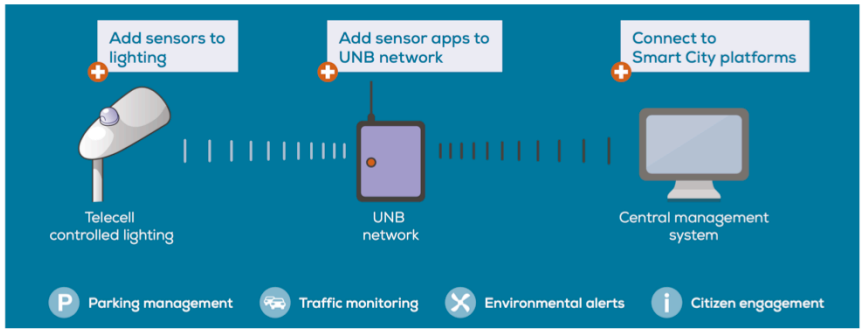
- IoT is at the peak of the hype curve, making it difficult for cities and utilities to identify genuine opportunities and viable technologies.
- This presentation from Telensa aims to provide clarity by looking at technologies and applications from the perspective of the business case for connected streetlights.

Telensa

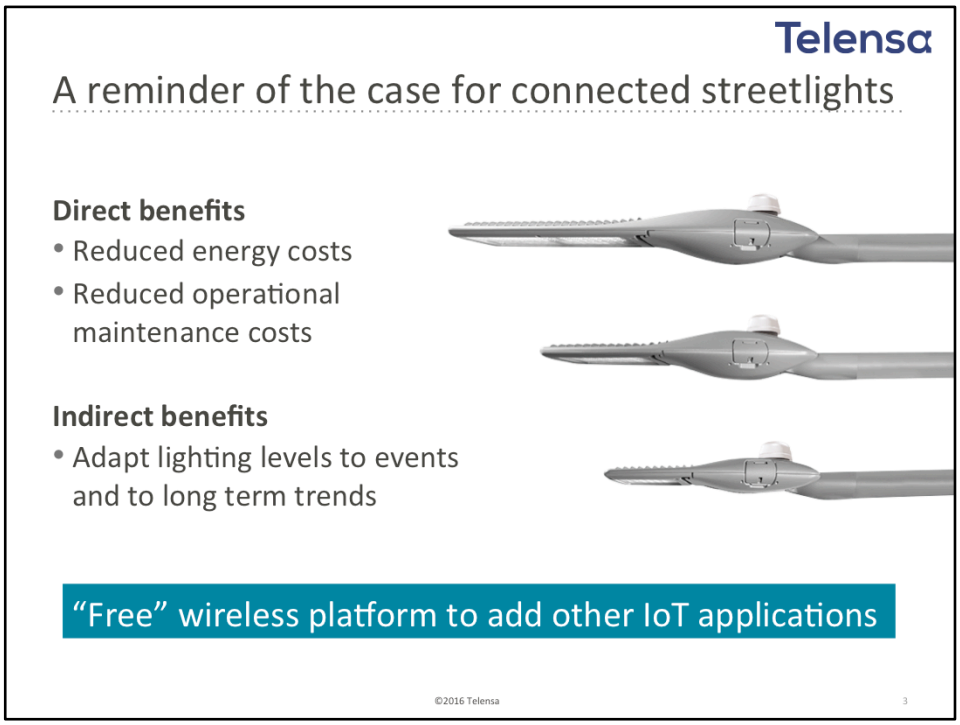
Telensa: area of expertise

Specialist in connected streetlights, low-power wide-area (LPWA) networks and smart city applications

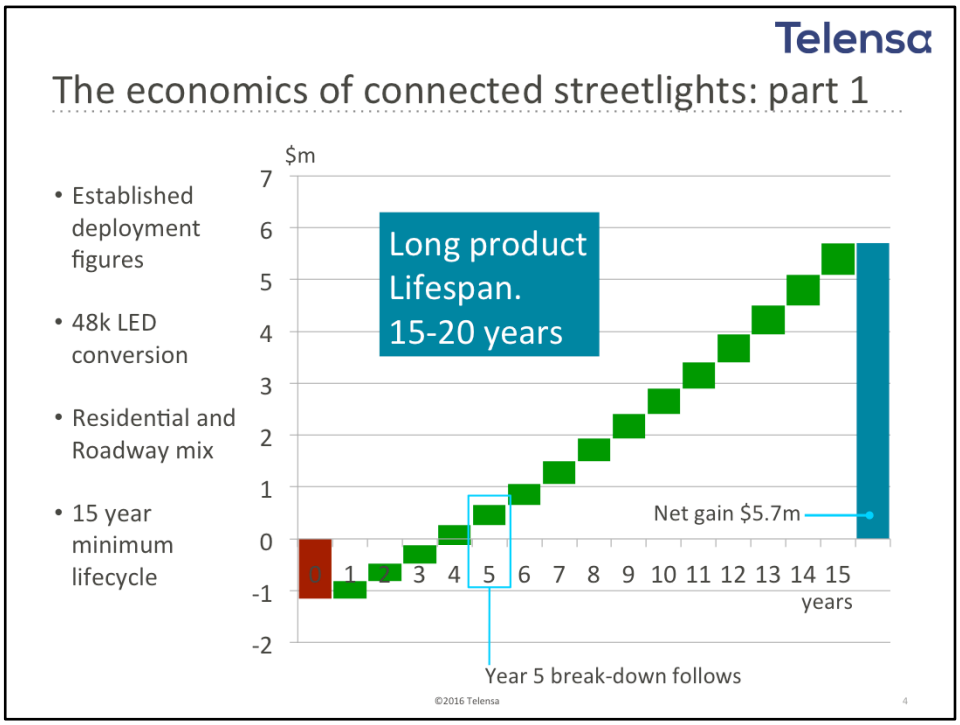
- 1 million+ streetlights deployed
- Mature deployments in 8 countries, including UK and US
- 10 years deployment experience
- Light-centric sensor applications



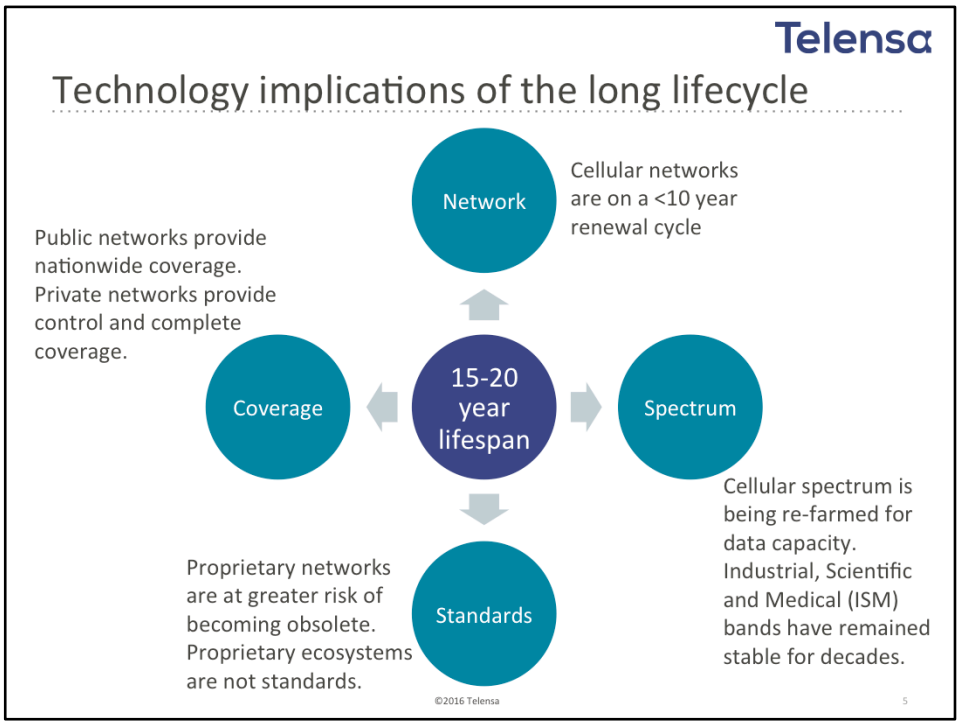
- Telensa is a UK-headquartered company specializing in connected street lighting.
- It is one of a handful of firms that have deployed city-wide and region-wide connected street lighting systems at scale, and provides a vertically integrated solution comprising wireless control nodes and sensors, Ultra-Narrow-Band base stations (range 10+ miles) and a Central Management System (CMS).
- In a deployed footprint of over 1 million lights, Telensa's US customers include leading utilities and city authorities.



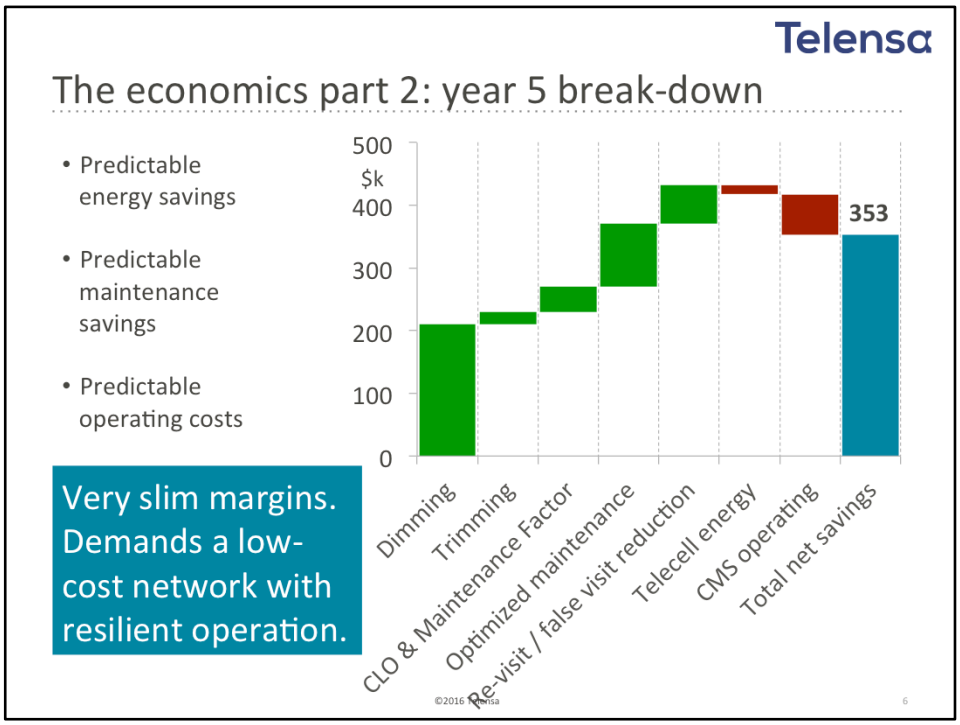
- Connected streetlights are a great base for IoT sensors, but first we need to look at the underlying business case.
- Whether an LED upgrade is included or not, the case for connected streetlights is delivered by a combination of reduced energy use and reduced maintenance costs. These will be spelled-out in the following slides.
- The indirect benefits are the ability to adapt local lighting levels over time and in response to events and sensor inputs. These do not need to be factored into the business case figures – it is robust without including them.
- The big news is that when connected street lighting is done right it pays for itself. That means the wireless network comes for free, and dramatically reduces the cost of adding other IoT sensors, because they can simply join that network.



- But there are 2 economic aspects of connected street lighting that constrain the technology that can support it.
- The first is the long product lifecycle for connected street lighting – typically 15 to 20 years.
- This is a case study for an established deployment, showing the initial investment in red, the 15 years of savings in green and the net gain in blue. This deployment was for 48,000 lights, a mix of residential and roadway.
- The figures do not include any energy savings from the LED lights themselves – these savings are purely from the wireless controls.
- The business case is compelling, but it depends on a long and uninterrupted service life, and many technologies are not designed for that.

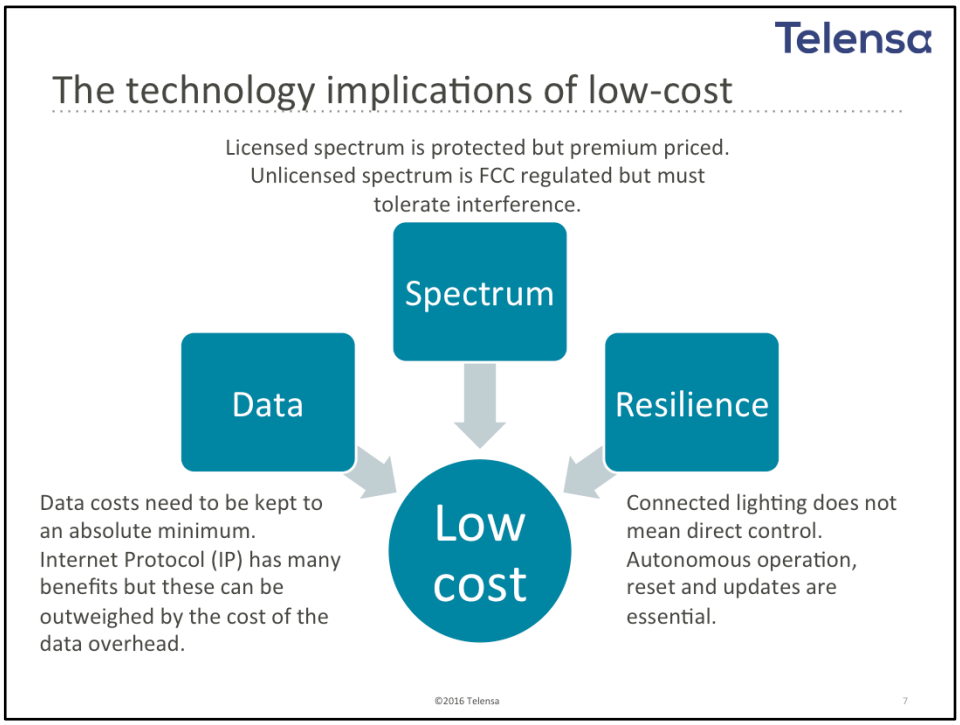


- Here are just four technology implications when thinking about dealing with a long lifecycle:
  - **Network**: you have to look back at network renewal cycles to get an idea of the future. The cellular tech of 15-20 years ago, for example, is very different to today.
  - **Spectrum**: wireless spectrum is a valuable asset and licensed spectrum in particular is in great demand to support the growth in mobile data consumption. As a result there is occasional but highly disruptive re-planning of licensed spectrum over the long term. The connected street lighting business case requires government-protected long term stability, such as that provided by the Industrial, Scientific and Medical (ISM) bands.
  - **Coverage**: connected streetlights all need connecting, over the whole lifecycle. This is a much higher level of coverage guarantee than is possible for a public network. For most long-lifecycle applications in the M2M space, private networks are utilized because the coverage can be controlled.
  - **Standards**: there is a greater risk of a proprietary network becoming obsolete than one based on standards.



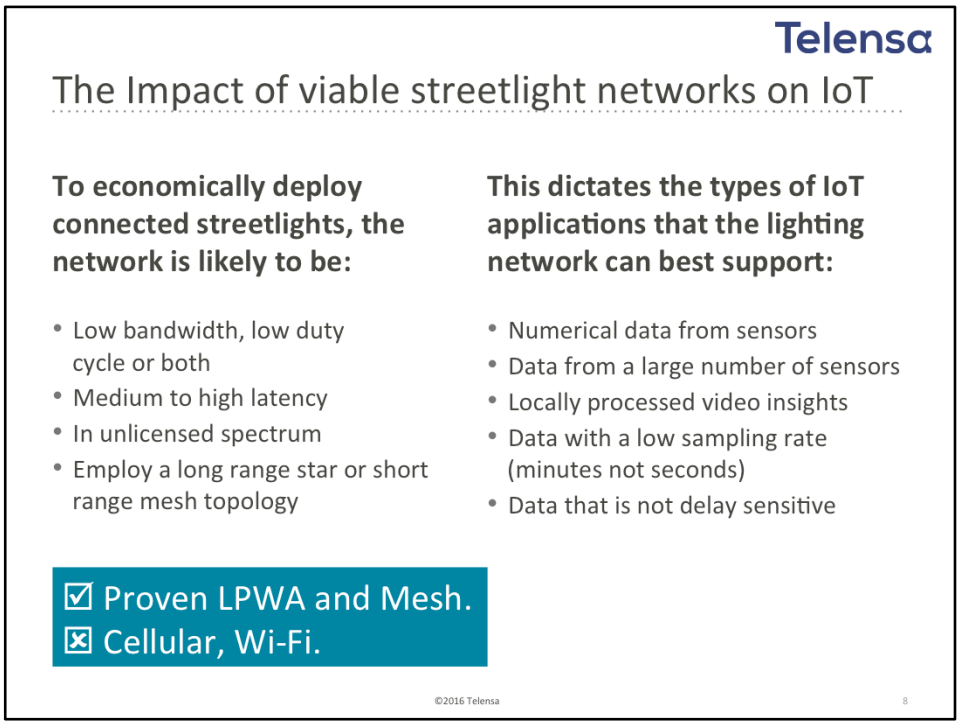
- The second economic factor in the technology choices for connected streetlights is the slim margin. Cities do not have money to burn.
- To make small gains reliably over a long product lifecycle you need a low-cost network that is highly resilient.
- The graph breaks down year 5 of the deployment:
    - It shows **energy savings** through modest dimming programs, by trimming the on/off times more accurately than photocells, and by adapting power levels to provide constant light output (CLO) to compensate for the natural LED/lamp degradation, and to compensate for cleaning intervals.
    - It shows the **maintenance savings** through the elimination of night scouting for faulty lights, accurate fault identification, and better planning groups of maintenance actions.
    - There are some **increased costs**. Wireless nodes us a little more power (~0.8W) compared to photocells (~0.3W) and there are some operating costs for the central management system.

- So the returns can be accurately predicted but the margins are slim. That calls for technology that adds up in a low-cost environment.



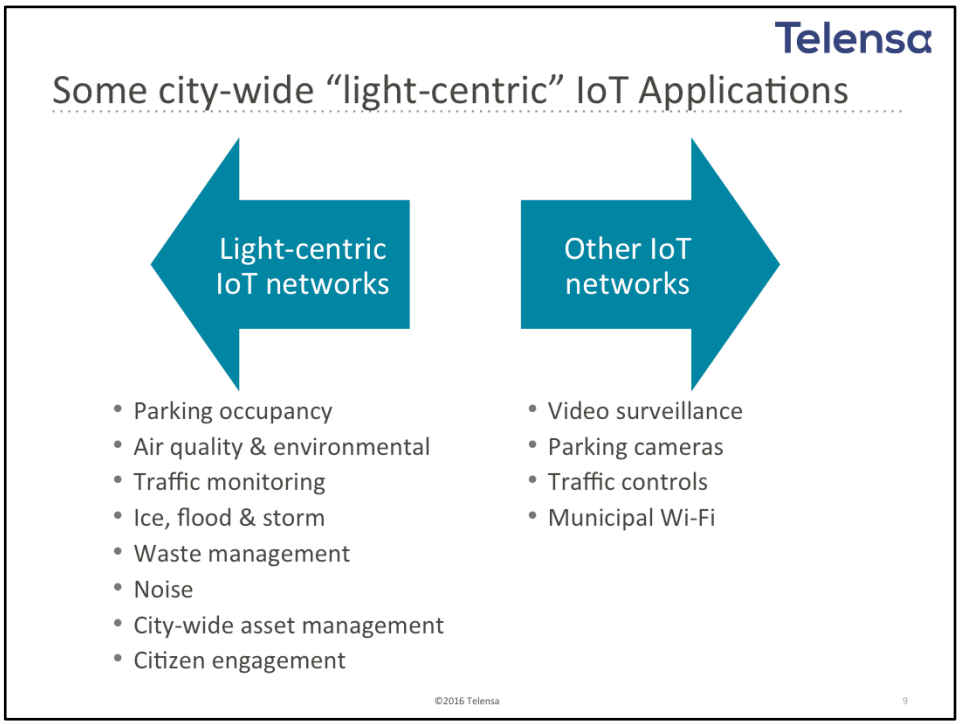
Here are three tech implications of the low-cost economic requirement:

- **Spectrum** (again) - licensed spectrum is a valuable asset and its cost tends to be passed on to users.
- **Data**: data costs need to be kept to an absolute minimum or they can become a significant long term cost. That applies to the information and to the protocols used to transport it. For reference a Telensa base station supporting 5,000 streetlights with a typical reporting and instruction interval generates less than 500MB of data per month.
- **Resilience**: connected street lighting only connects when reporting status measurements or receiving new policies and override instructions. The ability to work normally when the network is not available, the ability to do remote updates and resets are all essential to reduce long term operational and support costs.



- So economically viable connected streetlight technology must combine longevity with low-cost.
- It is therefore no surprise that all of the high volume deployments today use technology that meets these requirements.
- Broadly speaking, we are talking about long range Low Power Wide Area (LPWA) technology (specifically Telensa's UNB) and a variety of shorter range mesh technologies.
- In addition, all of the technologies deployed at scale today have proved themselves over many years – either in street lighting (Telensa) or in smart meter applications (mesh).

- So what kind of streetlight-based IoT applications can these technologies support?
    - Numerical data from sensors, data from a large number of sensors, locally processed video insights, data with a low sampling rate (minutes not seconds), data that is not delay sensitive.



- So when thinking about what IoT applications can be added to connected streetlights, it is the economics that determined the network technology that also decide what applications can be added.
- A large variety of “light-centric” sensor applications can be added with virtually no network costs, because these are already covered by the streetlight business case.
- High bandwidth IoT applications such as video surveillance and municipal Wi-Fi can of course still be mounted on streetlights, but a separate business case and a different network must be specified.


Telensa
Thank you
Keith Day
kd@telensa.com
2016