CELtek Central Management System

Technical Specification

Charles Endirect Control + Connectivity Products

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Charles Endirect

Ingenuity at work

Introduction

Charles Endirect Ltd is a leading manufacturer of electrical components and equipment principally supplied into the street lighting industry. The Company has been supplying these products to the UK and International markets since 1985.

Our experience and expertise in this field gives us the edge to manufacture and supply some of the most intelligent, high specification and robust products to the market.

Charles Endirect Ltd is an ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 Quality Accredited company with all departments in our organisation operating stringent, quality control systems resulting in products that are designed and manufactured to comply with, or exceed, the requirements of current legislation, regulations and standards. Charles Endirect is a founder member of the Highway Electrical Association (HEA), and a Premier member and supporter of the Institution of Lighting Professionals (ILP).

The CELtek, Central Management System (CMS), introduced in 2012 by Charles Endirect Ltd, allows the end user to control and monitor their street lighting and traffic sign assets, along with the facility to maximise energy efficiency.

Charles Endirect Ltd and CELtek continue to keep at the forefront of customer demands and developments of "Smart City" thinking and technologies. Through CELtek, we offer "Internet of things" (IoT) capabilities, including multi-level platform integration to other manufacturer's equipment. This has broadened the scope of application possibilities to give increased system flexibility and give the end customer greater control of their assets.

The system can achieve high cost savings, resulting in a quick return on the initial investment and through-life cost savings, while helping to deliver the highest degree of public safety and security. The whole system can be set and adjusted to meet ever-changing requirements in standards and customer lighting policies.

In order to achieve the maximum energy savings on all forms of exterior and interior lighting, it has been clear for some time that a Central Management System (CMS) is a must have. This has been promoted by the UK Lighting Board and ADEPT (formerly the CSS) as well as being deployed in many installations throughout the UK and Europe.

TALQ – The Smart Protocol. We are members of the TALQ Consortium which aims to define a globally acceptable smart city protocol for central management software to configure, control and monitor smart city device networks.

Elexon - The CELtek system has an approved Elexon metering system which enables the cost savings to be recognised and then passed back to the customer. CELtek's Elexon approval is vital and plays a key role in ensuring that real cost savings are made. Without it, output and resulting energy charges are based on UMSUG codes alone. Elexon approval ensures that energy savings result in cost savings.

Contents

Charles Endirect Ltd reserves the right to change the information in this document without prior notice.

Glossary of Terms

AMS	Asset Management System
BSCP520	Balance and Settlement Codes for Unmetered Supplies registered in SMRS
CMS	Central Management System
DALI	Digital Addressable Lighting Interface (Software Protocol)
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communication
GPS	Global Positioning Satellite
HTTPS	Hypertext Transfer Protocol Secure (used to transfer and request data)
IoT	Internet of Things
Java	Program language and computing platform
LCU	Lighting Control Unit
LED	Lamp Type - Light Emitting Diode
MoRLiCS	Motorway Road Lighting Control System (Highways England)
NSG	National Street Gazetteer
OTA	Over the Air (remote access and upgrade protocol)
PECU	Photo-electric Control Unit
SLA	Service & Software License Agreement
SQL	A standardised form of computer language "Structured Query Language"
UMSUG	Unmetered Supply User Group (ELEXON Governing Body)

1. CELtek CMS Summary

- Components are required to run the CELtek system: a Gateway (4G/5G enabled) and Light Control Unit (LCU).

- There are two gateway options. The cabinet-based gateway can be fitted into a feeder pillar or be mounted onto a lighting column. Both options are located within IP65 rated enclosures. Zhaga Gateway is also available and can be Luminaire Mounted directly on a Zhaga socket.

- Zigbee/GSM antennas are required for the transmission and reception of data from and to feeder pillar mounted Gateways.

- Additional control can be added via Digital Photo-electric Control Unit (PECU) or an Analog LUX meter.

- No additional software is required as the system is controlled by the server using a web interface, accessed on the internet via most web browsers.

- A Zigbee based RF Mesh Network System is ideal for places where there are obstructions such as buildings and trees and where direct line of sight is not easily definable.

- Not all LCUs need to be in direct range of the Gateway as all units can communicate with each other. The range of communication between LCUs can be up to 500 meters.

-Power to the LCU can be turned off during the day to save energy and make circuits electrically safe.

- LCUs have a long-life span which equates to approximately 50,000 hours continuous operation.

- The system uses an Open communication Protocol (DALI). Zhaga units conform to latest DALI D4-i protocols.

- Compatible with all type-tested electronic control gear.

- Front end user screen is easy to navigate using simple drop-down menus on a Windows based platform.

- The system can be controlled with an internet connection, by external devices such as mobile phones, notebooks and tablets.

- The system can be expanded to meet customers' requirements and have a planned roll-out.

- Datek Light Control CMS by Datek is TALQ Certified. This gives the customer the reassurance that the product has been independently reviewed and assessed. As trading partners of Datek, Charles Endirect is pleased to market this system as CELtek.

- CELtek is also an approved Elexon metering system which enables the cost savings to be recognised and then passed back to the customer.

CELtek is fully supported by a UK based support team located at our Wincanton head office and local area support who are available for site work when required.

2. Smart Cities IoT
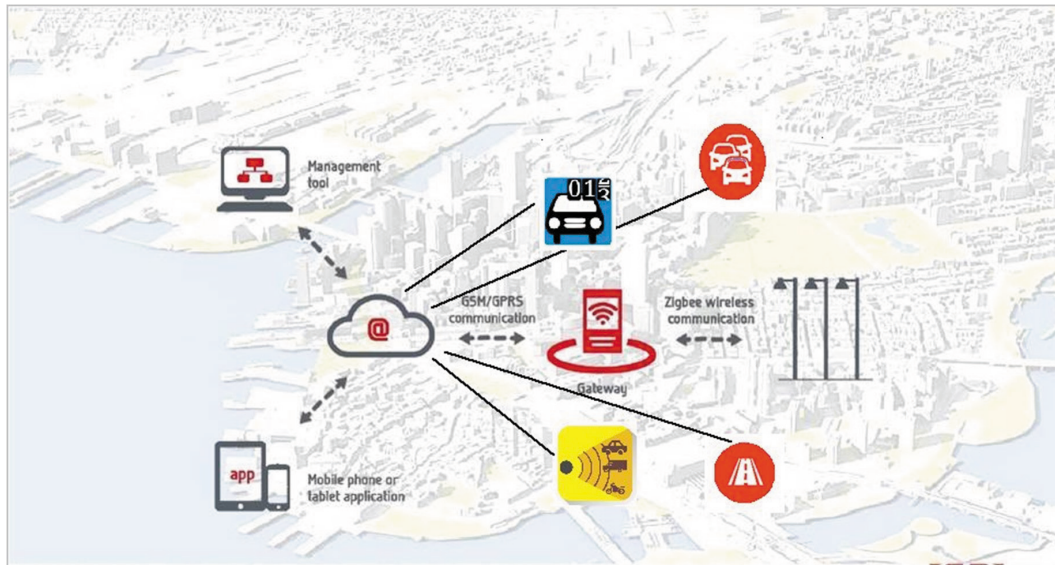
A "Smart City" can be defined as an urban area that uses different types of embedded electronic/digital sensors to supply data back to centralised hubs. These communicate through back office systems, which are then used to efficiently manage assets and resources.

The system works and interfaces with other systems so that data can be passed and processed using one network.

CELtek interfaces into many systems and other manufacturers equipment such as traffic counters, water meters and pumps. Currently CELtek interfaces with Motorway Road Lighting Control system (MoRLiCS), a National Highways system which uses a Web service to interface to monitor traffic flow. This enables the system to vary the light output in response to traffic flow, giving the correct lighting levels when and where is required.

CELtek also interfaces with Pharos DMX equipment. This means that commands from Pharos can control the lights to dim to the correct light requirements for an artistic event.

Charles Endirect are constantly developing the system with the intent to lead from the front with Smart City Technology. The system has several analogue and digital inputs and outputs which makes the system versatile.

From the Gateway up to 4 analogue inputs can be connected as well as 4 digital inputs and 4digital outputs. The following list shows what can currently be connected.

Analog Inputs such as:
- Lux Meter
- Water Level Meter
- Generic Analogue in Equipment

Digital Inputs such as:
- Incoming Control Signal
- Photocell
- Power Meter
- Traffic Counter
- Stadium Switch Panel
- Contactor Feedback
- Traffic Controlled Tunnel Lights
- Pump Station Monitoring
- Door Switch
- Circuit Breaker
- Residual Current Circuit Breaker
- Ground Fault Indicator
- Surge Protection
- Auto/Manual Switch

Digital Outputs such as:
- Lights
- Outgoing Control Signal

3. How CELtek Works

3.1   The Correct Level of Light

The principle behind the introduction of a Central Management System is to deliver the right amount of light at the appropriate time, whilst retaining the ability to increase or decrease lighting levels according to customer needs or local requirements. This will automatically contribute to the end user's ability to reduce their carbon footprint, their energy and maintenance costs.

Defined lighting levels are regulated from a program on the server. This sets typical parameters such as percentage of dimming power, along with start and finish times.

The most common control parameters for control of light levels are:

- Photocell, light meter, timer, astronomical clock (built into the server), a physical and digital switch.
- Programming and scheduling are determined by event, traffic density, motion detectors etc.
- All configurations for switching and dimming occur on the server's web-based interface and are accessed via the internet on a simple browser.

3.2   Data Acquisition

All LCUs transmit data every 10 minutes to the Gateway. In addition to the regular transmission of certain data to the server, data can also be requested as needed from the server by a user-initiated request.

3.3   Remote Monitoring

Although automatic switching and dimming of lights (all, groups or individual luminaires) is performed from the server as a pre-programmed operation. It is also possible to override existing programming by using real-time control via the web-based platform on your laptop or mobile device.

3.4   Data Communications

Communication between server and Gateway takes place over the Global System for Mobile communicatioon (GSM) network using General Packet Radio Service (GPRS) data communications. Should a failure of the GPRS network occur then the LCU will continue to operate on the last set of switching commands received.

Communication between the Gateway and an LCU is achieved by using radio communications. The radio technology used is Zigbee, self-healing mesh system. A standard system widely used for communication over short distances in area-based radio networks.

The system can communicate and integrate with third-party Asset Management Systems (AMS). CELtek has already been integrated with Alloy, Mayrise and Confirm. The system can also be integrated with other equipment manufacturers products such as, Traffic Counters and the National Highways Road lighting control system "MoRLiCS".

3.5   Local Control of Lamps

The system provides several built in features to ensure correct operation of the luminaires.

Normal Situation

In a situation where all the devices are functioning normally, new instructions are delivered from either the server or Gateway. If the control sequence is already programmed to happen at specific times, then the action is performed from the Gateway.

Error in Communication between the Server and Gateway or Server Failure

The server transmits to Gateways a daily timetable of expected and calculated lighting and switching command times for the next 7 days. If a Gateway fails to communicate with the server at the time of switching, the Gateway still performs the action of switching the lighting on and off locally.

If a Gateway is in full communication with the server, but at the time has not received the necessary command for switching the lighting, and within the configured time period, then the Gateway will perform the action of switching the lighting locally.

Error in Communication between the Gateway and LCU or Failure of the Gateway

The server transmits daily information about the next expected or estimated time of switching of all LCUs. However, if there is no communication between a Gateway and an LCU at the time of switching, then the LCU will perform the action locally from its previous instruction.

3.6   Functionality

Switching Lamps On

Luminaires can be switched on and off, in groups or individually. This is normally scheduled over each day of the week to allow differing levels to be set at weekends, school holidays and bank holidays if required. Switching can also be carried out from the mapping interface, (see the mapping section for more detail). The system allows for a manual override of the set switching regime at any time but this is subject to the level of authorisation given to a User. Setting of column groups of luminaires allows dynamic switching and dimming of the system, for example where a zone conflict exists or where alternative lighting levels are required.
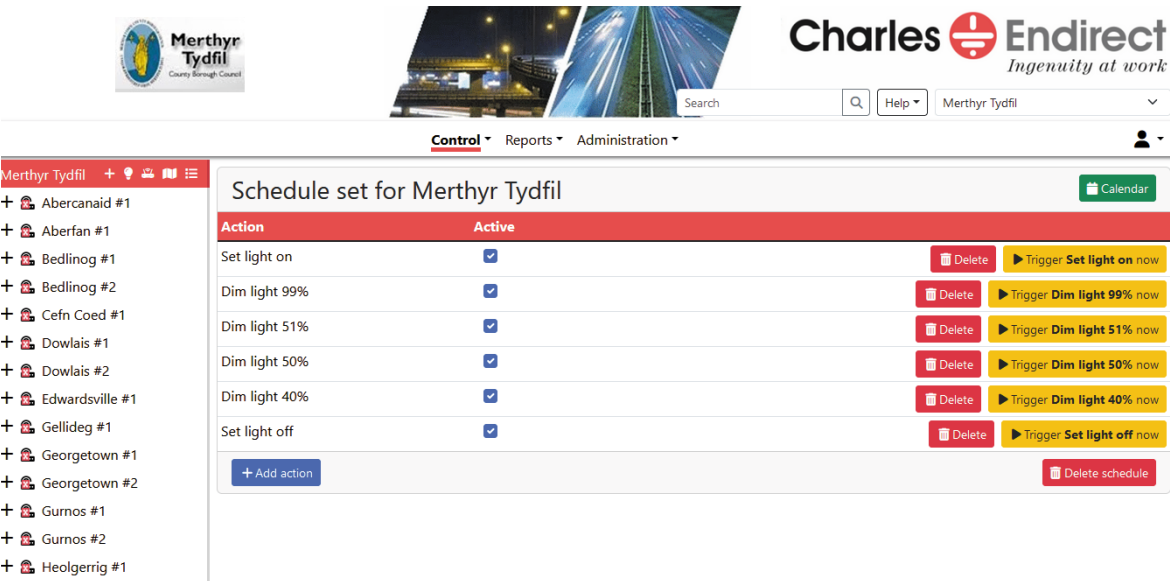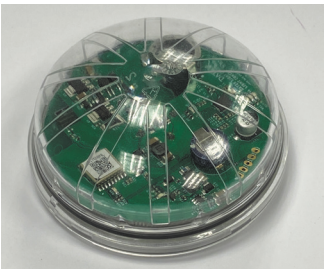

Electronic Control Gear

The LCU controls the electronic equipment with a DALI interface. This is an open commiunication protocol, essential to allow the control of different manufacturers' products.
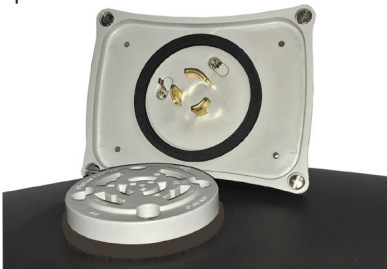
Zhaga Gateway
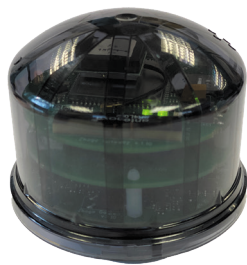
Zhaga External LCU

Feeder Pillar mounted gateway

Nema to Zhaga adaptor

Variable Dimming Levels

Dimming is available in steps of one percent increments within the lamp's control parameters.

Burn Time

Lamp burning hours are recorded and the information about the periods of burn time can be extracted from the reports section with the drop-down menu.

Dimming Value and Other Information

Any changes in the value of dimmed light fittings are stored on the server. These can be extracted from the reports section for a specified time period.

Current dimming values are displayed at all times on the server. In addition to the dimming values,the following information is also available:

- Voltage
- Current
- Phase angle (power factor)
- Temperature
- Lamp power (wattage)
- Communication (level of quality available at the unit)

Lamp Error – Alarms

The performance of the lamp's status will be reported and compared with the expected values. For example, if a lamp draws less power than expected from the defined nominal lamp wattage and dimming level, then an alarm will be generated regarding the low power of the system. Should a lamp burn out due to power failure this will also trigger an alarm.

These active alarms will be displayed on the main page of the web application. Alarm notifications can be generated by e-mail and/or SMS to the users who subscribe to them.

Communication Failures

If communication between the Gateway and LCU or the Gateway and the server drops out it will generate an active alarm. The LCU errors will be displayed with a red icon on the map.

Power consumption

The offset power consumption of each fixture is approved as Class B according to the standard EN 50470-3. The system is measured on each unit and includes input power to the lamp, electronic ballast and LCU.

System Voltage

System voltage (primary voltage) of all and any road lighting luminaire is available as a report and an alarm.

Software Upgrade, OTA

Software in the LCU can be upgraded via the radio link, (over-the-air (OTA)), this is done directly from the server. The system's Gateway(s) can be upgraded directly from the server; this allows forward and backward compatibility, making sure that systems are future proofed.

3.7   Functions and Information Available to the Operator

Monitoring and Management of Road Lighting Luminaries

The luminaires are organised in a tree structure that can be based on area, road or function and setup to integrate smoothly with the National Street Gazetter (NSG) structure or entirely at the choice of the end user.
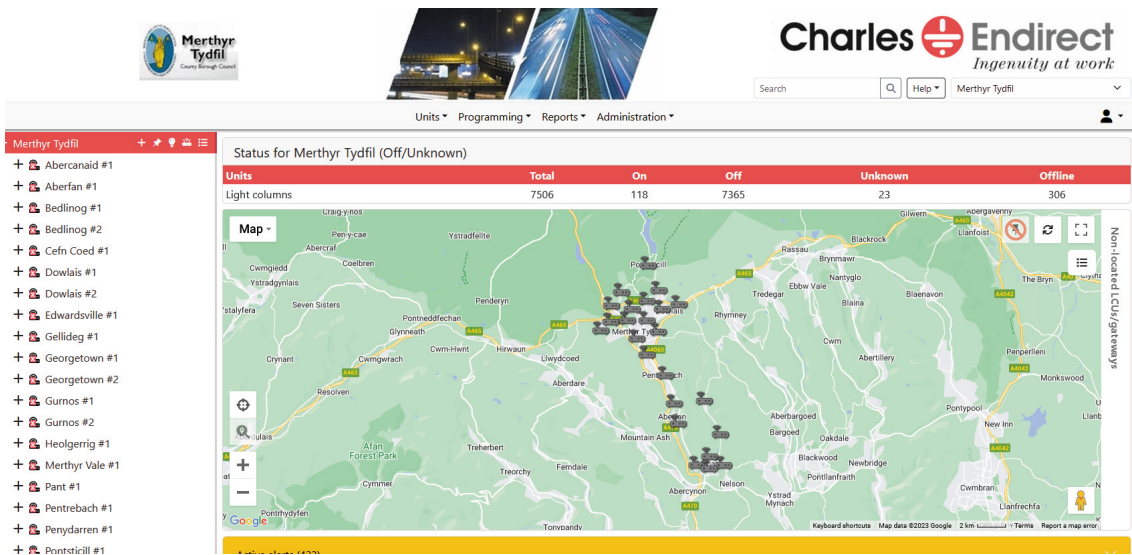
Status and Dynamic Measurements

Status of the fittings and the system is also available at several locations in the system and displayed by clear graphical presentation and a list view. The standard graphical display is via Google Maps, either in satellite or map view.

Luminaires are displayed as simple coloured icons depending on the status of each luminaire on the map.

LCU's		Gateways	
	On Online		On Online
	Off Online		Off Online
	Offline		Offline
	Offline on site		Offline Unknown
	Off powerless		Unknown
	Luminaire failure, low power		
	Power outage		
	Unknown		
	Unknown on site		
	On site		

From the map, the values of the luminaire are accessed by pointing to the lamp and selecting with the mouse.

Commands and Values

From the interface panel, the operator can send any command to all the units individually, in groups or by areas. All critical values are available from the operator interface and can be adjusted from there.
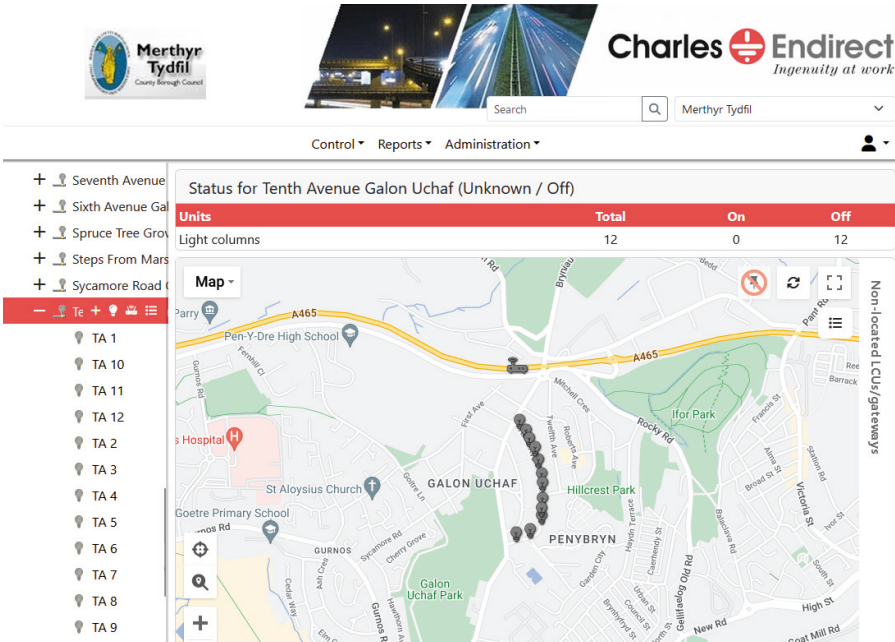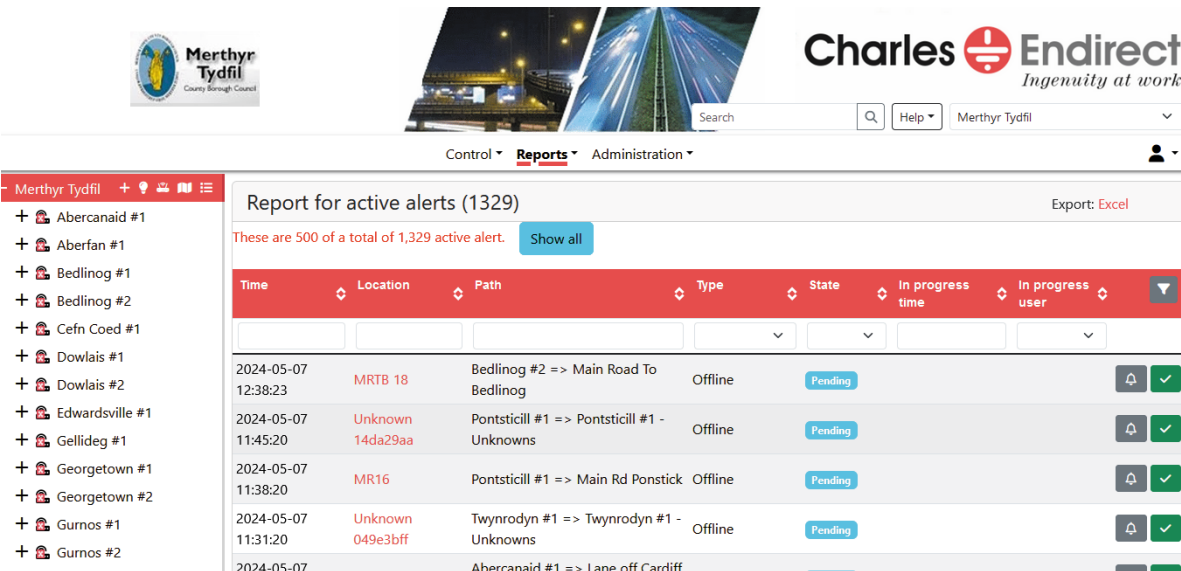

Screen capture of Command Screen

Alerts Handling

Alerts can be highlighted so that they are assigned to a particular operator(s). The system can determine what alerts should be removed automatically when the error is no longer present. In most cases it will be normal that an LCU alert that indicates lost communication with the unit will automatically remove the alert when the fault is fixed, and communication is re-established.

All alerts once cleared will be stored in the report section under Alert History. These can be accessed at any time and will show who cleared the alert.

Screen capture of Active Alerts

3.8   Access to Data

The system does not store data locally within the Gateway or LCU. If there is a need to retrieve information this can be done simply by connecting to the web-based platform, with any device that has an internet connection, assuming the individual has the access rights to do so.

Access will then be available to all data and functions for control and parameter setting etc. This is carried out at the same level as the operator interface.

3.9   Organisation of Data

The system stores all data received from the LCUs in a database for later use. All alerts are time stamped and stored within the database. Receipt of specific alerts will always be treated in accordance with the rules as registered on the server for notifications or other measures.

Each LCU will transmit data every ten to fifteen minutes to the server with information on all key parameters.

Screen capture of data organisation

3.10 Inadvertent Loss of Power

All system devices will "remember" the last state or value received and will turn on and revert to their correct status once the power is re-established. If the luminaires were in light before the power was lost, the lights will be lit when the power is restored. If the day/night setting has changed during the time of the power outage and the time when the power is restored, the server will send notice of change at the first receipt of a status report from the luminaires.

There are no self-test routines or other mechanisms in the system that can lead to inadvertent switching of the light.

3.11 Electronic Energy Metering

CELtek receives information about the energy measurement from all luminaires and records it on the server. All storage, processing and reporting of energy consumption and meter readings are handled by the system.

The system is ELEXON certified, approved for use within Balance and settlement Codes for Unmetered Supplied registered in SMRS (BSCP520), as required and UMSUG codes are available on the ELEXON website.

3.12 Language

All information supplied to the operator is in English.

4. CELtek CMS Hardware

4.1   Hardware Overview

CELtek has two main components to the operational system:

- Feeder Pillar mounted Gateways (4G/5G enabled) with Zigbee/GSM antenna
- LCUs which communicate with drivers to control the luminaires

The system can be used to turn on and off individual luminaires. Luminaires can be dimmed to the required lighting levels and be monitored for faults, voltage, current and energy usage.

Control capability will depend on the equipment installed:

1   Drivers installed on the CELtek system must be DALI compatible and approved and can be switched monitored, and luminaires can be dimmed subject to the restrictions of the luminaire type and the driver manufacturer's limits.

2   LED drivers must be DALI. Drivers can be switched and monitored and dimmed down to 1% light output.

Gateways can be used in two different types of installations:

1   Cabinet mounted Gateway can be used for Group Switching operations. This type of installation allows for monitoring and switching of individual cable circuits and can be controlled by a LUX meter, photocell or using the astronomic clock. The Gateway can also control a Zigbee network which will allow direct communication to individual columns or luminaires.

2   A Gateway fitted with a Zigbee antenna will carry out all the necessary functions to monitor and control individual luminaires using an LCU fitted to the luminaires. The Gateway can control up 800 LCUs using a Zigbee self-healing mesh network; the installation distance between each LCU can be up to 500m.

3   A Zhaga Gateway connected using the Zhaga socket on top of a luminaire, this latest technology will allow control of the Zigbee network in a more effective way when it comes to installation and commissioning. This gateway must be installed on a column/luminaire that is continually powered.

4.2 Feeder pillar mounted Gateway Plus 4G enabled

CELtek Gateway Plus 4G enabled

The Gateway is the physical link between the commands that are given in the platform and the LCU's which are the devices that will allow the command to be registered and executed. The Gateway is also the device that collects information from the LCU's. Communication with Gateways is wireless via the internet.

The Gateway can be connected to circuits that are to be controlled, and signals from specific components to be monitored such as integrity of fuses, RCD and contractor functions along with cabinet door open and water level alarms etc.

Key Features:

✓ The standard Gateway can control up to 800 LCUs.

✓ Notification of errors to the operating staff via email and/or SMS

✓ Communicates with the server over GSM-GPRS network

✓ Ethernet can be used instead of GSM where the customer's own network is used

✓ All outputs can be controlled separately and turned on and off simultaneously or at different times

✓ Battery back-up in case of a power failure

✓ IP67 Rating

✓ Built-in security that prevents unauthorised use

Inputs and Outputs

If more inputs and outputs on a Gateway are required, then a device can be fitted with expansion modules. For special applications the number of inputs and outputs can be expanded further by using the expansion port. The Gateway can also communicate and gather data from other systems over RS- 232, Ethernet or IoT

Function:	Gateway	
	Built in	Expanded Max
Relay Outputs	4	42
Digital Input	4	12
Analog Input	4	4
Analog Output	4	4
Expansion Port	Yes	
RS232	2	

Technical Data

Power Supply	Min	Typical		Max		
		DC	AC			
On Board Li-ion Battery Pack		1900			mAh	
Operating Voltage AC	85	-	-	265	VAC	Fused
Operating Voltage DC	8	-	-	36	VAC	Protected against wrong polarity

Other:	
Gateway external Dimensions:	W130mm x H180mm x D60mm (excludes glands)
UMSUG Code	81 7001 0001 100
International Protection code (IP):	IP67
Standards	EN61000-6-2 EN61000-6-3
Directives	2014/53/EU (RED) CE
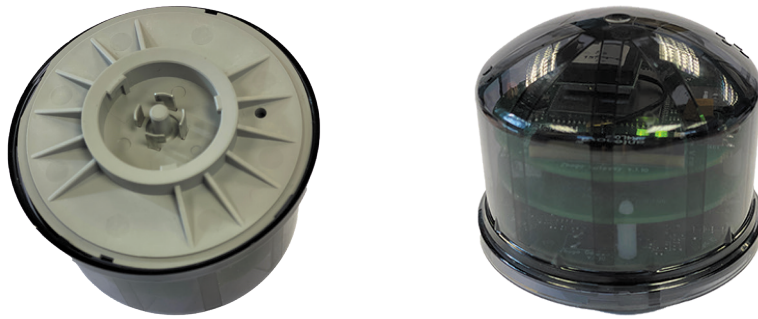
4.3   Zhaga Gateway

Zhaga Gateways offer alternative for standard gateways which can be luminaire mounted via Zhaga sockets. Zhaga products have standardised interfaces which allow interoperability between devices and facilitate Smart City and IoT integration. The smaller footprint of the Zhaga connection also means more devices, such as sensors, can be fitted to the luminaire.

Smart Data includes complete Luminaire, and LED Driver information read directly from the D4i driver in a standard universally accepted format.

Key Features:

✓   Luminaire mounted or additional asset mounted

✓   Gateway can control up to 600 LCUs or other sensors

✓   Smart data available from luminaire and LED drivers

✓   Full data information available including current status

✓   Communicates with the server via built 4G/5G

✓   All outputs can be controlled separately and turned on and off simultaneously or at different times

✓   Battery back-up in case of a power failure

✓   IP67 Rating

✓   Built-in security that prevents unauthorised use

✓   Remote software upgrade over the air (OTA)

✓   Remote app for installation

Technical Data

Power Supply:	
Rated Voltage AC	12 - 24V DC
Rated Current	40 - 50mA @ 24v DC, 100 - 150mA @ 24v DC for data traffic and active communication

Main Functions:	
Zigbee Transceiver	ZigBee 2.4 GHz Mesh radio for communication
Real Time Clock	From server
DALI line interface	Zhaga Book 18 standard contact
GPS (Optional)	Included

Other:	
Storage Temperature	- 20 to 60 degrees C
Operating Temperature	- 20 to 60 degrees C
Weight	144g
External Dimensions	H 70mm x W 70mm x D 70mm
internal Protection code (IP)	
UMSUG Code	8170002002100
Directives	CE
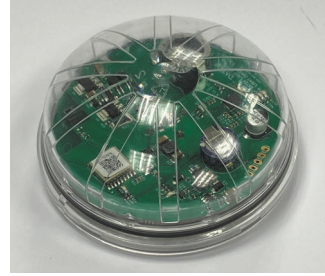
4.4   Zhaga LCU

CELtek Zhaga LCU

CELtek Zhaga LCU is a luminaire mounted node. Together with a CELtek Gateway Plus, and a cloud-based server, the lighting control system has been developed to optimize energy use, streamline operations and maintenance as well as minimizing unwanted light pollution.

Key Features:

✓ CELtek LCU Zhaga is designed for integration with LED light sources that have integrated the Zhaga Book 18 standard connector, and that support Dali 2.0 and D4i protocols.

✓ These standards facilitate integration between control system and luminaire so that the customer can freely choose the luminaire manufacturer without any concerns about compatibility with the CELtek Light Control solution.

✓ The control node uses the ZigBee 2.4 GHz Mesh radio for communication.

✓ With local intelligence and built-in light meter, the unit will provide the ignition and switch off itself should interruptions occur in one or more parts of the communication chain.

✓ The unit has an internal antenna and is powered direct from a compatible LED driver in the luminaire.

✓ In the event of a power outage in the post, a small amount of stored energy will be used to send a message to the server about this (Last Gasp).

✓ CELtek LCU Zhaga can be equipped with a GPS module for automatic location in the field.

✓ Upgrades are constantly being developed and CELtek is implementing continuous changes driven by: -

   o https://www.digitalilluminationinterface.org and
   o https://www.zhagastandard.org With OTA (Over-the Air) software update,

✓ The customer will always be assured that the device has been upgraded with the latest version of the software that includes new and updated features when available.

Technical Data

General information:	
Operating Temperature	-40 - + 70 ºC
Humidity	(RH, non-condensing): 4-90%
International Protection code (IP)	IP66
Weight	30g
External Dimensions	W84mm x H30mm x D48mm
Outdoor Suitability	(UV) UL 746C f1
UMSUG Code	9400010007100
Standards and Directives	EN 301 489 - 1 and - 17 EN 60529 EN 62262: 2002 impact IK9 EN 501581: 2012 IEC 61347 - 1 IEC 61347 - 2 -11 IEC/EN 61347 - 2 - 11:2001 IEC/EN 61347-:2015

4.5   7 Pin NEMA Socket

✓ Designed for connectivity of NEMA type plug in devices: photocell/CELtek LCU/smart city

✓ Simple luminaire or wall box fitment

✓ Pre-wired for ease of installation

✓ Compatible with 3 Pin NEMA devices

✓ CE marked

✓ "Smart City" future proof
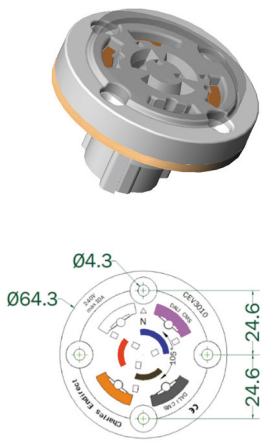
Electrical:	
Rated operational voltage UE	240V ac
Rated frequency fn	50/60 Hz
Rated current InA	10A
Rated Insulation voltage Ui	500V ac

Mechanical:	
Housing	Nylon PA66 UV Protected
Power contacts	Phosphor Copper, Nickel/Tin Plating
Dimming contacts	Beryllium Copper, Gold Plating
Pollution degree	IP2X / IP65 (with compatible IP rated device fitted)

Normal Service Conditions	
Ambient air temperature for operation	-25°C to 55 °C
Altitude	< 2000m
Humidity	95% @ 55 °C
Pollution degree	3

Connections				
Wires (BS6231)	CSA mm^2	Length mm	Terminations	Functions
Brown	0.75	500	Live 230V ac	Power
Blue	0.75	500	Neutral	Power
Red	0.75	500	Load 230V ac	Switching
Violet	0.5	500	Pin 4	Control signal connections for manufactures devices
Grey	0.5	500	Pin 5	
Orange	0.5	500	Pin 6	
White	0.5	500	Pin 7	

Directives:
LVD 2014/35/EU, EMC 2014/30/EU, RoHS 2011/65/EU

Related documents:
EU Declaration of conformity

4.6 CELtek LUX Meter IP65 (pillar mounted)

In some circumstances it may be deemed necessary to install an alternative method of controlling the lighting network, and under certain conditions, the provision of an additional monitoring device could be the solution.

The installation of a LUX meter provides that additional control. LUX Meters are wired via the Gateway, offering additional flexibility of customer options.

LUX Meters are connected and controlled via the analogue ports of the Gateway. LUX meters measures the light levels and outputs these readings as an analogue 0-10V DC value (the higher the value, the higher the light level).

LUX Meters supplied by Charles Endirect Ltd are wired and fitted into an IP65 rated polycarbonate enclosure with a transparent removable lid. The unit should be fitted in a suitable position on the feeder pillar body, below the pillar roof line.

Site installer to mount gateway on RH or LH side of feeder pillar

Site installer to drill 4 x M5.5 holes through feeder pillar body for supplied M5x20 fixings

Site installer to drill 1 x M20 hole through feeder pillar body for supplied M20 plastic conduit end fixing.
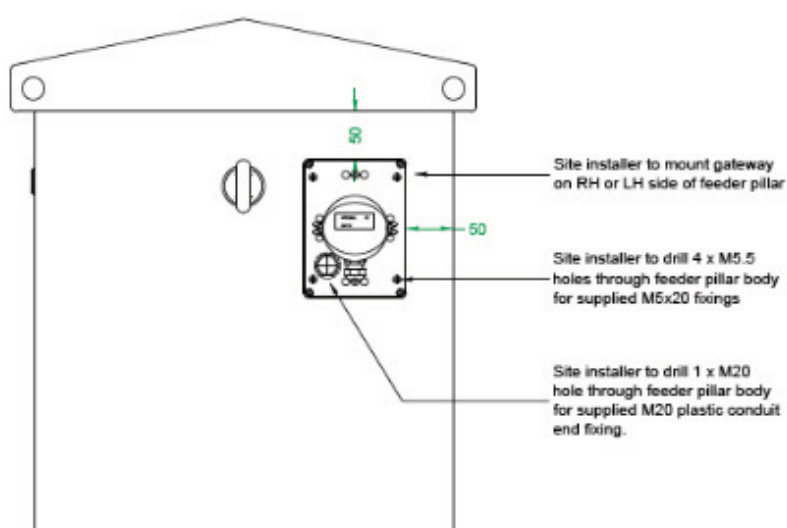
When connecting the LUX meter, the following connections to the Gateway are observed: -

Terminal 1 – to DC OUT12
Terminal 2 – AGND
Terminal 3 – A/1

A connection must be made between terminals AGND and GND on the Gateway

Attention: Make sure the wiring and the setting on the analogue input are correct.

5.   CELtek CMS Hosting

5.1 Servers

CELtek is a fully hosted system with access via a web browser. This gives full access using any device with internet connectivity.

- ✓ Windows and Mac compatible computers
- ✓ Tablets
- ✓ Smart Mobile phones

Platform

- ✓ Linux
- ✓ Windows
- ✓ Java (JME/JSE/JEE)
- ✓ Android

Database systems

- ✓ PostgreSQL
- ✓ JavaD/ Derby
- ✓ Oracle
- ✓ MS SQLServer
- ✓ MySQL

The data is stored in a Structured Query Language (SQL) database on a SQL server. The database used within our own installation is Postgre SQL. The data is backed up every day ensuring that the risk of data loss is kept to a minimum.

The Charles Endirect Ltd support team constantly carries out full and thorough system checks on all their customers' databases to ensure there is no loss of data. The support team also works regularly with the systems software engineers to maintain a high level of support.

The CELtek system is constantly reviewed and upgraded throughout the year with changes to the system only put in place after full analysis and testing has taken place.

This regular monitoring and upgrading is covered under the Customer Licensing or a Service Level Agreement.

5.2   Server Location

CELtek servers are based in a Data House with full and comprehensive security in Ireland. All data is backed up and stored at another location, this provides a full back up service of all of the CELtek data. This is carried out to ensure no data is ever lost and systems are fully functional at all times.

Amazon is the Data House that CELtek uses, giving full secure data and security for each customer.

6. CELtek CMS Reports

6.1   Selection

The reporting facility within the software is connected via the system's tree structure. The data chosen will be for the selected level or section of the tree, including all sub-areas.

To run the majority of the available reports, a time span must be selected. If a defined time span has not been selected, then the system will automatically default to the previous 2 days.

The reports are divided into seven categories:

Active Alerts	Shows live alerts for checks which need to be made actively reported changes.
Events	These are system-generated actions that are performed automatically. A specific parameter can be selected from the available list
Alert History	These are all alerts that have been cleared stored in the data base.
Photocell	This report shows the times that any selected photocell connected to the Gateways switch any circuits, or LCUs associated with that Gateway, on and off.
Lux Meter	This report allows the User to accurately calculate the energy used by the units connected to the system.
Energy Consumption	This report allows the User to accurately calculate the energy used by the units connected to the system.
Other Reports	These are standard reports. See the following for more details.

6.2 Events

The following reports can be generated:

Name	Group Switching	LCU Individual switching	Description
Configuration status	✓		Lists configuration updates
Current node status		✓	Lists the node status updates
Daytime	✓	✓	Lists the photocell switching to daytime
Dim		✓	Lists all the dimming commands
Get energy		✓	Lists collections of energy measurements
LCU data		✓	Lists data to/from LCUs (see below for detailed explanation)
Light switched off locally	✓	✓	Lists LCU(s) and time when the LCU(s) have switched off independently. Happens when the LCU is offline with the gateway at the same time as it switched off the day before.
Lights off	✓	✓	Lists all «off» commands
Lights on	✓	✓	Lists all «on» commands
Night time	✓	✓	Lists the photocell switching to night time
Ping		✓	Lists handshaking between an LCU and ZigBee gateway
Removed node		✓	Lists all commands to remove nodes (LCU)
Set all dim values		✓	Lists all outgoing dim commands
Signal strength	✓	✓	Lists signal strength measurements
Unit update	✓	✓	Log of when units were last updated

6.3   Lighting control Unit

Nema Example:
LCU-data (3248, EFF=1, DIM=0(0%), RSSI=-59, T=26,
Lqi=255mc=0.014(0.14), mv=239(239), cosPhi=0.42,
Wm=21577967, rel=5, rtc=2001-12-19 02:41:40, sw=9
eSw=v1.6, hw=7, route=27034)

Zhaga Example:
LCU-data (3248, EFF=1, DIM=yes, RSSI=yes, T=Yes
Lqi= Yes, mv=NO, cosPhi=No,
Wm= To be checked, rel=No, rtc= Yes, sw=Yes
eSw= Yes, hw= No, route=Yes

Zhaga LCU Example:
CU-data, G4 (nodeId: dcad, dim: 99%, dimVal: 247,
rssi: -47, lqi: 212, eSw: 4.02.19, upt: 557, ldr: 156,
msgVer: 6, lsi: 0, temp: 19, Wm: 12007915, DALI-count: 1,
dali-0: Online, dim: 247, status: 0x04, pow: 112,
eff: 112, router: 70-ac-08-ff-fe-ca-df-f1) HA4/8/01

6.3   Lighting control Unit cont...

Definition	
eff	Reported power consumption at the time of measurement
dim	Reported dimming level from LCU in levels from 0-255.
rssi	Signal strength in dBi
t	Temperature eon the LCU print board in degrees (centigrade)
Lqi	Link quality
Mv	Voltage
CosPhi	Phase angle
Wm	Watt minutes
Rel	Position of the relay(s) in the LCU
RTC	Date and time of the LCU internal Real Time clock
Sw	Software version of the measurement and control processor in the LCU
eSv	Software version of the communication software
hw	Version of the PCB
route	Routing information for the communication. For debugging purposes

6.3   Lighting control Unit cont...

6.4   Other Reports

| Name	Group switching	Pole Based Switching	
Actions	✓	✓	Lists all actions
Active alerts	✓	✓	Lists all active alarms
Energy usage	✓		Shows meter value for external power meter if connected
Meter reading	✓		Lists meter readings within the defied period
Burn time	✓	✓	Lists burn hours within a defined period
Burn time total	✓		Shows the total number of burn hour from the installation date
Lux meter	✓	✓	Lists the reported lux meter values within a defined period Gateway level only
Luminaire current (Nema only)		✓	Lists the current readings within a defined period
Luminaire power consumption		✓	Lists the power consumption readings within a defined period
Luminaire power consumption total		✓	Lists the temperature reading on the LCU print board within a defined period
Luminaire temperature		✓	Lists the temperature readings on the LCU print board within a defined period
Luminaire voltage (Nema only)		✓	Lists the voltage reading within a defined period

7. Mapping

CELtek has a built-in system for unit mapping and allows navigation of the system through Google maps. Many functions can be controlled using the built-in mapping tools; these include switching on or off of the luminaire via the LCU or dimming the luminaire via the LCU. Additional asset information is also available via the mapping tool. This mapping function provides an invaluable way of determining geographic information when viewing installations and areas within a customer's system. CELtek uses Google maps as its mapping interface.
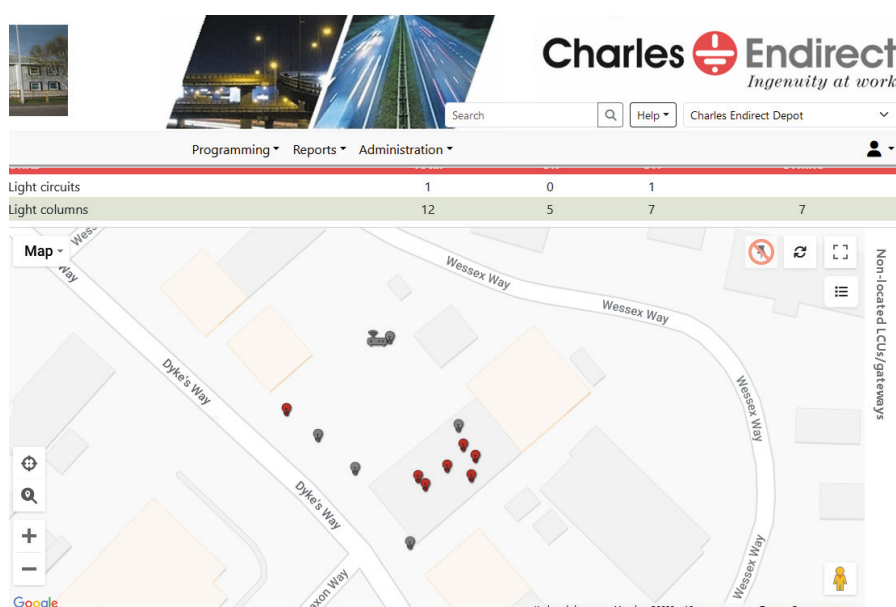
The use of Google Maps ensures that the CELtek system always has the most up to date mapping engine to suit all of the customer's requirements. It also provides the additional advantage of showing satellite imagery as well as hybrid and terrain mapping.

When Google update their mapping system, CELtek automatically updates. This ensures the system keeps up with the latest available mapping and images.
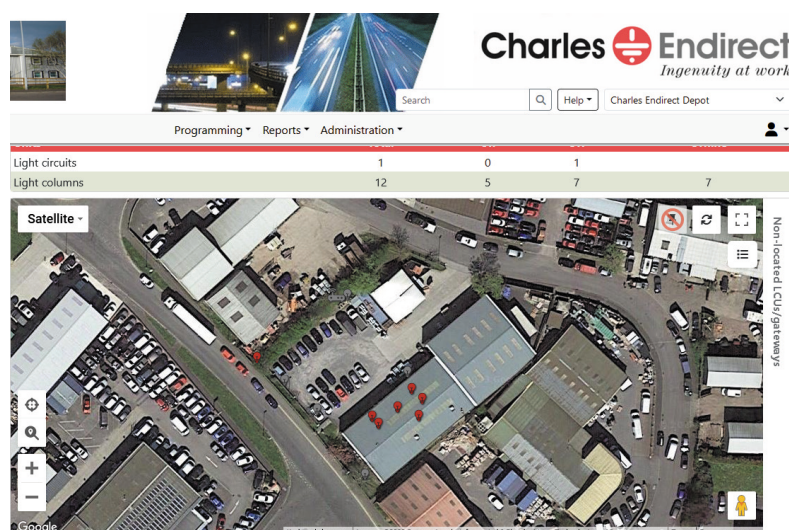
8. System Interfaces

CELtek provides interfaces with external programs to allow data to be synchronised. Currently there are several interfaces available with asset management systems and traffic counter systems.

Where a customer has an AMS program, links will be put in place to ensure only one data set is used. This will ensure that each customer's asset data system will be used to populate CELtek. This will guarantee that the data is in the "Well-Lit Highways Appendix "A" format".

With AMS integration in place, all the faults recorded in CELtek can be transferred and raised as jobs or works orders. These can then be issued to repair crews, and the outstanding faults and subsequent repairs logged electronically. Job sheets can be checked before they are issued to repair crews ensuring duplicate jobs are not raised.

Attributes can be updated with rules put in place so only accurate data is populated into CMS and AMS systems. This can save time and money for asset updates and checks can be put in place to ensure the system is only updated with correct data.

CELtek has analogue and digital interfaces for use with Traffic Counter Systems allowing dimming to be implemented when the required level or count is reached.

MAYRISE/ ALLOY

Causeway

CONFIRM

Brightly

A Siemens Company

MORLICS

national highways

9. Commissioning & Training

9.1 Commissioning

Charles Endirect Ltd will investigate and then plan large installations using Google Earth to select the best locations for the installation of the Gateways. By using the customer's asset data system and plotting locations by Easting and Northing, or by Latitude and Longitude, the number of Gateways used on any project will be optimised.
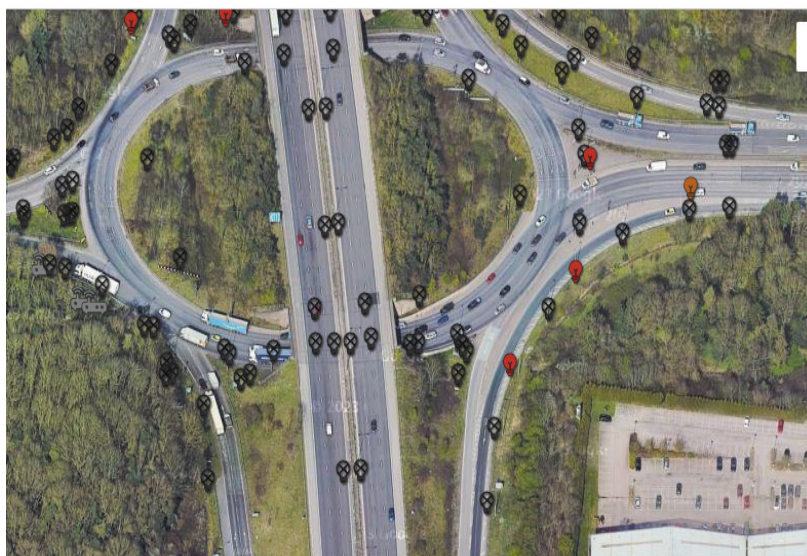
As the infrastructure is being rolled out and installed, the support team will constantly monitor progress of the works to ensure the system is up and running as the installation proceeds.

KML files are produced and exported enabling the roll out program and installation to be kept up to date. The KML files can also be used to update a corporate mapping system where required.

Charles Endirect Ltd can supply onsite engineers to help and assist with commissioning of the installation when requested by the customer.

All LCUs can be pre-populated into the CELtek system prior to installation. If the GPS version of the LCU is used; then once it is installed and connected to a working Gateway, the correct location and position of the LCU will be immediately identified as soon as it is registered into CELtek system, with no administrative input needed, saving time and money.

9.2   Training

As well as the continued support offered by Charles Endirect as part of our Service Level Agreement (SLA) with systems clients, additional training modules can be given upon request as detailed below. These modules are a chargeable extra over to SLA agreements.

Training is structured to meet the customer requirements and can be split into two areas: office-based staff and onsite engineers. In addition, all training can be tailored to meet specific requirements of the customer.

Training is carried out by the CELtek support staff and covers all aspects and functions of the CELtek system right up to Administrator level.

Half day training modules

- Basic Training covers a complete overview and reporting within the CELtek system

- Onsite Engineers training covers how to install Gateways and LCUs, and fault diagnosis of components

- Half day training is also given when updates to the system are released and changes to CELtek are made

- Training can be given at Charles Endirect Ltd offices or onsite at a customer's location. All training is agreed with customers so that all CELtek users are trained to the required standard

One and a half day training module

CELtek User training extensively covers how the system works. It explains how to enter data on to the system and how to program dimming profiles. The training also covers a comprehensive session on onsite installation.

Two day training module

This training is comprehensive and geared for CELtek Administrators. It covers how the software and the associated system works, explains and demonstrates in depth how to set up areas through the tree system and deals with individual units and control. The session also covers users, administration duties and profiles. It explains all reporting along with programming and dimming profiles, setting up Gateways and installation of LCUs and associated importing of data.

10. CELtek Support

10.1 Support

The CELtek support team is based in Wincanton, Somerset at Charles Endirect Ltd. Support is available Monday to Friday during normal office hours from 8.30am to 5.00pm. If system support is required outside normal office hours, then this can be arranged with prior agreement.

Onsite assistance from a Charles Endirect Technical Support Engineer during the hours stated above can also be provided, planned and agreed to suit the need of the customer.

Out of office support is available and specific times can also be arranged and negotiated at that time to meet the customer's requirements.

The standard assistance and support costs are covered in the annual software and service Level agreements, these costs also cover all software upgrades.

The support team logs all calls or emails with a log number which is then relayed to the customer as a reference. Any outstanding issue is updated to the current status to the customer every week.

Support team will notify of any upgrades and send out release notes before updates take place.

All technical documentation, user guides and documents relating to customers are maintained and updated by the support team

10.2 Managed Service

This is a service provided by Charles Endirect Ltd where a customer requires a project to be managed for an arranged period of time. This service is without the standard support terms and chargeable at our standard current rates and subject to our terms and conditions. If required, Charles Endirect Ltd can supply a managed service for any project involving CELtek where the customer requires additional resource.

10.3 Contacts for CELtek CMS Technical Support Team

Please contact us on 01963 828 400 alternatively email us at cms@charlesendirect.com

Approval of CELtek Central Management System

|	
Meeting Name	Supplier Volume Allocation Group
Meeting Date	2 April 2013
Purpose of paper	For Decision
Summary	Charles Endirect, in partnership with Datek, have produced the CELtek server-based Central Management System (CMS) for remote Street Lighting control. They submitted a formal application for approval of the system in January. We have received the self-test report and completed our witness testing. This paper reports that the system has passed the testing process, and invites the SVG to approve the CELtek CMS for use in Settlement. The Unmetered Supplies User Group (UMSUG) is currently considering the application ex-committee; we do not anticipate any UMSUG objections but will update the SVG verbally at its meeting.

1.   What is the CELtek CMS?

1.1   The CELtek CMS is an advanced service for the remote control of street lights.

1.2   The system uses a Gateway that controls a number of Lighting Control Units (LCUs) and the server is via Global System for Mobile (GSM) / General Packet Radio Service (GPRS) or Local Area Network (LAN).

1.3   Zigbee wireless communication is used between the LCUs, with a mesh functionality which offers full redundancy for Street Lighting columns. Each column fitted with LCU can act as a 'repeater' for other columns, securing communication over great distances. Failure of a single column will not disturb the overall functionality since columns can communicate via several other column routes, as shown in the diagram below:
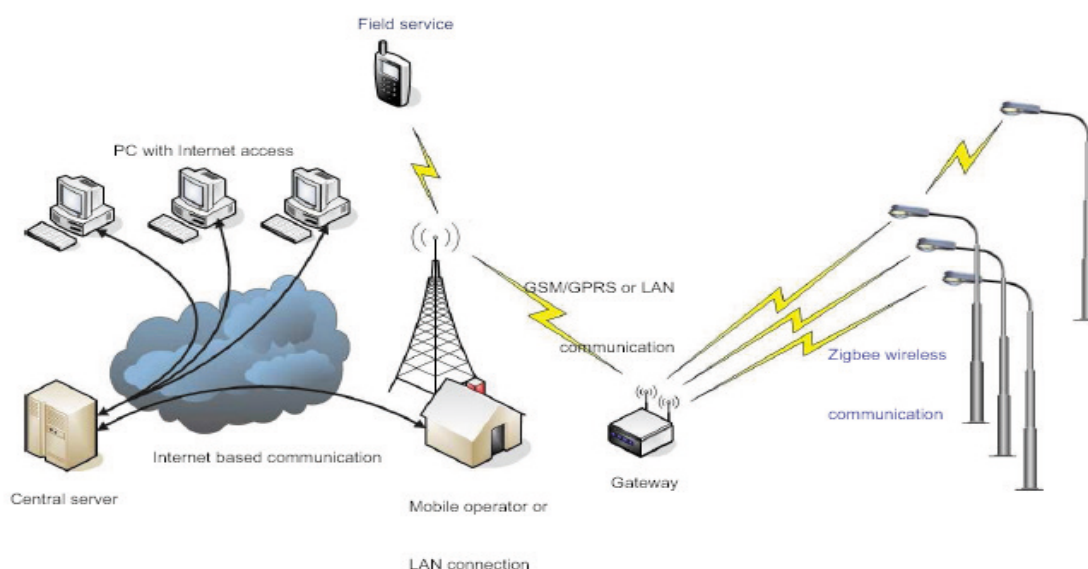
1.4 The system servers will be hosted by Datek on behalf of any customer that purchases the CMS. Additionally, the system will be implemented with a two-way electronic interface with the customer's inventory database (e.g. Mayrise, Confirm or other system).

1.5 The LCU and Gateway have already been provided with the following Charge Codes:

Nominal Watts	Unit Description 1	Unit Description 2	Company	Manufacturer's Designation	New Charge Code
2	CMS Equipment	Light Control Unit	Charles Endirect Ltd	Datek Wireless Light Control Unit (Light Control Unit)	817 0002 004 100
10	CMS Equipment	Gateway	Charles Endirect Ltd	Datek Wireless Light Control Unit (Gateway)	81 7001 0001 100

2. Test Report and Witness Testing

2.1 Charles Endirect have provided a test report (see Attachment A), detailing the self-testing that they have undertaken against the ELEXON Equivalent Meter (EM) Testing Specification.

2.2 We undertook witness testing of the CELtek CMS (v2.35.23) on 21 February 2013 at ELEXON's offices. The test scripts used were based on the Test Specification and the requirements set out in BSCP520 'Unmetered Supplies Registered in SMRS'. The system passed the witness testing process and a few follow-up data requests have been completed. These included provision of the systems user manual (available on request).

2.3 You can find the completed test report in Attachment B. The Event Log produced from the systems has also been successfully downloaded from the Datek File Transfer Protocol (FTP) server, and was processed by Power Data Associates who confirmed that it was in the correct format.

3. Testing and Approval Scope

3.1 The testing scope included the ability to switch and dim individual lamps using the CMS, and to accurately report the events to the Meter Administrator (MA) in the Event Log. The CELtek system can potentially, like other approved CMS systems, group-switch lamps on or off using a single controller (e.g. in a feeder pillar). In such a scenario, the customer would have to declare a separate inventory for group switch lamps on a separate sub-meter Id and declare the appropriate Switch Regime (200 Series).

3.2 The scope of the approval for the CELtek system is therefore to the extent that the system can be used to control individual lamps via a LCU. The approval does not preclude use of the system to undertake group switching, but where such switching occurs the customer must use the normal approach to inventory declaration for timeswitches.

ELEXON

4. ELEXON's and UMSUG's Views

4.1 The CMS passed testing and the approach to server hosting and management appears to be robust. The CMS customer interface is clear and easily understood. The system could potentially be used as stand-alone, but integration with customer inventory databases will most likely be used in practice.

4.2 ELEXON recommends that, since the system is robust and has passed the testing requirements, the SVG should approve the CELtek CMS for use in Settlement. The UMSUG is currently considering the application ex-committee; we do not anticipate any UMSUG objections but will update the SVG verbally at its meeting.

5. Recommendations

5.1 ELEXON invites the SVG to:

a) **NOTE** the findings in the CELTEK test report;

b) **NOTE** the successful witness testing undertaken by ELEXON; and

c) **APPROVE** the CELtek CMS (v2.35.23) for use in Settlement.

Appendices
None

Attachments
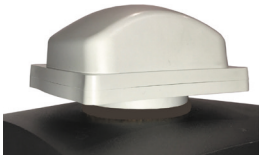Attachment A – CELtek report
Attachment B – ELEXON test report

For more information, please contact:
Kevin Spencer, Market Analyst, BSC Operations
Kevin.Spencer@elexon.co.uk / 020 7380 4115

ELEXON

11. CELtek CMS Component Options

Part no	Name	Description	Picture
CEV8999	CELtek Gateway Plus with 4G radio and onboard LAN (SIM card to be included with every Gateway despatched)	Gateway for CELtek CMS system for control of LCUs. Communicates with server over GSM GPRS and LCUs over radio. Antenna connectors: GSM and radio SMA F. IP67	
CEV8100	CELtek Column Mounted Gateway	Gateway and antenna in an IP65 box with bracket and stainless steel straps for column mounting	
CEV8101	CELtek Feeder Pillar Mounted Gateway	BDP80/HS Pillar fitted with Gateway	
CEV8104	CELtek CMS Interface Relay Unit	Isolator Unit (L4) with relay for connecting 230V remote photocell to a Gateway	
CEV8976	CELtek LCU/G3/NEMA/C HIP DALI ED04 (Without Tyco relay DALI only)	NEMA Gen3 external LCU for use with DALI gear.	
CEV8977	CELtek LCU/G3/NEMA/C HIPGPS DALI ED08	NEMA Gen 3 external LCU for use with DALI gear with internal GPS receiver.	

Part no	Name	Description	Picture
CEV3010	Seven Pin NEMA socket	Seven Pin NEMA socket IP2X for use with the CEV8976 or CEV8978	
CEV8975	Zhaga Node	Zhaga DALI node	
CEV8974	Zhaga Gateway	Zhaga Gateway	
CEV7062	CELtek GSM/Zigbee Puck Antenna (for Feeder Pillar)	Antenna for outdoor installation. Low profile, 2 x 1M cables with SMA M connectors.	
CEV5051	CELtek Ant Ext Zigbee 9 metre SMA-M/SMA-M	9m extension cable	
CEV5053	CELtek Ant Ext Zigbee 18mt SMA-M/SMA-M	15m extension cable	
CEV5055	CELtek Ant Ext Zigbee 15mt SMA-M/SMA-M	18m extension cable	
CEV6001	CELtek Antenna Cable HF50 FME F Connector Both Ends 1M	HF50 coax antenna cable (Super Low Loss)	

Part no	Name	Description	Picture
CEV6007	Adapter SMA M - FME M	Adapter option for aerial installation	
CEV6015	CELtek Antenna Cable HF50 FME F Connector Both Ends 2M	HF50 coax antenna cable (Super Low Loss)	
CEV6002	CELtek Antenna Cable HF50 FME F connector both Ends 3M	HF50 coax antenna cable (Super Low Loss)	
CEV6003	CELtek Antenna Cable HF50 FME F Connector Both Ends 5M	HF50 coax antenna cable (Super Low Loss)	
CEV6004	CELtek Antenna Cable HF50 FME F Connector Both Ends 10M	HF50 coax antenna cable (Super Low Loss)	
CEV6005	CELtek Antenna Cable HF50 FME F Connector Both Ends 15M	HF50 coax antenna cable (Super Low Loss)	
CEV6006	CELtek Antenna Cable HF50 FME F Connector Both Ends 20M	HF50 coax antenna cable (Super Low Loss)	
CEV7066	CELtek Adapter, RPSMA M to SMA F	Adapter, RPSMA M to SMA F, straight	
CEV7083	CELtek, Small Zigbee Puck Antenna	Antenna for internal or external installation - used in Column Mounted Gateway or remote gear housing. Ground plan not required.	

Part no	Name	Description	Picture
CEV6020	CELtek Adapter SMA F to FME M	Adapter SMA F to FME M	
CEV7047	LUX Meter, 1 - 10V DC	Lux-meter 0-1000 Lux. Connects to the analogue input on Gateway	
CEV7046	CELtek Feeder Pillar mounted LUX Meter	0-1000 Lux meter installed within IP66 enclosure for attachment to feeder pillar or column mounted gateway. Connects to the analogue input on Gateway (3G Enabled)	
CEV7043	CELtek Column or Post mounted LUX Meter	0-1000 Lux meter installed within IP66 enclosure and fitted with banding bracket for attachment to lighting column or post. Connects to the analogue input on Gateway (3G Enabled)	

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