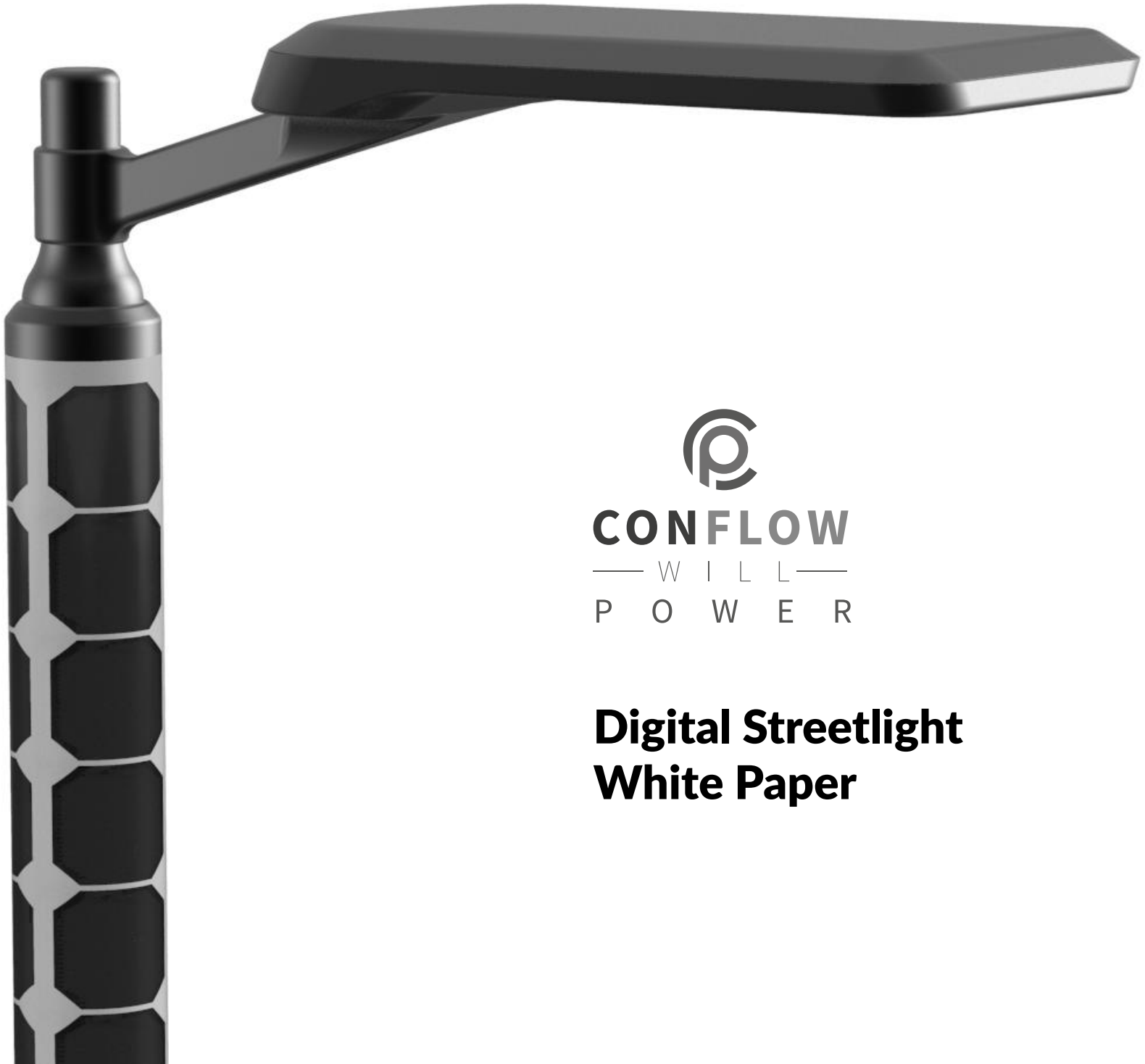

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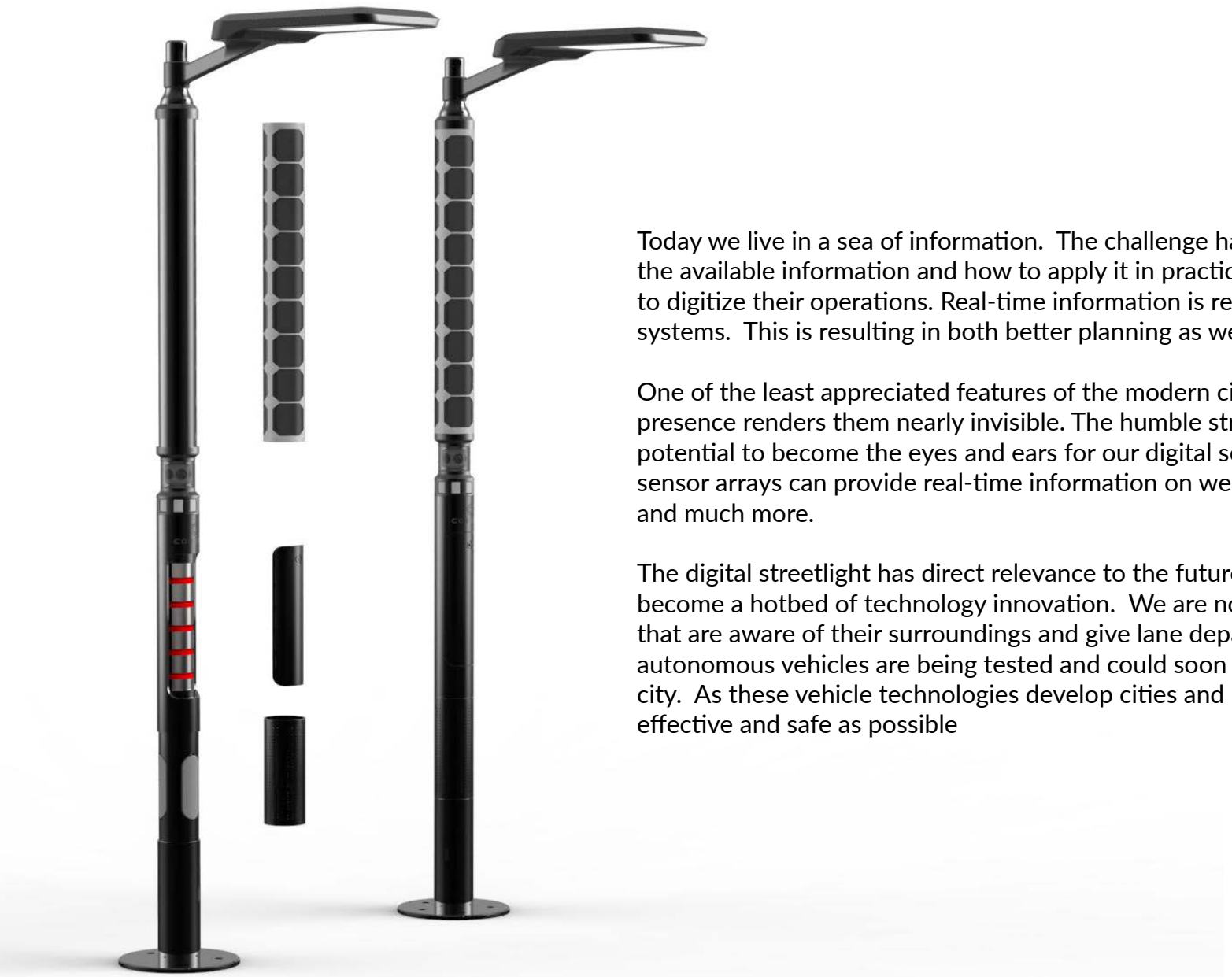
Digital Streetlight White Paper



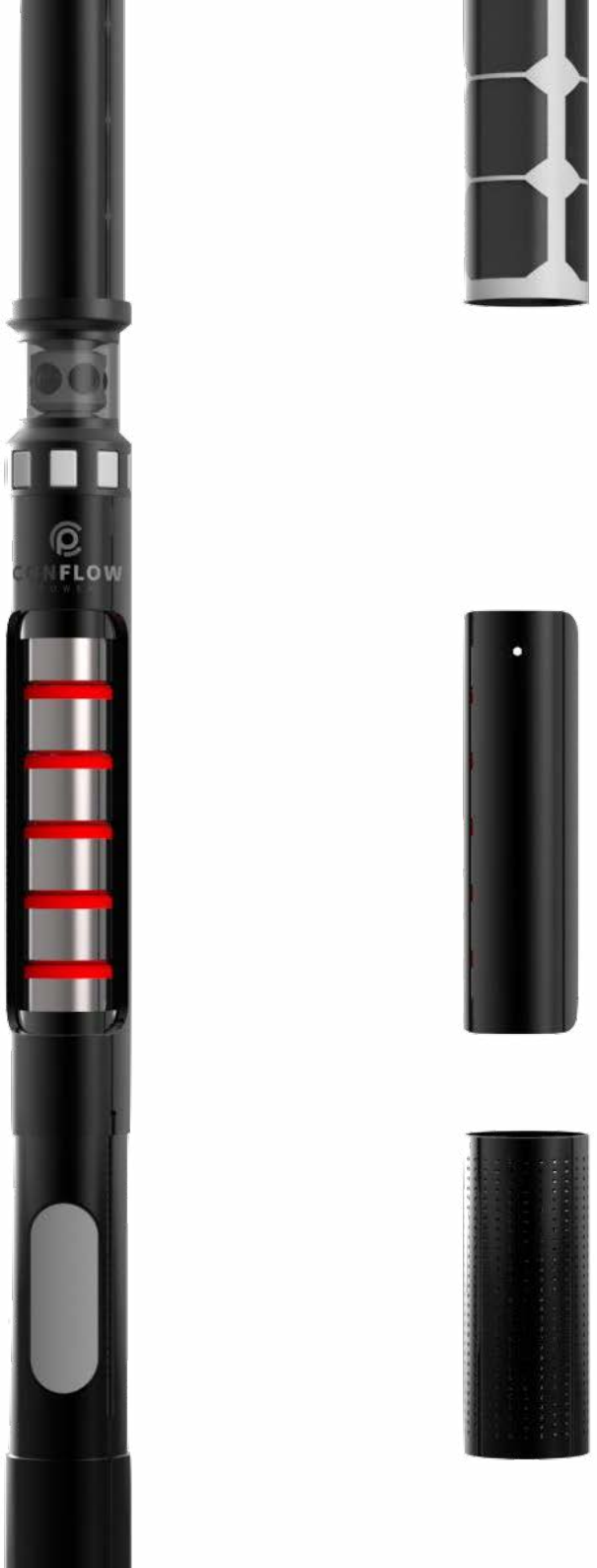
Today we live in a sea of information. The challenge has become, how to make sense out of the available information and how to apply it in practical ways. Modern cities are moving to digitize their operations. Real-time information is replacing older paper-based reporting systems. This is resulting in both better planning as well as reduced operating costs.

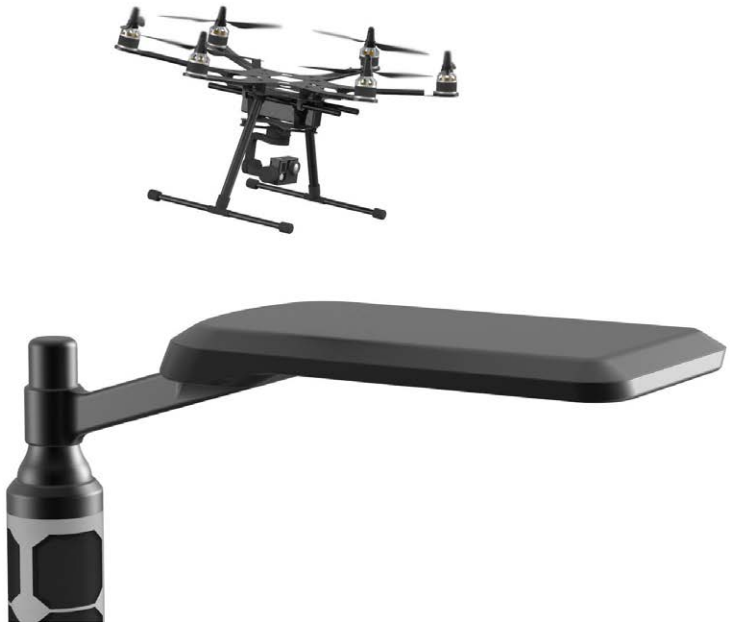
One of the least appreciated features of the modern city is the streetlight. Its ubiquitous presence renders them nearly invisible. The humble streetlight though has untapped potential to become the eyes and ears for our digital society. Streetlights equipped with sensor arrays can provide real-time information on weather, pollution, construction, traffic, and much more.

The digital streetlight has direct relevance to the future of the automobile. Vehicles have become a hotbed of technology innovation. We are now becoming accustomed to cars that are aware of their surroundings and give lane departure and collision warnings. Fully autonomous vehicles are being tested and could soon be travelling the streets of the smart city. As these vehicle technologies develop cities and roads need to adapt to make them as effective and safe as possible

One of the challenges is that the sensor systems that are built into a vehicle are limited. Limited in the distance that they can sense, and they cannot see around corners or obstructions. This places a heavy burden on the travelling vehicle to identify obstacles and chose a course of action before arriving there. Digital streetlights working in coordination with on-board vehicle sensors can provide supplemental information beyond the horizon that the vehicle can sense. This provides time for the vehicle to process the information and avoid trouble. Features such as intersection collision risk alerts can be raised before the car can even determine that an intersection is approaching.

The volume of information that a digital system of streetlights makes available is immense, and the uses for that information are vast and unexplored. Collecting and using information comes with a responsibility to protect it and use it respecting the rights, and privacy of individuals and complying with all the legal requirements. Digital Streetlights will collect information across a variety of information domains including potentially personal, aggregated, environmental, geospatial, and infrastructure information. Each area will have different usage rules for privacy, security protection, and retention duration. Each solution that emerges from the digital streetlight eco-system will need to be vetted to ensure that it meets the required standards, but also that it provides a measure of public good.





Collecting information is only one side of the challenge. This other side is how will this information be made available? How will solution providers be able to locate and consume the streams of information that are produced?

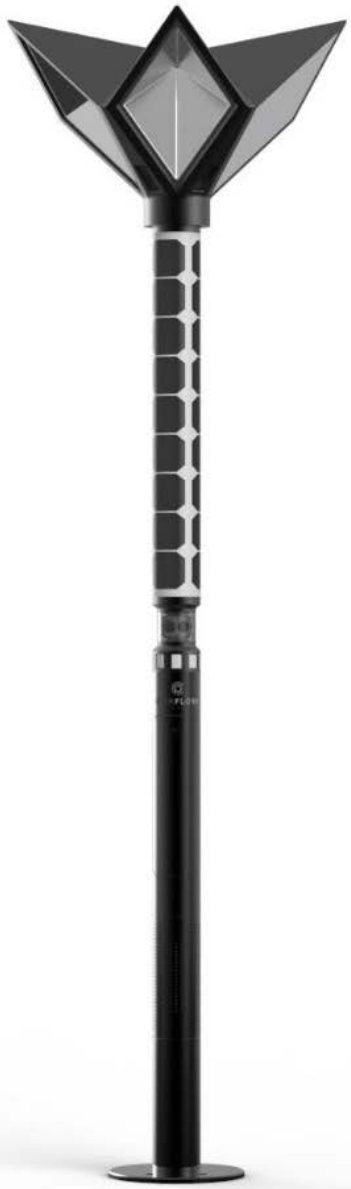
One portion of the answer to this challenge is leveraging blockchain technology as a mechanism to catalog and subscribe to the information that is valuable. Blockchain is most known as the technology that supports digital currency like Bitcoin. It is a technology that has much more potential than this. In the case of information produced by digital streetlights it can provide a market for selling and buying of this information in a secure manner while bridging the trust gap that exists between governments, business, and the larger community.

There is more to developing solutions then having a digital market. The streetlight information streams need to be processed and analyzed to provide usable insights for decision making. This can be a large and complex endeavor. This is the processing that allows the information to be applied to the purpose that is being considered.

Development of these larger more complex solutions constructed using the streetlight sensors might be best served by the larger “open source” development community. This provides for more opportunities and creativity to be applied to developing solutions. This also provides opportunities for small communities and companies to participate in providing solutions to local issues.

Developing a larger catalog of solutions provides additional incentive to attract sensor manufacturers and suppliers. An ecosystem of information and solutions becomes a catalyst for new business models and can offset the cost of installing and maintaining streetlights for the taxpayers.

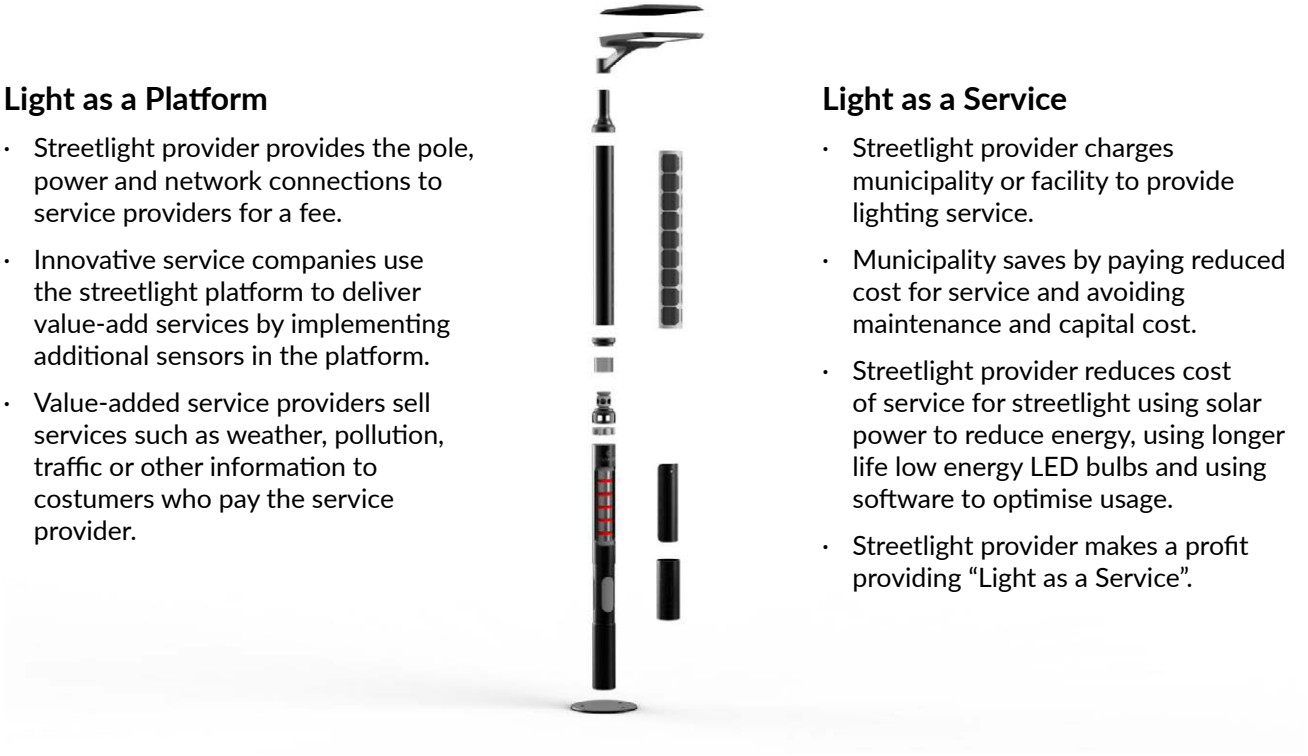
The evolution of digital streetlights and the smart cities that might implement them is also encountering new business models. In the past city infrastructure such as roads and streetlights were considered an unavoidable cost. Municipalities made large capital investments to acquire and maintain this infrastructure that was passed down to the taxpayers. With a few notable public/private partnerships building toll roads the business model was static.
The digital streetlight can lead to a profound shift from being a cost centre to being a profit centre. That shift is driven by thinking differently about what a streetlight is.



The diagram below describes ways of thinking about the business models that can be provided based on the Digital Streetlight.

Light as a Platform

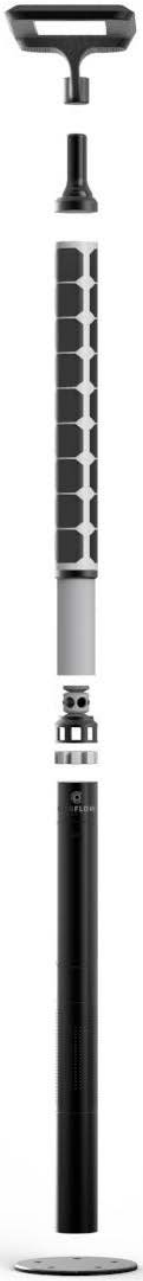
- Streetlight provider provides the pole, power and network connections to service providers for a fee.
- Innovative service companies use the streetlight platform to deliver value-add services by implementing additional sensors in the platform.
- Value-added service providers sell services such as weather, pollution, traffic or other information to costumers who pay the service provider.



Light as a Service

- Streetlight provider charges municipality or facility to provide lighting service.
- Municipality saves by paying reduced cost for service and avoiding maintenance and capital cost.
- Streetlight provider reduces cost of service for streetlight using solar power to reduce energy, using longer life low energy LED bulbs and using software to optimise usage.
- Streetlight provider makes a profit providing “Light as a Service”.

Power as a Service Module | Solar Power | Grid Power

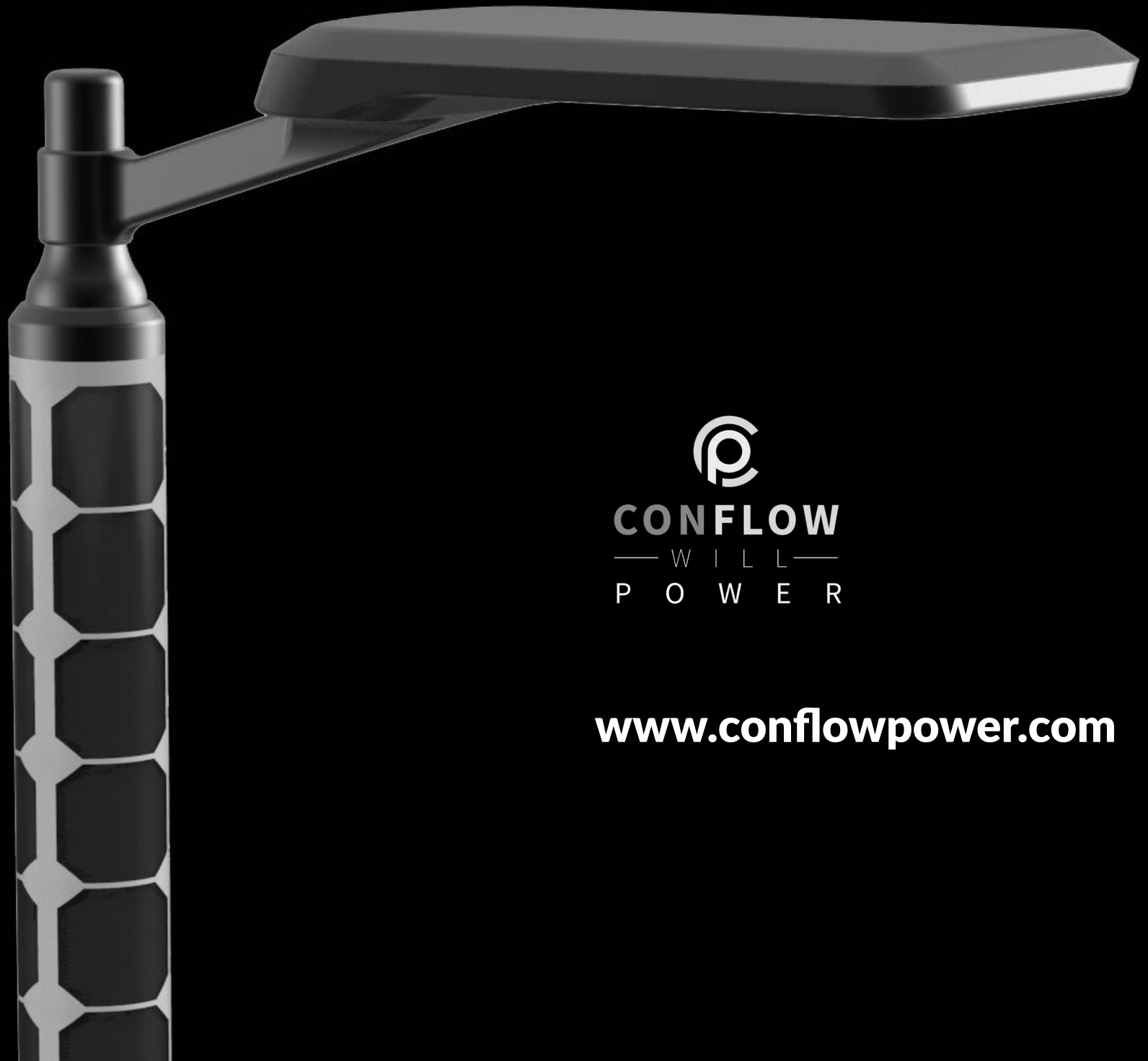


The first view is thinking about Streetlighting as a Lighting as a Service (LaaS) business. In this manner a third-party owns and installs the streetlight devices and charges the municipality or facility a fee to provide lighting. The fee charged is less than the historical cost of installing poles, paying for the power, and maintaining the lighting. This type of offer can be made because the new generation of digital streetlights are less costly to maintain and are more energy efficient reducing the operating cost. The also means the municipality does not need to raise capital or incur the borrowing costs. They also free themselves from the burden of maintaining the system.

Currently public lighting systems consume 3.19% of all the global energy produced. The digital streetlight incorporates energy efficient and renewable sources to power its services. The digital streetlights will incorporate innovative Power as a Service modules that literally harvest electrical energy from the air while billing only for the increments of power consumed. These modules will be supplemented with solar cells further reducing electrical demand. Power from the electrical grid continues to be available but is only used if required. Newer bulb technology with extended lifespans, and predictive monitoring and maintenance can further reduce the operating cost.

The second way to think of the Streetlight system is as a platform for the delivery of other services. In this Light as a Platform (LaaP) view the Streetlight provider charges solution providers a fee to have sensors placed within the Streetlighting system. The Streetlight provider is providing the physical space, the power, and the network connectivity to solution providers in exchange for that fee. The solution providers then build their business on providing innovative solutions built on these capabilities that are unlocked by the sensors.

The digital streetlight provides business opportunities and public benefits. The digital streetlight can make cities safer, more efficient and reduce the impact on the environment. Smart cities complete with digital streetlights are now a modern reality.



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