



carmanah®  
we put solar to work

# Carmanah Solar LED Lighting Alberta C.A.R.E.

**Rowan Plaxton**

**Sales Channel Manager, Canada**

**Carmanah Technologies**



# Presentation Agenda

- 1) Introduction to Carmanah**
- 2) Partnership with Beta**
- 3) EverGEN Product Line**
- 4) Energy Conversion/Management**
- 5) Light Performance**
- 6) Where Solar Lighting Makes Sense**
- 7) Project Examples**
- 8) Layouts**
- 9) Questions?**





- Carmanah has been developing solar LED technology since 1996 for a variety of markets & applications
- Hundreds of thousands of installations worldwide – from Alaska to Australia
- Key solar supplier to Municipalities, Cities, MOT's, US and CDN Coast Guard, international airports, military
- Strategic partner with BetaLED

# From Lights to Lighting



All Carmanah solar LED lighting solutions for general illumination applications use BetaLED fixtures.



Beta THE EDGE™ fixture



Beta LEDway™ fixture

# EverGEN Product Line

## Operating Profiles The LEDway and EDGE Luminaires

**Output**



EDGE Luminaire



EverGEN-20

EverGEN-30

Targeted for pedestrian  
scale applications



EverGEN-1710



EverGEN-1520



EverGEN-1530

Targeted for parking lot applications

**Cost**



# EverGEN Product Line



**Carmanah EverGEN  
20-30**

**Introduced 2008**



**Carmanah EverGEN  
1500 Series**

**Introduced 2009**



**Carmanah EverGEN  
1710**

**Introduced 2010**

# EverGEN 20-30 Series

- Pedestrian Paths
- Bike Paths
- Bus Stops/Shelters
- Gate Entrances
- Docks
- Private Driveways
- Kiosks (parking)





# EverGEN SE Series 20-30



Pathway Lighting

# Transit Solution



**Transit Agencies are moving towards area lighting for rider safety**

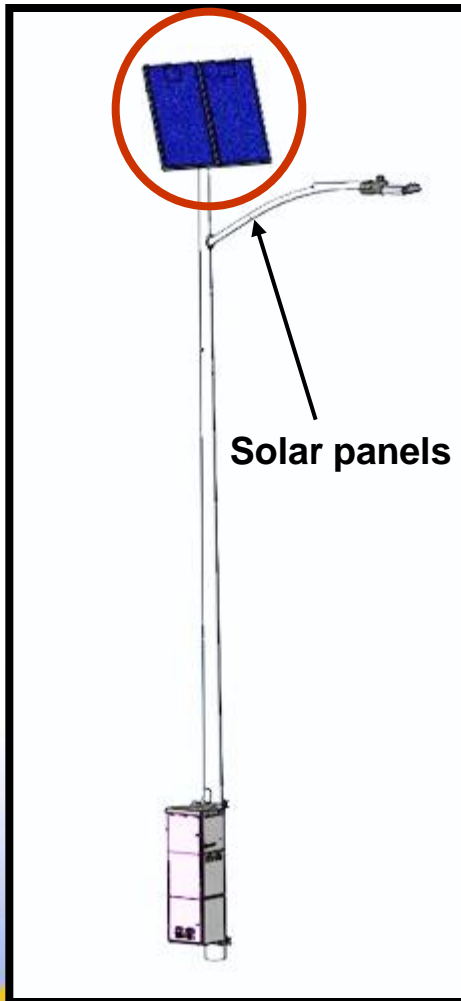
# EverGEN 1500 Target Applications

- Parking lots
- Residential street lighting
- Site lighting
- Perimeter/Security
- Camp Grounds
- Sign/Billboard Lighting

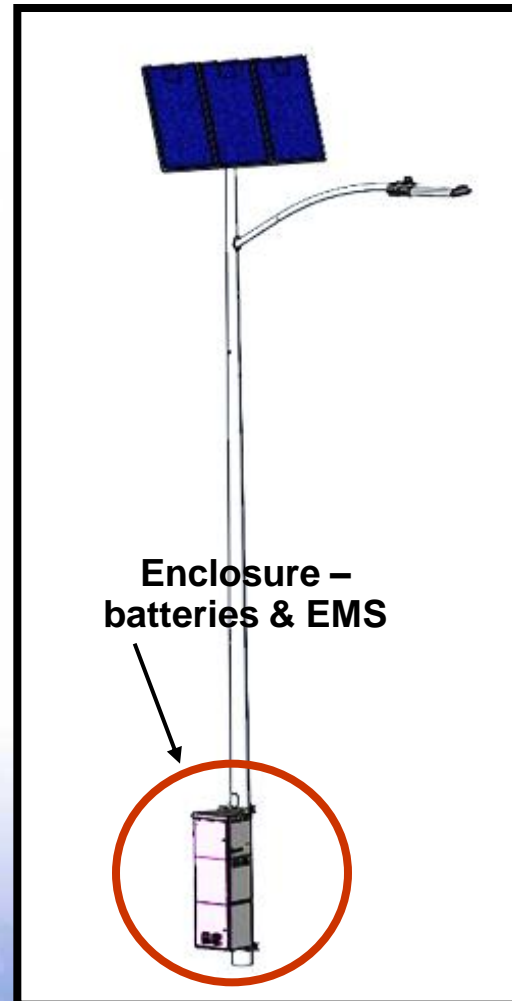


# EverGEN 1500 Series

**EverGEN 1520**  
(two panel system)



**EverGEN 1530**  
(three panel system)



## EverGEN 1500 Series

- Up to 6800 delivered lumens
- Solar equivalent of 70 to 200 W HID
- Supports up to two fixtures per engine
- Motion control & operating profiles



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# The Carmanah EverGEN 1710

# Ideal Applications



- Applications where day time appearance and integrated form factor are important
- Applications that accept motion sensing and operating profile functionality
- Compact, integrated system
- Motion sensor is fully integrated into the fixture
- Meets 150 mph windload
- Uses both Edge or LEDway fixture

# EverGEN 1710 Installation



Engineered for install in less than 30 minutes



Batteries and fixture wiring on ground



Hoist unit into place



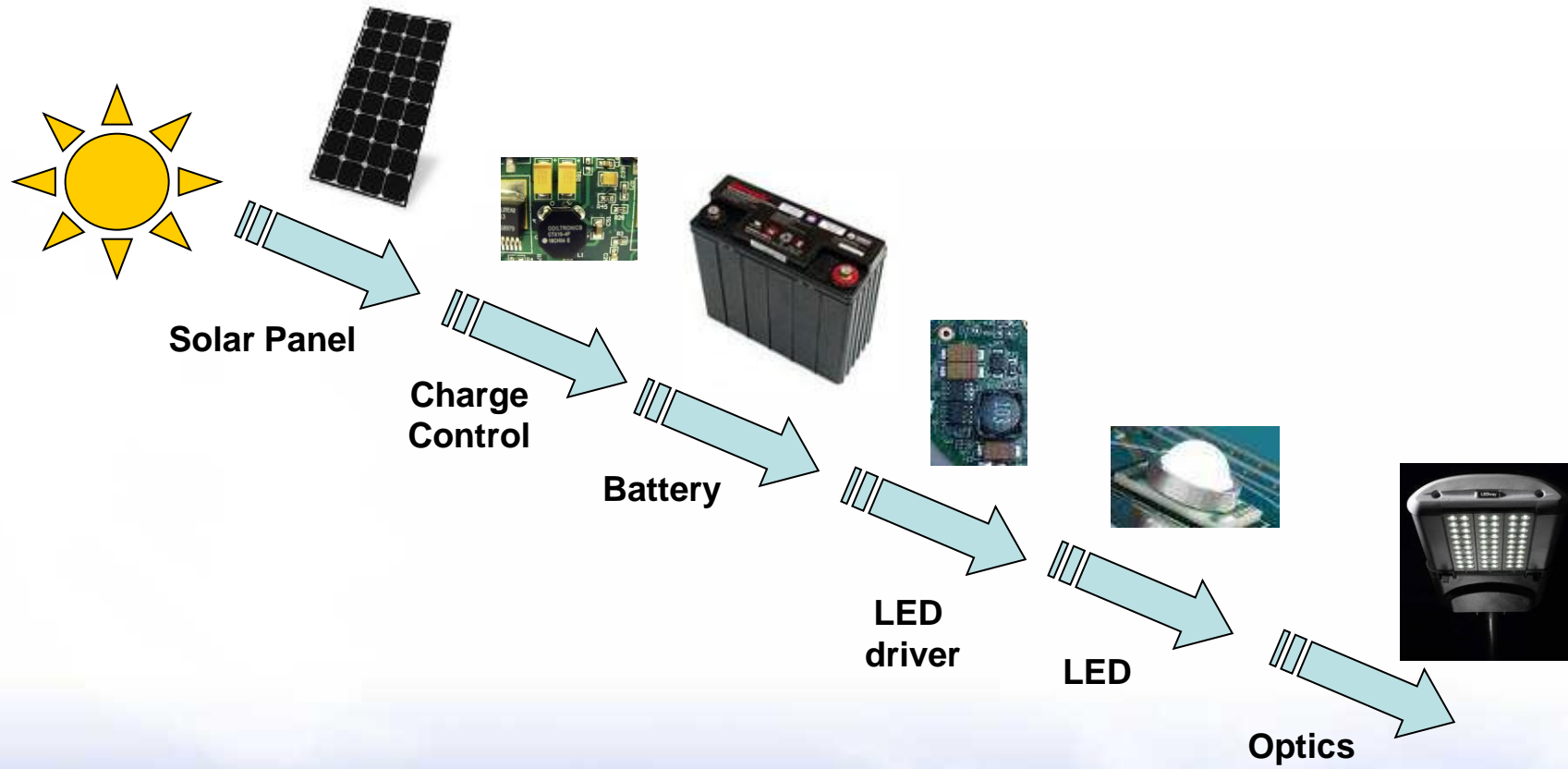
Affix & orient



Install complete!

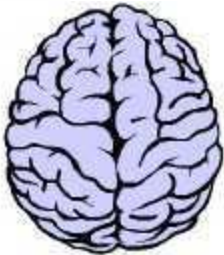


# Energy Conversion Process





- **The EMS is the “brain” of a solar LED light:**



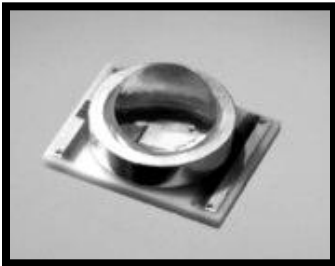
- **Monitors the surrounding environment & protects system & battery health**
- **Maximizes system efficiency – reducing system size & cost**
- **Allows for operation in non-ideal conditions i.e. improper solar panel orientation or panel shading**

# Energy Budget Considerations



## Geographic Location (energy in)

- Where in the world are you?



## Light Required (energy out)

- How much light do you need for your application?
- Often determines EverGEN product selection

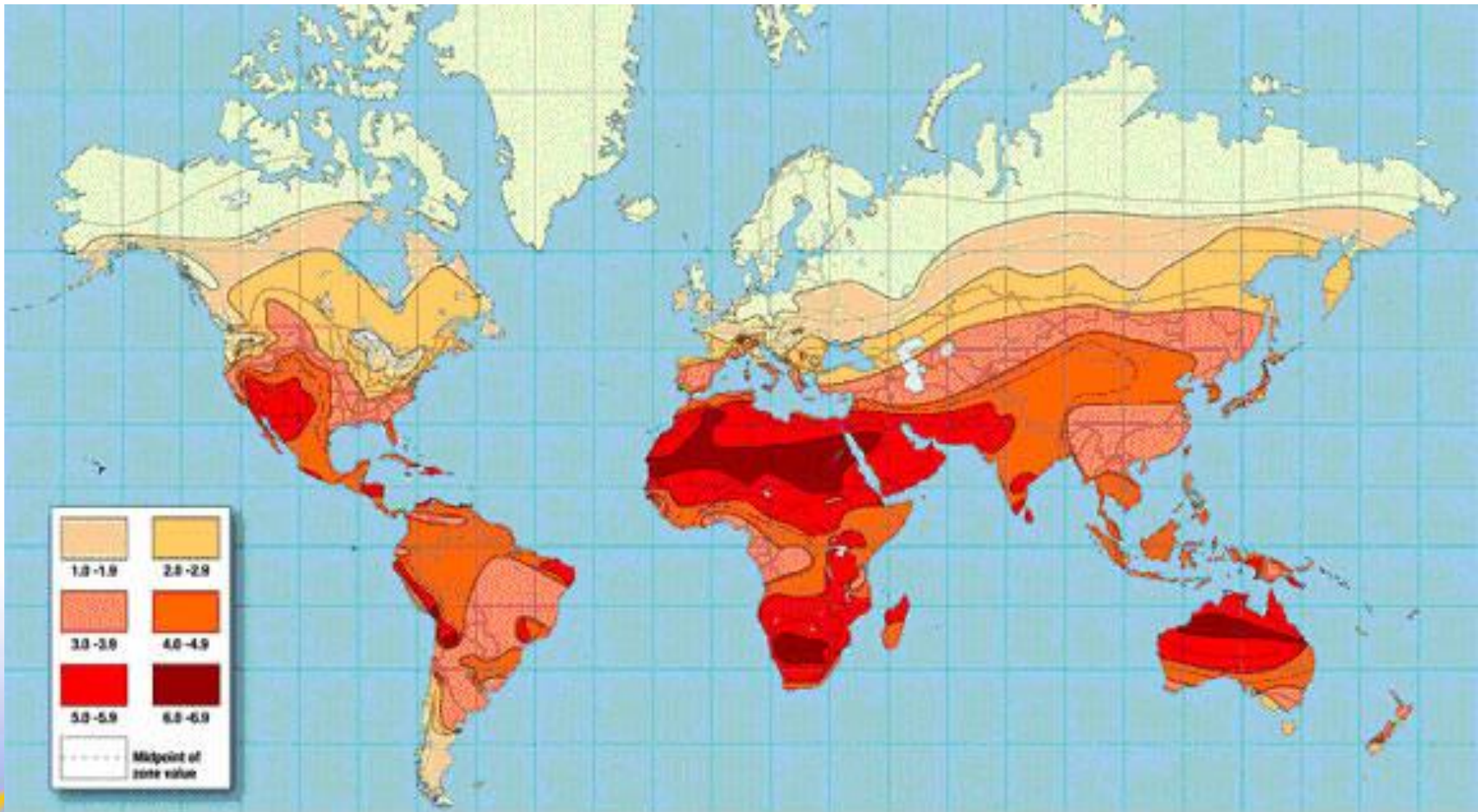


## Operating Profile (energy conservation)

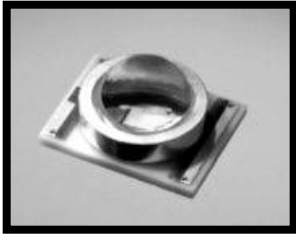
- When is light required during night?



Geographic Location – how much sunlight do you receive?



## How much illumination do you need?



**What kind of light do you require on the ground?**

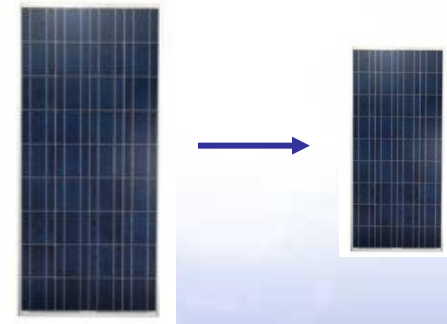
- **Basic Parking lots: 0.2fc**
- **Enhanced security: 0.5fc**
- **Often dictates which EverGEN model**



**Can your application accommodate a change in illumination levels throughout the course of the night?**

**An operating profile can increase the efficiency of the system by:**

- Dimming illumination levels when light is not needed
- Incorporating motion sensing capabilities
- Carmanah EverGEN has 65 different operating profiles
- Shorter run time = higher peak lumen values



**Increased efficiency means less power consumption and the ability to implement a smaller system.**

- **Fixed Night** – 100% for x hours – then off
- **Split night** – 100% for x hours – then reduced to % of full intensity for x hours – then back to 100% for x hours before dawn.

## Bi-Level

- **Off/On** – light remains off unless activated by the motion sensor.
- **Low/High** – light remains on at percentage of full intensity until activated by motion sensor to 100% intensity.

## Fixed Night + Bi-Level

- **Fixed Night + Off/On** –100% for x hours– on at 100% intensity only when motion detected – otherwise off.
- **Fixed Night + Low/High** –100% for x hours – then on at % of full intensity until activated by motion sensor to 100%.

## Split Night + Bi-Level

- **Split Night + Off/On** –100% for x hours –on at 100% only when motion detected – then on at 100% x hours before dawn.
- **Split Night + Low/High** –100% for x hours – then on at % of full intensity until activated by motion sensor to 100% intensity – then on at 100% for a x hours before dawn.

- Beta fixtures offer:
  - **Superior uniformity**
  - **Standard IES distributions**
    - Type II, III, IV, V
  - **Standard flood distributions**
    - 15°, 25°, 40°, 60°
  - **Full cut-off optics**
    - Compliant with Dark Sky guidelines
    - Backlit shields





# LED Fixture Performance

- LM-79 and LM-80
  - Standards for LED efficacy and lumen depreciation
- Two programs are of interest
  - Caliper program
    - Testing of off the shelf commercially available fixtures
  - Gateway Demonstrations
    - In situation deployment and testing
- The latest Gateway demonstration has excellent information on how LEDs perform in a street lighting scenario

GATEWAY DEMONSTRATIONS

## LED Street Lighting

*Host Site: City of San Francisco, California*

Final Report prepared in support of the  
U.S. DOE Solid-State Lighting  
Technology Demonstration Gateway Program  
and PG&E Emerging Technologies Program

*Study Participants:*  
U.S. Department of Energy  
Pacific Gas & Electric  
City of San Francisco, California  
Energy Solutions

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Prepared for the U.S. Department of Energy and  
Pacific Gas & Electric by Energy Solutions



Pacific Gas and  
Electric Company®

# LED Fixtures – Real World Installs

## DOE Gateway testing

- Testing of uniformity and overall distribution between fixtures



**Beta**



**Competitor**



## In existing parking lots where:

- lighting is not installed
- existing lighting is insufficient
- underground wiring / conduit is nearing end-of-life


# Where Solar Lighting Makes Sense

## For new facilities where:

- the site is a significant distance from grid
- the trenching costs are high
- the grid power is unreliable or inaccessible



- **When Government funding opportunities are available for:**
  - Renewable Energy Grants
  - Solar on Gov't Property
  - Solar for Schools
  - Solar for Military
  - Energy Efficiency and Conservation Block Grant



You've Got Funding!

## When green mandates are driving a project:

- Energy credit programs are a factor
- Energy consumption and cost are a concern
- Reducing CO<sub>2</sub> footprint is important
- Desire to show a move towards green practices is present at a corporate level



## Spokane WA Parking Lot Project

**End User:** Spokane Washington Public Facilities District

**Product:** EverGEN 1530

**Project:** Parking lot lighting

**Benefits:** Significant showcase of city's move towards sustainable practices

Portability will allow city to move lights as site requirements change



# Lockheed Martin – EverGEN 1520



## Lockheed Martin Roadway Lighting Project

**End User:** Lockheed Martin Lake  
Underhill Facility, Orlando FL

**Product:** EverGEN 1520

**Project:** Facility roadway lighting

**Benefits:** Initial cost and maintenance  
savings over 20 years: \$221,000



Carmanah



## Arizona Remote Intersection Project

**End User:** City of Phoenix, Arizona

**Product:** EverGEN 1520

**Project:** Remote intersection lighting at roundabout

**Benefits:** Avoided costly trenching and traffic disruption, improved safety



## California Energy Facility Project

**End User:** California energy facility

**Product:** EverGEN 1520

**Project:** Facility parking lot lighting

**Benefits:** Saved approx. \$1.5 million in installation costs (i.e. trenching & permits)

Preserved surrounding delicate park environment



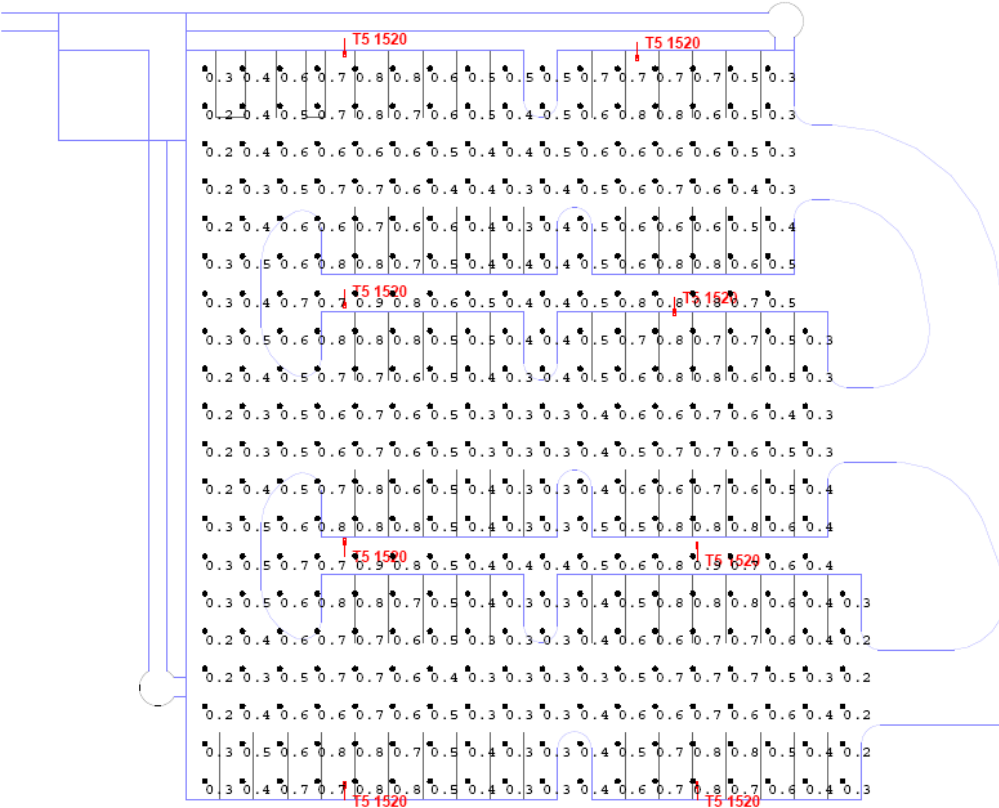
# Project Example- Carmanah solution



## Target

Minimum = 0.2 fc  
Average = 0.5 fc

- Carmanah Solution
- 8 x EverGEN 1520



Luminaire Schedule							
Symbol	Qty	Label	Lumens	LLF	Description	IES Class	Cutoff Class
	8	T5 1520	3400	0.950	2 Light Bars @ 100%	Type V	Full Cutoff

Numeric Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
CalcPts	Illuminance	Fc	0.53	0.9	0.2	2.65	4.50

# Project Example- Competitor Solution

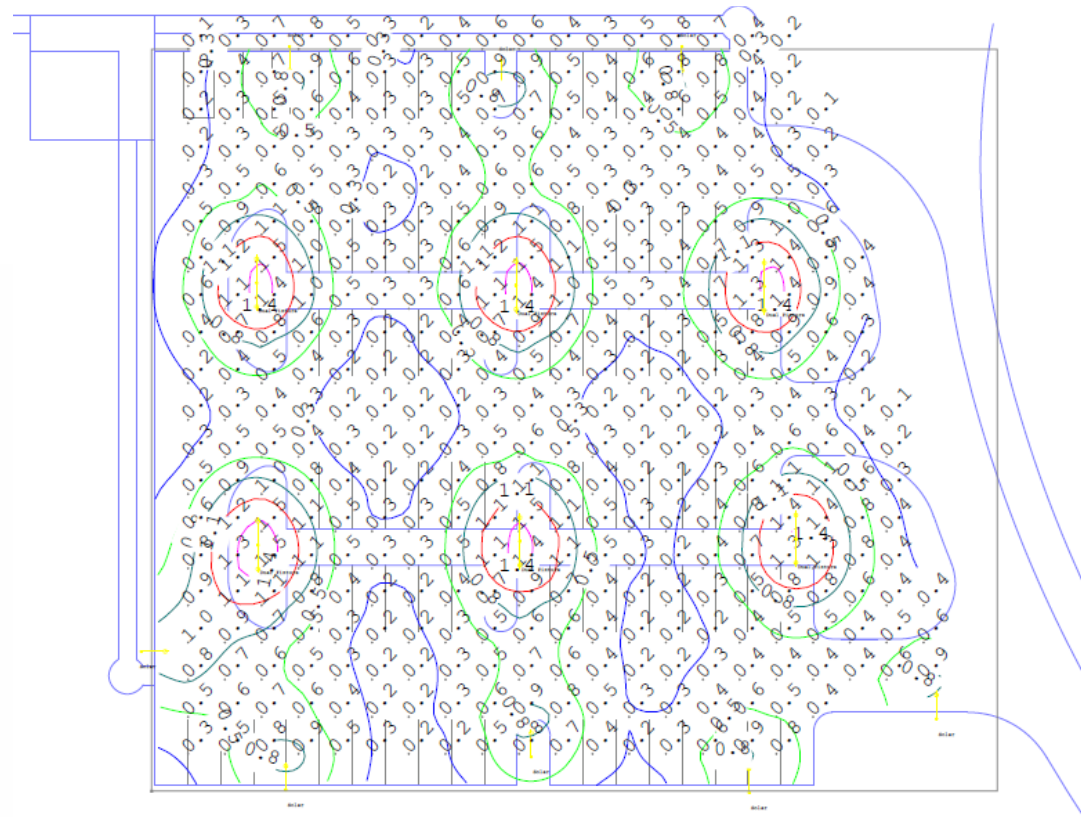
## Target

Minimum = 0.2 fc

Average = 0.5 fc

Competitor solution

- 14 systems



### Statistical Area Summary

<u>Stat. Area</u>	<u>Ave</u>	<u>Max</u>	<u>Min</u>	<u>Ave/Min</u>	<u>Max/Min</u>	<u>Std. Dev.</u>
Parking Area	0.53	1.52	0.12	4.32	12.37	0.31

# Project Example - Summary



## Target

Minimum = 0.2 fc

Average = 0.5 fc

- Competitor **40% less** than the minimum performance requirement
- Competitor's uniformity is **4.32** versus **2.65** for Carmanah
- Competitor needs **6 more systems** to do the job
- Competitor's system is running 6 hours, Carmanah's is dusk-dawn

Solution	Avg	Max	Min	Avg/Min	Max/Min	Number of Systems
Competitor B	0.53	1.52	0.12	4.32	12.37	14
EverGEN 1520	0.53	0.9	0.2	2.65	4.5	8

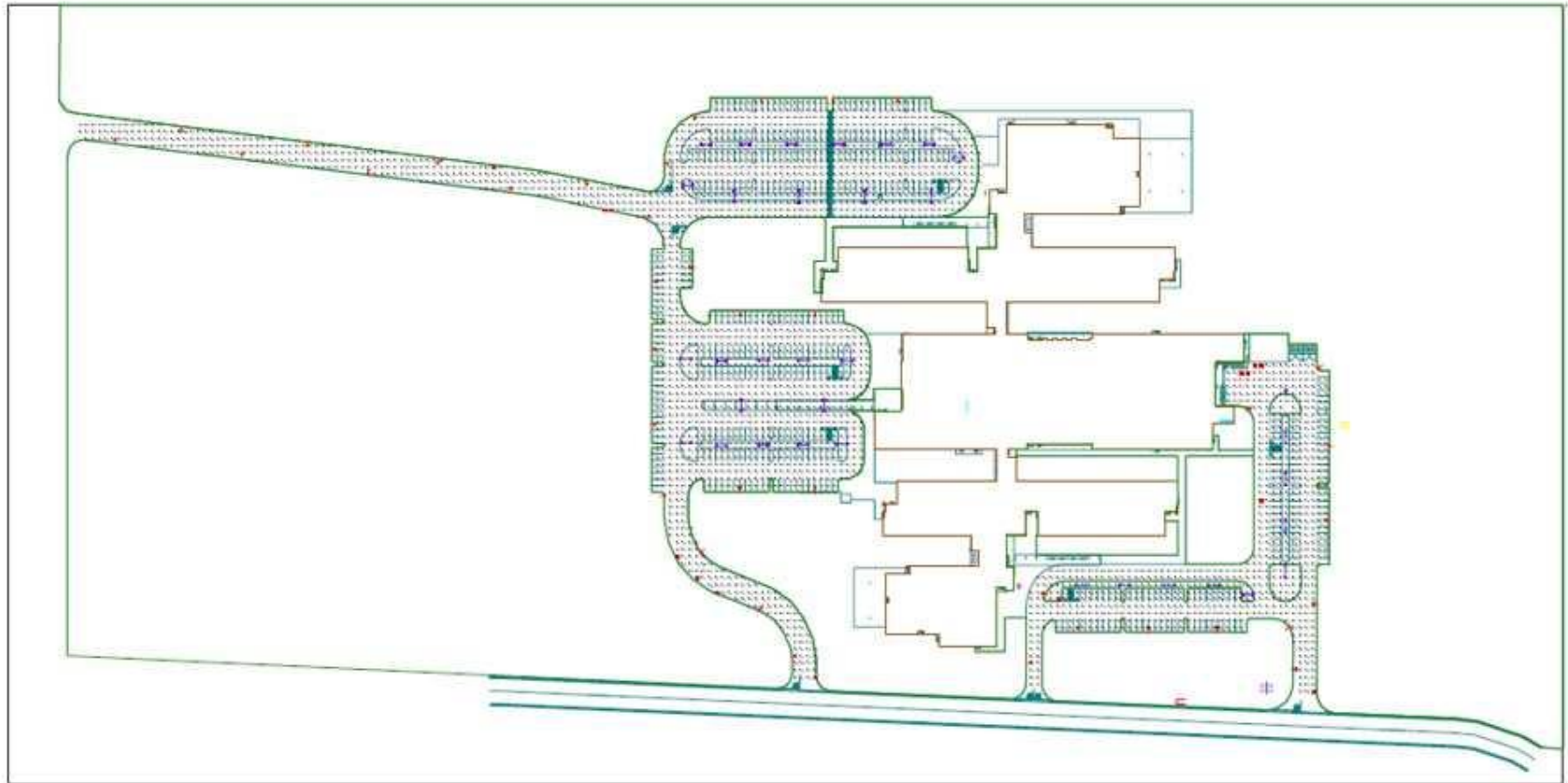
# Project Example – Price Comparison






- Competitor per unit cost is less than the Carmanah system
- Competitor requires 14 systems, Carmanah requires 8
- Projected cost for application
  - Carmanah is ~14% less for the project even though the Competitor's systems are significantly less expensive

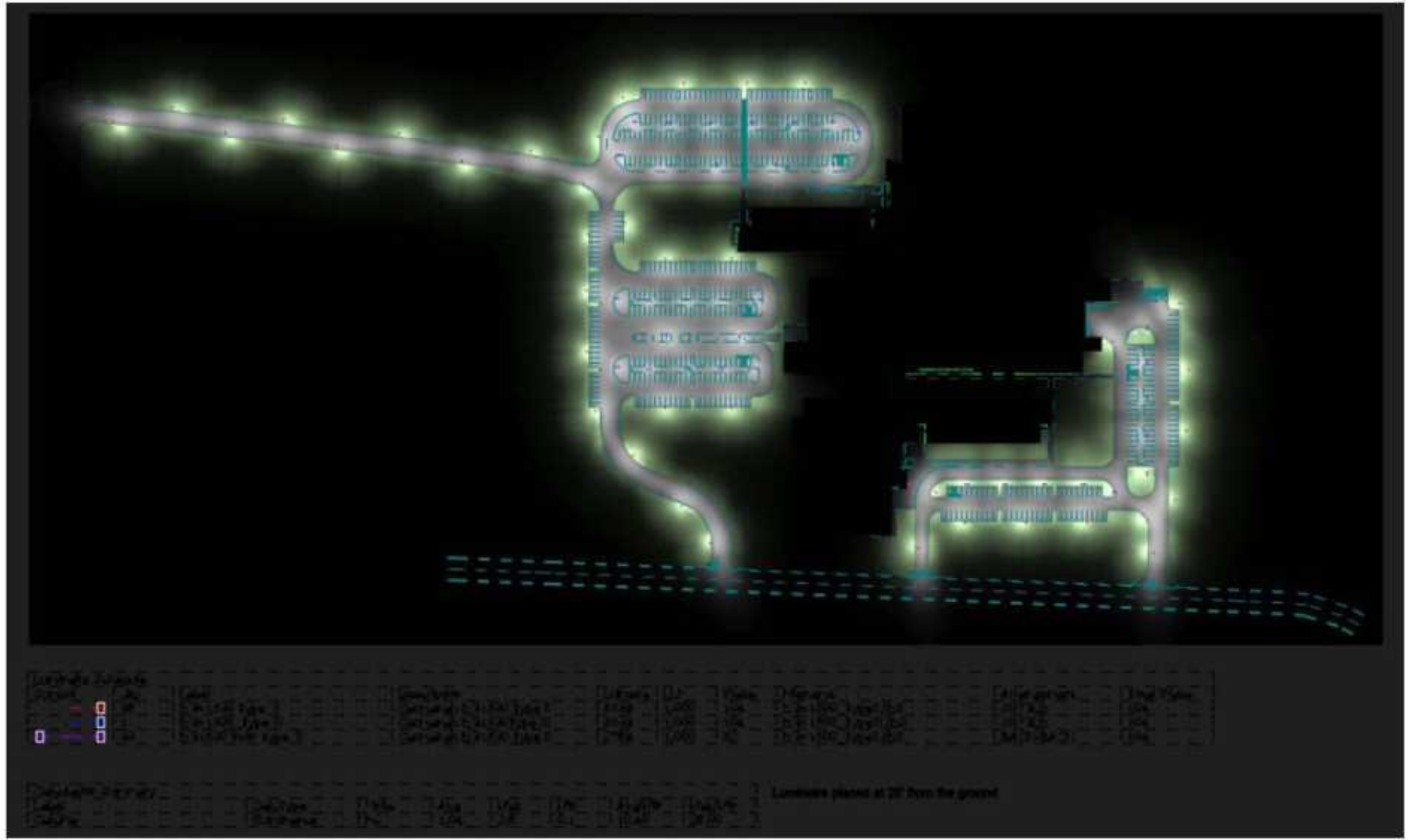
Manufacturer	Model	Number of Systems	Cost per System	Poles/Install	System Intall	Project Total
Competitor's		11	\$4,700	\$1,500	\$68,200	\$68,200
Competitor's		8	\$3,275	\$1,000	\$34,200	\$72,630
		6	\$4,905	\$1,500	\$38,430	
Carmanah	80	16	\$4,100	\$1,000	\$81,600	\$81,600
Carmanah	1520	8	\$6,300	\$1,500	\$62,400	\$62,400

# Layouts



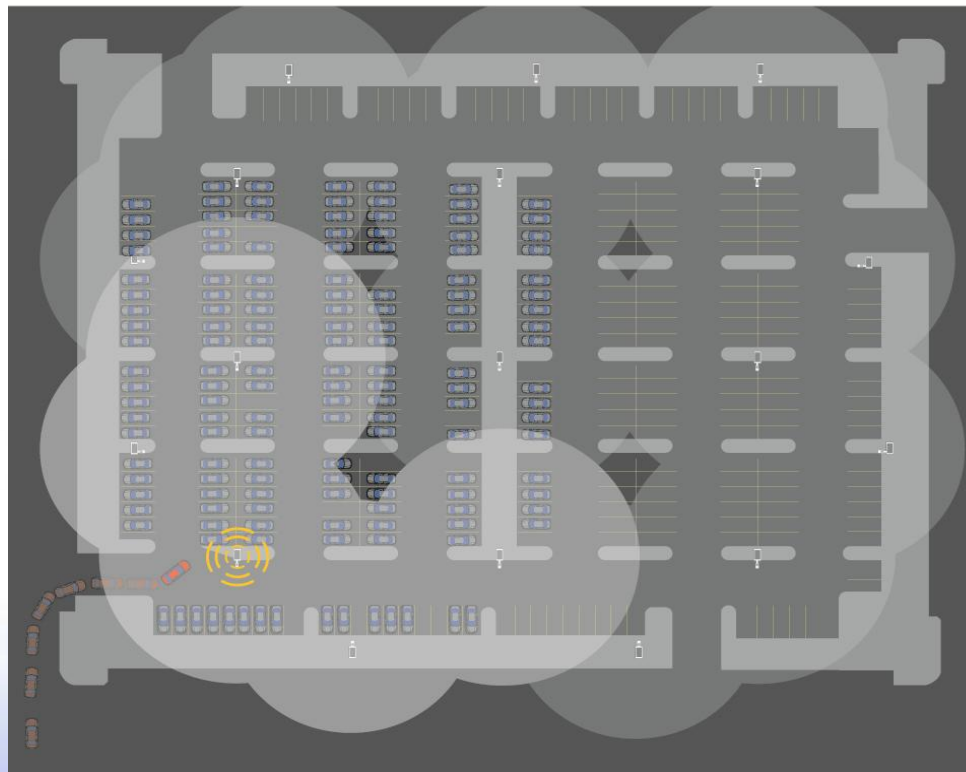
Luminaire Schedule									
Symbol	Qty	Label	Description	Lumens	LLF	Watts	Filename	Arrangement	Total Watts
	58	EG+1530 Type II	Carmanah EG1530 Type II	5536	1.000	104	EG+1530_TypeII.IES	SINGLE	104
	1	EG+1500 Type III	Carmanah EG1530Type III	5536	1.000	104	EG+1530_TypeIII.IES	SINGLE	104
	33	EG1530 Twin Type II	Carmanah EG1530 Type II	2766	1.000	52	EG+1530_TypeII.IES	BACK-BACK	104

# Layouts





**Activation of a network of lights when one light in the network senses motion.**



**Questions?**



**Rowan Plaxton  
Sales Channel Manager, Canada  
Carmanah Technologies  
rplaxton@carmanah.com  
www.carmanah.com**

