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April 10, 2017

Thoryn Simpson
Senior Procurement Analyst
Office of Management and Budget
City-County Building, Room 502
Pittsburgh, PA 15219

RE: Smart Street Lights RFI

Dear Mr. Simpson:

AT&T is pleased to submit its response to City of Pittsburgh's Request for Information ("RFI") for Smart Street Lights.

Ultimately, a city's ability to realize the true potential of Smart Cities is driven by its skill in effectively using its connectivity resources and the information that comes from them. As a communications and Internet of Things (IoT) leader, AT&T has the experience and skills to assist Pittsburgh in its deployment of integrated Smart City solutions. Below are some key facts about AT&T:

- **Smart Cities:** Our dedicated Smart Cities team will play an impactful role in linking the projected 50 billion connected devices by 2020. We have the resources, the networks, the platforms, the analytics, and the people with the best IoT experience to bring to life truly connected communities and cities – in transportation, utilities, infrastructure, public safety and citizen engagement.
- **Network:** AT&T owns its entire US network and data center technical infrastructure. This ownership ensures our products and services are delivered consistently and has enabled AT&T to build an intelligent and robust network that covers 365 million people in North America, with more than 100+ petabytes of data traffic utilizing our network on an average business day.
- **Connectivity:** AT&T is the preeminent global telecommunications company. Our portfolio of connectivity solutions includes all the connectivity choices needed for a dynamic Smart City deployment, including cellular, satellite, Wi-Fi, fiber, and more.

A comprehensive solution will require collaboration by multiple solution providers. A collaboration with AT&T Smart Cities extends beyond the capabilities of AT&T. Together with AT&T's vendors and relationships, we will be able to help Pittsburgh deliver and execute upon a comprehensive solution. A Smart City deployment supported by AT&T inherently increases the repeatability of solution elements across the U.S., due to our longstanding public sector relationships, national network presence, and proven capabilities to execute complex projects.

AT&T respectfully requests that information in this document be held confidential by the City of Pittsburgh to the extent allowed under applicable law.

Sincerely,

Robert G Taylor

Robert G Taylor
Strategic Account Lead
AT&T Government & Education Solutions

Amy McIlvaine

Amy McIlvaine
Sales Manager
AT&T Smart Cities Solutions

Executive Summary

AT&T appreciates the opportunity to assist the City of Pittsburgh (City) with its on-going smart streetlight evaluation with related energy and cost maintenance savings features along with an infrastructure platform to power a smart city.

AT&T understands the challenges confronting cities today and is prepared to work with Pittsburgh to develop and ultimately implement your Smart City solutions. We have an array of Smart City solutions, applications, connectivity options (including LTE, Wi-Fi, and Ethernet) and management services that can provide Pittsburgh with a single integrated solution.

First, and foremost, we want to alert the City of Pittsburgh about an important development from AT&T redefining smart cities for the digital age. Adding to its arsenal of Smart Cities competencies and capabilities, AT&T established an exclusive partnership with Current, powered by GE (a business unit of General Electric Company) earlier this year to redefine smart cities for the digital age. This agreement brings together two global leaders with a singular focus to drive and support the successful transformation of today's cities to become smart cities. The highlights of this announcement include the following details:

- AT&T named exclusive reseller of Current's intelligent sensor nodes in the US and Mexico;
- Utilizing the AT&T Smart Cities framework, Current brings end-to-end software and hardware solutions to connect cities to the Industrial Internet;
- Agreement builds on AT&T's long-standing relationships with municipalities, highly secured network connectivity and innovative IoT platforms; and
- AT&T and Current are already working together with the Cities of San Diego and Atlanta to transform existing street lighting into a connected digital infrastructure.

Secondly, the AT&T Smart Cities framework, developed in-part as a result of our Spotlight Cities projects, is recognized for its rich set of ecosystem partners some of which are featured herein in this Response. This short-list of ecosystem partners including Ameresco, Collins Engineer, Inc., Siemens, and Smart City Capital is adjustable as the needs and requirements of the City emerge, evolve, and become more clearly defined. But, for now, we believe this core team offers Pittsburgh solid insight to realize actionable results for the following reasons: Ameresco for its prowess to meet energy savings with energy management challenges typical in energy efficiency projects; Collins Engineer, Inc. for its diverse experience supporting cities like Chicago to meet their smart transportation objectives; Siemens' leadership role in electrical technology; and Smart City Capital for its disruptive financial modeling.

Finally, you will find this response to be clear, concise, and comprehensive. This document contains six sections including Project Overview, Deployment Plan, Technical Specifications, Operational Considerations, Business Model, and Evaluation. The content contained in these sections are representative of our smart city experience which are recognized as industry best practices across today's smart city arena.

Project Overview

Taking into consideration the City of Pittsburgh's smart streetlight goals including the potential to deploy smart city technologies and backed by our legacy of innovation, AT&T can deploy a holistic, futureproof, scalable, and affordable, citywide smart LED streetlight environment with a digital communications network comprising of multi-sensor and data analytics using GE's Evolve LED Roadway Fixtures (street lights) and technology delivered by AT&T Smart Cities and General Electric (GE). The AT&T Internet of Things network will serve as the foundation for a sustainable, resilient, equitable, and prosperous Pittsburgh of tomorrow - starting today.

Project Understanding: The leadership in the City of Pittsburgh is passionately building the best possible future for the people who live, work, study, and visit. The aim is to transform Pittsburgh into a world-class city through the intersections of technology, sustainability, and performance. A key part of that vision are technology innovations that add real, meaningful public value for all Pittsburghers. Through the RFI, the City wants to know what high-quality, fully developed solutions exist today and are ready and available to be deployed in Pittsburgh.

Project Approach: AT&T can deploy the approximately 40,000 needed streetlights using GE smart LED streetlights citywide with approximately 10,000 AT&T Digital Infrastructure nodes. The nodes are developed by GE and are connected by AT&T's IoT/LTE network and supported by GE's Predix data analytics platform. AT&T will use as appropriate existing technology currently deployed in other US cities, including San Diego and Schenectady. GE and the City of San Diego recently announced a major deployment across the City, and within the last few weeks the City of Atlanta made a similar announcement with AT&T.

http://about.att.com/story/smart_cities_transforming_communities_and_creating_value_for_citizens.html

Pittsburgh's street lights are greatly undervalued and underutilized real estate in the public right of way. Street lights can now enhance public value by hosting a wide array of smart, connected infrastructure to support essential city services well beyond lighting. Services like advanced communications, public safety situational awareness, traffic mitigation, parking operations and enforcement, environmental monitoring, and asset management are just some of the potential solutions available.

Project Impacts: A citywide digital sensor network deployed with smart connected street lights will provide optical, acoustical, and environmental sensors to create a whole new class of real time IoT data on a scale never before possible and help make Pittsburgh's vision reality.

Economic Development: Recognizing and embracing the true goals of a smart city to be urban sustainability and economic growth, opportunities will emerge for Pittsburgh's businesses and entrepreneurs to be part of this urban revitalization effort.

Public Safety: Vision Zero - V2V, V2I and V2P alerts and complete data sets will save lives and reduce the number of crashes and injuries. Situational Awareness – video and image for better prevention, safer, faster response, and detailed forensics. Gunshot Detection - built in ShotSpotter combined with real time

video will get more guns and bad people off Pittsburgh streets. Forensics - PPD and DA will spend less time canvassing and build better cases to increase productivity and prosecution rate.

Deployment Plan

AT&T is the recognized Smart City industry leader. We've been doing this type of smart cities transformation work longer than most companies. We've learned how to deliver success quickly with our eight (8) spotlight city projects; our involvement with the Federal DOT challenge grant awarded to Columbus, OH; our on-going engagement with the National Institute of Standards & Technology (NIST) and our key partnership with Envision America focused on helping cities be more innovative.

AT&T's deployments follow our own Smart Cities framework centered on a secure, holistic approach to helping cities improve functions like lighting, transportation, safety, and sustainability. We are committed to testing our framework in several spotlight cities and universities, which include Atlanta, Chapel Hill (NC), Chicago, Dallas, Georgia Institute of Technology, Miami-Dade County, and Montgomery County (MD). We've also added a new spotlight city to our smart cities program: Portland, Oregon. And we have added more leading technology companies to our smart cities alliance—CIVIQ Smartscapes, HydroPoint, MetroTech and Streetline. "Collaborating with the cities and our strategic alliances puts us closer to making smart cities a reality," per Mike Zeto, General Manager and Executive Director, AT&T Smart Cities.

AT&T would consider a discussion to determine the criteria for a mutually successful smart city pilot with Pittsburgh. This conversation would include detailed criteria including but not limited to scale, success criteria, timeline, location, stakeholders, budget, and next steps.

LED Deployment Plan: Upgrade all streetlights with GE Evolve LED and provide smart lighting control and management with LightGrid.

AT&T Sensor Platform Deployment Plan: Potentially the only City infrastructure access required is to the street light pole mounting to install the nodes, access to some poles or other locations to install gateways and networking gear and use of the electrical connection to the street light to power the intelligent node ("node"). The node is then provisioned, calibrated and remotely commissioned and checked by the project team. The intelligent node will be provided with both AT&T cellular and fiber connectivity options.

Installation: The nodes install the same as a basic street light and require no additional tools or skills – turn off the power, connect the red wire, black wire, and the ground. It is suggested that the install be done with City approved contractors. Each node takes approximately 20 to 30 minutes to install depending on site conditions. Total install time is estimated at 12 months depending on labor resources used. A good base would be six or seven, two person crews.

Commissioning: After the nodes are installed, AT&T ensures that nodes function properly, that the GPS accurately locates the fixture, that the optical sensors are aimed and operating correctly, and that the

sensors are all provisioned. This process is expected to take two to four hours per intelligent node. AT&T will work with vendors like ShotSpotter to ensure the gun-shot detection capabilities are working and tied into the city's existing SST application.

Systems Integration (SI): Integration requirements for the intelligent node is limited and mostly required for cameras that require live and real-time video feeds. Integration would be with new or existing VMS (video management systems) for transportation and public safety command centers. AT&T and GE have collaborated with several leading vendors focused on public safety concerns ranging from Hitachi and Genetec, but can work with any company Pittsburgh prefers. There are a host of prequalified SIs familiar with the system available or we can work with other SI's as directed.

Required City Infrastructure: An AT&T Smart Cities Digital Infrastructure solution will have zero impact on sidewalk or roadway space as it requires no space at ground level. The only public infrastructure required is access to the street light mounting bracket. The AT&T communications network leverages existing 4G LTE highly secure wireless connectivity but in the event a multi-communications connectivity network is needed then AT&T will work with the city for the uses of conduit, manholes, hand wells, towers and other locations.

Technical Specifications

The AT&T Smart Cities Digital Infrastructure solution is specifically designed to be easy to deploy, maintain and operate. It is plug and play and built to be future proof with the ability to remotely upgrade software.

Power Requirements: The AT&T intelligent node platform draws less than 30w, but requires 24/7 power to maintain day time and night time detection and communication. Some cities AT&T has worked with did not have streetlights that were energized 24/7. In these cases, sections of lights grouped on the same electrical circuit that is switched by a high-power contactor. The contactor may be controlled either by photocell or time schedule. A simple remedy to this electrical configuration is to replace the master photocell with a shorting cap, change the schedule such that power is always delivered to the lights, or set the contactor so that it is constantly in the closed position. Installing lighting controls on the existing LED would then allow for flexibility in LED light operation and would also collect critical performance parameters about the lighting system that allows for optimization of energy consumption and maintenance. The electrical connection is the same as for an LED street light - red wire, black wire, ground wire. There is no other power work required for the install and operations of the solution.

IoT Communications Connectivity: AT&T will leverage AT&T's industry leading IoT communications network to power the intelligent node data backhaul and provide public internet access.

Data Ownership: Any non-process, source data, extracted or distributed by the AT&T solution will be owned by the City of Pittsburgh. AT&T will not sell, monetize, or share City data with any entity other than the City of Pittsburgh.

All data from the intelligent node will flow from node to the Predix cloud over a dedicated, safe AT&T network infrastructure and then to the City or its partners as directed by the City. Data will be temporarily stored at the edge, with intermittent data packets flowing to the cloud for valuable historical collection or as required and directed by the City. Once the data is extracted out of the cloud it can be used, saved, or analyzed with any other platform.

Transmission: As addressed in the deployment plan, basic transmission can be handled leveraging the required city infrastructure.

An AT&T Smart Cities Digital Infrastructure solution will have zero impact on sidewalk or roadway space as it requires no space at ground level. The only public infrastructure required is access to the street light mounting bracket. The AT&T communications network leverages existing 4G LTE highly secure wireless connectivity but in the event a multi-communications connectivity network is needed then AT&T will work with the city for the uses of conduit, manholes, hand wells, towers and other locations.

System Security: AT&T and GE use the highest levels of encryption and security specifications and standards. GE maintains security and network operation centers that are focused 24/7/365 on information security, requires privacy and security education training for individuals worldwide who support Predix data centers, and follows a standard security software development lifecycle for building infrastructure and solutions. GE security policies and standards are reviewed and re-evaluated annually. Predix security incidents are handled in accordance with an incident response procedure.

Predix has adopted the ISO 27001/27002-based Information Security Management System and the Cloud Security Alliance-based Common Controls Matrix (CSA-CCM) for building its security governance and controls framework. Through these processes, Predix enables support for more than 60 regulatory and compliance frameworks, including the following:

CSA/CCM 3.01	ISO 27001/27002	SOC 2 Type 1	SOC 2 Type 2
HIPAA (protects)	FedRAMP	Export Controls/ITAR	

Privacy: AT&T understands that the issues of digital rights and privacy in the era of IoT have not been fully explored or socialized with residents who may have concerns about the deployment of a sensor platform. AT&T believes that public privacy is essential and that engaging the community and building trust are key requirements of the proposed project.

To help build that trust, AT&T Smart Cities Digital Infrastructure has been designed to ensure data security, but to also protect privacy. By using edge analytics, AT&T will be able to anonymize most data - preventing the possibility of misuse.

AT&T is also offering a suite of solutions that will help the City and residents build a shared vision of the Pittsburgh of the future.

Sensor Technology: AT&T proposes to use the Smart Cities Digital Infrastructure Solution.

Each node includes the following components:

- 2 color cameras - 1080P resolution
- 1 acoustic sensor - supports ShotSpotter gun-shot detection
- 1 environmental sensor package – temperature, pressure, humidity, vibration,
- 1 512GB solid state storage
- 1 edge analytics computing device

Operational Considerations

Standard warranty for both Lighting and Digital Infrastructure components is 5 years, however 10-year warranty is an option. The design life for all components exceeds 10 years and maintenance requirements are minimal. GE's system is rated for 100,000 hrs. (LED and Drivers). This means the fixtures have a useful life of approx. 22 yrs. (12hrs/day * 365).

AT&T will work with the city's maintenance staff to train them on proper maintenance techniques, or AT&T can offer a turnkey solution that includes maintenance.

GE has an established history of LED installations. Pilots with Digital Infrastructure have been in the field for more than two years. GE failure rate is approximately ¼ of 1 percent / 1000 fixtures. This is approximately 3 fixtures per 1000 per year.

Business Model

AT&T approaches Smart City engagements leveraging a strategic framework developed from our experience with eight (8) Spotlight City engagements. The AT&T approach has four strategic pillars and is a recognized business model delivering results.

Secure Connectivity: The back bone of the framework is multi-platform secure connectivity that creates the fabric upon which smart city solutions and applications are run. It's imperative that the right connectivity technology is used for the right device. Heavy data intensive applications like CCTV should be placed on fiber or Ethernet solutions that can handle the bandwidth. Mobile, new devices and simple devices can be deployed on AT&T 4G LTE, which provides connectivity free from regional or physical constraints. AT&T realizes the need to consistently meet these connectivity needs which is why AT&T recently launched the new LTE-M technology. This low power/lower bandwidth connectivity is ideal for sensors that consume small amounts of data, such as water meters or environmental sensors, with the benefit of being battery powered for up to 10 years.

Platform: AT&T platforms make up the second pillar, which enables cities to manage their own solutions and allow their ecosystem to leverage open data strategies. This starts with the AT&T Control Center which helps entities provision and manage the millions of devices that make up a smart city. Additionally, AT&T has developed specific platforms—M2X and Flow—which help developers and manufacturers easily connect devices while giving tools to manage and make sense of the new streams of data. Finally, AT&T also provides additional key tools like NetBond, Cloud Storage, AT&T Dedicated

Ethernet (ADE), AT&T Switched Ethernet (ASE) and Security tools to make sure that a new network of smart sensors is safe, scalable, and manageable.

Alliance Members: Within smart cities, AT&T has realized that no one organization is able to address all of the needs of a smart city. This is why AT&T has created strategic alliances with 10 major Smart City industry leaders across the solution domains that help create a more unified approach and strategy to address the unique needs of a city. These alliances include:

- Cisco
- IBM
- Hitachi
- Southern Company
- Deloitte
- Intel
- Qualcomm
- General Electric
- Ericsson
- Nokia

Vertically Integrated Solutions: The final pillar consists of 5 key solution domains that encompass smart city offerings developed by AT&T and its partners, and guide the development and execution of our product roadmap. AT&T segments the needs of a smart city into 5 verticals; Citizen Engagement, Public Safety, Transportation, Infrastructure and Energy & Utilities. Within each of these verticals AT&T has or knows of the right product/sensor to meet the City's needs.

Although AT&T is not able to specifically identify revenue sharing models of value or meaning to the City of Pittsburgh based on what is known today, we recognize Pittsburgh's intent to identify a partner to assist with securing a Return on Investment, identifying new revenue sources and cost avoidance scenarios.

Return on Investment (ROI): The two primary reasons to invest in a citywide digital sensor platform now are 1) to positively impact quality of life and bring the value of enhanced, equitable and efficient services to Pittsburgh and 2) to own the smart city economy and drive business growth, job creation and ensure a tech-talent pipeline that is open and accessible to all Pittsburghers.

New Revenue Generation: AT&T's experience with other cities confirms a primary source of new revenue is often associated with enhanced parking enforcement. We are confident that a thorough evaluation of Pittsburgh's current parking enforcement practices will result in the identification of enhancements driving remarkable and measurable new revenue generation.

Cost Avoidance: Deploying an integrated, citywide sensor platform will provide the City with cost avoidance savings in the tens of millions of dollars.

We reserve the right to engage the correct stakeholders to understand the true financial concerns of the City. In addition, we suggest a future discussion with our partner Smart City Capital. Smart City Capital has developed a disruptive outcome based model, which is manufacture agnostic, availing cities of all available options, without the typical limitations when linked to one partner.

Evaluation

AT&T proposes to evaluate the project by the estimated impacts and measure success using key metrics to show savings, efficiencies, enhanced performance and total public value. AT&T requests the

opportunity to work with City staff and outside interested parties, like academic institutions and NGO's as applicable and appropriate to develop an evaluation program and set baseline metrics for measuring project performance.

Civic Value: The AT&T proposal will be a catalyst for Pittsburgh to be the HUB for what comes next. One of the expected values of data is the ability to promote accountability and transparency. AT&T believes a citywide deployment will promote civic engagement and empower residents to play a more informed and active role in their own communities.

Community Collaboration: Pittsburgh area universities are leaders in Smart Cities and Civic Technology. CMU and the University of Pittsburgh already are serving as a research and development arm, and the city serves as a test-bed for technologies and policies. Local higher education will benefit significantly from having a citywide living lab to conduct urban research. AT&T welcomes these institutions to monitor, analyze and report on the Smart Cities deployment. Federal research funding should increase significantly, as a result.

Proposal Strengths: A major strength, first and foremost for the AT&T proposal is that Pittsburgh will own all data and can use however desired. AT&T does not want to own, store or monetize the data. Data is an essential foundation of a smart, connected future.

Proposal Weaknesses: AT&T is completely confident with its ability to deliver Pittsburgh's desired smart city vision. The network, hardware and software are all existing and will perform as represented. The proposal will be greatly enhanced by working directly with the City on specific deployment locations, integration with community partners and the refinement.

The weakness in the AT&T proposal is additional input and collaboration with the City and the Pittsburgh community at large are recommended to finalize design and maximize value and impact. In producing this proposal AT&T has reviewed available documentation and other materials to align both with the City as it exists today and with stated visions for tomorrow.

Unknowns/Risks: Much of the risk associated around the AT&T proposal is associated with change. This response is asking the City to change the way it both operates internally, as well as how it delivers services and interacts with the public and how the public interacts with government. Adoption of large scale, comprehensive smart city innovations are still new. AT&T believes Pittsburgh has an operational maturity to implement and use the proposed solution.

Expected Public Impacts and Benefits

City of Pittsburgh Digital Initiatives - The City has a robust data analytics programs called the Pittsburgh Data Forum managed by the City's Data Analytics Team. In addition, the City is a proud partner of the Western Pennsylvania Regional Data Center. The AT&T Smart Cities Digital Infrastructure solution will create a new class of data on a bigger scale to let the City do even more while retaining ownership and control of all data.

Expanded Wi-Fi Internet for Digital Equity – AT&T’s network expertise enables the ability to deploy internet access where it is needed to close the digital divide.

Economic Vitality of the City - With a slightly higher unemployment rate in Pittsburgh than the Northeast region today, investing in Smart Cities offers the ability to corner the growing IoT and civic tech industries.

STEM Education - Pittsburgh could have an unequalled advantage in training the civic technologists of the future. Higher education will benefit significantly from access to the Smart Cities Digital Infrastructure platform to learning civic tech skills through living labs.

Mitigate Traffic Congestion – Although we did not identify the total daily vehicle commuters/annual hours spent in traffic delays across the Pittsburgh road structure, we know that Pittsburgh has been labeled the 8th most congested area, in the past, due to automobile traffic because vehicle transport is a preferred transportation option. This congestion costs the Pittsburgh economy annually. The Smart Cities Digital Infrastructure offers citywide data of vehicles, incidents, speeds, violations, and predictive analytics. This data can support congestion pricing and policies to mitigate traffic.

Air Quality – The AT&T Smart Cities Digital Infrastructure does not include integrated air quality sensors. Air quality is best measured at the human level as opposed to the level of a street light. DI (digital infrastructure) does allow for connection of remote sensors by either BLE (Bluetooth Low Energy) or Wifi. This provides a seamless way to integrate data from other sensors into the AT&T solution. Air quality sensors can be deployed in meaningful locations but use the DI network to collect the data.

Streamline Parking Operations & Enforcement - Pittsburgh currently generates approximately \$17.1 million in parking revenue annually with 950 new multi-space parking meters. To streamline parking operations further, the AT&T Smart Cities Digital Infrastructure, may provide additional essential data, including occupancy, dwell time, churn, and violations. This data supports operations, enforcement and spot finding and new services like dynamic parking to drive even more revenue.

Enhanced Public Safety Functionality - Cities must mitigate a host of crimes from gun violence to car thefts. Ubiquitous optical sensors allow for 24/7 situational awareness and data analytics that allow for a more efficient use of resources and the forensics to solve and prosecute crimes more effectively.

Resilience and Sustainability - As a city driving to be one of the most sustainable cities in the world, a citywide platform like the AT&T Smart Cities Digital Infrastructure offers the data to monitor environmental micro conditions, provide flood alerts, measure vibrations and generate historical image and data points.

Autonomous Vehicles – Pittsburgh has been out-front on this topic with Uber. AT&T would be delighted to discuss the city’s goals, objectives, and accomplishments to determine other adaptive and complimentary autonomous vehicle options to maximize and accelerate results. As an example of AT&T’s focus here, to guide vehicles, future autonomy uses LIDAR, lasers, and other technologies. The

Smart Cities Digital Infrastructure can aid in navigation by providing citywide situational awareness, connectivity, and predictive analytics to support guidance, V2V and V2I communications, as well as a redundant IoT communications path for extra security.

In addition, AT&T is working to help make cars safer, more comfortable and more reliable through IoT technologies. We are committed to the future of connected car technology. Whether it's working with top automakers, leading new breakthroughs at the AT&T Drive Studio or providing a modular, global drive platform – AT&T is leading the way in the innovation of the connected car.

Partner Overviews

We acknowledge the City's answer to question 13 (RFI 2017-0001 Smart Streetlights, Questions and Answers) where the City published its plan "to use its own crews to install any new street lights". The proposed partners --- Ameresco and Collins Engineers, Inc. --- are suggested members of the AT&T Team based on the recent successful AT&T partnership and deployment at the City of Chicago. We suggest the potential likelihood for value and benefits probably exists from learning about this teaming experience in Chicago for Pittsburgh. In addition, we also believe AT&T would be remiss to overlook sharing this relevant experience with the City of Pittsburgh.

Ameresco

Ameresco, Inc. (NYSE: AMRC) is a leading, independent provider of energy efficiency, infrastructure upgrades and renewable energy solutions for customers throughout North America. Ameresco's comprehensive approach to LED street light conversions includes asset auditing and condition assessment, lighting design and engineering, procurement and installation of LED luminaires and wireless control systems, and long term operation and maintenance services. They also provide an array of financing services, from municipal leases to P3 structures.

Over the past five years Ameresco has also emerged as a leader in the development and implementation of turnkey LED street light solutions, with thirty-five projects representing nearly 500,000 street lights installed, in construction or awarded to date. Among these are the Chicago Smart Lighting project, the largest municipal LED street light project in North America to date, encompassing more than 270,000 street lights, a city-wide umbrella network, and targeted infrastructure stabilization repairs.

One of the City's key objectives expressed in this RFI is to convert some 35,000 street lights to LED, generating savings of 60-80% and using those savings to pay for the conversion through an Energy Savings Performance Contract. Ameresco has proven expertise in designing and implementing street light conversions that deliver outsized energy savings while at the same time eliminating over-lighting, light trespass, and other issues that have resulted in resident complaints in some cities. For example, Ameresco's conversion of some 20,000 street lights for the City of Tucson is on track to generate over 75% energy savings, excluding additional control-based savings, using low blue emission 3000K luminaires.

Ameresco is accredited by the National Association of Energy Services Companies (NAESCO), and in Pennsylvania is pre-qualified by the Pennsylvania Treasury Department's PennSEF program and the Commonwealth's Guaranteed Energy Services Act (GESA) program.

Collins Engineers, Inc.

Collins Engineers, Inc. is an ENR Top 500 Design Firm based in Chicago with a national reach and a though leader in the field. Collins regularly authors manuals in conjunction with participating in the implementation of industry protocol, nationally and internationally. Continually on the leading edge of standards and methodology, Collins provides engineering ingenuity and solutions to complex problems, and realistic, honest answers. Collins excels at providing design and analysis services coupled with field experience to the transportation, marine, construction, and land development industries. Collins' insistence on obtaining firsthand knowledge means that its engineers are on the project from start to finish, from the initial on-site inspection to the design of repairs, from performing the construction administration to following up with construction inspection. Such practical experience provides a unique and customized approach in the development of solutions, and provides continuity for our clients.

Collins' most recent project with AT&T in Chicago focused on a public private partnership in conjunction with the AT&T Smart Cities – spotlight City initiative. This was something that was never attempted in Chicago before and AT&T chose Collins to help lead the way and provide the right balance of insight, subject matter expertise and real world experience to get the project through the rigorous and complex approval process in Chicago. This type of ingenuity will be crucial moving forward to address Pittsburgh's desired multimodal transportation options including safer and more efficient transportation journeys.

Siemens

In December of 2015, the USDOT launched its Smart Cities Challenge. 78 cities responded, and seven were chosen as finalists. Siemens had the distinct pleasure of providing expertise and assistance in answering the Challenge to four of the finalist cities, among whom was the City of Pittsburgh, as well as the city that was the ultimate winner of the challenge. The ability to act in a consultancy capacity speaks to the knowledge, experience, and reputation of Siemens in the realm of Smart Cities technology. And, as a trusted partner to the winner, any insights gained will be put into practice for subsequent implementations.

In the United States, Siemens is a leader in the LED streetlight conversion field. With its' staff of professionally certified Engineers, Project Managers, and Electricians Siemens' has extensive experience executing successful street light conversion projects. As industry recognized leaders, Siemens' staff has developed a unique approach to roadway lighting conversions that has earned recognition among the roadway and outdoor lighting industry organizations.

Key benefits of partnering with Siemens are:

- Extensive experience installing LED street lights; with over 162,000 LED street light conversions in 86 communities throughout the US.

- Knowledge and experience installing and maintaining networked control systems; with over 20,000 street light control nodes installed in the US and 70,000 abroad.
- In-house street light and traffic signal maintenance organization; currently providing maintenance services for 400,000 street lights and 10,000 signalized intersections
- Provide in-house financing via Siemens Financial Services (SFS); SFS has successfully funded over \$1.5 Billion in performance contracts.

Siemens' ability to meet LED conversion requirements is best indicated by an extensive list of satisfied customers and highly relevant work experience including but not limited to the following:

- Metropolitan Area Planning Council (MA) - Siemens staff installed 26,000 fixtures in 23 communities in the New England area, with realized energy savings of \$1.1 million dollars per year. In addition, Siemens staff is currently providing warranty services.
- Cape Light Compact (MA) - Siemens staff installed more than 16,000 LED fixtures, resulting in an annual customer savings of \$875,000. Siemens staff is currently providing warranty and maintenance services.
- City of Providence, RI - Siemens staff installed 16,780 Networked LED fixtures, resulting in \$1,400,000 in annual savings. Siemens staff is currently providing warranty and maintenance services.

Founded in Germany in 1847, Siemens has been at the forefront of electrical technology since its inception.

Smart Cities Capital

Smart City Capital has developed a disruptive Outcome Based Model / Solutions, which is manufacturer agnostic, availing the City of all available options, without typical limitations when linked to one financing partner. Smart Cities Capital's vision and flexibility has been the hallmark of its relationship with AT&T and why cities leverage this relationship.

AT&T Smart Cities is delighted to submit this Proposal RFI Response. We look forward to moving to the next step with the City as it pursues this ambitious undertaking.



Universal Intelligent Node for Street Lights

CityIQ: Transform lighting network into digital infrastructure

These intelligent nodes can see, hear and feel the heartbeat of a city. The node connects city officials and citizens to real-time data, allowing for endless applications. From optimized parking and traffic to enhanced public safety and environmental monitoring, this IoT platform can improve the quality of life in your city, today and tomorrow. CityIQ's aesthetics offer seamless integration into all streetscapes by attaching to any light pole and providing power to any light fixture.



VERTICAL NODE: FOR DECORATIVE POST TOP OR TEAR DROP LIGHT POLES

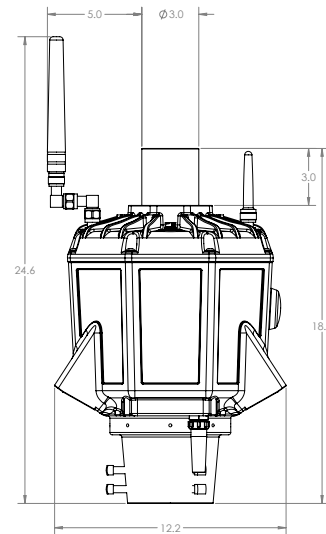
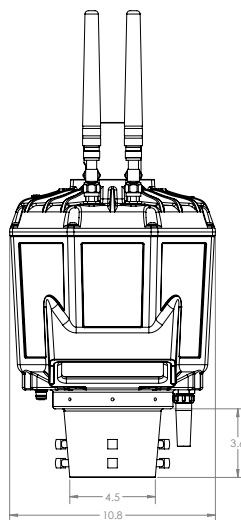
MECHANICAL

Max Weight: 35 lbs
Ingress Protection: IP65

Max Weight of the Luminaire: 35 lbs
Luminaire Mounting: 3" diameter x 3" long tenon (76mm x 76mm)
EPA: 0.933 ft² (0.087 m²)

DIMENSIONAL DRAWING

Note: All dimensions are in inches



Other examples of decorative street light connection

Preliminary – Subject to Change



UNIVERSAL INTELLIGENT NODE SPECIFICATIONS

ELECTRICAL

Input/Output Voltage: **120 – 277V and 480V**
Frequency: **50/60 Hz**
Max Power: **<30W (excluding auxiliary devices connected to PoE port)**
Minimum Surge Withstand Capability: **20kV**
Average Power: **25W**
Metering: **Utility-grade energy meter**

TEMPERATURE

Operating Range: **-40 C to +40 C**

COMMUNICATIONS

- Node to Access Point: **Wi-Fi: 802.11 a/b/g/n**
- Cellular **LTE**
- **Ethernet**

PLATFORM

Scalable: **Endless metadata streams available**
Cybersecurity: **AES Encryption and Certificate-Based Authentication**
Open: **Supports third-party app development using APIs**

CAMERAS

Color Cameras:
Resolution: **1080p (1080x1960) per camera**
Quantity: **up to 3 colors**

Machine Analytics Cameras:
Resolution: **QVGA+**

REGULATION

- **cUL**
- **FCC**

EXTERNAL SENSORS COMMUNICATION

- **Wi-Fi**
- **Bluetooth**
- **BLE**
- **PoE**

ENVIRONMENTAL SENSORS

- **Temperature**
- **Compass**
- **Noise/Acoustic**
- **Pressure**
- **Humidity**
- **Camera**
- **Lightning**
- **Vibration**

STORAGE

Local Hard Drive: **512GB SSD**

EXPANSION PORTS:

Power: **Power over Ethernet**

MAINTENANCE AND UPGRADES

Maintenance Service: **Available**
Software Upgrades: **Over the air**

INTENDED APPLICATIONS

- **Parking Optimization**
- **Monitoring & Surveillance**
- **Traffic Optimization**
- **Environmental Monitoring**
- **Public Safety**
- **Pedestrian Planning & Safety**
- **Gunshot Detection**

Contact GE for a list of premier partner applications.

OTHER

- **No externally visible cameras**
- **No externally visible wiring for power or controls**
- **Ability to remotely adjust camera orientation**
- **Camera field-of-view protection for cold temperatures**
- **Public Wi-Fi: Contact GE for public Wi-Fi expansion capabilities**

Preliminary – Subject to Change



Universal Intelligent Node for Street Lights

CityIQ: Transform lighting network into digital infrastructure

These intelligent nodes can see, hear and feel the heartbeat of a city. The node connects city officials and citizens to real-time data, allowing for endless applications. From optimized parking and traffic to enhanced public safety and environmental monitoring, this IoT platform can improve the quality of life in your city, today and tomorrow. CityIQ's aesthetics offer seamless integration into all streetscapes by attaching to any light pole and providing power to any light fixture.

HORIZONTAL NODE: FOR AREA OR ROADWAY LIGHT POLES

MECHANICAL

Max Weight: 30 lbs (not including the arm bracket or light fixture)
Ingress Protection: IP65 lower housing compartment

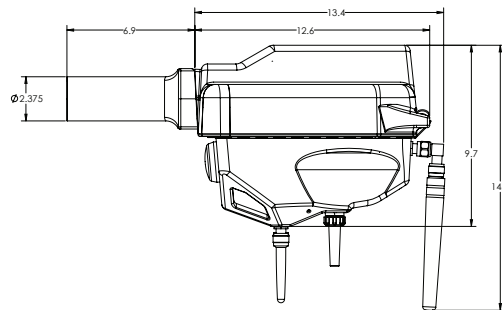
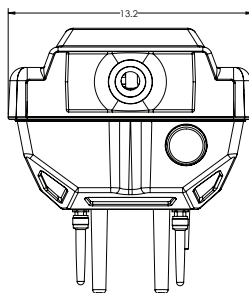
Max Weight of the Luminaire: 30 lbs
Luminaire Mounting: 1.66" to 2" slipfitter arm
EPA: 0.97 ft² (0.09 m²)

DIMENSIONAL DRAWING

Note: All dimensions are in inches (not including fixture mount bracket)



Other example of street light connection.



Preliminary – Subject to Change



UNIVERSAL INTELLIGENT NODE SPECIFICATIONS

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- Temperature
- Pressure
- Lightning
- Compass
- Humidity
- Vibration
- Noise/Acoustic
- Camera

STORAGE

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Power: **Power over Ethernet**

MAINTENANCE AND UPGRADES

Maintenance Service: **Available**
Software Upgrades: **Over the air**

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Preliminary – Subject to Change