



Session 5A

Emerging Lighting Technologies

Presented by:

Jack Callahan

Emerging Technology Program Manager

BPA Energy Efficiency

May 11th , 2011



Top Two Lighting Trends

1. Technology Innovation

- **LED:** Explosion of new products, rapid price and performance developments.

Improvements all around:

- HID – Dimmable electronic ballasts, controls, longer life, better lumens per watt
- Improving Fluorescent, 46,000 hours

Top Two Lighting Trends

2. Lighting Controls – From watts/SF to kWh/SF

- Codes & Standards, ASHRAE 90.1 – getting tougher: eliminating incandescent and T12; lower LPDs, more automatic controls required, more impact on retrofits
- Digital Controls– wireless, dashboards, “...all done in software”
- Better sensors and communications.
- **Utilities exploring performance based incentives**

Putting it All Together: *Adaptive Lighting*

Advance Control
Strategies

High Performance
Sources

- Bi-Level control approach
 - For low occupancy non-task spaces (outdoors, stairwells, hallways etc.)
 - Occupancy controls, Time clocks, photocells, and
- LED, fluorescent, induction sources
- Potential of 30 – 75% energy savings
- **Gaps:** Measurement and Verification of energy savings

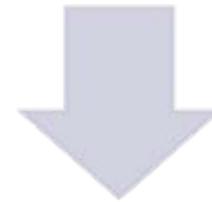


Reducing Lighting kWh per SF

Themes for Today

**Advanced
Control
Strategies**

**High
Performance
Sources**



Reducing Lighting kWh per SF



Implementing Advanced Lighting Efficiency

Presented by:

Ray Hartwell, Commercial Sector Lead
BPA Energy Efficiency

Overview

- New Measures
- Advanced Control Strategies
- Tomorrow's Challenge and Opportunity
- Delivering Savings at Volume

New Measures: More Savings Opportunities

- BPA has expanded the number of measures in the C&I Lighting program and has raised reimbursement rates
- Linear Fluorescent
 - Low Wattage
 - Delamping
 - Dimmable Cold-Cathode
 - Induction Screw-In
 - LED
 - Area Lights, Recessed Cans, Refrigerated Case Lighting, Signage
 - Canopy Lights, Screw-In Reflector Lamps (demonstration technologies)
 - Non-Standard Measure Opportunities

Advanced Control Strategies

- Lighting Calculator 2.2 includes increased functionality to support use of lighting controls
- Customizable hours reduction, with defaults
- Balance between accuracy and implementability

Measure #	Space ID	Quantity	Equipment	Type	Sub-type	Lamp Wattage	Lamp per Fixture	kWh/year - Adjusted for HVAC		
								Baseline	Savings or % increase	
Deemed Lighting Measures										
1	Main Area	100	ExistingFixtures	T12 8ft	Slimline, Magnetic Ballast		75	2	Baseline	54,521
		100	Retrofit	T8HP 4ft	High-performance, Normal Light Output Ballast		32	3	Proposed (w/ controls)	19,382
		10	Controls	Photocells	wall-mounted	% Reduction in Hours >>	25%		Savings or % increase	35,139

**If Maximum Eligible Rebates is blank, check that all data is entered correctly and that the combination of existing fixtures and proposed new fixtures is eligible (see the Program Offering page for more details on measure eligibility).*

Baseline	54,521
Proposed (w/ controls)	19,382
Savings or % increase	35,139

Tomorrow's Challenge and Opportunity

- Drivers of change demand adaptive program management
 - New technologies
 - Adaptive lighting and “redesign” savings
 - Federal standard changes
- Huge opportunity to achieve greater site savings than ever before – but complex projects
- Many program design options, each with a set of tradeoffs

Delivering Savings at Volume

- Programmatic challenge of balancing depth and breadth
- Restructured T12 to HP T8 offer as an example:
 - Was: Flat for all multi-lamp T8 retrofit
 - Now: 3 levels
 - Lamp for lamp →\$
 - Lamp for lamp with low wattage → \$\$
 - Delamping → \$\$\$
- Program offer can complement technology to bring ideas to implementation at scale

Questions?

For more information, contact:

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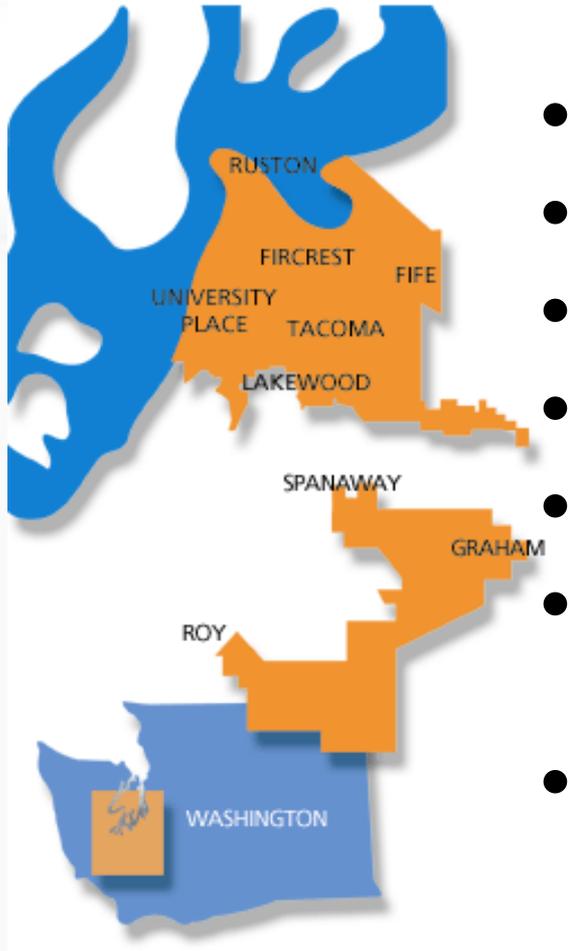
Emerging Lighting Technologies Tacoma Power C/I Projects

BPA Energy Efficiency Utility Summit
Portland May 11, 2011

Conservation Resources Management

Peter Meyer, Commercial-Industrial Manager

Who We Are



- Municipal utility serving Tacoma area
- Over 165,000 accounts
- Commercial Rates 4.5-6.9¢/kWh
- Service territory 180 square miles
- Generation capacity: 713 MW
- Tacoma Power's hydro projects provide about 46% of energy
- BPA provides most of the rest

Background

- **2010 savings goal: 5.4 aMW**
- **2010 actual savings: 8.39 aMW**
- **About 60% was from lighting (all sectors)**
- **2010 Bright Rebates (Commercial-Industrial lighting):**
 - 10.8 million kWh
 - 127 projects
 - \$1.6 million incentives provided

C/I Conservation Programs

- **Bright Rebates Program**
(efficient lighting)
- **Compressed Air Efficiency Program**
- **Custom Retrofit Program**
- **Energy Smart Grocer Program**
- **Equipment Rebates**
(Variable Frequency Drives; Heating, Ventilating and Air Conditioning equipment, appliances)
- **Federal Facilities Program**

C/I Conservation Programs

Continued

- **Energy Bill Profile**
(Analysis of facility electric usage trends)
- **LED Traffic Signals**
- **New Construction Program**
- **On-site walk through energy audits**
- **Zero Interest Loan Program**

Case Study

Simpson Lumber Lighting Project



Gary Watson, Electrical Systems Supervisor

Project Overview

New equipment:

- T5 High Bay Fluorescent Fixtures
- Occupancy sensors

Annual kWh savings:	2,025,670
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Total project cost:	\$480,810
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Tacoma Power Incentive:	\$308,122
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Net cost to Simpson:	\$92,688
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Payback period:	1.3 years
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Case Study

Tacoma Art Museum Lighting Project



- **Removed PAR38 Incandescent**
- **Installed Ceramic Metal Halides**
- **85% energy savings**
- **Better light quality**
- **Less maintenance costs and lower energy bill**

Case Study

Tacoma Art Museum Lighting Project



- Incentive: \$52,533
- National recognition by GE Lighting
 - www.BetterMuseumLighting.com
- Energy savings: 317,456 kWh
- Annual Power bill savings: \$15.9K

Pilot Project

TPU Parking Lot LED



400 watt High Pressure Sodium

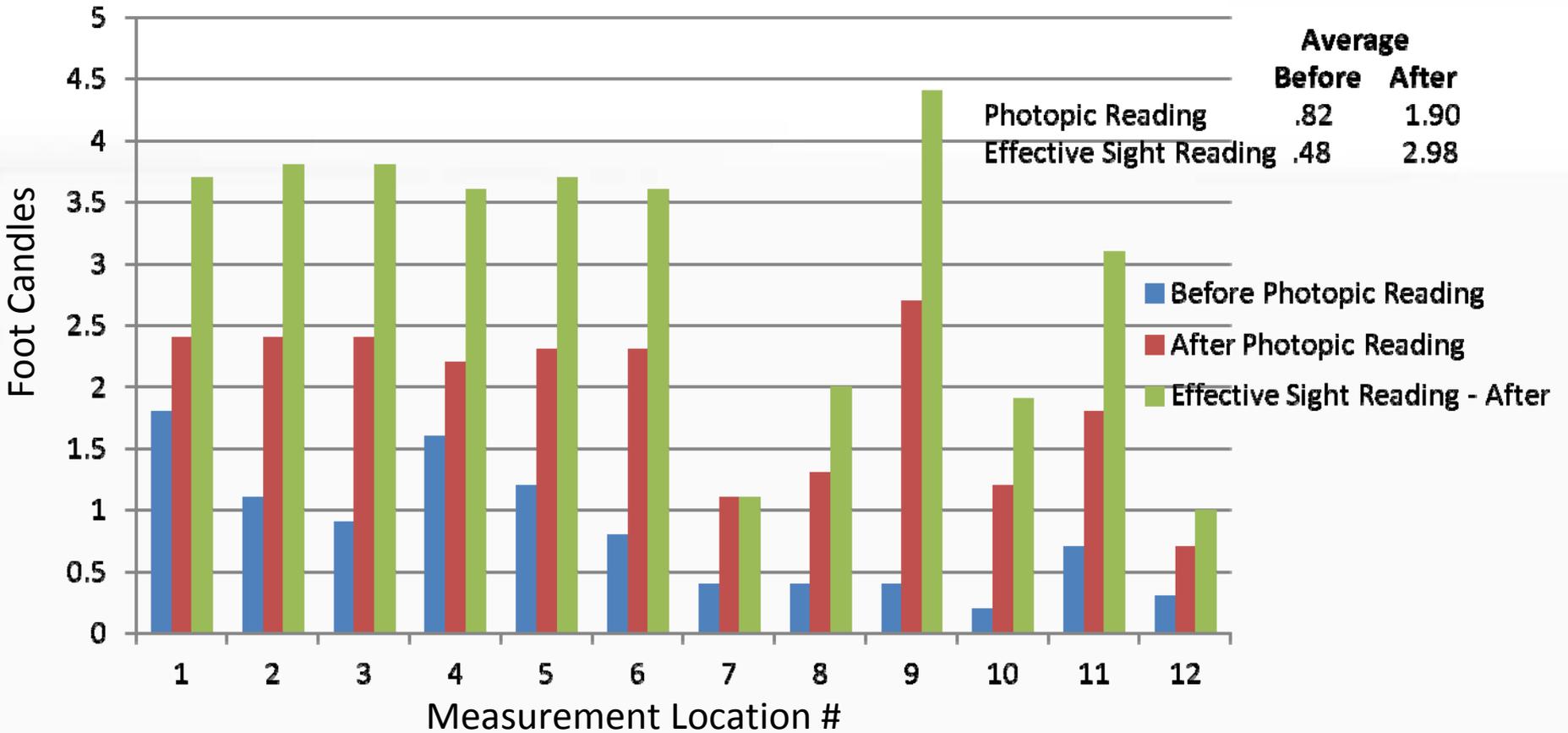
- Dim
- Yellow light with poor visibility
- 460 watts



211 watt LED

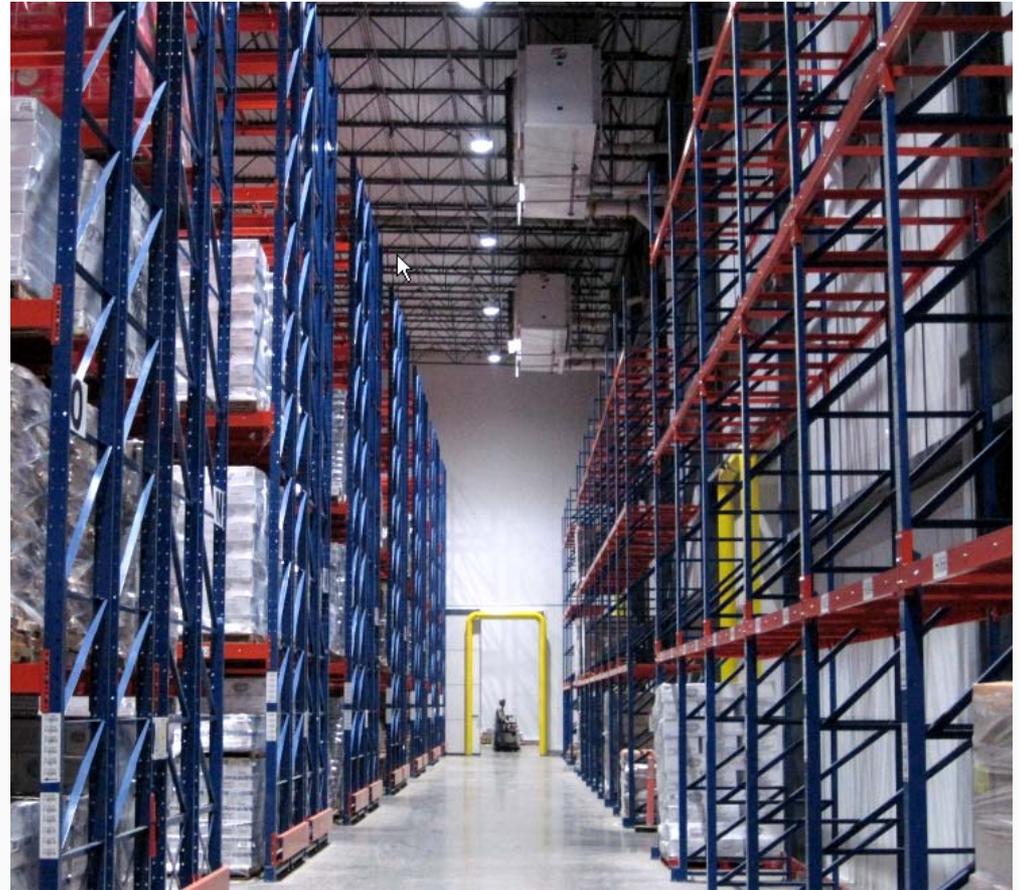
- Bright
- White light with good visibility
- 211 watts
- 55% less energy use

Parking Lot Lighting Levels



New Construction Project: VersaCold

- 196K sq ft new building built 2010
- 75% more efficient than code
- Annual savings of 4.7 million kWh
- Multiple ECMs installed
- Incentive: \$822,471
- ROI – 57%



LED Lighting Fixtures with controls

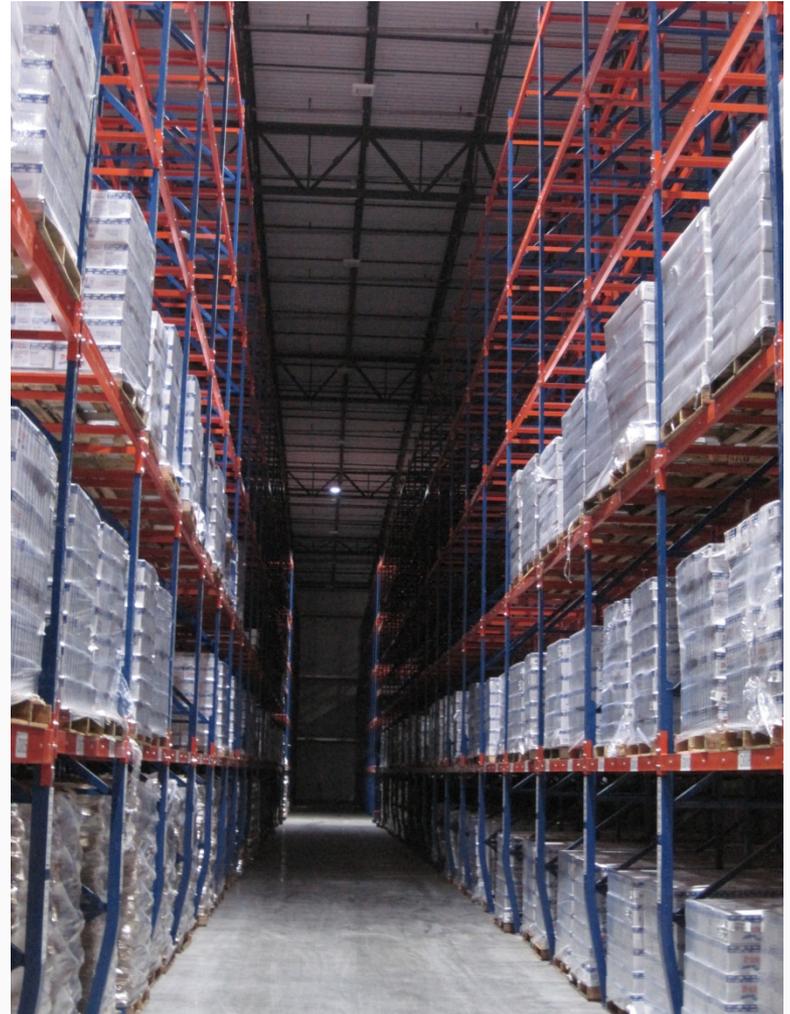
VersaCold Project: LEDs



**LED Beta Lighting Fixtures with
Controls set at 30 second time delay**



VersaCold Lighting



Lighting Details

- **Lighting Savings: 1.6 million kWh**
 - Reduced refrigeration consumption
- **Beta Fixture wattage: 195 watts**
- **Code baseline: 400 W Metal Halide**
 - 1.18 watts per sq ft
- **276 Fixtures installed**
 - 0.29 watts per sq ft

Case Study

Whirlpool New Construction



Rick Elliott



Whirlpool warehouse in Frederickson

Equipment Installed

High Bay Fluorescent Fixtures

Occupancy and daylight sensors

Annual kWh savings:	3,771,032
Lighting fixture costs:	\$565,860
Tacoma Power Incentive:	\$361,610
Annual energy cost savings :	\$152,879
Payback period:	instant

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New Construction VersaCold Cold Storage

- Central computer refrigeration control system
- Variable frequency drives on the evaporator fans
- Top efficiency compressors, condensers, and evaporator coils
- Efficient warehouse traffic doors





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