

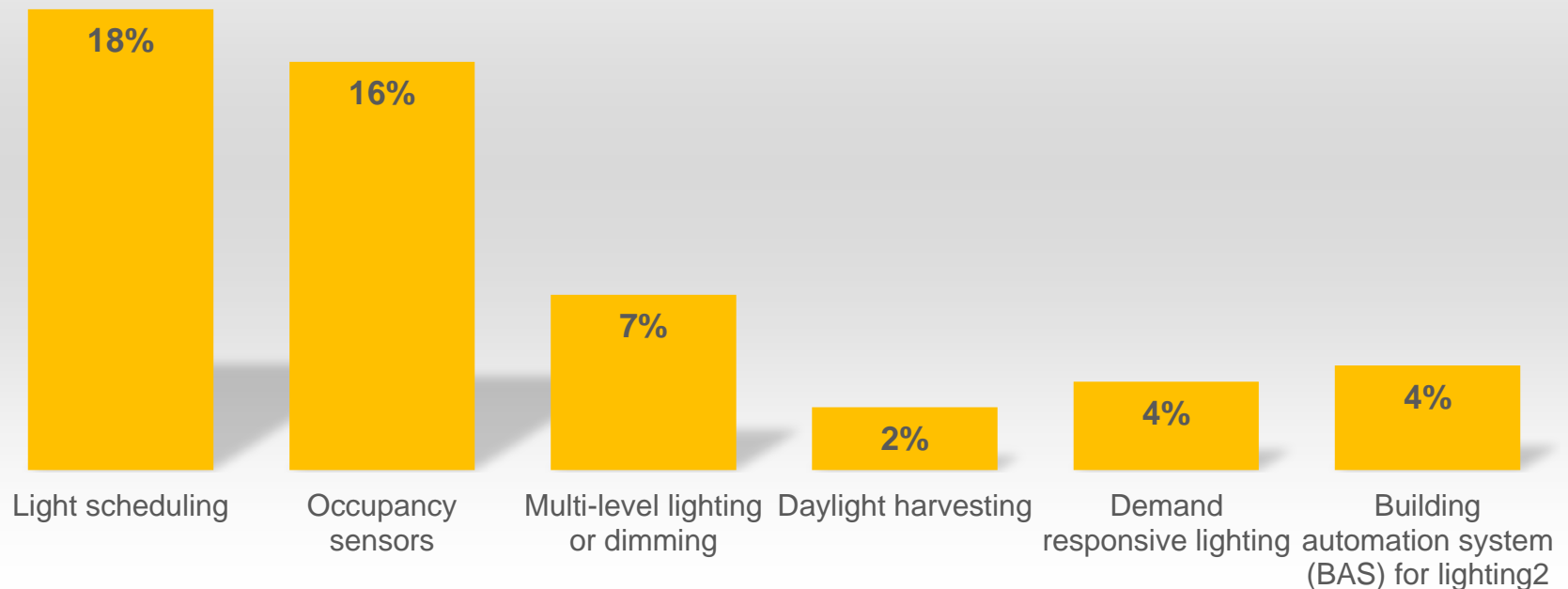


Why Lighting Systems Need to Evolve

DOE Connected Lighting Systems Meeting
November 16, 2015

Lighting Controls – A Lost Opportunity

Percent of Buildings with Control Strategy



Source: 2012 Commercial Buildings Energy Consumption Survey,
US Energy Information Administration

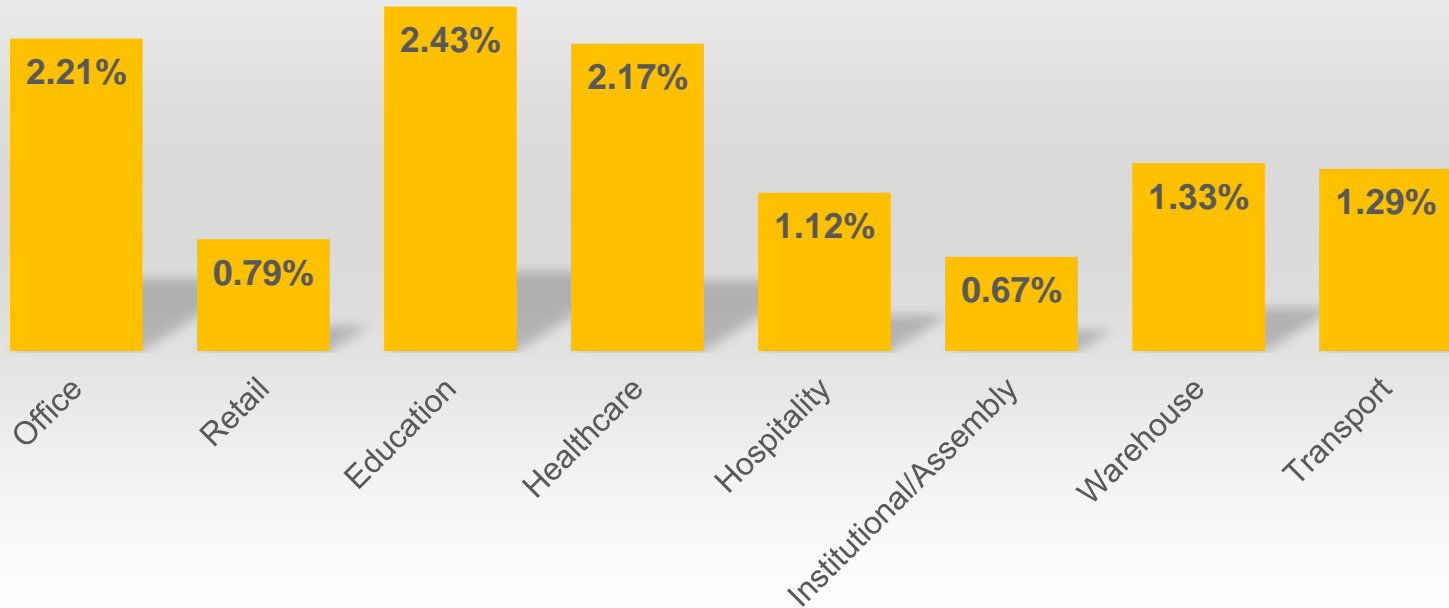
Lighting Controls – A Lost Opportunity

Northwest Region Indoor Lighting Power by Control Type and Building Type

Control Type	All (n=791)	Assembly (n=104)	Food Service (n=43)	Grocery (n=69)	Lodging (n=69)	Office (n=113)	Residential Care (n=68)	Retail (n=129)	School (n=72)	Warehouse (n=43)	Other (n=81)
Manual	2,087 73% ± 2%	279 77% ± 6%	53 87% ± 7%	63 72% ± 8%	121 86% ± 3%	448 68% ± 6%	118 91% ± 3%	447 68% ± 7%	139 61% ± 8%	211 83% ± 7%	208 76% ± 6%
Occupancy Sensor	224 8% ± 1%	27 7% ± 4%	0 0% ± 0%	1 1% ± 1%	1 1% ± 1%	73 11% ± 4%	3 2% ± 2%	12 2% ± 1%	34 15% ± 5%	43 17% ± 7%	32 12% ± 4%
EMS System	256 9% ± 2%	33 9% ± 4%	2 3% ± 4%	6 7% ± 5%	0 0% ± 1%	45 7% ± 4%	1 1% ± 1%	120 18% ± 5%	30 13% ± 6%	0 0% ± 0%	18 7% ± 4%
Dimming	24 1% ± 0%	10 3% ± 2%	4 7% ± 5%	0 0% ± 0%	4 3% ± 1%	1 0% ± 0%	1 0% ± 1%	0 0% ± 0%	1 0% ± 0%	1 0% ± 1%	2 1% ± 1%
Timeclock	74 3% ± 1%	7 2% ± 2%	0 0% ± 0%	2 2% ± 3%	2 1% ± 1%	31 5% ± 3%	1 0% ± 0%	28 4% ± 3%	2 1% ± 1%	0 0% ± 1%	2 1% ± 1%
Photocell	13 0% ± 0%	0 0% ± 0%	0 0% ± 1%	0 0% ± 0%	1 0% ± 0%	4 1% ± 1%	0 0% ± 0%	8 1% ± 1%	0 0% ± 0%	0 0% ± 0%	0 0% ± 0%
Other	126 4% ± 1%	5 1% ± 1%	0 0% ± 0%	5 6% ± 3%	0 0% ± 0%	50 8% ± 4%	0 0% ± 0%	33 5% ± 3%	24 10% ± 5%	0 0% ± 0%	9 3% ± 2%
None (Continuous)	54 2% ± 0%	3 1% ± 0%	1 2% ± 4%	11 12% ± 6%	13 9% ± 3%	6 1% ± 0%	6 5% ± 2%	10 2% ± 1%	0 0% ± 0%	0 0% ± 0%	4 2% ± 1%

Lighting Controls – A Lost Opportunity

Penetration of Advanced Networked Lighting Controls in Commercial Buildings



Source: DLC, Navigant Consulting 2014

Lighting Controls – A Lost Opportunity

- **Utilization of Advanced Networked Controls within EE Programs less than 1%**

Energy Efficiency Program	Number of Projects with Advanced Networked Controls	Total Number of Lighting Projects	Utilization Rate
Efficiency Vermont (2011-2013)	<10	1,885	<0.5%
Cape Light Compact (2013)	0	291	0%
Burlington Electric Department (2013)	0	153	0%
PSEG Long Island (2013)	<25	5602	<0.5%

Adoption Barriers – Look Familiar?

- Knowledge and Experience
- Complexity
- Lack of Standardization
- High Costs
- Value Proposition
- EE Program Designs





A New Future for Connected Lighting Systems



Imagine a Future Where...

Connected Lighting is Widely Adopted

- Installed on nearly every new construction, renovation, and energy retrofit project as standard practice
- Small and large
- Sophisticated and not
- All applicable control strategies installed on all projects – and they work!

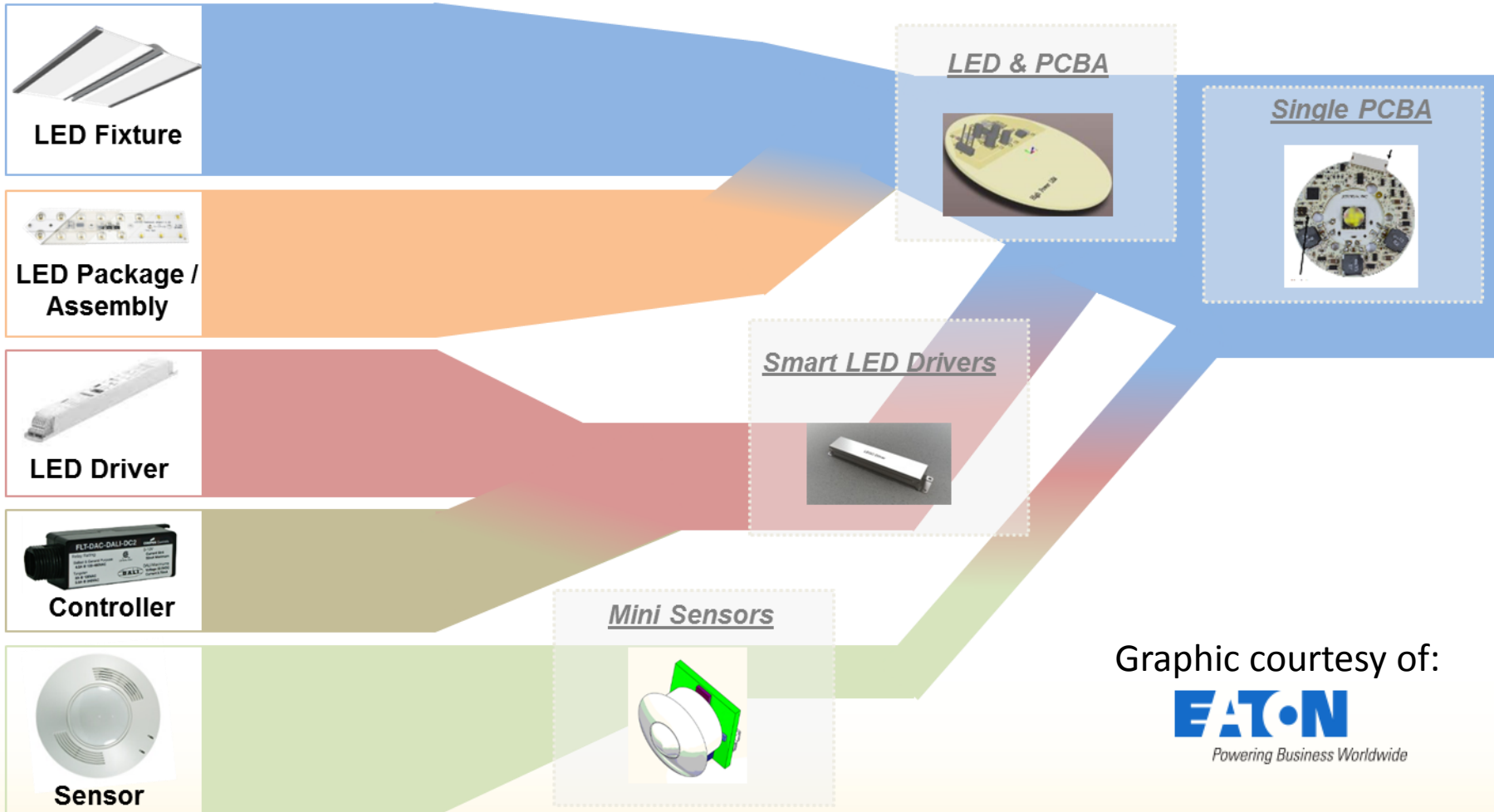


“Integrated. Standardized. Interoperable. Interchangeable”

- Sensors, intelligence, communication incorporated into every device, into every luminaire



Integration & Standardization Drive Lower Costs



Graphic courtesy of:

We Purchase Lighting Systems Like Cars

Base Model Features

- Basic GUI
- Wireless
- Occupancy Sensing
- Ambient /Daylight Sensing
- Task Tuning
- Scheduling
- Demand Response
- Basic Energy Reporting

Advanced Energy Package

- Advanced GUI
- Advanced Energy Strategies
- Advanced Energy Reporting

Productivity Package

- Advanced GUI
- End User Personal Control
- Color Tuning
- Space Utilization Analytics

Connectivity Package

- More inputs / outputs
- Advanced Integration w other systems
- LiFi

Retailer Package

- Advanced GUI
- Wayfinding
- Customer Analytics
- Advertising Integration
- LiFi



We Purchase Lighting Systems Like Cars

Base Model Features

- Basic GUI
- Wireless
- Occupancy Sensing
- Ambient /Daylight Sensing
- Task Tuning
- Scheduling
- Demand Response
- Basic Energy Reporting

Service Package

- On-Call Support
- Worry Free Maintenance
- Periodic System Optimization & Tuning
- System Performance Reporting



Complex on the Inside, Simple on the Outside

- Out of the Box Functionality
- Intuitive, Easy to configure, reconfigure, and use
- Automated, Self-commissioning, Self-Optimizing



Design and Installation

- Design? What design? There isn't much needed.
- Installation? Not much needed there either.



HOW TO INSTALL:

With no extra wiring or devices to connect, installation is as easy as 1, 2, 3 ...

- ① **Mount** fixtures like any normal light fixture.
- ② **Connect** to power.
- ③ **Configure** groups of fixtures and controls as desired.

From there, some products will allow you to customize the light levels suitable for the business environment.

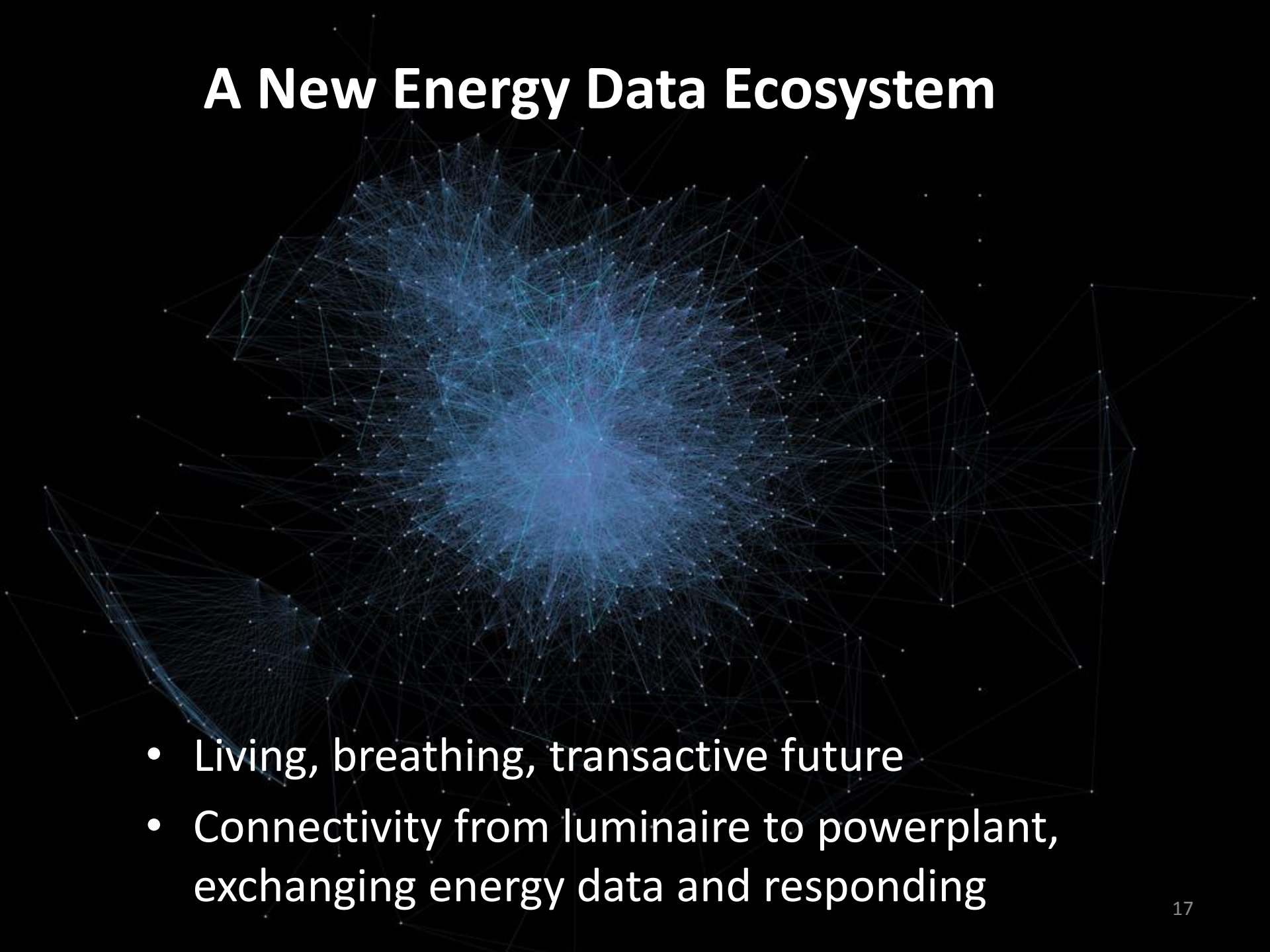


Better for People

- Responding to people, optimizing their environment, allowing for personal preferences
- Happier, more productive



A New Energy Data Ecosystem

- 
- Living, breathing, transactive future
 - Connectivity from luminaire to powerplant, exchanging energy data and responding

... and New Utility Business Models Enabled by Data



Understand

- Segment and effectively target business customers like never before



Engage

- Deliver customized, timely, and valuable content



kWh savings



Customer satisfaction



Manage demand



Reduce cost to serve

Deliver Results

- Improve customer adoption of programs, products, and services
- Achieve customer satisfaction, brand loyalty, and demand management results
- Reduce cost-to-serve with targeted program design, smarter marketing, and better channel management

Images courtesy of:



An aerial night photograph of the Chicago skyline, showing numerous illuminated skyscrapers and city lights. The text "What about the Lighting Industry?" is overlaid in white. The image captures the dense urban landscape with prominent buildings like the Willis Tower and the Trump Tower visible. The city lights create a warm, golden glow against the dark sky, with the city extending to the horizon where the lights of Lake Michigan are visible on the left.

What about the Lighting Industry?

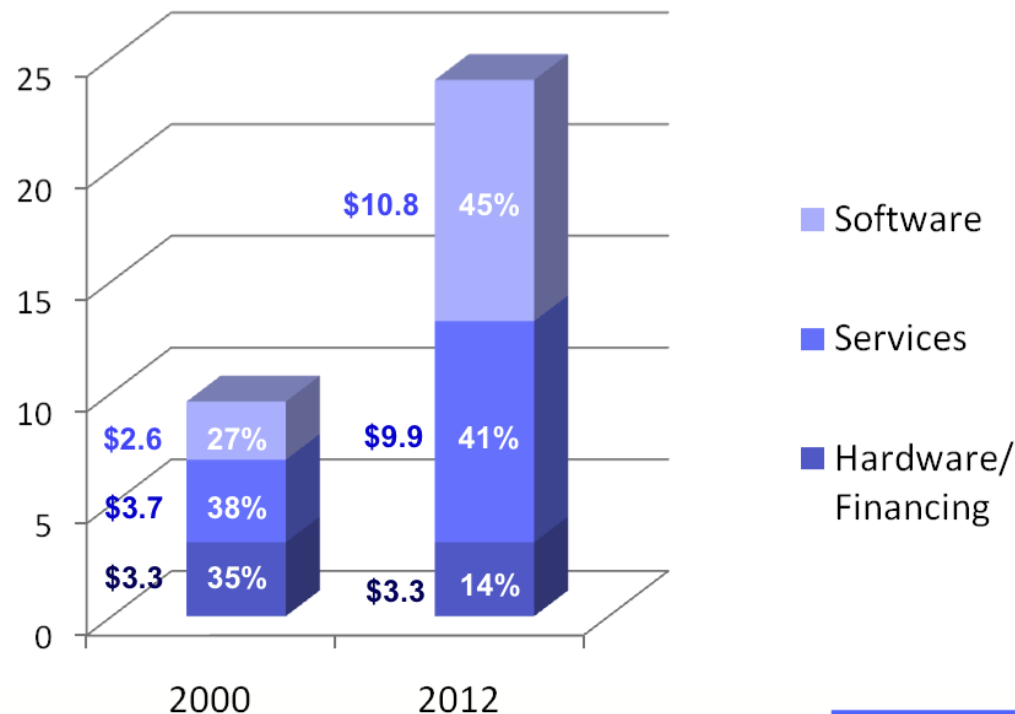
From Hardware to Software, Services, and Data

- A shift to where most \$ is made on software, service, and data, not sales of hardware
- Robust lighting service industry has developed
- New value streams for revenue and profit



We've already seen this in other industries

Segment Pre-tax Income
(\$ in billions)



Source: "Generating Higher Value at IBM" 2013

"IBM has benefited from its push toward higher-margin software and services that command higher fees and prices, while shedding less profitable businesses."

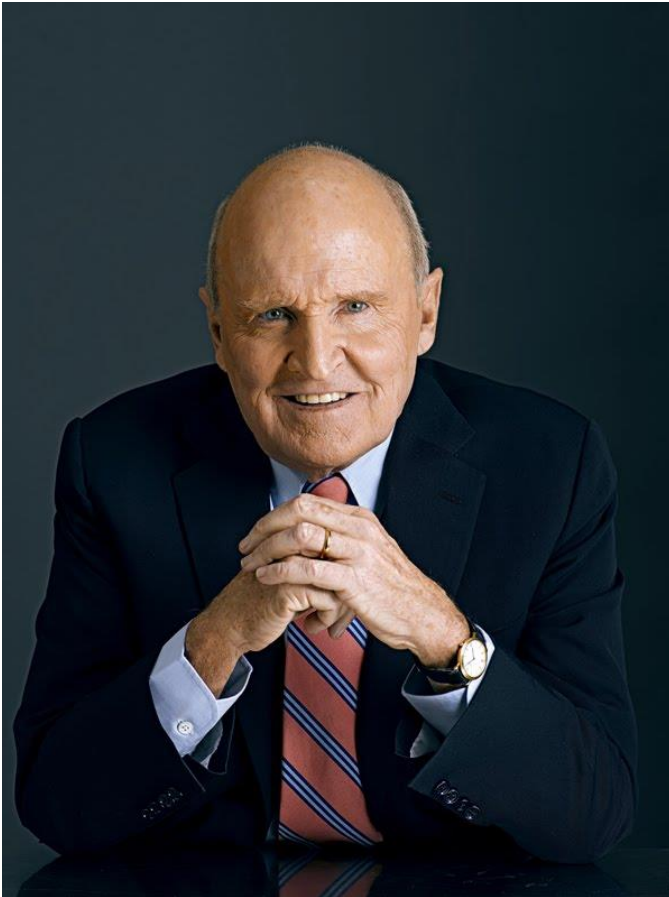
Wall Street Journal, Jan 2013

About 50% of IBM segment profit is expected to come from Software by 2015.

This Won't be Easy or Fast...



But Inevitable?



“Change before you have to”

“If the rate of change on the outside exceeds the rate of change on the inside, the end is near.”

“Willingness to change is a strength, even if it means plunging part of the company into total confusion for a while”

Jack Welch, CEO 1981-2001



If Successful, we get:

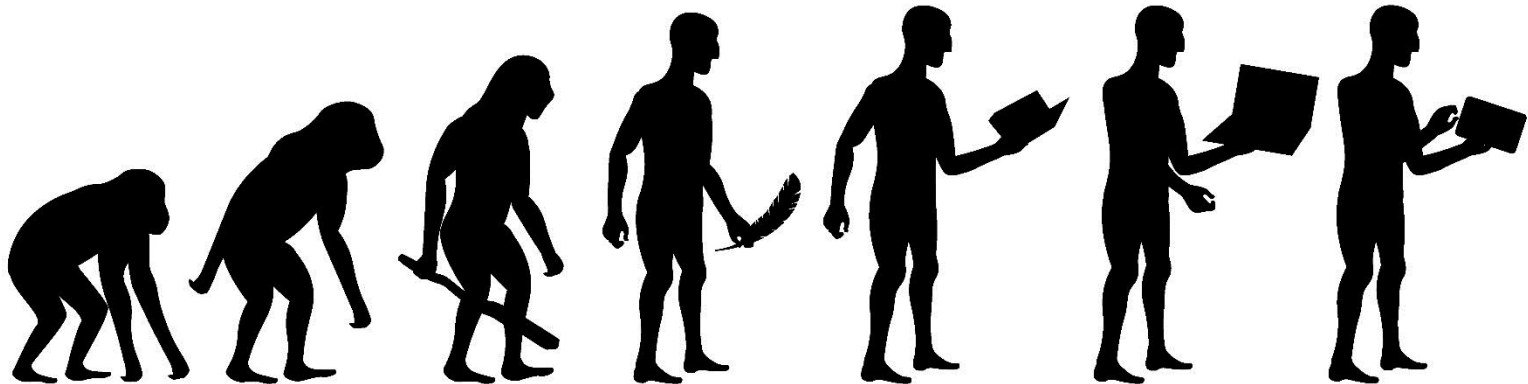
- Creation of new business markets and opportunities
- A thriving and profitable lighting market
- Unprecedented energy efficiency and lighting quality
- Happier, More Productive People
- Healthier Planet



Why do Lighting Systems need to Evolve?

- **Creation of new business markets and opportunities**
- **A thriving and profitable lighting market**
- **Unprecedented energy efficiency and lighting quality**
- **Happier, More Productive People**
- **Healthier Planet**

Why do Lighting Systems need to Evolve?



... Because the stone age was so yesterday...

Thank You!

Gabe Arnold, PE, LC, CEM

Program Manager

DesignLights Consortium™

781-860-9177 x161

garnold@neep.org

www.designlights.org