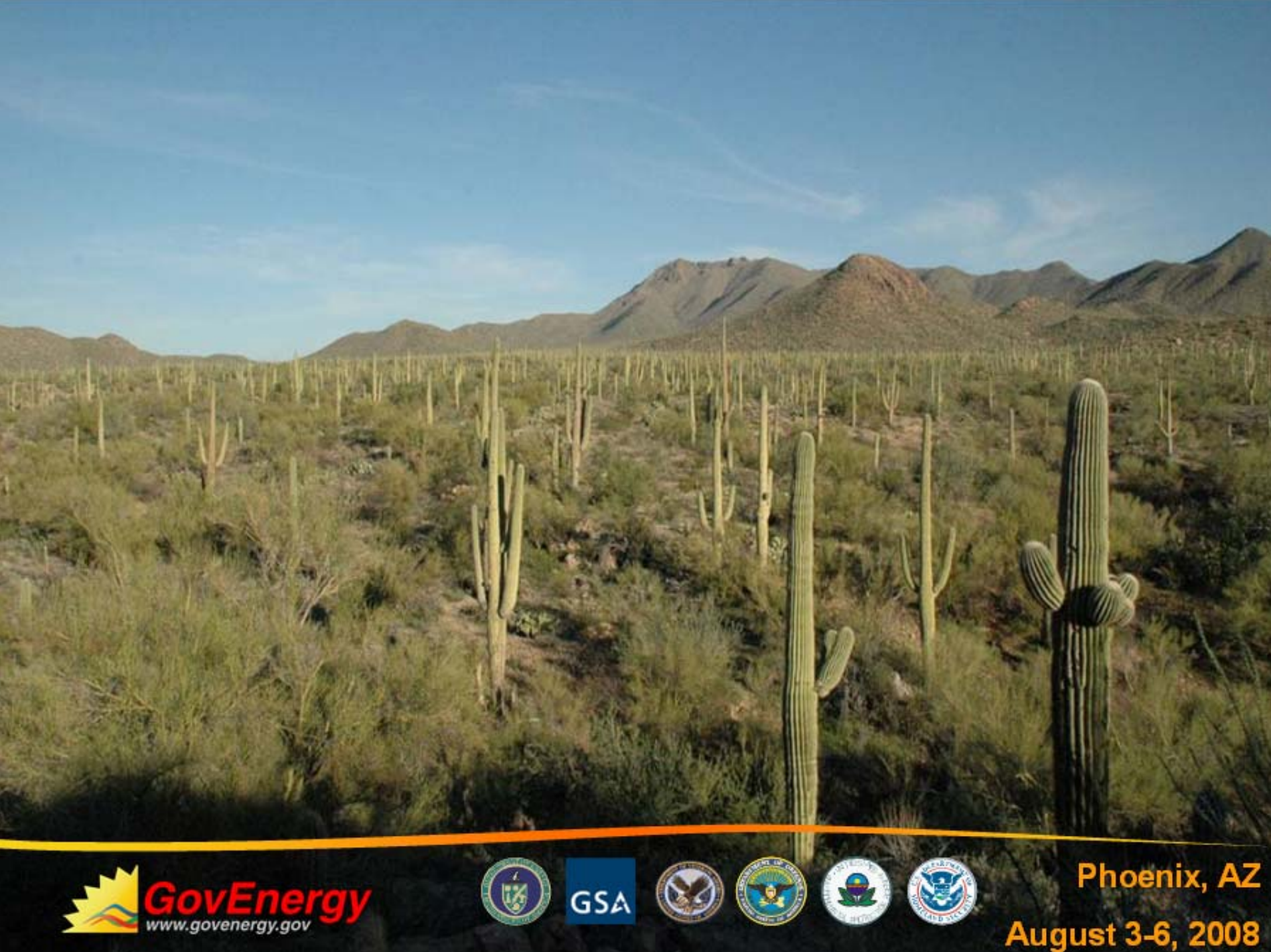
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HID Dimmers

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HID Dimmer

- What is it, how does it work?
- Data from projects
- Where does it work best?

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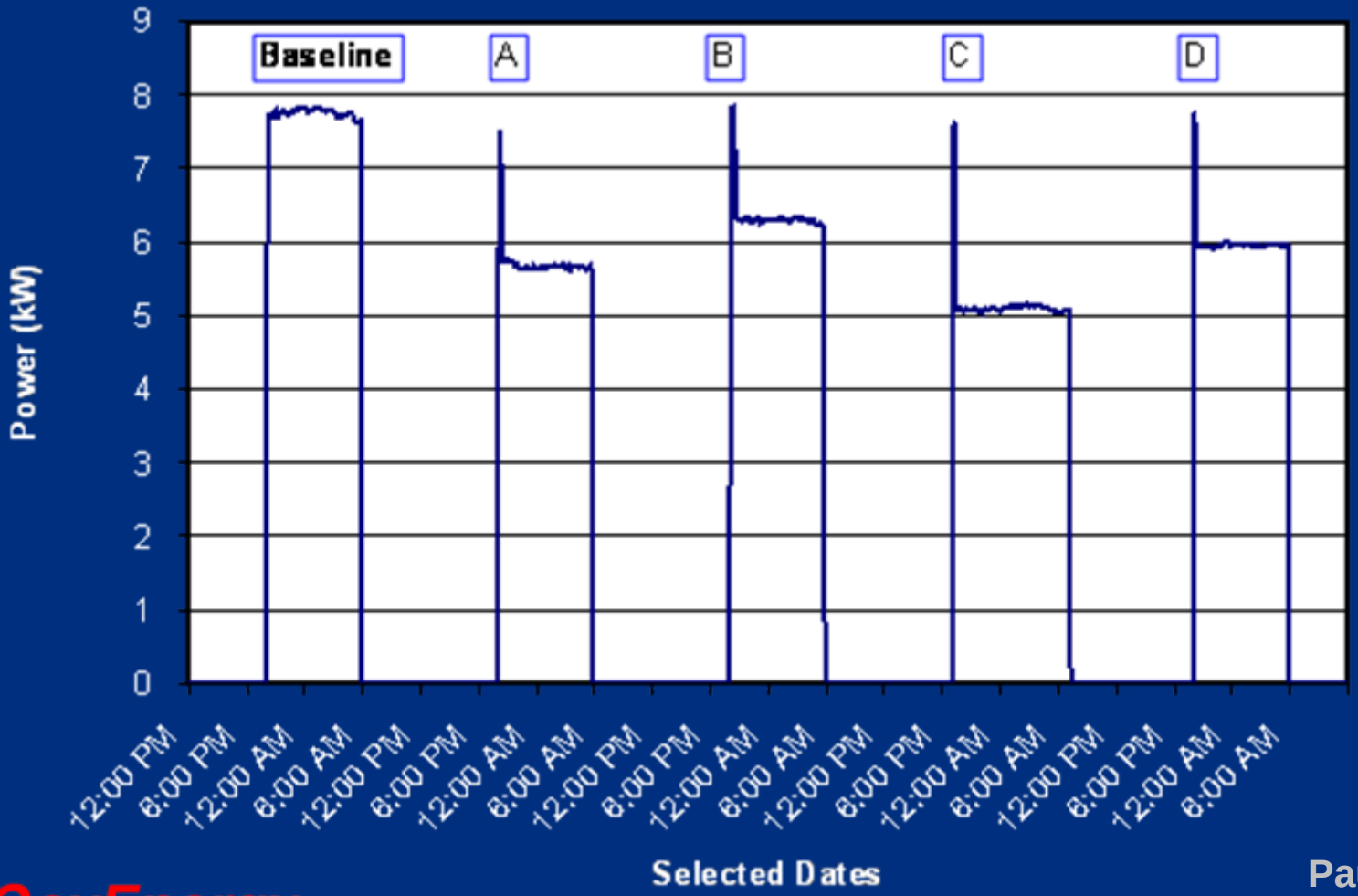

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IESNA Recommended Maintained Horizontal Illuminances for Open Parking Facilities		
Level of Activity	**General Parking and Pedestrian Area**	
	Lux (Minimum on pavement)	**NEX Parking Lot (Average:LUX)**
High	10	14.4
Medium	6	14.4
Low*	2	14.4

* This recommendation is based on the requirement to maintain security at any time in areas where there is a low level of nighttime activity.
Source: IESNA Lighting Handbook: Reference and Application, 9th Edition, figure 24-23.

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NEX Parking Lot Naval Base Ventura County,
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Test Setup At NBVC Commissary

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Average Commissary Parking Light Illumination and Power Measurements

System	Power (kW)	Photopic Illumination (average lux)	Scotopic Illumination (average lux)	Color Temperature (K)
Baseline	7.782	14.4	18.8	2090
A	5.692	11.0	9.4	2060
B	6.274	12.5	10.4	1990
C	5.064	10.0	8.6	2040
D	5.958	12.1	10.0	1980

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Relative Illumination and Power at the Commissary Parking Area

System	Power (relative kW)	Photopic Illumination (relative lux)	Scotopic Illumination (relative lux)	Color Temperature (relative)
Baseline	100.0%	100.0%	100.0%	baseline
A	73.0%	76.3%	50.0%	-30 K (warmer)
B	81.0%	86.9%	55.4%	-100 K (warmer)
C	67.7%	69.1%	46.0%	-50 K (warmer)
D	76.6%	83.7%	53.2%	-110 K (warmer)

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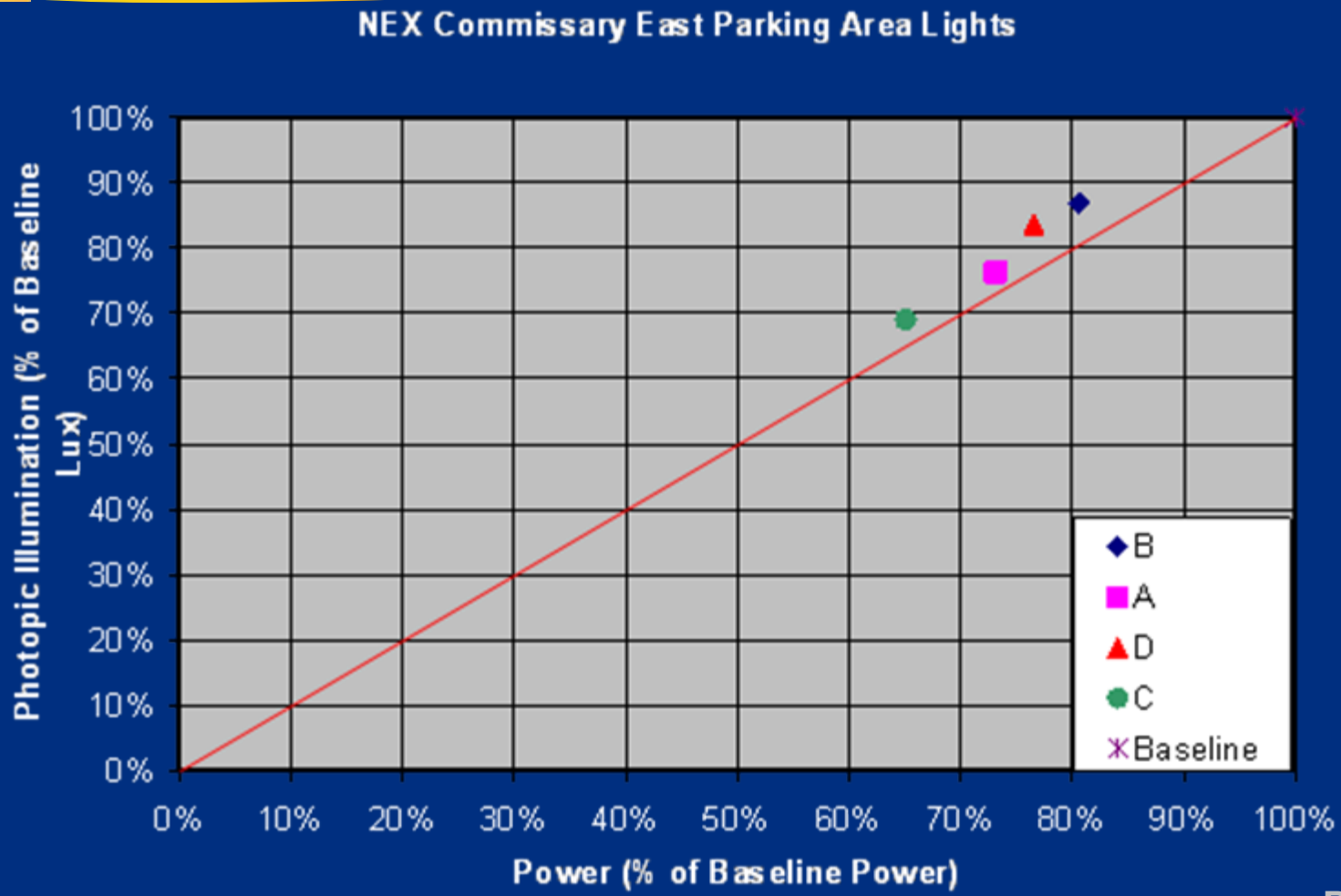

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Summary of Monitored Energy and Power Results for the Commissary Parking Area Lights				
System	**Average Power (kW)**	**Average Energy (kWh/day)**	**Average kVA**	**Average Power Factor (%)**
Baseline	7.774	84.94	7.83	96.9%
Bypass	7.731	84.87	7.95	96.0%
A	5.678	62.93	5.75	98.4%
B	6.304	69.98	6.46	96.6%
C	5.096	56.56	5.38	94.1%
D	5.854	64.73	5.92	97.1%

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Commissary Parking Light Power Quality Measurements				
System Description	**Crest Factor (CF) Current**	**Crest Factor (CF) Voltage**	**Total Harmonic Distortion (THD) Current**	**Total Harmonic Distortion (THD) Voltage**
Baseline (taken March 20, 2007)				
Circuit 3	1.4	1.4	9.9 to 10.1%	1.0%
Circuit 4	1.4	1.4	9.4%	1.0%
Circuit 6	1.4	1.4	10.6%	1.0%
Post-Installation (taken August 9 and 10, 2007)				
Bypass Mode				
Circuit 10	1.4	1.4	8.9% to 9.1%	0.9%
Circuit 11	1.4	1.4	7.6 to 7.9%	0.8 to 0.9%
Circuit 12	1.4	1.4	7.9%	0.7%

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Commissary Parking Light Power Quality Measurements				
System Description	**Crest Factor (CF) Current**	**Crest Factor (CF) Voltage**	**Total Harmonic Distortion (THD) Current**	**Total Harmonic Distortion (THD) Voltage**
Post-Installation (taken August 9 and 10, 2007)				
Bypass Mode				
Circuit 10	1.4	1.4	8.9% to 9.1%	0.9%
Circuit 11	1.4	1.4	7.6 to 7.9%	0.8 to 0.9%
Circuit 12	1.4	1.4	7.9%	0.7%
D-Source Side Measurements				
Circuit 13	1.4	1.4	9.0%	0.8%
Circuit 14	1.4	1.4	9.6%	1.0%
Circuit 15	1.4	1.4	8.7%	0.9%
D-Load Side Measurements				
Circuit 16	1.4	1.4	9.3%	0.9%
Circuit 17	1.4	1.4	8.6%	0.8%
Circuit 18	1.4	1.4	9.0%	0.8%

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Commissary Parking Light Power Quality Measurements				
System Description	**Crest Factor (CF) Current**	**Crest Factor (CF) Voltage**	**Total Harmonic Distortion (THD) Current**	**Total Harmonic Distortion (THD) Voltage**
Post-Installation (taken August 9 and 10, 2007)				
Bypass Mode				
Circuit 10	1.4	1.4	8.9% to 9.1%	0.9%
Circuit 11	1.4	1.4	7.6 to 7.9%	0.8 to 0.9%
Circuit 12	1.4	1.4	7.9%	0.7%
A-Source Side Measurements				
Circuit 27	1.4	1.4	8.7%	0.8%
A-Load Side Measurements				
Circuit 24	1.4	1.4	8.8%	0.8%

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Commissary Parking Light Power Quality Measurements				
System Description	**Crest Factor (CF) Current**	**Crest Factor (CF) Voltage**	**Total Harmonic Distortion (THD) Current**	**Total Harmonic Distortion (THD) Voltage**
Post-Installation (taken August 9 and 10, 2007)				
Bypass Mode				
Circuit 10	1.4	1.4	8.9% to 9.1%	0.9%
Circuit 11	1.4	1.4	7.6 to 7.9%	0.8 to 0.9%
Circuit 12	1.4	1.4	7.9%	0.7%
B-Source Side Measurements				
Circuit 26	1.4	1.4	9.7%	1.0%
B-Load Side Measurements				
Circuit 23	1.4	1.4	8.5%	1.0%

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Commissary Parking Light Power Quality Measurements				
System Description	**Crest Factor (CF) Current**	**Crest Factor (CF) Voltage**	**Total Harmonic Distortion (THD) Current**	**Total Harmonic Distortion (THD) Voltage**
Post-Installation (taken August 9 and 10, 2007)				
Bypass Mode				
Circuit 10	1.4	1.4	8.9% to 9.1%	0.9%
Circuit 11	1.4	1.4	7.6 to 7.9%	0.8 to 0.9%
Circuit 12	1.4	1.4	7.9%	0.7%
C-Source Side Measurements				
Circuit 7	1.6	1.5	8.2%	0.9%
C-Load Side Measurements				
Circuit 9	1.4	1.5	8.2%	4.0%

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Economic Analysis Summary for the Commissary Parking Area Lights					
System	Annual Energy Reduction (kWh/yr)	Annual Energy Cost Reduction ($/yr)	Total Installed Cost ($)	Simple Payback (years)	Net Present Value ($)
A	8,033	$964.00	$5,506.30	5.7	$7,968
B	5,458	$654.94	$4,377.50	6.7	$4,780
C	10,357	$1,242.90	$3,725.00	3.0	$13,649
D	7,375	$885.04	$10,700.00	12.1	$1,672

Payback if savings fixed at $885/yr

A	6.2
B	4.9
C	4.2
D	12.1

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Average Wharf Area Illumination and Power Measurements				
System	**Power (average kW)**	**Photopic Illumination (average lux)**	**Scotopic Illumination (average lux)**	**Color Temperature (K)**
Pole 4 Baseline	10.059	135.9	91.5	2130
Pole 4 C	8.504	91.1	58.2	2150
Pole 7 Baseline	9.913	147.8	99.3	2110
Pole 7 D	7.993	103.8	68.6	2130
Pole 8 Baseline	9.953	121.1	81.8	2100
Pole 8 B	8.456	90.5	59.9	2170
Pole 10 Baseline	10.141	118.9	78.8	2110
Pole 10 A*	7.130	71.6	47.8	2140
* One lamp burned out between the baseline and post-installation measurements				

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Relative Illumination and Power for the Wharf Pole Lights				
System	**Power (relative kW)**	**Photopic Illumination (relative lux)**	**Scotopic Illumination (relative lux)**	**Color Temperature (K)**
Pole 4 C	84.1%	67.0%	63.6%	+20 K (cooler)
Pole 7 D	80.3%	70.2%	69.0%	+20 K (cooler)
Pole 8 B	85.0%	74.7%	73.3%	+70 K (cooler)
Pole 10 A*	70.3%	59.1%	60.7%	+30 K (cooler)
* One lamp burned out between the baseline and post-installation measurements.				

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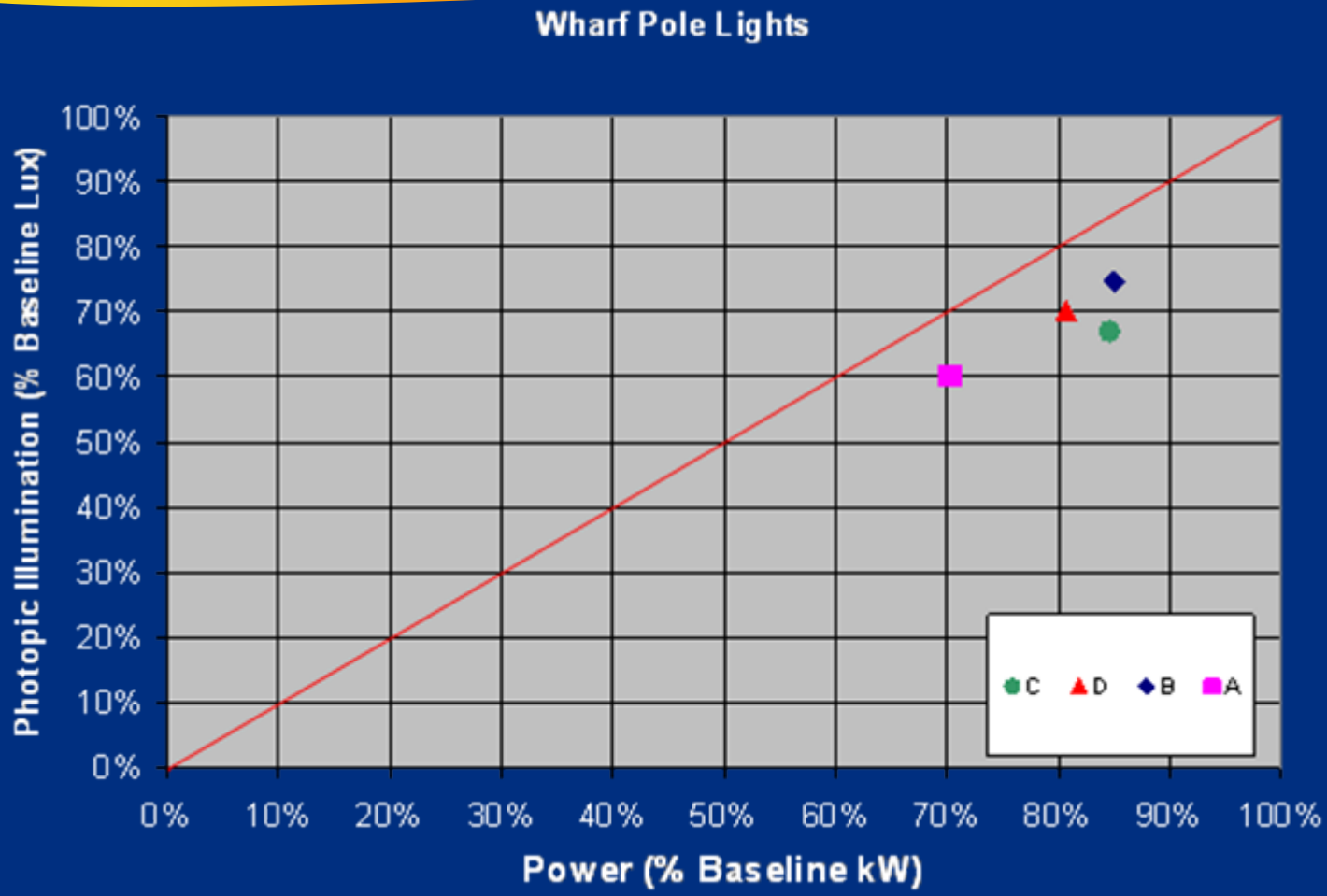

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Summary of Monitored Power Data for the Wharf Pole Lights

System†	Average Power (kW)	Average kVA	Average Power Factor (%)
Pole 4			
Baseline	9.995	10.058	99.4%
C	8.507	8.565	99.3%
Pole 7			
Baseline	9.907	10.010	99.0%
D	7.982	8.009	99.7%
Pole 8			
Baseline	9.896	9.946	99.5%
B	8.451	8.474	99.7%
Pole 10			
Baseline	10.070	10.139	99.3%
A	7.127	7.159	99.6%

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Wharf Area Light Power Quality Measurements				
System Description	**Crest Factor (CF) Current**	**Crest Factor (CF) Voltage**	**Total Harmonic Distortion (THD) Current**	**Total Harmonic Distortion (THD) Voltage**
Pole 4 Baseline (taken April 17-18, 2007)				
At cut-off switch	1.4	1.4 to 1.5	1.9 to 3.3%	0.8 to 0.9%
Pole 4 with C (taken August 10-11, 2007)				
At cut-off switch	1.4	1.4	2.1 to 3.8%	0.7 to 0.8%
At source-side of dimmer	1.4	1.4	2.4%	0.8%
At load-side of dimmer	1.5 to 1.6	1.5	12.3 to 13.6%	3.3%

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Wharf Area Light Power Quality Measurements				
System Description	**Crest Factor (CF) Current**	**Crest Factor (CF) Voltage**	**Total Harmonic Distortion (THD) Current**	**Total Harmonic Distortion (THD) Voltage**
Pole 7 Baseline (taken April 17-18, 2007)				
At cut-off switch	1.4	1.4	2.8 to 3.4%	0.8%
Pole 7 with D (taken August 10-11, 2007)				
At cut-off switch	1.4	1.4	1.6 to 4.9%	0.8%
At source-side of dimmer	1.4	1.4	1.8%	0.8%
At load-side of dimmer	1.4	1.4	1.5 to 1.8%	1.2%

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Wharf Area Light Power Quality Measurements				
System Description	**Crest Factor (CF) Current**	**Crest Factor (CF) Voltage**	**Total Harmonic Distortion (THD) Current**	**Total Harmonic Distortion (THD) Voltage**
Pole 8 Baseline (taken April 17-18, 2007)				
At cut-off switch	1.4	1.4	2.5 to 4.7%	0.8%
Pole 8 with B (taken August 10-11, 2007)				
At cut-off switch	1.4	1.4	2.0 to 6.1%	0.7 to 0.8%
At source-side of dimmer	1.4	1.4	2.1%	0.8%
At load-side of dimmer	1.4	1.4	1.6 to 2.2%	0.8 to 0.9%

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Wharf Area Light Power Quality Measurements				
System Description	**Crest Factor (CF) Current**	**Crest Factor (CF) Voltage**	**Total Harmonic Distortion (THD) Current**	**Total Harmonic Distortion (THD) Voltage**
Pole 10 Baseline (taken April 17-18, 2007)				
At cut-off switch	1.4	1.4	2.9 to 5.0%	0.7 to 0.9%
Pole 10 with A (taken August 10-11, 2007)				
At cut-off switch	1.4	1.4	1.6 to 6.2%	0.7%
At source-side of dimmer	1.4	1.4	1.6%	0.8%
At load-side of dimmer	1.4	1.4	1.7%	1.0%

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Economic Analysis Summary for the Wharf Pole Lights					
System	Annual Energy Reduction (kWh/yr)	Annual Energy Cost Reduction ($/yr)	Total Installed Cost ($)	Simple Payback (years)	Net Present Value ($)
Pole 4 C	969	116.27	$7,760.00	66.7	-$6,134
Pole 7 D	1,244	149.27	$10,700.00	71.3	-$8,614
Pole 8 B	936	112.32	$8,562.50	76.2	-$6,993
Pole 10 A**	1,410	169.19	$10,322.90	61.0	-$7,958
** Numbers corrected to nine dimmed lamps to make results comparable with the other technologies.					

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Where To Install HID Dimmers

- **Facilities with high electrical rates (> $0.06/kWh)**
- **Facilities with large number of HID lights (high load). Try to match load to max load for the unit. Parking lots, hangars, street lights.**
- **Long hours of use (> 8 hrs/day)**
- **Facilities that are overlit**
- **Facilities with differing levels of activity**

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Would you like to know more about this session?

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