

## PRACTICAL DESIGN AT WORK — OPERATIONS



Washington State  
Department of Transportation

## LED Adaptive lighting and illumination reform

### Background

WSDOT currently spends approximately \$7.8 million per biennium on power usage for illumination purposes. In keeping with our continuous improvement goal, WSDOT is continually looking for ways to be more efficient with our resources.

The lighting industry has changed dramatically in recent years. WSDOT has been evaluating light-emitting-diode (LED) luminaires for the past several years and until recently could not find a suitable replacement fixture for the High Pressure Sodium (HPS) luminaires we currently use. In the last year or two, a few manufacturers have improved their fixtures to the point where the LED fixtures are nearly comparable in light output to the HPS luminaires that WSDOT uses for roadway lighting.

### Original plan

Each year WSDOT spends close to \$5.5 million on illumination system maintenance and operations, with nearly \$4 million (73 percent) of the cost going toward electricity costs. In addition, nearly \$8 million per year is needed for life cycle replacement in order to effectively maintain the existing 60,000 light fixtures contained within the 3,100 lighting systems owned by WSDOT. Assuming we need each existing light fixture, the upfront cost for a complete conversion to LED is estimated to exceed \$50 million depending upon timing, pace and resources necessary for a large-scale conversion. Also, with electricity rates in Washington state averaging less than 7 cents/KWh, timing a large-scale replacement with the market cycle is critical to maximizing the return on investment. After examining these factors, it became apparent that WSDOT needed a more sustainable and practical approach to roadway lighting.

### Practical design solution

In April 2013, WSDOT began a pilot project to test the first light-emitting-diode (LED) lighting system on a state highway. The project installed new light fixtures with adaptive lighting, a system that allows crews to remotely adjust the light levels. The adaptive lighting system was a success, reducing power consumption 74 percent for the US 101 interchange with Black Lake Boulevard in Olympia. This led to an expansion of the pilot to include the US 101 and Cooper Point Road interchange located immediately to the east.



Before



After

## Results

This innovative approach is an example of applying the practical design philosophy of focusing spending where it's most effective to operational programs. In addition to the power savings and reduced preventative maintenance savings presented by LED technology, this effort provides the foundation for exploring public acceptance of time-of-day reduced lighting. Converting to LED, dimming, and on/off operation based on safety and mobility needs are just a portion of the issue. WSDOT and the University of Washington have joined forces to develop a risk and safety based decision-making process to help prioritize lighting investments.

Statewide, more than a dozen LED lighting projects are now underway, providing each region with LED lighting experience. Flexible and comprehensive procurement contracts through DES ensure WSDOT and other local agencies have access to the replacement LED fixtures and parts. These contracts, along with ongoing new products evaluation processes, make sure "best of class" materials, equipment and services are made widely available plus create continuous competition to drive down costs.

Additional information on the LED pilot project can be found at:

[www.wsdot.wa.gov/Design/Traffic/Electrical/LEDPilotProject.htm](http://www.wsdot.wa.gov/Design/Traffic/Electrical/LEDPilotProject.htm)

