Transitioning to Networked Adaptive Exterior Lighting

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About the California Lighting Technology Center

Learning Objectives

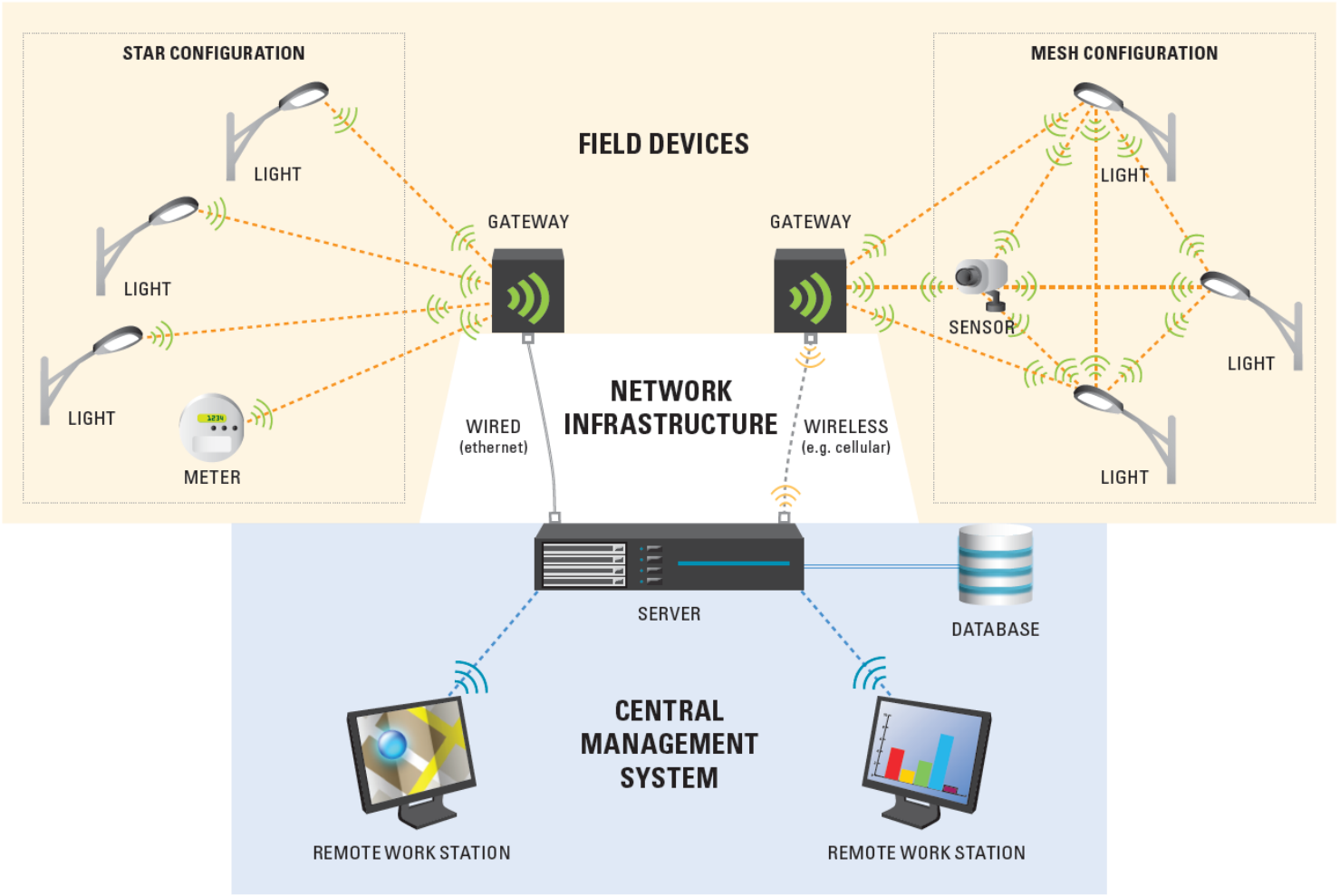
Identify cities and utilities participating in research activities with CLTC

Compare demonstration and research results

Describe the energy savings potential and best practices for the design of outdoor networked lighting systems

Analyze next steps to support broader adoption of outdoor networked adaptive lighting systems

Networked Adaptive Exterior Lighting Systems



Research sites: Networked Adaptive Lighting Systems

WASHINGTON SITES

Bonneville Power Administration (BPA)

- Large Office Building A (Richmond, WA)
- K–12 School (Pasa, WA)
- Fast Food Restaurant (Walla Walla, WA)
- Building Supply Franchise (College Place, WA)

CALIFORNIA SITES

Pacific Gas and Electric (PG&E)

- Big Box Store (West Sacramento, CA)
- 2nd St. (L St. to Pole Line Rd.) (Davis, CA)
- UC Davis Campus (Davis, CA)
- Office Campus, Vacaville, CA

Southern California Edison (SCE)

- Office Building B (Long Beach, CA)
- Outdoor Shopping Center (Irvine, CA)
- UC Irvine West Peltason Dr. (Irvine, CA)

San Diego Gas and Electric (SDG&E)

- E. Palomar and Heritage Corner, Chula Vista (San Diego, CA)
- Downtown, near 11th and Island (San Diego, CA)

Field: Demonstration Savings

Research Site	Site Type	Baseline Source Type	Retrofit Source Type	Control Strategy	Total Energy Savings (%)
City of Chula Vista	Street	HPS	LED	Fixtures + Network	55%
City of San Diego	Street	HPS	LED/Induction	Fixtures + Network	59%
UC Davis	Area	HPS/MH	LED/Induction	Fixtures + Network + Occ.	89%
UC Irvine	Street	Induction	LED	Fixtures + Network + Occ.	Pending
City of Davis	Street	HPS	LED	Network + Occupancy Sensing	27% - 42%
VacaValley Hospital	Area	Induction	LED	Fixtures + Network + Occ.	66%

Lab: Simulated Savings*

Research Site	Site Type	Baseline Source Type	Retrofit Source Type	Potential Energy Savings Range (%)
Big Box Store	Area	HPS/MH	LED	72% - 79%
Office Campus	Area	HID	LED	73% - 85%
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K-12 School	Area	MH	LED	80% - 84%
Large Office Building, A	Area	Induction	LED	78% - 82%
Fast Food Restaurant	Area	MH	LED	70% - 72%

* Control Strategy: Fixture + Network + Occupancy

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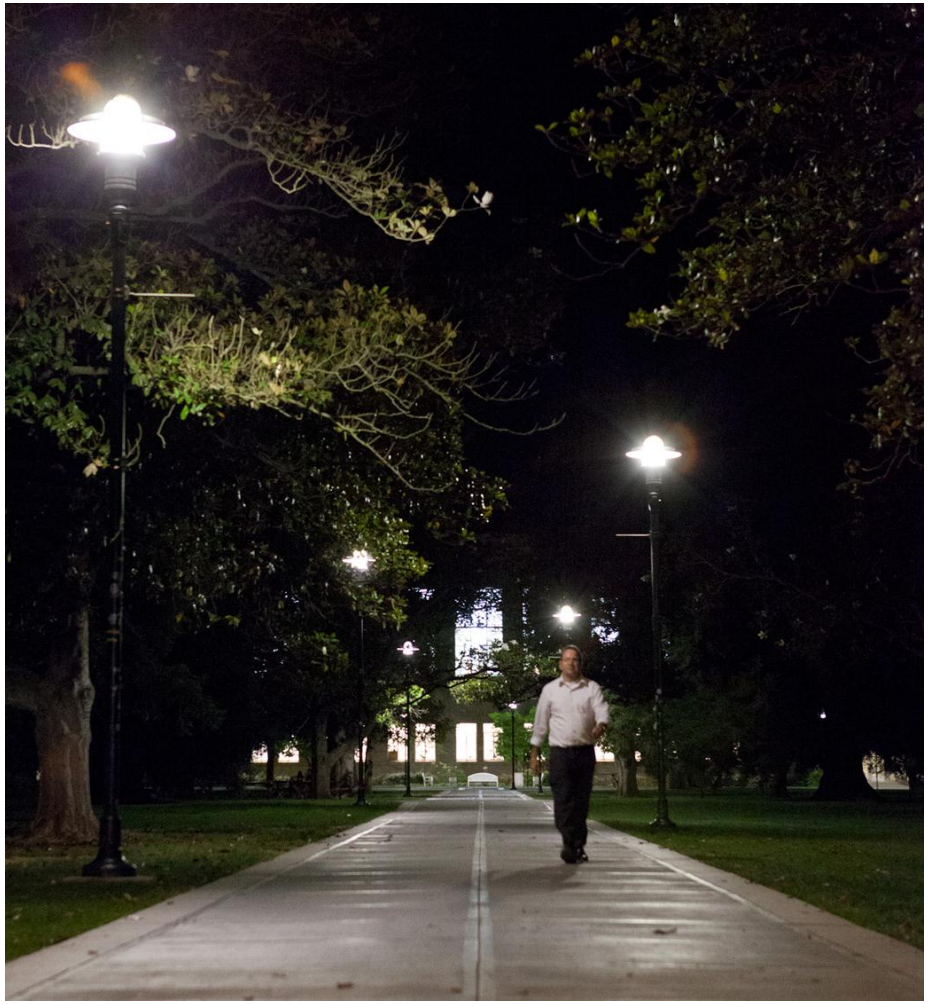

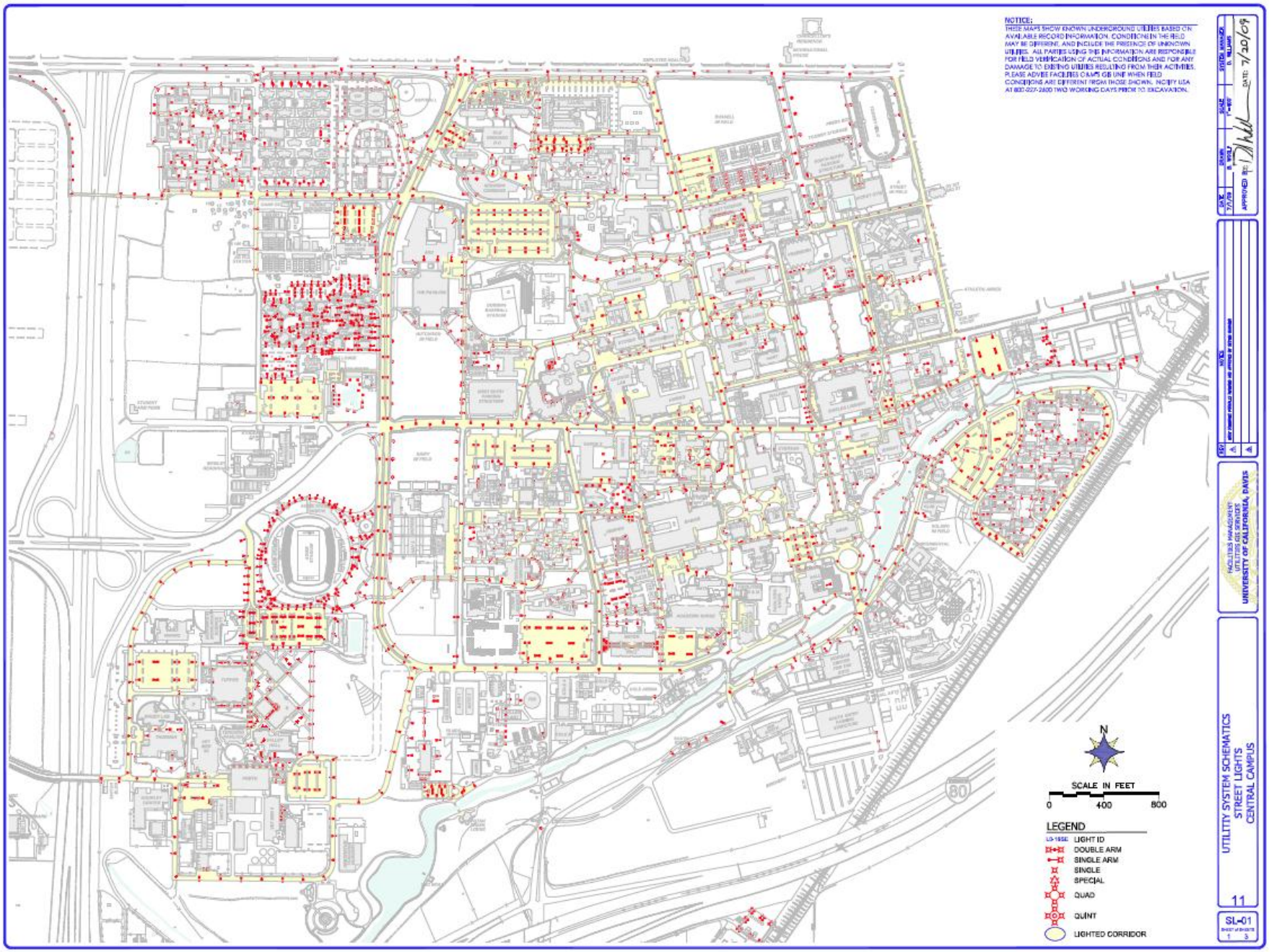
NOTICE:
THESE MAPS SHOW KNOWN UNDERGROUND UTILITIES BASED ON AVAILABLE RECORD INFORMATION. CONDITIONS IN THE FIELD MAY BE DIFFERENT, AND INCLUDE THE PRESENCE OF UNKNOWN UTILITIES. ALL PARTIES USING THIS INFORMATION ARE RESPONSIBLE FOR FIELD VERIFICATION OF ACTUAL CONDITIONS AND FOR ANY DAMAGE TO EXISTING UTILITIES RESULTING FROM THEIR ACTIVITIES. PLEASE ADVISE FACILITIES O&M'S GIS UNIT WHEN FIELD CONDITIONS ARE DIFFERENT FROM THOSE SHOWN. NOTIFY USA AT 800-227-2600 TWO WORKING DAYS PRIOR TO EXCAVATION.
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SCALE IN FEET
0
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LEGEND
LIGHT ID
DOUBLE ARM
SINGLE ARM
SINGLE
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APPROVED BY:
DATE: 7/20/09
FACILITIES MANAGEMENT
UTILITIES GIS SERVICES
UNIVERSITY OF CALIFORNIA, DAVIS
UTILITIY SYSTEM SCHEMATICS
STREET LIGHTS
CENTRAL CAMPUS
11
SL-01
1
3

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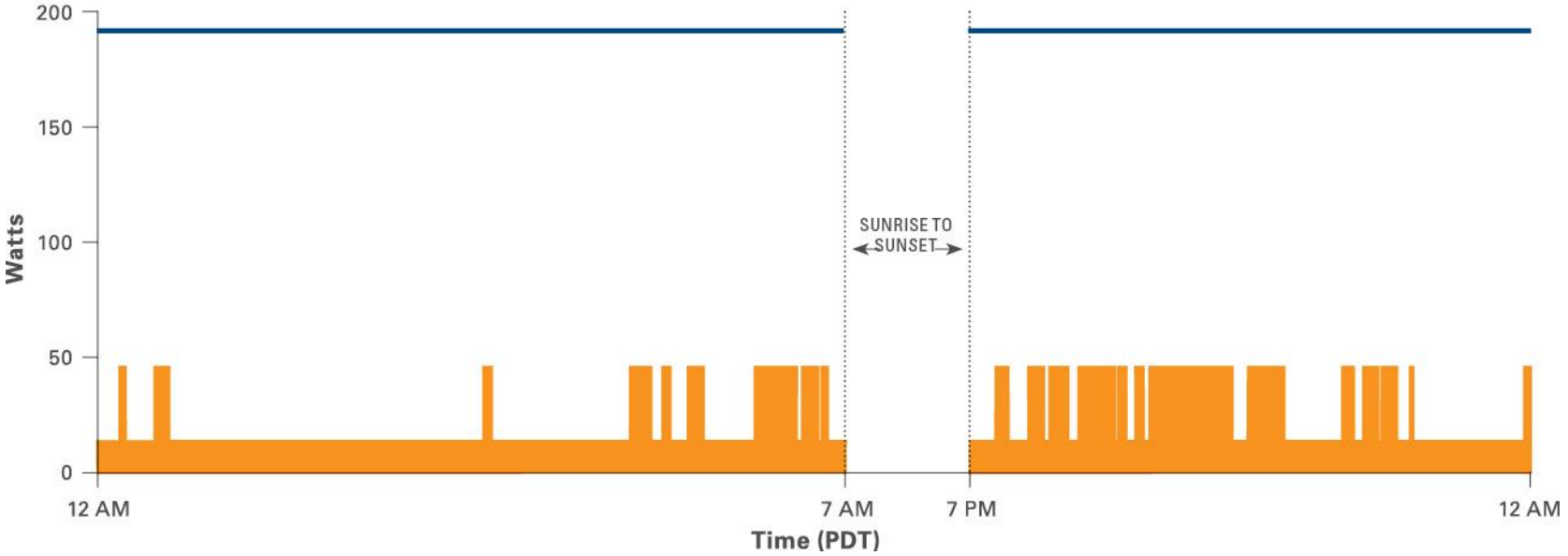
Wall Packs, Thermal Energy Storage building

Wall Pack Results:
89% Energy Savings
20% Occupancy Rate

Pre-retrofit HPS
189W

Post-retrofit LED
14W (low) and 45W (high)
Occupancy Rate: 20%



Occupancy Sensor Validation for Roadway

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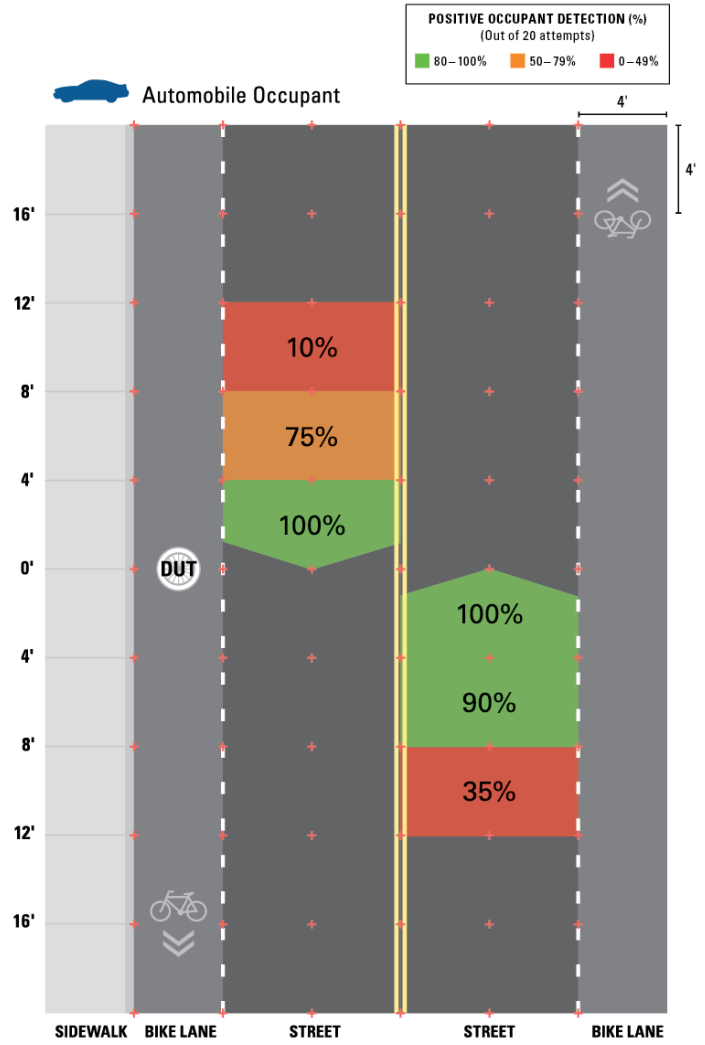

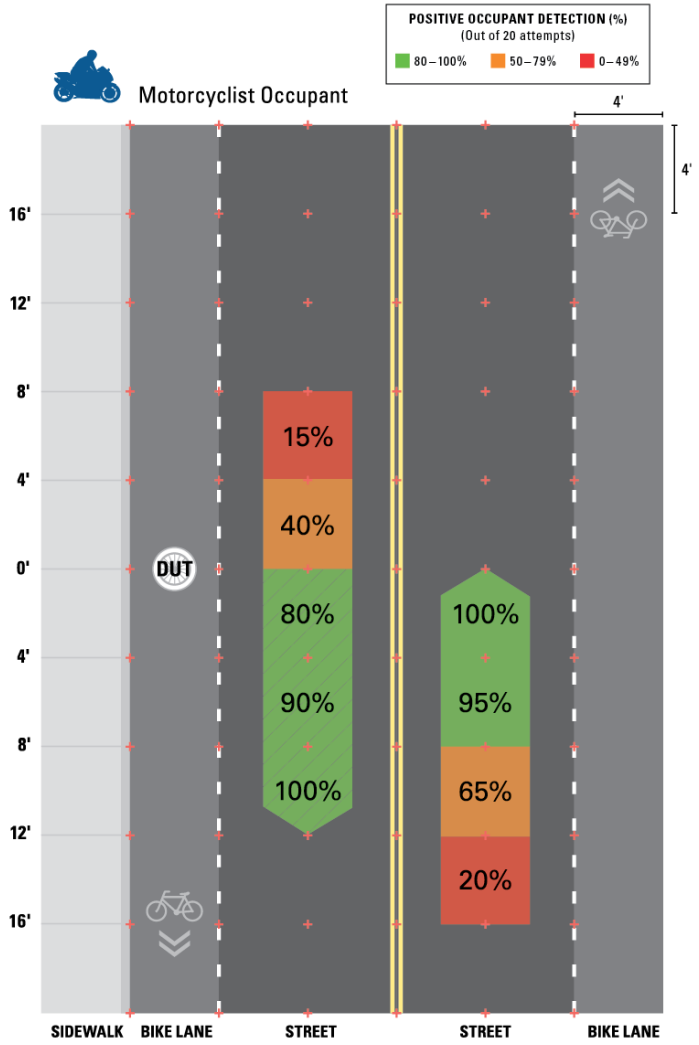

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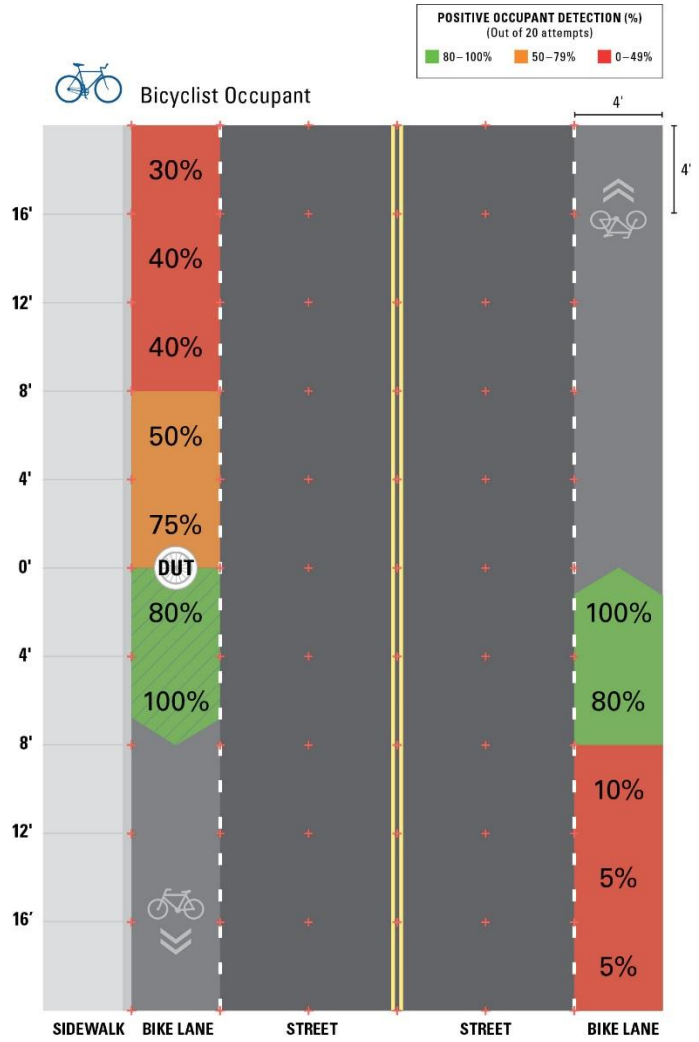
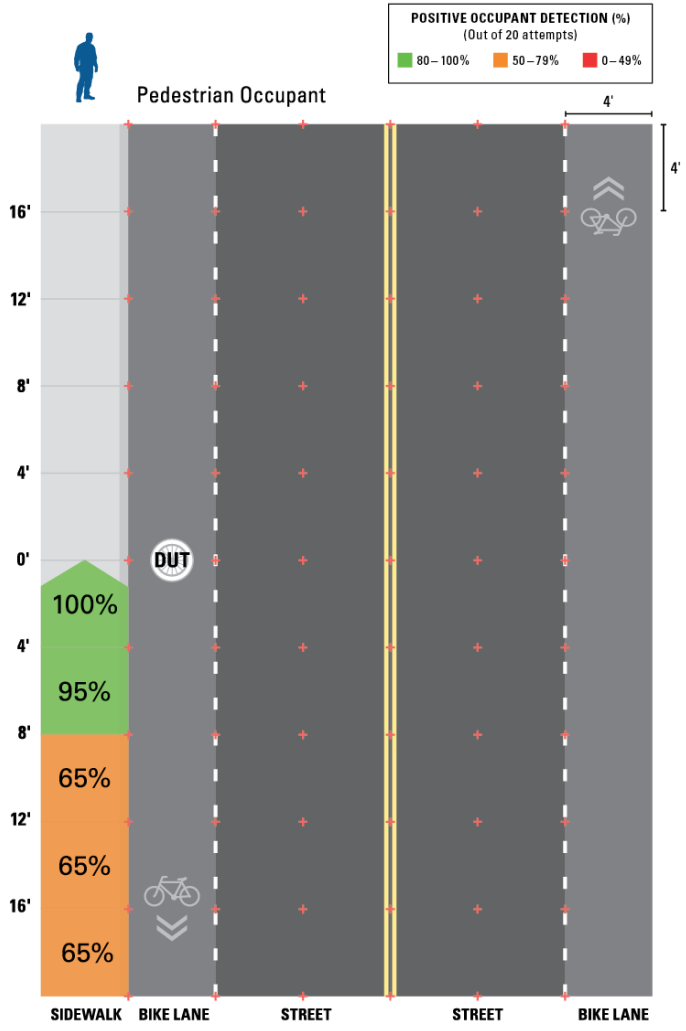
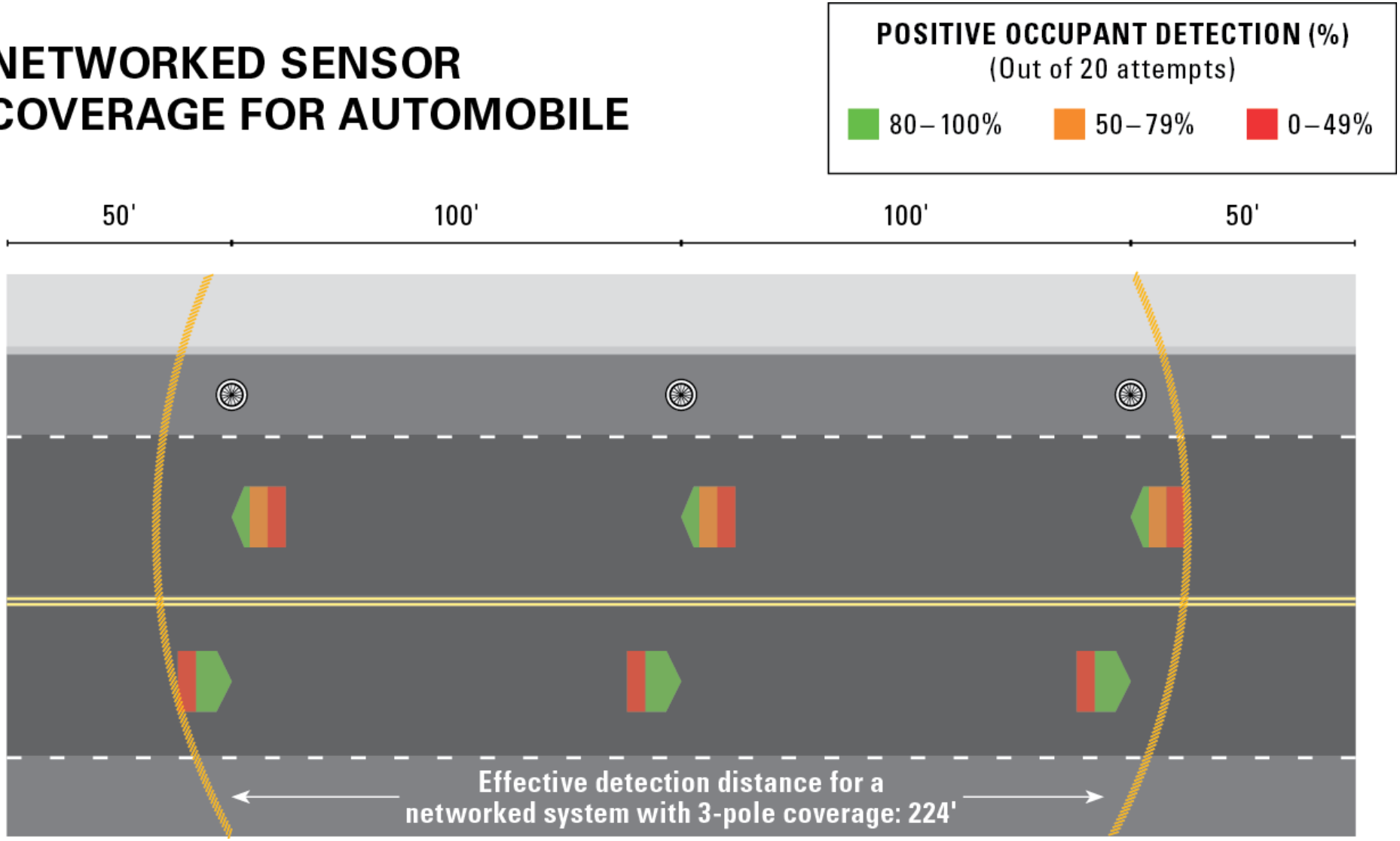




NETWORKED SENSOR COVERAGE FOR AUTOMOBILE



Control Strategies Considered

Occupancy Based Bi-Level

- Low mode: 20% power
- High mode: 100% power

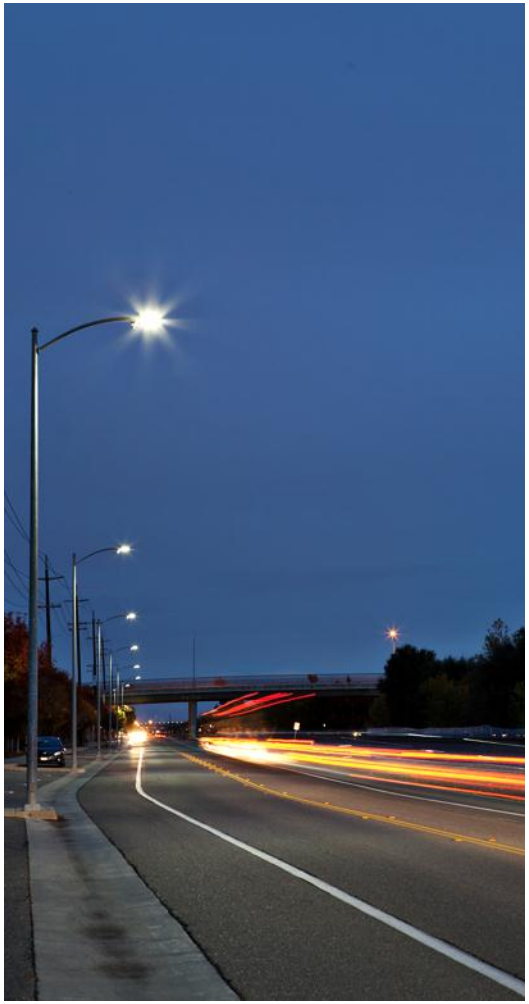
Number of luminaires adjusted per sensor trigger

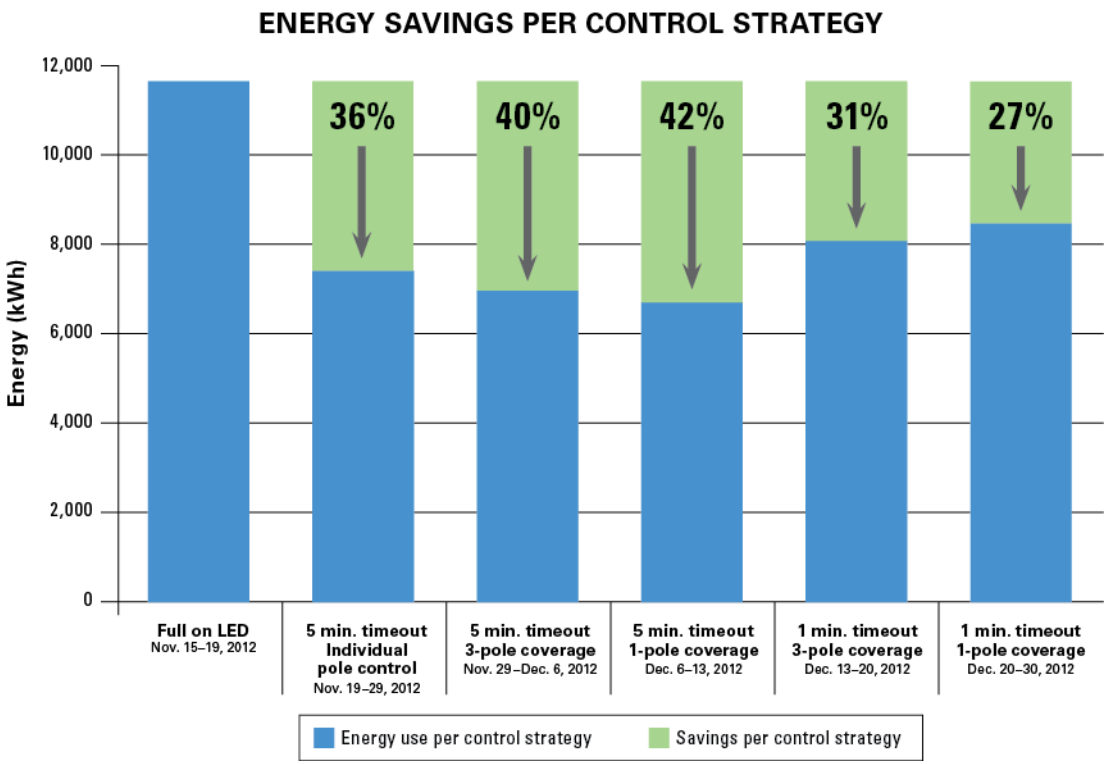
- One luminaire in the direction of travel
- Three luminaires in the direction of travel

Time delay to determine vacancy

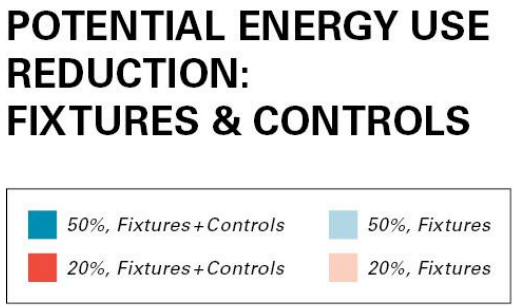
- 1 minute
- 5 minutes

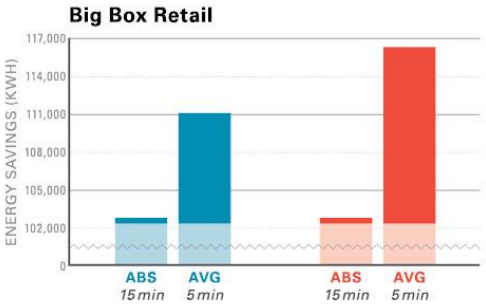
City of Davis

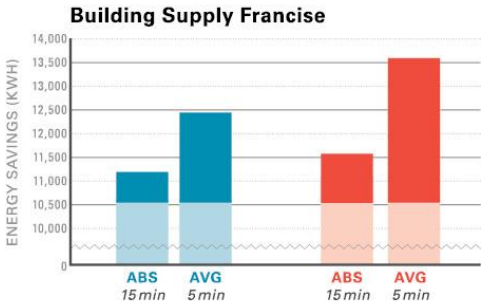


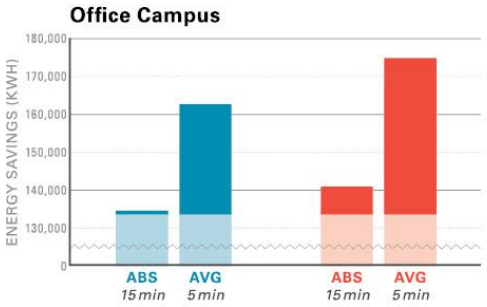


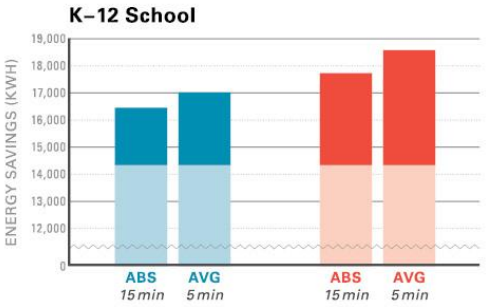
Exterior Occupancy Survey: Simulations

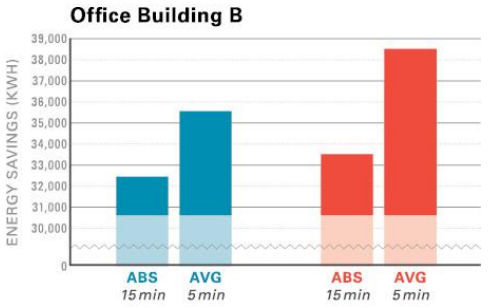


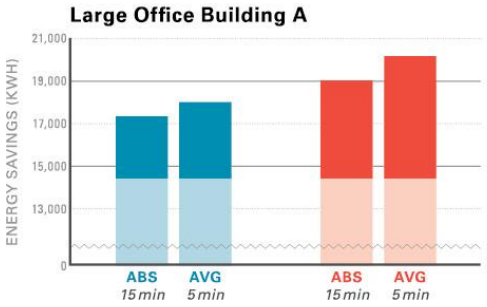


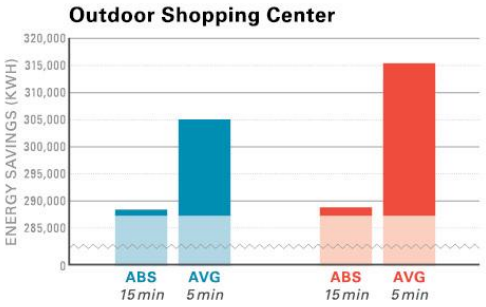


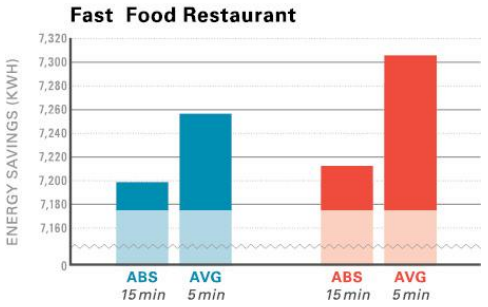












http://www.etcc-ca.com/reports/western-exterior-occupancy-survey

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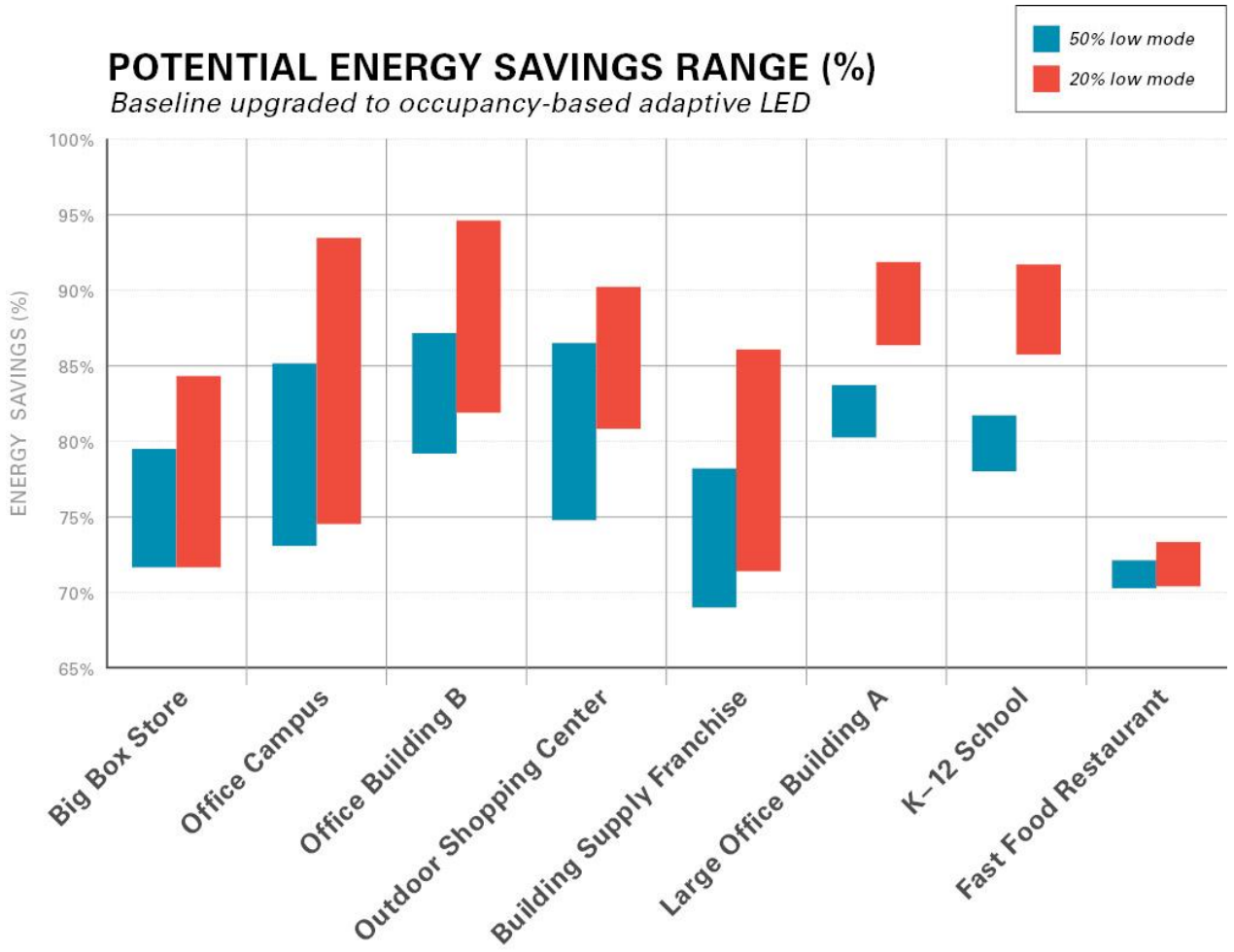

VacaValley Hospital

VacaValley Hospital

ENERGY SAVINGS
66%

OCCUPANCY RATE
35–55%

LIFETIME ENERGY COST SAVINGS
$23,220
at $0.08/kWh, over 10 years

2014 LIGHTING ENERGY EFFICIENCY IN PARKING (LEEP) AWARD WINNER
Best Use of Lighting Controls in a Single Facility

http://cltc.ucdavis.edu/sites/default/files/files/publication/case-study-adaptive-exterior-lighting-healthcare-vacavalley-hospital.pdf

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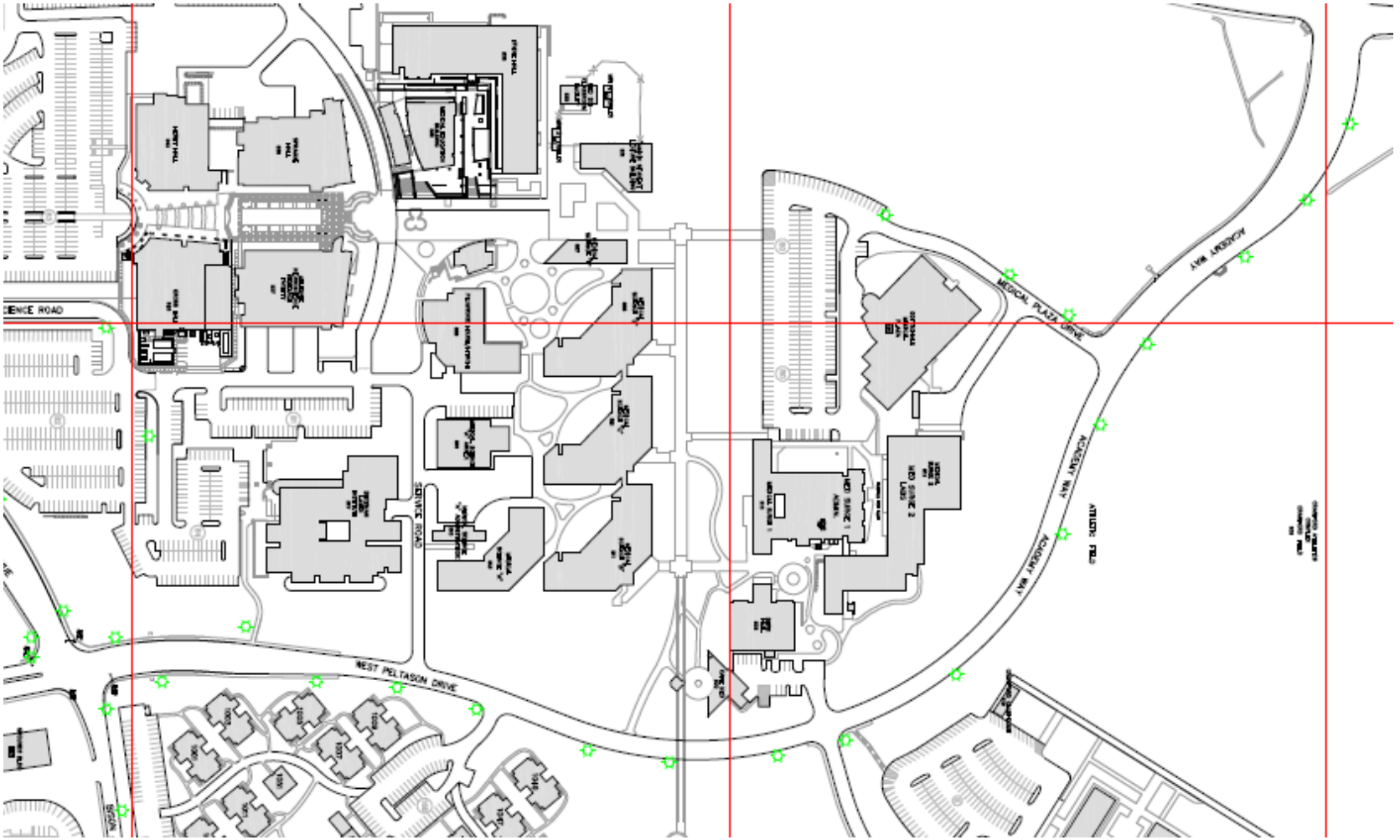

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Luminaire Specifications
Nominal Wattage: 101 W
CCT: 4000 K
CRI: 70
Distribution: Type II

Control System:
RF Communication
Microwave Sensors

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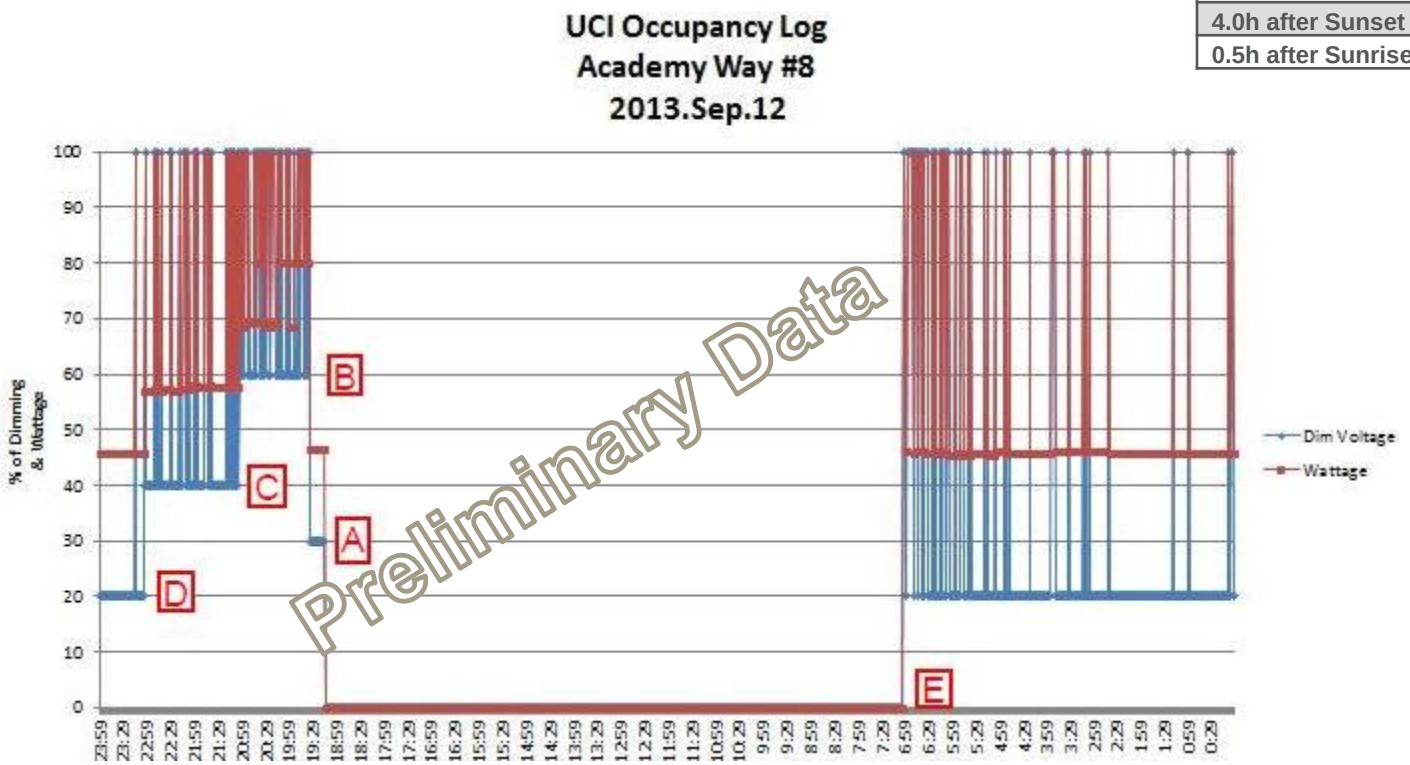
0.5h before Sunset	3.0v [A]
0.5h after Sunset	6.0v [B]
2.0h after Sunset	4.0v [C]
4.0h after Sunset	2.0v [D]
0.5h after Sunrise	0.0v [E]



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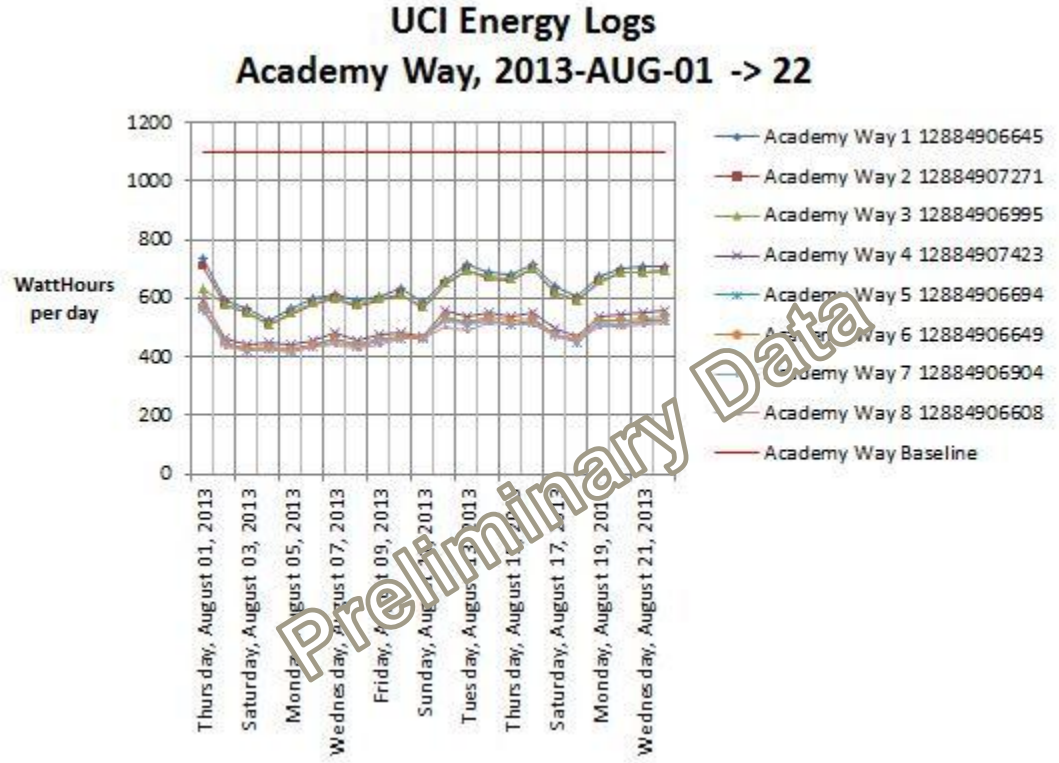

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Questions?

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