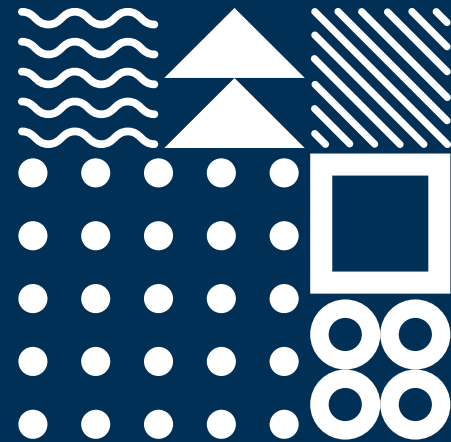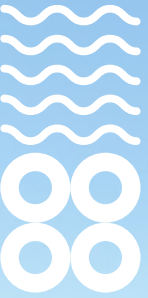# Outdoor Lighting Controls Ownership Update

Occupancy Detection, Enhanced Security, and Deep Energy Savings

By: Nate Mitten, Ph.D.

nmitten@kimcorealty.com

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DOE Lighting R&D Workshop

Agenda

Context

Business Drivers
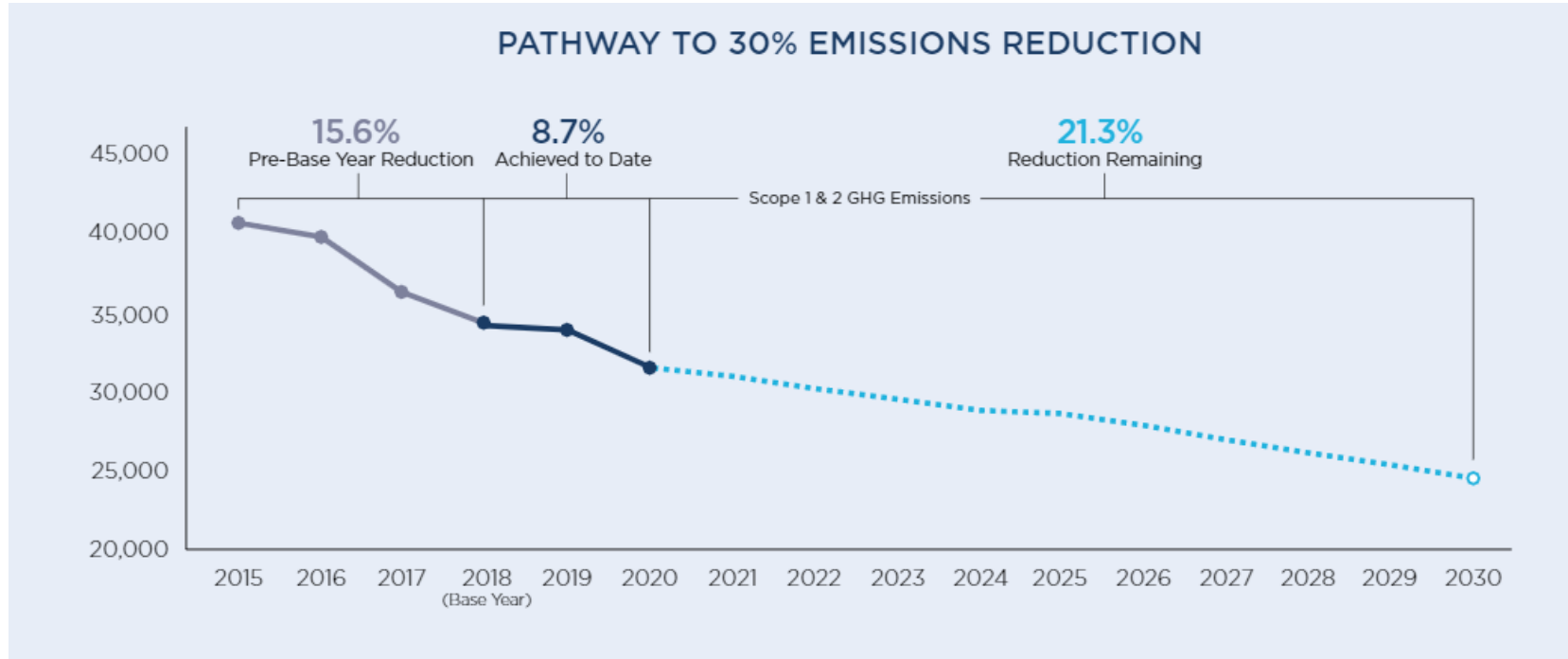
Project Results

Challenges

Opportunities

Context

- Kimco is North America's largest publicly traded owner and operator of open-air, grocery-anchored shopping centers and mixed-used assets.

- 545 shopping centers and mixed use assets

- 94,000,000 square feet of gross leasable space

- 400,000+ managed parking spaces (2,250+ football fields)

- Responsible for almost all outdoor and common area lighting

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Context

- Piloted fixture-level, networked control system at 3 HID sites in 2011 but technology was not ready and it was unsuccessful

- Developed and installed 400+ networked control systems achieving zone-level scheduling and fault monitoring by 2018

- Launched LED conversion program in 2015 with 350+ sites converted to "controls-ready" LED fixtures by 2021. Continued use of zone-level control but continued to pilot fixture-level solutions.

- Have been monitoring performance of 15 fixture-level projects installed from 2019 to current

Context

PATHWAY TO 30% EMISSIONS REDUCTION

15.6% Pre-Base Year Reduction

8.7% Achieved to Date

21.3% Reduction Remaining

Scope 1 & 2 GHG Emissions

Networked Circuit Level Lighting Controls (Zones)

LED "Controls Ready" Fixture Retrofits

Retrofit Fixture-level Lighting Controls

Source: Kimco 2020 Corporate Responsibility Report

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Business Drivers

- Expense reduction

- Emissions reduction

- Safety and security

- Enhanced maintenance / warranty management

New
^

Business Drivers

- **Aggressive carbon goals**
  - New 15% (additional) emissions reduction goal by 2030 (total of ~45% since 2015)
  - Net zero goal by 2050
  - More we can save, the less renewables we need to implement

- **Increased security threats**
  - Our security expenses are growing substantially from 2019 to current
  - Our surveillance camera installations growing 600% between 2019 to 2022
  - Cameras are now coupled with remote guarding services and mobile patrol dispatch as a cost-effective alternative to tradition foot patrols
  - Focus is now on using cameras for deterrence more then forensic investigation due to high demands on police force (use them as a "big stick")

- **Growing need for operational awareness**
  - Security cameras "double" as remote eyes on the property so we can "do more with less"
  - They provider valuable tool for disaster and emergency response
  - COVID-19 travel restrictions limit ability to visit property
  - Increase in remote working arrangements / less proximity to sites

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Project Results
Typical Components

Project Results
Typical Site Layout

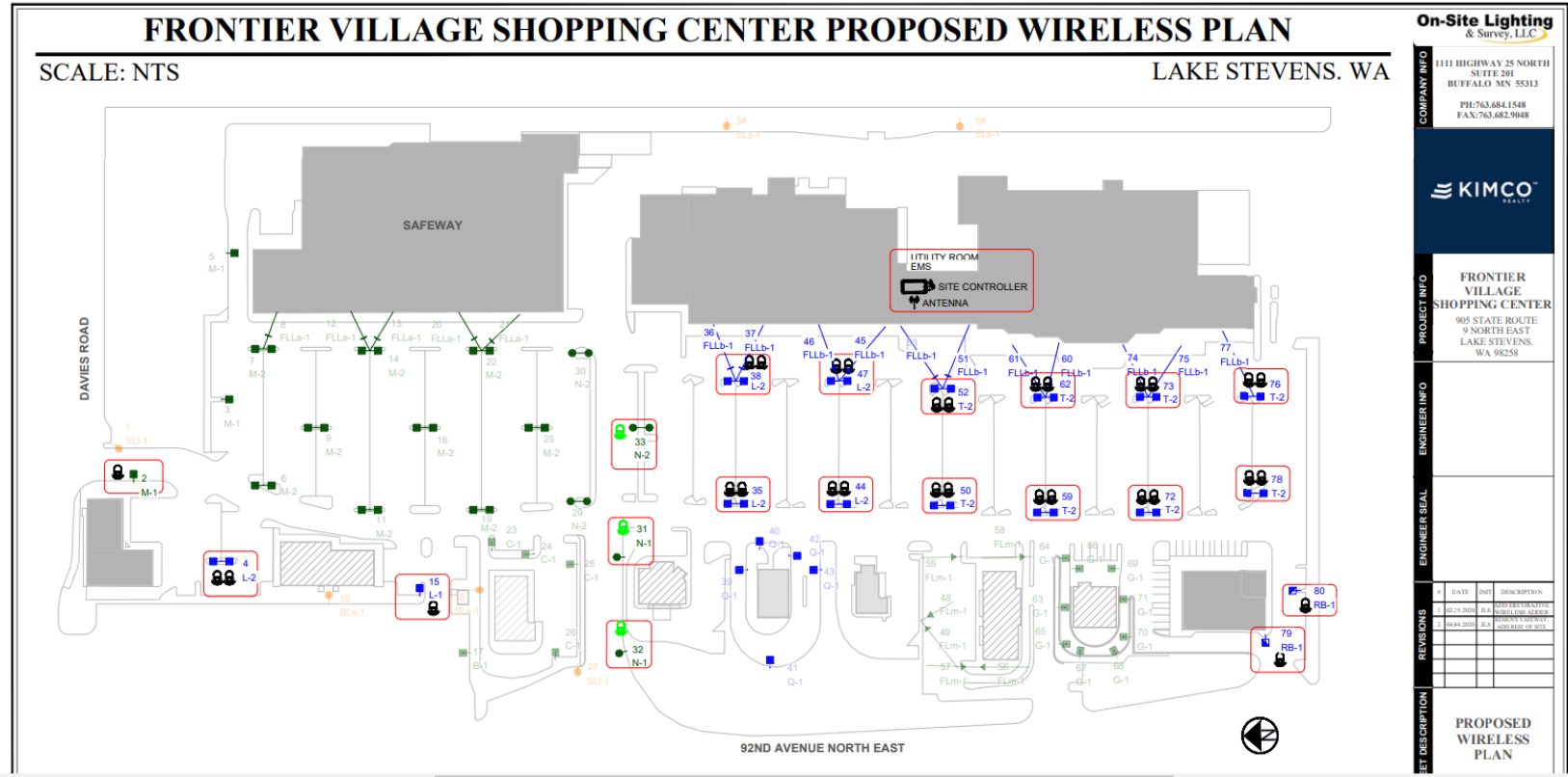Anaheim, CA – 2,232 parking spaces

Tustin, CA – 793 parking spaces

Anaheim, CA – 1,075 parking spaces

Westminster, CA – 949 parking spaces

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Project Results
Typical Site Layout

FRONTIER VILLAGE SHOPPING CENTER PROPOSED WIRELESS PLAN

SCALE: NTS

LAKE STEVENS. WA

Project Results

Energy Savings from Fixture-Level Controls Retrofit
*parking lot meters only, baseline already includes savings from LED fixture retrofits

Programming at most sites:
1. At Dusk-10 go to 40% of full on
2. At Dusk+5 go to 100% of full on
3. At 10p set to 30% dim and on motion go to 60% of full on
4. At Dawn go off

- Motion timeout: 90 Seconds
- Zone config: Separate zone per pole
- Dim Rate: Instant
- Ramp Rate: Instant

| Site Name	Average Savings*
Anaheim Plaza	38.5%
280 Metro	32.6%
Brookhurst Center	15.6%
El Camino North	41.3%
Embry Village	47.1%
Forest Ave	47.6%
Fremont Hub	44.2%
Frontier Village	9.1%
La Mirada	36.0%
Larwin Square	28.1%
Palm Plaza	5.6%
Pavilions Place	9.1%
Pocono Plaza	25.9%
Sycamore Plaza	38.4%
University Town Center	43.7%

*Preliminary results – methodology still being finalized

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Project Results
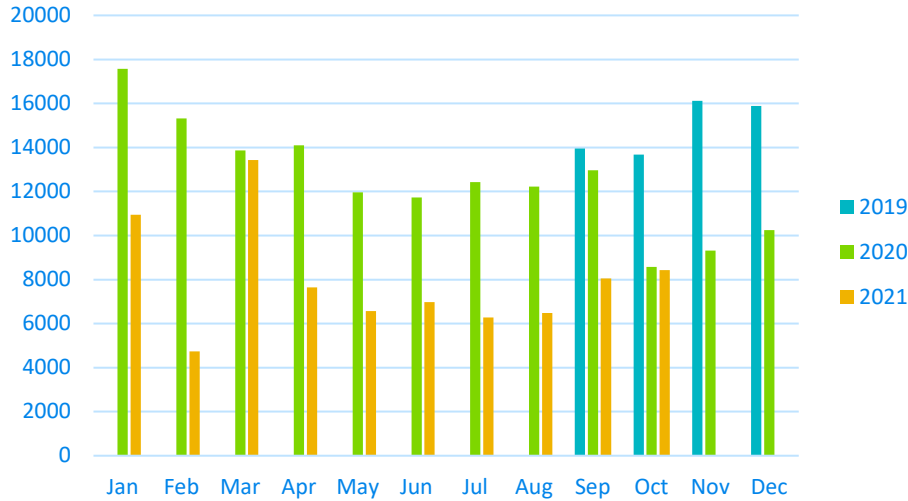
Energy Savings (cont)
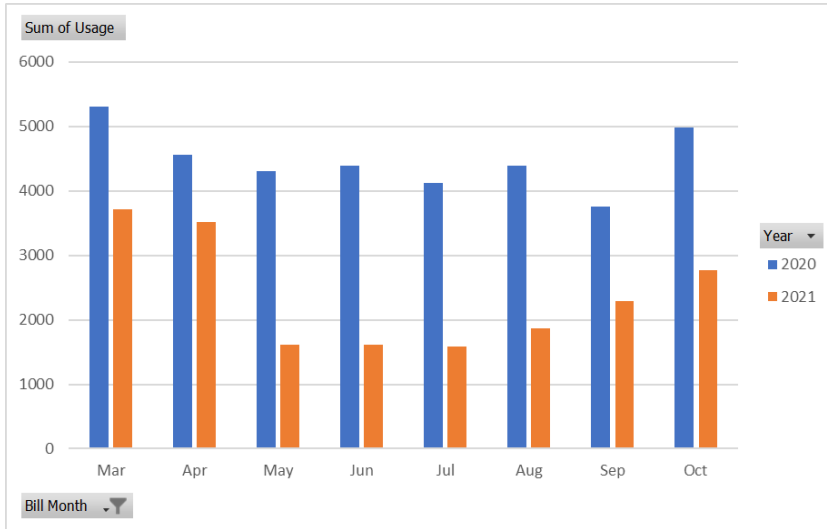
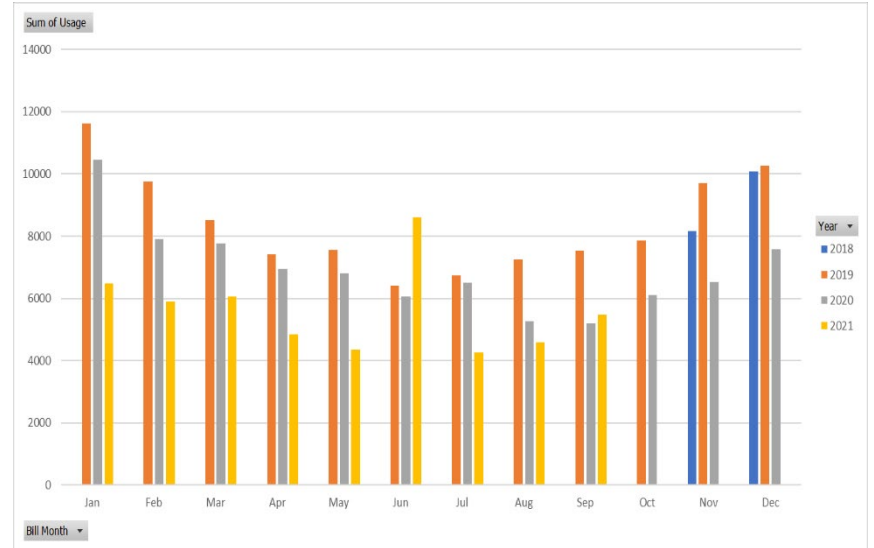

Forest Avenue: 47.6%
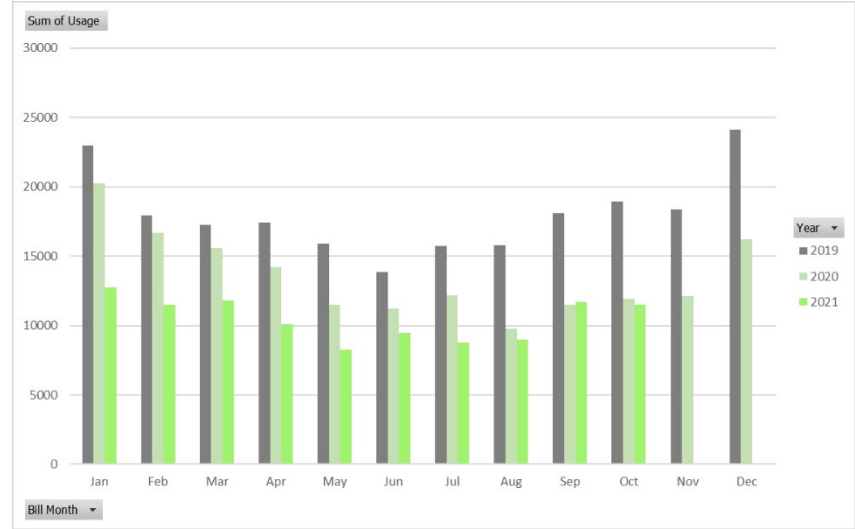
Anaheim Plaza: 38.5%

Project Results
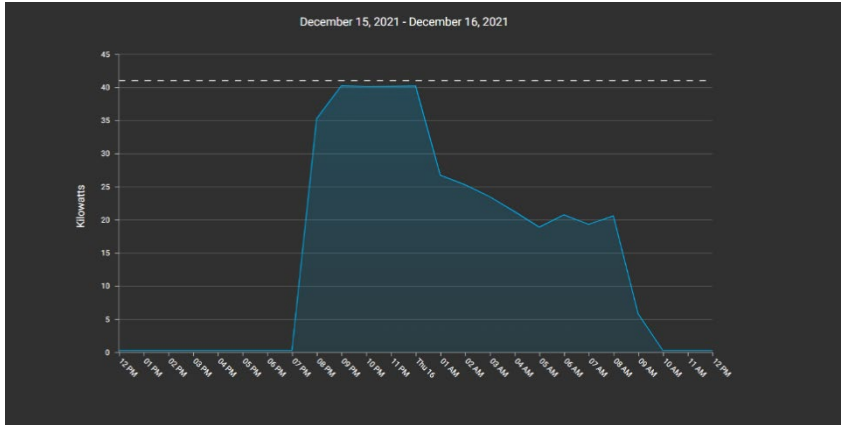## Energy Savings (cont)
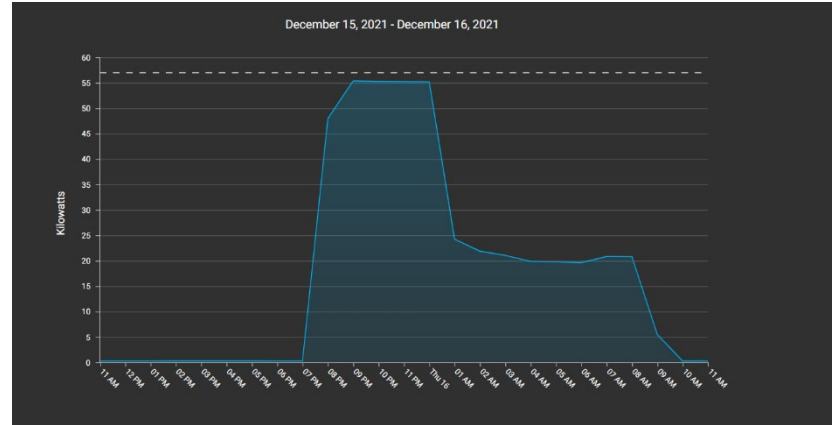

El Camino North: 41.3%

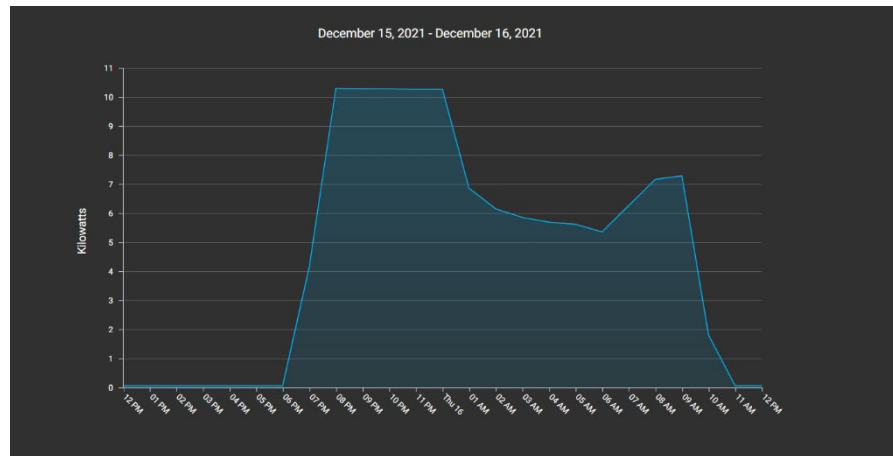Larwin Square: 38.5%

Project Results
System Behavior (Demand over 24hr period)

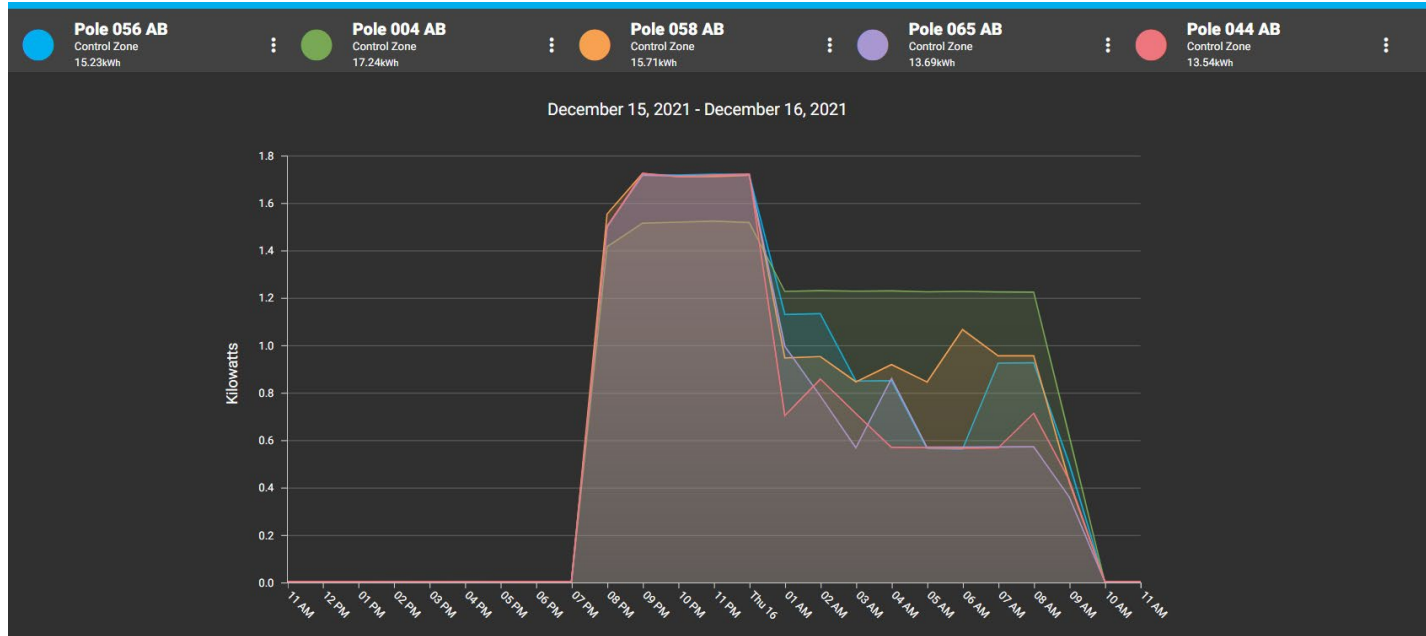Anaheim Plaza: More Late Night Motion

Palm Plaza: Very Little Motion

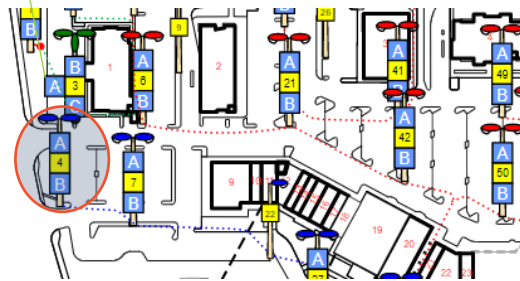Frontier Village: Early Morning Motion
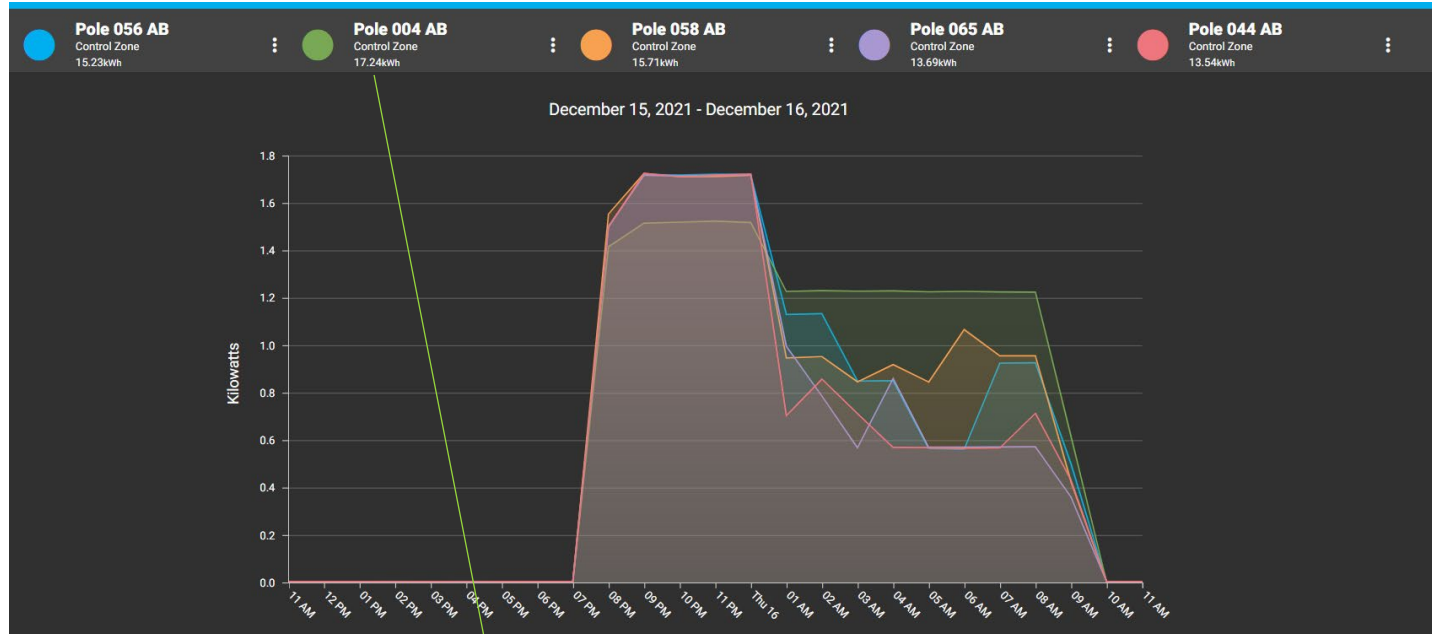
Project Results

Fixture Behavior (Demand over 24hr period)

La Mirada: Wide Range of Power Trend Based on Pole Location
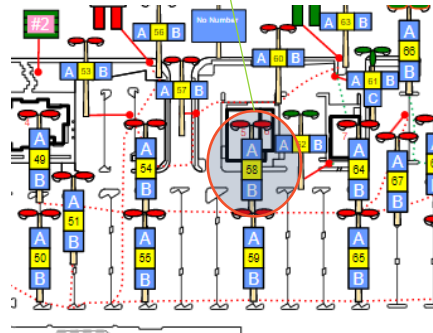
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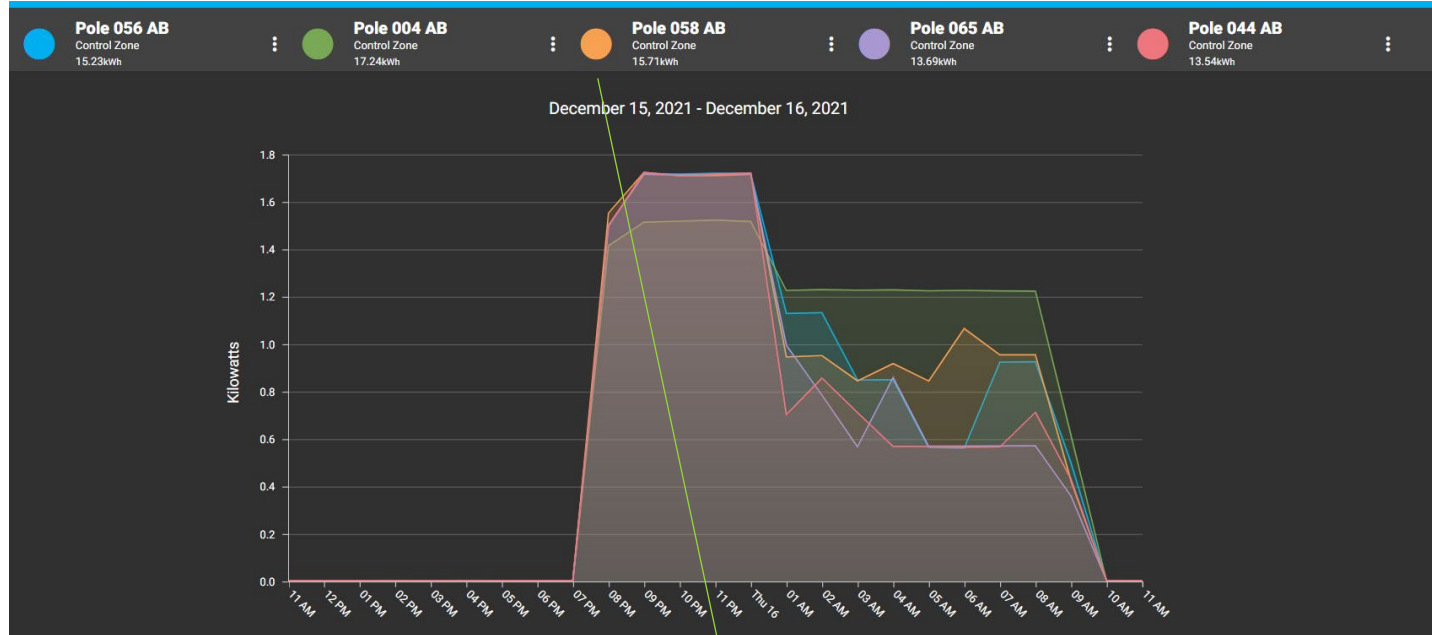# Project Results

Fixture Behavior

Pole 4: Main entrance – very high late-night motion

Project Results

Fixture Behavior

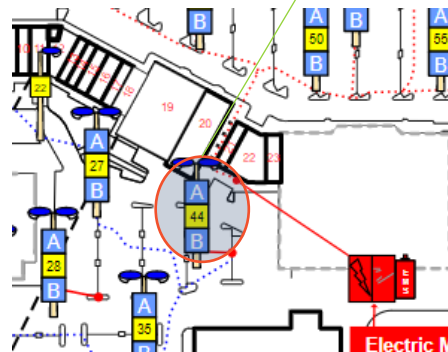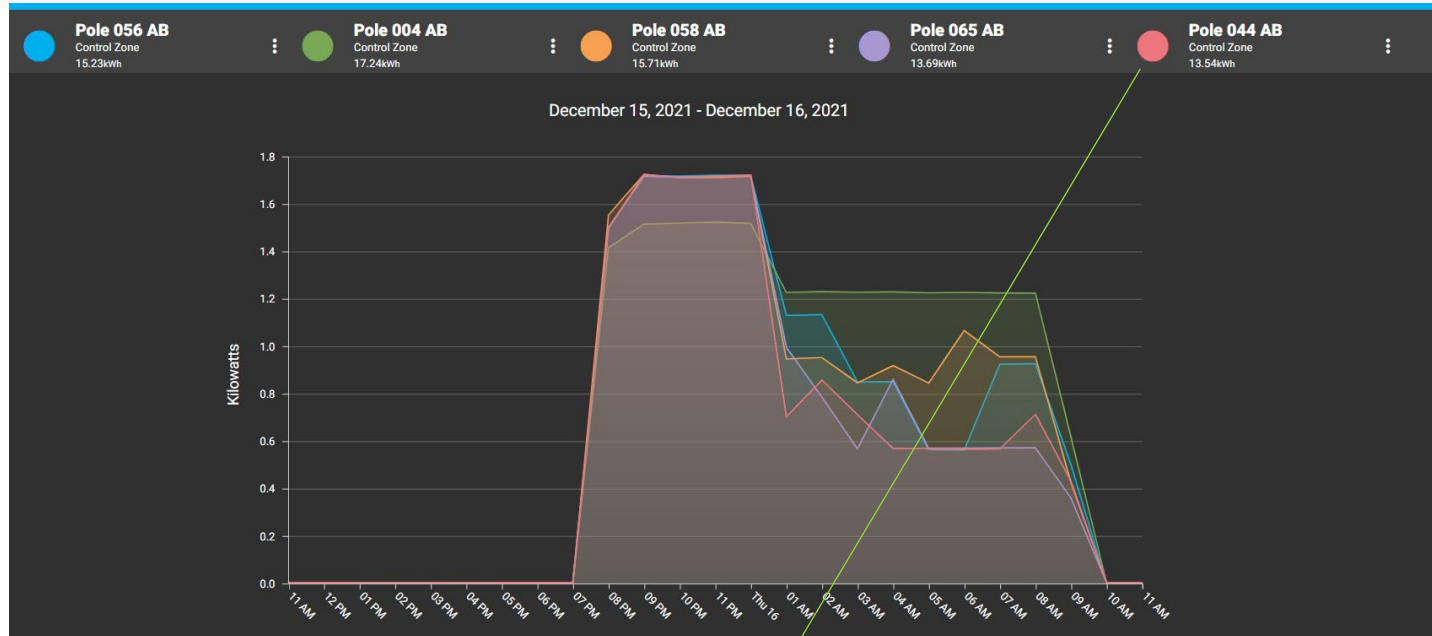Pole 58: Main parking lot – moderate late-night motion

Project Results

Fixture Behavior

Note: other poles didn't always have a strong correlation between location and activity and we found some sensors that didn't seem to be working at all in some cases

Pole 44: Rear parking lot – low late-night motion

Project Results
Presence Detection

Project Results

Presence Detection

Project Results

Presence Detection

Radius from Pole	Presence Detection
20ft	High response rate
30ft	Moderate response rate
40ft	Low response rate

- Pole spacing is commonly 100-150ft. Assuming detection is satisfactory at a 30ft radius, that leaves a 40-90ft gap between poles.
- Seasonal ground temperature changes lead to wide variance in performance of PIR
- Recently started combustion powered vehicles and all electric vehicles do not give off heat signature

Challenges

1. **Unpredictable savings (5.6% to 47.6%)**

   1. Partially due to wide range of savings already realized due to night-lighting from incumbent zone-level control system

   2. Difficult to consistently forecast savings / varies widely due to late night activity

2. **Gaps in occupancy detection**

   1. Even though they generally work, we do not trust the sensors to detect reliably

   2. Therefore, dimming settings are conservative due to motion sensor gaps and risk of person/vehicle not being detected

   3. Current commissioning and operational tools are limited in ensuring the proper setup and ongoing operation of the sensors

3. **Current detection technology provides marginal benefits in security and operational awareness (missing 2 of the 3 main business drivers)**

   1. Deterrence of crime and unwanted activity due to dynamic light behavior needs to be better understood

   2. Cameras are key in enhancing security and operation awareness but they are not currently integrated into connected lighting systems. Some infrastructure between IP camera system and connected lighting is redundant wasting investment dollars.

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Opportunities

1. **Better forecasting of savings from connected lighting systems**
   - Owners can better forecast project pro forma
   - Wider market adoption leads to lower price points and accelerated tech maturity

2. **More precise and reliable occupancy detection**
   - Leads to better deterrence and therefore confidence in deeper dimming levels
   - Estimated 10-20% additional system level savings

3. **Tap into the synergetic benefits and infrastructure between connected outdoor lighting systems and camera systems**
   - Cameras need better deterrence (such as dynamic lights)
   - Lighting needs better detection (camera analytics are becoming very smart)

Takeaway: I believe image sensors coupled with the low bandwidth connected lighting networks using readily available software analytics would solve presence detection

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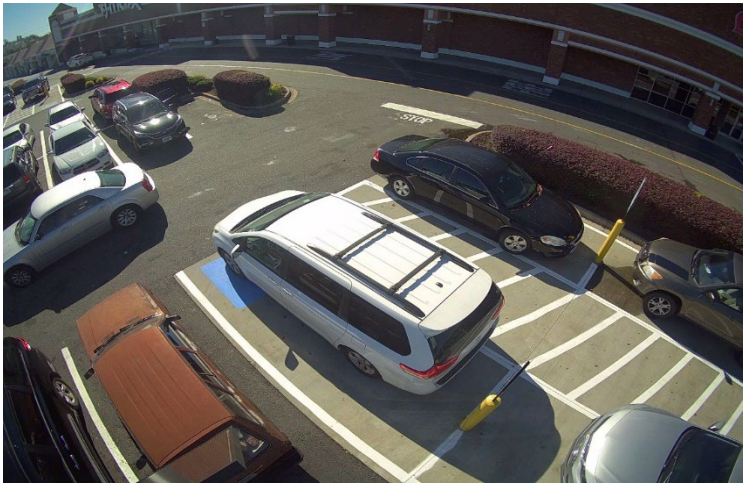# Opportunities
What can a camera see?

Opportunities

What can a camera see?

Additional Resources

- Kimco 2020 Corporate Responsibility Report:
https://kimcorealty.widen.net/s/7rqrh6zb5d/kimco-2020-cr-report-final

- Nate Mitten IES Street and Area Lighting 2016:
https://static.sched.com/hosted_files/ies2016streetandarealightingconf/ee/IES-Outdoor-and-Area-Mitten.pdf

- Michael Poplawski Connected Outdoor Lighting Systems for Municipalities:
https://www.energy.gov/sites/default/files/2015/11/f27/outdoor-lighting-systems-webinar_10-22-15.pdf

THANK YOU!

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