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Smart Street Lighting Playbook

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1 Introduction

In January 2017 Illinois Department of Central Management Services (CMS) in consultation with Illinois Department of Innovation and Technology (DoIT) issued a Request for Proposal (RFP) for Smart Street Lighting for Illinois Municipalities. The RFP sought a primary, secondary and tertiary vendor to enter into state master contracts to provide:

- Turnkey services for Street Light Upgrades to light emitting diode (LED) luminaires with implementation and financing options
- Luminaires
- Adaptive Controls and Value add Services

In December 2017 awards were made to the following three vendors:

- Primary vendor: Johnson Controls
- Secondary vendor: Globetrotters Engineering
- Tertiary vendor: TEN Connected Solutions

State master contracts with the three vendors are executed and available at:

<https://www2.illinois.gov/sites/doit/Strategy/Pages/smartlighting.aspx>

2 Smart Street Light Architecture

The Smart Street Light solution architecture is shown in figure 1.

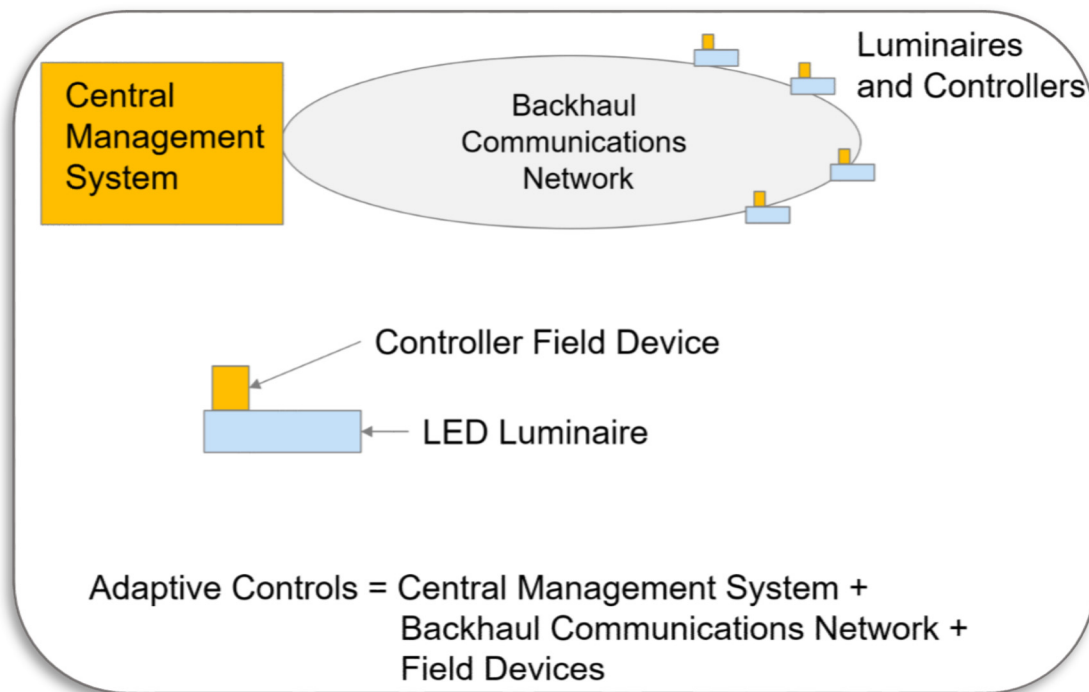


Figure 1. Smart Street Lighting Architecture

Luminaires are the light emitting diode (LED) light fixtures that would replace old style lights. Old style municipal lighting typically consists of high pressure sodium, metal halide or mercury vapor. The LED luminaire has a receptacle (7 pin receptacle is recommended) that enables the wireless controller to be inserted.

Adaptive controls provide the ability to remotely monitor and control the light fixtures, with the control initiated based on sensor input, time or manually. The resulting networked light fixtures, including a communication network, provides the foundation for value add smart city services. Adaptive controls incorporate the field device or wireless controller, the backhaul communications network and the central management system.

- The **field device or wireless controller** enables a data connection from the LED luminaire to the central management system and enables the “smart” features of the architecture to be implemented. The wireless controller slots into the luminaire via a receptacle.
- The **backhaul communications network** provides a broadband connection between the luminaires and central management system. The broadband connection bandwidth, whether high or low speed, would be implemented to support the municipal requirements.
- The **central management system** enables control and monitoring of the luminaires via the backhaul communications network.

The smart street lighting architecture described together with the physical infrastructure of the light post and the power to the light post provides a foundation for other smart city applications, such as smart parking, Wi-Fi network, smart trash removal, cameras, environmental sensors etc.

3 Smart Street Light Benefits

Smart Street lighting benefits include:

- **Energy savings.** The electric power required to provide the same lighting level as old-style lights, for example High Pressure Sodium, Mercury Vapor or Metal Halide, is less, resulting in cost savings of 50% or more.
- **Reduced maintenance and longer lifespan** is experienced with LED luminaires when compared with old style lights, thus further reducing costs.
- **Higher quality light** – LED lighting provides a more uniform light – i.e. less light variation when compared to old style lights. LED lighting can also be better directed to where it is needed resulting in reduced light waste and reduced light pollution in the night sky.
- Adaptive controls enable **real time control of lighting levels**, based on external factors. For example, lights can be dimmed to 50% of their normal level with no traffic on the road. This light optimization provides further energy savings. Adaptive controls can also assist in public safety and emergency management. For example, lights could be remotely set to maximum brightness for emergency services personnel in the area.



Photograph courtesy of Globetrotters Engineering

- **Real time maintenance alerts** can be provided with adaptive controls on the LED lighting.
- The smart street light architecture provides a **foundational infrastructure for Smart City applications**.
- **Value add services could be incorporated** at the same time as the street light upgrade. Examples of value add services include wireless broadband network between the street lights, sensor devices measuring air quality, vehicle and pedestrian occupancy sensors, smart parking and smart trash removal devices.

4 The Business Case

The key driver for municipal upgrade to LED luminaires is the business case. LED luminaires require much less electricity to provide the same illumination as the original luminaires being replaced, resulting in typical cost savings of greater than 50%. These cost savings make possible financing approaches meaning no out of pocket cost for the municipality. Energy performance contracting, where a vendor guarantees the cost savings, and is responsible for the procurement and installation and potentially operation of the solution is available to municipalities. Another option is municipal tax-free bonds. With the significant cost savings, the monthly spend during and after the upgrade, including the spend to the utility company, is often less than the monthly spend prior to the upgrade.

5 Turnkey Services

In addition to procuring, installing, operating and maintaining the smart street lighting solution, additional turnkey services are available for a successful project outcome.

Turnkey services include inventory audit, photometric design, energy savings analysis, financing options, LED luminaire procurement, installation and commissioning and adaptive control procurement installation and commissioning.



Photograph courtesy of TEN Connected Solutions

6 Key Steps in the Vendor Interaction

After an initial communication with the vendor, project success is facilitated by the municipality providing as much information as possible regarding the current street lighting system to the vendor. This will enable the vendor to provide a preliminary estimate of the economics of upgrade.

Once the vendor has determined the business case of the upgrade, a meeting should be expected between the vendor and municipality where key project topics are discussed. This phase may be one face to face meeting or several face-to-face and phone conferences.

Once project topics are understood by the municipality, and there is agreement by the municipality and vendor to move forward, the next phase is contract execution. The state master contract terms will apply, and the pricing stated in the state master contract sets the maximum price. The contract between the municipality and vendor may have a price lower than that stated in the state master contract but not a higher price.

After contract execution, the initial project activities are implemented followed by procure, install, commission luminaires and adaptive controls and depending on the contract executed, the vendor may also be responsible for operation and maintenance of the solution.

A bulleted list of the key steps in the vendor interaction is given below, including an explanation of terms.

Please note that the following list provides a high-level view of the vendor interaction and a guide as to what to expect. The below steps are not intended to precisely describe all the vendor interaction steps since those are vendor-dependent.

1) Municipality shares basic streetlight info with potential vendor

Information that would help a vendor determine the business case for upgrade is as follows:

- a. Current luminaire inventory (or approximate inventory) by type and wattage
- b. Energy costs per month
- c. Global Information System (GIS) maps showing street lights, if available

Providing as much information as possible regarding the current street light system will help the vendor estimate the business case for the upgrade and help scope the upgrade project.



Photograph courtesy of Globetrotters Engineering

2) Vendor uses provided information to generate estimated summary economics of conversion project

The estimate is usually provided at no cost to the municipality, and provides the basis for a more detailed discussion on project topics and the financing options available.

At this stage, the vendor can also provide an estimate of available incentives from the utility companies. In Illinois incentives are available to encourage the upgrade to more energy efficient LED luminaires.

3) Vendor and municipality meet to discuss summary economics and conversion related topics, including (but not limited to):

- a. Expected energy savings & economics
- b. Utility Rebate / Grant Opportunity
- c. Financing approaches
- d. Lighting audit
- e. Approximate project timeframe
- f. Post-conversion maintenance
- g. Contract overview
- h. Key project tasks

In this phase, key tasks are explained to the municipality, including discussion on the business case, available financing options, incentives, project timeline. This is the phase where the municipality and vendor come to agreement on the project scope.



Photograph courtesy of TEN Connected Solutions

4) Municipality and vendor work towards contract execution

- a. The contract will be between the municipality and vendor and detail vendor deliverables for service and materials; pricing; timeline etc.

Following agreement on project scope, the municipality and vendor work towards contract execution. State master contract terms will apply, and pricing given in the state master contract will set the maximum price chargeable by the vendor. The vendor may charge a lower price than that stated in the state master contract.

After contract execution, initial activities include:

- b. Inventory audit (if required by municipality)
- c. Utility Reconciliation
- d. Photometric design (if required by municipality)
- e. Initiate financing
- f. Implementing a pilot to choose the light fixture to use
- g. Public outreach campaign

After contract execution, initial project activities, as required by the municipality are implemented. A brief description of these initial project activities follows:

Inventory Audit means the vendor performs a detailed audit of the municipality’s current street light solution. This typically involves somebody in the field checking each street light with a mobile tablet and recording information about each luminaire as well as GIS coordinates.

Utility Reconciliation means the municipal utility bills are verified against actual municipal spending and energy usage. The predicted new utility bill amount after upgrade is also determined.

Photometric Design is where lighting engineers will recommend the required illumination (and thus wattage) based on the street design, municipal requirements, type of area. Lighting standards are followed in this phase.

Initiate Financing means to select a financing option and to work with the vendor, supplying the necessary information needed for financing.

Implementing a Pilot is a best practice to allow the municipality, including municipality staff and the public, to experience the street lights in a live setting. The community could be given the choice to vote for certain street lights.

Public Outreach Campaign ensures the public is kept aware of the project, and any concerns from the public can be taken into consideration.

5) The following key steps are then implemented

- a. Conclude and implement the financing
- b. Procure and install luminaires and adaptive controls
- c. Commission luminaires and adaptive controls
- d. Operate and maintain the luminaires and adaptive controls

7 Value Add “Smart City” Services

The implementation of a Smart Street Lighting solution provides the foundation for smart city applications and services. The light post and power together with the communications network used in the Smart Street Lighting solution, means other devices could be attached to the light post at the same time as the upgrade to LED luminaires. Other devices could include environmental sensors, cameras, Wi-Fi network devices, smart parking and smart trash removal devices, speakers, signs etc. The installation of these devices at the same time as the street light upgrade is more cost effective than adding these devices to the light post at a later date.

Each of the Smart Street Lighting vendors can explain in more detail potential smart city applications to be incorporated. If a municipality is not installing smart city applications on day one, it may be possible to design a future-proof solution.

8 Incentives

Municipalities within the ComEd and Ameren service territories (regardless of electricity supplier) are eligible to receive cash incentives for the replacement of municipality owned street lights with qualified LED street lighting products. Replacement street lights must be certified by the DesignLights Consortium. More information on qualified products can be found at www.designlights.org. All municipal street light projects will require pre-approval for the incentives from ComEd or Ameren. Please note that street lights purchased via the state master contracts are on the qualified product list at www.designlights.org. This was a mandatory requirement in the RFP. For further information on incentives available please see ComEd and Ameren contact information in section 9.

9 Next Steps

This section has provided a brief overview of the Smart Street Lighting solution and what to expect when interacting with a vendor. The recommended next step is to contact and discuss with one or more of the awarded Smart Street Lighting vendors. Contact information is given below:

Primary vendor: Johnson Controls

Ermin Arslanagic
Performance Infrastructure
Account Executive, Government Solutions
3007 Malmo Dr., Arlington Heights, IL 60005
Cell: 847-207-7268
<http://www.johnsoncontrols.com/smart-cities/smart-street-lighting-illinois>
ermin.arslanagic@jci.com

Secondary vendor: Globetrotters Engineering

Brian J. McPartlin
Executive Vice President
Globetrotters Engineering Corporation
300 S. Wacker Drive – Suite 400
Chicago, Illinois 60606
O) 312-922-6400
D) 312-697-3614
<https://www.gec-group.com/>
brian.mcpartlin@gec-group.com

Tertiary vendor: TEN Connected Solutions

Jim Schriver
TEN Connected Solutions
1501 Reedsdale Street, Suite 401
Pittsburgh, PA 15233
412-429-8888, ext 131 (O)
412-992-1397 (C)
<https://www.tenconnected.com/>
jim.schrive@tenconnected.com

ComEd contact details for incentive information
Website: ComEd.com/PublicSectorEE
Email: PublicSectorEE@ComEd.com
Call: 773-328-7040

Ameren contact details for incentive information
Website: AmerenIllinoisSavings.com/Business
Email: IllinoisBusinessEE@ameren.com
Call: 1-866-800-0747