BAMBOO PENDANT

ENVISIONING A CLEAN, GREEN FUTURE FOR OFFICE LIGHTING AND ELECTRIC INFRASTRUCTURE

MANUFACTURING INNOVATOR CHALLENGE:

SUSTAINABLE MANUFACTURING OF LUMINAIRES

KOERNER DESIGN

U.S. DEPARTMENT OF ENERGY

A CLASSIC FORMAT, MADE SUSTAINABLE

Simple design, natural materials

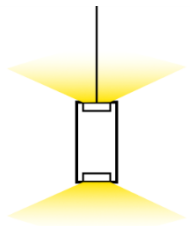
- A radically simplified design in support of the circular economy
- Low embodied-energy using bio-derived and biodegradable, low-toxicity, sustainable materials
- Simple construction, fast disassembly, radically reduced toxicity = dramatically reduced lifecycle costs & liabilities

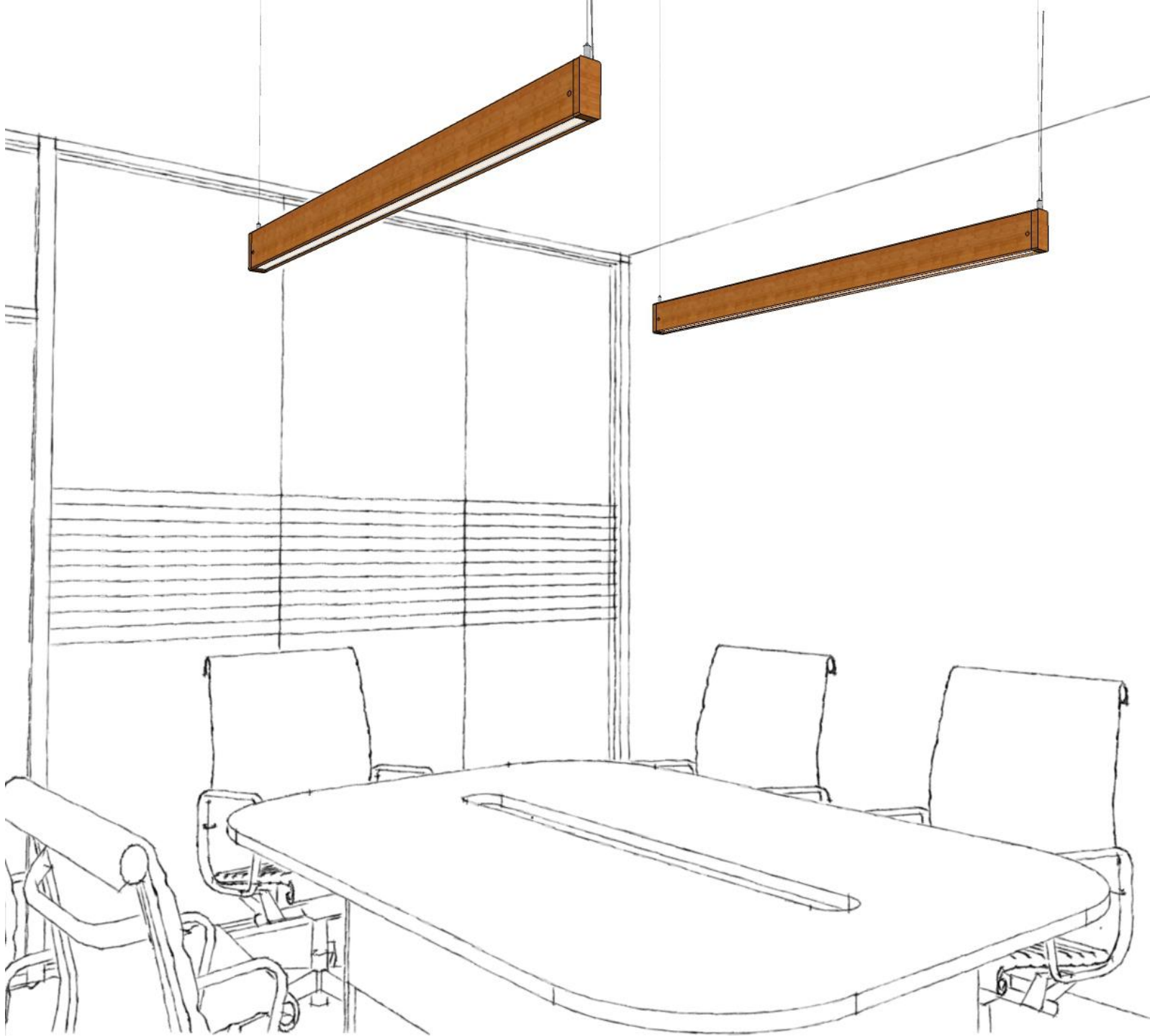
Anticipating centralized DC power

- Net-zero-energy buildings with onsite solar PV and battery storage can save 15% overall system efficiency by skipping DC-AC-DC conversions
- Centralized DC/DC conversion with solid-state switching, solid-state fault interruptions and Class 2 topologies allow us to create SELV-compliant fixtures

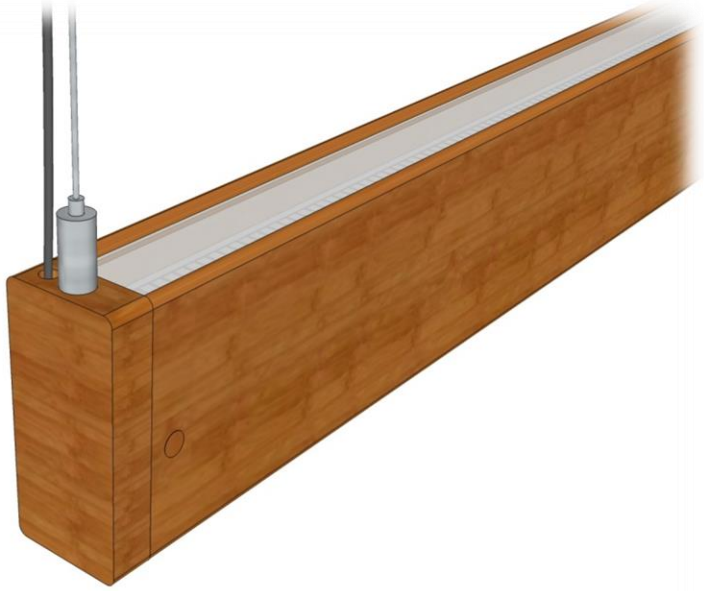
Of course…the specs

- Direct/indirect Lambertian distribution
- 6.5 watt/linear foot (split 50/50 up/down)
- 150 lm/w (minimum fixture efficacy)
- Designed to meet 35fc average office requirements
- Designed to meet 0.6 w/sqft for LEED applications
- Various CCT/CRI combinations available
- Full range dimming & digital control integral to centralized DC/DC system
- Additional optical distributions in the future





OLD SCHOOL SIMPLICITY

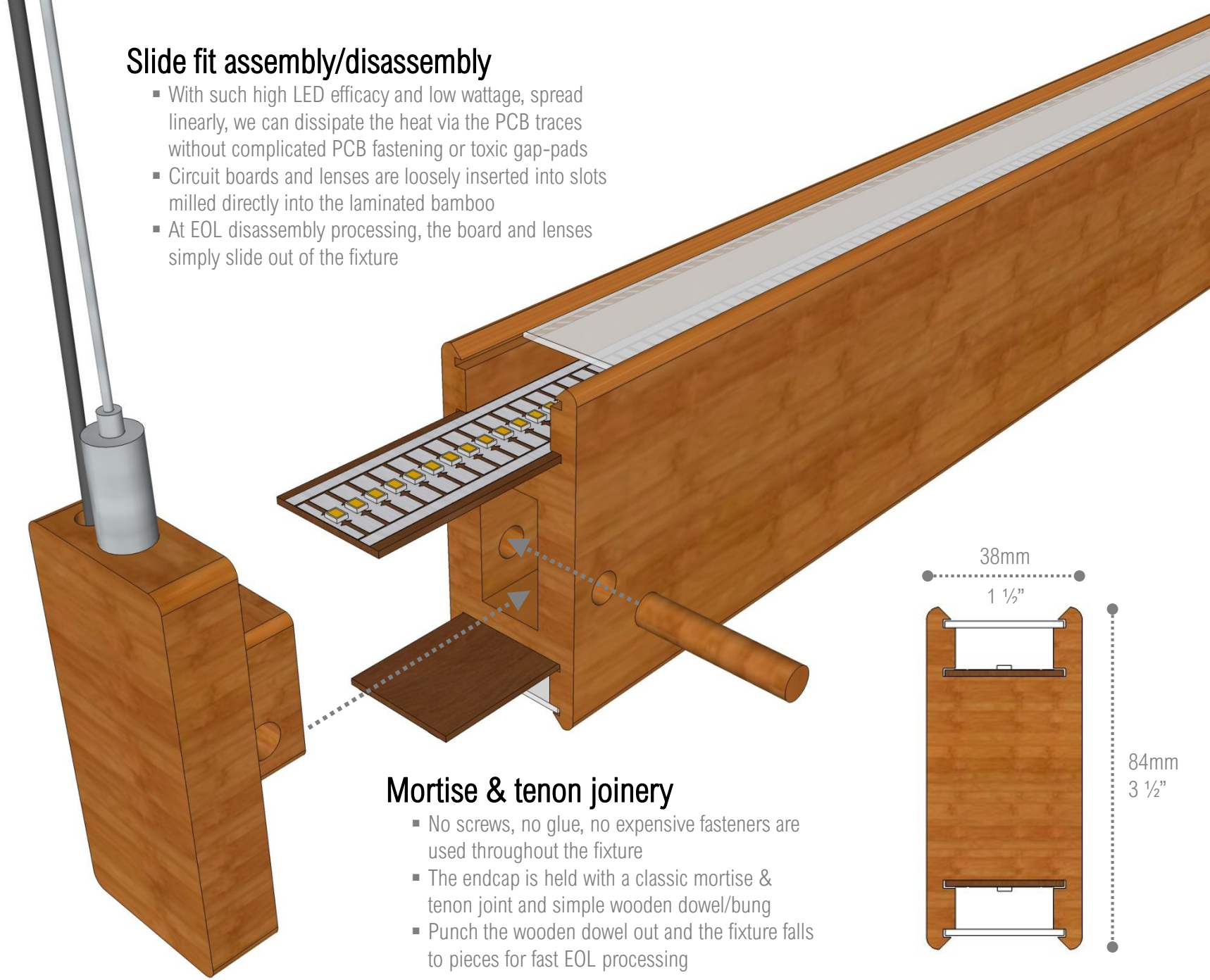


Endcap concept

- To ensure fast assembly and later disassembly for circular economy processing, the end caps hold the fixture components captive
- The aircraft cable support for the fixture and wire strain relief are simply drilled into the end cap, without requiring additional hardware

Slide fit assembly/disassembly

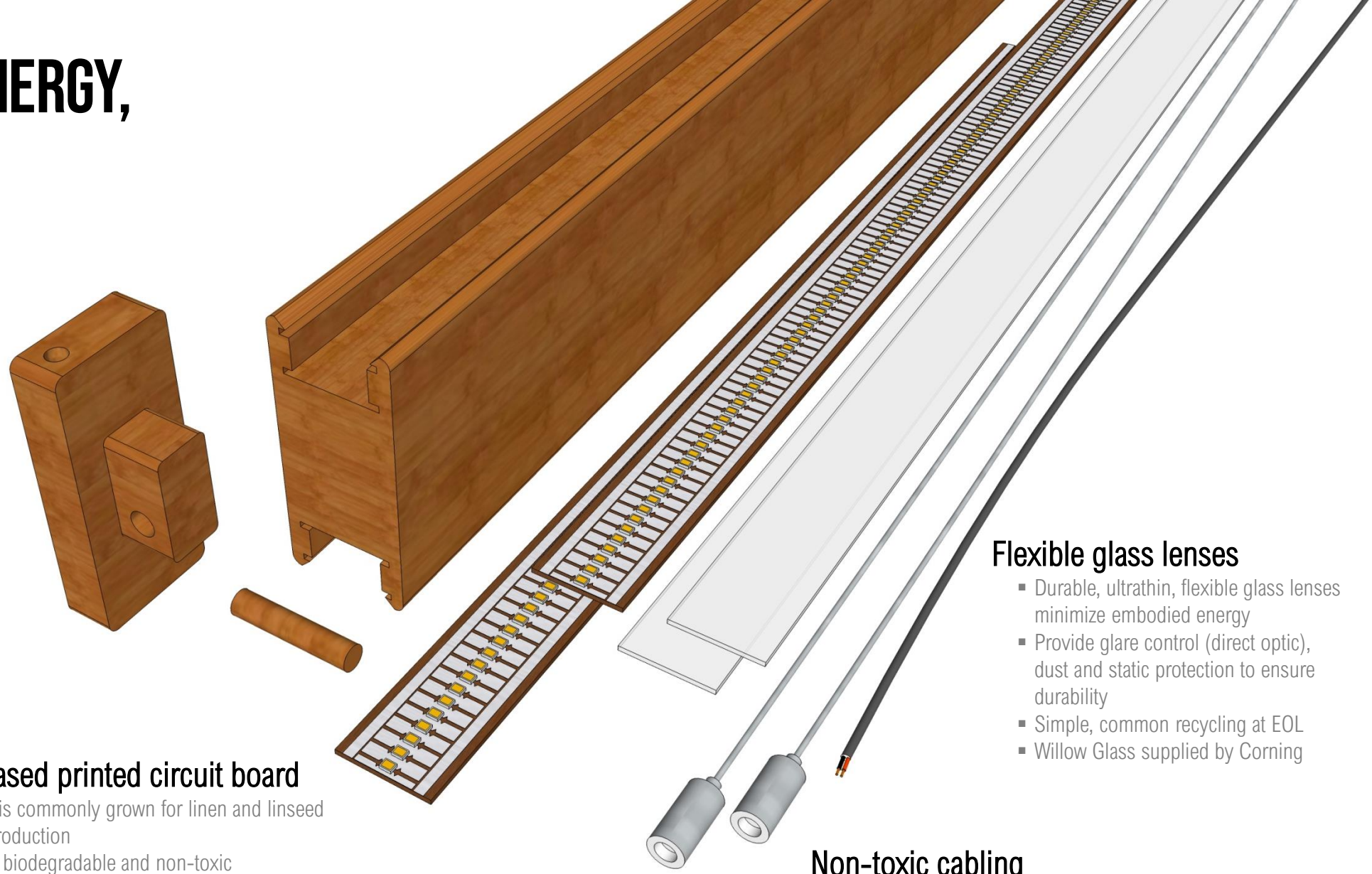
- With such high LED efficacy and low wattage, spread linearly, we can dissipate the heat via the PCB traces without complicated PCB fastening or toxic gap-pads
- Circuit boards and lenses are loosely inserted into slots milled directly into the laminated bamboo
- At EOL disassembly processing, the board and lenses simply slide out of the fixture



Mortise & tenon joinery

- No screws, no glue, no expensive fasteners are used throughout the fixture
- The endcap is held with a classic mortise & tenon joint and simple wooden dowel/bung
- Punch the wooden dowel out and the fixture falls to pieces for fast EOL processing

LOW EMBODIED ENERGY, LOW TOXICITY



Laminated bamboo body

- Bamboo is one of the fastest growing, most renewable resources on the planet
- Fully biodegradable and non-toxic adhesives and finishes
- Dimensionally stable, non-sagging across lengths up to 12'-0"
- Standard 2"x4" profile easily channeled to precise profiles on 5-axis moulder
- Elements supplied by Lamboo Technologies

Flax-based printed circuit board

- Flax is commonly grown for linen and linseed oil production
- Fully biodegradable and non-toxic
- At end of life, traces and electronic components dissolve away from substrate
- Substrate is compostable
- Soluboard supplied by Jiva Materials

Flexible glass lenses

- Durable, ultrathin, flexible glass lenses minimize embodied energy
- Provide glare control (direct optic), dust and static protection to ensure durability
- Simple, common recycling at EOL
- Willow Glass supplied by Corning

Non-toxic cabling

- Small gauge low-voltage DC wire minimizes copper consumption
- Free of halogen, chlorine, bromine, fluorine
- EcoAcePlus supplied by Furukawa Electric

NET-ZERO ENERGY BUILDINGS

ARE LEADING US TO A DC POWER REVOLUTION

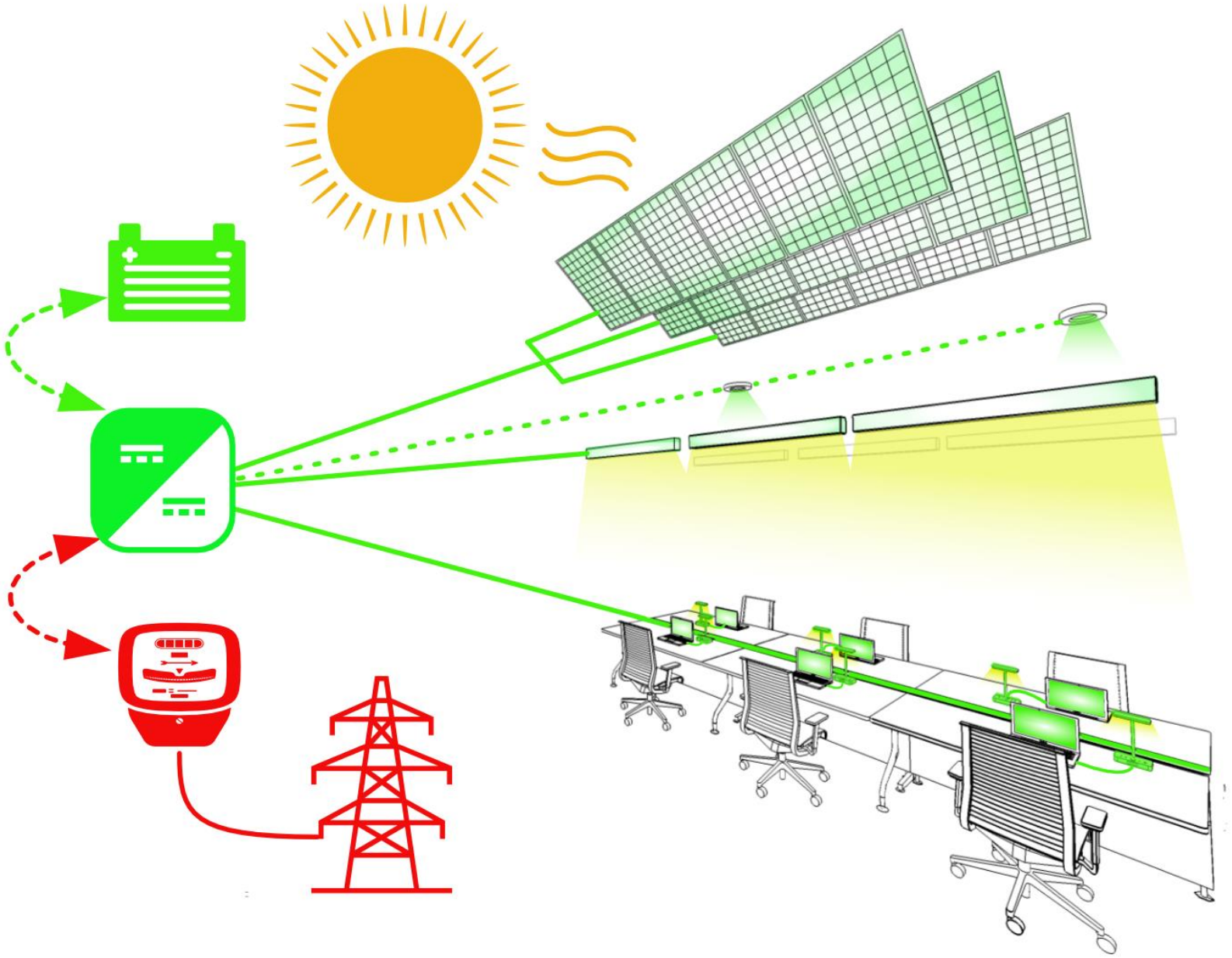
Centralized 380/48vdc power

- Net-zero-energy buildings with onsite solar PV and battery storage can save 15% overall building-level system efficiency by skipping DC-AC-DC conversions
- Centralized DC/DC conversion with solid-state switching/current control, solid-state fault interruptions let us channel power directly from solar PV into our lighting systems with less than 2% total conversion loss, zero inrush current or power surges, and complete digital control and monitoring from hardware circuits on up

DC power lets us fundamentally reconsider fixture designs

- Centralized DC/DC conversion and Class 2 topologies allow us to create SELV-compliant fixtures
- Now we can substantially simplify the electronics and use natural, bio-based materials for fixtures

SIMPLIFY, SIMPLIFY



BAMBOO

Fast growing and plentiful resource

- Bamboo is one of the most rapidly renewing resources on the planet
- Laminated structural bamboo is a low-embodied energy, non-toxic, durable material

Can light fixtures make the world a better place?

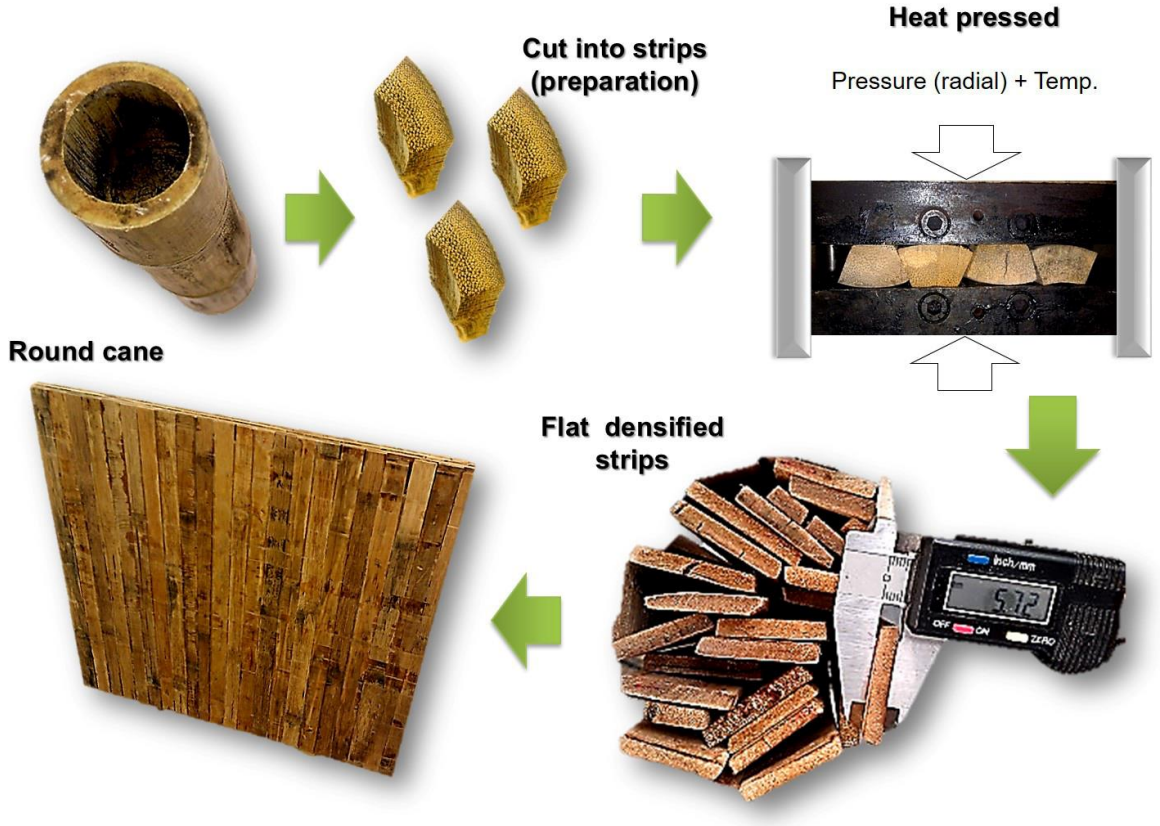
- Instead of merely “mitigating our impact” we want to help correct excess CO2 levels
- The laminated bamboo in our fixture sequesters 10.72 lbs of CO2 per 4’ length (even after considering CO2 released during manufacturing processes of laminated product)

Safe

- Class B Fire Rating per ASTM E84 testing standards for standard product (not treated with flame retardants)

LEED v4 Credits

- Our products may offer the following LEED Credits:
  - MRc3: Sourcing of Raw Materials
  - EQc2: Low Emitting Materials (No added formaldehyde)
  - INc1: Innovation in Design (Life Cycle/Environment Impact)



BEAUTIFUL FACTORIES

ALUMINIUM VS. BAMBOO
WHICH IS "MORE SUSTAINABLE"?

Do you want to live next to any part of the supply chain?



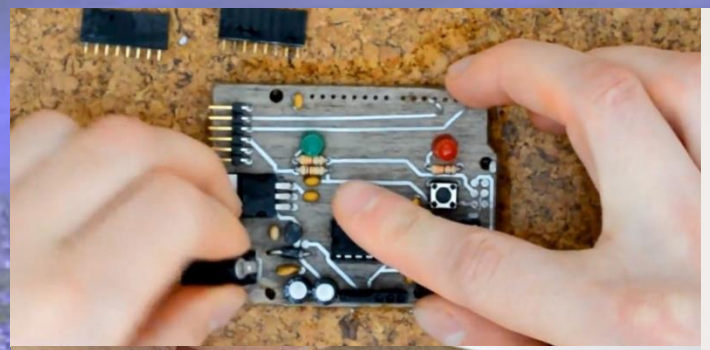

VS

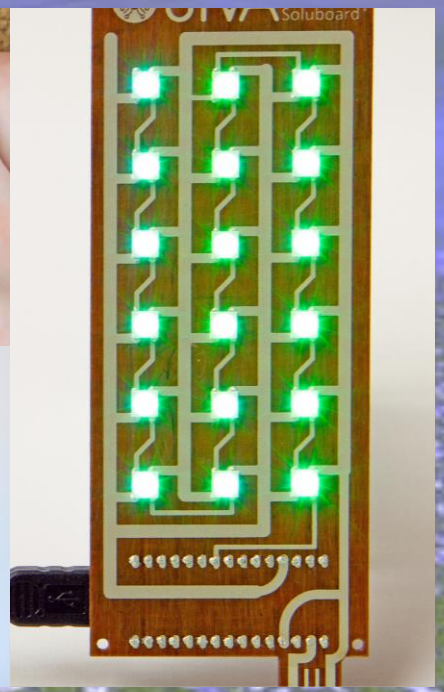



BIO-BASED PRINTED CIRCUIT BOARDS

ELIMINATING THE TOXIC LEGACY OF FIBERGLASS, EPOXY RESINS AND E-WASTE FROM THE LED REVOLUTION

Will this be the legacy of LEDs? Poisoning children in Ghana?





Jiva Materials SOLUBOARD
Flax-based compostable circuit board

OUR SUPPLY CHAIN:
Flax-fields in bloom

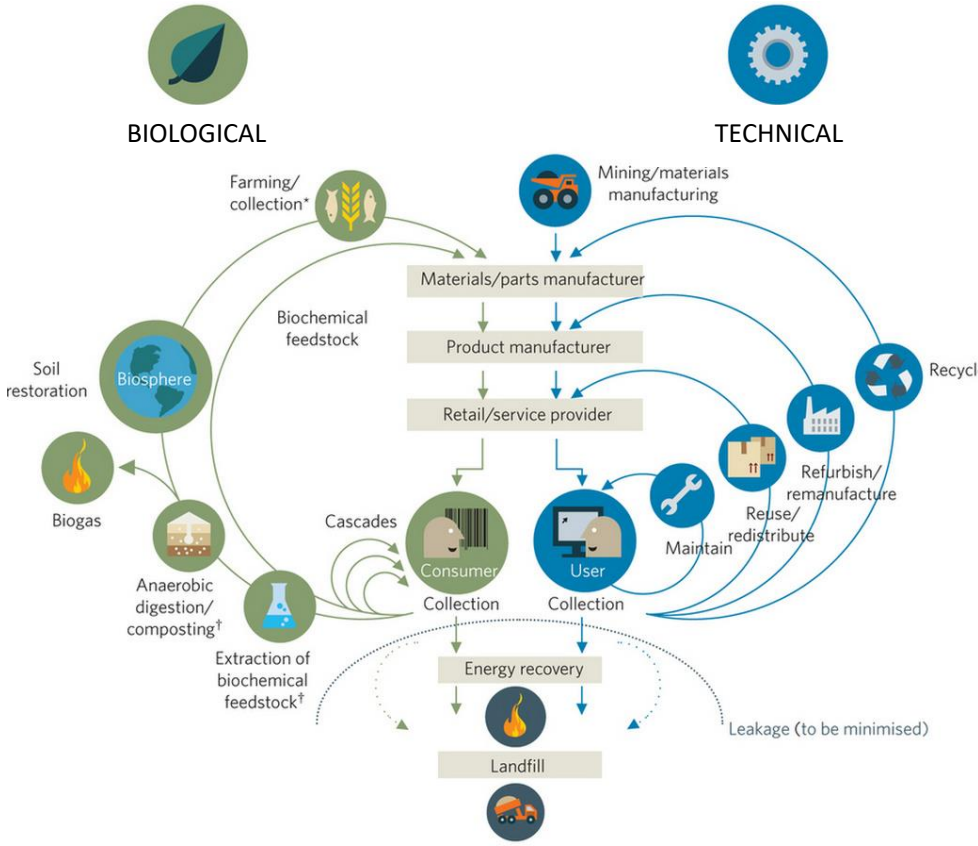
And our circuit boards can compost back into the fields from which they were grown

DESIGN FOR ABUNDANCE

ENVISIONING A CLEAN, GREEN FUTURE FOR OFFICE LIGHTING AND ELECTRIC INFRASTRUCTURE

Design for the circular economy:

Our design aims to reduce the lighting industry's dependence on "technical" materials and increase our use of "biological" materials



Directly supporting sustainability initiatives:

Lighting hardware as a positive to be celebrated, not minimized

KOERNER
DESIGN

Brad Koerner is an entrepreneurial project leader with a range of design, marketing and product management experience. Brad has spent 20+ years in the architectural lighting and construction industries, spanning global matrix organizations, design consultancies and startups. Brad has developed award-winning architectural lighting projects as well as new LED lighting products and market categories that have earned in excess of $350m. Brad is an accomplished speaker and writer forecasting future trends in lighting design and technology.

Brad received his Master of Architecture degree from Harvard University, where he received the IALD Education Trust Fund Grant and the IESNA Richard Kelly Grant for his research into interactive luminous retail displays. Brad received his B.S. in Architecture from the University of Virginia. He has lectured for the IALD, IESNA, PLDA, US DOE, and his work has been published in Architectural Record, Professional Lighting Design, LEDsMagazine, Lux Review, and Interiors.

THANK YOU!

BRAD KOERNER
FOUNDER

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