



INTEGRAL
GROUP

Net Zero Energy (r)Evolution

DEEP GREEN ENGINEERING



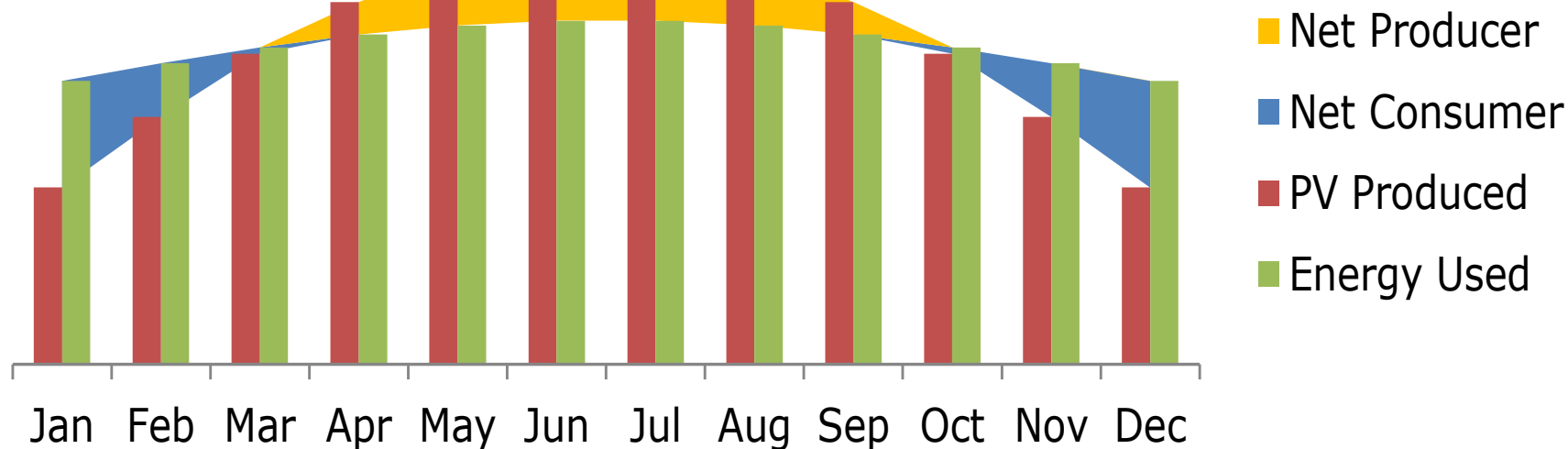






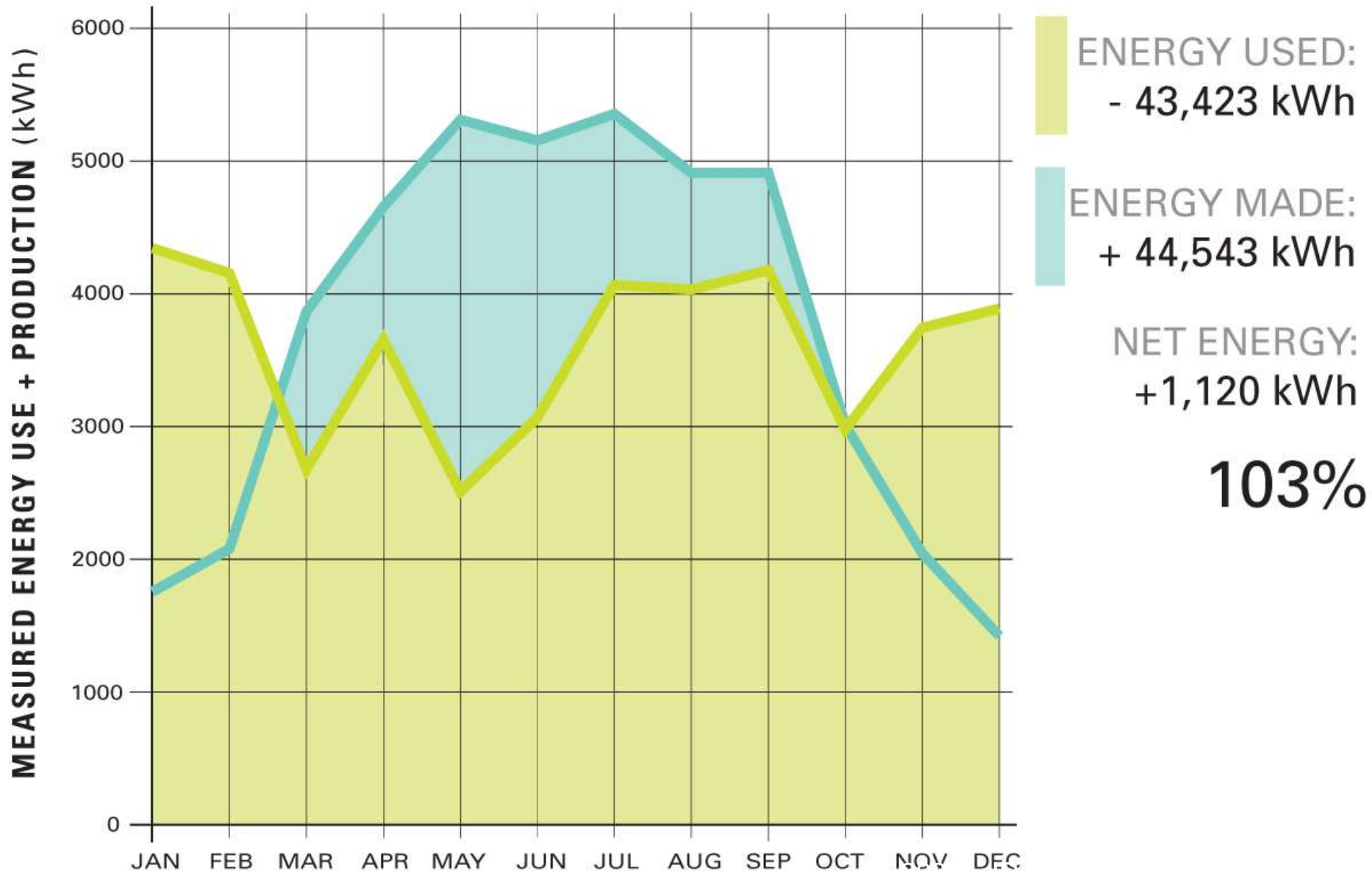
Net Zero Energy

Energy use does not exceed energy production from on-site renewables **annually**.

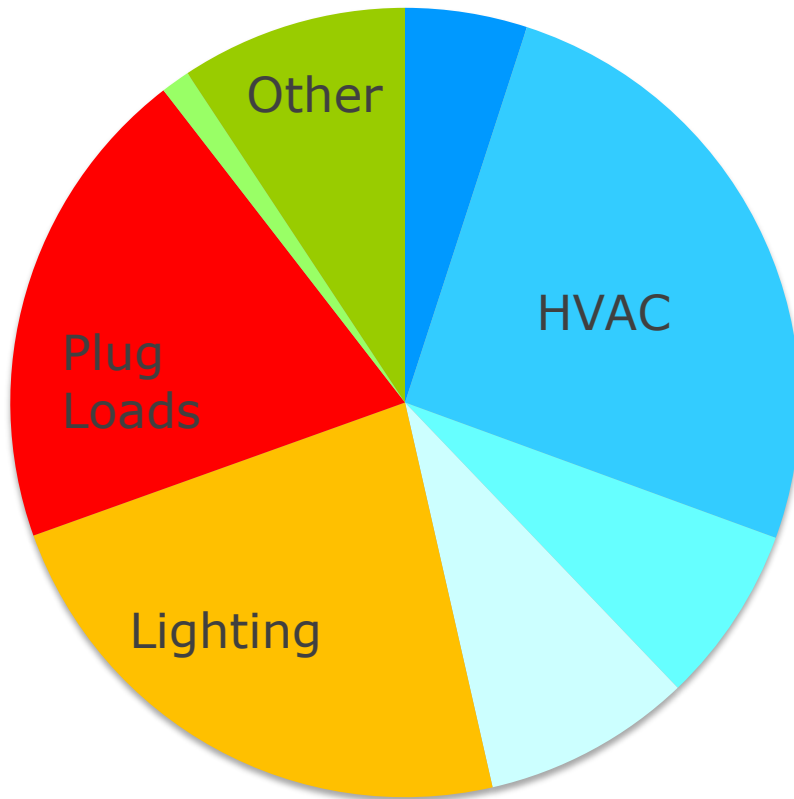




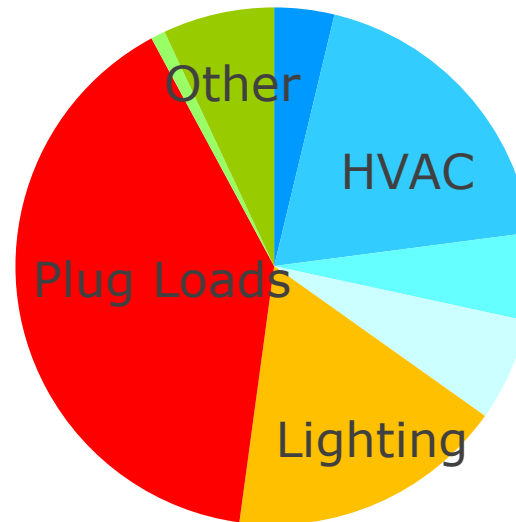
Production > Consumption



Plug Loads Dominate



Standard
Commercial
Building



High
Efficiency
Design

~50% below
standard





Dashboards

Administration Building - Real Energy Consumption

Net Energy Consumption - Table View

Current Day Current Week Current Month **Current Year**

Admin Bldg

Solar

Net Energy

67294

-

51022

=

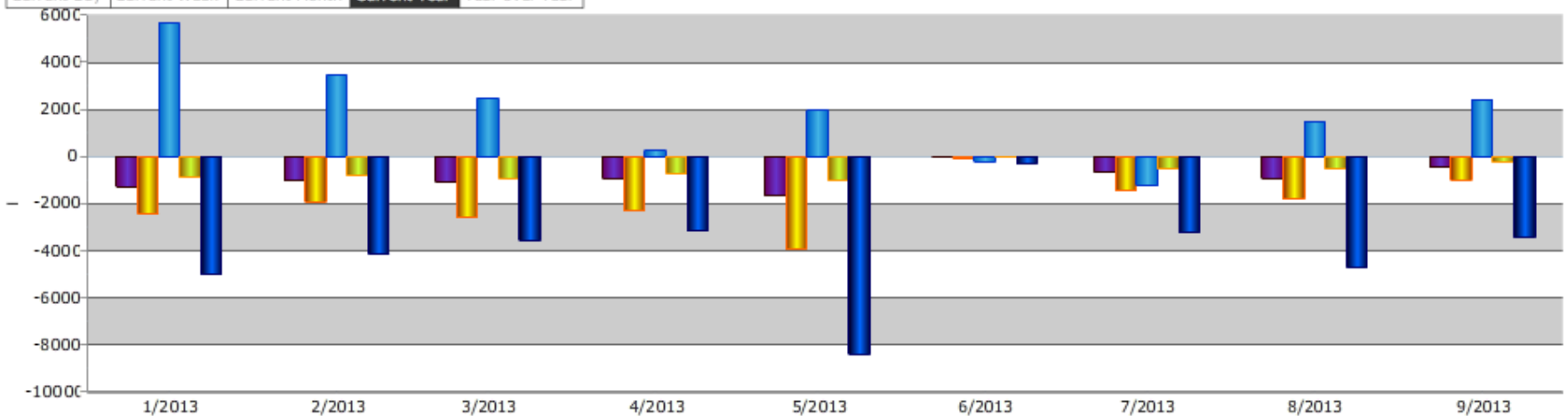
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What is Energy?

Energy is what makes things happen. Energy is used to light and heat campus.

Net Energy Consumption - Trend

Current Day Current Week Current Month **Current Year** Year over Year



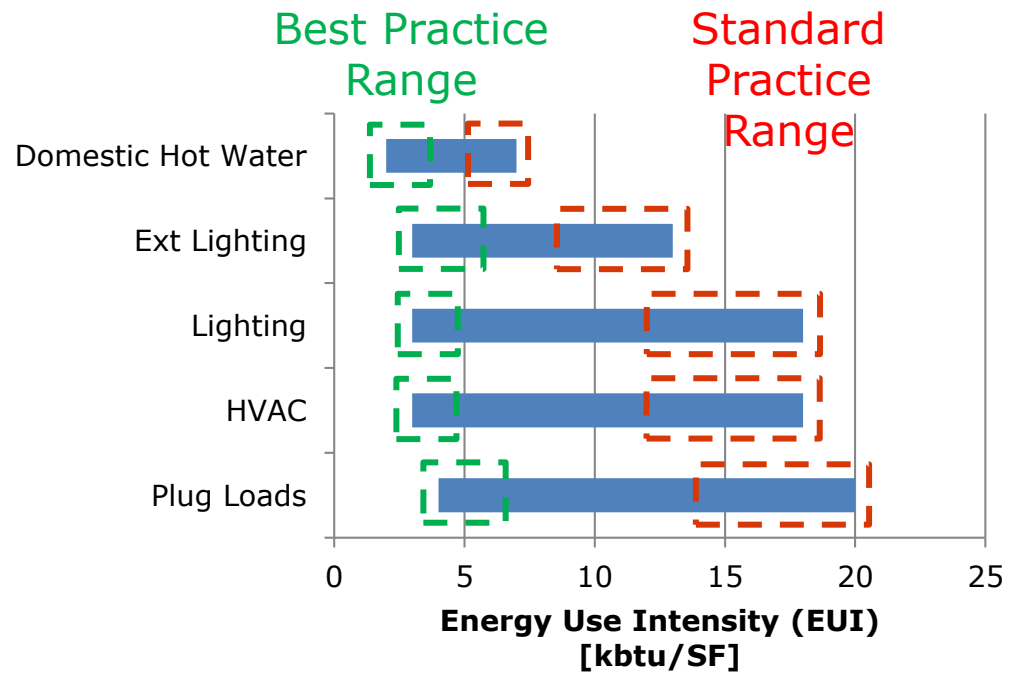
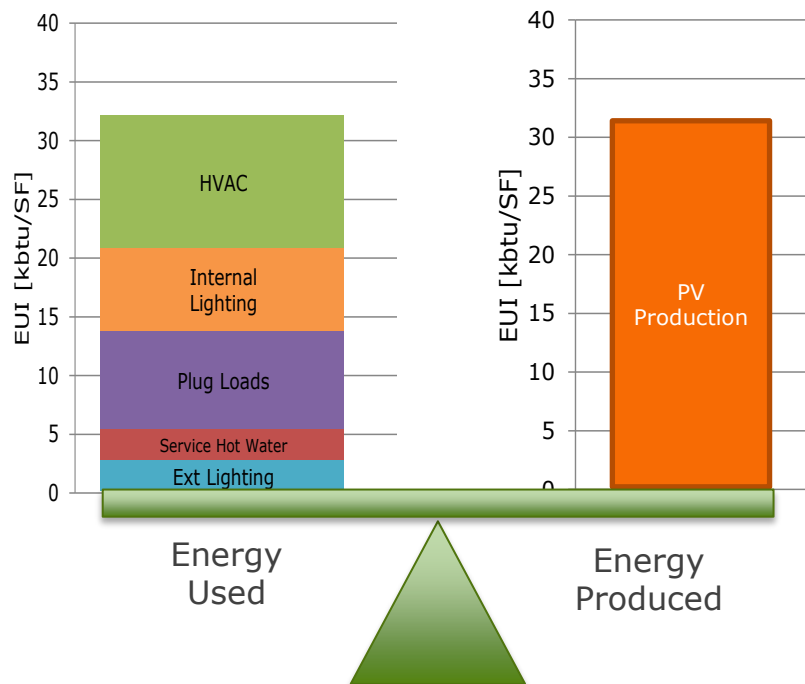
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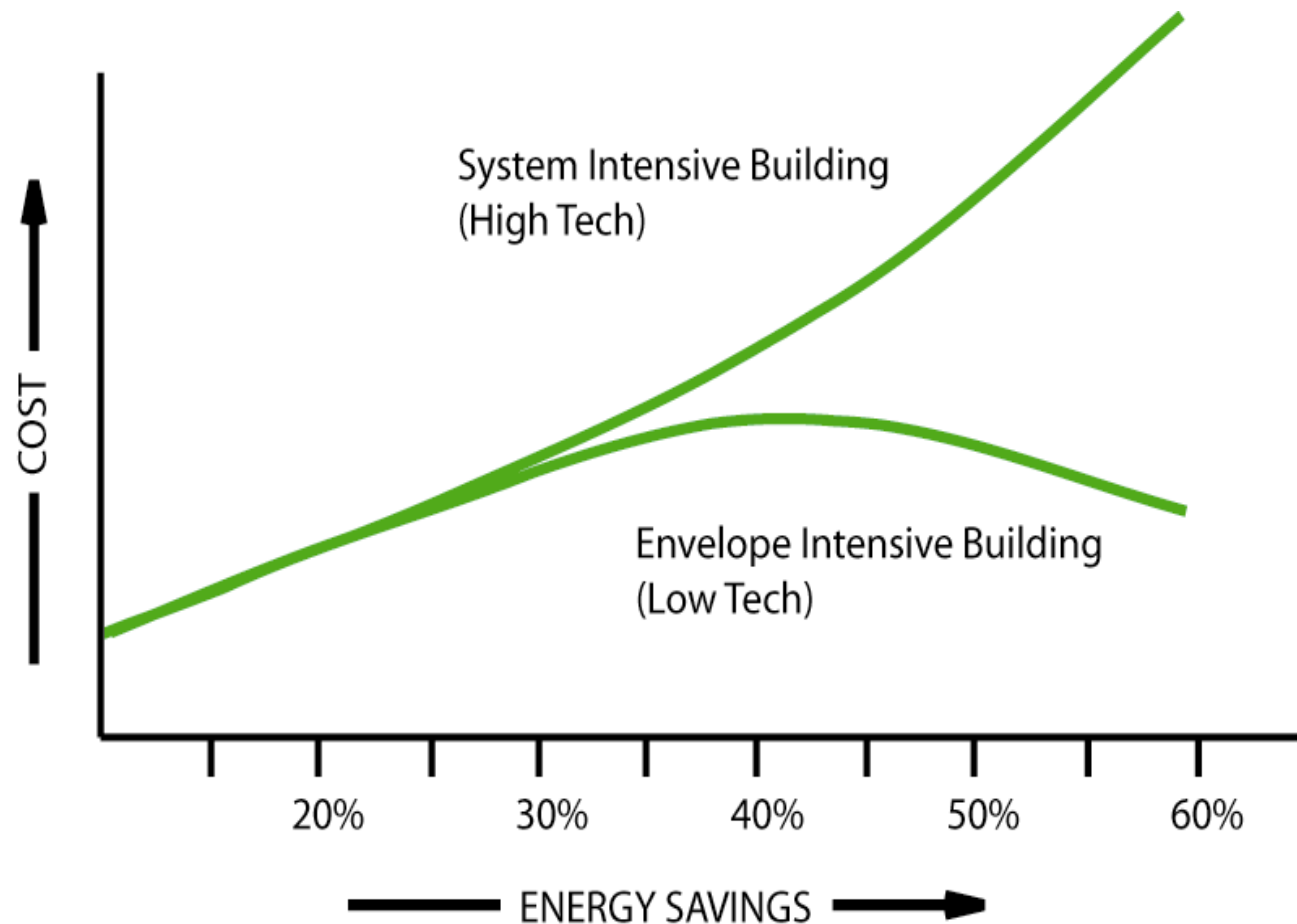
Calculate an Energy Budget

Set a maximum energy budget to help make design decisions

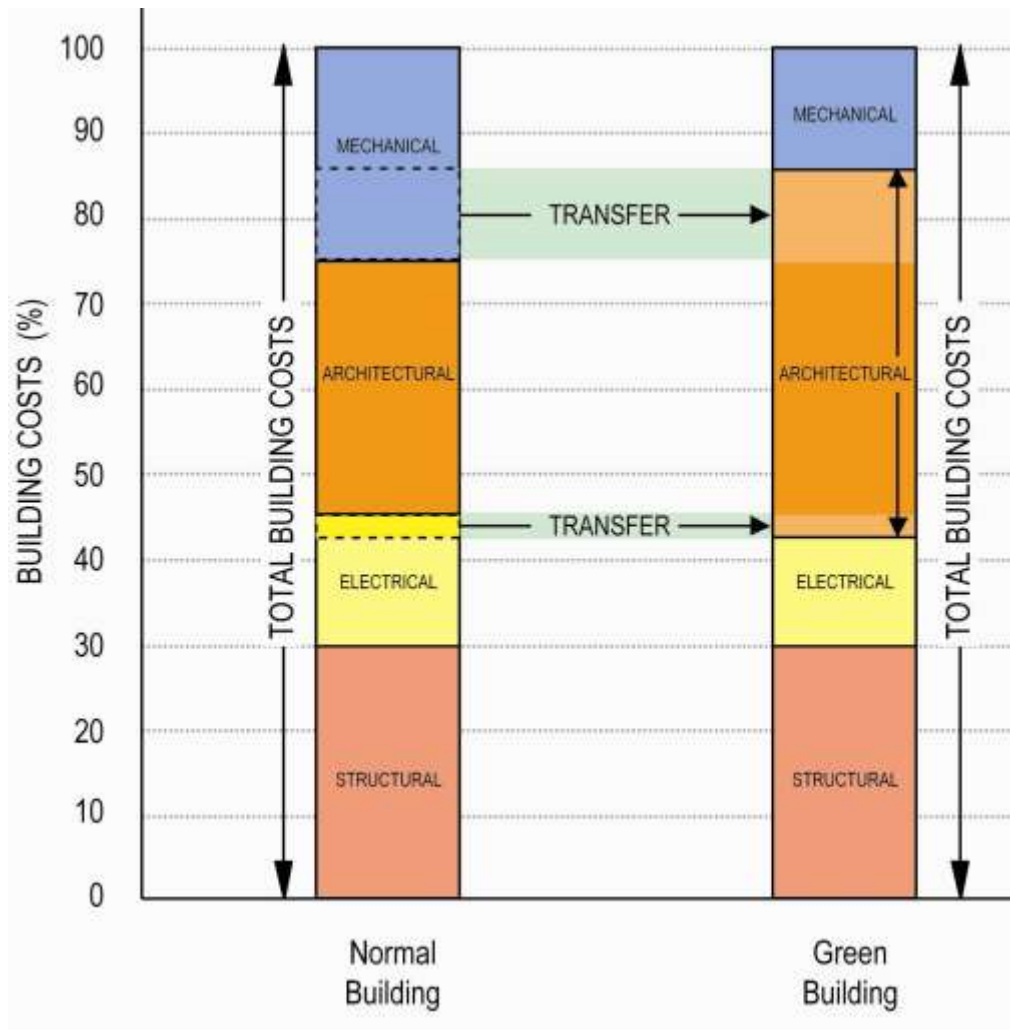
Understanding “Best Practices” in the context of the Energy Budget



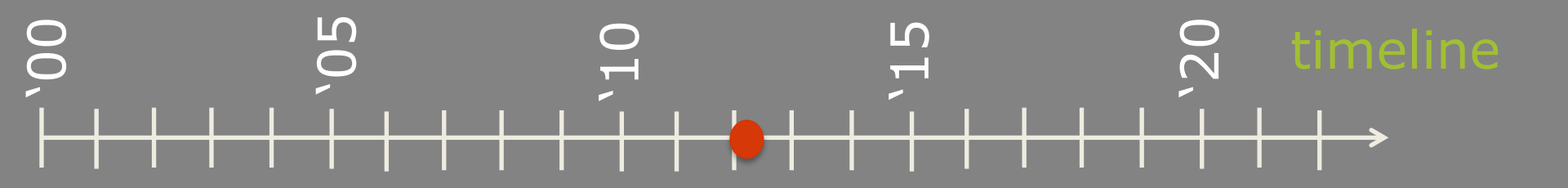
Tunneling Through the Cost Barrier



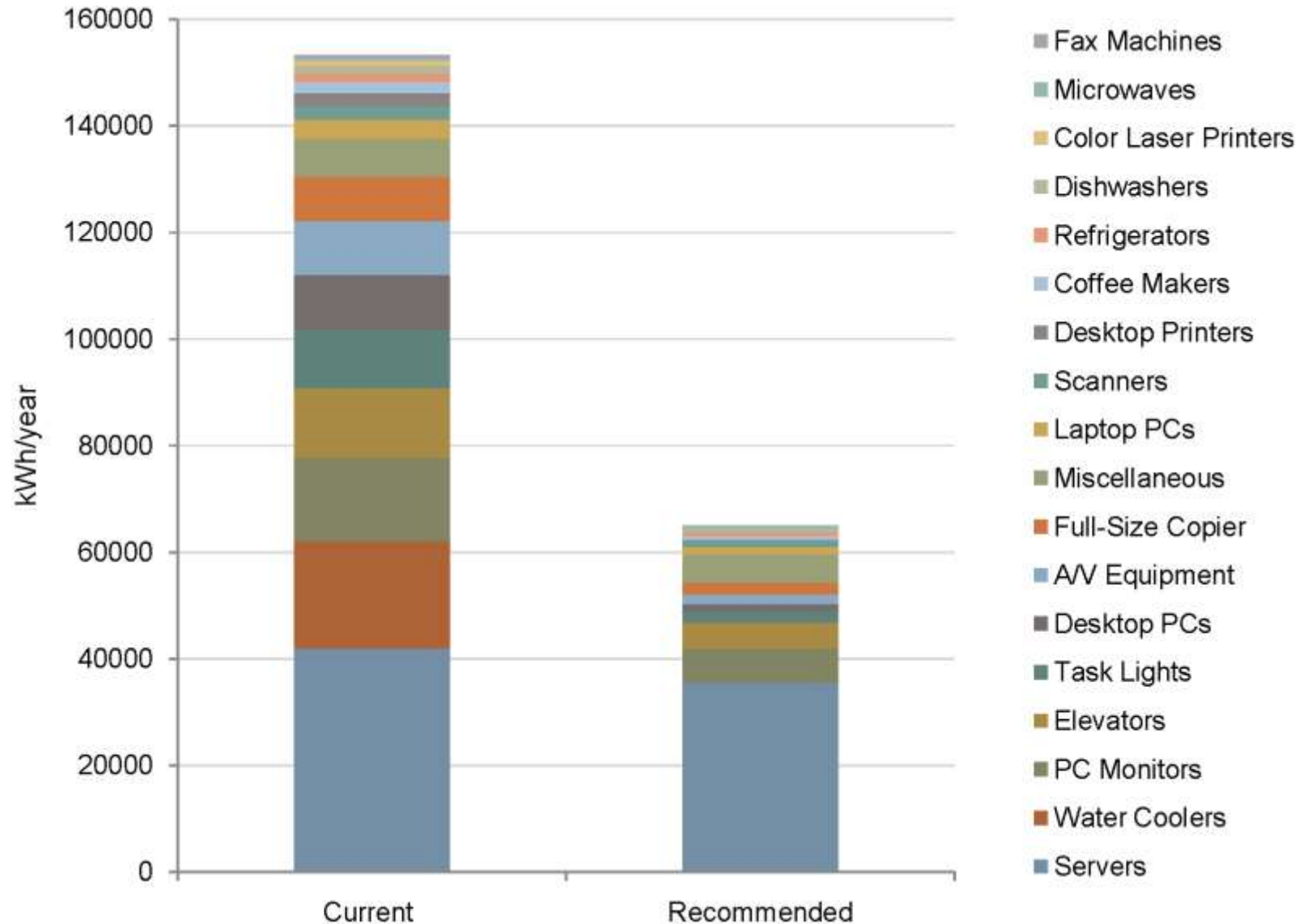
Cost Transfer



- ✓ Total cost same
- ✓ Mechanical cost less
- ✓ Invest in Architecture
- ✓ Active to passive
- ✓ Fragile to robust
- ✓ Longer life
- ✓ Less cost over life
- ✓ Simpler



Reduce Plug Loads

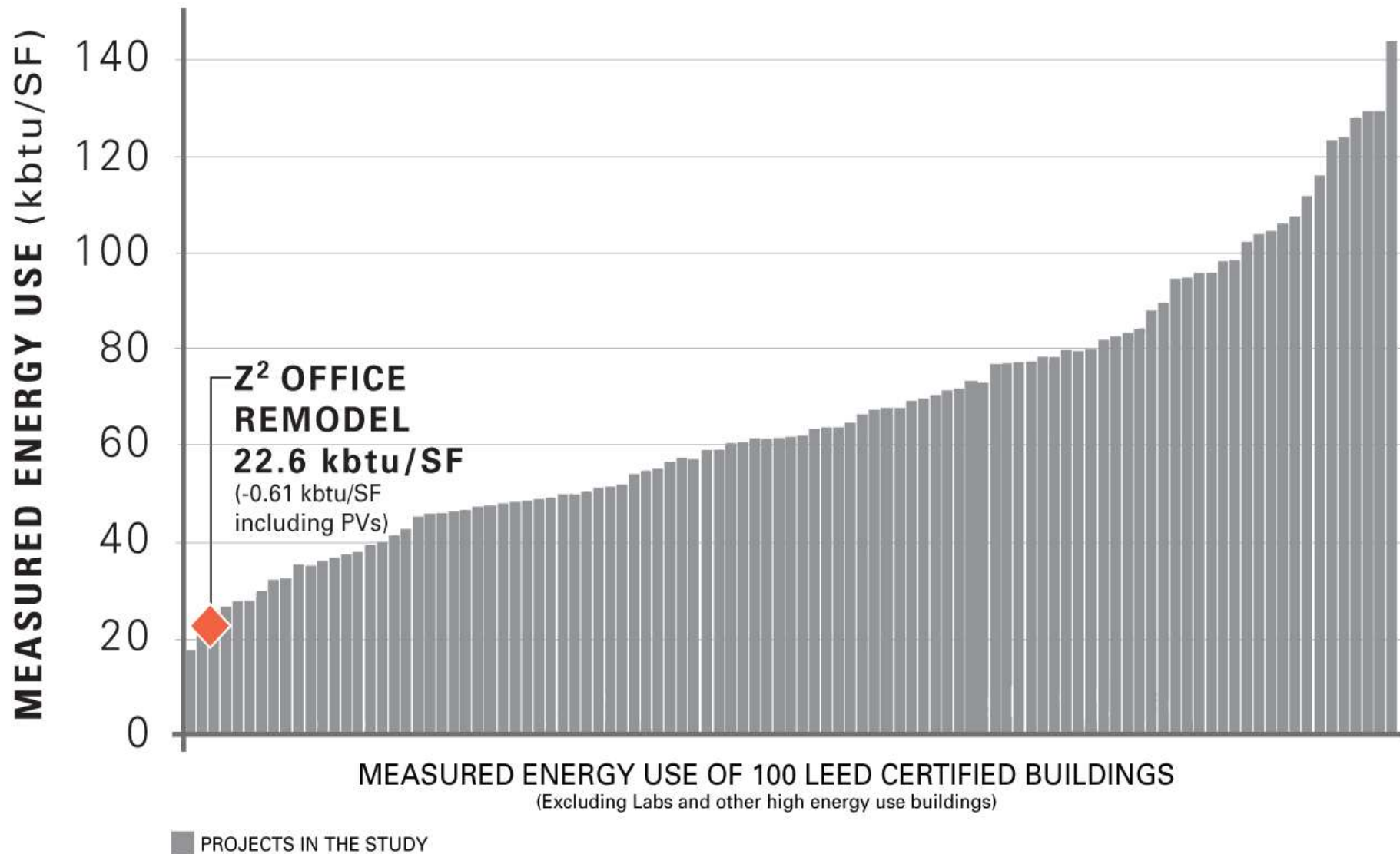


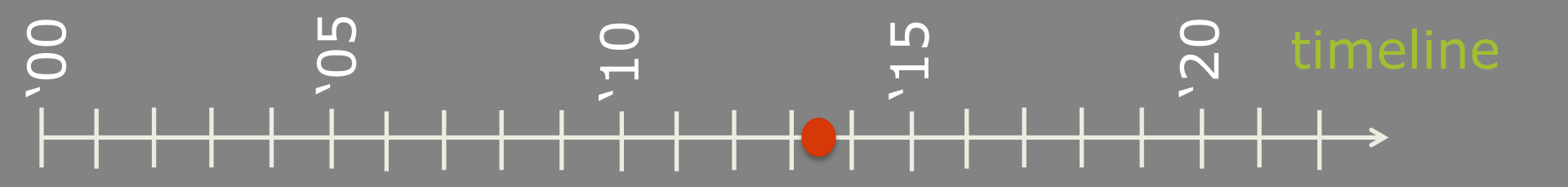
What's next!!!!?



INTERNATIONAL
LIVING FUTURE
INSTITUTESM

Set Energy Budgets





Net Zero Energy for Profit

- Performance based lease (carrot and stick for good occupant behaviour)
- Reduced reserve requirements (HVAC, lamp replacement)
- Reduced operating expenses (utilities, maintenance, etc)
- Reduced churn expenses (faster leasing)
- Reduced miscellaneous costs (unanticipated savings - no mechanical screen)
- \$44/sf added construction cost (including PV array) offset by reduced expenses
- If actual energy use meets prediction, the financial model is more profitable than standard practice (build to code)



higher efficiency, lower EUI, higher PV to FAR

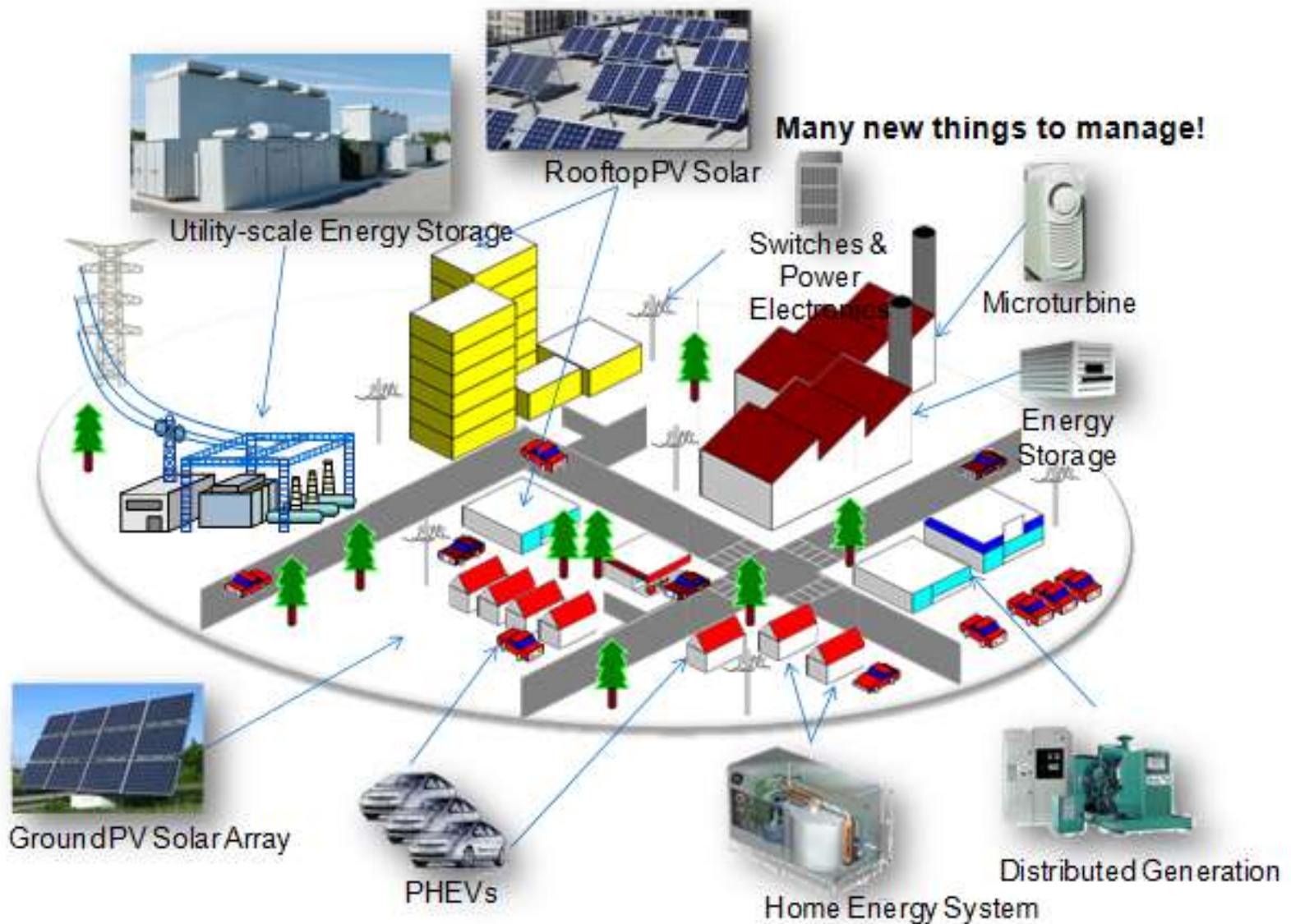




IPD, Co-location, Integrated Design



Microgrids

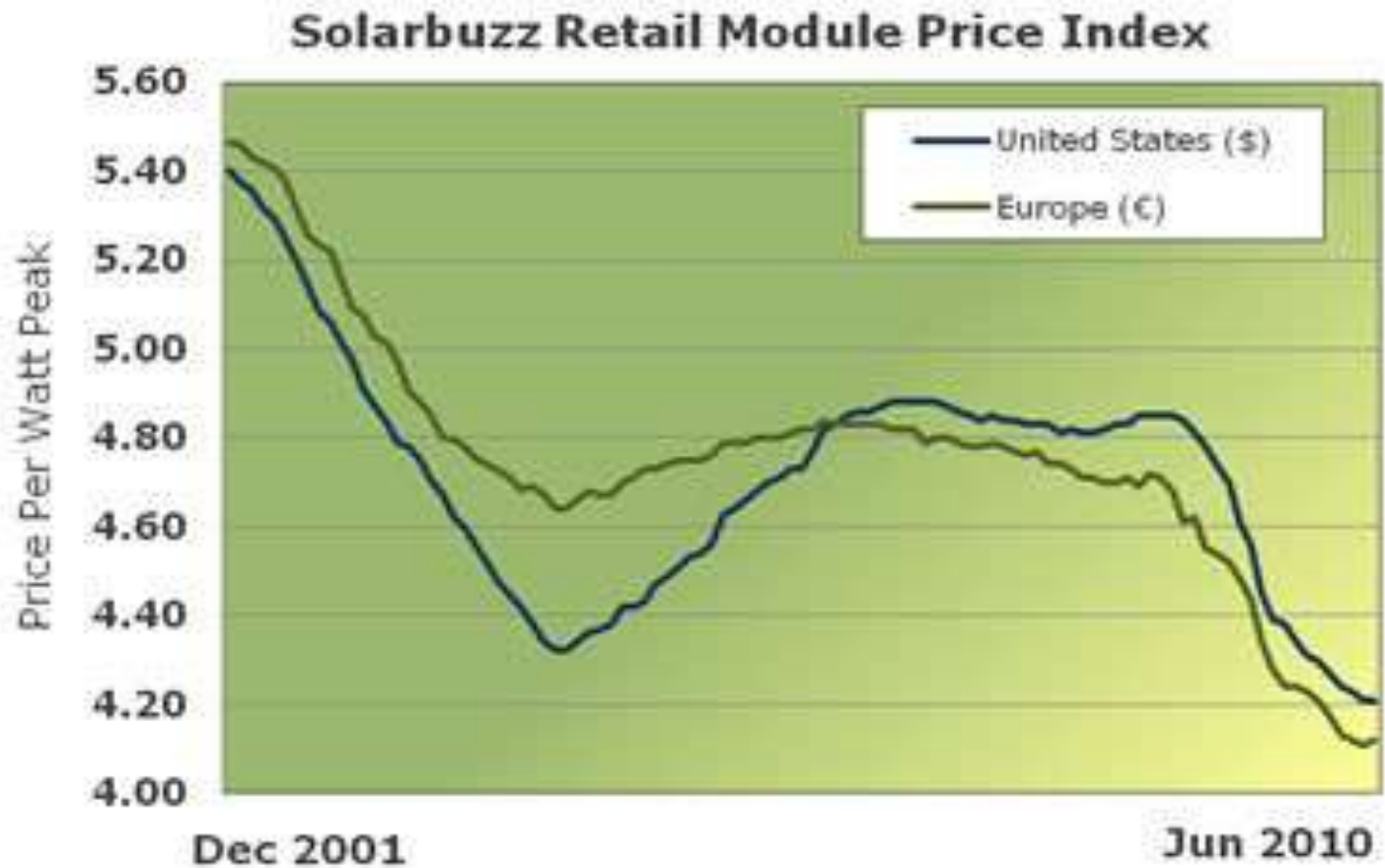


New Technologies for Building Skins



The Cost of PV is Dropping.

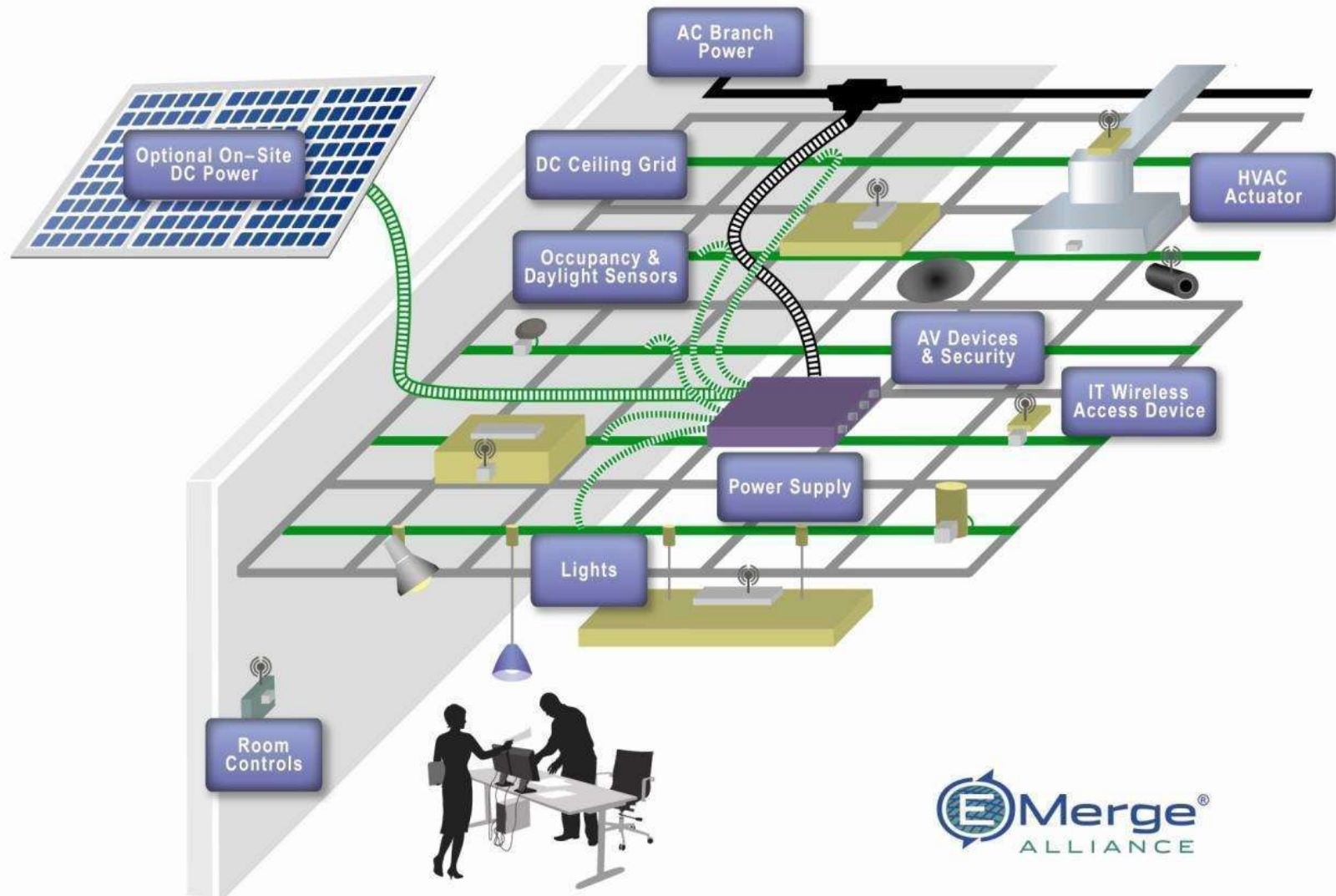
- 2008 - \$9.50 a watt installed*
- 2013 - \$3.10 a watt installed*



*(Bay Area)



DC Power Distribution

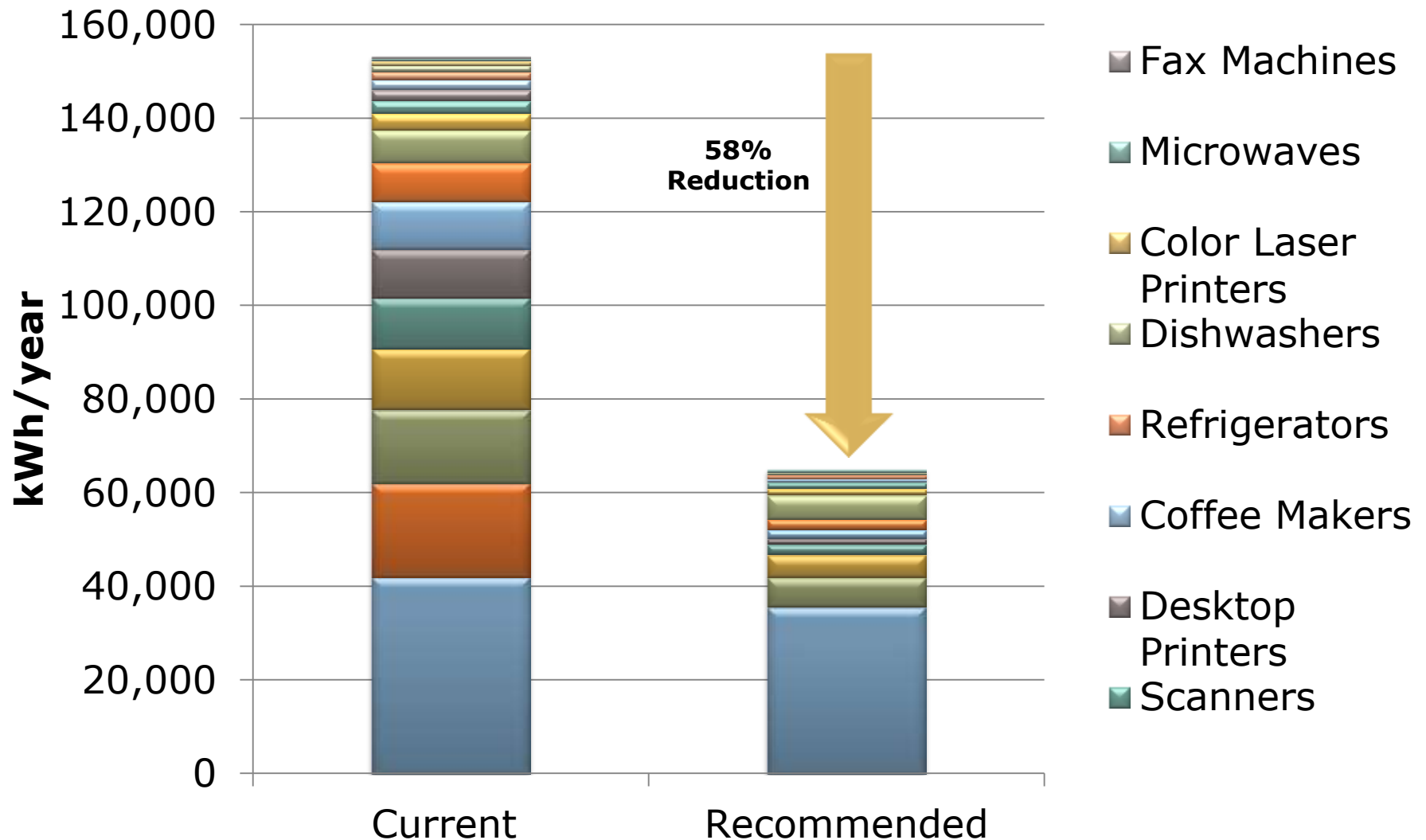


Complex yet Simple

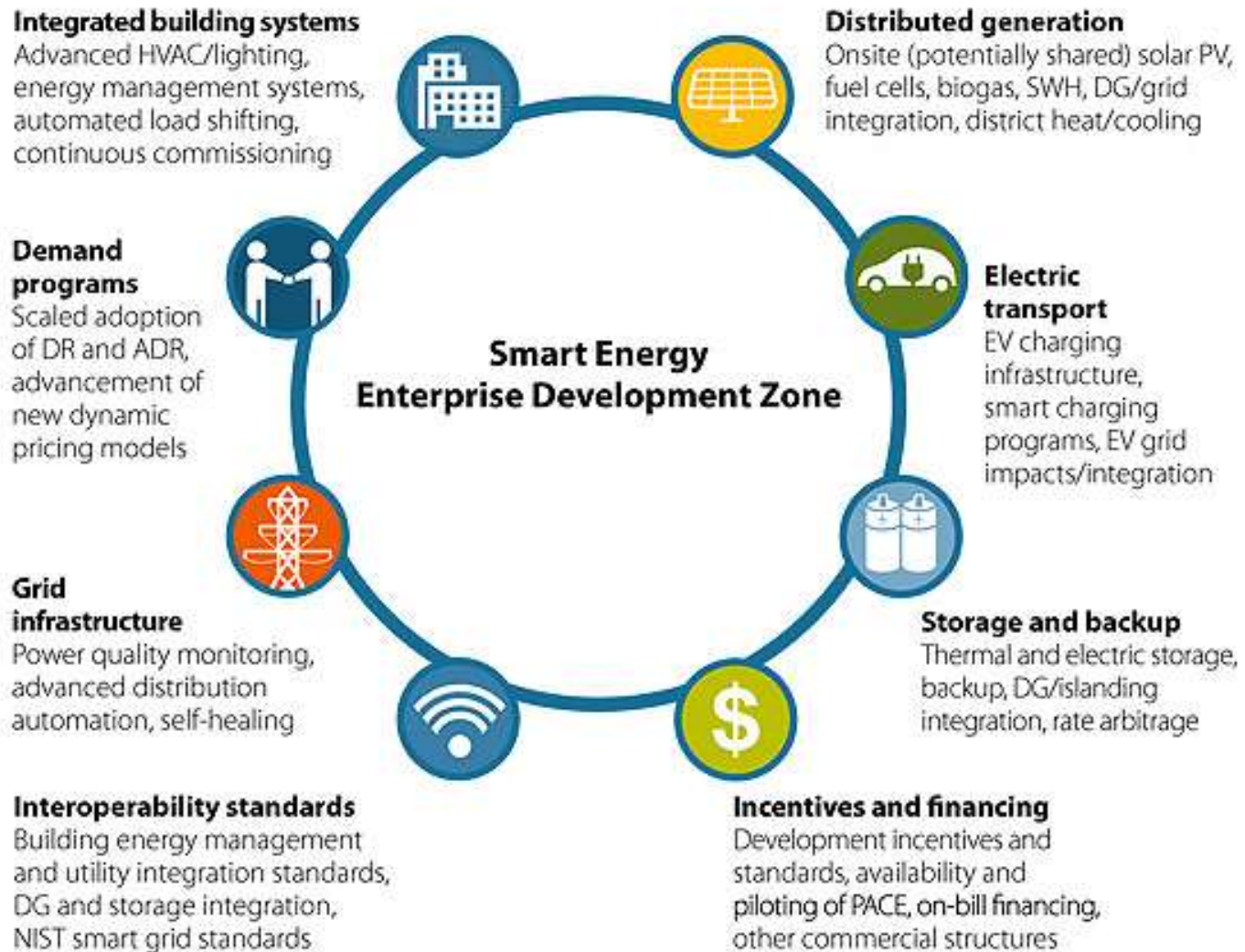


Reduce Plug Loads

Packard Foundation – Plug Load Reduction

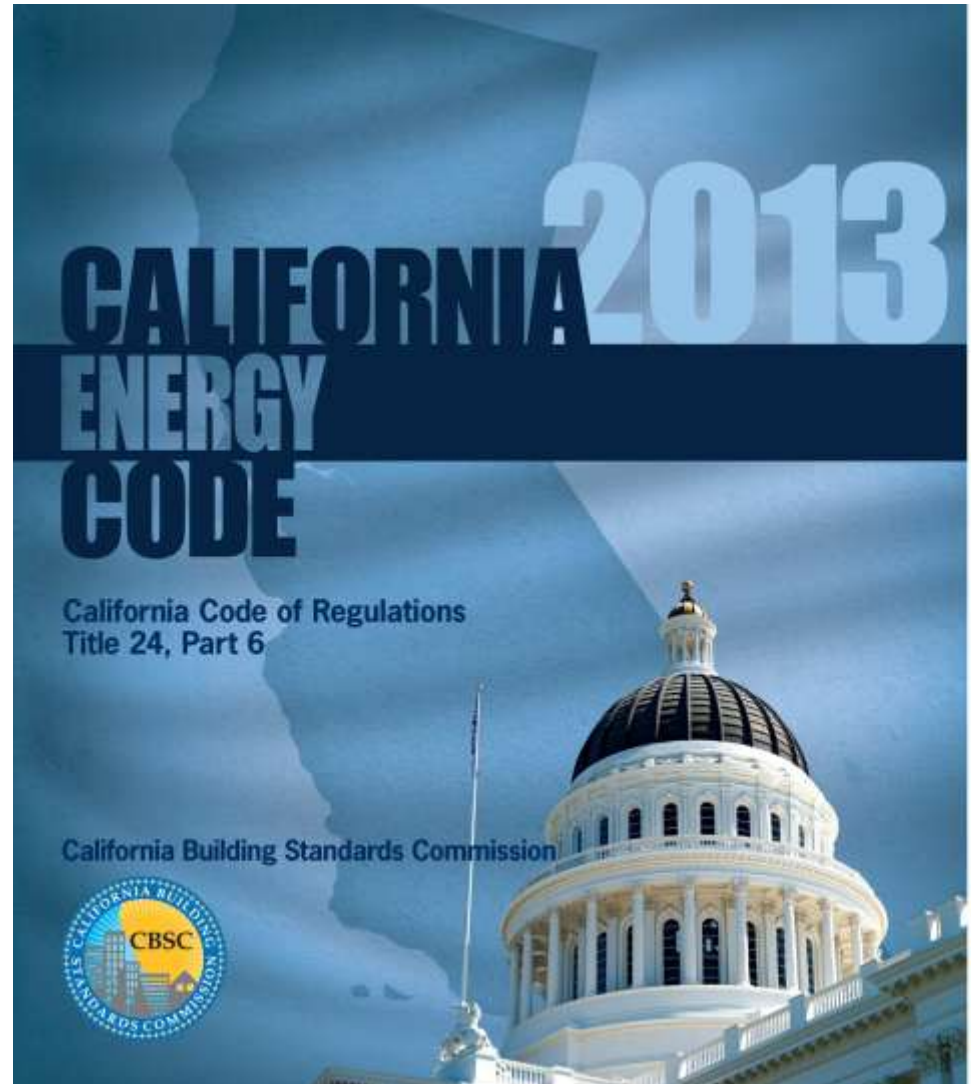


Community Scale - SEEDZ



New Building Codes

- Performance Based Energy Codes
- More aggressive energy efficiency requirements
- Zero energy targets



New Laws

2011 ENERGY BENCHMARKING REPORT

San Francisco Municipal Buildings

October 2012



Assembly Bill No. 1103

CHAPTER 533

An act to add Section 25402.10 to the Public Resources Code, relating to energy.

[Approved by Governor October 12, 2007. Filed with
Secretary of State October 12, 2007.]

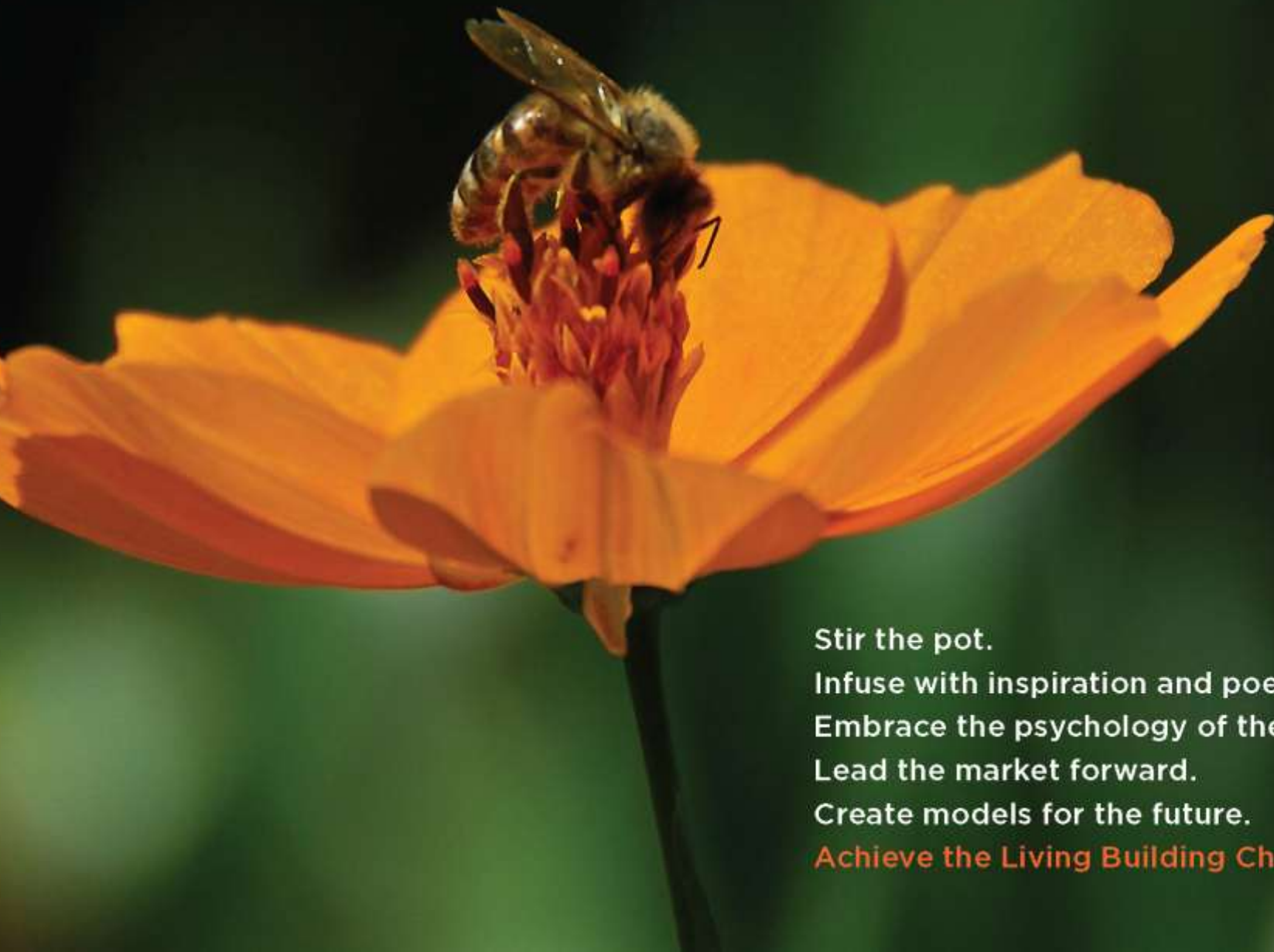
LEGISLATIVE COUNSEL'S DIGEST

AB 1103, Saldana. Energy: commercial buildings: consumption.

Existing law declares that electrical energy is essential to the health, safety, and welfare of the people and the economy of this state, and it is the state's policy to promote all feasible means of energy conservation.

This bill would require electric and gas utilities, as defined, on and after January 1, 2009, to maintain records of the energy consumption data of all nonresidential buildings to which they provide service, in a format compatible for uploading to the United States Environmental Protection Agency's Energy Star Portfolio Manager (Energy Star Portfolio Manager), for at least the most recent 12 months. Upon written or secured electronic

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