WRCOG Smart Streetlights - Agency Readiness Survey Results

Date Received:	Email Response	4/22/21	4/9/21	4/6/21	4/5/21	4/5/21	4/5/21	4/2/21	3/25/21	3/25/21	3/25/21
What jurisdiction or municipality do you work for?	**City of Eastvale**	**City of Wildomar**	**City of Lake Elsinore**	**City of Perris**	**City of Calimesa**	**City of Banning**	**City of San Jacinto**	**City of Riverside**	**City of Menifee**	**Jurupa Community Services District**	**Temecula**	**City of Murrieta**
How many streetlights are currently within your jurisdiction/municipality?	4201	1405 (soon to be 1411) City-owned streetlights; 73 signal safety lights; approx. 100-200 other non-City streetlights (SCE owned).	3500	4,943	340		3052	Approximately 30,000	Refer to Daniel	approx 2000	approx 7,400	6500
Who owns the streetlights in your jurisdiction?	Combination of City of Eastvale and SCE	See above	City	City of Perris	SCE	City of Banning	City	Riverside Public Utilities	City of Menifee	Mostly us; some SCE	City	City. SCE owns lights in certain HOA areas.
How many streetlights have been converted to LED?	Most	Most	All	Most	Most	Most	Most	Some	Most	Most	All	Most
Are additional streetlights planned for LED conversion?	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	No
Does your jurisdiction/municipality provide public wi-fi in any capacity?	No	Yes	No	No	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Where does your jurisdiction/municipality provide public wi-fi?	My jurisdiction does not provide public wi-fi	City/County/Municiple Buildings	City/County/Municipal buildings	My jurisdiction/municipality does not provide public wi-fi	City/County/Municipal buildings	City/County/Municipal buildings	City/County/Municipal buildings	Library	City/County/Municipal buildings	My jurisdiction/municipality does not provide public wi-fi	City/County/Municipal buildings	City/County/Municipal buildings

How many traffic signals are within your jurisdiction/municipality?	58	17 City owned/maintained signals; two additional signals are currently under construction and are expected to be complete by end of 2021/beginning of 2022, bringing the total to 19; One signal is on the City border with the City of Murrieta but is maintained by Wildomar; 8 County/Lake Elsinore maintained signals: these signals are on the City border with either the County or Lake Elsinore and serve more than one jurisdiction; 4 Caltrans owned/maintained signals.	60	94	5 intersections, approximately 125 signal heads	18	172	Approximately 400	More than 80, but I do not have the exact count - see Daniel Soltero	N/A	127	We have 100 signalized intersections
Who owns and maintains the traffic signals in your jurisdiction/municipality?	City owns the traffic signals, and they are maintained through contract with Econolite Systems.	See above	City	City, County, Shared Municipalities	City owned	Banning, Beaumont and Caltrans	Riverside County Transportation	The Public Works Department	City of Menifee	N/A	City	City
Are there communications systems tying the signals together?	Yes	No	No	I'm not sure	No	No	No	Yes	Yes	I'm not sure	Yes	Yes

What kind of “Hard” IT/networking assets does your jurisdiction/municipality own and maintain (e.g., Fiber optics backbone, server or cloud processing, etc.)?	Some fiber, some copper, some wireless. No central server	No response	Server or cloud processing	Server or cloud processing		Server or cloud processing	Server or cloud processing	Fiber optics backbone	Server or cloud processing, Wireless (Microwave) and limited Fiber backbone	N/A	Fiber optics backbone	Fiber optics backbone
How does your city maintain (within your jurisdictional limits; please include staff numbers committed to) streetlights?	Maintained through an umbrella contract with WRCOG, Siemens provided maintenance services for streetlights.	Contract with Siemens/WRCOG for maintenance. Public Works Inspector may coordinate with Siemens staff during reinstallations of knocked-down streetlights.	Out source	The maintenance and repair of City owned streetlights is contracted out to a third party.	SCE maintained	City of Banning Electric Department. There isn't a set amount of linemen that are dedicated to street light maintenance.	Contractor	15	City Staff for Streetlight administrative duties: • Office Specialist • PW Analyst • PW Supervisor • PW Manager Streetlight Maintenance and Repairs: City has a maintenance contract with WRCOG and SIEMENS. SIEMENS is the contractor assigned to maintenance and repairs.	Contract with external vendor	City maintains with 2 Traffic Signal Technicians, contractors on-call for major maintenance requirements	We contract with Siemens for maintenance services
How does your city maintain (within your jurisdictional limits; please include staff numbers committed to) traffic signals?	Maintained through contract with Econolite Systems.	Contract with Siemens for maintenance.Public Works Inspector may coordinate specific signal issues with Siemens staff, as necessary.	Out Source	The maintenance and repair of City owned traffic signals is contracted out to a third party.	Contract with Siemens	Contractor	Riverside County Transportation	5	City contracts with the County of Riverside TLMA	N/A	same as above	We contract with County of Riverside for most maintenance. However, we also have one staff member responsible for coordinating maintenance, programming traffic signals, troubleshooting issues at intersection cabinets.

How does your city maintain (within your jurisdictional limits; please include staff numbers committed to) City/Public IT/networking?	Maintained through contract with Econolite Systems.	Contract with Interwest Consulting Group for City IT Services. Two City employees coordinate with IT Services as necessary.	City Staff	5		In house staff (3) and contractors.	City (2)	5	Maintenance/support duties are shared among five different people.	N/A	same as above	Internal IT staff. 3
How does your city maintain (within your jurisdictional limits; please include staff numbers committed to) wi-fi?	City does not have public wi-fi	Contract with Interwest Consulting Group for City IT Services, including wi-fi support at City Hall. Two City employees coordinate with IT Services as necessary.	City staff	N/A		In house staff (3)	0	1	Maintenance/support duties are shared among five different people.	N/A	City IT Department	Internal IT staff. 3
Do you have any policies or ordinances related to collection of data from pubicly owned IT/networking assets?	No	No - I don't believe so, but not 100% sure	No	Yes		No	No	No	Yes		Yes	unknown

May 31, 2022

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Subject: WRCOG Smart Streetlights: Peer Agency Review

Michael Baker is assisting the Western Riverside Council of Governments (WRCOG) in developing a Smart Streetlight Implementation Plan. As part of this effort, Michael Baker has reviewed five peer agencies that have applied smart streetlight technologies to learn from their successes and problems, which will inform WRCOG's development of this plan and potential implementation of a smart streetlight or smart city program. The review included a combination of online research, interviews with key staff, and first-hand knowledge from staff involvement on Smart City plans, where applicable. This technical memorandum summarizes the peer agency review and resulting key takeaways.

Introduction

At the direction of the Executive Committee, WRCOG developed a Regional Streetlight Program that assisted 10 member agencies and a Community Service District to purchase nearly all the streetlights within their jurisdictional boundaries which were previously owned and operated by Southern California Edison (SCE). Between 2019 and 2020, the Program converted over 53,000 streetlights across 11 local jurisdictions to LED fixtures. The LED fixtures use substantially less power, resulting in a 70% reduction in energy consumption across the participating agencies. The upgrade also substantially reduced light pollution, benefiting the community as well as the Palomar Observatory in San Diego County. The cost savings and reduced power draw present an opportunity to add smart city architecture to the streetlights. The Smart Streetlight Implementation Plan will assess which types of technologies would provide the most value to the WRCOG communities. The first step of this evaluation was to learn from the successes and problems experienced by other agencies implementing smart streetlights.

Approach

Michael Baker conducted a review of peer agencies that have established programs or partnered with vendors resulting in smart streetlight implementation. The reviews first consisted of literature reviews and online research. The research covered the type of communications equipment installed on existing or new streetlight poles, additional in-ground infrastructure required for implementation (i.e., fiber or communications), agreements or contracting arrangements with service providers, types of data collected or reported, and what successes or problems have been reported.

After performing online research, Michael Baker and WRCOG staff conducted one-on-one interviews with key staff from each of the peer agencies to get further insight into program implementation. Questions were developed to identify lessons learned, business models, contract solicitation approaches, and technology prioritization for each peer agency's program. The selected peer agencies and interview questions were developed in consultation with WRCOG staff.

Peer Agency Reviews

Los Angeles, CA

The City of Los Angeles had the widest variety of Smart Streetlight uses of the peer agencies reviewed, including solar streetlights, smart gas meters, electric vehicle (EV) charging stations, smart poles (poles with built-in small cell technology), 5G co-location, air quality sensors, safety cameras (at select locations), pedestrian counters, motion sensors, seismic sensors, USB charging, and digital banners.

City staff completed a public survey with various communities which identified public Wi-Fi and air quality monitoring as priorities when implementing smart city technologies. While Wi-Fi was a community priority, the tested technology did not meet the requirements. Air quality sensors have been installed in select communities and have been limited to sensors that communicate with cellular technology. Data collection and analysis is conducted by a different department at the City.

The City has installed nearly 400 electric vehicle (EV) charging stations on streetlights systems that operate on 240v. Staff were trained to install and maintain the EV charging stations across the city. Installing 7kW EV chargers required additional infrastructure upgrades, including a new transformer, conductor, and fusing. Consumers pay a nominal fee to utilize the EV chargers.

Furthermore, the City has implemented Smart Nodes (Remote Monitoring Units (RMUs)) and uses third-party vendor-proprietary platforms such that each technology has a different control platform. Most technology is being applied at small scale as a beta-test. The systems that generate revenue have not been found to cover the cost of the program. While 5G co-location is the most lucrative, it requires substantial coordination effort between the vendors and service providers. Finally, the community has expressed concerns about invasion of privacy related to the pedestrian counters and cameras.

Lessons Learned

- Business model is uncertain. How can the program be implemented so the system pays for itself?
- Identify program parameters ahead of time. What problem are you trying to solve? What is your existing inventory? What new skills will your maintenance workforce need for these systems?

San Diego, CA

The City of San Diego has implemented smart sensors that collect data such as available parking spaces, vehicle counts, pedestrian counts, bicycle counts, temperature, humidity, and atmospheric pressure. The City uses the CityIQ online platform, which allows staff to aggregate and organize data collected various sensors, as well as provide public access to data. In implementation, the City has not realized the cost savings that were anticipated prior to deployment. Finally, the community has expressed concerns related to privacy.

Lessons Learned

- Beta test ahead of large-scale installation
- Get public buy-in if features might be controversial

Las Vegas, NV

The City of Las Vegas maintains over 50,000 streetlights and has implemented separate pilot programs with Ubicquia and with Philips. The pilot systems include remote control, power usage reporting, dimming and light scheduling. During the planning phase staff identified that the streetlight systems are photocontrolled at the point-of-service, as opposed to each individual streetlight, which only supplies power to the streetlight circuit from dusk to dawn. As a result of this condition, the City had to complete circuit upgrades to provide continuous power to the circuit allowing the sensors to operate without interruption.

Rather than fiber, the Las Vegas pilot systems use AT&T's LTE cellular network. The City has reported that it intends to continue to work with AT&T and Ubicquia to install more sensors to collect temperature, ozone and particulate levels, traffic and construction, air quality, etc. The City also reported that it plans to expand the 5G WiFi network especially around the new NFL stadium. The streetlight upgrades have resulted in cost savings for the City.

Lessons Learned

- Streetlights are only on at night, meaning all associated technologies can only function at night unless circuit upgrades are completed.
- A user-needs assessment would identify the most important systems to prioritize

Chicago, IL

The City of Chicago is converting streetlights to LED fixtures that allow for remote monitoring and notifications of light failures. The City has reported cost savings in operations, and it also benefitted from ComEd energy-efficiency incentive rebates. Chicago city staff were not available for an interview, and therefore the review was limited to information that was available online.

Lessons Learned

- Successful public engagement program. Regular community meetings to gauge feedback, and no concerns have been reported. Upgrades are mapped on a publicly available website to allow the community to track installations.

Kansas City, MO

The City of Kansas City has implemented Sensity technology for streetlights along the streetcar line and has implemented separate pilot programs with Ubicquia and with Philips. The systems include alerts of streetcar track blockages, cameras, smart lighting, Wi-Fi, electric vehicle charging stations, and sensors that record data pertaining to traffic, parking, noise, crowds, air quality, and weather. The data collected by the streetlights are accessible to the public via an online portal. The City has reported reduced energy and maintenance costs from the streetlight upgrades.

Lessons Learned

- Incorporated smart technologies on a larger infrastructure project (streetcars), which made the perceived cost smaller in comparison to the overall higher-dollar construction project
- A city-needs analysis would have improved project usefulness and outcomes.

Key Takeaways

Although these agencies differ from WRCOG, their experiences will help inform how WRCOG and/or its member agencies can successfully implement a Smart Streetlights program. Key takeaways that WRCOG staff should address in its Smart Streetlight Implementation Plan are as follows:

- Identify program parameters ahead of time. Agencies need to know what problem they are trying to solve as well as their system capabilities.
- Consider the agencies' current traffic signal and IT staff capabilities as well as the responsibilities for the systems. Agencies should consider what new skills maintenance workforce will need for these systems.
- Start with a pilot for testing the technology and data quality. As part of the pilot program consider different vendors and technologies to understand the limits and capabilities of different systems.
- Understand that the current business model is uncertain. For most cities, the smart applications have been an expense with little or no return revenue for the City. Agencies should consider how programs can be implemented so they pay for themselves or recognize the expense to solve an identified need.
- Understand who owns the data for the implemented systems. When developing contracting documents, specify who owns the data and what data will be sent and maintained by the agency. It is also beneficial to determine if the agency can handle the raw data for analysis or if dashboards are the preferred method of monitoring system performance.
- Public transparency in the process is essential. Agencies should understand there is a potential for community concerns about privacy. Outreach should clearly outline what technology is being implemented, what data are being collected and what data will be maintained. Decision maker and community buy-in is highly recommended if features may be controversial.

Supplemental Agency Review

Columbus, OH

The City of Columbus recently solicited proposals for the implementation of a Columbus Smart Street Lighting System (CSSLS). This system will include features such as centralized remote monitoring and control (two-way communication) of individual streetlights for outages, remote changes in time of operation, and dimming of fixtures by time of day or sensors. The CSSLS will leverage the existing fiber optic communication network for the backhaul system. The City intends to operate the CSSLS in an existing management center and the system may accommodate the incorporation of other applications, such as traffic counters, gunshot detection, environmental sensors, etc. This procurement will convert about 58,000 luminaires to LED and follows a pilot project that will convert 2,559 luminaries.

Summary & Conclusions

The review of peer agencies identified several lessons learned that will benefit WRCOG and its member agencies with a potential Smart Streetlight program implementation. WRCOG staff will need to first identify the priorities of the program to select the best technology to implement. A pilot program will ensure that the technology will meet staff needs and will validate the cost estimates provided by technology vendors to inform the actual cost of full roll-out. WRCOG should also consult with its

members to determine if deployed systems will be managed by individual members or centrally through WRCOG, as a central management approach with a dedicated staff could provide the attention and monitoring needed to fully realize the benefits from the program. Finally, WRCOG should also prepare a public outreach plan to help the affected communities understand what technology is being implemented and how their privacy will be protected. These measures will ensure a successful Smart Streetlight Implementation Plan.

If you have any questions pertaining to the findings summarized in this memo, please call Dawn at (760) 603-6266.

Sincerely,

Dawn Wilson,
Department Manager
Transportation Planning

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May 31, 2022

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Subject: WRCOG Smart Streetlights: Technology Application Review

Michael Baker is assisting the Western Riverside Council of Governments (WRCOG) in developing a Smart Streetlight Implementation Plan. As part of this effort, Michael Baker has reviewed potential Smart Streetlight technologies based on applicability categories and level of readiness. This technical memorandum summarizes the application review for WRCOG's consideration.

Introduction

At the direction of the Executive Committee, WRCOG developed a Regional Streetlight Program that assisted 10 member agencies and a Community Service District to purchase nearly all the streetlights within their jurisdictional boundaries which were previously owned and operated by Southern California Edison (SCE). Between 2019 and 2020, the Program converted over 53,000 streetlights across 11 local jurisdictions to LED fixtures. The LED fixtures use substantially less power, resulting in a 70% reduction in energy consumption across the participating agencies. The upgrade also substantially reduced light pollution, benefiting the community as well as the Palomar Observatory in San Diego County. The cost savings and reduced power draw present an opportunity to add smart city architecture to the streetlights. The Smart Streetlight Implementation Plan will assess which types of technologies would provide the most value to the WRCOG member agencies. The first step of this evaluation was to learn from the successes and problems experienced by other agencies implementing smart streetlights, as documented in the *WRCOG Smart Streetlights: Peer Agency Review* technical memorandum, dated June 8, 2021. The second step of the evaluation was to evaluate which technologies could be considered for the WRCOG Smart Streetlight Implementation Plan.

Approach

Michael Baker conducted a review of technology applications to be considered for the WRCOG Smart Streetlight Implementation Plan. Each application is summarized in cut-sheet format, including a general description, technology readiness, general assessments of the potential need for hardware (including, but not limited to, sensors, mounting equipment, and communication equipment), support infrastructure required, backhaul communications requirement (e.g., wireless, cellular, or fiber-optic), back-end systems and monitoring, and maintainability and maintenance requirements, including general descriptions of additional hardware, back-end, and support services needed. The applications are grouped into general categories of technology applicability: Environmental and Sustainability, Economics, Mobility, Public Safety, and Connectivity. Some applications fall into multiple categories, as noted in the detailed cut sheet. Each of these categories is described further below.

Environmental and Sustainability

Applications in the Environmental and Sustainability category could include tracking air quality to provide local planners, researchers, and the general public with high-quality, local environmental data. Water detectors could be deployed to identify flood conditions or optimize water use for irrigation, and road temperature detectors could be used to determine when roadway treatment is needed for snow or ice conditions. Smart streetlights may also provide electric vehicle charging to support battery electric or plug-in hybrid electric vehicles, or dimmable nodes to reduce power consumption when lights are not needed. A combination of sensors could also be applied for wildfire detection to alert or track wildfire events.

Economics

Applications in the Economics category include technologies that can generate revenue, such as electric vehicle charging for a fee, or a smart banner that can feature ad space to be sold to local businesses. Small cell technology to support 5G cellular networks can be leased or sold to providers, or dimmable nodes would reduce power consumption and associated energy costs, with the streetlight increasing illuminance when a vehicle or pedestrian is detected.

Mobility

Applications in the Mobility category could include smart cameras or other detectors that can count vehicles, bicycles, or pedestrians or can identify collisions and near misses. These detectors could be implemented in combination with automated lighting, or they could be used to measure parking turnover or to track and report real-time parking availability.

Public Safety

Applications in the Public Safety category could include surveillance cameras that may be used to monitor public parks or roadways for criminal activity, or it may include dimmable nodes to provide additional light only when road users are detected. They may also include a combination of sensors used for wildfire detection or gunshot detection, and alerts could be automatically sent to relevant emergency responders. Water detection could be used to alert the jurisdiction staff or the public to dangerous flooding events, or road temperature sensors could identify dangerous snow or ice conditions.

Connectivity

Applications in the Connectivity category include communication to jurisdiction maintenance departments or internet connectivity for the public. For example, asset management nodes would help the streetlight program management predict utility pole or transformer failure to make repairs before an outage. Small cell technology and Wi-Fi hotspots could also be provided for public internet access.

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Environmental and Sustainability

Category: Environmental and Sustainability		Readiness: Green Light/Proven ○ Tested ○ Pilots ● Proven

Air Quality Sensor

Description:
Air quality detection and tracking is becoming a growing need as communities are faced with concerns about pollution and particulates. Air quality sensors can measure temperature, humidity, a variety of gas pollutants (including ozone, nitrogen oxide, and carbon dioxide), and a variety of particulate matter. An air quality sensor could be used to inform the community about dangerous pollution events. Some individuals are more likely to have negative reactions to air pollutants, and they could take appropriate protection measures according to local air quality levels.

Applications:
Data collection for research
Pollution tracking
Wildfire detection (in combination with other technology)

Vendors:
Ubicquia
CIMCON
Siemens Mobility
ENE.HUB

Benefits:
On-demand monitoring/reporting?

Hardware:
Straps onto pole
Plug-in for power

Communications:
Wireless

Monitoring:
Temperature
Humidity
Ozone
Nitrogen Dioxide
Particulate Matter < 2.5 µm
Vary by vendor:
Sulfur Dioxide
Nitrogen Monoxide
Carbon Monoxide
Particulate Matter < 1.0 µm
Particulate Matter < 10.0 µm
Noise level (decibels)

Maintenance:
Easy to detach/replace
Over-the-air updates

Source: Ubicquia Information Brief

Additional Categories:
- ✓ Economics

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Category: **Environmental and Sustainability**		**Readiness:** **Green Light/Proven** ○ Tested ○ Pilots ● Proven

Dimming Light Control

Description: Dimmable streetlights can be used to provide only as much light as needed, based on schedule, ambient conditions and road user needs. Because the light will not be operating at full power from dusk to dawn, the streetlight will use less energy. These dimmable nodes can be based on complex schedules, or can be installed in combination with other sensors based on the control desired, whether it be ambient light, weather conditions, presence of a vehicle or pedestrian, traffic volumes, or a noise trigger.		**Applications:** Streetlight adjusts based on ambient light Streetlight activates/brightens when road user is detected **Vendors:** Ubicquia CIMCON Siemens Mobility ENE.HUB LightGrid by GE Current Signify (formerly Phillips Lighting) Pangea by Visionaire Lighting Holophane
Benefits: Reduced operating costs Reduced light pollution	**Hardware:** Attaches directly to luminaire	**Communications:** Wireless
Monitoring: Power usage Quality of line and load GPS *Varies by product:* Sensor trigger Tilt/vibration	**Maintenance:** Over-the-air updates	 *Source: Ubicquia Product Catalogue*

Additional Categories:
- ✓ Public Safety
- ✓ Connectivity

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Category: **Environmental and Sustainability**		**Readiness:** **Yellow Light/Some Pilots** ○ Tested ● Pilots ○ Proven

Water Detector

Description: Water detectors can be used in combination with streetlights to identify flood events or assist with irrigation needs along roadways. Whether monitoring roadways that commonly flood or identifying build ups in catch basins before flooding occurs, flood detection can help jurisdictions react to dangerous water levels as soon as possible. In combination with an irrigation system, a water detector can identify real-time water data such that landscaping is irrigated to exact needed levels, improving efficiency and decreases water consumption.		**Applications:** Flood detection Irrigation **Vendors:** CIMCON/Senix ENE.HUB
Benefits: Flood alerts Catch basin clog alerts Efficient irrigation	**Hardware:** Sonic sensor installed on streetlight or in nearby catch basins	**Communications:** Wireless
Monitoring: Water level Water volume 50-foot detection range 10-mile communication range	**Maintenance:** Easy to detach/replace	 *Source: https://www.senix.com/news/sensors-provide-iowa-flood-warnings/*
Additional Categories: ✓ Public Safety		

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Category: **Environmental and Sustainability**		**Readiness:** **Yellow Light/Some Pilots** ○ Tested ● Pilots ○ Proven

Road Temperature Detector

Description: For roads affected by snow and ice conditions, monitoring road temperature can inform when salt or other chemicals should be applied. Even installed only at high risk areas, road temperature sensors would inform jurisdictions exactly when roadway treatment is needed to improve roadway safety.		**Applications:** Winter road maintenance **Vendors:** CIMCON
Benefits: Reduced road maintenance cost Improved road safety	**Hardware:** Mounts onto pole	**Communications:** Wired or wireless
Monitoring: Road temperature Air temperature	**Maintenance:** Easy to detach/replace	 *Source: CIMCON Road Temperature Monitoring Technical Data Sheet*
Additional Categories: ✓ Public Safety		

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Economics

Category: **Economics**		**Readiness:** **Yellow Light/Some Pilots** ○ Tested ● Pilots ○ Proven

Electric Vehicle Charging

Description: While electric vehicles are becoming more popular, they require charging infrastructure to allow them to be useful. Because charging an electric vehicle with a standard power source can be slower than filling up a gas tank, charging most conveniently occurs when the car is parked. Streetlights near on- or off-street public parking can offer electric vehicle charging, contributing to electric vehicle infrastructure at lower cost than standalone charging stations. If electric vehicle charging is offered for a fee, this provides a revenue stream back to the streetlight operator.		**Applications:** Pay-for-charge in parking spots located near streetlights **Vendors:** FLO LilyPad EV ENE.HUB
Benefits: Reduced vehicle emissions Potential revenue stream	**Hardware:** Level 2 charging stations require a 240V AC power source Mounts onto pole	**Communications:** Wireless
Monitoring: Charge time Electricity provided High-demand areas for electric vehicle charging	**Maintenance:** Modular elements allow for easy replacement of components	 *Source: Case Study: City of Los Angeles, FLO*

Additional Categories:

- ✓ Environmental and Sustainability

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Category: **Economics**		**Readiness:** **Yellow Light/Some Pilots** ○ Tested ● Pilots ○ Proven

Smart Banners

Description: Dynamic, digital signage on light poles can be used to alert drivers or pedestrians traffic issues, emergencies, or other public information. Schedule slots could also be sold to private businesses for advertising purposes.		**Applications:** Traffic notifications Other public information Private advertisements **Vendors:** YuChip Keewin ENE.HUB
Benefits: Public communication Potential revenue stream	**Hardware:** Digital display	**Communications:** Wireless
Monitoring: Display time Image/video progression	**Maintenance:** Easy to detach/replace Over-the-air updates	 *Source: keewindisplay.com/smartstreetlights*
Additional Categories: ✓ Connectivity		

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Mobility

Category: **Mobility**		**Readiness:** **Yellow Light/Some Pilots** ○ Tested ● Pilots ○ Proven

Smart Cameras

Description: Cameras mounted on a street poles can be used for security and surveillance. When paired with video analytics, cameras can become vehicle counters, pedestrian counters, curb space monitors, and collision or near-miss detectors. Cameras typically have a wide field of view and can be remotely panned, pivoted, and zoomed.		**Applications:** Surveillance Vehicle counts Pedestrian/bicyclist counts Curb space/parking data and enforcement Collision/near-miss data Wildfire detection (in combination with other technology) **Vendors:** Ubicquia CIMCON Siemens Mobility ENE.HUB
Benefits: On-demand traffic monitoring Congestion management	**Hardware:** Mounts onto pole Connects to smart processor mounted to luminaire (for analytics)	**Communications:** Camera is hard-wired to video processor, video processer communicates wirelessly
Monitoring: Video recording	**Maintenance:** Easy to detach/replace	 *Source: CIMCON Vehicle Analytics (Camera) Technical Data Sheet*

Additional Categories:
- ✓ Public Safety

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Category: **Mobility**		**Readiness:** **Green Light/Proven** ○ Tested ○ Pilots ● Proven

Other Detection Options

Description: Rather than using cameras, a variety of other sensors including radar, infrared, thermography, induction, or magnetic fields can be used to detect vehicles or pedestrians. For example, vehicle volumes and speeds can be detected by radar. Pedestrians and bicyclists can be detected by thermal imaging cameras. Parked vehicles could be detected by in-pavement magnetic field sensors. Any of these sensors can communicate wirelessly with a smart city platform for easy monitoring and analysis.		**Applications:** Vehicle counts Pedestrian/bicyclist counts Curbspace/parking data and enforcement **Vendors:** CIMCON Siemens Mobility ENE.HUB Signify (formerly Phillips Lighting) Pangea by Visionaire Lighting
Benefits: On-demand traffic monitoring Congestion management	**Hardware:** Various: installs on pole, on pavement, or in pavement	**Communications:** Wired or wireless
Monitoring: Presence of vehicle Presence of pedestrian/bicyclist	**Maintenance:** Easy to replace	 *Source:* *https://www.mobility.siemens.com/global/en/portfolio/road/smart-intersection/traffic-detectors.html*
Additional Categories: ✓		

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Public Safety

Category: **Public Safety**		**Readiness:** **Green Light/Proven** ○ Tested ○ Pilots ● Proven

Noise Detector

Description:
By monitoring noise levels, emergency responders can react to sudden increases in noise levels that are associated with aggressive and/or criminal events, including gunshots or breaking glass. Such noise detection may also be paired with sound recording to help understand key events just before or after a crime.

Noise ordinance compliance can also be more effectively monitored, with the potential for automatic alerts sent to nearby businesses such as concert venues and bars that may be more likely to produce noise.

Applications:
Emergency responder alerts
Criminal evidence
Noise compliance violation monitoring and alerts

Vendors:
Ubicquia (feature of Air Quality sensor)
CIMCON (Aggression events)
ENE.HUB
Signify (formerly Phillips Lighting)
Pangea by Visionaire Lighting

Benefits:
Faster emergency response
Improved noise ordinance compliance

Hardware:
Straps onto pole
Plug-in for power

Communications:
Wireless

Monitoring:
Decibel sensitivity varies

Maintenance:
Easy to detach/replace
Over-the-air updates

Source: CIMCON Gunshot and Aggression Detection Technical Data Sheet

Additional Categories:
- ✓ Environmental and Sustainability

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Connectivity

Category: **Connectivity**		**Readiness:** **Green Light/Proven** ○ Tested ○ Pilots ● Proven

Asset Management

Description: A key feature of smart streetlights is the monitoring of streetlight health. If power usage or line quality fluctuate outside of a normal range, maintenance can be performed to ensure continuous service is provided. If an unexpected power loss occurs, an alert can be generated with detailed information about the time of failure and equipment status immediately before power loss, which can help diagnose the issue and reduce the repair time. Additional sensors can be deployed to monitor transformers and utility poles to detect the need for replacement before equipment failure occurs. If a pole is tilting due to weather or due to a vehicle collision, an alert can be sent to prioritize repairs before further damage occurs. The transformer sensor can measure additional conditions relevant to power grid health.		**Applications:** Equipment health tracking for replacement schedules Equipment failure prediction and prevention **Vendors:** Ubicquia (transformer and pole) CIMCON Siemens Mobility ENE.HUB LightGrid by GE Current Signify (formerly Phillips Lighting) Pangea by Visionaire Lighting Holophane
Benefits: As-needed equipment maintenance Helps prevent utility outages Reduced equipment repair times	**Hardware:** Attaches directly to luminaire, utility pole, or transformer	**Communications:** Wireless
Monitoring: Light power usage Power line and load quality Light tilt Light vibration Light power loss detection *Utility pole sensor* Pole tilt Pole vibration *Transformer sensor* Oil temperature Oil pressure Pole tilt Pole vibration Power output	**Maintenance:** Easy to detach/replace	 *Source: https://www.ubicquia.com/products/tvm*
Additional Categories: ✓ Public Safety		

Michael Baker INTERNATIONAL

Category: **Connectivity**		**Readiness:** **Green Light/Proven** ○ Tested ○ Pilots ● Proven

Small Cell

Description: Small cell antennas are key for cellular and data providers to provide the dense coverage needed to provide 5G service. Small cells are so named because they are substantially smaller than the traditional cellular towers. They are lower to the ground and have a smaller range, and so they must be well-distributed to provide continuous quality service. Streetlights offer the potential to leverage existing well-distributed infrastructure to provide small cell technology. This high-quality data service can be leveraged to offer high-speed public Wi-Fi.		**Applications:** Private Cellular Networks Public Wi-Fi **Vendors:** Ubicquia CIMCON ENE.HUB
Benefits: Improved cellular service for community Potential revenue stream	**Hardware:** Attaches directly to luminaire	**Communications:** Wireless or wired
Monitoring: Power use	**Maintenance:** Over-the-air updates	 *Source: Ubicquia Information Brief*

Additional Categories:
- ✓ Economics

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Michael Baker INTERNATIONAL

Category: **Connectivity**		**Readiness:** **Green Light/Proven** ○ Tested ○ Pilots ● Proven

Public Wi-Fi

Description: Publicly available Wi-Fi hotspots helps the population stay productive on-the-go. These hotspots can provide internet connectivity to underserved communities, and they could encourage public transit use by allowing commuters to work at bus stops and transit stations. Wi-Fi service could be offered for free or could be provided on a subscription basis to generate revenue.		**Applications:** Public Wi-Fi **Vendors:** Ubicquia ENE.HUB Signify (formerly Phillips Lighting) Pangea by Visionaire Lighting
Benefits: Potential revenue stream	**Hardware:** Attaches directly to luminaire	**Communications:** Wired: ethernet, fiber, LTE, or DOCSIS
Monitoring: Number of connections Duration of connections	**Maintenance:** Over-the-air updates	 *Source: Ubicquia Product Catalogue*
Additional Categories: ✓ Economics		

Michael Baker INTERNATIONAL

June 1, 2022

Daniel Soltero, Program Manager
Western Riverside Council of Governments
3390 University Ave, Suite 200
Riverside, CA 92501

Subject: WRCOG Smart Streetlights: Procurement Strategies Review

Introduction

Considerations for deployment of any new technology-based system must extend beyond the individual equipment and system components. This memo reviews administrative and financial activities that WRCOG member agencies could pursue to successfully deploy Smart Streetlight components and systems.

Public lighting systems generally require one or more agreements between electrical power providers (in this case, Southern California Edison (SCE)) and public agencies. Adding Smart Streetlight components to the lighting network will likely include agreements with additional partners. Vendors may also be able to offer financing approaches that may offset the cost of system components or may provide an additional revenue stream for member agencies, which could be further invested into Smart City initiatives. WRCOG member agencies may also be presented with an opportunity to realize interjurisdictional benefits of larger-scale Smart Streetlight technology deployment or leverage the cost-savings from converting to LED light fixtures.

City Purchase with License Agreement with Southern California Edison (SCE)

In 2017, the participating agencies of the WRCOG Regional Streetlight Program entered into individual purchase and license agreements with Southern California Edison (SCE) for some or all the streetlight poles, fixtures, and hardware as part of the effort to upgrade to LED capabilities. As a result of these agreements, the agencies outright own the above ground infrastructure, and are responsible for the maintenance and operation of the poles and attached lighting fixtures. These agreements also explicitly pertain to "Wireless Attachments" for SCE equipment.

SCE has installed communications equipment on the light poles that are necessary for operating or managing the electricity distribution system, consisting of a radio communications device attached to the mast arm. Per the agreements (and necessary for the functionality of the electricity distribution management system), SCE has priority on space for this equipment. SCE is allowed cost-free access to the poles to maintain this equipment. The agreements grant SCE a cost-free license to leave in place, operate, maintain, remove, and replace their equipment.

The agreement between the agencies and SCE allows for the installation of other third-party equipment, provided the equipment does not interfere with the communications of the SCE equipment. The agreement also allows the individual agencies to deny SCE from installing additional equipment if that installation interferes with "municipal operations". This definition could be interpreted that smart city applications are considered "municipal operations".

The agreements specify that the installation of any additional equipment may not be "non-conforming loads". In essence, any additional operating equipment placed on the street poles cannot consume electricity markedly different from the amount and frequency of the streetlights.

While these agreements were instrumental for the streetlight upgrade process, they are also important as they provide guidelines for the installation of equipment on the light poles, and for access to equipment installed. While there are separate agreements for each agency, the concept, content, and language are consistent across the agreements, providing a framework for leveraging these assets for future Smart City infrastructure.

Considerations

Below are some considerations as WRCOG communities explore the potential of leveraging their streetlight infrastructure for smart city applications.

Restrictions. There are no outright restrictions in the agreement that would prohibit third-party smart city application equipment. The agreements include language for permitting additional equipment on the streetlight poles (with the restrictions detailed in the previous section of this memo).

SCE Equipment. Existing SCE equipment has a priority on the streetlight poles; the agreements specify that any additional equipment must not interfere with the SCE communications equipment. While this isn't expected to be an impediment for adding smart city related equipment, SCE will need to be a continued partner with any initiative to leverage the infrastructure.

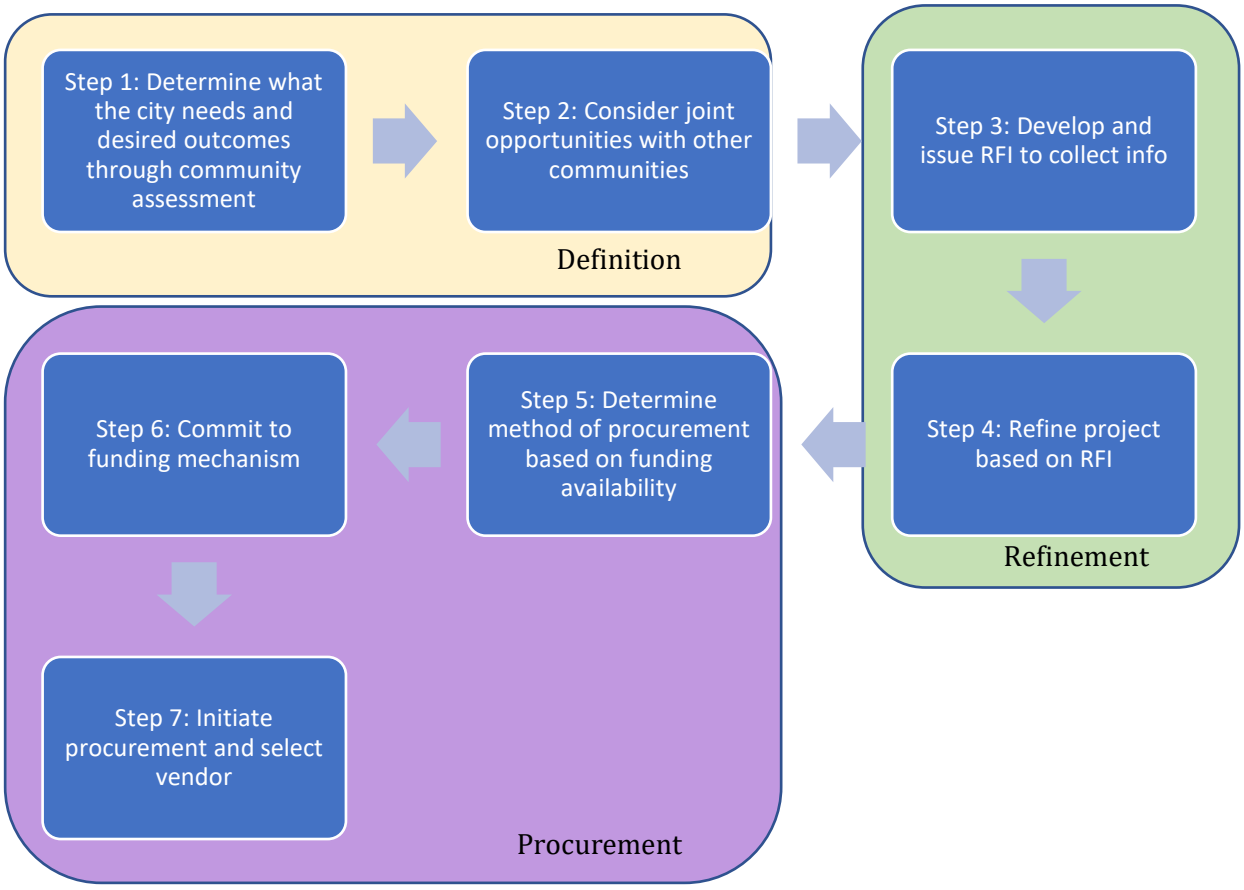
Evaluation of Poles. Whenever new equipment is proposed to be added to existing streetlight poles, an evaluation of structural impacts of the equipment, power need and impacts of the equipment, and wireless communications interference should occur. Depending on the contracting method pursued, these items could be conditions placed on the third party.

Non-conforming loads. Proposed equipment on the streetlight poles to support smart city applications should also include an electrical analysis, to ensure that non-conforming loads are not placed on the electrical distribution system.

Existing Framework. The no-fee streetlight pole license agreements guide the requirements of additional third-party equipment suppliers. The provisions for site access, operations and maintenance, and agency coordination have been agreed to between the agencies and SCE. These license agreements can serve as the basis for engaging third-party suppliers of smart city-related equipment.

Procurement Decision Roadmap

The procurement decision roadmap was created to guide cities through the process to make key decisions in partnership, procurement, and methods.



Procurement Types

Through research and engagement with other entities, it was identified that there are several options for municipalities to procure smart streetlight technologies. The context of the procurement and the agency leading the effort can make a difference in the success of a particular type of strategy. Each of the strategies identified below are feasible for an individual city or multiple cities to procure jointly, but each have their own challenges and opportunities. This section is intended to guide cities through the process so each can make the best choice for its needs.

Outright Equipment Purchase

The desired equipment could be purchased outright. This option would follow an agency procurement process. With the purchase of the equipment, there would need to be a consideration for operations and maintenance. One option is for agency maintenance and/or IT staff to performance operations and maintenance duties.

Another option is to include these tasks in the vendor contract. There may be an annual or monthly fee associated with operations and maintenance but could be ideal if staffing numbers or skillsets are a concern. The framework for vendor operations and maintenance appears to be addressed through the existing streetlight agreements. If this option is chosen, it would be important to evaluate bids on total cost of ownership or life-cycle costs instead of initial installation fee.

Pros:

- Use standard procurement processes
- Control over requirements, specifications, and equipment
- Known project cost

Cons:

- Incur expense to maintain and operate system (in-house or contractor)
- Staff support needs may exceed capabilities or limitations
- Data management responsibility
- Least amount flexibility
- Responsible for equipment after replacement / obsolescence

With purchasing the equipment, it should be easier to lay claim to the data. This still needs to be specified in the procurement documents. However, the agency may need to host the data – depending on the maintenance and operations options chosen – which leads to data privacy concerns as well. The agency should leverage data to make informed decisions at an aggregated level but having granular data could be a concern.

Public-Private Partnership

A city can partner with the vendor to develop a Public-Private Partnership, offering the public space for technology installations in exchange for desired sensors and data. The challenge resides in that the efforts needs to be a positive value-proposition for vendor. This usually comes in the form of data or ability to charge for services.

Privacy agreements due to using public infrastructure should be a consideration. The vendor would have a strong claim to the data, so procurement and partnership documents need to be clear and strong in identifying data requested and required so there is no misunderstanding and the agency gets the data desired.

Pros:

- Minimize cost to City
- Easiest to implement “design, procure operate and maintain” model
- Could be easiest approach to provide “application as a service” model.

Cons:

- Private party needs a commercial incentive
- Privacy & ownership of data
- Potential negative public reactions to data sharing

This method could require an agency to provide capital costs up to the full amount depending on the equipment or applications requested by the agency. The procurement documents should make the competitive bid the least cost to city to select the vendor.

Demonstration or Pilot

A lot of technology projects and deployments start with a demonstration or pilot phase. While they are a great way to determine the feasibility and value of a technology application, there are limitations. The deployments would be product-specific giving less flexibility to get a smart city application the agency would want. Most systems engineers advise to shy away from single vendor driven smart city solutions, so it would be important to gather a variety of technology applications from different vendors. Further, a pilot would likely only address a fraction of the total need locations desired, requiring investment beyond the pilot phase if that technology were selected for procurement.

Pros:

- Likely to be little or no cost
- Full engagement of vendor
- Could influence development of equipment or application.
- Potential discount on future purchase
- City could be in a leadership role

Cons:

- Likely not a long-term solution
- May not achieve needs or desired outcome
- May be hidden costs

A demonstration would be the most likely option to have the least cost to the agency, but there could be a high chance of hidden costs to agency, through staff time. In a procurement scenario, terms and duties are clearly defined. In a demonstration, they are less defined and often agency staff have to invest time to work on the integration and support of the product. Since pilots are often used by vendors as a way to prove-out solutions, there is also a chance of not having enduring, permanent, workable application.

Finally, data requests and collection may be the most challenging in this scenario, as the applications are deployed at the vendor's expense. The vendor may see value in the data as the return on investment but may not be willing to share critical data due to the lack vested interest by the city or the data privacy considerations.

Grants

A great opportunity for cities to demonstration or deploy equipment is through the securement of grant funding. Many local, regional, state, and federal opportunities exit. Typically, the larger the grant, the more detail the plan supporting the effort needs to be. This could be in the form of an overall smart city or community plan. The WRCOG Smart Streetlight Implementation Plan may suffice with some customization for the specific agency.

Pros:

- Dedicated funding source
- Potential technical and administrative resources from grantor

Cons:

- One-time funding
- May not fund operations and maintenance
- Local match may be required
- Costs incurred for grant application without a guarantee of grant

Preparedness for grant opportunities requires tracking grants to be ready when they are advertised since there is typically a short application window. Grants often have a long, detailed process that involves many city departments and resources. Extensive discussion with potential partners is also required since cooperation and teambuilding usually provide the best chance of success, especially when showcasing local match or in-kind contributions.

With the signing of the Bipartisan Infrastructure Law (Infrastructure Investment and Jobs Act), some existing programs received continuation funding and new programs were created. The following programs may have applicability to the deployment of smart streetlight technologies:

- Congestion Mitigation and Air Quality (CMAQ) Improvement Program fund can be used for technologies that reduce congestion, such as traffic cameras used to improving signal timings, and for electric vehicle charging equipment.
- Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) grant program included a formula and competitive grant program to support resilience improvement to transportation infrastructure, community resilience and evacuation routes, and at-risk coastal infrastructure.

The Department of Energy also has a Carbon Reduction Program (CRP), but it requires each state, in consultation with any MPO designated within the state, to develop a carbon reduction strategy not later than 2 years after enactment and update that strategy at least every four years, so coordination with the State of California would be required. CRP funds may be obligated for projects that support the reduction of transportation emissions, including:

- traffic monitoring, management, and control
- deployment of infrastructure-based intelligent transportation systems capital improvements and the installation of vehicle-to-infrastructure communications equipment
- street lighting and traffic control devices with energy-efficient alternatives
- support of the deployment of alternative fuel vehicles

projects to improve traffic flow that are eligible under the CMAQ program, and that do not involve construction of new capacity

AGENCY
#####, CALIFORNIA
(###) ###-####
##, 2022

<<City Logo>>

Request for Information No. ######
for
SMART STREETLIGHT TECHNOLOGIES
Due Date: ### ##, 2022
Time: #:## P.M.

DELIVERY OF RESPONSES
By Mail:
City of _____
Procurement Department, 11th floor
Attn: _____
_____
_____, CA #####

1.0 **Introduction.**

Between 2019 and 2020, WRCOG converted over 50,000 streetlights across 11 local jurisdictions to LED bulbs. The Regional Streetlight Program included purchasing nearly all of the streetlights from the local utility, SCE. The LED bulbs use substantially less power, resulting in a 70% reduction in energy consumption. The upgrade also substantially reduced light pollution, benefiting the community as well as the Palomar Observatory in San Diego County. The cost savings and reduced power draw present an opportunity to add smart city architecture to the streetlights with minimal net cost increases to WRCOG communities. The Smart Streetlight Implementation Strategy has been evaluating which technologies would provide the most value to the WRCOG communities. The <CITY> has been working with WRCOG to evaluate smart streetlight technologies and determine which may be suitable in its jurisdiction.

This RFI will assist in evaluating which technologies could be considered for the <CITY> Smart Streetlight program.

1.1 **Objective.** The objective of issuing this RFI is to:

a) Determine the level of market interest in providing smart streetlight technologies;
b) Obtain information on potential financing options for adding and integrating smart city infrastructure onto the existing LED streetlights

This RFI seeks to gather information from equipment and solution providers about the options for implementing smart streetlight technologies to assist the City in advancing its innovative vision. The City anticipates that the benefits of smart streetlight technologies may include the creation of cost-saving opportunities or opportunities to generate revenue, or both; the enhancement of the City as a community and regional destination; enhance municipal services to City residents; and direct and alternative connectivity options for the City's networking needs, both present and in the future. Firms are encouraged to recommend innovative financing options that will advance this vision for the City.

1.2 **Background.** The City of _____ .<<Inset City description here>>

_____ Department of _____ operates and maintains approximately _____ city-owned/city-leased LED streetlights. Department of _____ is responsible for the City network, which provides <<provide info on IT network, if applicable>>.

2.0 **RFI Responses.**

Interested parties are invited to submit responses to the requests for information set forth in this Section 2.0 ("RFI Responses") in accordance with the requirements of Section 3.0 ("Response Contents"). Information that would be helpful mayinclude the following:

2.1 Provide an overview of the technology or services available including key features and benefits and how the technology or services could provide a competitive advantage to the City by leveraging the existing LED streetlight system;

2.2 Describe potential service locations where this technology or service relating to the City's LED streetlights could be implemented and examples of successful projects in other cities;

2.3 Describe how the equipment or applications regarding the City's LED streetlights, or both, could complement or enhance, or both, the operations of the City's public works departments;

2.4 Provide a general timeline for implementation of described smart streetlight technologies and applications related to the City's LED streetlights, including, if applicable, a general timeline for the design, construction, and use;

2.5 Describe the source(s) of the revenue stream(s) that smart streetlight technologies or applications could generate for the City;

2.6 Provide the best estimate of the cost and revenue generated for the City by the smart streetlight technologies and applications related to the LED streetlights;

2.7 Provide Respondent's thoughts or observations on actions that might be taken by the Citythat could improve the City's ability to produce a revenue stream from the equipment or applications related to the LED streetlights.

2.8 Other information specific to the nature of this RFI and deemed important by the Respondent.

2.9 **Application considerations.**

A. Provide a typical approach and ability to provide the following applications leveraging the City's LED streetlight system, as applicable:
- Cameras
- Automated License Plate Recognition (ALPR)
- Public wi-fi
- Electric Vehicle Supply Equipment (EVSE)
- Smart digital banners
- Radiation detector
- Gas leak monitor
- Water meters
- Noise monitor
- Air quality monitors

B. Could equipment or applications leveraging the LED streetlights include the installation of electric vehicle charging infrastructure on light poles?

C. What public safety provisions may be enhanced through smart streetlight technologies or applications related to the City's LED streetlights?

D. How may environmental issues, such as weather conditions, pollution levels, energy efficiency, water use, and stormwater, can be collected leveraging the City's LED streetlights?

E. How could the City's LED streetlight system facilitate 5G deployment?

F. What features could be incorporated into the City's LED streetlight system to support community resilience and help citizens to adapt to operating failures, service issues, and external events such asweather events or natural disasters?

G. Could the City's LED streetlight system be used for the delivery of internet access services to the public?

H. Can you provide product cutsheets for review by the City?

2.10 **Financial Plan.**

A. List examples of funding models that have been successful in other cities to develop smart city infrastructure leveraging LED streetlight systems. Of particular importance is those models where the streetlights have already gone through an LED conversion.

B. What types of procurement and financing models do you participate in? Does your company take the lead in the financing?

C. Is it typical for the public agency(ies) to provide any matching funding as part of the procurement?

2.11 **Operating Plan**.

A. Would the smart streetlight technologies and applications leveraging the LED streetlight system be operated by the City or by vendors and contractors?

B. How is maintenance of the added smart city infrastructure generally handled and funded?

C. What type of joint public/private governance could be anticipated?

D. What sort of Service Level Agreements could be provided for City integrated systems as apart of smart streetlight technologies leveraging the LED streetlight system?

2.12 **Information and Innovation Plan**.

A. When data are generated by various smart streetlight technologies, who collects and owns the data?

B. What data collected through smart streetlight technologies could be made available to the public and how would information requests be handled?

C. Do you have a standard data sharing agreement, or do you rely on the public agency(ies) to develop?

D. What types of data analytics are measured and collected through smart streetlight technologies and how could the outputs of the analytics be used to better manage City operations or provide additional services?

E. How could ongoing innovation be encouraged by the smart streetlight infrastructure regarding both usage of and the upgrade to innovative technologies that evolve during the life of the infrastructure, as well as features that attract future innovation to the City?

3.0 Response Format.

The response should be organized as set forth in this section.

3.1 The Respondent shall submit one electronic copy in a portable document format (PDF) readable by the Adobe Reader program and in a Microsoft Word format that can be searched.

3.2 The response submitted by Respondent should include the following: (i) a cover letter, (ii) a table of contents, and (iii) your detailed responses to any or all of the requests for information set forth in Section 2.0.

4.0 Inquiries.

Please direct all questions regarding this Request for Information to XXXXX at XXXXXX@XXXXXX or #########.

5.0 Submissions.

Responses to the RFI should be submitted to XXXXXXX@XXXXXX no later than XXXXXXXX XX, 2022 at XXXX PM. The submission should be in PDF format, and only digital submissions will be accepted. Responses received after the deadline may not be considered.

6.0 Disclaimer.

6.1 Please be advised that this is a request for information only. This RFI is issued solely for information and planning purposes – it neither constitutes request for proposals nor is a promise to issue an RFP in the future. No warranties or representations of any kind are made by the City, including a representation or warranty as to the suitability of the City's infrastructure for any particular purpose.

6.2 Parties responding are advised that the City will not pay for any information or administrative costs incurred in response to this RFI; all costs associated with responding to this RFI will be solely at the interested party's expense. Submission of a response to this RFI is not considered a response to any future solicitations for potential opportunities related to smart city infrastructure or for any other design, construction, finance, maintenance or operations opportunities offered by the City. The City reserves the right to cancel this RFI at any time with or without notice to respondents and without liability.

6.3 Ownership of all data, materials and documentation originated and prepared for the City pursuant to this RFI shall belong exclusively to the City.

6.4 **Proprietary Information.** Firms should indicate on the Cover Sheet any portions of their response that the firm deems proprietary and return the signed Cover Sheet with their submission. Please list the page number(s) and reason(s) the firm considers the data or materials to be proprietary.

**include SCE equipment are on the poles.
** And then have a question being "how would you ensure that the equipment needed to support the smart city application would not adversely interfere with the pre-existing SCE equipment referenced in xxxx.xxx.

**Where have they installed equipment and applications previously?

May 31, 2022

Daniel Soltero, Program Manager
Western Riverside Council of Governments
3390 University Ave, Suite 200
Riverside, CA 92501

Subject: WRCOG Smart Streetlights: Implementation Strategy

Introduction

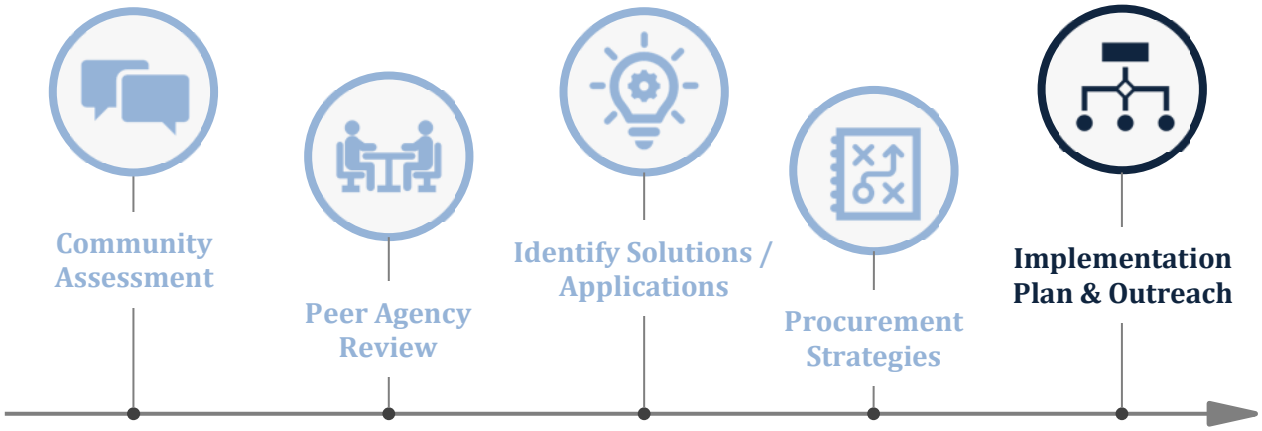
Between 2019 and 2020, the Western Riverside Council of Governments (WRCOG) converted over 53,000 streetlights across 11 local jurisdictions to LED fixtures. The Regional Streetlight Program included purchasing nearly all of the streetlights from the local utility, Southern California Edison (SCE). The LED fixtures use substantially less power, resulting in a 70% reduction in energy consumption. The upgrade also substantially reduced light pollution, benefiting the community as well as the Palomar Observatory in San Diego County. The cost savings and reduced power draw present an opportunity to add smart city architecture to the streetlights. As a result, WRCOG set out to create a Smart Streetlight Implementation Plan to assess how member agencies could leverage their streetlight infrastructure with smart city technologies to provide the most value to their communities. This Implementation Plan takes a holistic approach to smart streetlight integration, considering existing infrastructure and staff capabilities, technology readiness, identified community needs, and approach to procurement. The result is a strategy that is completely scalable and can be applied to the wide range of community contexts that fall within the Western Riverside County subregion.

Smart Streetlight Background

Converting streetlights to LED offers a significant benefit of reduced energy consumption and light pollution. Adding smart streetlight controllers to LED light fixtures yields the added benefit of remote light control and tilt/vibration sensing. Dimming capabilities alone further reduce energy draw, inventory costs, and operation and maintenance costs. Most importantly, streetlights equipped with smart controllers can be leveraged as part of an overall Smart City framework, allowing additional sensors and connections to be added to the fixture.

Project Process

The approach to developing the Smart Streetlight Implementation Plan was a multi-step process. The first step of this evaluation was to survey WRCOG communities to identify existing infrastructure as well as staff capabilities. The second step was to learn from the successes and problems experienced by other agencies implementing smart streetlights. Next, the "menu" of technologies was evaluated for consideration in the WRCOG Smart Streetlight program. Lastly, financial and administrative action items were identified, and a Request for Information (RFI) template was created to assist the WRCOG or its members in future procurement of vendor hardware and services. The findings of each of these tasks have been compiled into the Implementation Strategy presented in this document.



Community Assessment

WRCOG members were contacted for participation in the Community Assessment task, the goal of which was to identify the current state of the infrastructure in each jurisdiction. In total, twelve jurisdictions in the WRCOG provided feedback. Survey responses provided information on the number, type, ownership, and maintenance of streetlights, traffic signals, and IT/networking in each city. The survey responses are detailed in **Appendix A**.

This task showed that the number of streetlights within each jurisdiction ranges from 340 to approximately 30,000. Streetlights are largely owned by the city or Southern California Edison (SCE), and maintenance is primarily contracted out for agencies in the WRCOG Regional Streetlight Program (Yunex). Most or all of the streetlights within the responding jurisdictions have been converted to LED. Larger cities own and maintain their own streetlights.

The number of traffic signals in each jurisdiction ranges from five to 400. Signals are owned by the City, County, or Caltrans. Traffic signal maintenance is mostly contracted out either to a vendor or the County of Riverside, but some agencies have one or two in-house staff as well. Larger cities own and maintain their own traffic signals.

Lastly, 60% of respondents indicated that their jurisdiction provides public wi-fi in some city/county/municipal buildings. Less than half of the jurisdictions have communications systems for interconnected traffic signals. Nearly all of the respondents have in-house IT/networking staff, but most do not have any policies or ordinances related to data collection from publicly owned assets.

Peer Agency Reviews

A review of peer agencies that have successfully implemented smart streetlight technologies was conducted, such that the insight from their successes and challenges could be applied to the development of this implementation plan. The review included a combination of online research, interviews with key staff, and first-hand knowledge from staff involvement on Smart City plans, where applicable. The Peer Agency Review memorandum is located in **Appendix B**.

The agencies interviewed include the City of Los Angeles, the City of San Diego, the City of Las Vegas, and the City of Kansas City. The key takeaways from the peer review are:

- Identify program parameters ahead of time.
- Consider the agencies' current traffic signal and IT staff capabilities as well as the responsibilities for the systems.
- Start with a pilot for testing the technology and data quality.
- Understand that the current business model is uncertain.
- Understand who owns the data for the implemented systems.
- Public transparency in the process is essential.

Identify Solutions/Applications

Available technology applications were identified and assessed for consideration in the WRCOG Smart Streetlight program. The applications are grouped into general categories of primary technology applicability including Environmental and Sustainability, Economics, Mobility, Public Safety, and Connectivity. A total of twelve smart streetlight applications were identified as summarized below. The Application Review memorandum is found in **Appendix C**, including a description of each application in cut-sheet format.

Environmental & Sustainability

Air Quality Sensor: Monitor temperature, humidity, gas pollutants, and particulate matter

Dimming Light Control: Adjust light levels as needed based on ambient conditions or detection triggers (e.g., vehicle or pedestrian detected)

Water Detector: Identify flood events or assists with irrigation needs

Road Temperature Detector: Inform when road treatment is needed (e.g., salt for winter conditions)

Economics

Electric Vehicle Charging: Electric vehicle charging from on- or off-street parking spaces

Smart Banners: Display alerts for road users or private advertisements

Mobility

Smart Cameras: Cameras provide security/surveillance; video analytics can perform mobility counting, curbspace monitoring, or identify near-miss incidents

Other Detection Methods: Radar, infrared, thermography, induction, magnetic fields, etc. used for mobility detection

Public Safety

Noise Detector: Monitor noise levels to respond to noise ordinance violations, or combine with analytics to detect breaking glass or gunshots and alert emergency responders

Connectivity

Asset Management: Monitor streetlight health through power usage detection, or predict and prevent utility pole or transformer issues

Small Cell: Provide high-quality 5G cellular service

Public Wi-Fi: Wi-Fi hotspot for public use

Procurement Strategies

This task included reviewing the existing agreement between Southern California Edison (SCE) and the communities of WRCOG and identifying possible procurement types for smart streetlight projects. In 2017, the cities of WRCOG entered into individual purchase and license agreements with Southern California Edison (SCE) for some or all the streetlight fixtures and hardware as part of the effort to upgrade to LED capabilities. As a result of these agreements, the cities outright own the infrastructure and are responsible for the maintenance and operation of the poles and attached lighting fixtures. A review of the existing agreement with SCE shows that there are no restrictions that would prohibit third-party smart city application equipment. However, all proposed applications will need to be vetted through a structural and electrical analysis. Additionally, SCE equipment has priority over all city-owned equipment, so the utility provider should continue to participate in the discussion of WRCOG's Smart Streetlight Plan.

Procurement types were identified as (1) outright equipment purchase, (2) public-private partnership, (3) demonstration or pilot, and (4) grants. Selection of the procurement type may vary by project or initiative and will be informed through the Request for Information (RFI) process. A template RFI was created for engaging vendors process, allowing for input on technology features and benefits, financing of costs, operations and maintenance of equipment, and data management. The procurement type summary and template RFI document are contained in **Appendix D**.

Implementation Strategy

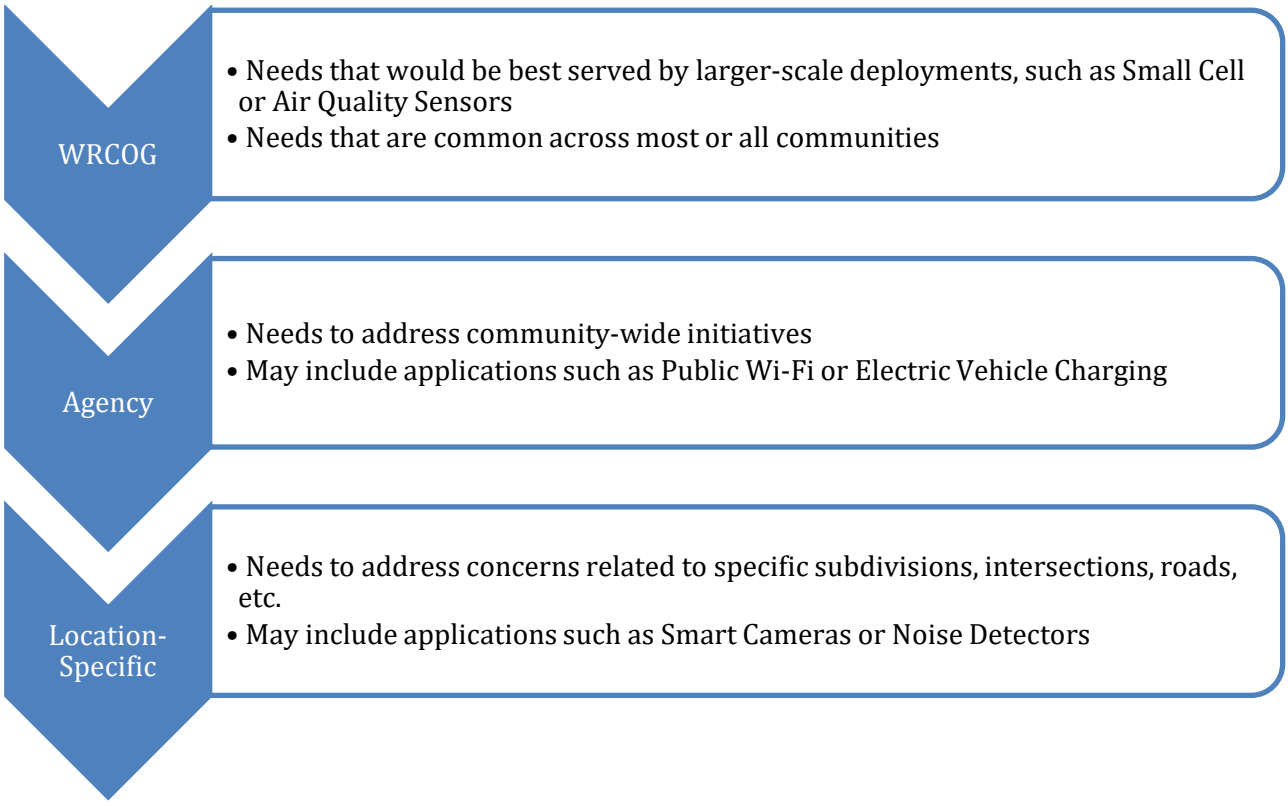
Taking the findings of the previous tasks in the project process, the implementation strategy summarizes the action items that the WRCOG and its communities will need to accomplish to build a successful Smart Streetlight Program. The implementation strategy is presented in three phases: (1) Assess, (2) Test, and (3) Expand. It is anticipated that this will be an iterative process, with phases revisited as the program matures.

Phase 1 – Assess

This phase describes processes to assess the community needs, agency capabilities, and technology readiness. In all, Phase 1 will result in a final list of feasible applications for immediate testing/deployment.

Phase 1A – Needs Assessment

A recurring message from the Peer Agency Review task (**Appendix B**) was that program needs should be well established at its inception. Therefore, the first phase of the implementation strategy is to assess needs. Due to the nature of the applications, it is likely that needs will vary significantly by agency and even throughout each community. However, overlapping initiatives between agencies or across the WRCOG members should be leveraged to the extent possible. Partnerships reduce the financial burden on any one agency, and larger-scale deployments may offer reduced per item costs. Needs should be considered at three geographical levels:



This assessment should be completed with input from agency staff, stakeholder engagement, and public engagement. Surveys are an effective strategy for receiving feedback from each of these groups, and survey questions can be adapted to varying knowledge levels. Initial surveys of the WRCOG members indicated that public safety applications were of the most interest at this time. Continual monitoring of public feedback channels in addition to crash patterns, areas of congestion, criminal activity, flood zones, etc. will identify patterns and "hot spots" that can be addressed through smart streetlight technologies.

Most importantly, this assessment should answer specific questions to set the goals of the program and the role of each individual application:

1. What is the problem that needs to be solved?
2. What is the expected impact of the application?
3. What are the expected secondary impacts, if any?
4. What data/information is required to measure the impacts?
5. Are there data privacy concerns?

The needs assessment will identify the complete "menu" of applications that each community, or the WRCOG as a whole, would like to consider for implementation. It may be necessary to further refine the list of applications meeting the community needs to a select few considering other factors such as cost, communications needs, maintenance aspects, and technology readiness. The table on the following page provides a side-by-side comparison of applications that can be used to assist communities in this prioritization exercise; more detailed information is contained in **Appendix C**. Application specifications will need to be checked and updated as technologies continue to progress.

This task will set realistic, and if possible, measurable expectations for the program and each of the selected applications. Having a clear understanding of the existing problems and expected impacts will be essential for public outreach and will simplify the benefit/cost analysis as projects begin to take shape (see Phase 2 – Test). Additionally, defining the needs up front lays the foundation for the entire program; not only are the applications themselves defined, but also the initial requirements for data management and vendor or staff capabilities.

Application	Benefit Categories	Relative Cost	Communications	Maintenance	Readiness
Air Quality Sensor	• Environmental & Sustainability	• Low	• Wireless	• Easy to detach/replace • Over-the-air updates	• Proven
Dimming Light Control	• Environmental & Sustainability • Economics • Public Safety	• Medium	• Wireless	• Over-the-air updates	• Proven
Water Detector	• Environmental & Sustainability • Public Safety	• Medium	• Wireless	• Easy to detach/replace	• Pilots
Road Temperature Detector	• Environmental & Sustainability • Public Safety	• Medium	• Wired or wireless	• Easy to detach/replace	• Pilots
Electric Vehicle Charging	• Environmental & Sustainability • Economics	• High	• Wireless	• Easy to replace modular components	• Pilots
Smart Banners	• Economics • Connectivity	• High	• Wireless	• Easy to detach/replace • Over-the-air updates	• Pilots
Smart Cameras	• Mobility • Public Safety	• High	• Wireless • Camera is hardwired to smart processor	• Easy to detach/replace	• Pilots
Other Detection Options	• Mobility	• Medium	• Wired or wireless	• Easy to replace	• Proven
Noise Detector	• Environmental & Sustainability • Public Safety	• Low	• Wireless	• Easy to detach/replace • Over-the-air updates	• Proven
Asset Management	• Public Safety • Connectivity	• Medium	• Wireless	• Easy to detach/replace	• Proven
Small Cell	• Economics • Connectivity	• Medium	• Wired or wireless	• Over-the-air updates	• Proven
Public Wi-Fi	• Economics • Connectivity	• Medium	• Wired: ethernet, fiber, LTE, or DOCSIS	• Over-the-air updates	• Proven

Phase 1B – Technology Assessment

The technology assessment will be completed by issuing a Request for Information to solicit responses from available vendors. The template RFI document prepared as part of the development of this plan (**Appendix D**) can be tailored to specific agencies and technologies of interest, based on the findings of the needs and agency assessment. This task will identify the practical elements of what is possible, including:

- How does the available technology and data align with the identified needs?
- What services are available through the vendor versus those that must be provided in-house (e.g. data management, operations and maintenance)?
- What funding mechanisms are available through vendor partnership?

From this assessment, a final list of preferred applications and associated vendors will be developed. The information gathered on available vendor services and funding mechanisms will be carried forward into the Agency Assessment task.

Phase 1C – Agency Assessment

Based on the outreach completed in previous tasks, it has been identified that communities are at varying levels of maturity regarding streetlight infrastructure, staff, and IT/networking. The community assessment survey in **Appendix A** can serve as an initial evaluation. The goal of the agency assessment phase is to expand upon this information, specifying existing capabilities and gaps that should be addressed as the program progresses. The AASHTO capability maturity model (CMM) assessment for Transportation Systems Management and Operations (TSMO) programs provides a basic framework that the WRCOG communities may apply for the self-assessment phase. The CMM assessment considers six dimensions:

1. Business Processes – Planning, programming, budgeting, and implementation.
2. Systems and Technology – Systems engineering, standards, and technology interoperability.
3. Performance Measurement – Measures, data/analytics, and utilization.
4. Culture – Technical understanding, leadership, outreach, and program authority.
5. Organization/Workforce – Organizational structure and workforce capability development.
6. Collaboration – Partnerships among levels of government with public staff agencies and private sector.

The AASHTO process includes a one-minute evaluation[1] and guidance on how to advance each dimension to the next level. While this is specific to TSMO programs, the assessment can loosely be interpreted for application to any technology program including this Smart Streetlight program. The outcome of this phase will be a list of actions items, which may include:

- Develop funding strategies to support the Smart Streetlight Program.
- Determine how the data from applications will be utilized, and if access to raw data output is necessary or if a dashboard application is sufficient.
- If ownership of the data is required, ensure that the appropriate back-office systems are in place including staff and network servers.
- Develop or update existing policies and procedures to support planning, deployments, operations, and maintenance.
- Outreach and collaborate with internal and external stakeholders including other WRCOG agencies, the community, and other third parties.

This process is important to determine what an agency can support with its existing capabilities. It will inform the procurement process and requirements that identify what a vendor is to provide. As an example, an agency may not have a robust cloud-based network that can handle large amounts of raw data and may prefer to receive dashboards. On the other hand, another agency may want several feeds of raw data to be able to overlay and better inform operational decisions.

Phase 2 – Test

The procurement type summary in **Appendix D** details the financing options available to fund individual smart streetlight projects. To minimize the funding burden and risk to the community, it is recommended that initial projects be limited to pilot deployments of applications that are new to each community. Standalone pilot sites will be determined through the assessment phase (Phase 1). After the demonstration period, the successes and lessons learned from the pilot should be determined, including a benefit/cost analysis and verification of data quality. Benefit/cost analysis is a necessary step in conveying the value of a project both to agency leadership and the public.

The testing phase provides the opportunity to see the applications in action and recognize their real-world implications for a minimal investment. The results of pilot study evaluations will guide the selection of future project priorities in Phase 3.

To streamline the testing phase, the WRCOG may take ownership over pilot projects developed throughout its communities. This will ensure consistency between deployments and a continual progression of knowledge, skills, and abilities that can be shared with all jurisdictions. The WRCOG can also take ownership over the creation of specific policies and guidelines for smart streetlight application implementation, which will be developed as the results of this testing phase are gathered.

[1] http://www.aashtotsmoguidance.org/one_minute_evaluation/

Phase 3 – Expand

Once proof of concept has been shown in Phase 2 – Test, the last phase will examine the available funding to expand the most successful pilot projects into full scale deployments. At this time, available technologies should be reevaluated through the RFI process to ensure that prioritized projects are aligned with the latest capabilities and features. Successful pilot projects that are not eligible for outside funding should be prioritized for funding by the WRCOG or individual communities. Project applications that are eligible for outside funding may be sidelined for future submission on federal grant applications.

Summary

The conversion to LED streetlights throughout the WRCOG communities offers an opportunity to lay the groundwork for a future Smart City. The WRCOG Smart Streetlight Implementation Plan presented here was developed based on the findings of extensive outreach and research efforts. The plan identifies the processes and action items to be undertaken by each community and the WRCOG as a whole to realize a successful smart streetlight program. This strategy should be approached as an iterative process, with phases revisited as the program matures and new funding opportunities emerge.