What Went Wrong?

Lessons Learned from Lighting Professionals

Moderated by:

Armando Berdiel, LC, Meng.

Panelists:

Shaun Darragh, LC, MIES

Daniel Salinas, LC, IES

Armando Berdiel, LC, Meng.

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Before we begin...

During the Webinar

- Attendees will be muted
- Please use the chat feature in the control panel to submit questions to LDL staff
- The presenter will pause to address questions every ~10 minutes
- Please participate in the online polls.

Following the Webinar

- Please take the short survey
- A recording and the slide deck will be posted on LDL's webpage
- Reach out to LightingDesignLab@seattle.gov with comments or questions.

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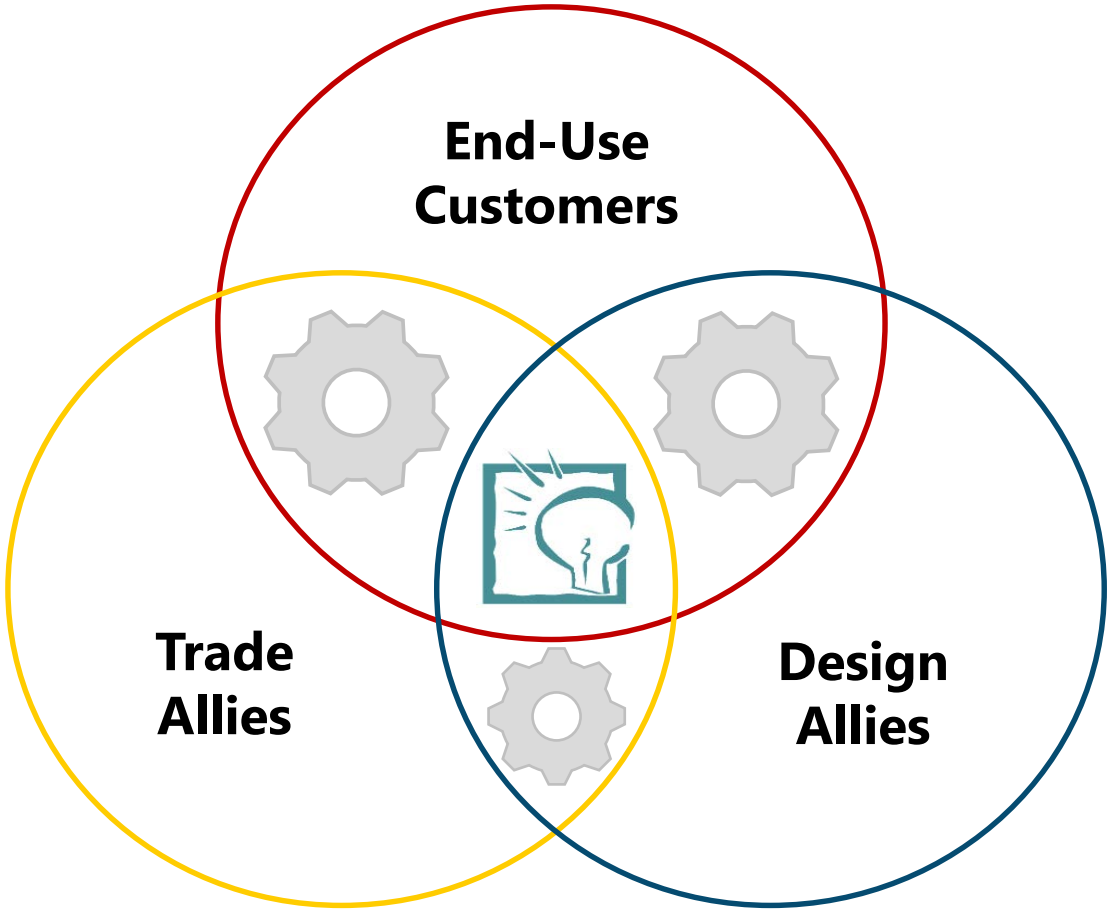
It takes a village…



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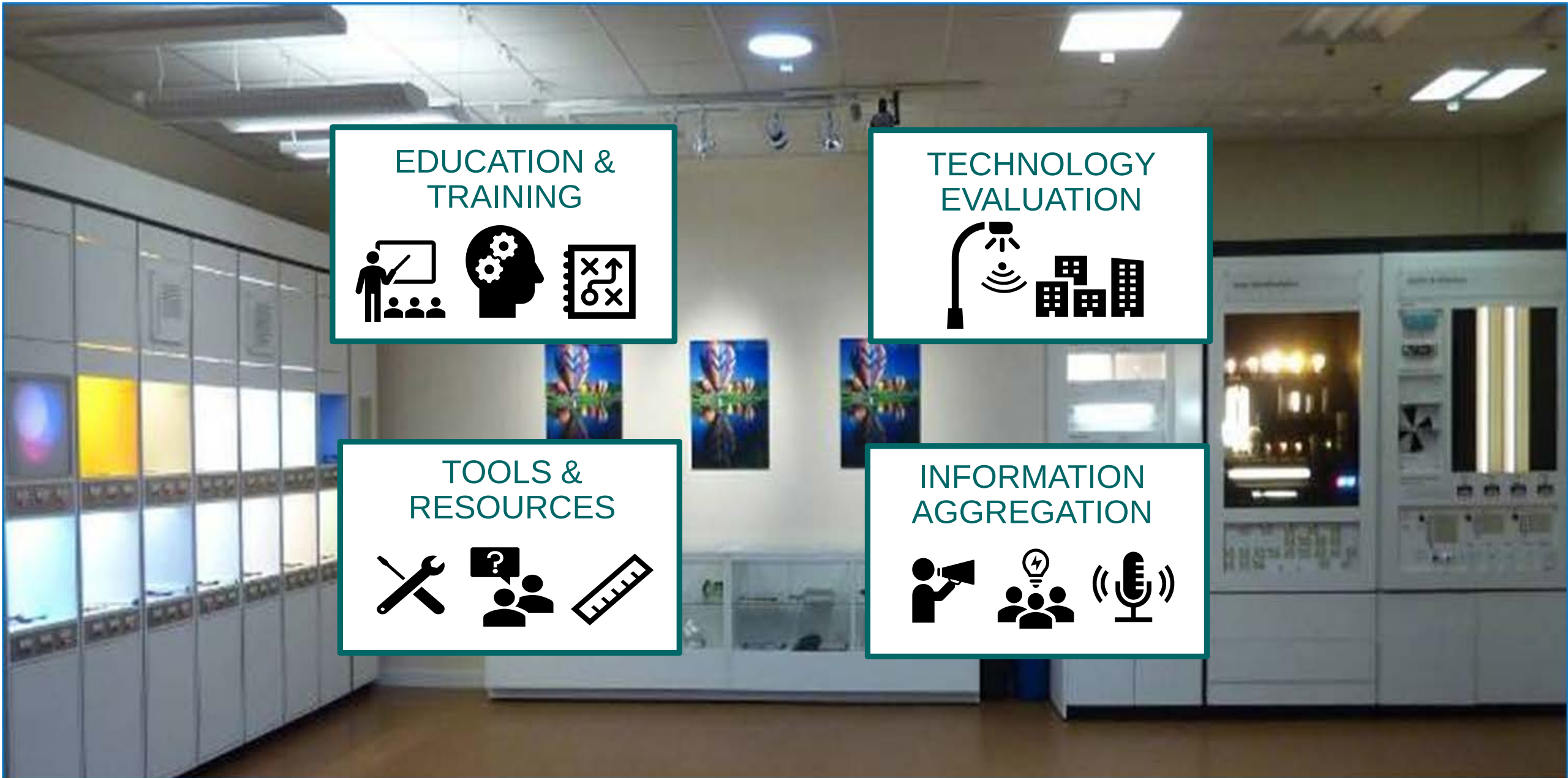
LDL’s Four Core Service Areas



Today’s Panelists

Shaun Darragh, LC, MIES

Daniel Salinas, LC, IES

Armando Berdiel, M.Eng., LC

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Shaun.Darragh@seattle.gov

- More than 30 years in the lighting industry as an architectural lighting designer, instructor, daylighting and sustainability specialist, lighting control system consultant, and theatrical designer.
- Has taught and consulted on sustainability issues, lighting, and daylighting for the Lighting Design Lab and University of Washington Architecture Department

Selected Projects

- King Abdullah University of Science and Technology
- Masdar Headquarters
- Pearl River Tower
- Canyon Ranch Spa Club
- Amgen Helix Campus
- Reebok World Headquarters
- Reno Sparks Convention Center
- Pacific Place Retail Center
- Ala Moana Retail Center
- REI Denver Flagship Store
- Boeing Commercial Airplanes Offices
- Real Networks Headquarters
- Tommy Bahama Headquarters
- Microsoft B16/17
- San Francisco PUC Headquarters

Selected Awards

- Amgen Helix Campus
- Amgen Helix Pedestrian Bridge
- Canyon Ranch Spa Club
- Harvard University 60 Oxford
- King Street Station
- Lighting Design Lab
- Methodist Hospital Research Institute
- Microsoft B16/17
- One Cambridge Center
- Pacific Place Retail Center
- Reebok World Headquarters
- Reno Sparks Convention Center
- Real Networks Headquarters
- SFPUC Headquarters
- Tommy Bahama Headquarters

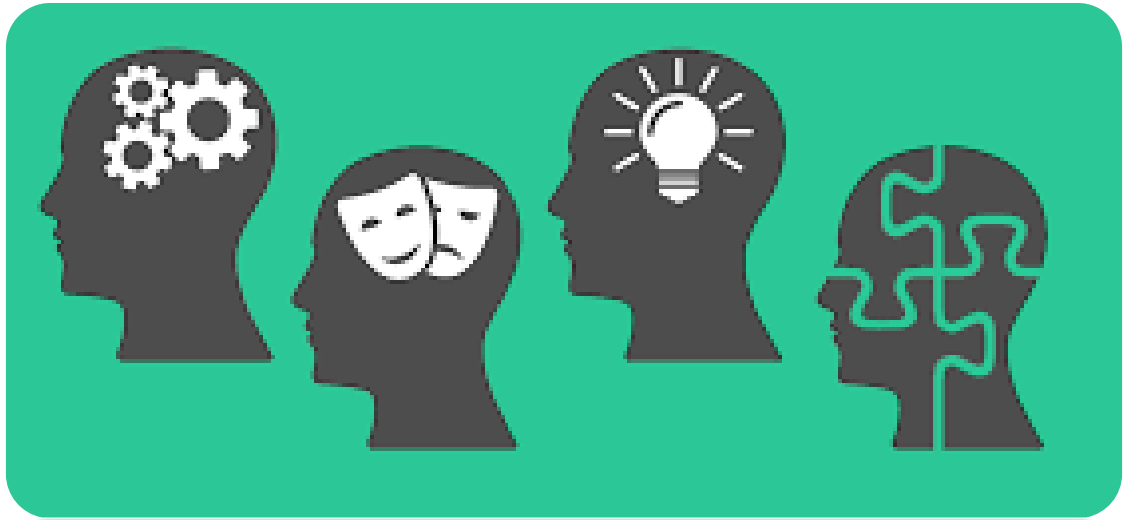
AIA COTE Top 10

- REI Flagship Store Denver
- King Abdullah University of Science and Technology
- San Francisco PUC Headquarters
- Manitoba Hydro Place

Time for a Quick Poll…

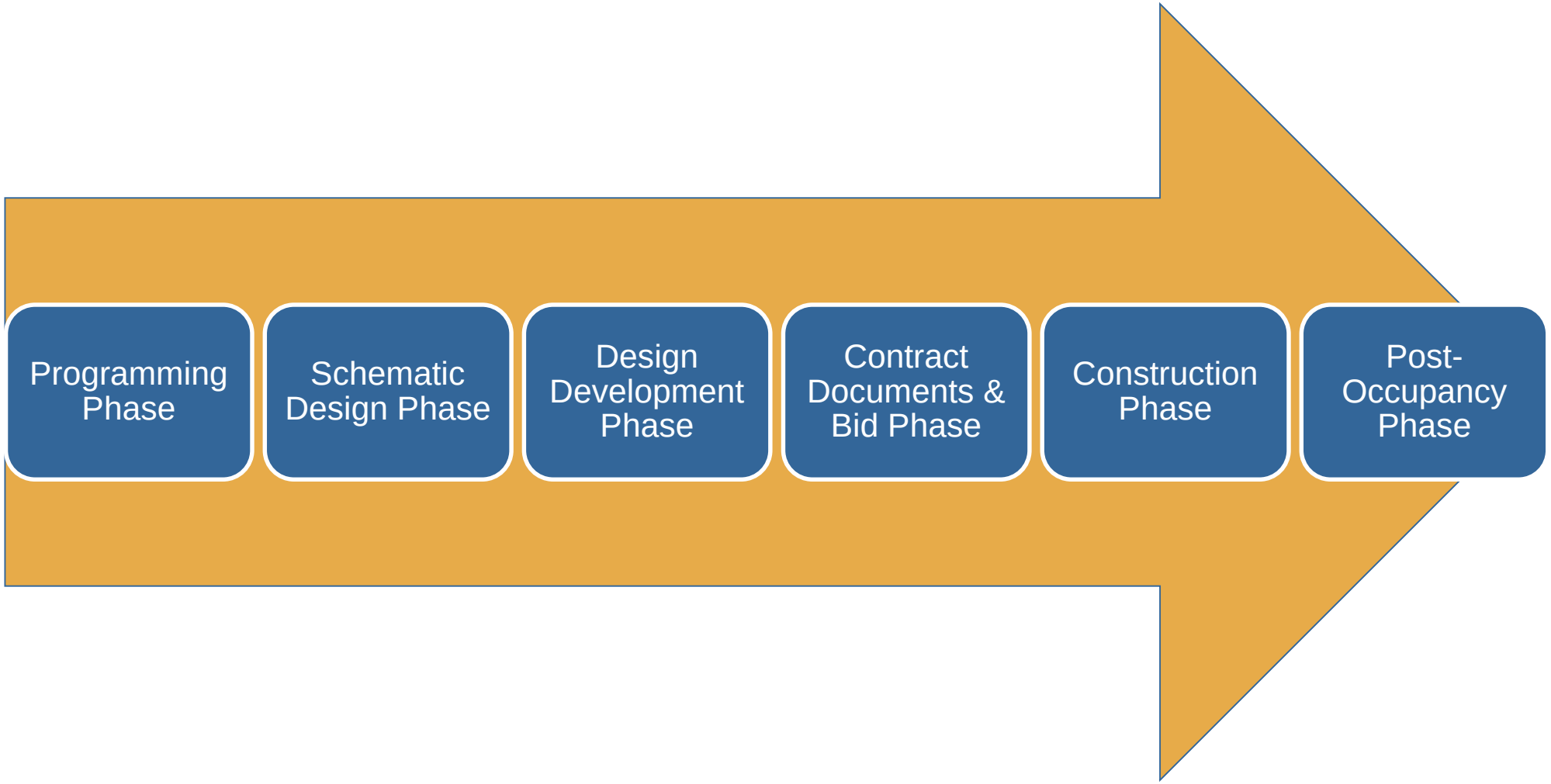
Enough about me…

Let’s talk about you…



Common Obstacles in Lighting Project

Construction Phases



Common Pain Points for Lighting Retrofit Projects

- Constructability
- Cost
- Maintenance

- Not adding Controls
- Design Expectations
- Stakeholder Engagement

Design Expectations & Maintenance

Class Number and Title

Presented by

Daniel Salinas

President, Lighting System Design: Salinas Lighting Consult

September 22, 2020

Today’s Learning Outcomes

- To understand the needs of a project and why long term maintenance should be part of the design process
- Ensuring there is full understanding of an owner and users requirements during the design process
- How design concepts not fully resolved in advance, can become a long term issue if not dealt with at the time of construction.

Entrance to Vatican City
Photo by Daniel Salinas

Bellevue Arts Museum

- Founded in 1975
- Moved to Bel-Square in 1982
- New Museum opened in 2001
- Closed in 2003
- Reopened in 2005

Bellevue Arts Museum
Stephen Holl Architects

Bellevue Arts Museum

Photo courtesy Arcspace.com

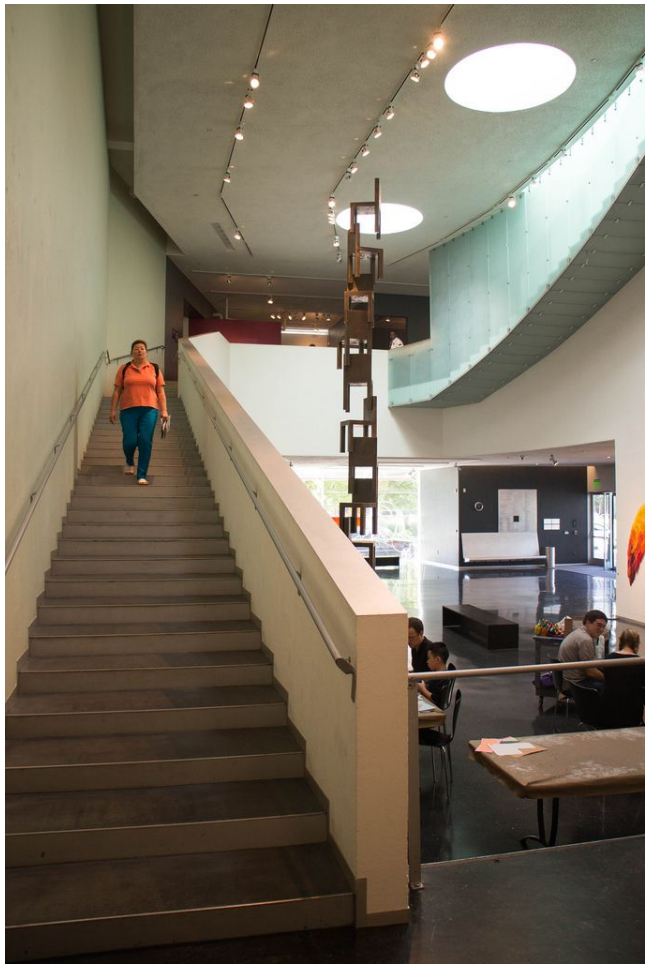


Photo courtesy Pinterest

Taste Café at Seattle Art Museum

- Constructed in 2007
- Café remodeled approximately 2010

Photo courtesy Taste Café at SAM

Taste Café at SAM

- Clear cased glass v/s art glass
- Lighting controls
- Design collaboration

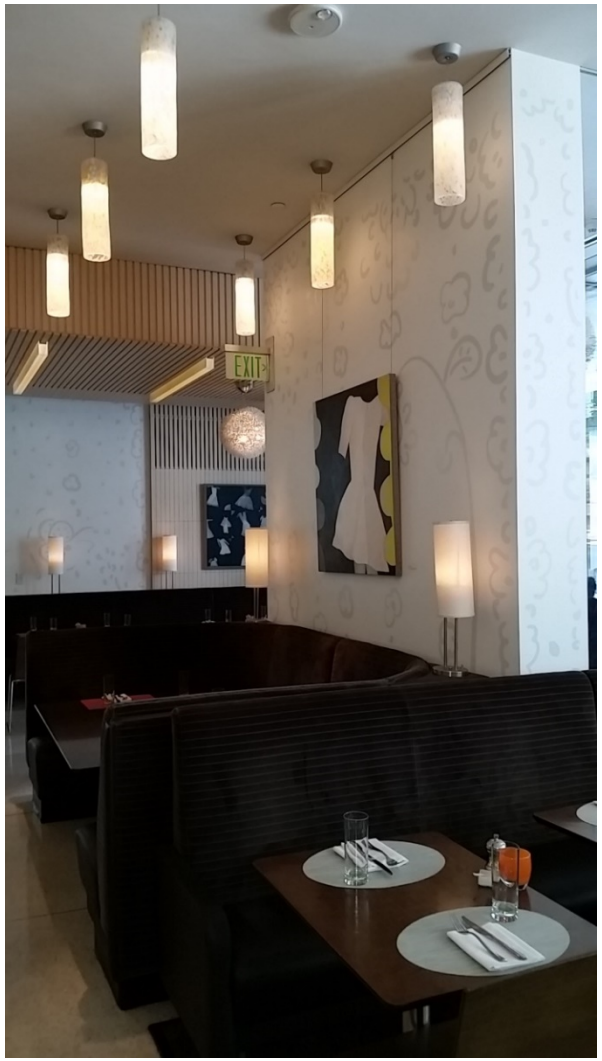


Photo courtesy Taste Café at SAM

Makah Cultural and Research Center

- Constructed in 1978
- Lighting and controls renovation in 2017

Photo courtesy Makah Cultural and Research Center

Makah Cultural and Research Center

Photo courtesy Taste Café at SAM

Up Next: Shaun Darragh

View from Palatine Hill, Rome, IT
Photo by Daniel Salinas

Controls & Stakeholder Engagement

Why use networked lighting controls?

- Flexibility
- Productivity
- User Satisfaction
- Aesthetics
- Maintenance
- LEED / WELL / LBC
- Energy Savings
- Energy Codes

Tommy Bahama Headquarters
SkB

What went wrong?

What went wrong?

Pacific Place

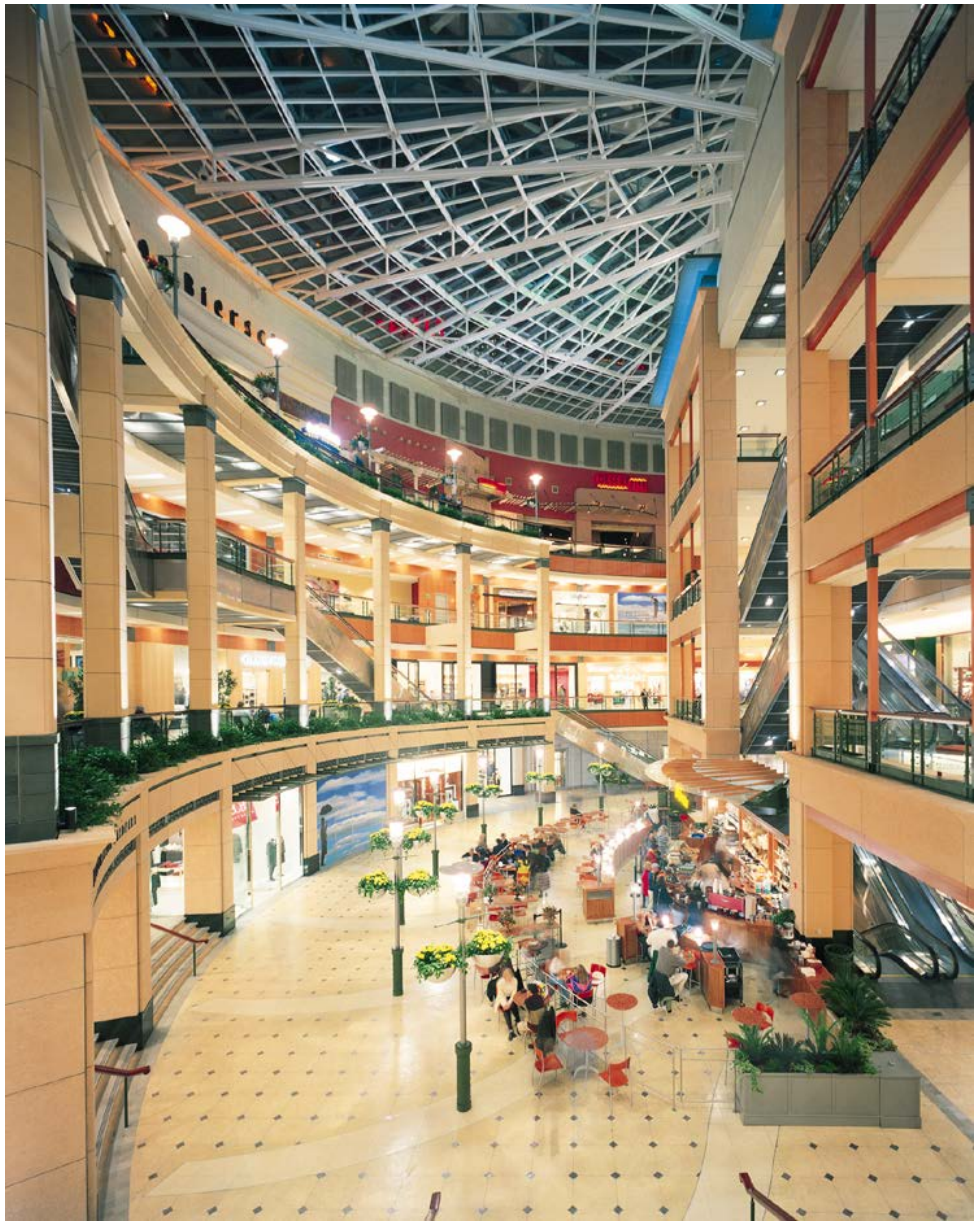
- Design Mid 1990s
- Opened December 1998

- NBBJ
- Koetter Kim
- JMA
- Bouillon

Pacific Place

- Design included lighting controls

- Daylight threshold switching
- Neon Dimming
- CFL Dimming
- Linear FL Dimming
- Zoned Area Switching



Pacific Place

Pacific Place

Ala Moana Mall Waikiki, HI

525 Golden Gate – SFPUC Headquarters

- Design Begun 2006
- Opened 2012
- Designed to be among the most energy effective urban office buildings in the US
- AIA COTE Top 10

- KMD Architects
- JMA

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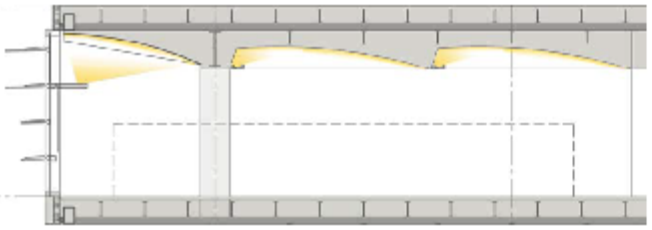
Typical Control Strategies

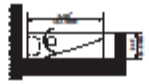
- Manual Switching
- Manual Dimming
- Scene / Preset Control
- Occupancy Sensing
- Vacancy Sensing
- Daylight Harvesting
- Task Tuning
- Time Scheduling
- Astronomic Scheduling

San Francisco Public Utilities Commission Headquarters
KMD

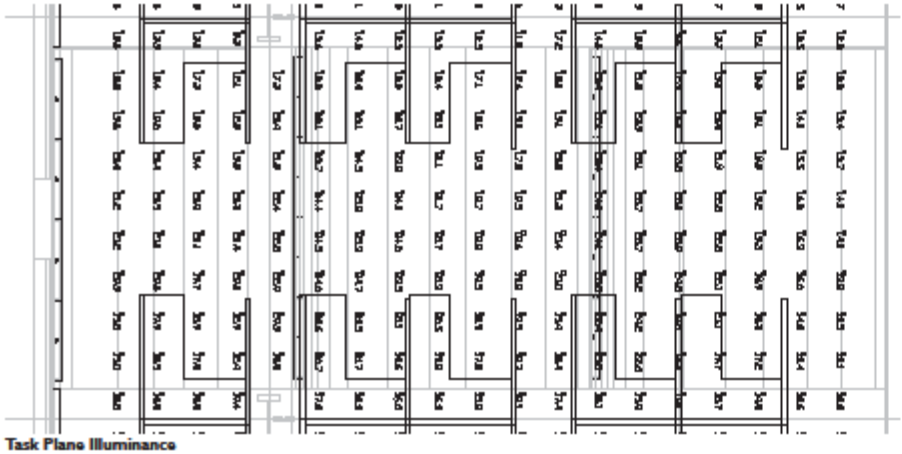
Office Lighting

Interior Perspectives





Office Section



Task Plane Illuminance

office lighting concepts

option 2

Option 2: Integrated Architectural Cove

Lighting system is comprised of high performance cove lighting integrated into architectural elements equipped with one (1) 28 watt T5 fluorescent lamp in cross section. Within the daylighting zone, an indirect fluorescent luminaire will be mounted on the interior light shelf.

Each workstation will be equipped with energy efficient task lights; fluorescent is preferable. Task lighting will provide approximately 30-40fc at the task. Energy efficiency for the office lighting is achieved by a three part hybrid system. The three parts are: natural light, electric ambient and electric task lighting. This type of system will provide an excellent and balanced light quality throughout the office environment.

Lighting the ceiling plane provides a perception of brightness within the office environment, and balances the brightness of the natural light.

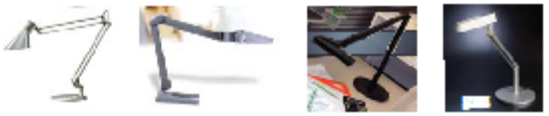
Lighting controls are an important key to the conservation of energy and maintenance of a comfortably balanced lit space. An intelligent addressable control system is recommended for the integration of shading devices, daylight and occupancy sensors, and scheduling software. The control system will modify shade positions and electric light levels to complement for transient incoming natural light (daylight harvesting). Dimmers and switches coordinated with occupancy sensors in interior zones save energy and meet personal preferences for work space lighting

Electric Ambient Lighting

- Sample Area: 3,900 sq. ft.
- Average Illuminance: 18.6 footcandles
- Number of Lamps: 60 T5 standard output lamps
- Proposed LPD: 0.46 watts / sq. ft. (connected load)
- LPD allowed by Title 24: 1.1 watts / sq. ft.
- 58% below Title 24

Task Lighting

- Target Illuminance: 30-40 footcandles
- Lamping: Fluorescent ~13W
- Proposed LPD: 0.18 watts / sq. ft. (connected load)
- LPD estimated by Title 24: 0.2 watts / sq. ft.



SFPUC Administration Office Building at 525 Golden Gate Avenue

May 21, 2007

KMD | STEVENS

A Joint Venture

PIVOTAL

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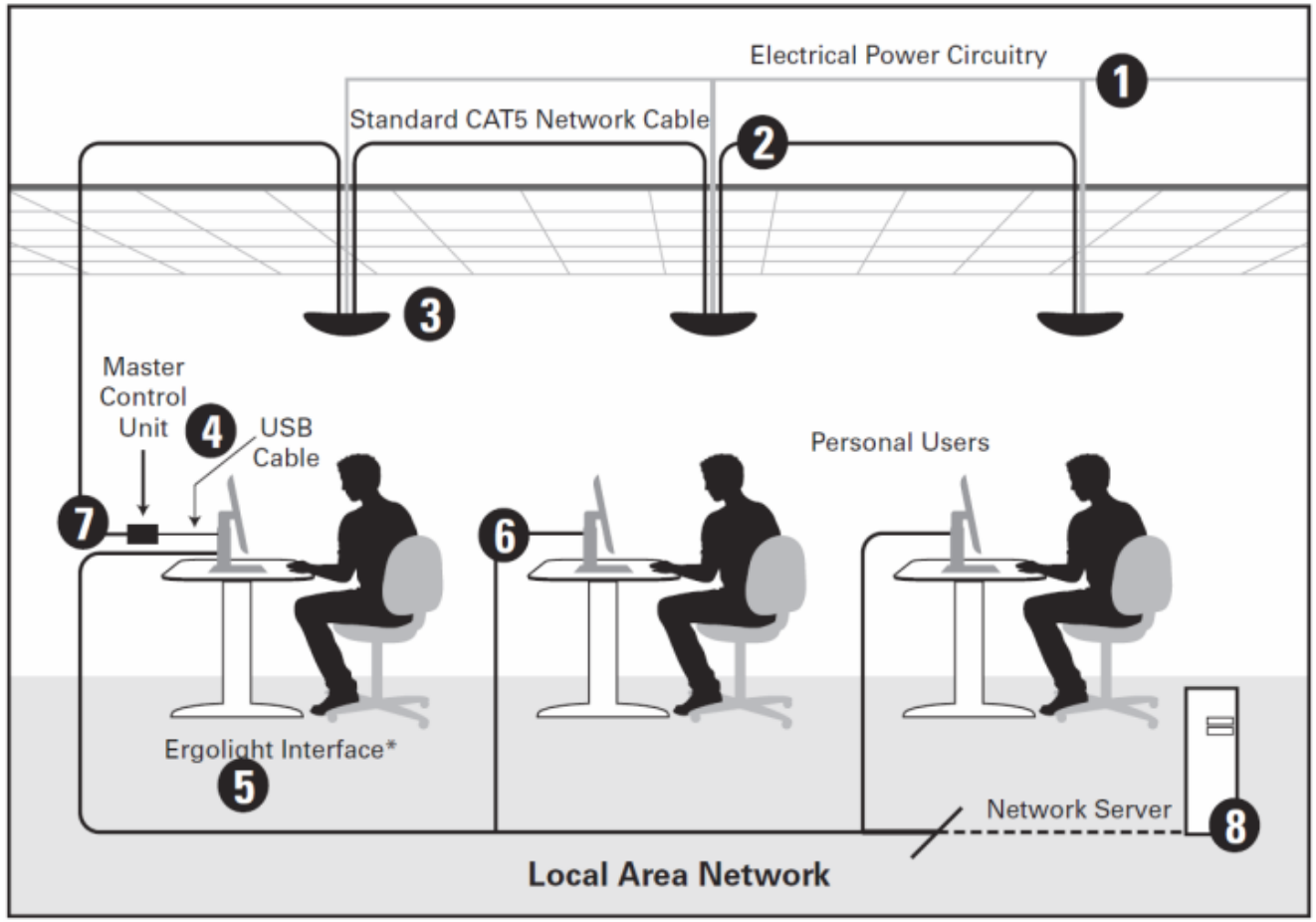
LLLC



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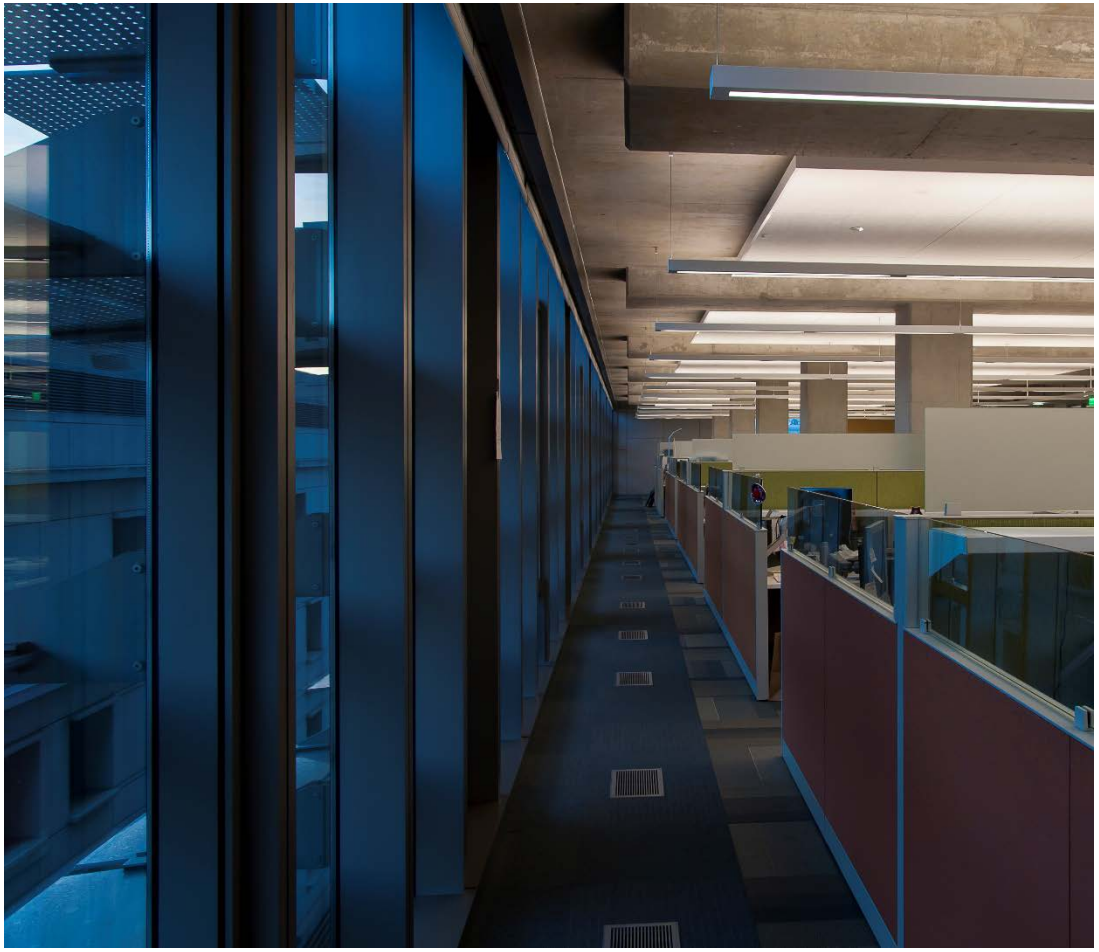
Office Lighting



Dashboarding And……

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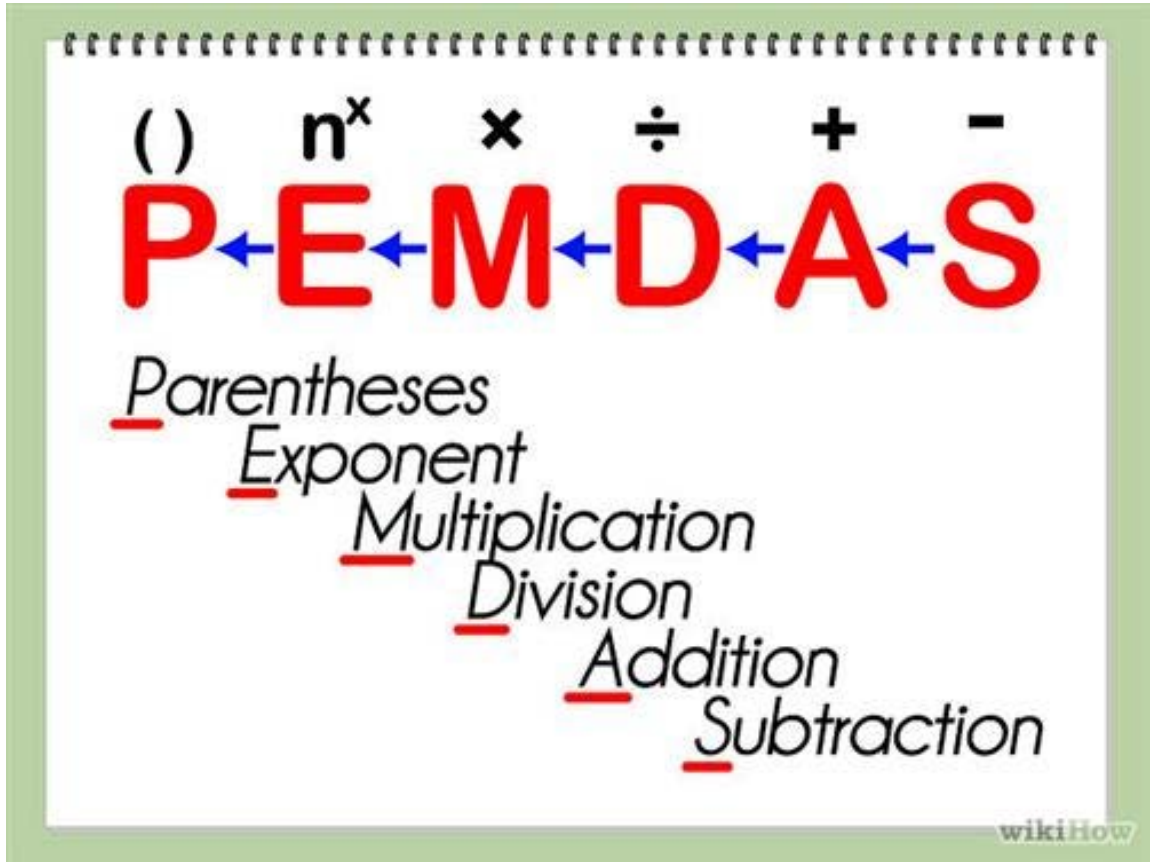
Sequence of Operations

Ok….so now we have all of this great hardware….now what?

- Who is going to tell us what it's really supposed to do?
  - Lighting Designer?
  - Electrical Engineer?
  - Architect?
  - Owner?
  - Factory Tech?
  - Contractor?



Sequence of Operations

Whoever winds up doing it….a sequence of operations is required to tell the contractor, startup technician, and commissioning agent how the system is supposed to function.

- What are the time and astronomic schedules
- Which sensors are vacancy and which are occupancy?
- What is the vacancy timeout?
- What are the target light levels for task tuning?
- What switches or dimmers are tied to which zones?
- What zones are included in each preset and at what levels?
- What are the daylight zone dimming thresholds?
- Are there any specialty programming tasks like partition controls?

Sequence of Operations

There are lots of ways that SOO information may be conveyed.

- Basic Matrix
- Narrative
- Detailed Matrix
- Panel Schedule
- Dimming Schedule
- Most manufacturers have their own system

Microsoft Building 87
JPC

Sequence of Operations

J. Typical private office

1. All general lighting will be programmed to automatically turn “ON” as the user enters the room through the Occupancy Sensor initial light level will be 50% of light output,

2. Four button switch with off and raise/lower function override switch located at door will override current light setting as long as the override light level isn’t above the set point for the daylight sensor during daytime hours.

   a. Pressing Button 1 will turn all fixtures to 50% light output.

   b. Pressing Button 2 will turn all fixtures to 70% light output.

   c. Pressing Button 3 will turn all fixtures to 90% light output.

   d. Pressing Button 4 will turn all fixtures to 100% light output.

   e. Pressing Button 5 will turn all lighting fixtures “OFF”.

3. Photo sensor will continuously dim the light fixture up/down depending on the amount of daylight present. Daylight sensor to be calibrated to provide an average of (+/-) 50 footcandles measured at work surface (30” above finished floor).

4. When the user leaves the room, the lights will automatically turn “OFF” after a 15 minute delay (from unoccupied signal).

Sequence of Operations

Project X Sequence of Operations Matrix																			
Room Number	Control Zone	Space Type \ Use	Lighting Type	Target Light Level	LCS	Manual Switch	Dimmer Switch	Preset Station	Time Clock	Astronomic Time Clock	Occupancy Sensor	Vacancy Sensor	Occupancy/Vacancy Time Out	Daylight Dimmining	Daylight Threshold	Task Tuning	Site Occupancy Sensor	Site Photo Control	Specialty See Note	Typical Sequence of Operations
1	a	Conference Room	Linear Indirect / Direct	30	1			1					30						1	1
	b		North Wall Wash	NA																
	c		South Wall Wash	NA																
2	a	Janitor	Industrial	20									10							
3	z1	Private Office	Recessed Troffer	30			1						15		200%					2
	z2		Art Accent	NA			2													
4	z2-12	Open Office	Indirect Direct - Daylight	30				1					15		200%					3
	z2-13		Indirect - Direct Inboard	30											200%					
	z2-14		Circulation	10											150%					

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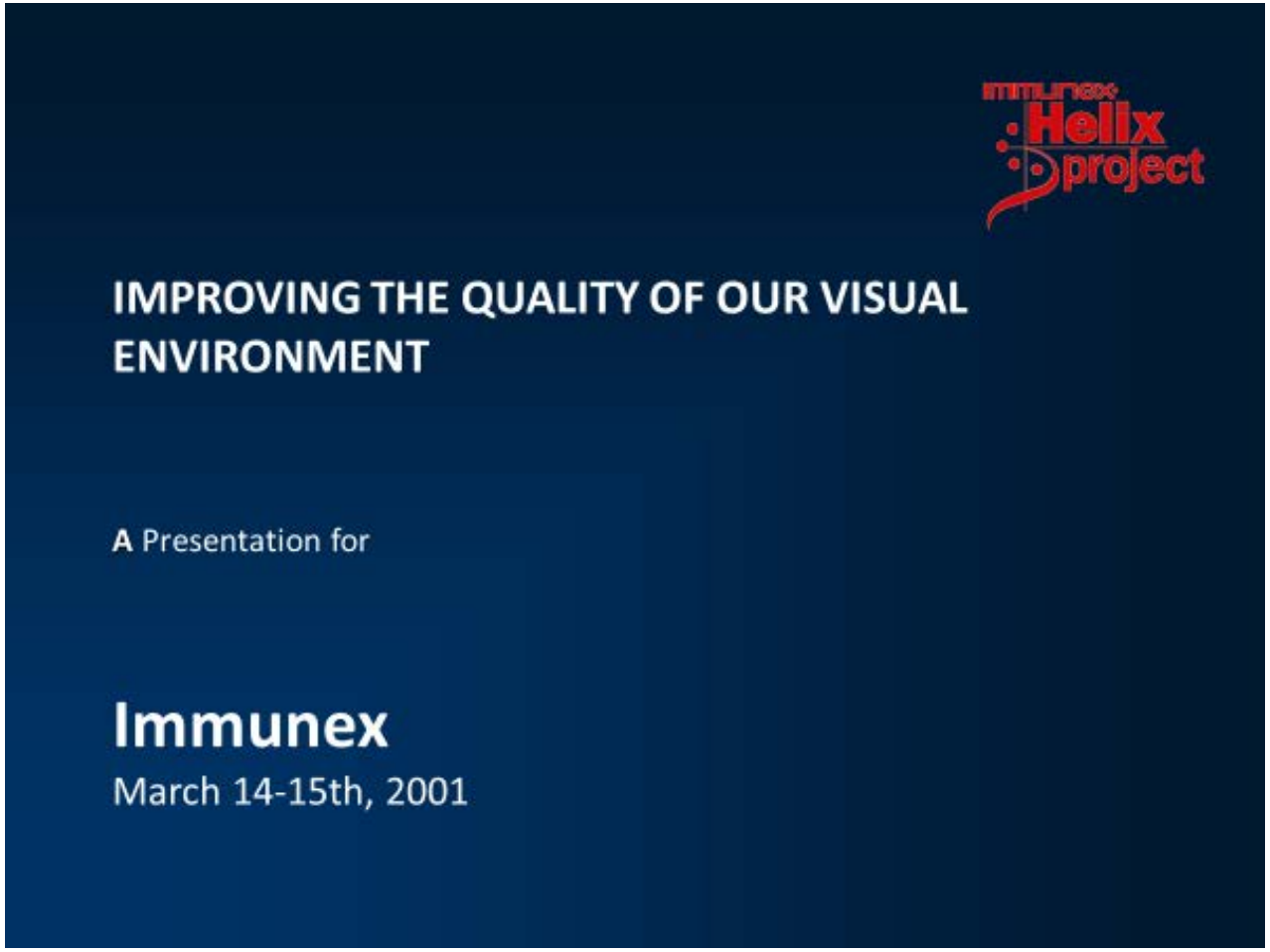
Amgen Helix Campus

- Biotech Campus Pier 90
- Labs, Offices, Support Areas

- Koetter Kim
- NBBJ
- Flad
- AEI

- Design began 1999
- Completed 2005

Stakeholder Engagement



Stakeholder Engagement

Proposed Solution

immunex Helix project

Lamping:

- Linear Fluorescent luminaires are standardized to modern T5 standard and High Output lamps with dimming ballasts.
- Compact Fluorescent luminaires are standardized to Amalgam Triple Tube PLT Style Lamps.
- All Fluorescent lighting shall be controlled by high frequency electronic ballasts to eliminate perceptible strobing.

Envision the lighting group of
Affiliated Engineers, Inc.

nbbj LIGHTING

Perimeter Lab Zone

immunex Helix project

Envision the lighting group of
Affiliated Engineers, Inc.

nbbj LIGHTING

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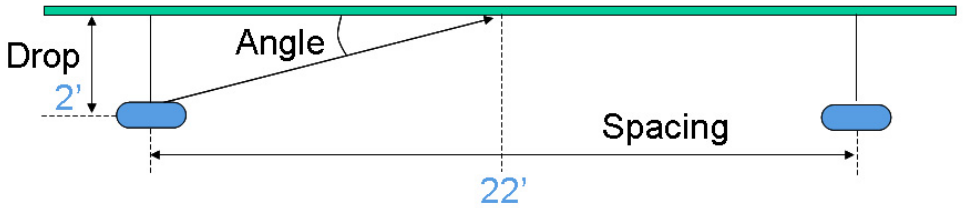
Immunex….then Amgen…

Amgen



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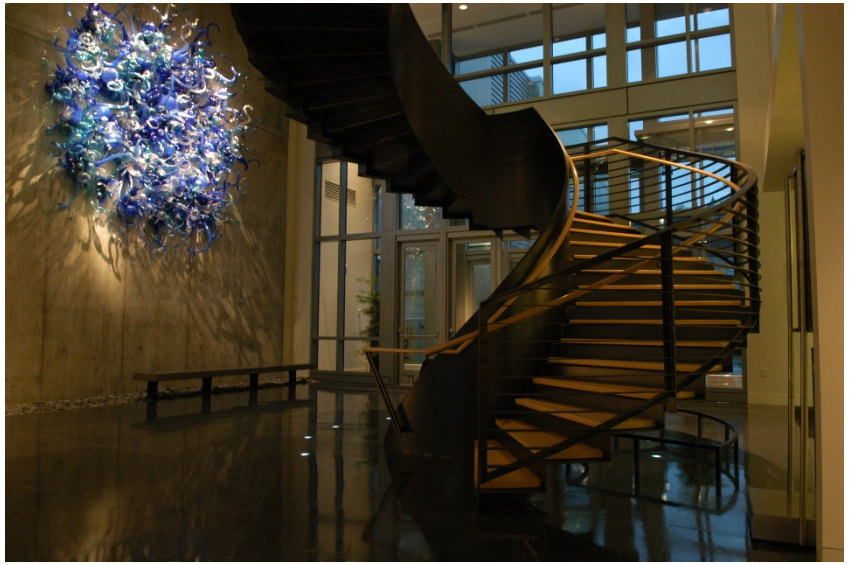
Public Areas



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Stakeholder Engagement

- One of the most often overlooked Commissioning elements….

  Commission the occupants….

- Let them know what to expect from the system and how it operates….and why….

- Dashboard it for them if you can

Microsoft Building 17
Gensler

Continued Stakeholder Engagement

- 2012 Controls Hardware Upgrade

- Mockups
- Occupant Surveys
- User Group Meetings
- Engaged Occupant Scheduling

- Needs change
- Spaces Change
- Our Understanding Changes

Cost & [IT] Infrastructure

Interview: Healthcare Energy Manager

- Lighting Audit helped start conversation, decision
  - T12 in BOH!
  - Feedback from auditor
  - Help Decision Makers Prioritize
- SME familiar handling special space types
- Financials
  - Simple Payback > ROI, IRR
  - $Labor > $Hardware
  - Rebates!
- NEB
  - Ease of Maintenance, feedback
  - Facilities could reprogram
  - No need for software contract

Energy Management and Sustainability

Angela Mu

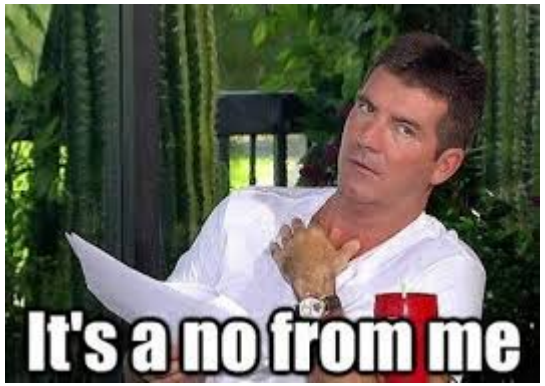
Energy Manager

Weill Cornell Medicine

Lunera Smart TLEDs Pilot at NYU

- 2017 Pilot at NYU
- Free gear from Lunera
  - Happy decision makers
- Each T8 needed IP address on Client's Network

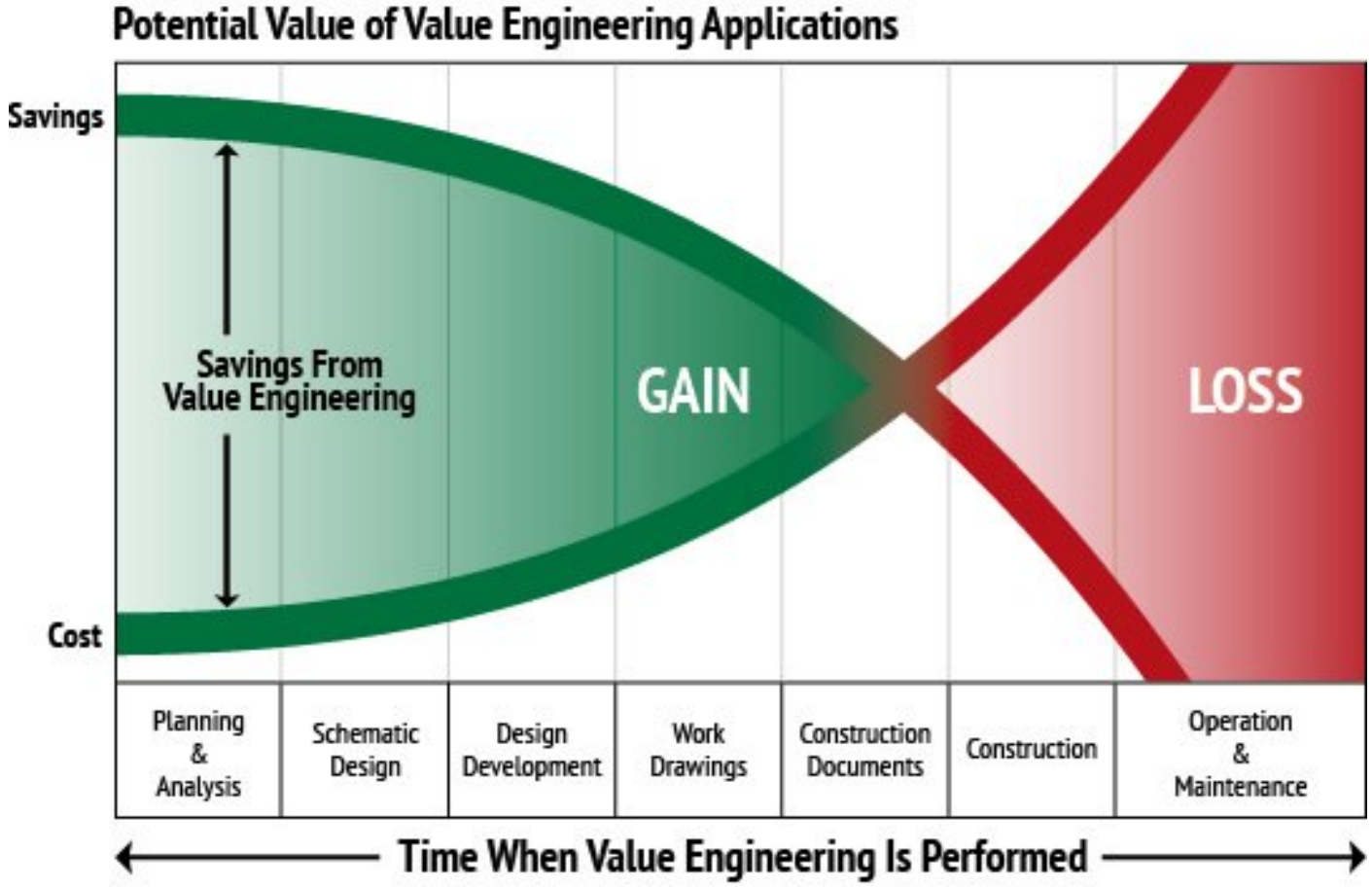
IT Dept:



Lunera Lighting

Not “Value” and not “Engineering”

- Removes hardware / features last minute to reduce cost
- Other Building contractors up-sell
  - EC typically down-sell
- True value engineering “adds” to up-front cost to reduce life-cycle cost



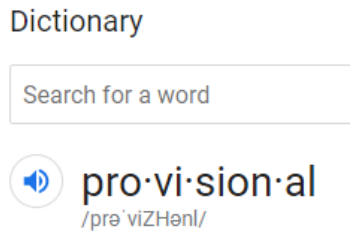
Program Design *Considerations:* Savings & Incentives

Example of prescriptive savings in City Light's lighting program

Space Use Type	Networked Lighting Controls	Luminaire Level Lighting Controls
Break Room	40%	50%
Classroom	25%	25%
Hallway	40%	50%
Lobby	40%	50%
The Loo	40%	50%
Warehouse	40%	50%

And so on and so forth…

Regional Technical Forums: Non-Residential Lighting Retrofits protocol



1. Arranged or existing for the present, *possible to be changed later*

Simplify Approach:

- prescriptive savings
- prescriptive incentives

Right-Sized Incentive

- $50-75 incentive bonus –

In addition to performance savings!

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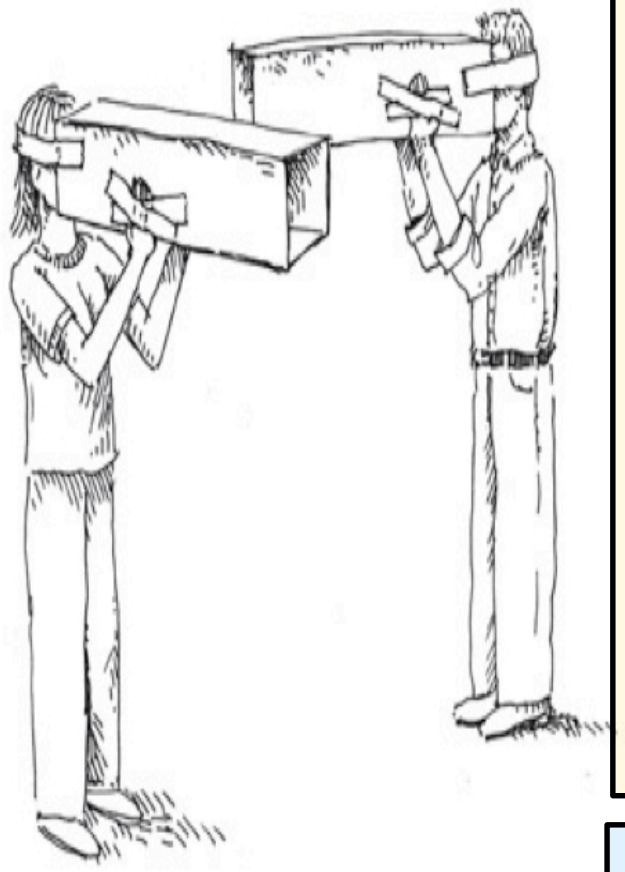
Tunnel Mindset on Margins and Value

Can You Recognize The Tunnel Mindset?

The Disconnect…



We block out the voices trying to give us new information

Cost-Focused Stakeholder OR Implementer

Up front cost

Too complicated

Customer doesn't need it

Too time consuming

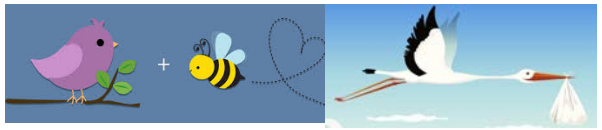
Design Ally:

I can't remember the last time I didn't spec an NLC product…

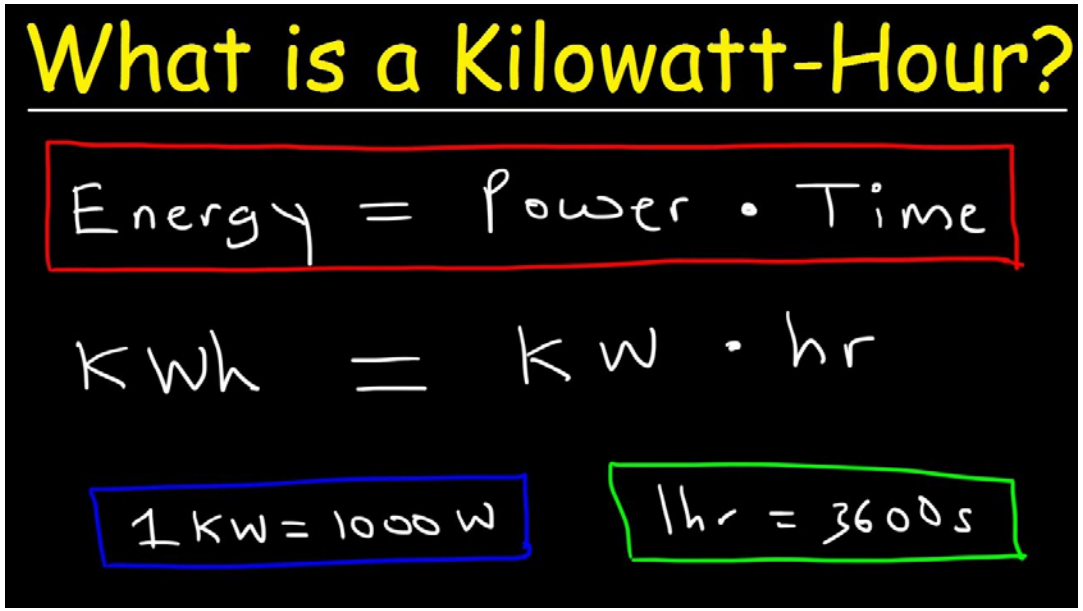
End-Use Customer:

I need integrated solutions…

Where do Savings Come From?



- Converting to LEDs
  - Reduces Wattage
  - About 50%-75% reduction
- Adding NLC/LLLC Systems
  - Reduces Operating Hours
  - 8760 hours in a year
  - About 50%-75% reduction

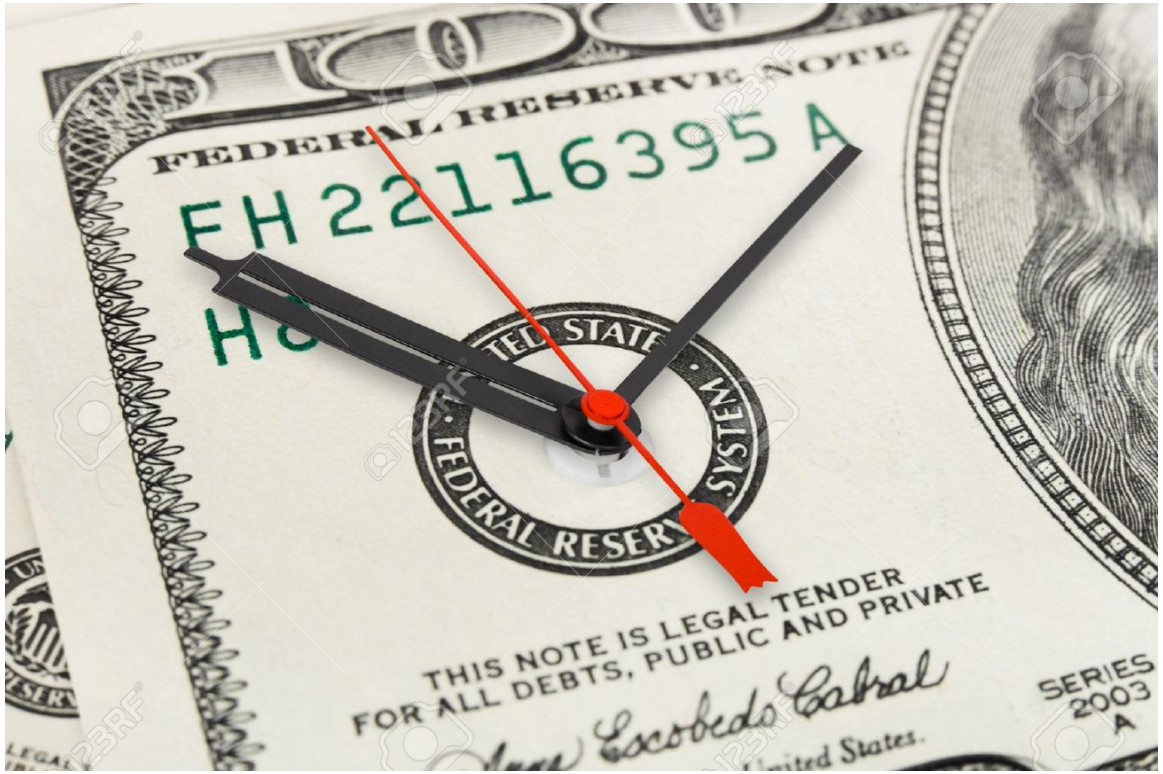


Medium General Service Downtown Network (MDD)

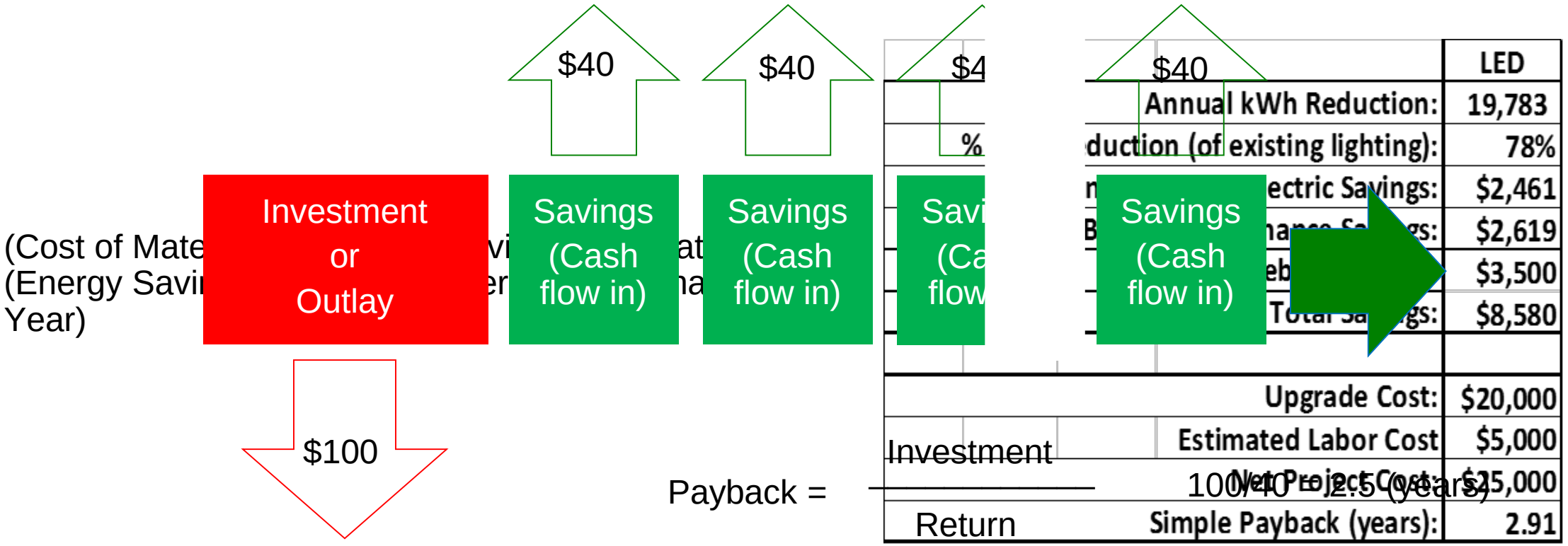
	Jan 2019	Nov 2019	Jan 2020
Per kWh	$ 0.0925	$ 0.0919	$ 0.0987

Discuss The Cost of Waiting

- Cost of Waiting - Urgency
  - Utility funding
  - Continue overspending on energy
  - Continue overspending on human capital
  - Equipment nearing EOL
- Listen to Stakeholder Objections
- Buy in from stakeholders



Simple Payback

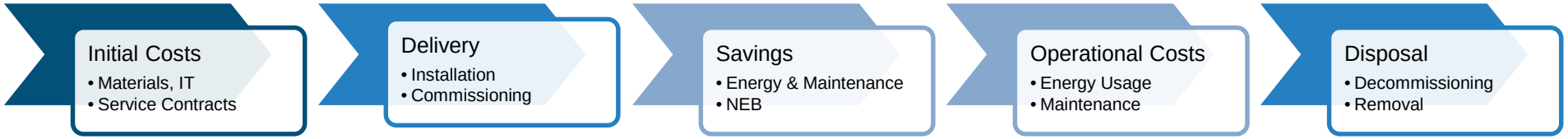


- Not a complex measure
- Initial financial talking point
- TLED projects usually have lower paybacks
- Real story is more complex

Simple Payback vs. Life Cycle Cost

Life Cycle Cost Analysis

System Life (i.e. 10 years)



To be expressed factoring Time Value of Money

Lighting as a Service = Netflix and Lit?

- No up-front capital costs
  - Equipment, Commissioning, Maintenance by Provider
  - Monthly Payment from Savings
- Energy Metering
- Contract with Provider and Implementer

Seattle City Light EEaS Pilot

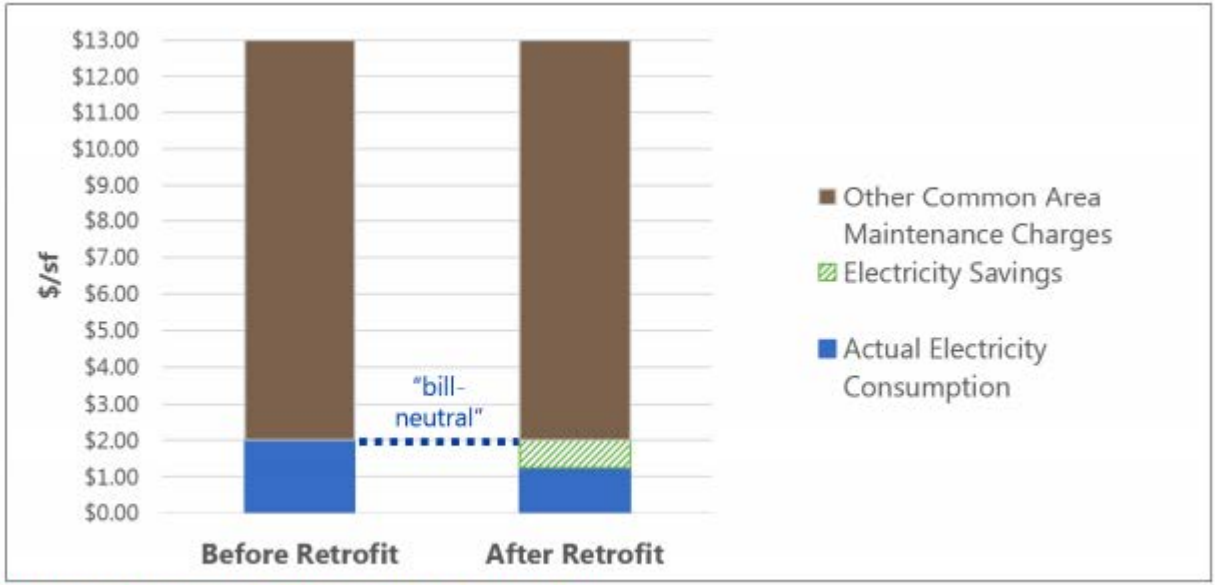


Figure 1. Example of Tenant Bill Neutrality

RENEWABLE ENERGY WORLD

Energy Efficiency, News

Seattle City Light is piloting America's first Energy Efficiency-as-a-Service program

By Jennifer Runyon | 6.19.20

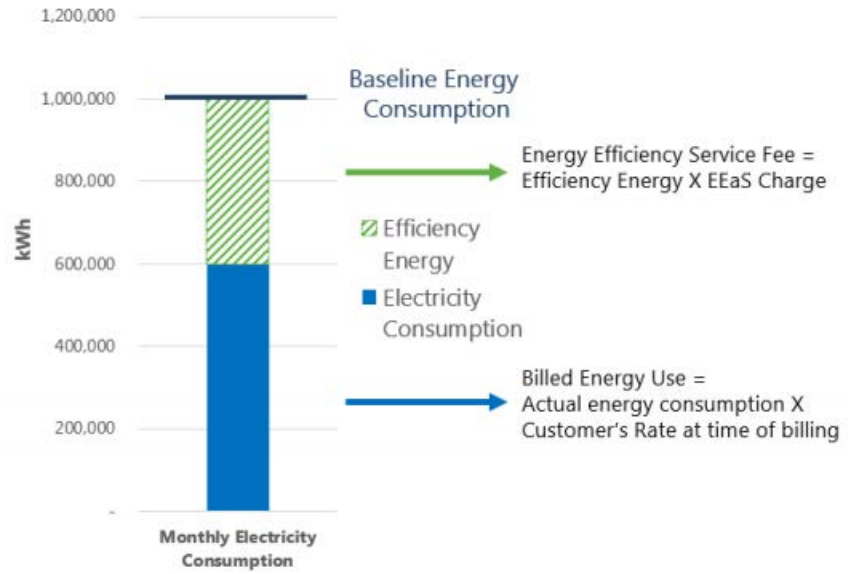


Figure 3. Basis of EEaS Seattle City Light Charges

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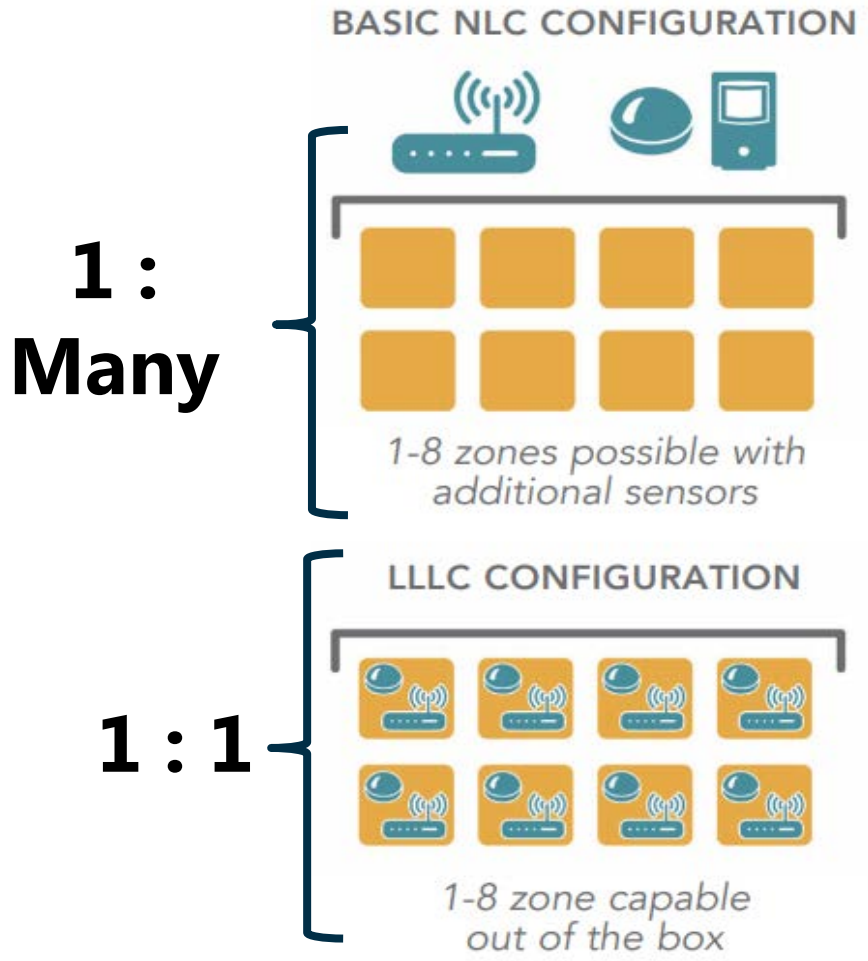
A Novel Solution – Luminaire Level Lighting Controls

Did You Know… NLC & LLLC

- Luminaire Level Lighting Control
  - Individually Addressable
  - Integrated occupancy and daylight sensors
  - Continuous dimming
  - Networkable
- Benefits
  - Less Components
  - Labor Savings
  - Simple Configuration
  - Future Expandability
  - Reconfigurable



BONUS: Automatically Meets Code

2018 Washington State Commercial Energy Code*

C405.2 Lighting controls. Lighting systems shall be provided with controls that comply with one of the following:

1. Lighting controls as specified in Sections C405.2.1 through C405.2.7.
2. *Luminaire level lighting controls (LLLC)* and lighting controls as specified in Sections C405.2.1, C405.2.3 and C405.2.5. The *LLLC luminaire* shall be independently configured to:
   - 2.1. Monitor occupant activity to brighten or dim lighting when occupied or unoccupied, respectively.
   - 2.2. Monitor ambient light, both electric and daylight, and brighten or dim artificial light to maintain desired light level.
   - 2.3. For each control strategy, configuration and re-configuration of performance parameters including: bright and dim set points, timeouts, dimming fade rates, sensor sensitivity adjustments, and wireless zoning configuration.

2: Individually Addressable

2.1: Occupancy, Vacancy, Dimming

2.2: Daylight Harvesting, Dimming

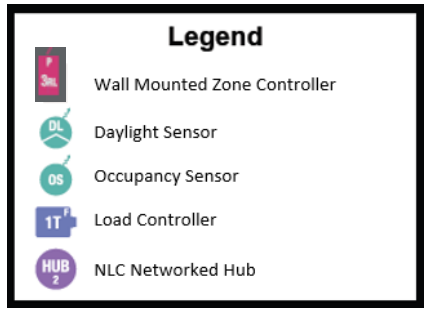
2.3: Networkable

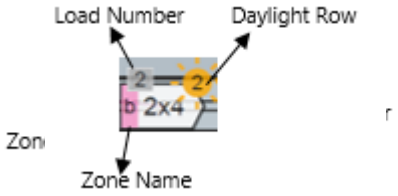
*As per Gov. Inslee – To be Applied Nov 1st, 2020

LLLC Functionality Example

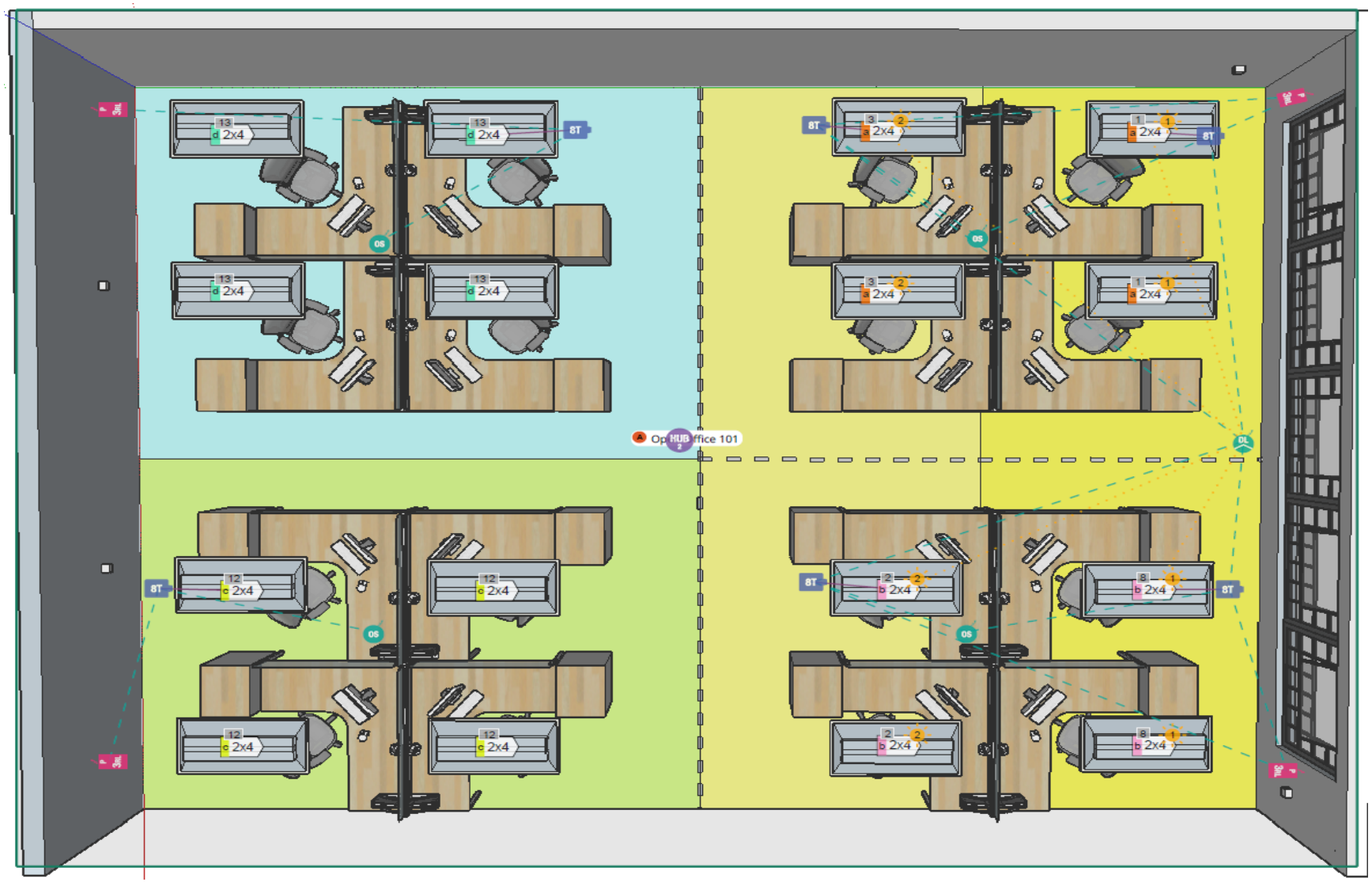
2)
4)
9:00am
7:00pm
Half Occupied
Vacant Space
Lights brighter
Lights go off
Lights dimmed
daylight level
if occupied

NLC & LLLC Cost Analysis Case Study





Assumption:
Labor Rate:
$100/hour



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NLC & LLLC Case Study Cost Comparison

	NLC (non-LLLC) Bill of Materials						
#	Part Number	Description	Quantity	Price	Install (Minutes)	Install $	Material $
1	PJ2-3BRL-GWH-L01	Wall Station	4	$ 21.00	30	$ 200.00	$ 84.00
2	LRF2-DCRB-WH	Daylight Sensor	1	$ 125.00	30	$ 50.00	$ 125.00
3	LRF2-OCR2B-P-WH	Occupancy Sensor	4	$ 89.00	30	$ 200.00	$ 356.00
4	HJS-2-FM	Gateway/Hub	1	$ 1,700.00	60	$ 100.00	$ 1,700.00
5	RMJS-8T-DV-B	0-10V Load Controller	6	$ 152.00	60	$ 600.00	$ 912.00
6	CW-1-WH	Claro Wallplate	4	$ 5.00	0	$ -	$ 20.00
7	PICO-WBX-ADAPT	Wallbox Adapter	4	$ 8.00	0	$ -	$ 32.00
8	FIXTURES	Placeholder for Fixtures	16	$ 200.00	30	$ 800.00	$ 3,200.00
						$ (1,950.00)	$ (6,429.00)

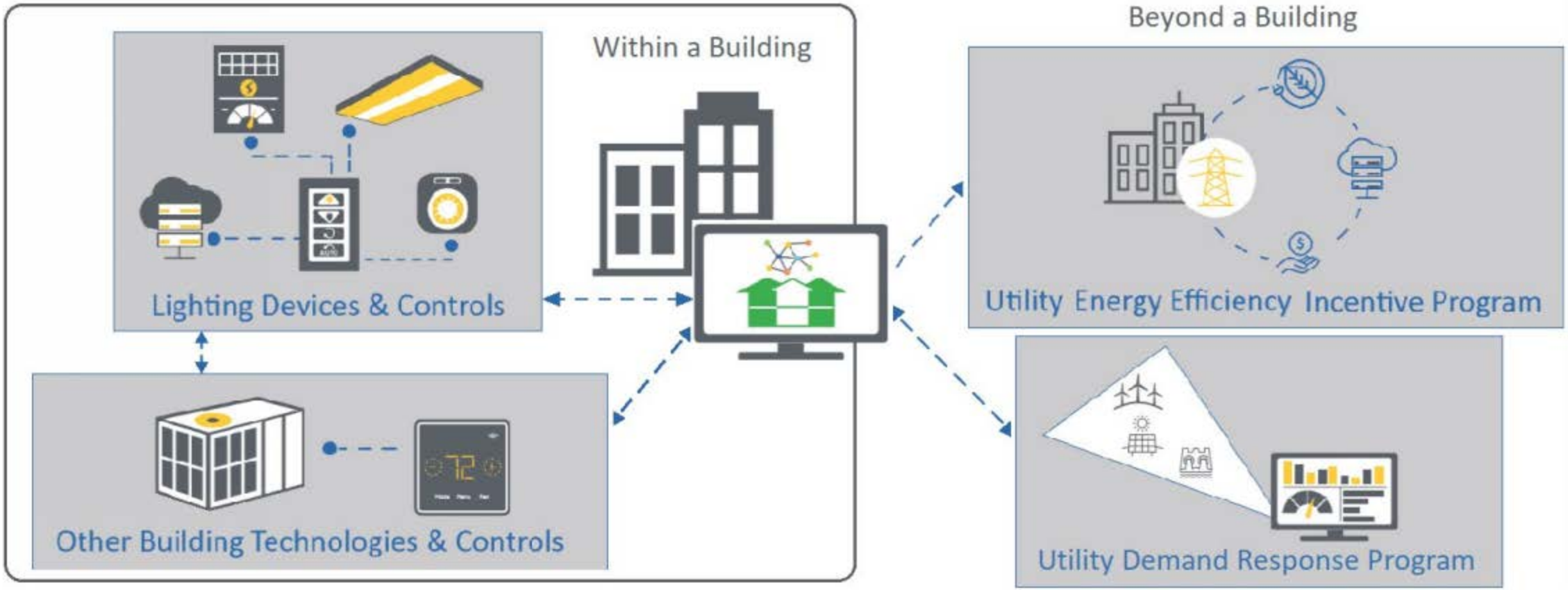
	LLLC Bill of Materials						
#	Part Number	Description	Quantity	Price	Install (Minutes)	Install $	Material $
1	PJ2-3BRL-GWH-L01	Wall Station	4	$ 21.00	30	$ 200.00	$ 84.00
2	HJS-2-FM	Gateway/Hub	1	$ 1,700.00	60	$ 100.00	$ 1,700.00
3	CW-1-WH	Claro Wallplate	4	$ 5.00	0	$ -	$ 20.00
4	PICO-WBX-ADAPT	Wallbox Adapter	4	$ 8.00	0	$ -	$ 32.00
5	LLLC FIXTURES	Placeholder for LLLC Fixtures	16	$ 270.00	30	$ 800.00	$ 4,320.00
						$ (1,100.00)	$ (6,156.00)

NLC & LLLC Case Study Cost Comparison

NLC (non-LLLC) Net Project Costs		
NLC Materials Cost	$	(6,429.00)
Labor	$	(1,950.00)
Room Commissioning	$	(200.00)
Utility LLLC Incentive	$	-
Utility Performance Incentive	$	500.00
Net Project Cost	**$**	**(8,079.00)**

LLLC Net Project Costs		
LLLC Materials Cost	$	(6,156.00)
Labor	$	(1,100.00)
Room Commissioning	$	(150.00)
Utility LLLC Incentive	$	800.00
Utility Performance Incentive	$	600.00
Net Project Cost	**$**	**(6,006.00)**

Infrastructure for the Technologies of Tomorrow



Courtesy of DLC: *Interoperability for Networked Lighting Controls (May 19 2020)*

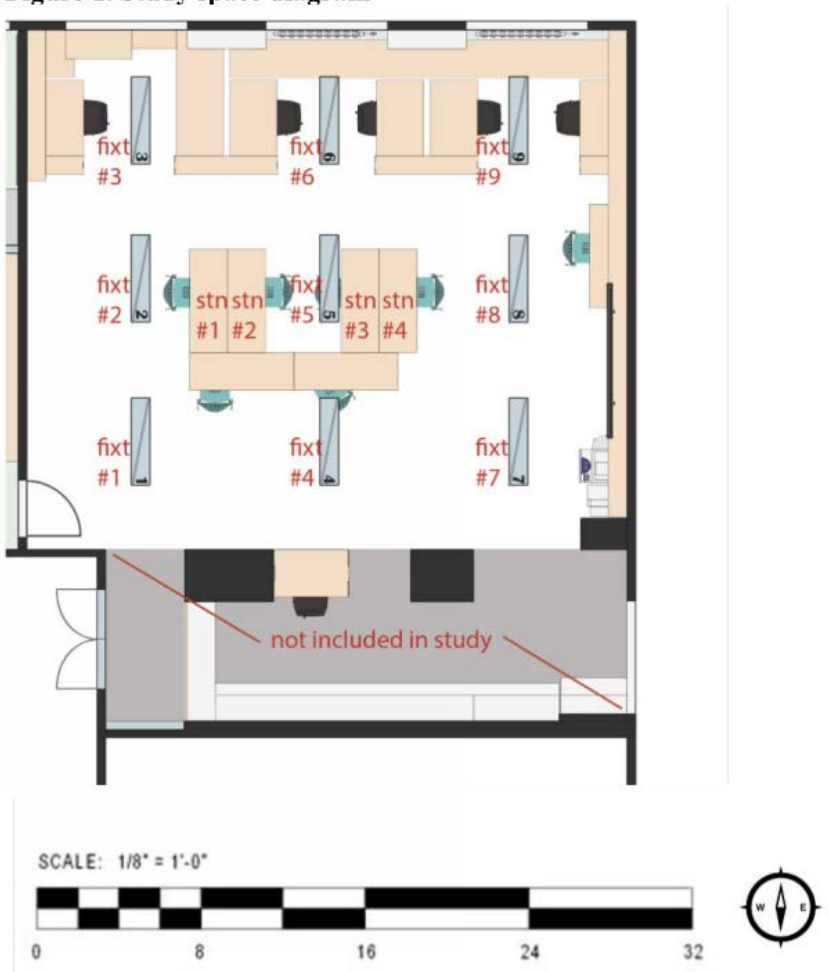
NEEA NLC/LLLC Retrofit Study

Luminaire Level Lighting Controls Replacement vs Redesign Comparison Study

September 3, 2020

REPORT #E20-315

Figure 1. Study space diagram



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LLLC/NLC Retrofit Systems Cost Comparison

Table 12. Total Cost Comparison of All Retrofit Solutions

System	*Hardware total*	*Luminaire per unit*	*Labor*	*Design/ Specification*	*Total cost*	*Total cost/ft²*
LLLC System #1	$4,181.00	$380.00	$1,045.00	$252.76	**$5,383.76**	**$6.04**
LLLC System #2	$4,204.77	$410.00	$1,536.15	$379.14	**$6,120.06**	**$6.87**
LLLC System #3	$4,455.43	$490.00	$1,163.75	$1,011.04	**$6,630.22**	**$7.44**
LLLC System #4	$4,015.96	$403.00	$760.00	$631.90	**$5,407.86**	**$6.07**
Redesign System #5	$8,347.07	$389.00	$1,654.90	$5,655.80	**$15,657.77**	**$17.57**

LLLC/NLC Retrofit Systems Implementation Times

Table 3. Time Required for Install, Programming, and Commissioning

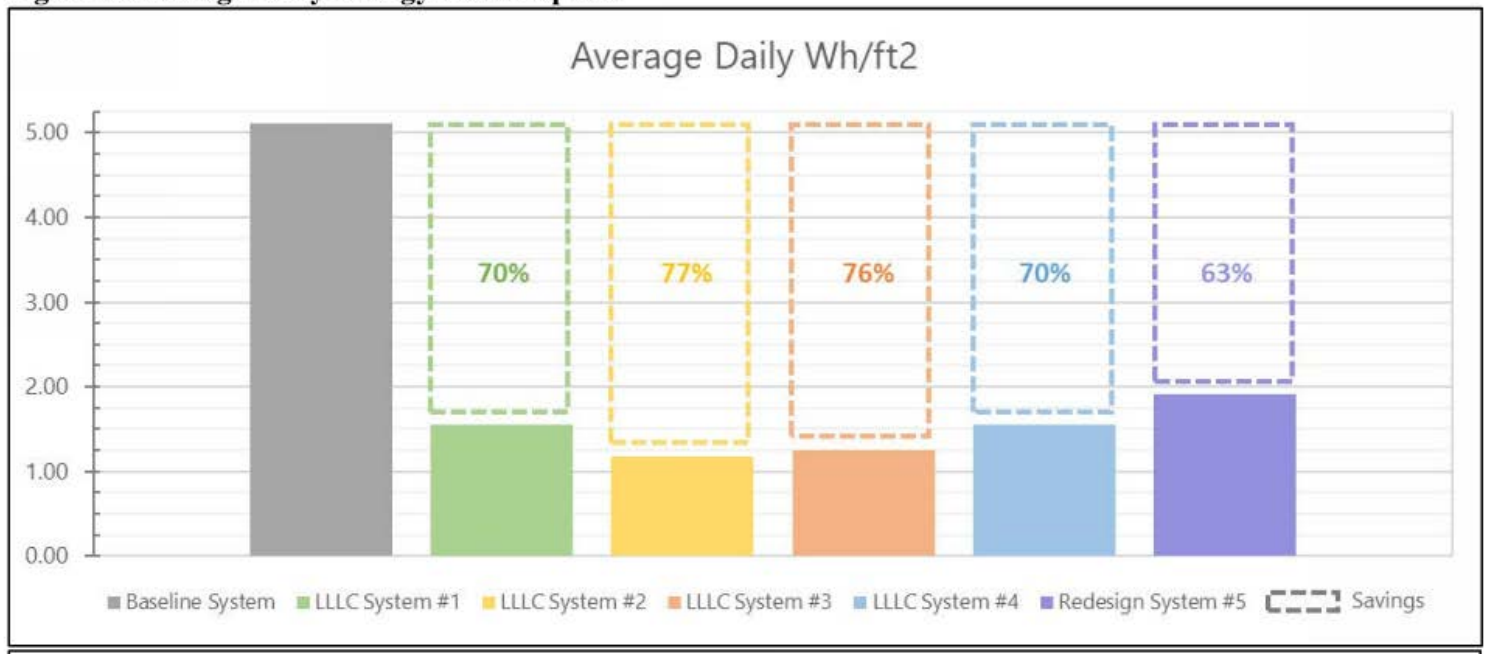
System	*Hardware install (HH:MM)*	*Programming (HH:MM)*	*Commissioning (HH:MM)*	*Total (HH:MM)*
LLLC System #1	05:15	00:45	03:00	**09:00**
LLLC System #2	05:50	02:45	04:30	**13:05**
LLLC System #3	05:40	00:35	04:30	**10:45**
LLLC System #4	03:30	00:30	02:30	**06:30**
Redesign System #5	07:05	02:35	06:00	**15:40**

LLLC/NLC Retrofit Systems Savings Breakdown

Table 5. Average Energy Consumption

	Wh/ft²									
	Total	***Lum. 1***	***Lum. 2***	***Lum. 3***	***Lum. 4***	***Lum. 5***	***Lum. 6***	***Lum. 7***	***Lum. 8***	***Lum. 9***
Baseline	**5.11**	0.57	0.58	0.57	0.45(1)	0.59	0.58	0.59	0.59	0.59
LLLC System #1	**1.54**	0.23	0.18	0.08	0.25	0.15	0.12	0.25	0.23	0.05
LLLC System #2	**1.18**	0.15	0.24	0.07	0.26	0.19	0.04	0.07	0.10	0.04
LLLC System #3	**1.25**	0.22	0.19	0.06	0.18	0.13	0.04	0.24	0.14	0.05
LLLC System #4	**1.55**	0.43(2)	0.22	0.05	0.21	0.16	0.05	0.17	0.19	0.03
Redesign System #5	**1.90**	0.41	0.16	0.06	0.40	0.21	0.02	0.40	0.18	0.02

Figure 8. Average Daily Energy Consumption



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Annual Estimated Savings & by Major Strategies

System	Fixture Zone *	Annual estimated lighting energy savings based on pre-tuning maximum energy consumption					
		Savings due to all controls measures		Savings due to daylight and occupancy		Savings due to high-end trim	
LLLC System #1	Perimeter	74%	51%	74%	45%	0%	6%
	Middle	49%		37%		12%	
	Core	32%		25%		7%	
LLLC System #2	Perimeter	85%	74%	75%	40%	10%	34%
	Middle	74%		23%		51%	
	Core	71%		31%		40%	
LLLC System #3	Perimeter	80%	50%	80%	42%	0%	8%
	Middle	45%		31%		13%	
	Core	25%		15%		10%	
LLLC System #4	Perimeter	86%	63%	71%	43%	15%	20%
	Middle	58%		35%		23%	
	Core	47%		26%		21%	
Redesign System #5	Perimeter	86%	67%	71%	32%	15%	35%
	Middle	73%		23%		50%	
	Core	47%		7%		40%	

Notes: Annual estimated lighting energy savings attributed to controls relative to pre-tuning maximum energy consumption of each fixture and system.

Never Forget… The Human Factor

4.5 Human factors comfort responses

- Highest satisfaction: LLLC systems being tuned to IES standards
- Overall brightness was found to be lower than expected (Trim)
- Light was more calming and helped focus than FL baseline
- Brighter task (desk) illuminance
- No major satisfaction difference between LLLC & NLC

Table 8. Study Participant Demographics and Sample Statistics

	Total # subjects	*Female/ male*	*Age*			*Vision correction*	*Total # 2-hr session*
			18-30	*31-45*	*46-55*	*Y/N*	
Baseline	8	4/4	7	0	1	5/3	22
LLLC System #1	16	8/8	13	3	0	6/10	34
LLLC System #2	12	7/5	8	4	0	5/7	28
LLLC System #3	10	7/3	7	3	0	4/6	34
LLLC System #4	15	8/7	11	3	1	6/9	36
Redesign System #5	15	9/6	14	0	1	4/11	29
Total	**76**	**43/33**	**60**	**13**	**3**	**30/46**	**183**

And now – a few words from LDL

Upcoming LDL Online Events

LDL Course	Delivery Date	Time
Intro to PoE	Oct 6	10:00 - Noon
NLC for Healthcare Environments	Oct 20	10:00 - Noon
Fundamentals of NLC (Side A – Theory & Technology)	Nov 3	10:00 - Noon
Fundamentals of NLC (Side B – Practical Application)	Nov 4	10:00 - Noon
NLC for Warehouses	Nov 17	10:00 – Noon

Today's slide deck and previous online courses can be found on our website

Click – Call – Connect

- Armando Berdiel Chavez
  - 206-475-2722
  - armando.berdiel@seattle.gov
- Shaun Darragh
  - 206-475-2722
  - shaun.darragh@seattle.gov

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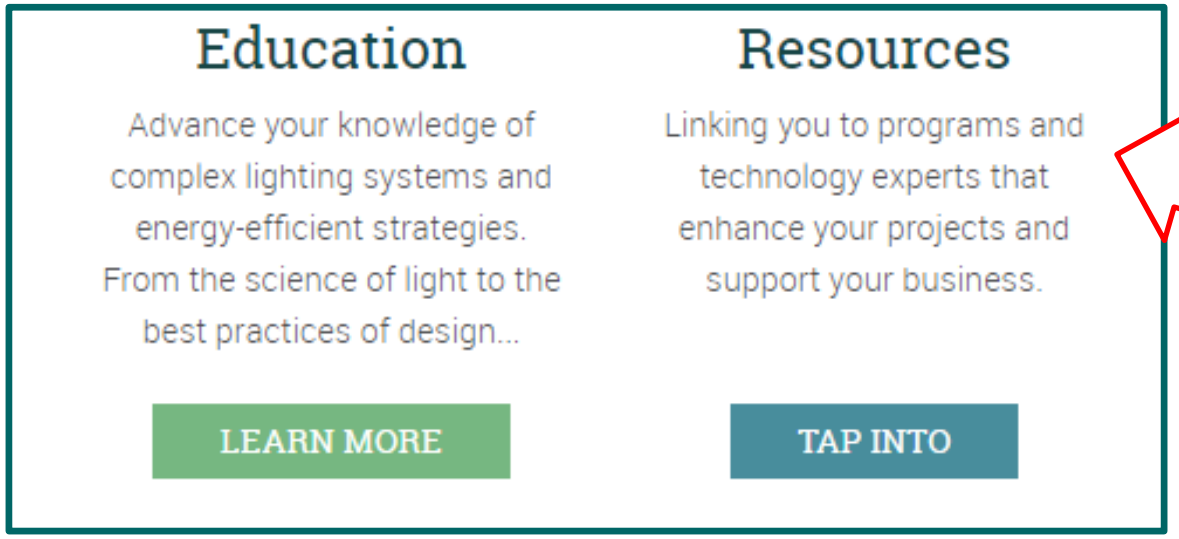

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Todays slide deck will be posted here!

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