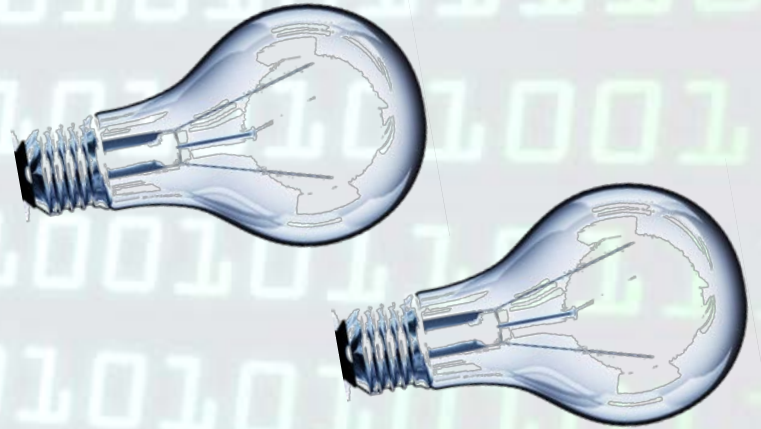


Of Bits and Bulbs: *Impact and analysis of the digitization of the lighting industry*

Jed Dorsheimer
Canaccord Genuity
6/2013



See important disclosures in Appendix

Agenda

- Who we are
- Phase 1: Replacement
- Phase 2: Digitization
- Conclusions



Canaccord Genuity – a Full Service Platform

A leading independent financial services firm focused on growth companies

Breadth of Products and Services

Corporate Advisory

- ☐ Mergers & Acquisitions
- ☐ Restructuring and Debt Advisory

Corporate Finance / Corporate Broking

- ☐ Initial public offerings/public venture capital
- ☐ Follow-on/secondary offerings
- ☐ Private placements & PIPEs
- ☐ Structured finance

Research

- ☐ Large and Small Cap
- ☐ Quest™ – proprietary CFROC valuation methodology

Sales and Trading

- ☐ Canaccord Electronic Trading Solution
- ☐ Market making
- ☐ Specialist teams

Fixed Income

- ☐ Origination and structuring
- ☐ Sales, trading and research

Deep Industry Knowledge across 18 Focus Sectors

AEROSPACE & DEFENSE



AGRICULTURE



CLEANTECH & SUSTAINABILITY



CONSUMER & RETAIL



ENERGY



FINANCIALS



HEALTHCARE & LIFE SCIENCES



INFRASTRUCTURE



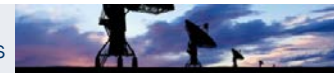
INVESTMENT COMPANIES



LEISURE



MEDIA & TELECOMMUNICATIONS



METALS & MINING



PAPER & FORESTRY PRODUCTS



REAL ESTATE & HOSPITALITY



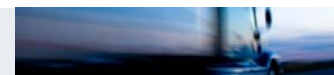
SUPPORT SERVICES



TECHNOLOGY



TRANSPORTATION & INDUSTRIALS



PRIVATE EQUITY



Expertise across Markets



* Pending

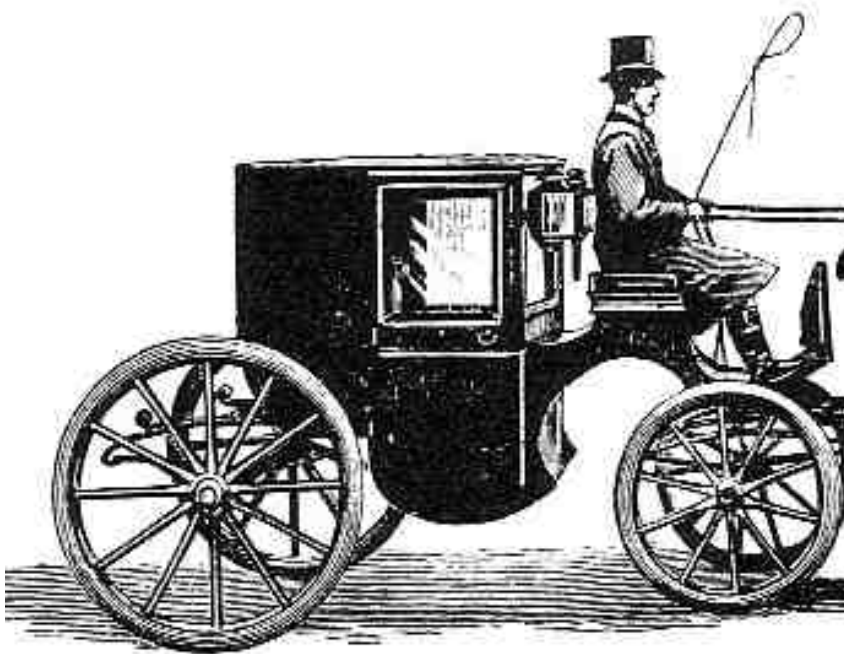
Investment style/Why you are listening to me today

- Strong tradition of industry-first or unique thematic pieces
- Clients look to us as thought leaders and generation of longer-term theses



First phase of LED lighting adoption: *Replacement*

Conventional wisdom of adoption

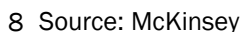


LOOK FAMILIAR?

Conventional wisdom of adoption

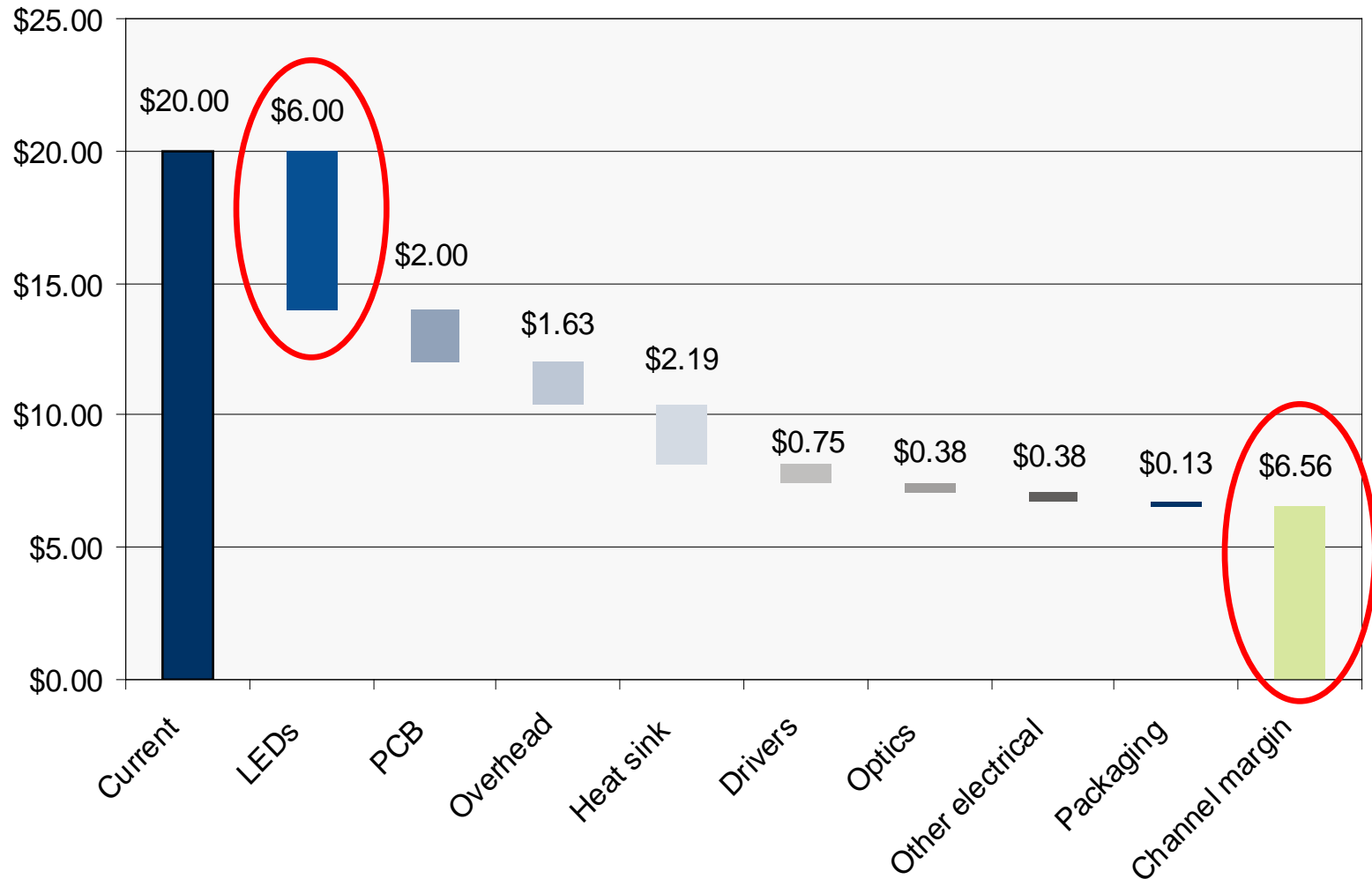


- Policy
- Cost
- Energy efficiency



\$20 to \$2 how does this happen?

60W(eq) LED Lamp Bill of Materials

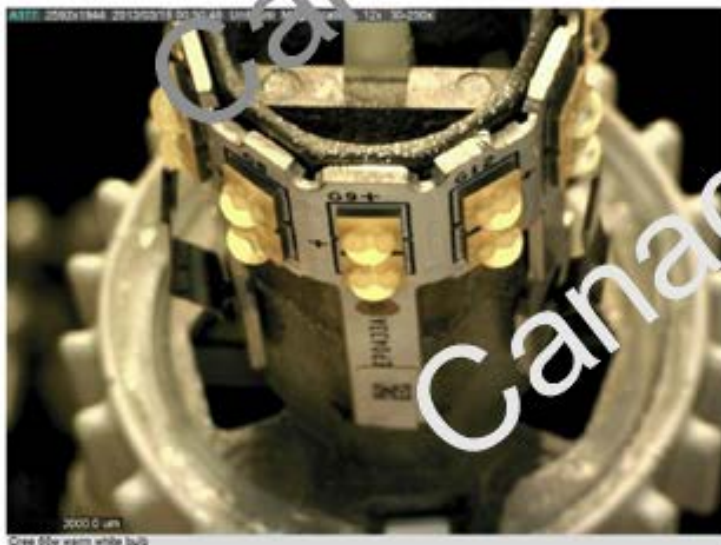
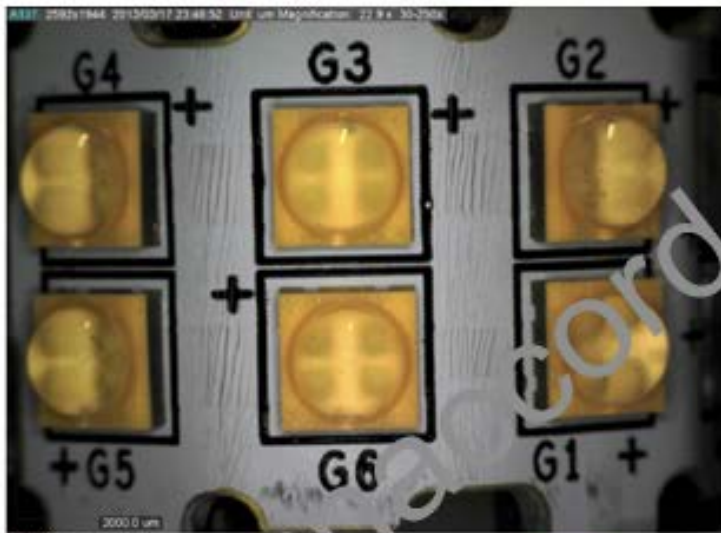


Cree 60W-eq LED Bulb



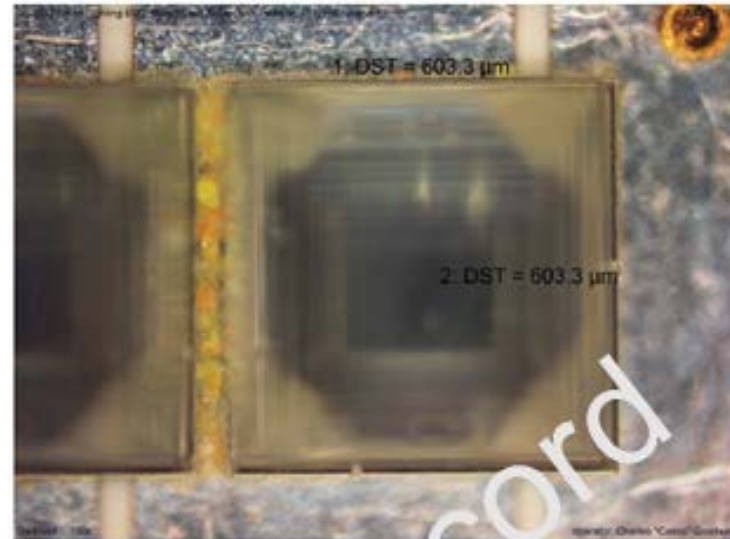
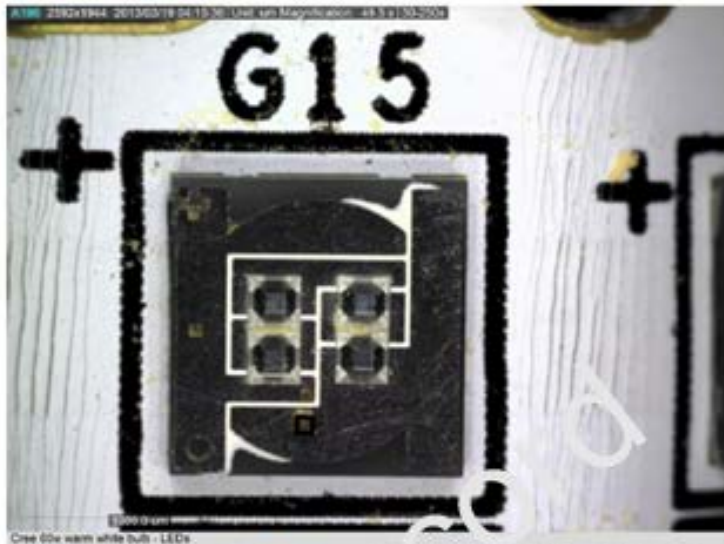
	Low		High	
LEDs	\$	4.80	\$	5.76
PCB	\$	0.65	\$	0.75
Driver	\$	0.20	\$	0.35
Discrete Components	\$	1.00	\$	1.25
Heat Sink	\$	0.50	\$	0.75
Enclosure/Packaging	\$	0.40	\$	0.50
Assembly	\$	0.08	\$	0.10
Total	\$	7.63	\$	9.46
Transfer Price	\$	8.11	\$	9.73
Gross Margin		6%		22%

Cree 60W-eq LED Bulb



- 20x LED packages
- 4x dies in each package
- Single string, with all 80 LED dies in series
- Packages soldered to aluminum-core PCB.
- PCB folded into decagon to press onto heatsink stalk in the bulb center.
- Electrical connection by springy tabs (not soldered)

Cree 60W-eq LED Bulb



Soraa

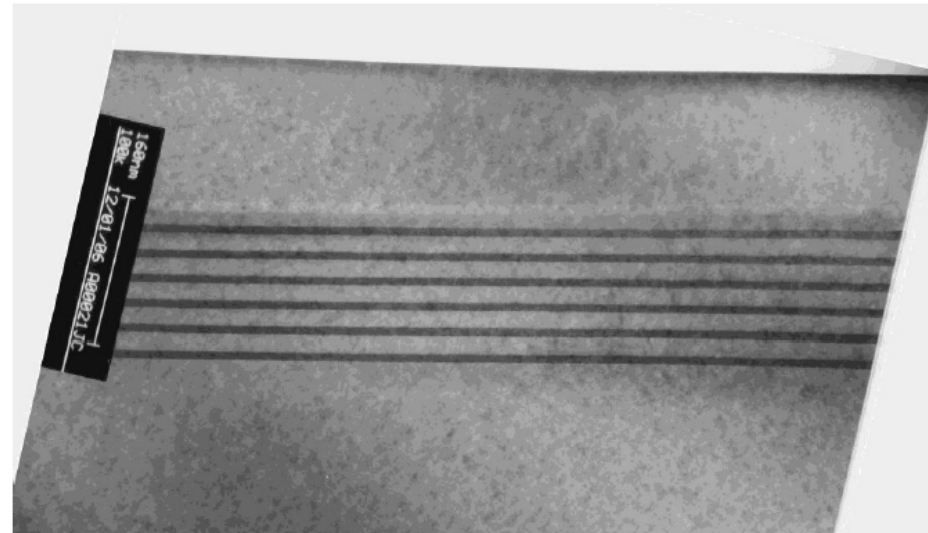
- Focused on homoepitaxial growth vs. heteroepitaxial growth
- Benefits: lower defects = higher current density & greater EQE

LED on Sapphire



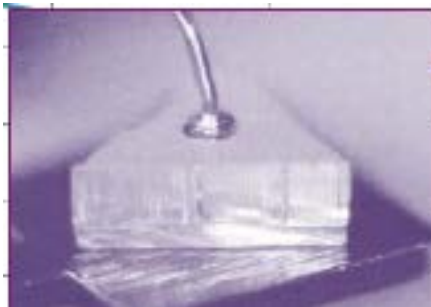
Vs.

LED grown on GaN



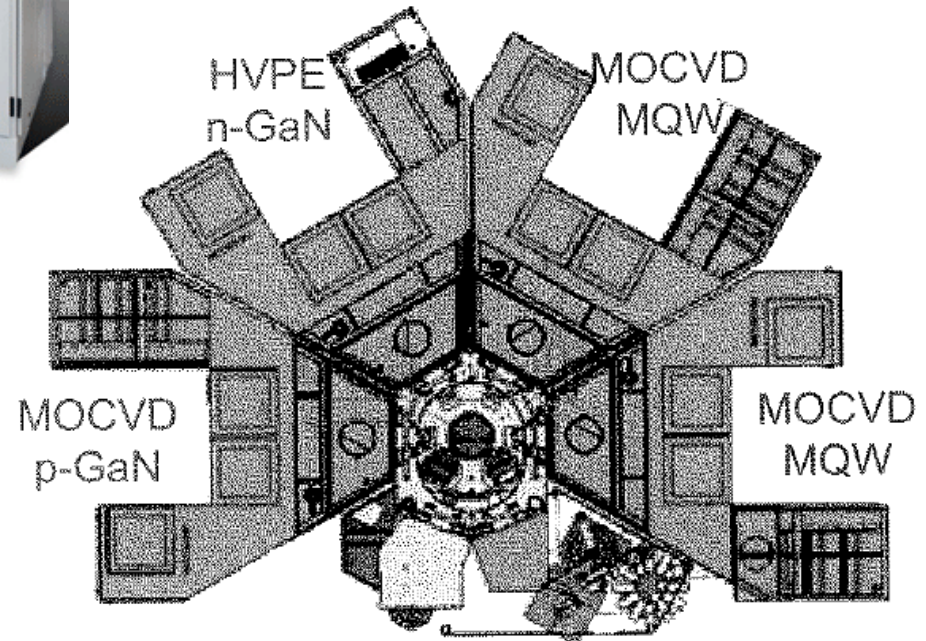
Soraa

- Litmus test on a technology start-up transitioning to a vertically-integrated manufacturing model
- Challenges:
 - From chemistry/physics to commodity-type manufacturing
 - Sacrificing assembly/materials quality control to outsourced partners
 - High volumes/working capital needs
 - Competing on technology vs. competing on price/COO
 - Seller's market upstream vs. buyer's market downstream
 - Product pipeline and channel development



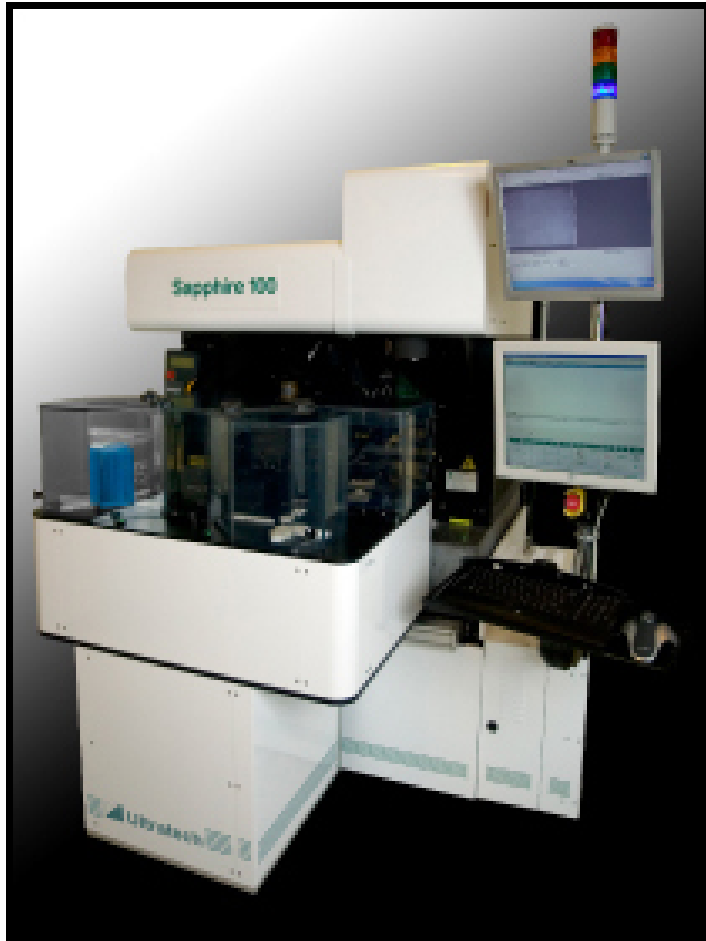
Other manufacturing changes

- Cluster tools



Other manufacturing changes

- Yield enhancement solutions



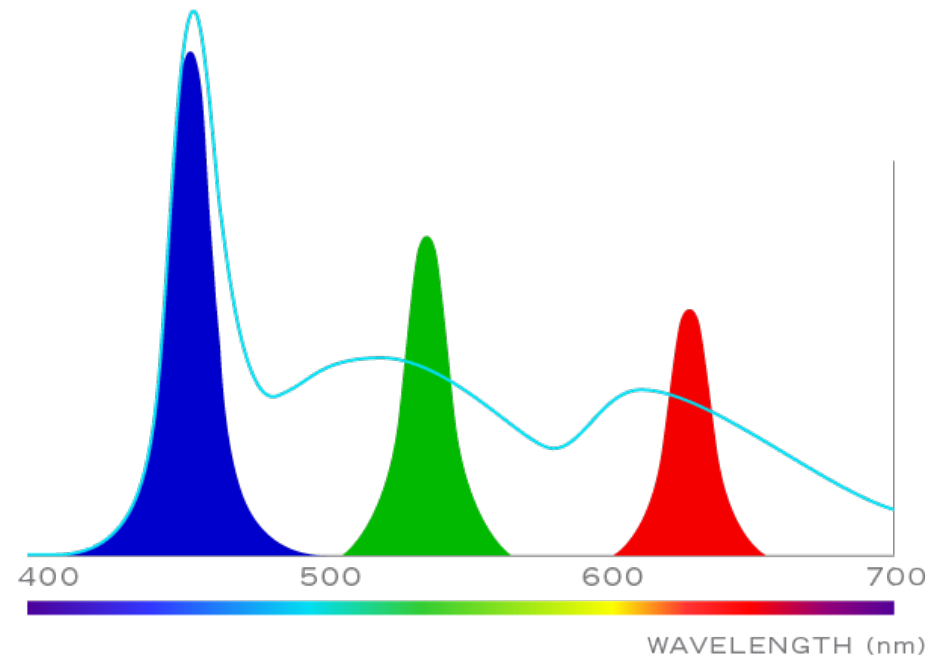
Other manufacturing changes

- We see the gradual adoption of 6" sapphire wafers but not 8" due to cost, reactor geometry, yield, demand
- We believe silicon (also 8") will remain niche due to yield issues



Other manufacturing changes

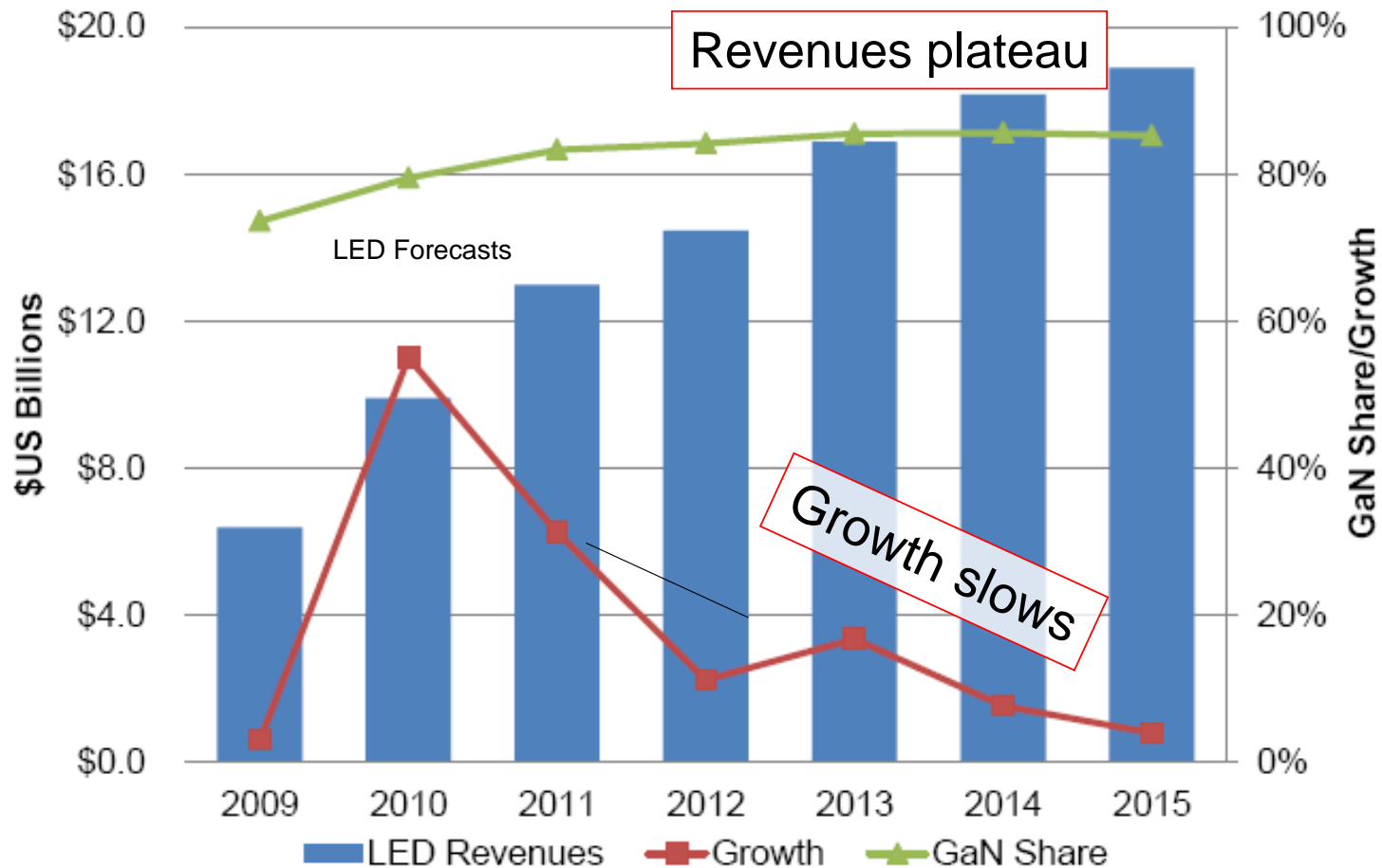
- GaN templates
- Quantum dots from phosphors



Second phase: *Digitization*

One last look at the replacement market

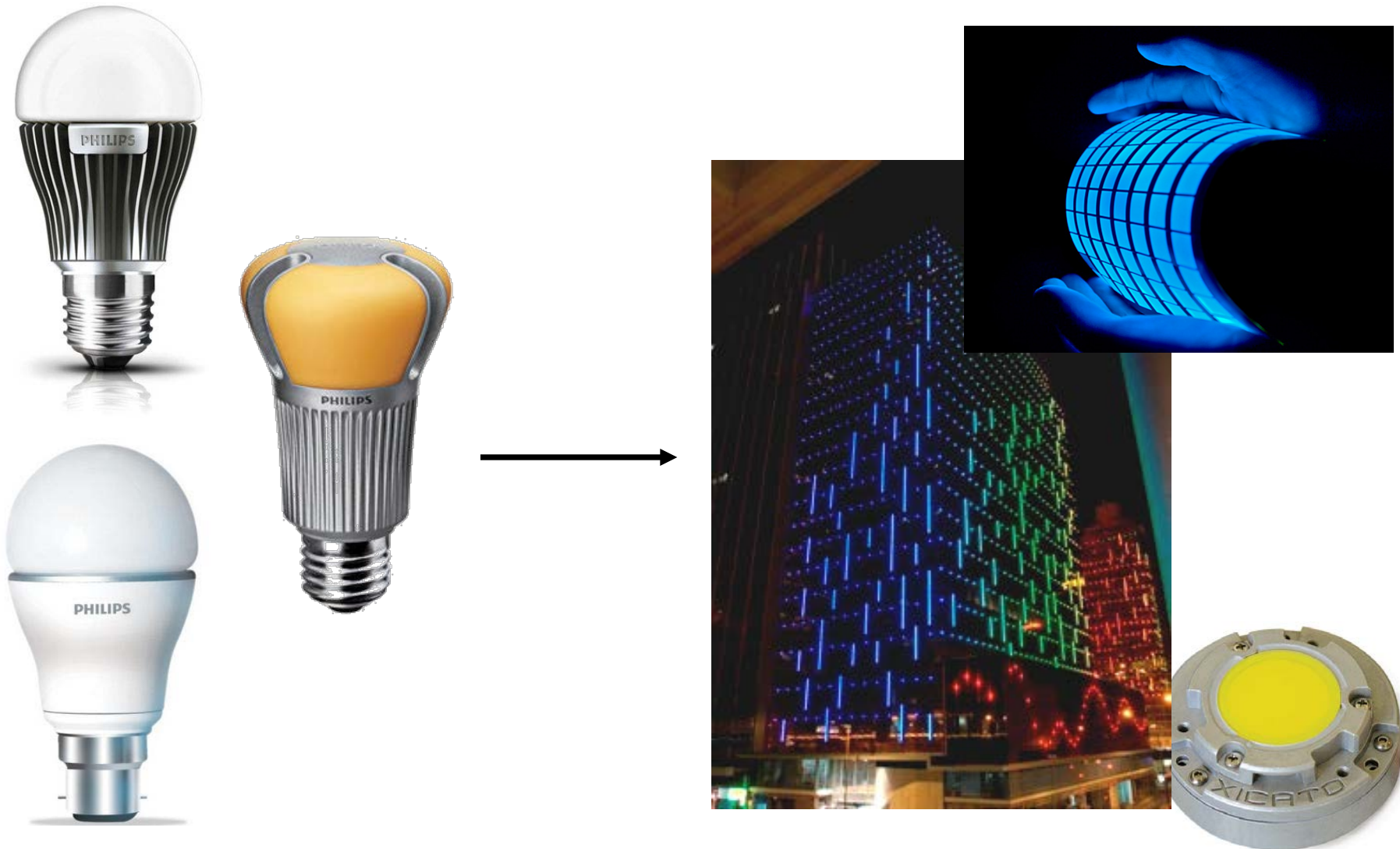
- No matter what manufacturing changes occur, all companies will have to eventually deal with a slowing replacement market



Evolution



Evolution



Occupancy sensors/Controls

- Reducing waste in commercial lighting



Applications that are underlit or not lit at all



Over 4,500 ports



Nearly 500 refineries



~300k construction sites



22,000+ power plants



Millions of parking lots



25,000 mines

The shot heard 'round the world

CANACCORD Genuity

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Sustainability & CleanTech -- Energy & Power Technologies

A Light Read

Canaccord Genuity's Energy & Lighting Monthly

In the past, the adoption of Solid State Lighting will have little to do with energy efficiency. Yes, we said it! Now let us explain what we mean. The first and best in SSL has everything to do with energy savings. We have seen this immediately prove to be an error. This is not to suggest that SSL will be inefficient; in fact, it will be the opposite. Our hypothesis that the value of the technology will prove to be less pertinent to the decision to convert to SSL over time. Think of it as a technology that became an embedded standard – something in the modern automobile comes to mind.

What will be the catalyst for adoption if energy savings is not the key driver? It is our belief that it will be the flexibility for lighting designers to light objects and spaces in a unique way. Benefits will include data harvesting – what would it mean to know the floor traffic in each aisle every day? What is the value of a store where they could achieve a productivity boost by increasing the quality of light? Light has the ability to adjust our moods, affect our sleep habits, improve the appearance of the food we buy, and increase productivity. Most people don't know how to quantify these intangibles, but know them when they see them.

So what does this mean from a business perspective? Bulbs as we know them will eventually go away as SSL solutions evolve into a system design. This allows for a company to expand its portfolio and create sustainable value. It means Lm/W becomes an almost meaningless metric. It becomes air conditioning in the car – expected. This month, we will explore some of these topics, as well as include our commentary on Taiwan's monthly sales data.

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12 June 2012

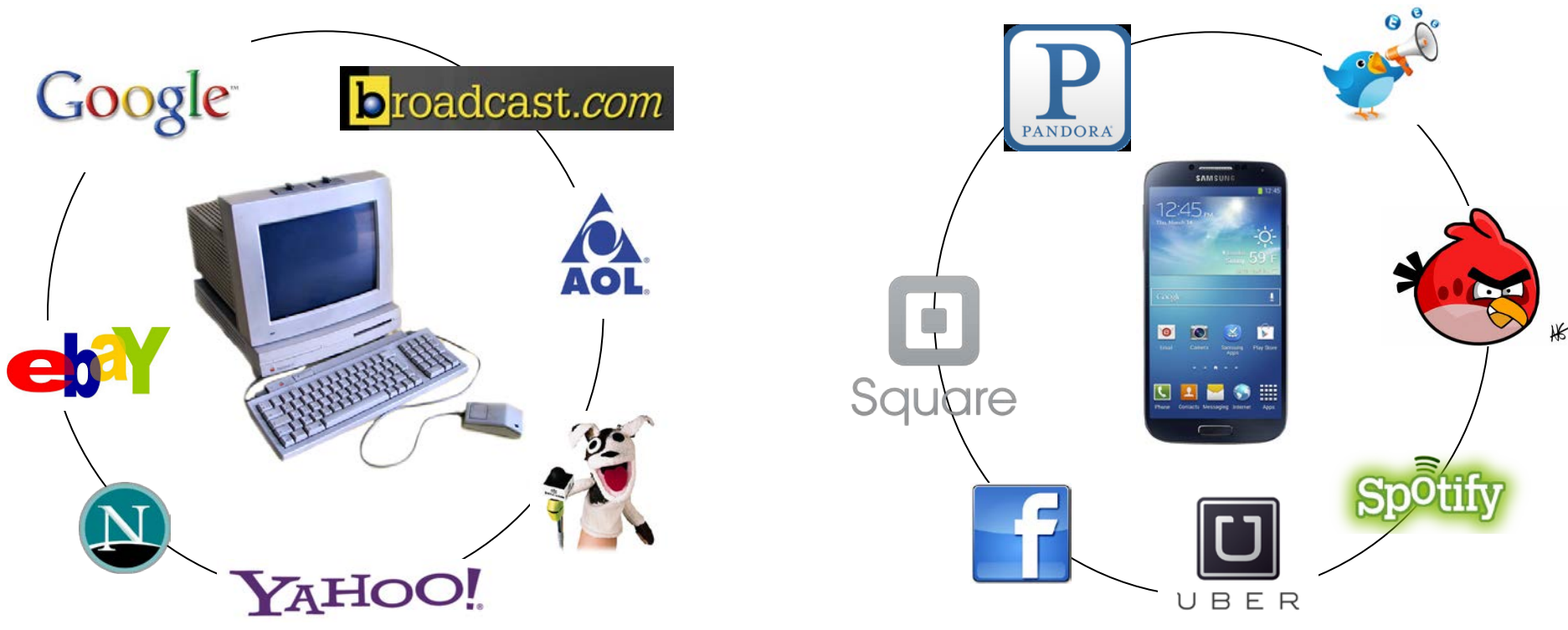
“In the near future, adoption of Solid State Lighting will have little to do with energy efficiency.” -6/12/2012

The Trojan Horse



The Trojan Horse

- In the 1990s PCs in the home and enterprise provided the gateway to the internet
- Similarly handsets provide the gateway to the cloud today, enabling countless new mobile business models



What will lighting enable?

- We see lighting becoming a node/gateway to something bigger vs. just a light source
- Embedded intelligence - the exponential increase in silicon processing power means that every LED source can have its own microprocessor
- Better understanding of light's effects on health
- “Lighting as a Service” business models?



Possibilities

- LED lighting can help solve some of our most fundamental problems – either directly or indirectly



Access to healthcare



Climate change



Aging population



Obesity

Health and well-being

- We expect offices will increase and optimize lighting for productivity



Health and well-being

- Education

NORMAL

Normal Class Lessons Standard Color Tone



FOCUS

Concentration for Testing Cool Color Tone



ENERGY

Support Fresh Start (Morning) or (Early Afternoon)
Very Cool Color Tone



CALM

When Class Is Hyperactive Warm Color Tone



Health and well-being

- Recovery after transcontinental flights

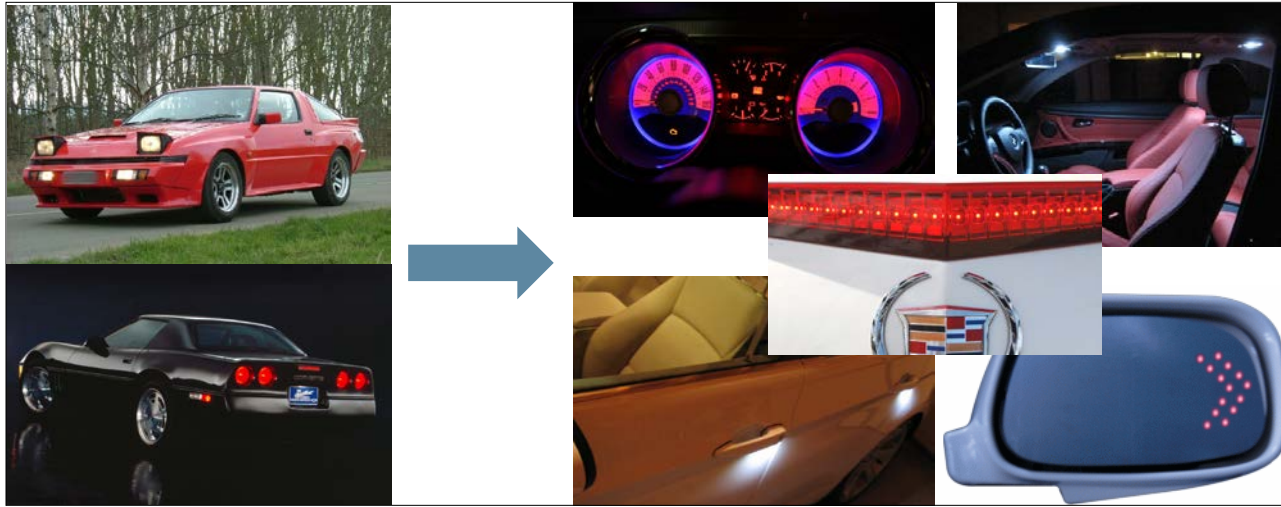


Agriculture

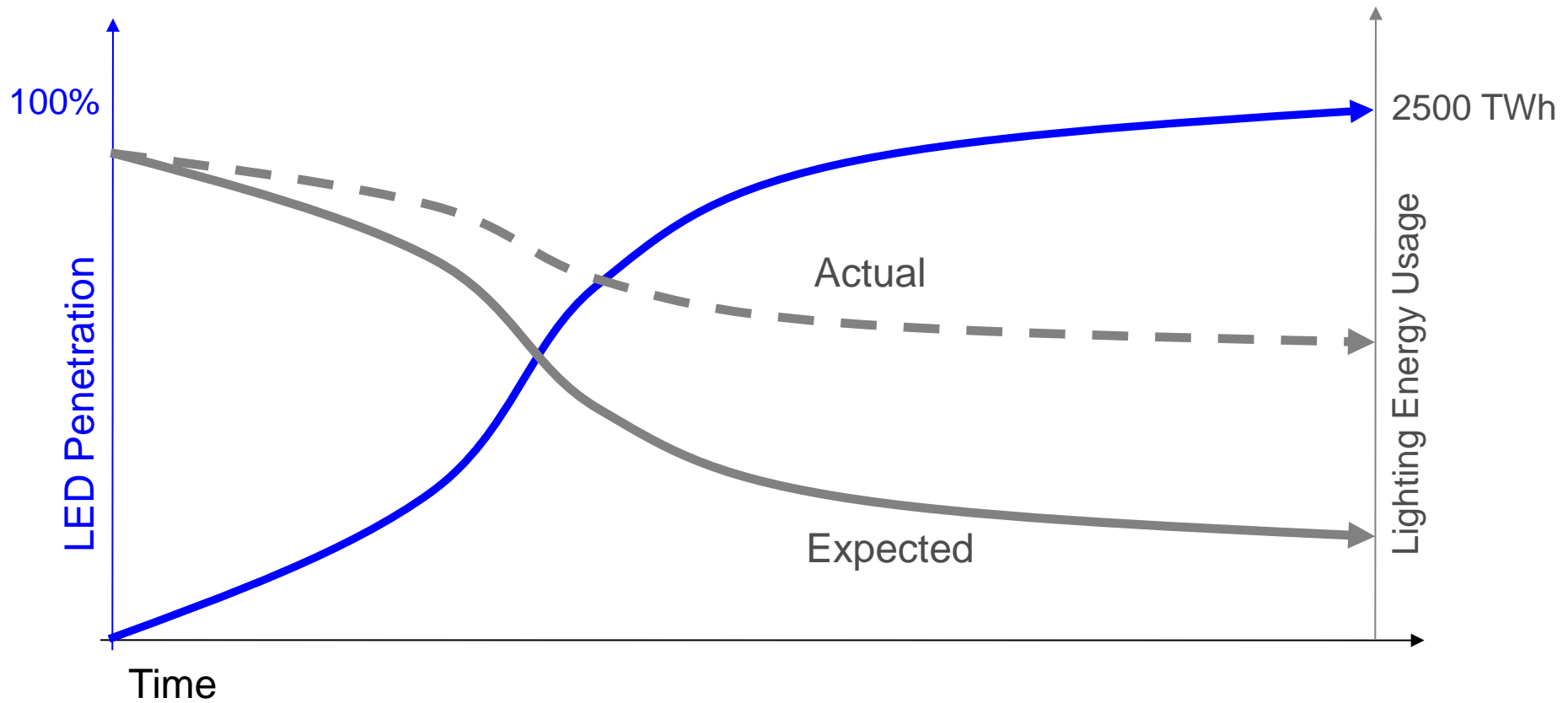
- Not just cultivation...



Implications: Expansion of TAM

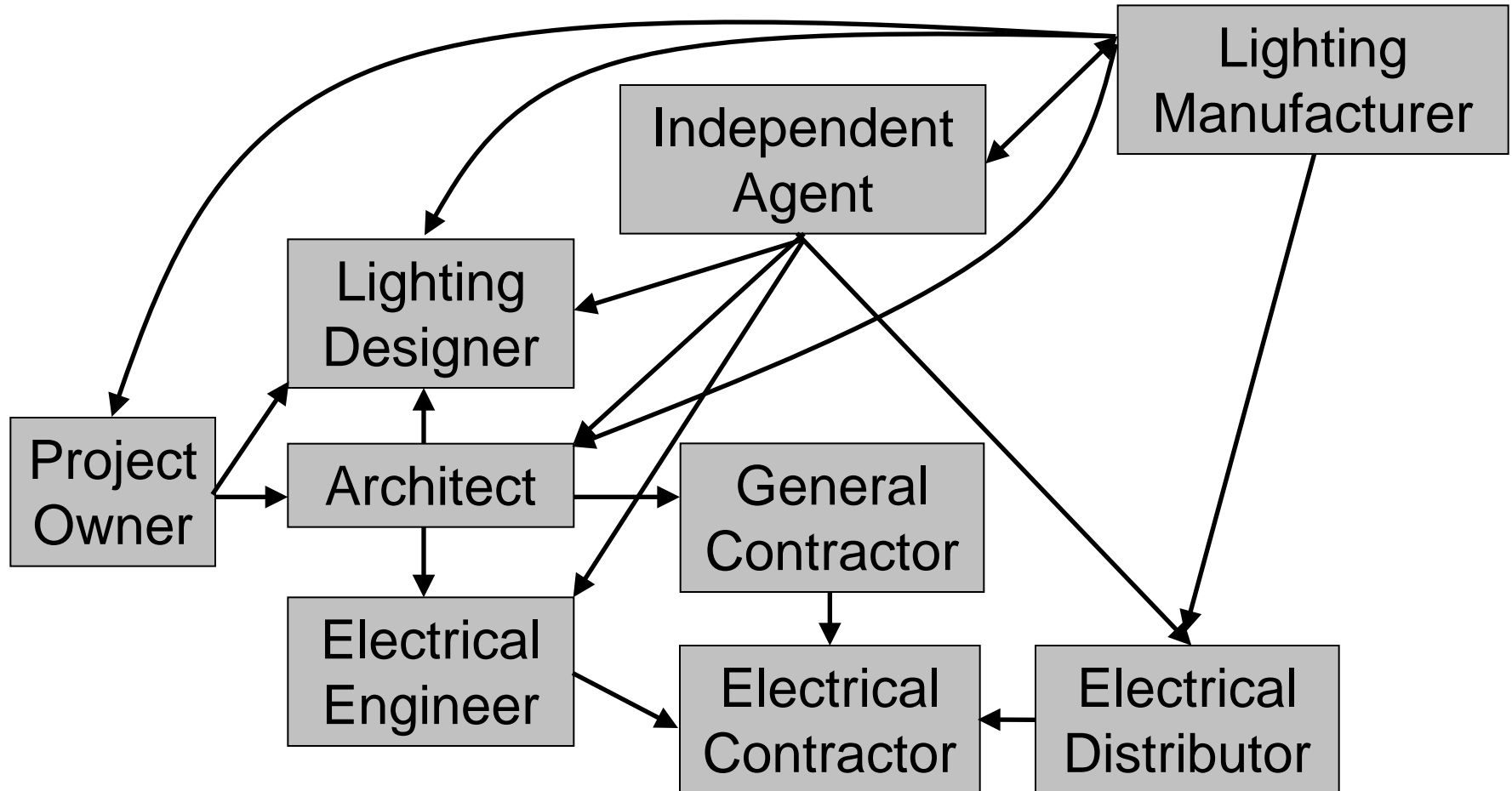


Implications: The rebound effect



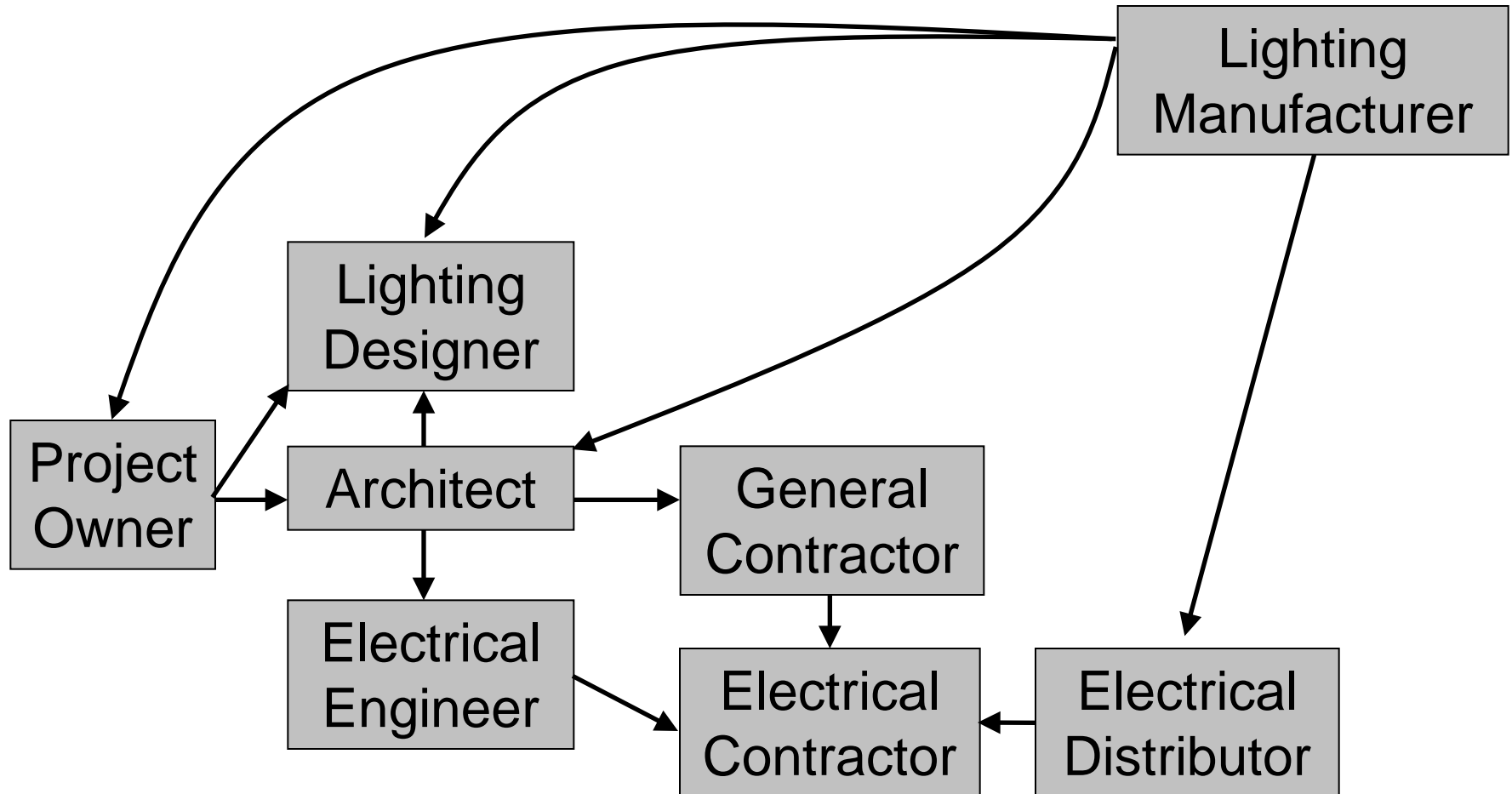
New business model disrupts the channel

- Many mouths to feed



New business models disrupt the channel

- More direct influence & the marginalization of the independent agent



Conclusions

- Today lighting is being driven by policy, cost and energy efficiency
- Cost/efficiency being driven by new chip designs, larger wafers/reactors, yield solutions, new technologies
- The replacement market slows and eventually saturates
- Once key efficiency thresholds and cost-of-light targets are met, lighting adoption will be driven by incremental utility
- This focus on utility should ensure untold numbers of new applications and billions of dollars of opportunity
- Manufacturing supply chain doesn't really change all that dramatically – it will be more of a change in business model: software & distribution

Thank you!

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Risk Qualifier: SPECULATIVE: Stocks bear significantly higher risk that typically cannot be valued by normal fundamental criteria. Investments in the stock may result in material loss.

Distribution of Ratings: Global Stock Ratings as of 28 March 2013

Coverage Universe			IB Clients
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Speculative Buy	60	6.0%	55.0%
Hold	308	30.8%	13.0%
Sell	50	5.0%	6.0%
	1004*	100.0%	

*Total includes stocks that are Under Review

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