



2019 ETCC Webinar Series

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LED Track Lighting

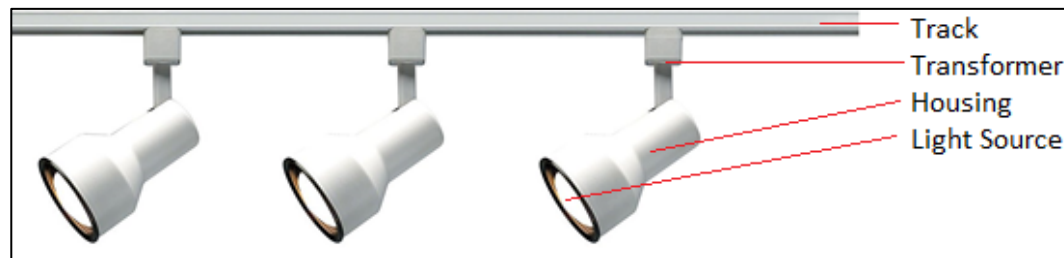
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Project Overview

Replacement of screw-based halogen track lighting with:

1. Screw-base LED replacement lamps
2. LED track-lighting luminaires with dedicated LED sources that cannot be replaced with other light sources

The evaluation criteria included luminous, energy and economic performance, using halogen track-lighting luminaires as the performance baseline.



The California Lighting Technology Center (CLTC) conducted the evaluation with funding and oversight from SCE's Emerging Technologies Program.

Methodology: Market Assessment

- Estimate track-lighting market share
- Energy impact in retail environments for SCE territory
- Identifying retail appropriate:
 - Screw-base LED replacement lamps
 - LED track-lighting luminaires
- Product literature review
 - peak electricity demand
 - energy use reduction
 - identify barriers to adoption



Methodology: Field Evaluation

- 9x Track Heads with screw-based halogen lamps
- LED screw-base replacement lamps and LED track-lighting luminaires selection lighting design criteria:
- CRI of 90 or greater to adhere to the California Energy Commission's Voluntary California Quality LED Lamp Specification
- CCT of 3,000 K to match existing LED downlight luminaires that were installed during a previous retrofit
- At the request of the retail establishment, LED retrofit approaches aimed at matching the pre-retrofit horizontal illuminance levels
- The retrofit LED track-lighting technologies were evaluated in two phases:
 1. Screw-base LED replacement lamps installed in the existing track-lighting luminaires
 2. LED track-lighting luminaires replacing all existing screw-base track-lighting luminaires.

**Downlights (yellow dots) were already replaced with LED prior to evaluation so they were not touched as part of this project*

Results: Market Assessment

- The ENERGY STAR® Light Bulb database was used to benchmark LED screw-base replacement lamp performance as of January 26, 2018.
 - 7,122 ENERGY STAR® certified LED screw-base replacement lamps
- LED track-lighting luminaire products were identified using publicly available data during the first quarter of 2016.
 - 41 manufacturers with a total of 3,467 LED track-lighting luminaires.

TABLE 1. LED SCREW-BASE REPLACEMENT LAMP CHARACTERISTICS

	Minimum	Maximum	Average	Standard Deviation
Power (W)	1.5	80	9.8	9.7
Light Output (lm)	120	5,300	797	452.50
Efficacy (lm/W)	1	139	81.4	11.7
Correlated Color Temperature (K)	2,200	6,500	3,375	901.7
Color Rendering Index (CRI)	80	98	84.9	4.2
Rated Life (Hours)	10,000	40,000	23,312	4,453.20
Warranty (Years)	2	23	4.1	1.7

TABLE 2. LED TRACK-LIGHTING LUMINAIRE CHARACTERISTICS

	Minimum	Maximum	Average	Standard Deviation
Power (W)	0.5	74	25	12.9
Light Output (lm)	88.25	7,000	1,748	1,156.9
Efficacy (lm/W)	8	143	68	23.3
Correlated Color Temperature (K)	1,960	6,500	3,293	571.7
Color Rendering Index (CRI)	70	98	87	6.8
Rated Life (Hours)	30,000	100,000	52,379	10,209.1
Warranty (Years)	1	10	5	2.1

Results: Field Evaluation

- 98 Track Heads with Halogen Lamps
 - Screw-based 1-for-1 Replacement
 - Replaced with 51 Dedicated LED Track Lighting Luminaires
- 31 Day Monitoring Period for each Technology
- Overall energy savings of 70% for either LED screw-base lamps and LED Track Lighting Luminaires
- The price per light source was used in a lifecycle cost analyses.
 - Pre-retrofit light sources are assumed to be halogen lamps at an estimated cost of \$5 per lamp.
 - The LED screw-base replacement lamp cost \$22 each
 - LED track-lighting luminaires cost \$65 each during the field evaluation.

Lamp/ Fixture	Total Energy Use (kWh)	Average Daily Use (kWh)	Calculated Annual Energy Use (kWh)
Baseline Halogen	2,991.6	93.5	34,123
LED Screw- base Lamp	879.6	27.5	10,033
LED Track- Lighting Luminaire	885.5	27.7	10,100

Technology Transfer

- LED lamps and luminaires had significant energy savings over the baseline Halogen lamps
- The Customized Program had minimal participation
- By the completion of the project, the code baseline had been updated to LED
- Ultimately technology was not adopted into a program as a Deemed Measure

Thank you!

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