STREETSMART PITTSBURGH

RFI (#2017-0001) for **Smart Streetlights**

APRIL 2017

RFI RESPONSE

CITELUM US

5404 Wisconsin Ave, Ste 400
Chevy Chase, MD 20815

INSIDE

"Cities are like people. They are resilient. They can change, and they do change... **Cities have had the ability to come back, re-identify themselves, and become something else. "**

MAYOR BILL PEDUTO, PITTSBURGH

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

Dear Mr. Simpson,

Citelum US is excited to see the City of Pittsburgh taking strides towards developing of a smart LED streetlighting infrastructure by evaluating the scope of technologies and services that exist in today's marketplace. Pittsburgh has long embraced a tradition of technological advancement, stemming from its industrial roots and educational institutions with world class STEM programs. As we progress into the modern era, Pittsburgh is defining itself as the model city for rejuvenation and modernization, transitioning from traditional manufacturing to emerging technological industries. A relatively recent influx of tech companies working collaboratively with local universities has fostered an ecosystem of innovation, where pilot projects abound and no idea is too big.

In this spirit, Citelum is eager to demonstrate how our experiences with lighting and technology in cities around the world can translate to the City of Pittsburgh and improve the quality of life for its citizens. Citelum's comprehensive approach to lighting design through the development of a Lighting Master Plan guarantees high quality lighting performance that is both aesthetically pleasing and in line with industry standards. Through a Global Management Performance Contract, Citelum can further guarantee energy and O&M performance and savings with no upfront cost to the City.

Beyond world-class lighting design, Citelum is experienced as a technology solutions integrator. Citelum has worked with technology providers such as Silver Spring Networks and Cisco Systems in capital cities around the world, including Rome, Barcelona, and Mexico City. We are experienced with integrating these systems with our own computerized maintenance management system, MUSE, as well as carrying out the hardware installations alongside LED streetlight conversions.

We look forward to continuing this discussion as the RFI process moves forward.
Citelum has read and acknowledges Section 5 of Pittsburgh's RFI document.

Sincerely,

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Citelum US is aware that all responses to this RFI *(#2017-0001)* may be considered public information in accordance with the Commonwealth of Pennsylvania Right to Know Laws.

PROJECT OVERVIEW

INTRODUCTION

Citelum US, Inc., along with its team member Sargent Electric, Inc., appreciates the opportunity to respond to the **City of Pittsburgh's Request for Information for Smart Streetlights (RFI 2017-001).** There is a tremendous amount of discussion about the benefits and applications of "smart city" and "IoT" technology to cities. Unfortunately, much of this discussion is focused on hype rather than on practical commercial technologies and applications. There is certainly a large role for business, academia and government to explore how smart technologies can evolve to make cities better. When it comes to designing and implementing a smart streetlight program for the City of Pittsburgh, we know from our unparalleled experience that the emphasis must be on practical and proven solutions.

In order to adequately approach the topic of smart technology and applications, Citelum believes that the City should primarily **emphasize a plan that is built on foundational understanding of urban design, quality of services, and infrastructure operations**. Any plan to implement a smart streetlight program will only be as good as the reliability of the underlying streetlight infrastructure, the network and the company that is maintaining those assets.

ABOUT CITELUM

Citelum is the global leader in urban outdoor lighting and smart city applications. We provide light and connected services to **over 25 million people in over 1,000 cities around the world**, including many of the world's greatest cities and countless iconic structures. Headquartered in Chevy Chase, Maryland, Citelum US, Inc. is a wholly owned affiliate of EDF, the world's largest power generator and one of the world's largest renewable energy companies. When clients work with Citelum, they know they are dealing with a company with a global footprint and the financial backing of a $90 billion parent company.

At Citelum, performance lighting solutions and technology integration has been the core of our business for more than 23 years. Indeed, our corporate vision is that light can change the world for the better! Our employees are committed to help cities and businesses become more attractive, sustainable, efficient and safe through lighting and smart technology – whether it is the Eiffel Tower; the streets of Albuquerque, New Mexico; London's Tower Bridge; a monumental Christmas tree in Naples, Italy; or an iconic bridge in our Nation's capital, Washington, DC - Citelum's expertise is behind these projects.

Citelum is a solutions integrator, meaning we design, build, finance, operate and maintain smart streetlighting systems. From this position, we remain product agnostic, allowing us the freedom to provide customized, best solutions and best practices for our clients. While we strive to provide our clients with our practical advice, we do not have an incentive to recommend one solution over another. As the world leader in streetlighting, our global buying power also allows us to obtain favorable pricing and warranty terms from manufacturers.

ABOUT SARGENT ELECTRIC

Sargent Electric was established in 1907 in Pittsburgh, Pennsylvania, to serve the then thriving steel, glass and coal industries. Sargent remains headquartered in Pittsburgh and has since evolved into one of the largest electrical contracting companies in the Northeast and Midwest region. Sargent Electric serves all segments of the electrical contracting industry, and specializes in the fields of industrial/power, utilities, wireless, commercial, highway/transportation and street lighting service.

Sargent has previously held the service contract for streetlighting in the City of Pittsburgh and its significant knowledge of the City will ensure that local union labor will be part of the team installing and maintaining the City's assets. International Brotherhood of Electrical Workers ("IBEW") employees help Sargent to consistently exceed client expectations and Sargent has consistently maintained agreements with IBEW Local 5 and many other IBEW chapters throughout the nation. Sargent has extensive experience with lighting and transportation projects, as well as wireless projects, and its dedicated team of professionals will be on call around the clock to work with Citelum to ensure that Pittsburgh's streetlighting system is optimally maintained.

CITELUM'S GLOBAL SMART STREETLIGHT EXPERIENCE

Citelum has designed and implemented smart city solutions in cities all around the world. Some of the most noteworthy projects include Rome, Barcelona, and Mexico City. Each project involved different use cases and technology providers. Additional information on these, and other projects can be viewed at the below links: http://www.citelum.com/our-references/by-country

CITY	CONTRACT INFO	SMART LIGHTING	MOBILITY	COMMUNICATIONS	SECURITY
Rome, Italy	• 10,635 light points	• Lighting Control System, CMMS	• Traffic light system/ Traffic Management	• Variable message signs • Advertising media • Communicating street furniture	• Security cameras
Barcelona, Spain	• 44,191 light points	• Lighting Master Plan • Artistic Lighting • Lighting Control System, CMMS	• Traffic light system/Traffic management	N/A	N/A
Mexico City, Mexico	• 49,000 light points • 55 Artistic Lighting projects	• Lighting Master Plan • Artistic Lighting • Lighting Control System, CMMS	• Traffic light system/ Traffic management	N/A	N/A
Sète, France	• 9,660 light points • 30 signal controlled intersections	• Lighting Master Plan • Artistic Lighting • Lighting Control System, CMMS	• Smart Parking • Traffic light system/ Traffic management	• Variable message signs • Advertising media	N/A
Perugia, Italy	• 31,075 light points	• Lighting Master Plan • Artistic Lighting • Lighting Control System, CMMS	N/A	• WiFi/LiFi • Variable message signs • Advertising media • Environmental sensors	• Security cameras

APPROACH TO THE PROJECT: ENSURE PERFORMANCE AND FISCAL RESPONSIBILITY

Based on our 20+ years of experience managing more than 2.5 million streetlights all over the world for many of the world's premiere capital cities, Citelum provides an innovative **turnkey solution** through a Global Management and Performance Contract ("GMPC"). The GMPC is a **performance guaranteed,** public private partnership contract that covers the entire scope of a **turnkey solution: design, build, finance, operate and maintain**. This agreement helps to ensure an all-inclusive, fixed price for the length of the contract to eliminate the risk of unforeseen costs to the City.

The key benefits to this approach, and of key importance to the City of Pittsburgh, is the fact that Citelum will:

- **Secure financing** for the complete system upgrade,
- **Guarantee the energy savings,**
- **Guarantee lighting performance,**
- **Guarantee maintenance performance,** and
- **Transfers the technical, financial and operational risks from the City to Citelum.**

Citelum presents a **best-value proposition**. Our Complete System Upgrade looks at the infrastructure holistically, not just a replacement of streetlights with LEDs, but also replacement of **deficient poles, arms, wiring, and other associated equipment** to ensure the long-term health of the City's lighting system.

With the existing City budget for streetlight energy and operations as a baseline, Citelum can guarantee improved lighting and maintenance performance at a lower annual cost. The City's energy and O&M savings will account for the investment (principal and interest) as well as value-added projects, such as artistic lighting and the desired smart city applications.

Figure 1 Simplified GMPC Contractual Model

If the City intends to move forward with a City-wide smart city implementation, there will likely be additional revenue streams that are generated from the integration of femtocells, advertising mediums, parking/mobility services, and indirect savings across city budgets. **These revenue streams can be integrated directly into the GMPC model**.

Within the GMPC structure, Citelum is contractually motivated to consistently look for increased savings, new efficiencies, and improvements to process throughout the duration of its long-term contracts through a system of **incentives and penalties**. This is very important considering the rapidly changing environment with respect to smart streetlight technology and applications.

DATA COLLECTION – A CRITICAL FIRST STEP

A critical first step to any upgrade must involve a thorough assessment of the City's current streetlight assets to understand:

(a) the exact location expressed in an interactive GIS format;
(b) the condition of those assets;
(c) existing light levels relative to location and local, state, and Federal standards; and
(d) if the current utility billing aligns with the existing inventory.

To meet these goals, Citelum will conduct a thorough inventory of all the assets and their condition. This inventory will become a deliverable to the City, along with a digital map and database. **All data that is collected by Citelum will be property of the City**.

Citelum will also conduct a thorough **Citemetrix® Photometric Assessment** of all City streetlights to compare the current lighting to the City's needs, as well as to any local, State and Federal roadway lighting standards. The photometric analysis is a key component in defining the overall strategy and identifying any lighting deficiencies, while ensuring that such deficiencies are corrected as part of the smart streetlight upgrade.

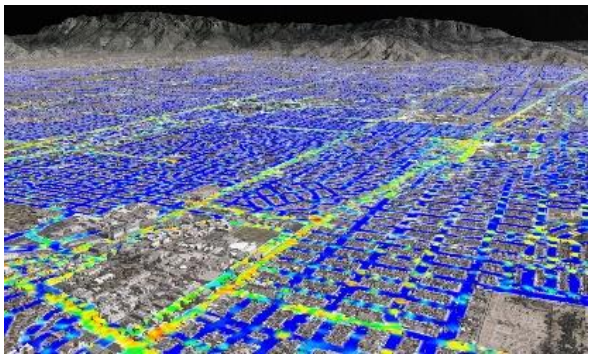
Figure 2 Citemetrix® Analysis of Albuquerque

A COMPREHENSIVE LIGHTING MASTER PLAN TO GUIDE THE UPGRADE

Incumbent streetlighting systems have often been designed in piecemeal fashion based on perceived need, whether by the municipality, its citizens or in some cases, developers. Modern lighting, however, needs to be accurately and consistently designed and compliant with state and national lighting standards to be truly effective. Streetlight design, planning, and installation should not simply replicate historical inaccuracies, but rather should be installed based on a comprehensive and scientific approach.

A roadmap for success based on a properly planned approach to the location and intensity of light is absolutely critical for a successful lighting upgrade. However, lighting should not be designed in a vacuum. Other considerations must be taken into account to maximize benefits for all stakeholders connected to the project. The roadmap that distils these collective goals and objectives with respect to lighting and defines effective, beautiful solutions to achieve them is **Citelum's comprehensive Lighting Master Plan.**

Our goal for the City of Pittsburgh as its business partner is to ensure **the right light, at the right place, for every application in the City of Pittsburgh,** and to commit to a high-level of performance and innovative maintenance for the entire duration of the contract.

For over two decades, Citelum has applied its Lighting Master Plan approach to many of the world's greatest cities. Paris, Mexico City, Copenhagen, Barcelona and Venice have all benefited from Citelum's Lighting Master Plan. The Lighting Master Plan will become a reference tool, allowing the City to develop a coherent and thorough lighting strategy that can be used to enhance the City both functionally and aesthetically.

CITY BRANDING

A core component of Citelum's Lighting Master Plan is artistic lighting. During the urban analysis phase of design, Citelum will identify architecturally interesting landmarks, concentrations of nightlife, and other points of interest. Citelum's team of lighting designers will then develop a portfolio of potential artistic lighting projects utilizing the latest technological solutions to create unique installations, promoting a look and feel that is **distinctively Pittsburgh.**

As the structure of our Global Management Performance Contract encourages us to seek performance improvements and savings over the course of the contract term, Citelum anticipates that the City will be able to commission artistic projects well into the future, taking full advantage of technological advancements.

ECONOMIC DEVELOPMENT AND JOB CREATION

Another key benefit of working with Citelum and its business partner, Sargent Electric, is the economic development activity that will be created by our joint activities.

Should our team be selected by the City of Pittsburgh, Citelum plans to establish a Northeast regional headquarters location in Pittsburgh. Citelum will also locate a warehouse and operations center in Pittsburgh that will **create local jobs for supervisory personnel, electricians, laborers and customer service representatives, among others**.

Citelum's strong commitment to fair labor practices and its partnership with Sargent Electric also ensures that union labor will be used for the installation and maintenance of Pittsburgh's streetlight assets, thus greatly supporting the local economy.

ENVIRONMENTAL RESPONSIBILITY

As a result of the conversion to LED, and streamlined maintenance practices, Citelum routinely reduces City carbon emissions related to streetlight operation by greater than 50%.

Beyond simple energy reduction, however, Citelum is committed to achieving net environmental benefits at every step of the process. This includes designing to try and meet Dark Sky goals and maximizing recycling of old components.

OPERATIONAL INGENUITY

Providing the best services that offer safety, service continuity, and quality can be extremely complex and require constant communication and information accuracy at every stage. To address these challenges, Citelum has developed its own **Computerized Maintenance and Management Software ("CMMS"), MUSE**™, a solution dedicated to the computerized management and monitoring of urban infrastructure.

Citelum will use this field-proven, cloud-based streetlight asset management system to create intelligent work orders and track the progress of the upgrade process. The MUSE data will be readily

available to the City to ensure contract compliance and to provide City departments with total operational transparency on a real-time basis. In addition to its asset management functions, MUSE also functions as a field maintenance, monitoring, and reporting tool.

MUSE, or its predecessors, has been in use among the Citelum group and its clients worldwide for more than 20 years. Approximately 2.5 million lighting points around the world are currently operated by Citelum, many of them with the support of MUSE technology. MUSE monitoring and reporting dashboards will be integrated into the Smart City Digital Platform that Citelum will propose to the City of Pittsburgh. Should the City move forward with additional smart city applications, MUSE is TALQ compliant and can be easily accessed and integrated with additional platforms.

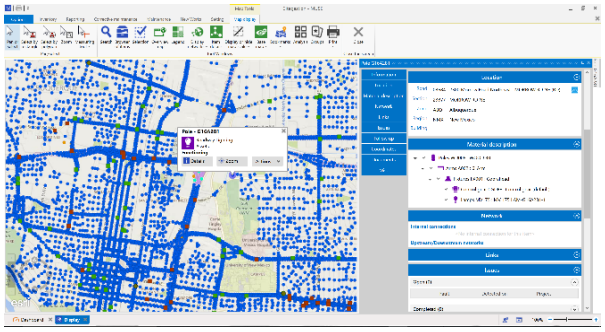

Figure 3 MUSE Asset Database Screenshot

For additional information on MUSE, please feel free to watch this brief demo: https://www.youtube.com/watch?v=wdZxoWbJbe8

A LONG-TERM PARTNERSHIP WITH GUARANTEED RESULTS

Once the City's streetlight system is upgraded, it must be properly maintained to generate a consistently high level of performance and to retain the value of the assets.

If desired, Citelum and Sargent Electric plan to carry out maintenance of the City's streetlighting system and **Citelum will guarantee a high level of lighting performance for a fixed price,** backed with financial penalties for failing to do so. This is the ideal structure for risk mitigation on the part of the City. Citelum's Global Management and Performance Contract eliminates the operational and financial uncertainties that potentially exist in alternative contractual structures.

Citelum commits to key performance indicators ("KPIs") in the contract. Failure to achieve or exceed the defined KPIs will result in financial penalties to Citelum. Enforcement of the KPIs and Citelum's performance is accomplished by regular reporting and analysis via MUSE.

TECHNICAL SPECIFICATIONS

The City of Pittsburgh's Smart Streetlights project has two distinct technological hemispheres—the conversion to LED streetlights, and the implementation of smart city technologies. These two hemispheres each have their own sets of technical components and specifications. Although they are intrinsically linked through a common deployment, shared infrastructure, and financial mechanisms. Due to the ubiquity of streetlights in the urban landscape, it makes technical sense to leverage their distribution and infrastructure for the deployment of smart city network hardware. Financially, the conversion from incumbent lighting technologies to LED generates significant energy and maintenance savings, from which additional projects can be financed. For the purposes of this section, the technical components of each facet will be examined in order to accommodate flexibility in the path forward.

STREETLIGHT UPGRADE

The LED industry is rapidly evolving as technologies improve and market adoption increases, driving prices lower. Efficiency and optical advances, along with increased product lifetimes have drastically shortened the payback period for LED conversion projects, making this an attractive time for municipal governments to pursue large-scale upgrade projects. The number of potential options for lighting and related technologies though, can make the LED marketplace difficult to navigate for municipalities. As a technology agnostic systems integrator, Citelum is well-positioned to assist its clients in finding the best solutions that balance performance and price and meet the most current industry standards, while taking into account future developments.

As a worldwide leader in streetlight operations, Citelum has extensive experience not only operating and maintaining streetlight systems, but also designing and implementing upgrade programs for cities looking to convert to LED technology. We have worked with different material providers in countries around the world in order to develop the most effective solutions for our clients.

Key to Citelum's success in designing effective LED solutions for cities is the development of a robust Lighting Master Plan, grounded in an urban analysis, that seeks to address long-term City goals. Citelum's urban analysis takes into account a variety of City and neighborhood defining characteristics, as well as plans for future development.

Citelum will compare various products with regards to general luminaire performance, photometrics, luminaire and LED color, aesthetic design and appearance, and compatibility with other hardware components, such as lighting control nodes.

At this preliminary stage, Citelum recommends that the City consider the following performance requirements for LED luminaires that are ultimately selected as part of the upgrade program:

- **General Luminaire Performance**
  - Efficacy: >90 lumens/Watt
  - Lifetime: L70>100,000 hours
  - Warranty: 10 Years-Entire Luminaire
  - Safety Certification: UL/ETL/CSA
  - DLC Qualified (Premium Preferred)
- **Photometrics**
  - IESNA RP-8 compliant
  - Full Cut-Off, Dark Sky Compliant
  - Type II or Type III distribution preferred
- **Luminaire and LED Color**
  - Correlated Color Temperature (CCT): Between 2700K and 4000K. *(Aiming to be in line with AMA recommendations)*
  - Color Rendering Index (CRI): >70 required, >80 preferred
  - Design should accommodate additional nodes/sensors or other smart city hardware
  - Modern aesthetic is preferred
- **Compatibility**
  - NEMA 7-Pin Receptacle
  - Dimmable driver

SMART CITY

As a systems integrator, Citelum has experience working with a variety of technology providers and implementing their smart city solutions in conjunction with LED conversion programs. This experience has provided us with many key lessons on operational best practices that will be valuable during solution implementation.

Citelum recognizes that many IoT and smart city offerings are currently in their nascent form. Additionally, it is understood that Pittsburgh wishes to position itself as a pioneer on the IoT frontier, not only in the present, but for years to come. Therefore, rather than commit to specific technological solutions that serve a single use case, it is Citelum's perspective that the **City is best served by identifying present-day solutions that can enable the broadest future portfolio**. Below are examples of applicable solutions, however Citelum remains committed to integrating a fully customized system of the City's choice.

Citelum is a turnkey solutions provider. We have the experience and capabilities to integrate our solutions with any IoT provider.

CISCO SMART+CONNECTED DIGITAL PLATFORM

Citelum believes that **Cisco's Smart+Connected Digital Platform ("CDP")** can be considered one of the market leading solutions for accomplishing the goals of this project. The CDP solution is customizable and scalable, enabling the City to develop a wide range of cutting-edge smart solutions. These include smart traffic and parking management, lighting control and energy optimization, environmental data collection, public safety and security, and location analytics. CDP offers a pay-as-you-go cloud-hosted service that delivers a set of tools and guidelines for creating a smart city framework and managing an effective solutions portfolio for Pittsburgh's priorities, requirements, and budget. The CDP can be thought of as a conduit between traditionally distinct silos of City infrastructure that leverages a network of streetlight nodes and other end-point sensors to collect data and present them in a single cohesive dashboard.

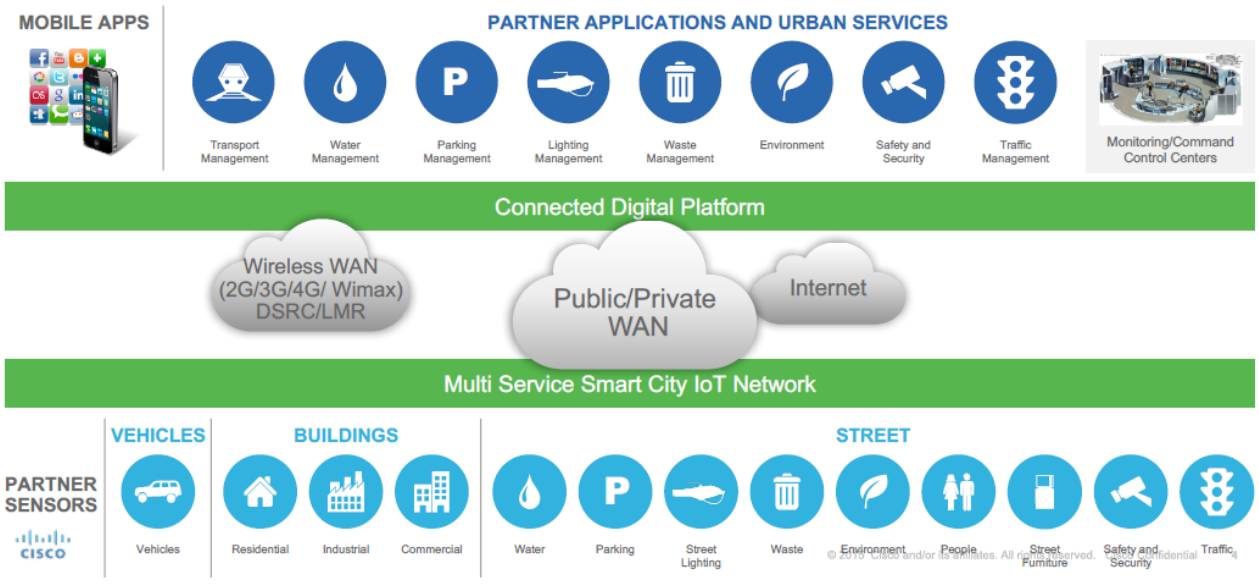

Figure 4 Cisco CDP Solution Architecture for Smart+Connected Cities

INTELLIGENT CONTROLS

As a technology vertical within the CDP, Citelum strongly recommends the inclusion of lighting control nodes. During the LED conversion phase of the Smart Streetlight project, Citelum operations will install luminaires with ANSI 7-pin receptacles and multi-sensor control nodes that can be embedded in the lighting infrastructure. These nodes, in addition to the supporting network hardware, will form the Light Sensory Network which will support intelligent street lighting controls as well as many other city services from a single dashboard. Multi sensor nodes will enable intelligent lighting controls which can generate the following benefits:

- GPS location for easy asset management
- Flexible Dimming Controls
- Revenue grade energy metering
- Reduced energy costs through adaptive dimming
- Reduced maintenance and repair costs

REVENUE GENERATION

The City has expressed interest in generating additional revenue streams to finance its smart city initiatives. As a potential means of achieving this goal, the City specifically expressed interest in the deployment of femtocells, or small cells. Femtocells are an attractive option to increase cellular capacity and serve faster, more reliable data and voice services to more people. In addition to the benefits of improved service for citizens, femtocells free up additional capacity for cell towers, which can be sold back to cellular service providers to create revenue for the City.

Based off market position and experience, Citelum believes that Crown Castle can be a strong partner to achieve this vision. Crown Castle has been implementing small cell solutions for over 10 years, and has deployed approximately 18,000 nodes and 26,500 route miles of fiber, making them the industry leader. Furthermore, Crown Castle already has a strong presence in Pittsburgh, as they have recently deployed their small cell solution throughout the Oakland neighborhood.

Sargent and Citelum have a strong working relationship with Crown Castle, and believe that the City would benefit from a joint deployment of our services. However, as a systems integrator, Citelum is committed to pursuing any strategic partnership that will most effectively advance the City's agenda.

CITELUM SYNERGIES

Ultimately, Citelum is technology agnostic and believes that the City should pursue a solution that will position Pittsburgh to be a Smart City leader now, and for years to come.

At the core of all IoT solutions is a strong IP-based network foundation, which Cisco can provide. If the City is interested in long-term flexibility, and the ability to capitalize on future development in IoT technologies, then it makes sense to deploy a backbone that hardware and software providers are accustomed to building around. Citelum's CMMS MUSE, for instance, would readily tie in with Cisco's CDP, creating operational and technological synergies.

Crown Castle is an industry leader in shared wireless infrastructure, with nationwide deployments and a strong presence in Pittsburgh. Small cell hardware often relies on streetlighting infrastructure. As a result, the LED conversion process can be leveraged to create operational efficiencies.

Under a potential collaboration in the City of Pittsburgh for smart streetlights, Cisco and Crown Castle would be responsible for their individual system designs, while Citelum would be responsible for the implementation, installation, and maintenance of the smart streetlight system. The installation of all network hardware would take place concurrently with the streetlight upgrade. Cisco and Citelum are currently in the process of developing other smart city projects together in the US, and Citelum has experience collaborating with other IoT providers on projects in Barcelona, Sète, Copenhagen, and Rome, among other cities.

With Cisco's cloud architecture and Crown Castle's industry positioning coupled with Citelum's experience as the world-wide leader in streetlight design and operations, Pittsburgh can feel confident that the City will be transformed for the better.

DEPLOYMENT PLAN/SCOPE AND SCALE

The ultimate goal for Pittsburgh's smart streetlight project is to realize a City-wide implementation of new, high performing LED streetlights while simultaneously laying the groundwork for a smart city network that can be expanded on in the future.

RECOMMENDATIONS

The implementation of the streetlight upgrade should be carefully designed in order to balance the competing factors of minimizing the payback period and taking advantage of the latest technology on the market. The two potential paths on either side of this balance are:

A) **A City-wide deployment as a single project.** A City-wide deployment will maximize the return on investment by minimizing the time from project initiation to completion and maximizing the energy and maintenance savings recognized from the start of the project. It may also allow for more competitive pricing through a single deployment.

B) **A phased approach**. LED and IoT technologies will continue to improve and evolve in the coming years. By phasing the upgrade, the City can ensure that the latest technology is deployed, eliminating the need to revisit poles for subsequent upgrades. The primary drawback is that the conversion to LED will progress more slowly, resulting in a longer payback period.

At this time, Citelum does not anticipate that short-term LED advancements will be significant enough to merit a phased approach, and **we recommend a City-wide deployment of LED streetlights** to maximize return on investment.

For smart city technologies, however, it may carry some advantages to take a more phased approach. For evolving technology, a phased approach mitigates the risk. For some technology solutions that are less proven or require a larger investment to implement, it may be worth developing pilot projects to demo potential solutions. **Citelum recommends deploying two to three smart city pilot projects concurrent with the LED upgrade to be leveraged as core system components, on which the system can be expanded.**

When developing a deployment plan there are a few key considerations to keep in mind. The works should be distributed equitably throughout the City in order to allow all citizens to reap the intended benefits. The upgrade should also be designed to capitalize on, and integrate with, existing deployments and infrastructure. By capitalizing on this existing and planned infrastructure, the City can ensure a streamlined startup process as well as a cohesive deployment that engages neighborhoods all over the City.

Citelum's final deployment plan will be guided by the Lighting Master Plan. The analysis will provide a granular understanding of the best way to implement the technology and upgrades to maximize impact. It will be critical to engage with local industries, residents, and stakeholders to communicate in clear terms how this project will provide added benefits to "Yinzers" and to ensure a successful implementation.

EVALUATION/CONCLUSION

Pittsburgh should choose a service provider that....

- **Offers the best value proposition**
- **Completely funds the upfront investment**
- **Develops a comprehensive Lighting Master Plan**
- **Guarantees the lighting and maintenance performance as well as energy and O&M savings**
- **Is experienced implementing smart city and IoT technologies**
- **Has a long and successful track record of city-wide smart lighting projects**

Citelum's proposed solutions will provide the City with the best value at the current budget for the energy, operations, and maintenance of the existing streetlighting system.

Based on our extensive experience, the City can feel confident that Citelum is able to deliver on the design and implementation of a large scale city-wide project. Beyond the design, Citelum can guarantee the quality of the lighting performance post-conversion, which can be measured and verified through on-site photometric analysis. Citelum's innovative CMMS, MUSE, allows us to guarantee a high level of maintenance performance, at, or below, current budgets. Additionally, Citelum brings expertise as a global leader in artistic lighting projects and a strong portfolio as a systems integrator working with various IoT providers to create smart city solutions.

With Citelum's complete system upgrade approach, coupled with artistic lighting and smart city projects under a Global Management and Performance Contract, the City can be assured that the project will be completed with guaranteed performance levels for lighting and maintenance, and budgetary flexibility to implement iconic artistic lighting and smart city projects.

Teamed with the local expertise of Sargent Electric, and bringing best of breed technology integration, Citelum will provide a turnkey solution to aid the City on its march into the future, to make Pittsburgh Street Smart.

PHOTOGRAPHY CREDITS

Cover

"Downtown Composite" by Danny Navarro on Flickr
https://www.flickr.com/photos/dannyfowler/14400598566/

Introduction

"Pittsburgh, PA Light Up Night" by John Craig on Flickr
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Back Cover

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