



# Infrastructure Challenges from Innovation in Route Lighting

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## Key Discussion Points

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Changing face of Central Management Systems

Can our lighting assets be the Intelligent Hub of the future

Is the UK highways lighting infrastructure ready for the future Smart City

# Smart Cities



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Central Management Systems why might you have one.

In the early 2000's

- Indicate outages
- Save on night scouting
- Predict lamp failure

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Central Management Systems why might you have one.

In the late 2000's early 2010's

- Indicate outages
- Save on night scouting
- Predict lamp failure
- Provide energy information for billing
- Report on luminaire control gear health
- Introduce Part Night dimming (poor returns with discharge light sources)
- Introduce Part Night switch off

Central Management Systems why might you have one.

Now

- ~~Indicate outages~~ LEDs last forever they wont go out?
- ~~Save on night scouting~~ LEDs last forever we don't need to check?
- ~~Predict lamp failure~~ LEDs last forever they wont fail?
- Provide energy information for billing
- ~~Report on Luminaire control gear health~~ Now control gear will also last forever so it wont fail?
- Introduce Part Night dimming
- Introduce Part Night switch off

Of course LEDs will fail but with predicted usable life of 20 to 25 years what happens after this

A warning they may not burn out but just fade away

## We Don't Want CMS



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### What we want for a Smart City is Adaptive Intelligent Lighting Systems

- Indicate outages and save on night scouting
- Provide energy information for billing
- Allow complete and immediate control of intensity and switching
- Interphase with smart technology to adapt to situations
  - Traffic flow or accidents
  - Weather - Fog, Ice, Snow and Heavy Rain
  - Events – Sporting, Entertainment and Specialist
  - Pollution
  - Crime
  - Occupancy – Bus stops, cycle and footpaths, car parks and highway

Someone has to manage this and ensure

- Protocols are in place
- Conflicts, communication and safety are all considered and mitigated.

## We Don't Want CMS we want for a Smart City is Adaptive Intelligent Lighting Systems



Someone has to manage this and ensure protocols are in place for usage

- Who can adapt
- When can you adapt
- Are you going to have auto adaption
- Are you going to have minimum and maximum levels
- Conflicts, hierarchy for changes
- Communication, who needs to understand what's happening
- Safety.

Are all considered, detailed, documented, communicated and mitigated.



## Smart City : Challenges What is Important to Residents



Most Smart City initiatives are broadly trying offer one or more of the following Key Objectives

Provides an open system

- Has Interoperability
- Integration
- Flexibility
- Future proof
- Security

## Smart City : Challenges What is Important to Residents



Most Smart City initiatives are broadly trying to offer one or more of the following Key Objectives

Provides an open system

Inform Residents:

- Provide real time information
- Improve mobility
- Enhance safety

## Smart City : Challenges What is Important to Residents



Most Smart City initiatives are broadly trying to offer one or more of the following Key Objectives

Provides an open system

Inform residents

Provide security:

- Identify risks
- Inform law enforcement
- Inform decisions
- Provide evidence
- Analysis of information

## Smart City : Challenges What is Important to Residents



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Provides an open system

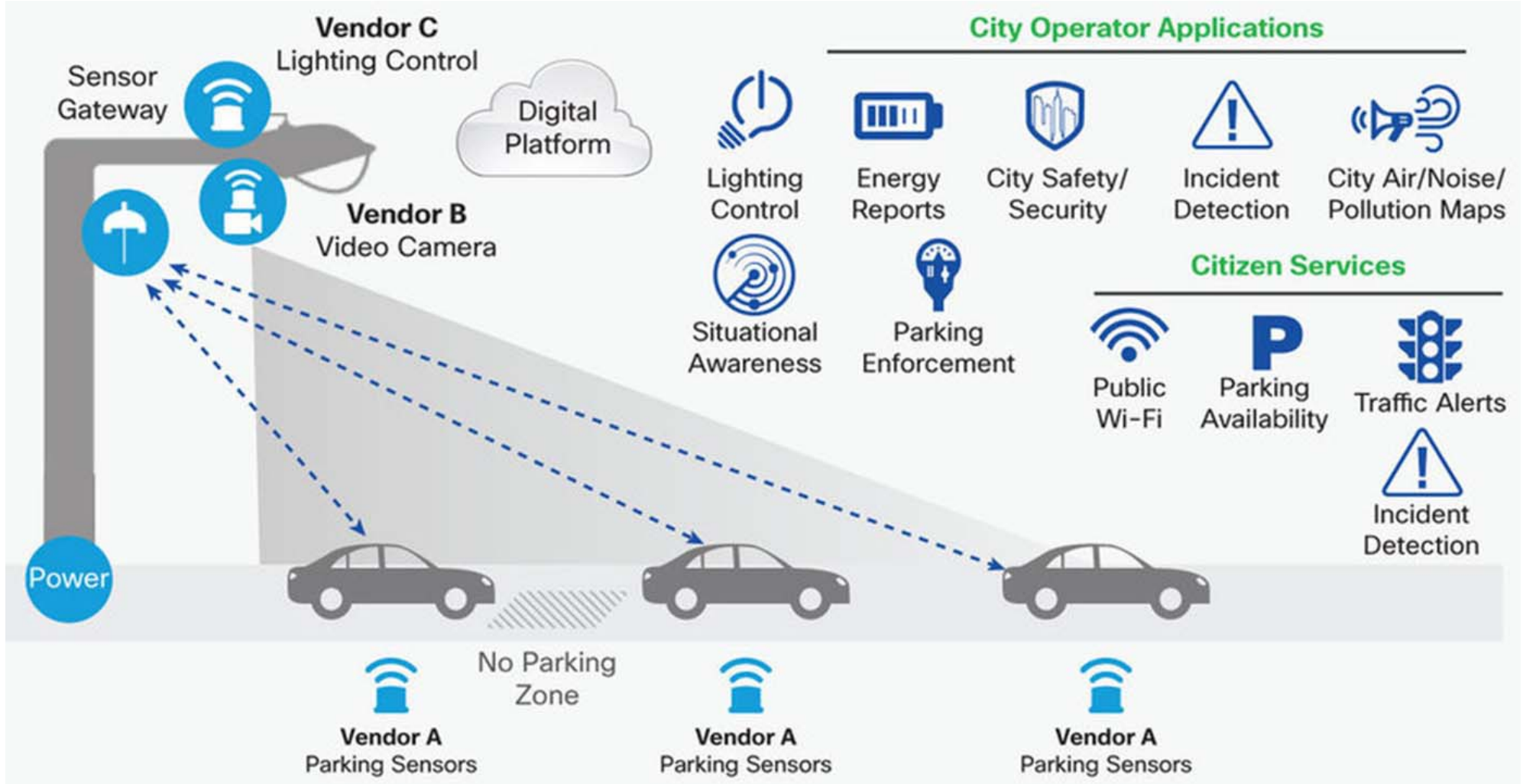
Inform residents

Provide security

Create connections:

- Social Media
- Advertising
- Entertainment
- Hotspots, 5G, WIFI, LIFI and beyond
- Analytics
- Suggestions of what to do

# Smart Technology: What might we want to sense, record or transmit



Multiple data streams to be used by different sections for varied purposes.

- Interoperability of hardware and language
- Cross platform communication
- Data storage
- Data control
- Various cloud servers
- Who controls data and formats
- What do you pick (you don't want to be the one with a Betamax)
- Data security
- Communication security
- System robustness

# Smart Technology: Sensors, Input and Intelligence



Indicators



WIFI Or 5G



CCTV



Speakers



Intercom and phone charging



Car Charging



# Smart Technology: Sensors and Input





We Can Hang All Of This On Our Street Lights

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Are We Sure?

# Our Lighting Asset is in Great Condition



# Our Lighting Asset is in Great Condition



## What State is the Asset in



In 2017 UK Highway Lighting NDT test houses reported an average of 3.5% lighting column assets are in a red condition indicating these columns have critical structural issues

They report a growing number of amber assessed columns indicating these columns are showing indicators of critical structural issues (2010 it was 11% / 2016 it had grown to 37%)

Furthermore 10% of amber columns have turned red over 3 years – hence as the number of ambers increase so does the number of reds

Given there are approximately 7.5million street Lights in the UK

262,500 columns are in a critical condition structurally

2,755,000 columns are showing indicators of critical condition structurally

Over 3 years 277,500 more columns will become critical

## What State is the Asset in



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Can Lighting be the facilitator for Smart Cities?

Answer is Yes, However:

- Asset ability to safely support additional technology hardware cannot be assumed.
- Is there space to accommodate ancillary electrical terminations safely

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## What State is the Asset in



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Can Lighting be the facilitator for Smart Cities?

Answer is Yes, However:

- Asset ability to safely support additional technology hardware cannot be assumed
- Is there space to accommodate ancillary electrical terminations safely
- Is all of the equipment safe to be worked on or near to
- Will all of the equipment remain in a safe state under accident conditions
- Do all parties understand safety procedures and risk associated with other technologies
- Do all parties understand impact of leaving something inoperative

# Car Charging

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Just some quick points on car charging



## Car Charging : Some quick points on car charging



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The Government have a target that by 2040 every new car & van should be Ultra Low Emission Vehicle (ULEV).

- Require recharging infrastructure
- Smart choices
- Increased customer awareness
- Energy response for capacity and infrastructure

Climate Change Commission UK ULEV Target.

- By 2020 9% new cars to be ULEV (approximately 0.25 million)
- By 2030 60% new cars to be ULEV (approximately 1.6 million)

## Car Charging : Some quick points on car charging



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### Types

Mode 1: Domestic socket and extension cord

Mode 2: Domestic socket and cable with a protection device

- This would be the type which could potentially be incorporated in a street lighting column

Mode 3: Specific socket on a dedicated circuit

- Typically commercial non fast charging unit often on three phase or larger single phase supply

Mode 4: Direct current (DC) connection for fast recharging

- Commercial fast charger not all vehicles can take the full load

# Car Charging : Some quick points on car charging



## Charging time

Charging time for 100 km of BEV range	Power supply	Power	Voltage	Max. current
6–8 hours	Single phase	3.3 kW	230 V AC	16 A
3–4 hours	Single phase	7.4 kW	230 V AC	32 A
2–3 hours	Three phase	11 kW	400 V AC	16 A
1–2 hours	Three phase	22 kW	400 V AC	32 A
20–30 minutes	Three phase	43 kW	400 V AC	63 A
20–30 minutes	Direct current	50 kW	400–500 V DC	100–125 A
10 minutes	Direct current	120 kW	300–500 V DC	300–350 A

The Direct Current fast chargers require huge three phase supplies and significant infrastructure

# Choices



SAE J1772



Type 2 Connectors  
(Mennekes)



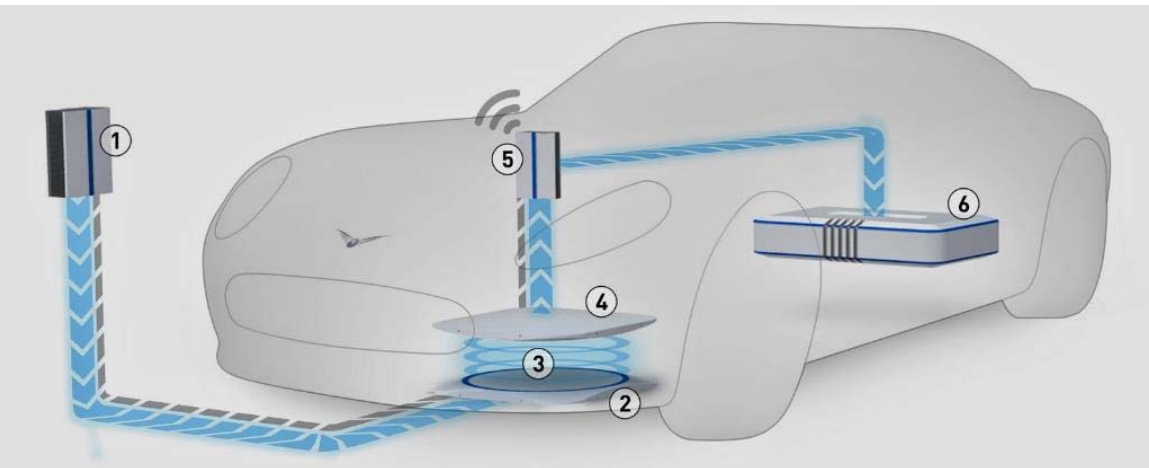
SAE Combo



CHAdeMO



For our on street systems surely inductive charging is the way forward





Thank You

[www.theilp.org.uk](http://www.theilp.org.uk)