LED Exterior Lighting Demonstration Project

March 5, 2010

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Sacramento Municipal Utility District

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Customer Advanced Technologies Program

**Mission:**
“Work with researchers, customers, and others to develop, test, evaluate and promote new and underutilized energy efficiency technologies.”

**Benefits:**
- Help customers sort fact from fiction
- Identify most promising technologies through direct, first-hand experience
- Avoid making major investments in technologies that don’t work
Lake Forest ARCO LED Demonstration Project

**Basecase**
- Canopy: twenty-four 320 Watt, pulse-start metal halide fixtures (346 Watts / fixture)
- Parking lot: eight 1,000 Watt, pulse-start metal halide fixtures mounted on 20 ft. poles (1,071 Watts / fixture)
- Car wash: four 100 Watt, pulse-start, metal halide fixtures (119 Watts / fixture)

**Retrofit**
- Canopy: twenty-four 118.5 Watt Beta LED fixtures (60 LEDs @ 525 mA)
- Parking lot: eight 138 Watt Beta LED fixtures mounted on 20 ft. poles (120 LEDs @ 350 mA)
- Car wash: four 104 Watt wall-mounted, Beta LED fixtures (80 LEDs @ 350 mA)
Lake Forest ARCO
13401 Folsom Blvd.
Folsom CA 95630
Horizontal Illumination Measurements

<table>
<thead>
<tr>
<th>Point</th>
<th>Metal Halide</th>
<th>Initial LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>20.0</td>
<td>29.4</td>
</tr>
<tr>
<td>H2</td>
<td>32.6</td>
<td>44.6</td>
</tr>
<tr>
<td>H3</td>
<td>27.7</td>
<td>46.0</td>
</tr>
<tr>
<td>H4</td>
<td>30.8</td>
<td>40.5</td>
</tr>
<tr>
<td>H5</td>
<td>28.3</td>
<td>34.5</td>
</tr>
<tr>
<td>H6</td>
<td>35.8</td>
<td>41.3</td>
</tr>
<tr>
<td>H7</td>
<td>37.8</td>
<td>44.5</td>
</tr>
<tr>
<td>H8</td>
<td>40.9</td>
<td>46.8</td>
</tr>
<tr>
<td>H9</td>
<td>40.9</td>
<td>45.1</td>
</tr>
<tr>
<td>H10</td>
<td>13.2</td>
<td>15.6</td>
</tr>
<tr>
<td>H11</td>
<td>21.8</td>
<td>29.0</td>
</tr>
<tr>
<td>H12</td>
<td>12.2</td>
<td>14.2</td>
</tr>
<tr>
<td>H13</td>
<td>8.4</td>
<td>8.9</td>
</tr>
<tr>
<td>H14</td>
<td>2.5</td>
<td>2.1</td>
</tr>
<tr>
<td>H15</td>
<td>3.2</td>
<td>3.3</td>
</tr>
</tbody>
</table>

Key to Symbols

- **G**: Gas pump
- **320 Watt, MH fixture**
- **T**: Trash can
- **Concrete seam**
- **Safety barrier**

NOTE: Not drawn to scale!
Vertical Illumination Measurements

<table>
<thead>
<tr>
<th>Point</th>
<th>Description</th>
<th>Metal Halide</th>
<th>Initial LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Gas pump display</td>
<td>20.1</td>
<td>19.1</td>
</tr>
<tr>
<td>B</td>
<td>Screw holes on pillar</td>
<td>19.0</td>
<td>21.0</td>
</tr>
<tr>
<td>C</td>
<td>On &quot;Cash&quot; sign</td>
<td>18.6</td>
<td>19.2</td>
</tr>
<tr>
<td>D</td>
<td>On post near curb</td>
<td>6.0</td>
<td>4.6</td>
</tr>
<tr>
<td>E</td>
<td>On face of curb</td>
<td>6.7</td>
<td>7.1</td>
</tr>
<tr>
<td>F</td>
<td>Side of person's face</td>
<td>7.5</td>
<td>6.4</td>
</tr>
</tbody>
</table>

Key to Symbols

- Gas pump
- Pillar
- Trash can
- 320 Watt, MH fixture
- Concrete seam
- Safety barrier

NOTE: Not drawn to scale!
Energy Savings Calculations

Canopy Lights

Energy savings = \[(\text{Total original Watts}) - (\text{Total LED Watts})\] x \(\frac{4,200 \text{ hrs / year}}{1,000 \text{ Watts / kW}}\)

= \[(346 \text{ Watts x 24 fixt.}) - (118.5 \text{ Watts x 24 fixt.})\] x \(\frac{4,200 \text{ hrs / year}}{1,000 \text{ Watts / kW}}\)

= \[(8,304 \text{ Watts}) - (2,844 \text{ Watts})\] x \(\frac{4,200 \text{ hrs / year}}{1,000 \text{ Watts / kW}}\)

= 22,932 kWh / year

Utility bill savings: 22,932 kWh / year \(\times\) $0.10377 / kWh = $2,379 / year
Energy Savings Calculations

Parking Lot Lights

\[
\text{Energy savings} = \left( \text{Total original Watts} \right) - \left( \text{Total LED Watts} \right) \times \frac{4,000 \text{ hrs / year}}{1,000 \text{ Watts / kW}}
\]

\[
= \left[ \left( 1,071 \text{ Watts} \times 8 \text{ fixt.} \right) - \left( 138 \text{ Watts} \times 8 \text{ fixt.} \right) \right] \times \frac{4,000 \text{ hrs / year}}{1,000 \text{ Watts / kW}}
\]

\[
= \left[ \left( 8,568 \text{ Watts} \right) - \left( 1,104 \text{ Watts} \right) \right] \times \frac{4,000 \text{ hrs / year}}{1,000 \text{ Watts / kW}}
\]

\[
= 29,856 \text{ kWh / year}
\]

Utility bill savings: \( 29,856 \text{ kWh / year} \times \$0.10377 / \text{kWh} = \$3,098 / \text{year} \)
Energy Savings Calculations

**Car Wash Lights**

Energy savings = \[(\text{Total original Watts}) - (\text{Total LED Watts})\] x 8,760 hrs / year
\[\text{1,000 Watts} / \text{kW}\]

\[= (119 \text{ Watts} \times 4 \text{ fixt.}) - (104 \text{ Watts} \times 4 \text{ fixt.})\] x 8,760 hrs / year
\[\text{1,000 Watts} / \text{kW}\]

\[= (476 \text{ Watts}) - (416 \text{ Watts})\] x 8,760 hrs / year
\[\text{1,000 Watts} / \text{kW}\]

\[= 525 \text{ kWh} / \text{year}\]

Utility bill savings: 525 kWh / year x $0.10377 / kWh = $54 / year
Lake Forest ARCO LED Demonstration Project

Results

✓ Excellent initial illumination levels
✓ Less glare
✓ Reduced light pollution
✓ Significant energy savings
  
  Canopy lights (65.7%): 22,932 kWh per year
  Parking lot lights (87%): 29,856 kWh per year
  Car wash lights (12%): 525 kWh per year
  Total annual savings: 53,313 kWh per year

✓ Estimated annual utility bill savings: $5,532
✓ Cost of project: $36,746
✓ SMUD research grant: $10,000
✓ Simple payback: $26,746 ÷ $5,532 = 4.8 years

The new LED lighting system was installed by Fillner Construction Inc.
SMUD Exterior LED Lighting Rebate Program

- Products must be on SMUD’s qualified product list.
- List will be updated approximately every two weeks
- All future applicants need to apply via the Design Lights Consortium (DLC) http://designlights.org/solidstate.about.php

- Incentive level
  - $0.10/kWh saved (first year savings)
  - Maximum limit: up to 20% of project cost or $50,000 (whichever is less)