

Demonstration Assessment of Light-Emitting Diode (LED) Freezer Case Lighting in Albertsons Grocery in Eugene, OR

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Study Participants:

Pacific Northwest National Laboratory
U.S. Department of Energy
LED Power, Inc.
Aztec Energy Partners
PECI, Inc.
Eugene Water and Electric Board

EE Richman
JR Tuenge

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Pacific Northwest National Laboratory
Richland, Washington 99352

Executive Summary

A retrofit of freezer cases at the Eugene, OR Albertsons store #507 indicates a potentially successful application of light-emitting diode (LED) technology with additional energy savings from the use of occupancy sensors. Total energy savings (including more efficient light source, reduced consumption from occupancy sensors, and reduced demand on the compressor) is estimated to be 2,659 kWh per year for a typical 5-door case. At Eugene electricity rates (\$0.0827/kWh), the calculated simple payback from energy savings alone is approximately 6.3 years. Maintenance savings are typically specific to each application and will not be the same for other applications. For this demonstration retrofit, maintenance savings are estimated to further reduce the payback to approximately 5.4 years. A complete simple payback analysis that might also include utility rebates and maintenance savings could be much shorter. Current Eugene area Utility rebates and Oregon tax credits could further reduce the payback period to about 1.6 years.

The logistics of arranging this comparison test did not allow for relamping of the existing fluorescent case lighting prior to the test and therefore a small portion of the apparent savings may be attributable to fluorescent lumen depreciation. It is more important to note that while the power consumed by the LED system showed a 61% reduction from that of the fluorescent system, a significant portion of the savings has resulted from a 36% reduction in illuminance as determined by relative measured levels before and after the retrofit.¹ This 36% light level reduction accounts for more than half of the savings, which may have been alternatively accomplished with a retrofit of different fluorescent technology in the form of a lower output lamp and/or lower driving ballast. However, the complete retrofit demonstrated here that incorporates step dimming based on occupancy would be difficult with fluorescent technology given the limited market offerings of specific dimming ballast technology.

It is also important to consider that other potential attributes of the LED application in freezer cases make it a potentially better retrofit than adjusted fluorescent lighting. These include potentially longer life and reduced freezer case heat load that contributes to additional savings with LED technology. The potential for savings from reduced freezer case heat load due to lighting is difficult to measure because of the number of variables affecting individual freezer case installations, so was only estimated in this analysis.

The uniformity of light distributed within the case was also evaluated and found to be generally comparable to the fluorescent system. It is commonly believed that the directional nature of LED light emission means that much higher uniformity can be achieved compared with the omni-directional light emission of a fluorescent system. However, in product cases

¹ The application of lower light level LED strips was the result of a conscious choice by the Albertsons store to provide an appropriate level of illumination at a preferred cost. It is common for refrigeration and freezer cases to be lighted above typical industry recommendations, and this planned retrofit to LED technology provided the opportunity to adjust and correct the corresponding levels at this location.

where widely varying package graphics and colors are the norm, the limited personal observation from this study revealed little noticeable difference among cases due to varying distribution uniformity.