Forward Looking Innovation

- Technology is ready for led general lighting
- Energy guidelines are ready for led general lighting
- Is the Canadian market ready to look forward to use led for general lighting

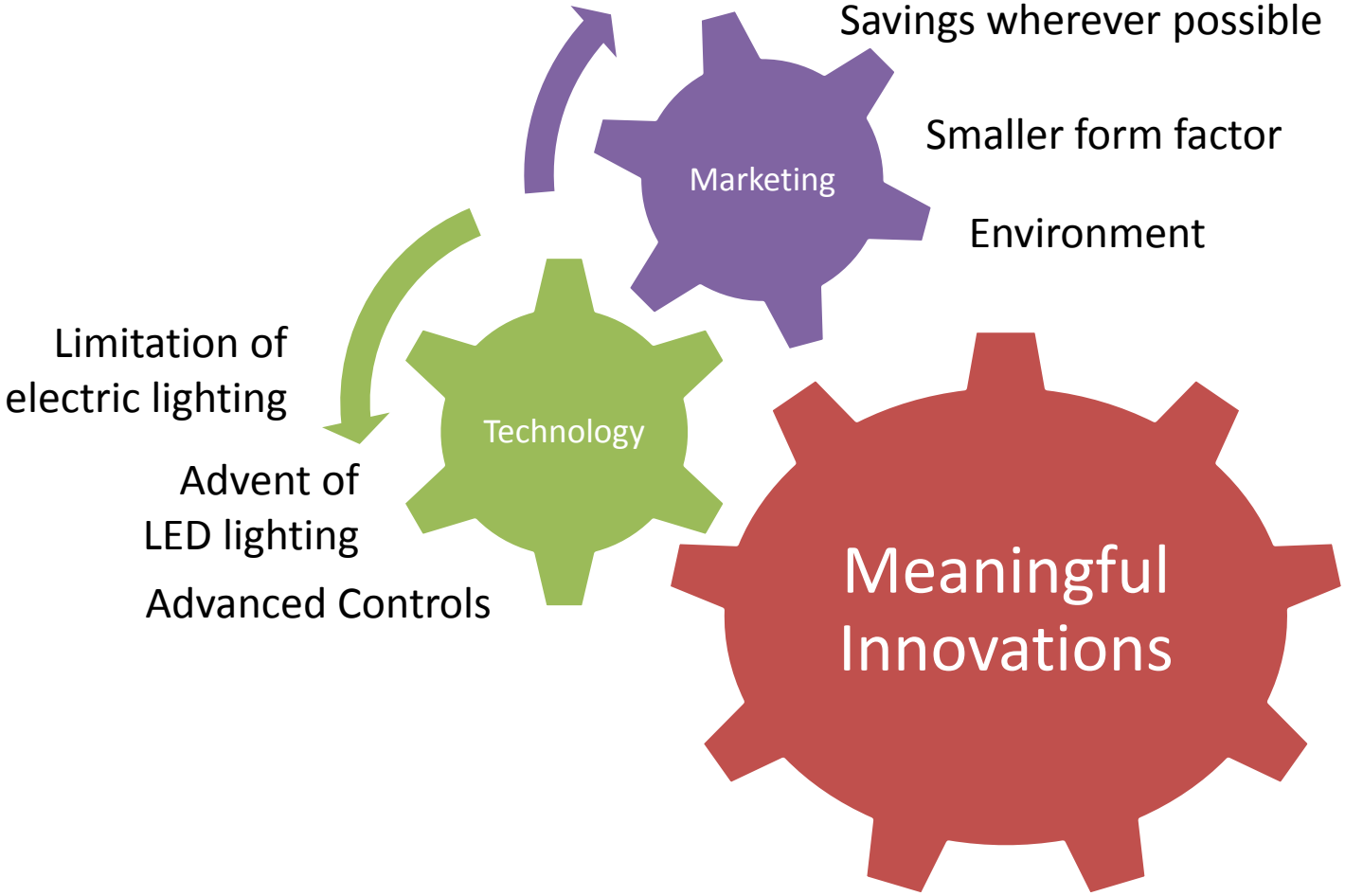
axis LIGHTING

Howard Yaphe, CEO

About Axis Lighting

- Fluorescent and LED linear lighting solutions founded in 1991
- 100,000 square foot head quarters and factory
- 250 employees
- Design, manufacturing and marketing in Montreal with a North American sales base
- Renowned for its responsive customer care and its architectural luminaires allowing design freedom.

Bringing Meaningful Innovations from the Lab to the Market…

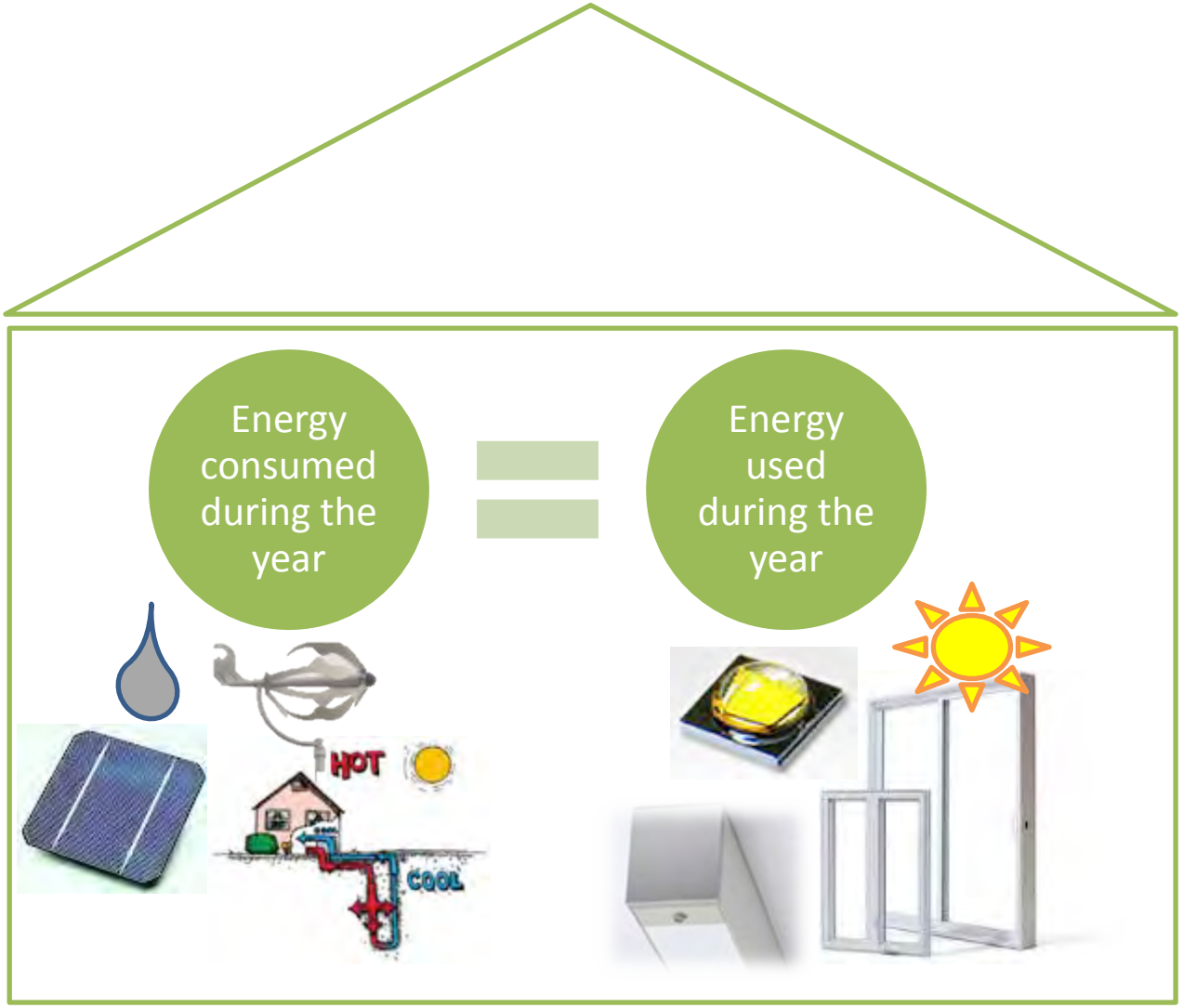


What's around the corner…

Market Drivers at a Glance

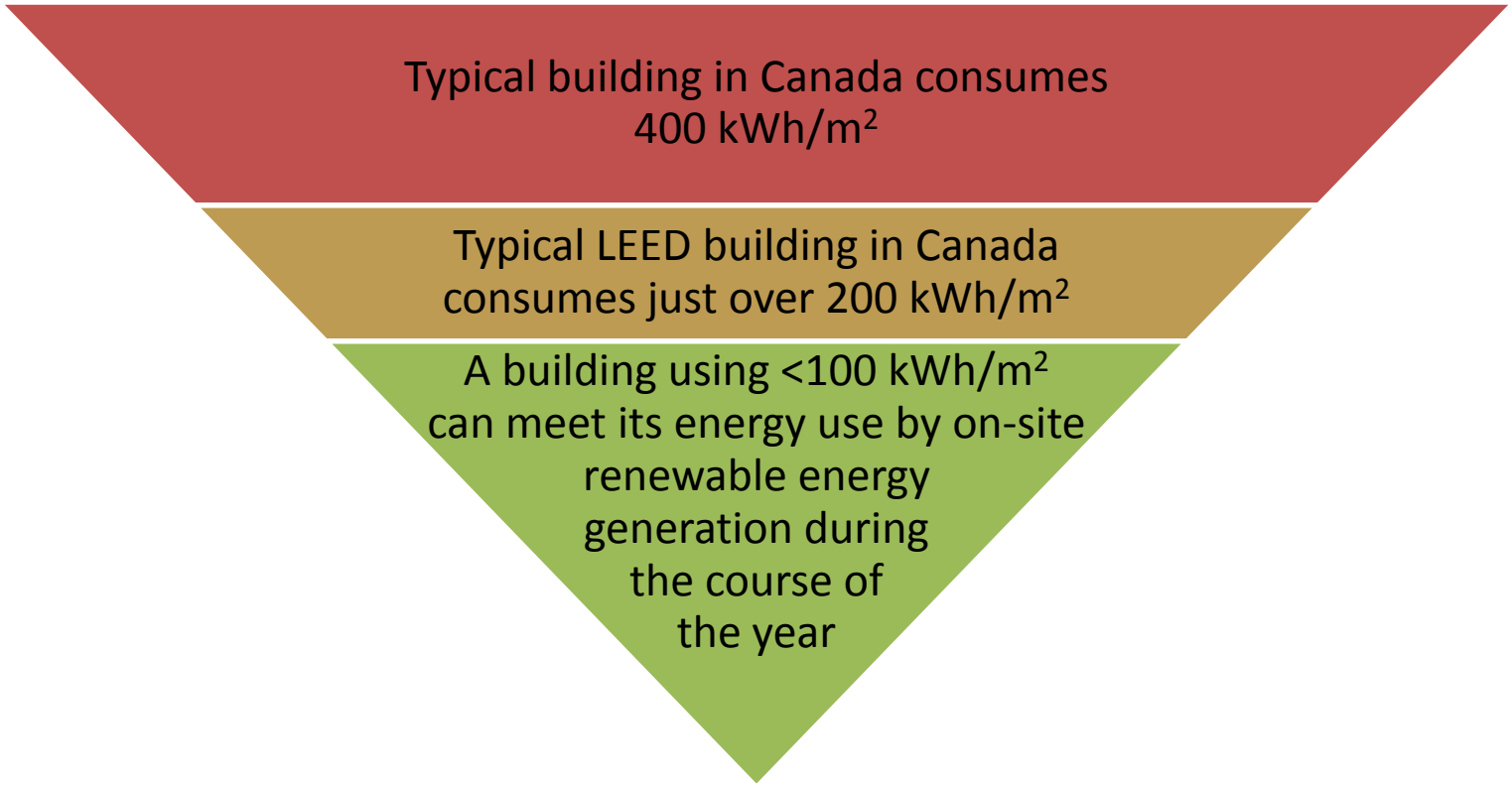
- IESNA recommend practices for lighting
- ASHRAE 90.1 – with IESNA – recommends the energy levels and technologies to support them
- LEED sets as the benchmark
- Net Zero Building initiative shows the road to follow

Looking Forward to net zero building
When will that be a reality?



Market

Net Zero Building is not an Utopia



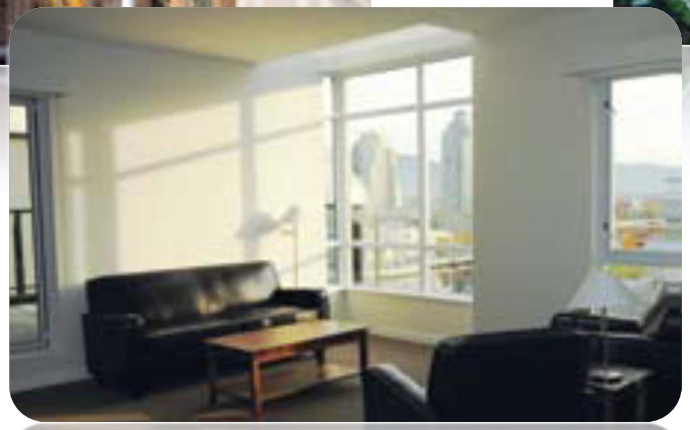
Best 5-10% of green buildings and 1% of new constructions are 'Net Zero Ready' as we speak

Source: http://www.sabmagazine.com/blog/2011/09/26/should-net-zero-be-todays-goal/

Market

First Canadian Net Zero Building in a Community Living in Vancouver, BC

Vancouver's Southeast False Creek development has transformed a former industrial site into a world-class model for sustainable community living with a Net Zero building as its centerpiece.



Market

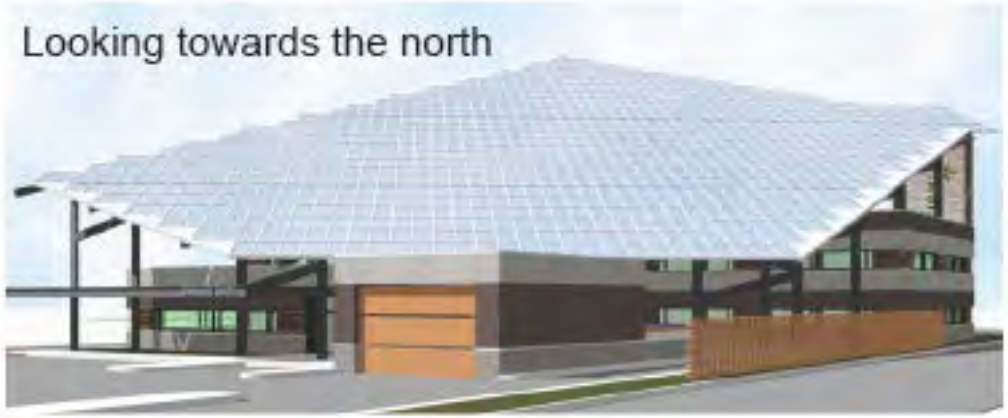
First Canadian Net Zero, Public Building in Varennes, QC

This first public building will be used by as the municipal library.

Market

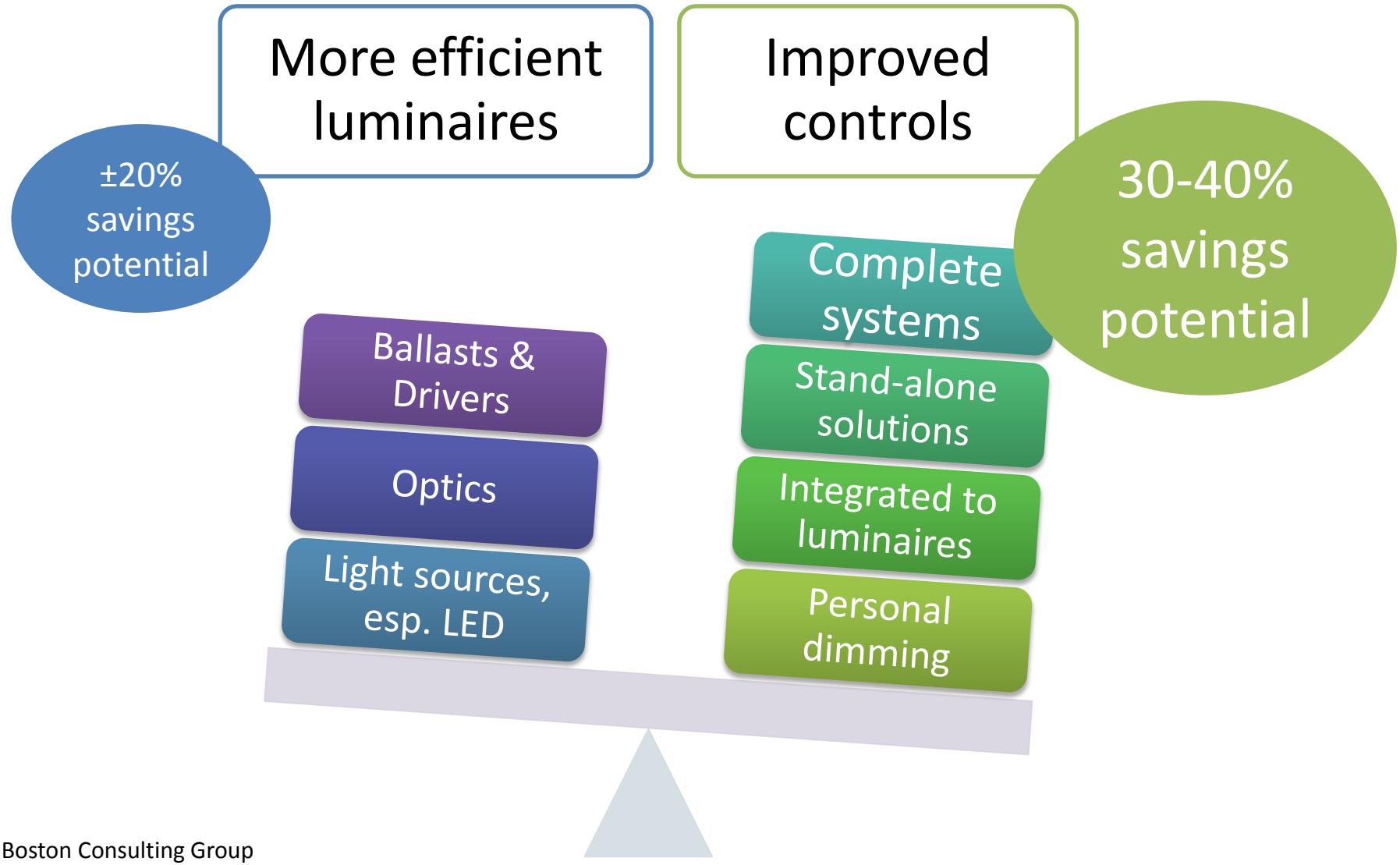
First Canadian Net Zero, Office Building in Markham, ON

Greenlife Business Centre



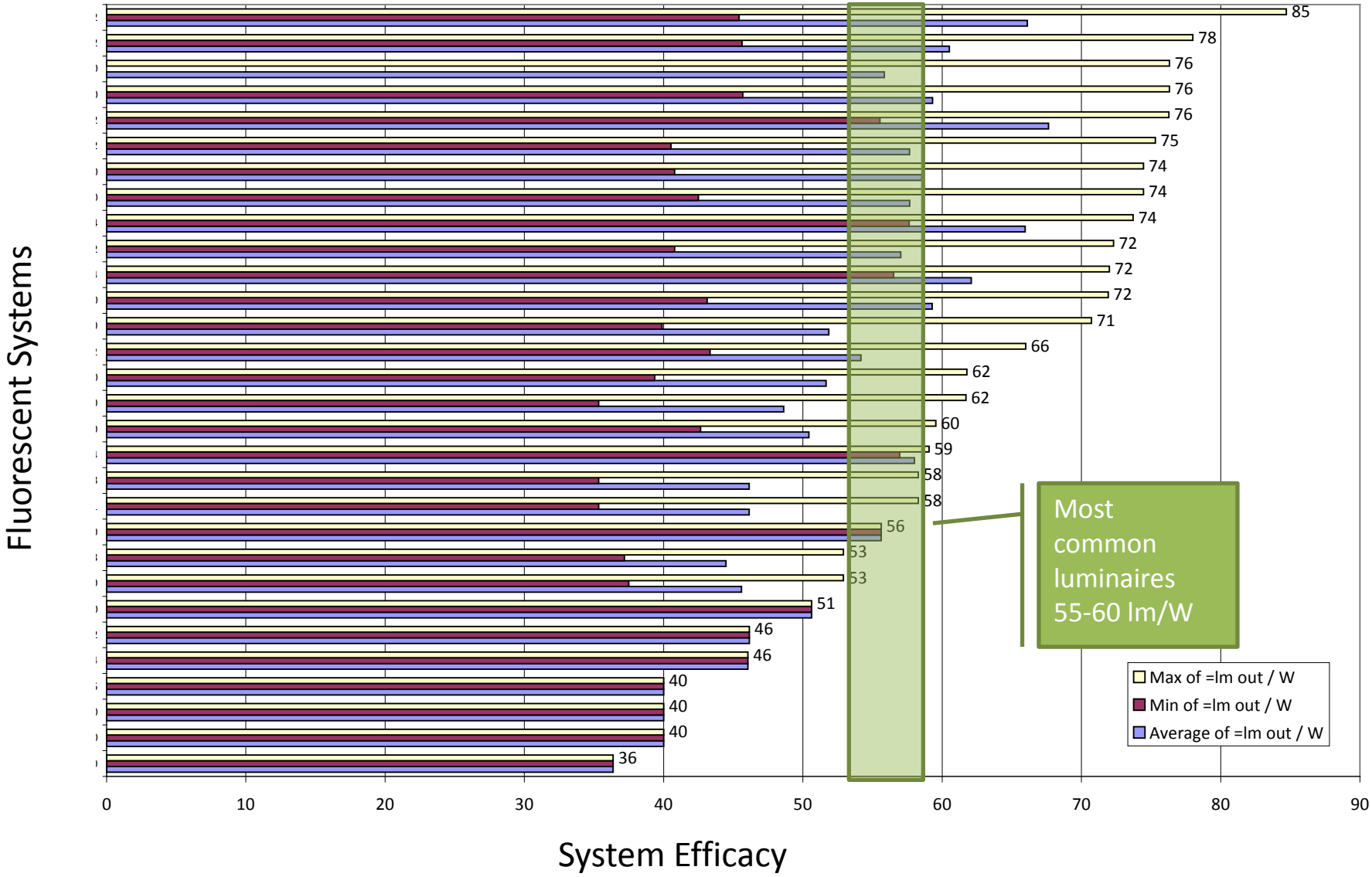
Market

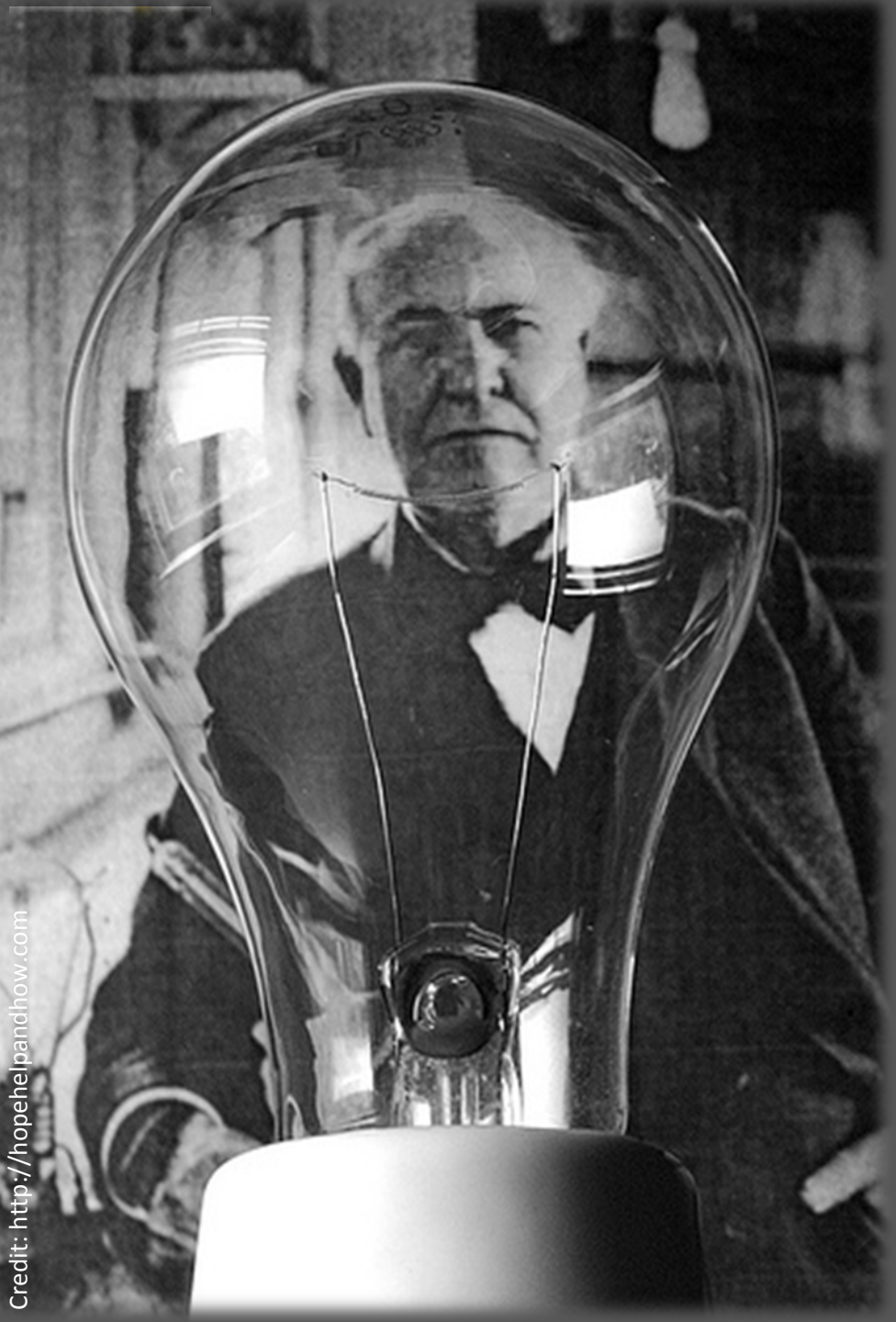
How to Achieve Quality Lighting & Sustainable Design Goals?



Source: Boston Consulting Group

Most Fluorescent Fixtures Are 60 lm/W





Credit: http://hopehelpandhow.com

“There's a way to do it better – find it.”

- Thomas A. Edison

Innova-
tions

The (r)evolution in personal computers

1977
Apple II

1983
Lisa

1984
Macintosh

1989
Macintosh Portable

1994
Powerbook 500 Series

1998
iMac

1999
iBook

2003
Power Macintosh G5

2006
Mac Book

2008
MacBook Air

2010
iPad

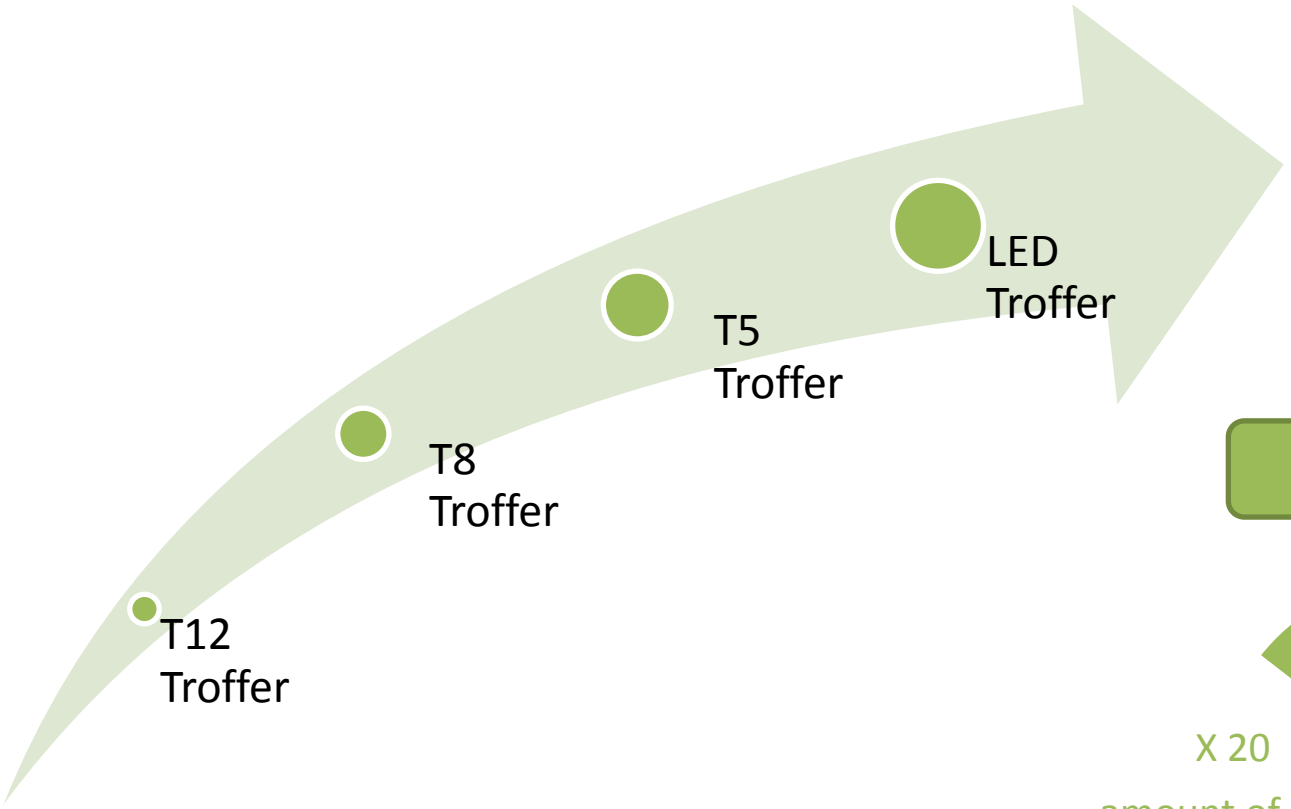
Moore's Law

X 2
performance

÷ 2
price

every 18 months

The (r)evolution in commercial lighting



Haitz's Law

X 20
amount of light

÷ 10
cost

every decade

Innova-tions

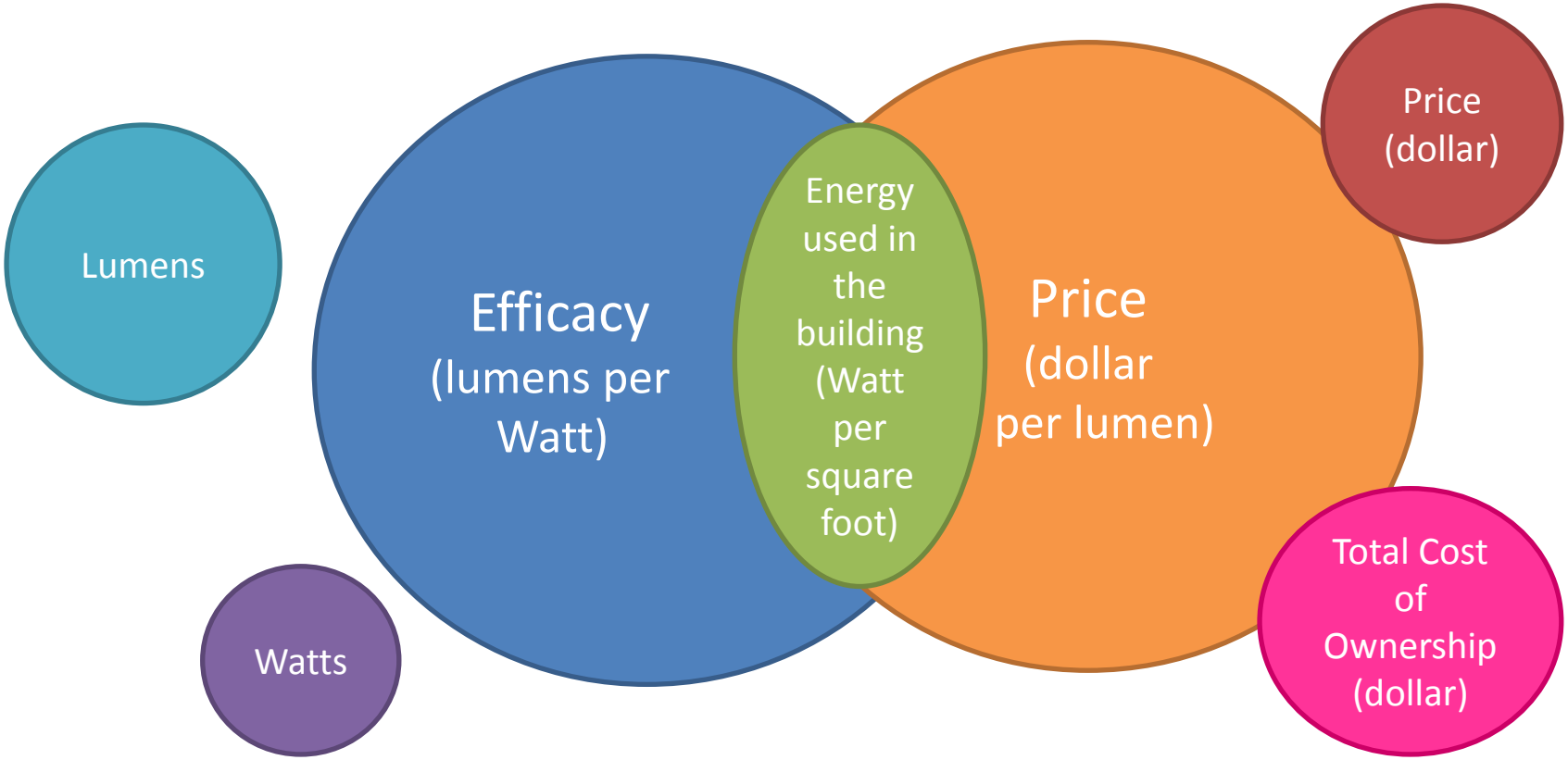
Main Challenges

My concern is first & foremost to reach my Lighting Quality goals

The energy savings are not really there compared to T5 and T8

My budget doesn't allow LED. And even if I could afford it, the return on investment is too long.

How can we evaluate the (r)evolution?



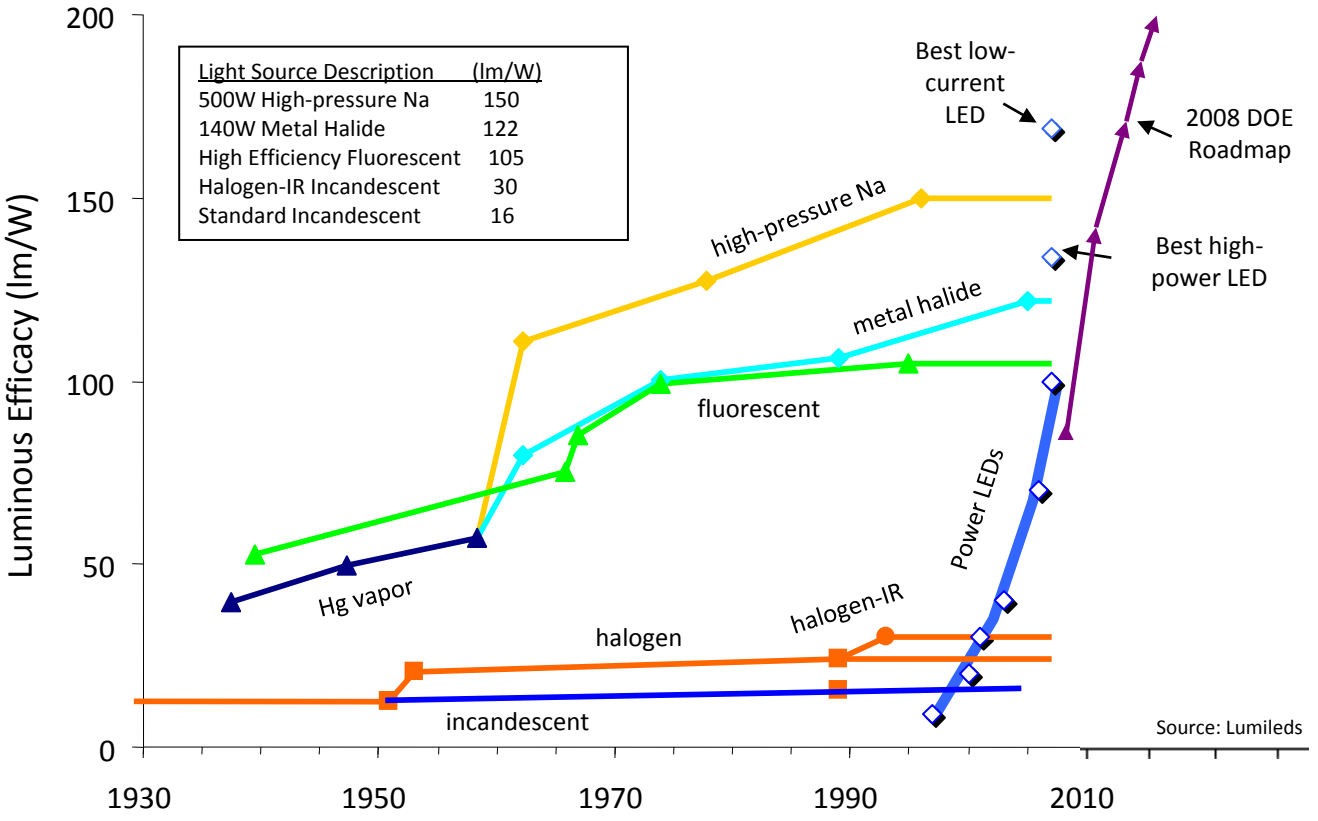
Innova-
tions

Lumen per watt

The energy savings are not really there compared to T5 and T8

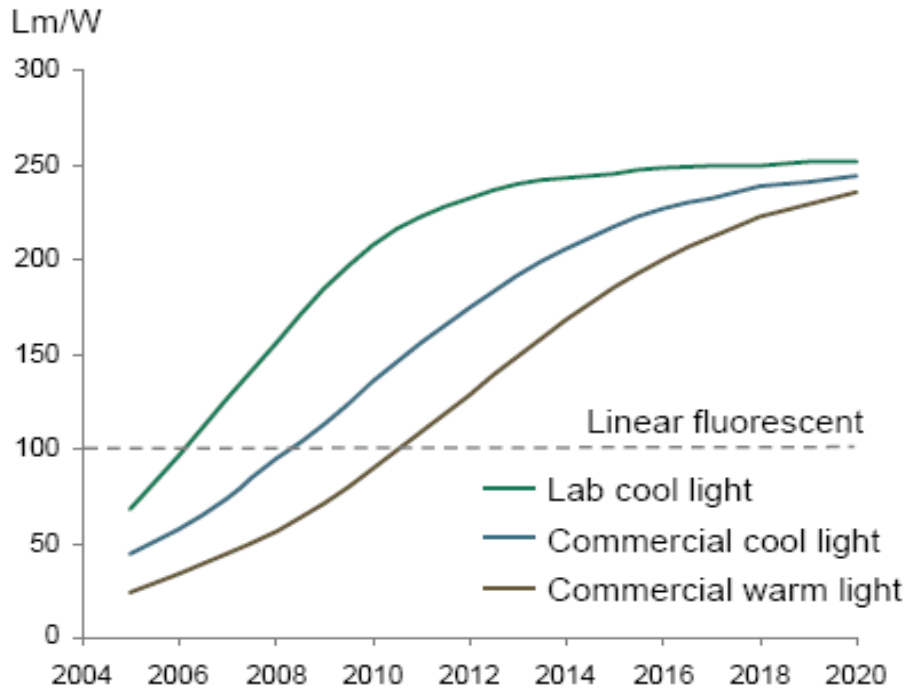
Watts per square foot

LED is the Only Source Growing in Efficacy



- The best LED sources today are nose to nose with the highest efficacy sources.
- LED efficacy is still rapidly increasing and will soon bypass that of other types of sources
- Emerging ~ 130 lm/W white light LED sources
- Expect ~ 150 lm/W LED source performance within the next few years

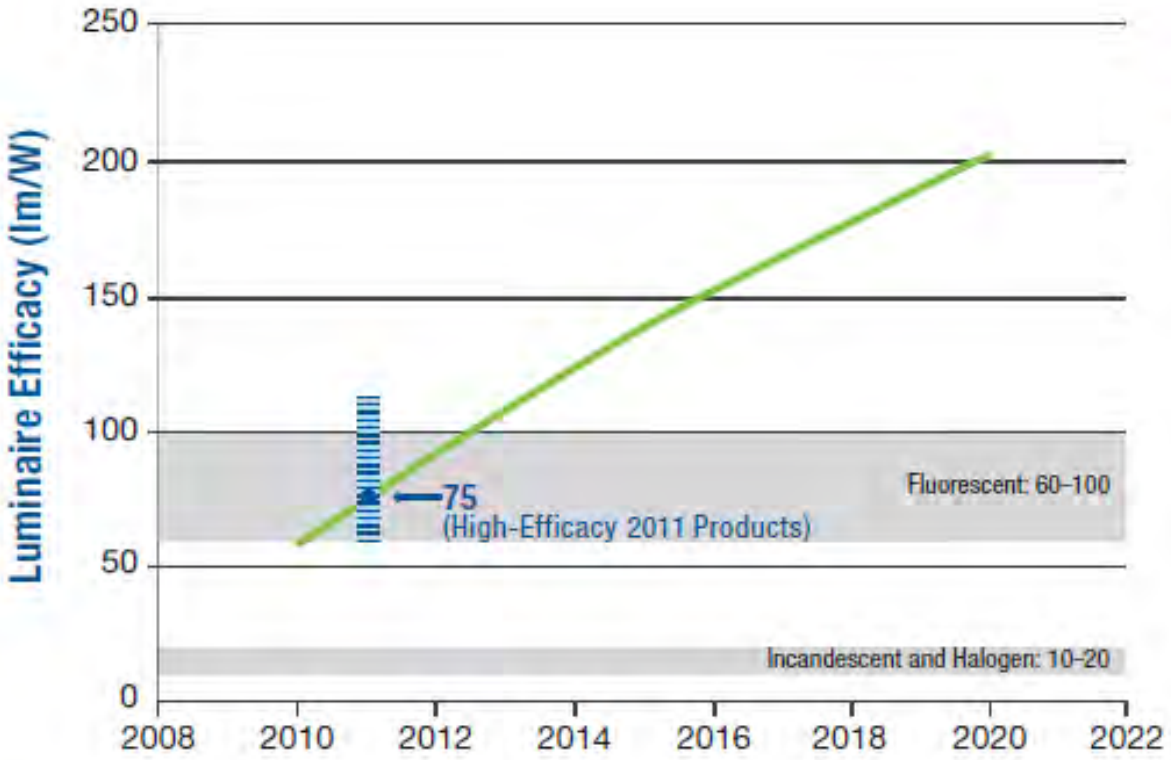
US DOE Comes to the Same Conclusion



- US DOE Forecasts Rapid Development in LED Efficacy
- Warm white LED sources have lower efficacy than cool white LED sources due to the phosphor conversion efficiency starting from blue LEDs

Source: U.S. DoE: Solid State Lighting Manufacturing Roadmap 2010

Luminaire Efficacies Exceeding 2 Times a Typical Fluorescent Fixture by 2015



Source: 2011 DOE SSL R&D Multi-Year Program Plan

- U.S. D.O.E. solidly predicts best commercially available white LED luminaires efficacy at 150 lm/W in 2015
- High efficacy products at 75 lm/W that can reach 110 lm/W using a lower current
- Less current = more efficacy

Innova-tions

Lumen per watt

The energy savings are not really there compared to T5 and T8

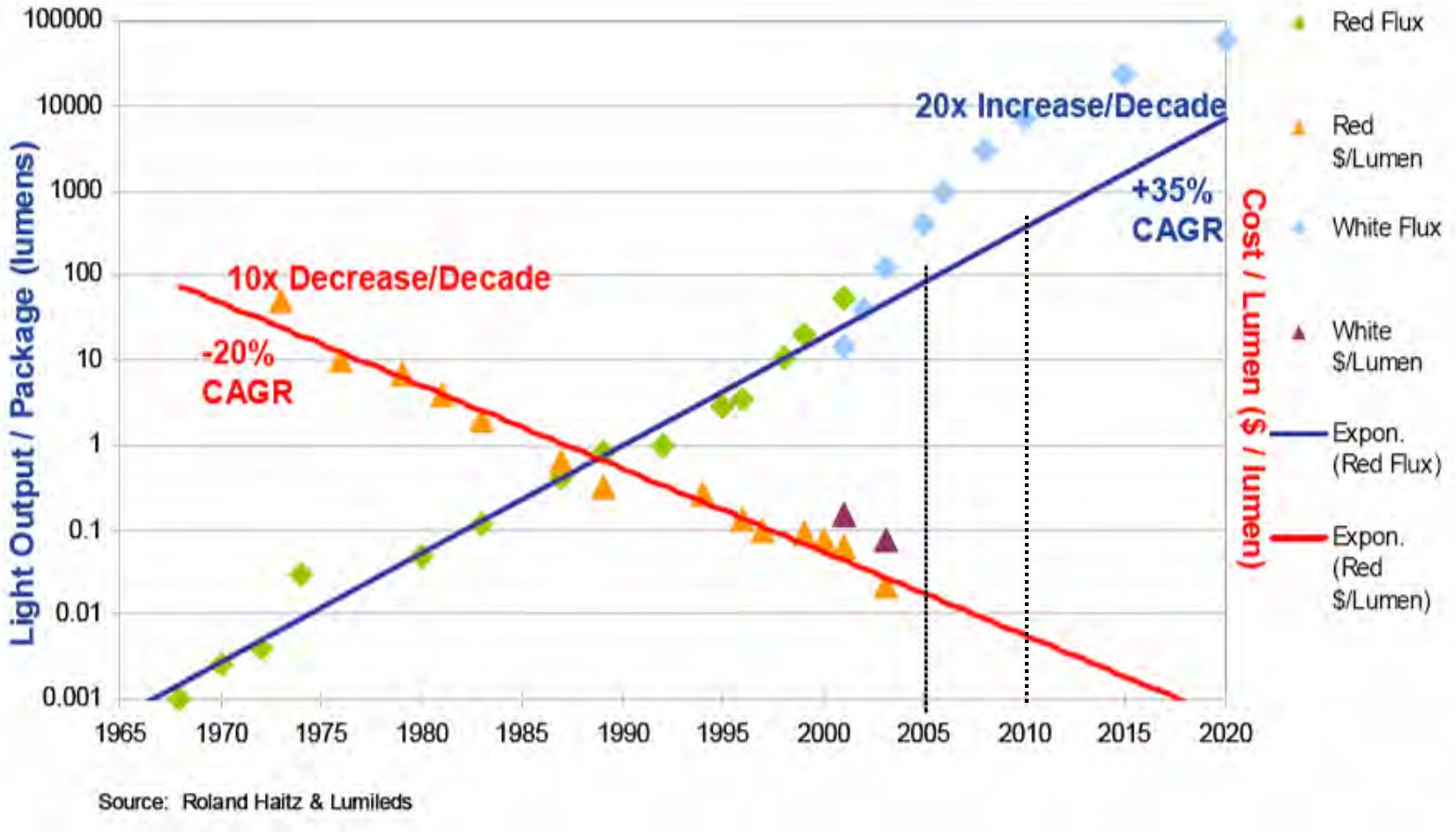
Watts per square foot

Total Cost of Ownership

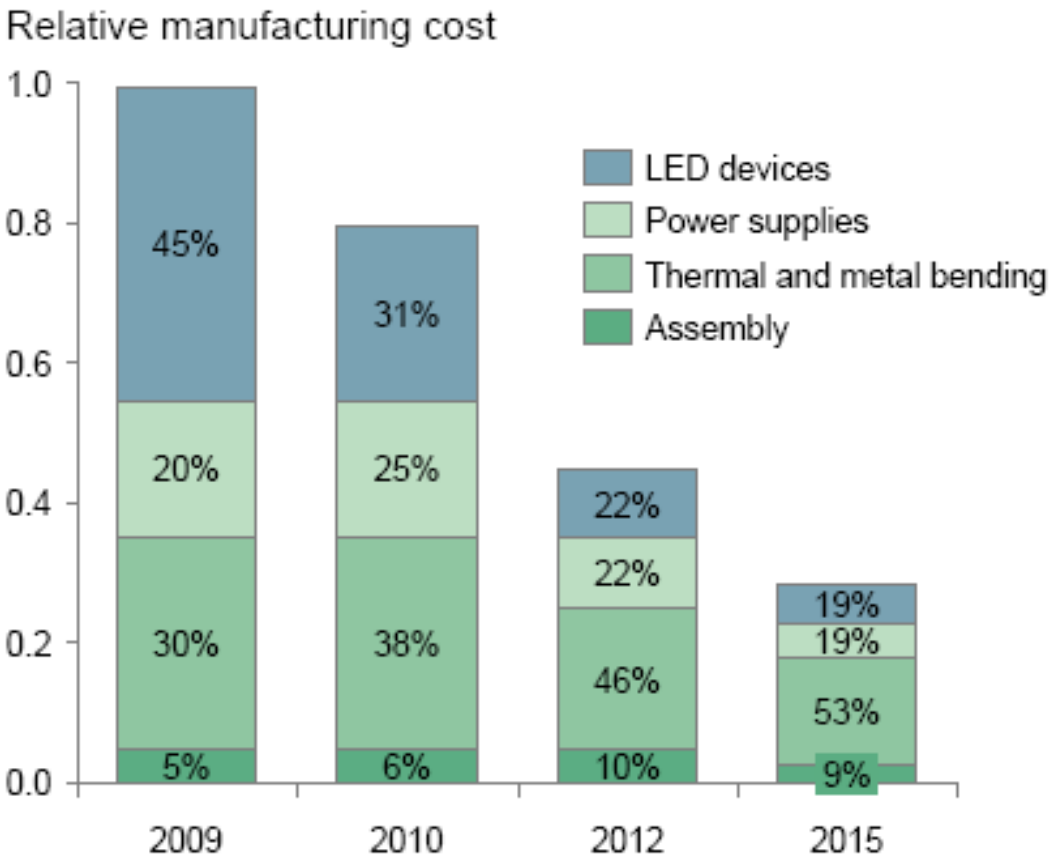
My budget doesn't allow LED. And even if I could afford it, the return on investment is too long.

Dollar per lumen

According to Haitz' Law that LED Costs with Decrease by a Factor of 10 Each Decade



And so does the DOE!



Innova-tions

lumens

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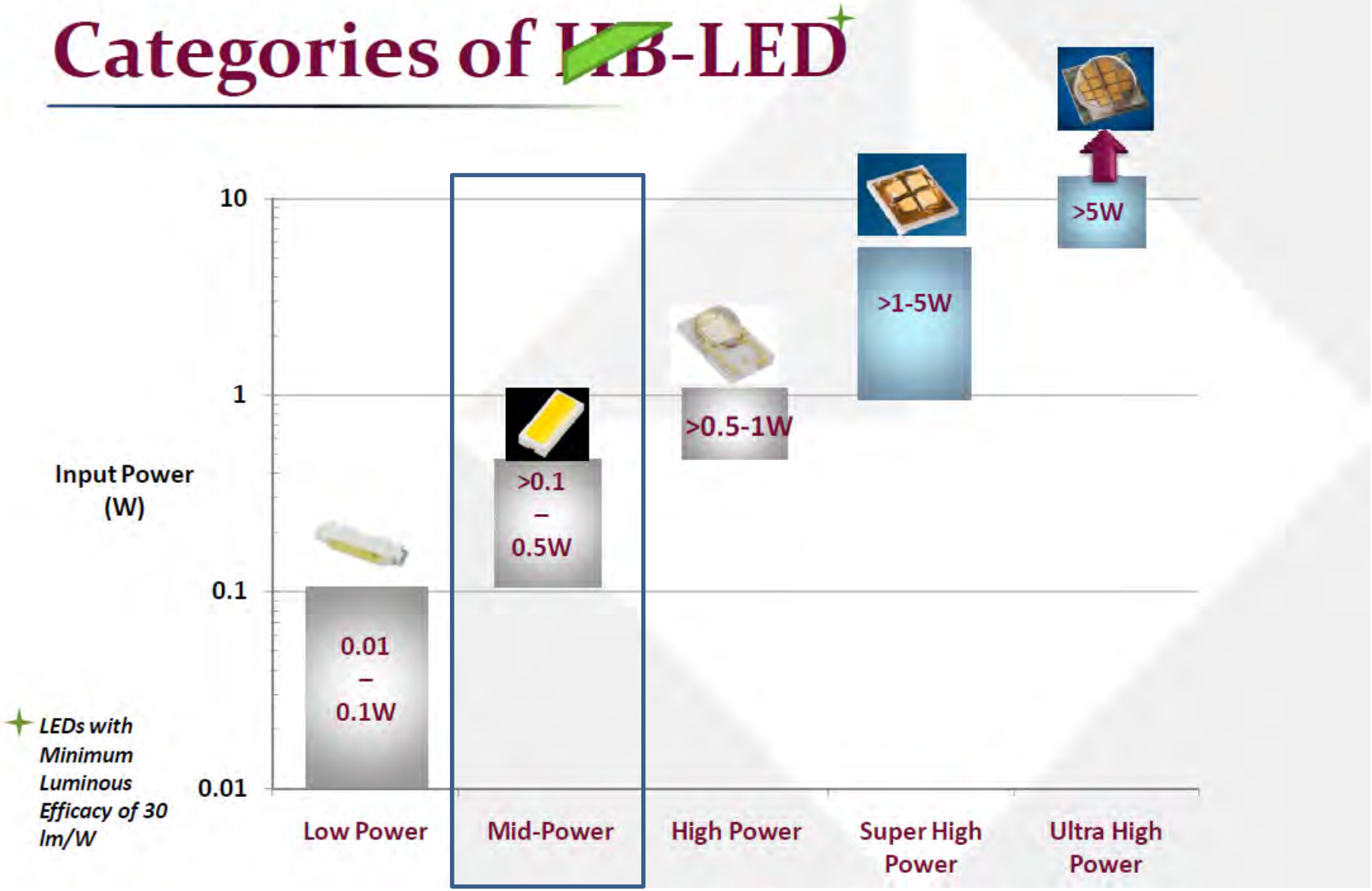
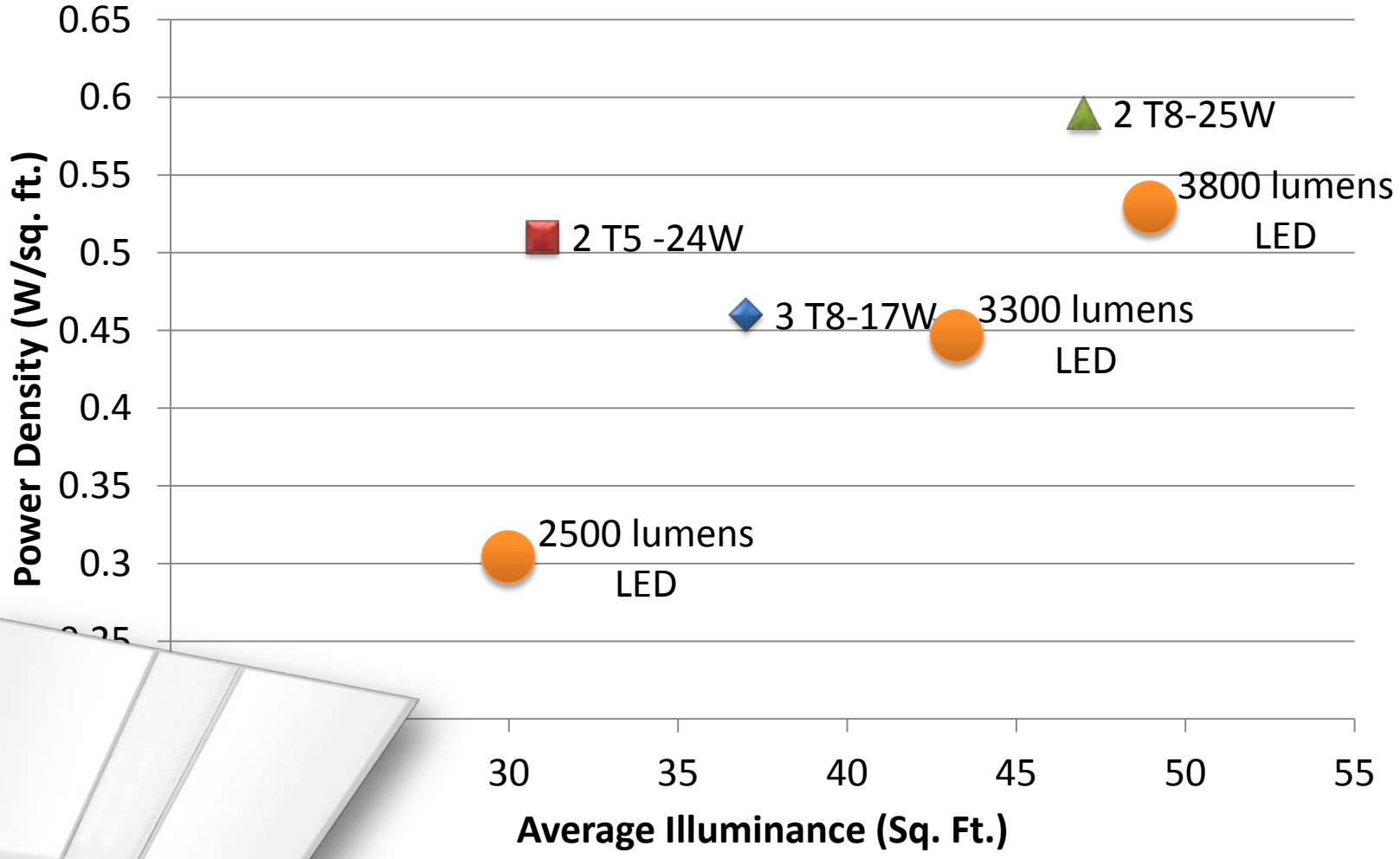
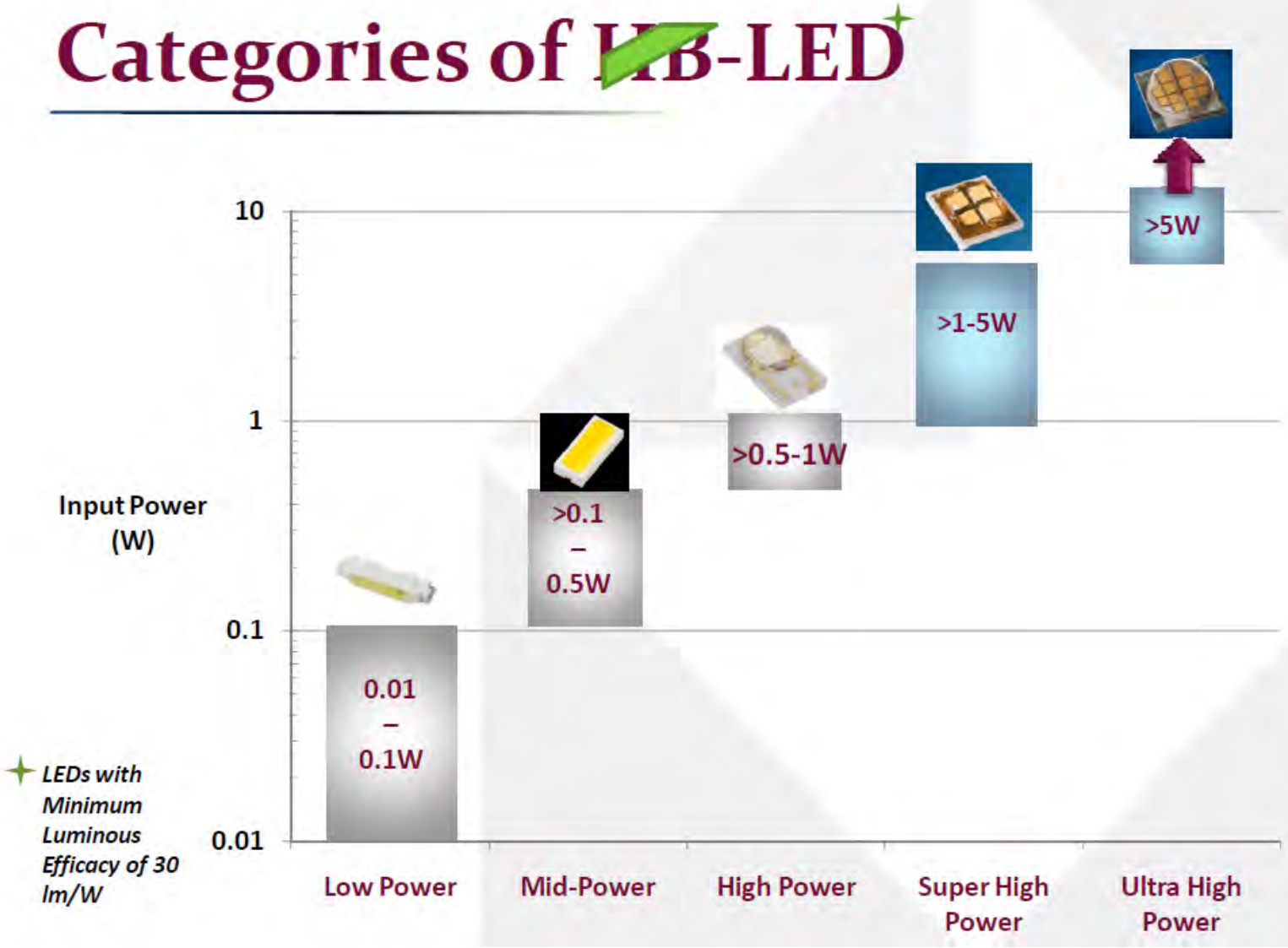
Categories of HB-LED



LED Performs Better Than Fluorescent in All Cases



Categories of HB-LED



LEDs with Minimum Luminous Efficacy of 30 lm/W

The Solution to our general lighting Challenges

Mid Flux vs. High Power LEDs

Mid flux LEDs consume less energy

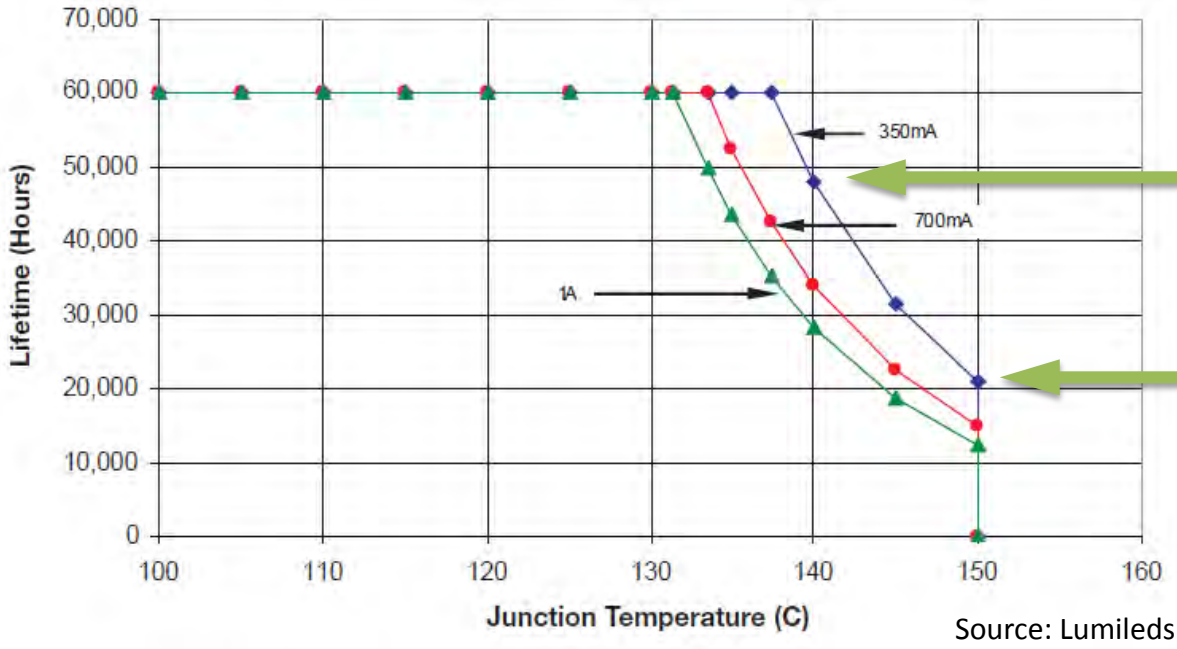
Mid flux LEDs live longer

Mid flux LEDs are cheaper

Mid flux LEDs do not require a fin heat sink

High Power LED

High Power LED at 350 mA, 700 mA and 1000 mA



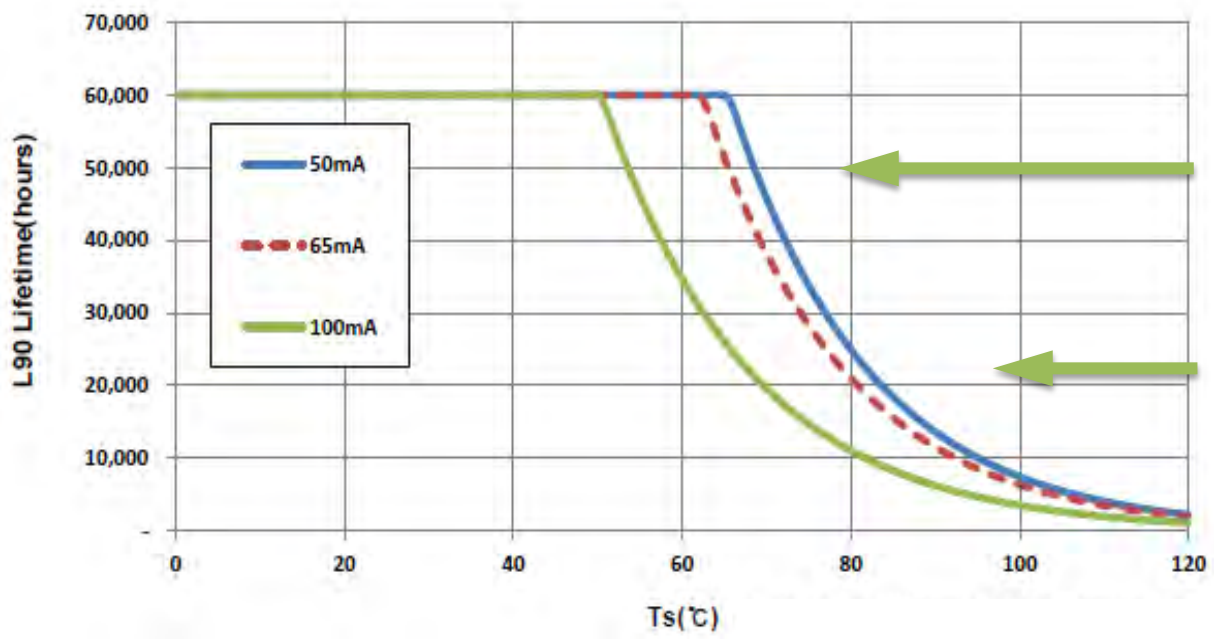
50,000 h @ 139°C (350 mA)

21,000 h @ 149°C (350 mA)

Source: Lumileds

- The operating temperature (measured at the board junction) is critical to performance
- Higher junction temperature results in :
  - Lower Color Stability
  - Lower light output
  - Shorter life – 50% reduction for every 10°C rise in Tj

Mid Flux LEDs Use 50-225 mA Drive Currents Have Lower Junction Temperatures



50,000 h @ 65°C (50 mA)

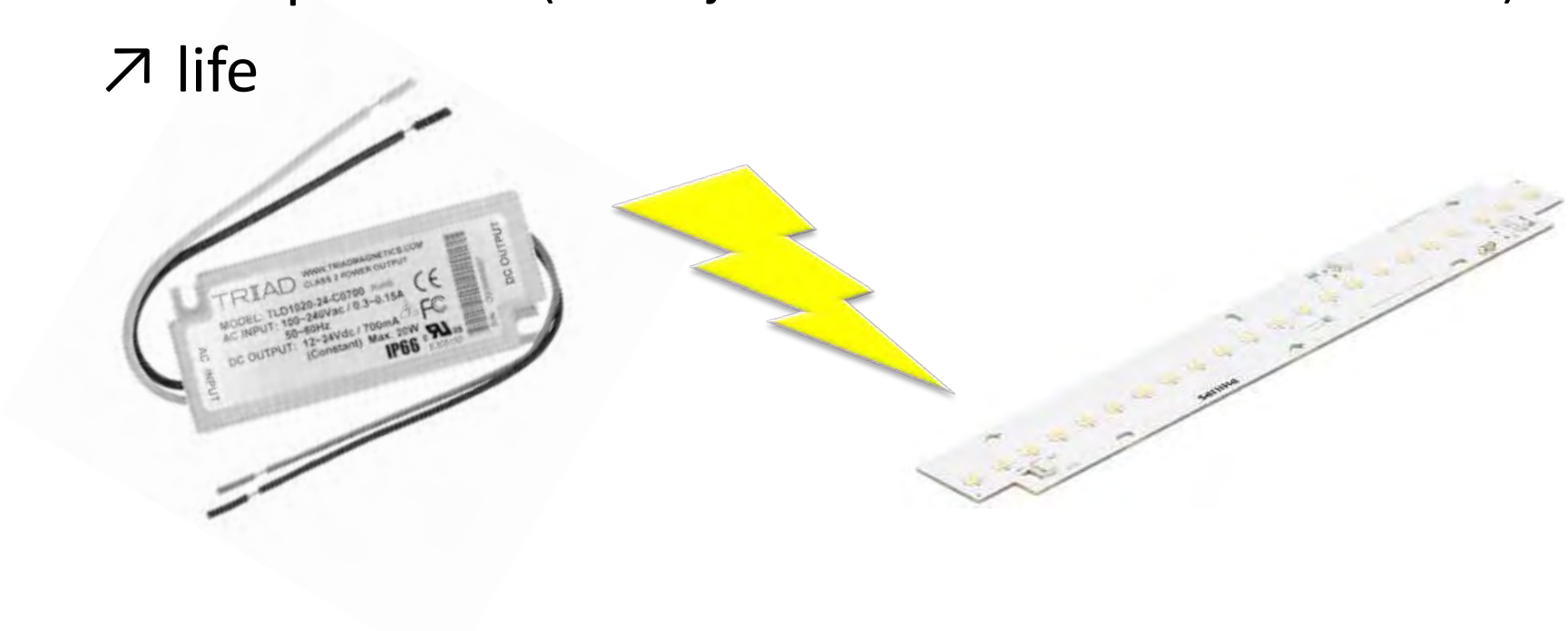
21,000 h @ 82°C (50 mA)

- The 5-9 square feet steel housing acts as a heat spreader
- No need for additional fins or heat sink, reducing size required in the plenum & weight (impact on amount of materials, transportation, handling, recycling).

Advantage of Mid Flux LED vs High Power Led

↘ milliamps (mA) =

- ↘ lumens per LED
- ↘ watts
- ↘ temperature (at the junction of the LED and the board)
- ↗ life



“The value of an idea lies in the using of it.”

- Thomas A. Edison

What we have learned

Up to now, the lighting industry was slow to evolve

The building code and design paradigms are switching tremendously towards green buildings with stricter criteria regarding energy consumption

At the same time the super T8 stagnate, more efficient luminaires and advanced controls are necessary to meet stricter requirements.

LED especially shows many advantages in terms of lumens, lumens per watt, dollar per lumens

LED solutions are available now.

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