



NECA
2013
WASHINGTON

LIGHTING RETROFIT AND RELIGHTING
A GUIDE TO GREEN LIGHTING SOLUTIONS
James R. Benya • Donna J. Lebon

Lighting Retrofits and Relighting
Cost Effective for the Customer, Good for the Environment, and Good Business for Our Nation

James R Benya, PE, FIES, FIALD
Benya Burnett Consultancy, Davis, CA

Continuing Education Credits

NECA has been accredited as an Authorized Provider by the International Association for Continuing Education and Training (IACET) and is authorized to offer IACET CEUs for its programs that qualify under the ANSI/IACET Standard.

This session is eligible for 0.1 IACET CEU

To earn these credits you must:

- Have your badge scanned at the door
- Attend 90% of this presentation
- Fill out the online evaluation for this session

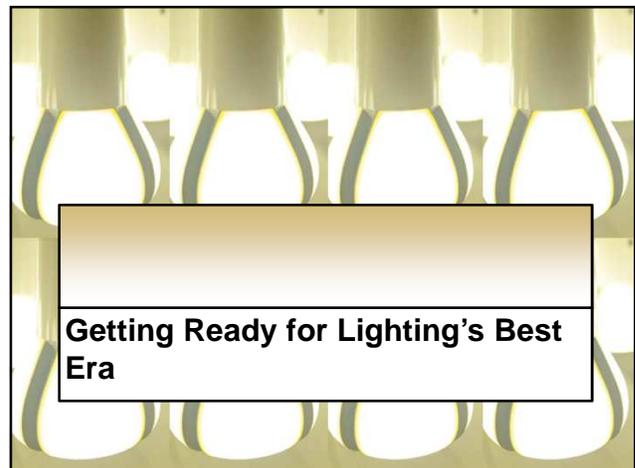
2

NECA 2013 WASHINGTON D.C.

Notice

This presentation, including excerpts, is licensed without cost to NECA members including owners, employees, and affiliates. Please support NECA and this program's recommendation to make lighting retrofits and relighting an important and integral part of our Nation's economic recovery, energy independence and sensible long term energy plan.

NECA 2013 WASHINGTON D.C.



Getting Ready for Lighting's Best Era

Opportunity in USA

- 15,000 million square feet of retail
 - 12,000 million square feet of offices
 - 9,000 million square feet of warehousing
 - 8,000 million square feet of schools
 - 12,000 million square feet of all other
- TOTAL of **54,000 million square feet** of commercial space in US (source EIA) not including government buildings

Opportunity in USA

- 139 million homes (US Census)
 - Average area = 2000 sf
- TOTAL **278,000 million square feet** of homes

Opportunity in USA

- 13 million street lights
 - 119 million area lights
 - 210 million signs
- TOTAL of at least **340 million** outdoor luminaires not including sports or landscaping (source ICSC)

Opportunity

- 54 billion sf of commercial space
- 10 billion sf of governmental space
- 40 billion sf of industrial and other space
- 274 billion sf of homes
- 340 million outdoor lights

Opportunity Using Cost Effective Retrofits

- 54 billion sf of commercial space @ \$2.50
- 10 billion sf of governmental space @\$1.50
- 40 billion sf of industrial and other space @\$1.50
- 274 billion sf of homes @\$0.25
- 340 million outdoor lights and signs @ \$1000

TOTAL \$600-\$700 BILLION DOLLARS

Energy Savings

Building Type	Typical Project	Energy Savings	Payback before rebate
School	Lighting controls, new luminaires or retrofits	40% or more	5-7 years
Office Building	Lighting controls, new luminaires or retrofits	50% or more	3-5 years
Academia, public buildings	Lighting controls, new luminaires or retrofits	50% or more	2-5 years
Street lighting	LED luminaires, dynamic controls	80% or more	5-7 years



Acceptable Costs

Parts and Pieces

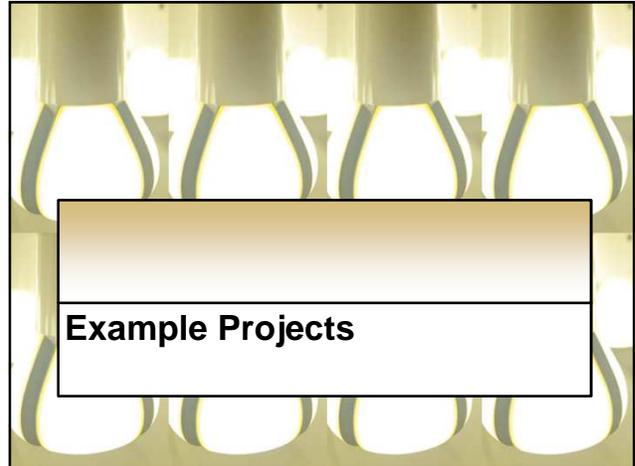
- New LED and other luminaires \$200 billion
 - New control systems \$200 billion
 - Labor and miscellaneous \$200+ billion
 - Proportion of US product including labor 70%
- Gross Made in America business \$420+ billion**

Subsidies

- Efficiency rebates
\$20-60 billion
- Tax deductions (50 BSF @\$.30) \$15 billion
- CURRENT SUBSIDIES
\$35-75 billion

Assumes average subsidy = 10% of actual cost

NECA 2013 WASHINGTON D.C.



Dartmouth Berry Library

- 200,000 sf
- Built in 2000-2003
- Largest energy user on campus
- Modern T8 and compact fluorescent lighting systems



NECA 2013 WASHINGTON D.C.

Dartmouth Berry Library

- Design practice consistent with east coast institutional design
- Professional design using best available products in 1998 catalogs
- Relay based control system



NECA 2013 WASHINGTON D.C.

The Opportunity- General Lighting

- Replace principal lighting system with new Super T8 system— saves 45% of connected watts, reduced light level 20% - almost 5000 feet of linear fluorescent fixtures
- Include dimming ballasts – use motion sensors and tuning to reduce energy use by 50-60%
- Cost about \$600,000

NECA 2013 WASHINGTON D.C.

The Opportunity- Down Lighting

- Replace 1000 2-lamp compact fluorescent downlights with LED downlights – save 40 watts (67%) per downlight
- Reduce maintenance by 75%
- Include dimming drivers– use motion sensors and tuning to reduce energy use by 80%
- Cost about \$200,000

NECA 2013 WASHINGTON D.C.

Total Project

Project Costs

- New luminaires \$450,000
- New controls \$100,000
- Labor and misc. materials \$450,000
- TOTAL ~ \$1 million

Project Savings

- Annual energy cost savings \$175,000
- Annual maintenance cost savings \$25,000
- Rebate \$200,000
- Net Payback 4 years

NECA 2013 WASHINGTON D.C.

Boeing Long Beach

Original Douglas Center

- Supports B1 bomber, other aerospace programs
- 750,000 sf campus



Building 801 (this project)

NEXT PROJECT

NECA 2013 WASHINGTON D.C.

Project Details

- Phase 1 – Building 800
- Approx. 250,000 sf
- Built 1988
- Retrofitted and delamped with T8/electronic 1995
- Annual energy costs for lighting ~\$200,000

NECA 2013 WASHINGTON D.C.

Investigation

- Dominated by 2- and 3- lamp lens troffers
- Lighting in good shape
- Shift of work towards computers and CADD based activities
- Reduced light levels, daylight harvesting and sensors are the best options

NECA 2013 WASHINGTON D.C.

Solution

- All new dimming ballasts
- Control system overlay
- Interconnected to BAS
- Minimum fixture work
- Power line carrier lighting control system to minimize rewiring

NECA 2013 WASHINGTON D.C.

Added Benefit

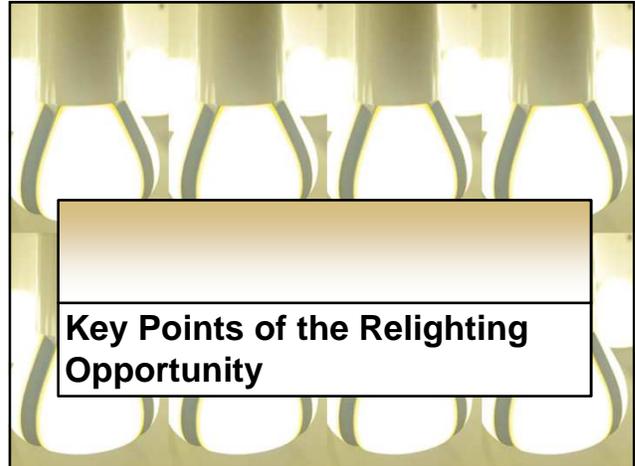
- Southern California Edison service
- Rebates for energy savings and automatic demand response
- Rebate increased due to work by CALCTP trained electricians
- Total rebate ~ \$75,000

NECA 2013 WASHINGTON D.C.

Project Economics

- Annual energy cost for lighting ~\$200,000
- Actual savings 58% (measured)
- New lighting and control system complete project ~\$400,000
- Net project cost \$325,000
- Payback ~ 2.8 years
- Building energy star rating 100

NECA 2013 WASHINGTON D.C.



Economic Considerations

- Expect utility rate increases >inflation
- Expect time of use pricing
- Expect falling costs of materials, especially LED lighting and lighting controls
- Expect rapid obsolescence of products

NECA 2013 WASHINGTON D.C.

Project Planning

Do

- Anticipate significant benefits from controls
- Determine the longest possible payback period
- Get the largest rebate and other incentives
- Do as much as you can with solid, efficient technologies

Don't

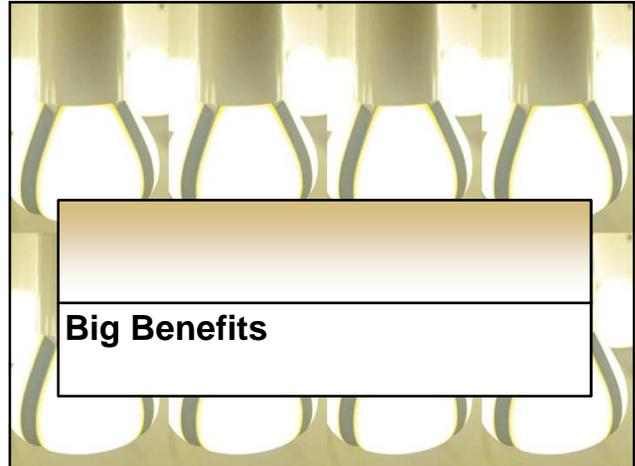
- Do the fastest payback project
- Only reduce watts
- Use sketchy technologies and fly by night vendors

Example

Fluorescent troffer system

- LED replacement lamps 1.5 year payback
 - Not more efficient than Super T8
 - Simply reduce watts
 - Not dimmable
 - Substantial risk
- True LED replacement luminaire with dimming controls payback 5 years
 - Saves more energy
 - Life cycle cost savings is larger
 - Product warranty and dependability higher

NECA 2013 WASHINGTON D.C.



Local Economy

- Made in America products
- Profitable work for NECA contractors
- Employment at all levels
- Work in all regions of the country

NECA 2013 WASHINGTON D.C.

National Economy

- Increased employment
- Better businesses
- American-centric industry revival
- Reduced dependence on foreign energy
- Reduced imports of foreign products

NECA 2013 WASHINGTON D.C.

Energy

- Buildings consume 25% of all energy in the US
- Lighting improvements can reduce this by 20-30%
- **TOTAL NATIONAL ENERGY REDUCTION 5-7%.**

NECA 2013 WASHINGTON D.C.

The Best Outcome

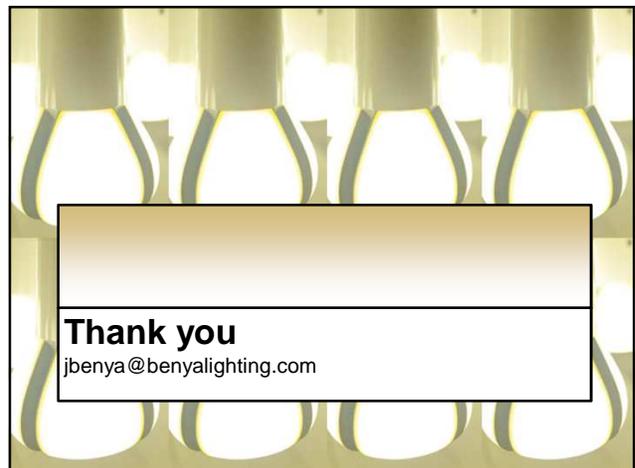
- Lighting is the **ONLY** major energy user that has improved efficiency >75% since the Oil Embargo of 1973.
- Lighting is the **ONLY** major energy saving opportunity that **PAYS FOR ITSELF CONSISTENTLY** in 5 years or less.
- Overall, this is a **TRILLION DOLLAR** national business opportunity.

NECA 2013 WASHINGTON D.C.

What Would Help

- Nationwide increase and consistent utility rebate programs
- Expansion of certification programs like CALCTP to ensure training and work excellence are mandatory
- Increase federal subsidies, tax benefits and other incentives

NECA 2013 WASHINGTON D.C.



Thank you

jbenya@benyalighting.com