Request Modernization

Open Data is the idea that government data should be freely available, when appropriate, to better enhance transparency, accountability and collaboration. Across the United States and the world, cities have established open data portals as a key first step in becoming smart cities. In many cases, open data has led to better citizen engagement, the creation of new businesses, and economic activity. Currently, Colorado Springs has a program for sharing financial data, called OpenBookCOS. Under SmartCOS, the City looks to expand beyond financial data by actively engaging civic organizations, local businesses and entrepreneurs and other stakeholders to identify the highest priority data sets.

Open Data does not serve one specific purpose; rather, it offers many possible solutions for a variety of different groups. The concept is to release datasets on a single platform so that any person can have access and form their own analysis. Some possible benefits include transparency, innovation, improved efficiency of services, impact measurement of policies and new knowledge from combined data sources and patterns in large data volumes.

Citizen requests are the primary way many people interact with their government. Citizens contact their government to request City services or information. The City has a number of methods of issuing these requests, and the variety of methods leads to inconsistent responses. Staff response to citizen requests can also vary, leading to disappointing citizen experience of their City government.

The concept of a smarter citizen request process includes a new Citizen Relationship Management (CRM) software to unify the citizens' experience of issuing a request, but it also suggests a new look at the request process, incorporating user experience testing, human-centered design, and an insistence on accessibility and inclusivity as core values. Benefits include improved responsiveness to requests, accountability in staff responses, and awareness of trends among requests, leading to the City proactively addressing community issues.

6.5 Smart Building Management System

A building management system (BMS) is a computer-based control system installed in buildings that controls and monitors the building's mechanical and electrical equipment such as ventilation, lighting, power systems, fire systems and security systems. At its core, the system helps with energy management while leveraging the innate need for connectivity.

A smart building management system is able to monitor and respond appropriately to the use of the building in real time to minimize energy costs and increase efficiency in occupied and unoccupied spaces. For example, sensors could dim or turn off lighting when a room is empty, subsequently creating additional savings. In emergencies, there could be exact information as to where people are in the building, making evacuations and searches faster and more precise.

The concept behind a smart BMS has a great deal to do with the convergence and integration of information technology and the increasing usage of analytics and actionable data. A smart building could potentially create cost benefits and enhanced efficiencies, simplified building operations and maintenance, create an environmentally friendly environment and leverage the IoT (internet of things). With the technology driven BMS, this will also produce real-time data for productivity, convenience and sustainability.

6.6 Smart Kiosks

As Colorado Springs continues to grow in population, it is important to help make information available to not only new residents but anyone that is living in or visiting the city. One possible solution is the smart kiosks.

Smart Kiosks come in different types and models and have shown to be of great value in public spaces, both indoors and outdoors. These values include wayfinding for visitors, emergency notification, citizen engagement, revenue streams through third party signage, economic development and promotion of local events, attractions and other visitor opportunities.

With the consumer in mind, the idea is to bring relevant information in a self-service format to various locations around the city. For example, on a large college campus, smart kiosks could help students navigate, see important updates, create personalized emergency alerts and view third party information such as off-campus restaurants. This concept can be applied to places such as downtown, the airport and other highly-visited areas.

6.7 Smart Parking

A smart parking program leverages smart technology to maximize important assets and accommodate responsible growth. Smart Parking can improve user experience by facilitating remote meter payments, making it easier to find parking and improving operational efficiencies. Possible features of a smart parking program could include better data management, a mobile payment platform, smarter cash collection and improved safety and compliance. The City hopes to develop a scope to determine what smart parking features are most beneficial to the community and what could leverage existing capabilities.

6.8 Smart Payment Solutions

With technology becoming more and more prevalent consumers are able to access information in real-time. Whether it's the news, general information or paying a bill, consumers desire technology to get things done in a convenient way. Having the ability to get everything done at once in one easy payment or place is preferred.

Public transportation is an important factor for job creation and economic growth in Colorado Springs. A modern digital payment solution for public transportation is part of the equation to increase the number of riders of choice, improve efficiency of onboarding and reduce risks and costs related to cash handling by drivers. The City's transit division, Mountain Metro Transit, is currently assessing different technologies and solutions. A sustainable transportation system contributes to all the different concepts of a smart city and an increased user-experience is an essential benefit.

6.9 Smart Security Solutions

Improving security and safety in Colorado Springs is an ongoing priority. An integrated safety and security system in which public entities and private stakeholders work together is one smart security solution. The idea is to proactively create a voluntary relationship with camera owners providing information about cameras, the camera locations, and the area each camera covers. For example, Project Green Light Detroit is a program in which the Detroit Police Department partnered with eight gas stations to leverage real-time video surveillance in an effort to deter, identify and solve crime[2].

The idea behind such a concept is to improve the community through partnerships aimed at improving neighborhood safety, promoting the revitalization and growth of local businesses and aiding in the police department's efforts in the fight against crime.

6.10 Smart Streetlights

With many cities adopting smart street light solutions, there are many different possibilities. For instance, with digital networks and embedded sensors, street lights are able to collect and transmit information that helps cities to monitor and respond to various circumstances. Smart streetlights can detect traffic congestion and available parking spaces, monitor air quality and noise. Digital networks can also remotely control streetlights to dim or turn on or off, which will maximize low-energy benefits and subsequently create future cost savings.

A smart streetlight pole requires connection to digital infrastructures such as fiber, Wi-Fi or cellular systems. If connected, the smart pole can host technology such as cameras, gunshot detectors, weather

[2] Project Green Light Detroit, 2017.

sensors, public or private Wi-Fi hotspots and more. Streetlights can connect to other infrastructure such as parking meters, kiosks, smart bus shelters and advanced traffic signaling solutions. The City and Utilities have great opportunities to benefit from this technology through operational and infrastructure savings.

6.11 Smart Transportation

The City of Colorado Springs will soon update its long-term transportation and mobility plan. Traditionally, a transportation plan uses model predictions of future traffic flows to produce solutions that typically call for an expansion of capacity. Utilizing this form of transportation planning, the overall goal is increased accessibility but with the rising numbers of electric vehicles (EVs) and other forms of transportation, there are more options to explore.

The goal of a modern transportation plan is no longer solely based on deciding where to lay asphalt; rather, it is to create a plan that institutionalizes a process for innovation and continual adaptation going into the future. A smart transportation plan seeks to manage demand and the transport system by leveraging technology to make more informed decisions. For example, the City could create a plan where technology is used to more efficiently route traffic instead of adding more lanes to reduce congestion. A Smart City will continuously seek to find new ways and test emerging technologies to manage transportation.

7. Deployment Strategy

The deployment strategy is largely dependent on the funding available to the SmartCOS program. That being said, we have identified a key geographical area where we would like to leverage existing public and private funding to deploy as much smart technologies that support the mission of the City and Utilities. That area is the Southwest Downtown redevelopment. This district offers a unique opportunity to leverage the momentum gained through stakeholder alignment, leverage over $42 million in existing state and local public funding, deploy a wide range of smart technologies in a defined area, and share data and lessons learned with our constituents and other communities. This will allow the opportunity for civic leaders to explore various use cases in a confined area to further engage the community and build broader business cases for scalable deployment across the community.

As we move from strategy development to smart city implementation, the City and Utilities should investigate and pursue funding options to support the SmartCOS program, such as grant opportunities, public-private partnerships, and leveraging existing capital expenditures where financially feasible.

8. Communications Infrastructure

While the focus of the SmartCOS Strategy is to identify a series of complementary smart city concepts that align with the core values and mission of City and Utilities, there is a need to identify potential communications networks to support the deployment of small and large scale smart technologies. This can be the utilization of existing fiber networks, expanding fiber networks, leveraging Utilities Advanced Metering Infrastructure (AMI) without impacting the core utilities functionality, or other wireless networks such as Long Range Wide Area Network (LoRaWAN), 4G and 5G. As smart city concepts are moved into implementation phases, communications networks will be discussed on a case by case basis depending on where the smart city deployments will take place, what data is being collected, how quickly does the data need to be analyzed, and at what scale.

9. Final Remarks

Colorado Springs is a regional hub of strong economic growth. It is known for its livability, natural resources and commitment to improving quality of services. With a strong focus on economic development, becoming a Smart City will assist Colorado Springs in continuing to attract jobs and growth by being a city of choice and offering forward-thinking amenities.

This report is the end deliverable by the CityNOW team after a nine month Pillar Process engagement. Its aim is to set the path for the City and Utilities to continue working in the Pillar Process framework in perpetuity to identify and solve problems for stakeholder alignment and to strengthen the community's vision of SmartCOS.

The most significant benefit of the SmartCOS Pillar Process is the alignment created by convening stakeholders from multiple departments to discuss benefits across organizational boundaries and through the creation of connections between organizations. The effects of this process include streamlined planning, efficiencies in moving projects forward, and awareness of SmartCOS goals. Now that the City and Utilities have engaged in the Pillar Process, it is recommended the organizations continue to use this framework as a tool for stakeholder alignment, management, and refinement of further smart city concepts because to reimagine, even the simplest of services, will create a whole new understanding of possibilities.