



Watts For Lunch

May 2nd, 2018

Hosted By



Why 'Watts for Lunch'?

- Quarterly C&I Forum focused on advancing the economic use of carbon-free electricity:
 - Learning, idea sharing, best practices
 - New technologies and services
 - Programs and incentives
- Interactive SVCE updates
 - Understand customer priorities and guide SVCE program investments
- Local peer networking

Electrification and Decarbonization in the Built Environment...



Today's Agenda

12 p.m.	Welcome – Lunch is served
12:05 p.m.	SVCE Intro and Host Welcome
12:10 p.m.	“Watt Do You Think?” Interactive Polling
12:20 p.m.	Attendee Introductions
12:25 p.m.	SVCE Update – Don Bray
12:35 p.m.	Q&A Session – Girish Balachandran
12:55 p.m.	Electrification Tee-up – John Supp
1:00 p.m.	Two Decades of Lessons – Peter Rumsey
1:25 p.m.	The Business Case for ZNE – Kevin Bates
1:50 p.m.	Operating All-electric Facilities – Peggy Brannigan and George Ackerson
2:15 p.m.	“Watt Do You Think?” Interactive Polling
2:30 p.m.	Wrap-up, Next event announcement

Attendee Introductions

SVCE Update

- 220,000 Residential and 28,000 C&I customers across 11 cities and Santa Clara County; soon Milpitas
- ~750MW Peak, ~4,000 GWh/year
- 97% enrollment rate
- Strong financial performance, start-up funding re-paid
- Annualized savings of \$20M, 1.1B pounds CO₂
- SVCE generation rates now **6%** below PG&E

Electricity Choices



GreenStart

- Clean and carbon-free – default product
 - 50% renewable energy
 - 50% hydroelectric energy
 - Savings of 6% vs. comparable PG&E gen rates

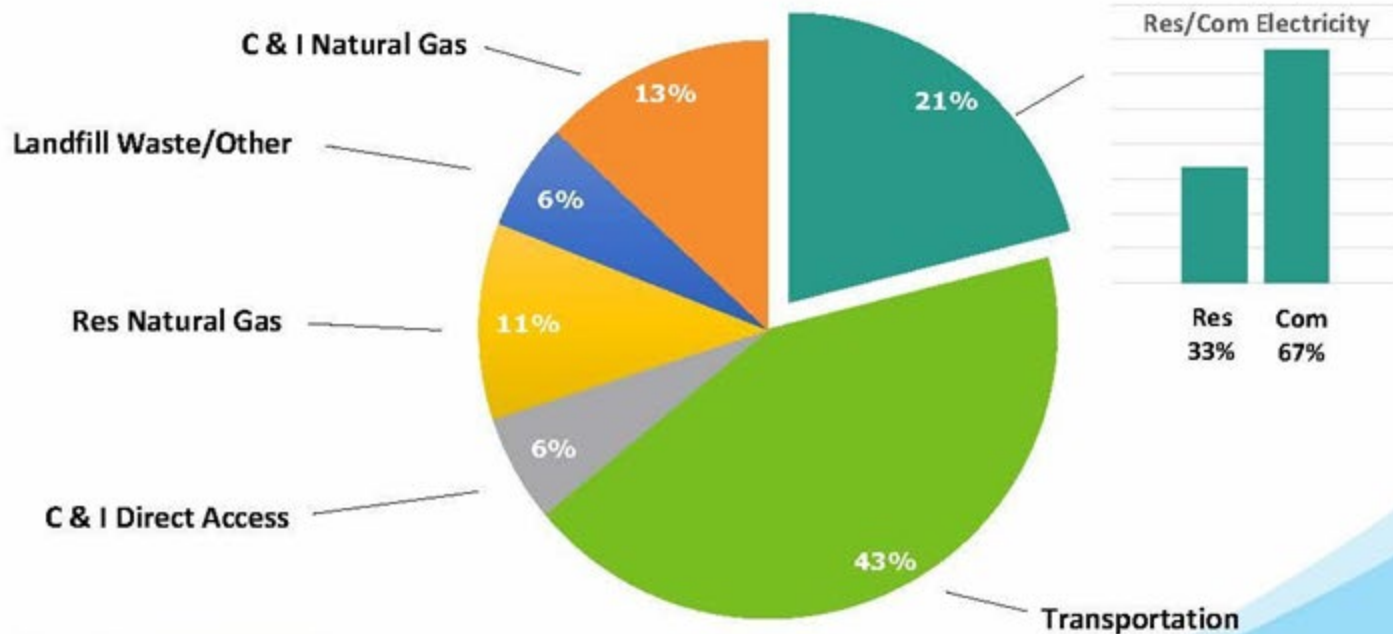


GreenPrime

- 100% renewable energy – optional upgrade
 - Green-e certified
 - Mix of wind and solar, carbon free
 - \$0.008/kWh premium to GreenStart

Regional GHG Status . . .

2015 Carbon Emissions by Source*





Girish Balachandran

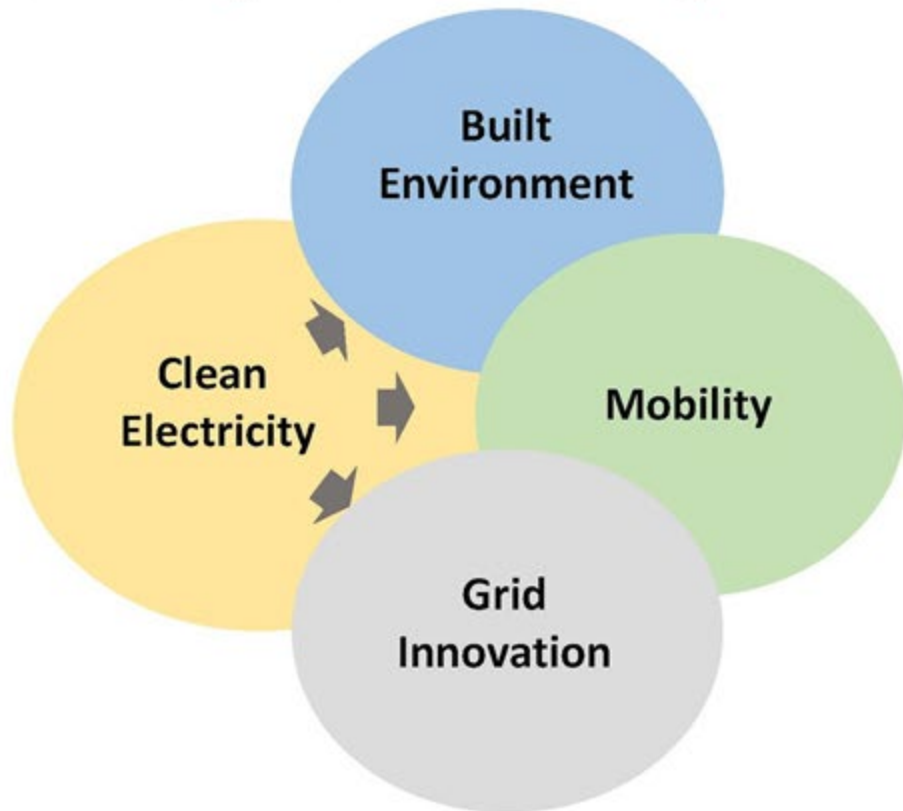
CEO, Silicon Valley Clean
Energy

BENDING THE CARBON CURVE

Health and Wealth for our
Community

SCOPE

Transformation and de-carbonization in Transportation and the Built Environment are very long-term initiatives, but we will start the process now



Silicon Valley Differentiators for SVCE

Differentiators

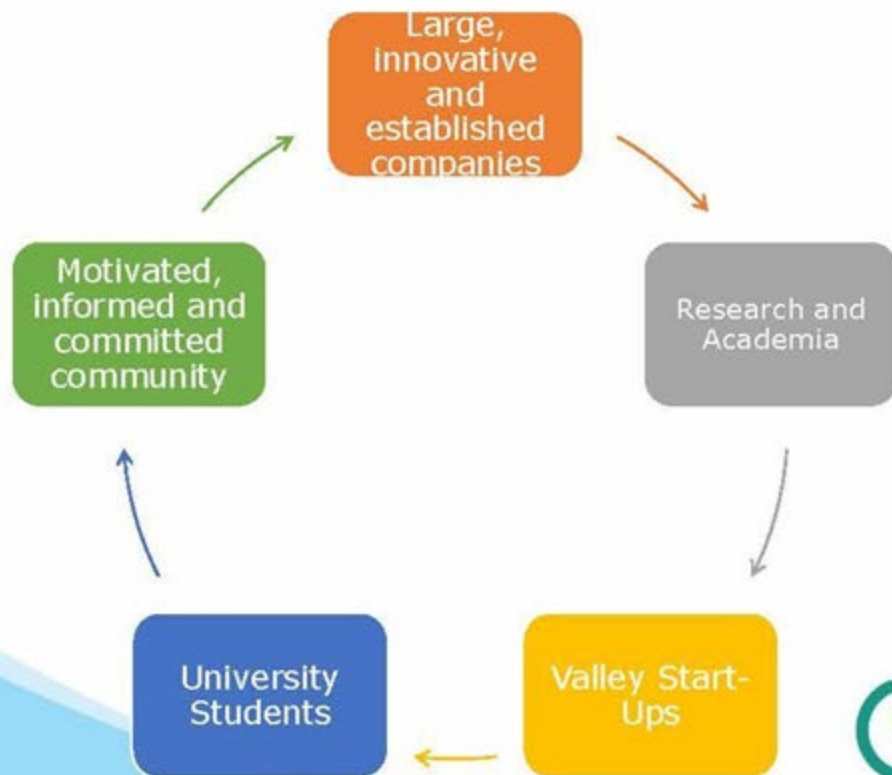
- Platform for Innovation
- Prototype
- Proof of Concept

Value

- Disruptor – creates an expanded vision
- Bold – accelerates change
- Moves the needle – bends the curve

Seek & Leverage Partnerships

Multiplier and Network Effects to the Value Stack



Questions?



John Supp

**Account
Representative**

On Electrification

Goings On For Building

- **Title 24**
 - Current – emphasis on natural gas over electricity
 - Proposed – even playing field for both
- **ZNE** – “Zero Net Energy”
 - Actually Zero Net Electricity
 - Improves efficiency over Title 24
 - Only refers to netting the electricity portion to zero
- **ZNC** – “Zero Net Carbon”
 - Can be met with offsets to drive carbon emissions to zero or less
- **Net Zero**
 - Must produce energy equal to or greater than what it consumes, regardless of type (electricity, natural gas, other)
- **Stretch goals**
 - Cities may pass more codes more efficient than Title 24
 - However, time dependent value (TDV) calculations effectively block high efficiency all-electric codes until Title 24 addressed

SVCE goal – carbon free, all electric built environment



Electrification: SVCE's 3 Priorities

Built Environment

- Single family homes
- Multi-unit residences
- Retail
- Commercial
- Industrial

Mobility

- Personal Transportation
- Mass Transit
- Trucking

Grid Optimization

- Hardware
- Software
- Support services

1 - Built Environment

ELEMENTS

- Reliability & Resiliency
- Decarbonization
- Reduced carbon emissions
- Asset monetization



SOLUTIONS

Distributed Renewables & Storage

Beneficial Fuel Switching

Targeted Energy Efficiency where electricity not viable

Connecting home/business devices for two-way shared value models

2- Mobility

ELEMENTS

- Automobiles



SOLUTIONS

Electric Vehicles

- Bicycles & Personal



Electric Bikes & Scooters

- Mass Transportation



Electrify Trains and Buses

- Trucking



Short/Medium/Long Haul E-Trucks

- Industrial



Electric Dump Trucks / Haulers



3 – Grid Optimization

ELEMENTS

- Behavioral
- Load shifting
- Short-term
- Usability
- Supply shifting
- Supply growth



SOLUTIONS

Rate Design

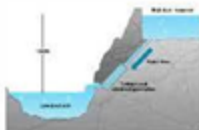
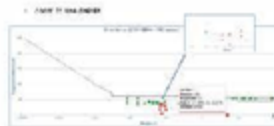
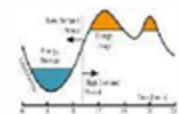
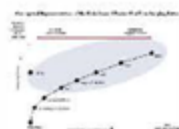
Advanced Controls

Demand Response

Power quality

Centralized Storage

Medium & Long term contracts to stimulate development



SVCE

- Gather input from Commercial and Industrial (C&I) Customers
- Design program elements
- Engage stakeholder groups on design elements
- Finalize proposed programs
- Launch C&I programs in 2019

John Supp

Account Representative

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20 years of Very Low Energy and Net
Zero Energy Buildings experience
summed up in 15 minutes....

Peter Rumsey, PE, FASHRAE
Founder & CEO

"We can save
twice as much
energy at half
of the cost"





Simple Solutions



Innovations Are Overpriced –
AT FIRST



TECHNOLOGY CONTINUES TO IMPROVE EFFICIENCY



Variable Flow Heat Pumps



LED Lighting



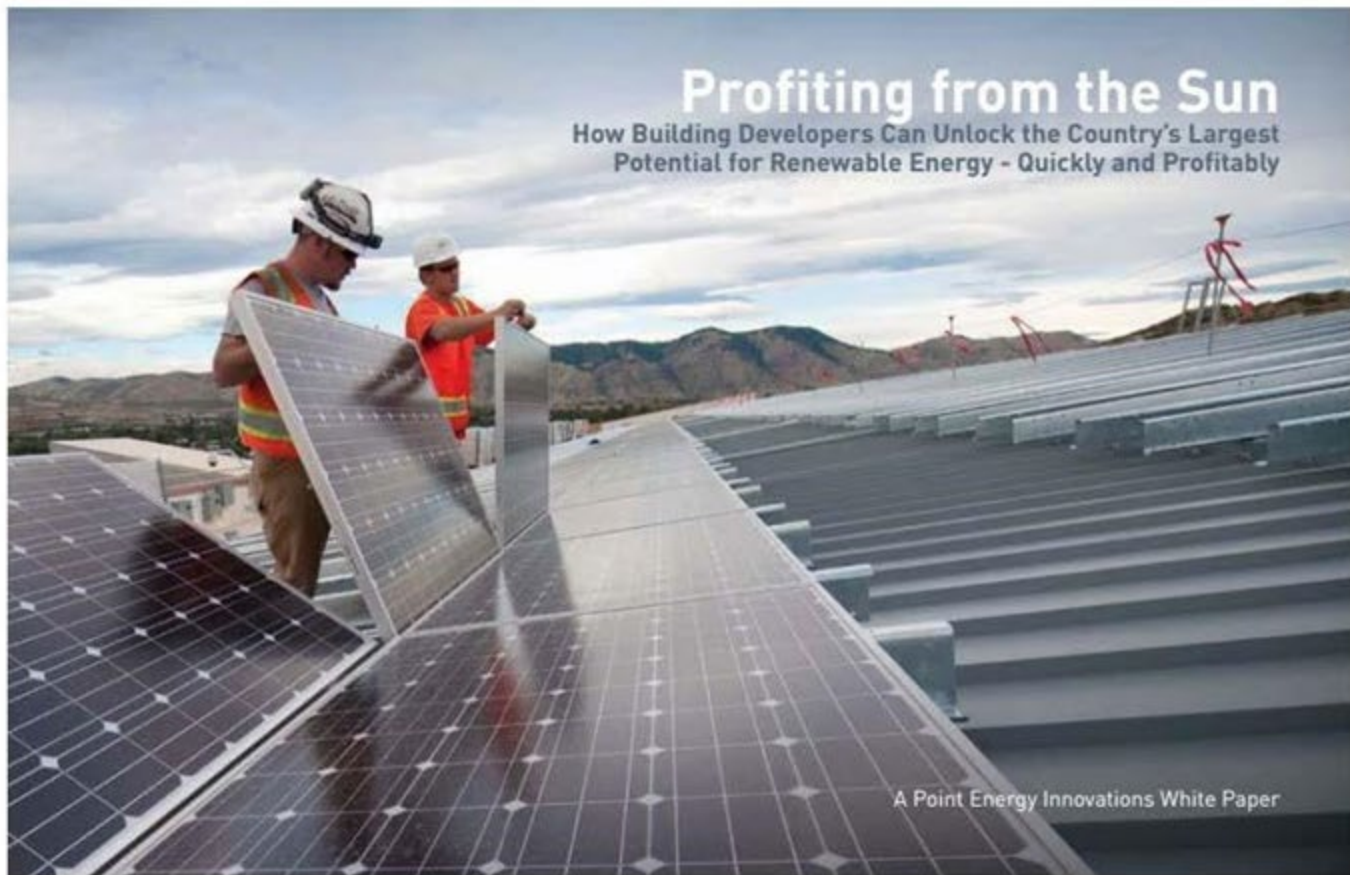
Laptops and LED Monitors

1400 Page Mill Road



Net Zero Buildings Can be Profitable





Profiting from the Sun

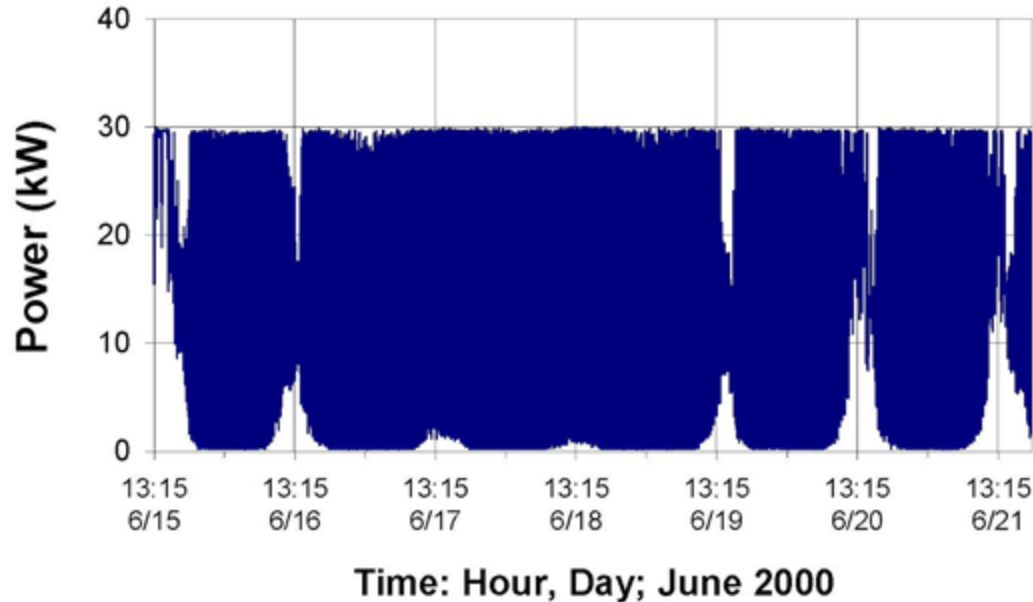
How Building Developers Can Unlock the Country's Largest Potential for Renewable Energy - Quickly and Profitably

A Point Energy Innovations White Paper

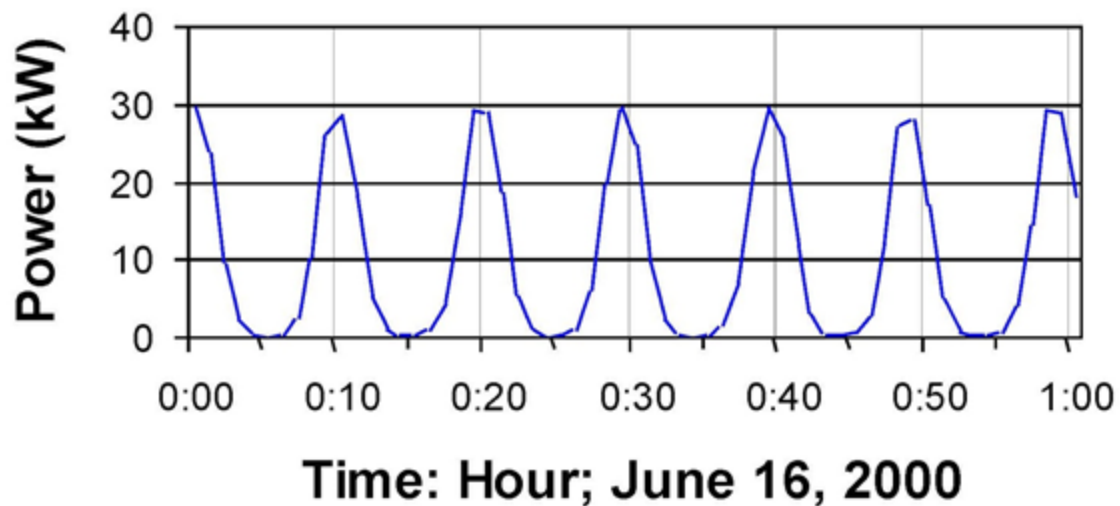
Point Energy Innovations White Paper on Developer Based PV Systems

<http://www.point.energy/profitng-from-the-sun/>

Building Controls Are STILL Out of Control

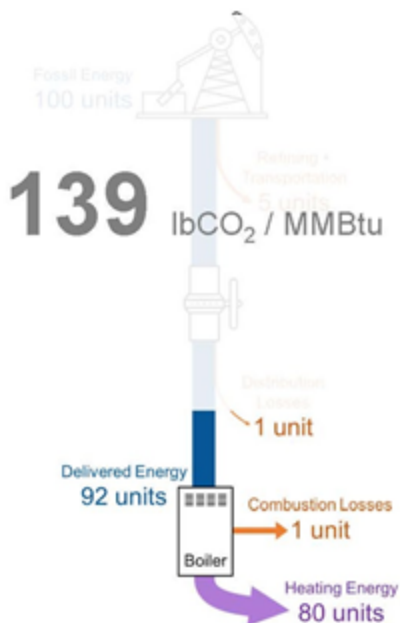


Tower #2 Cell B Power

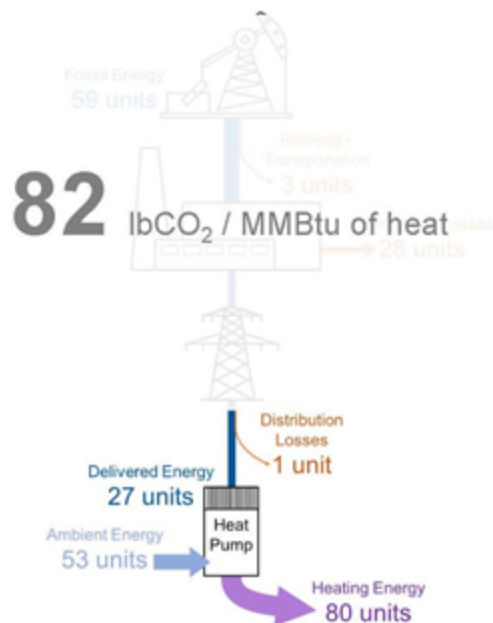


Heat Pumps Offer Best Hope for Getting Buildings off of Carbon

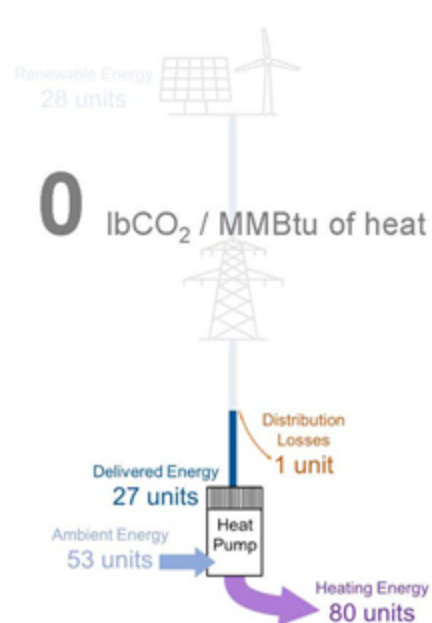
Fossil Fuel Boiler
80% "well to room" efficiency



Fossil Fuel Heat Pump
135% "well to room" efficiency



Renewable Heat Pump
285% "well to room" efficiency



Focus on the Building Envelope

Lower Cost Heating and Cooling System

Lower Cost Electrical System and Generators

Enhanced Thermal and Visual Comfort



In Summary

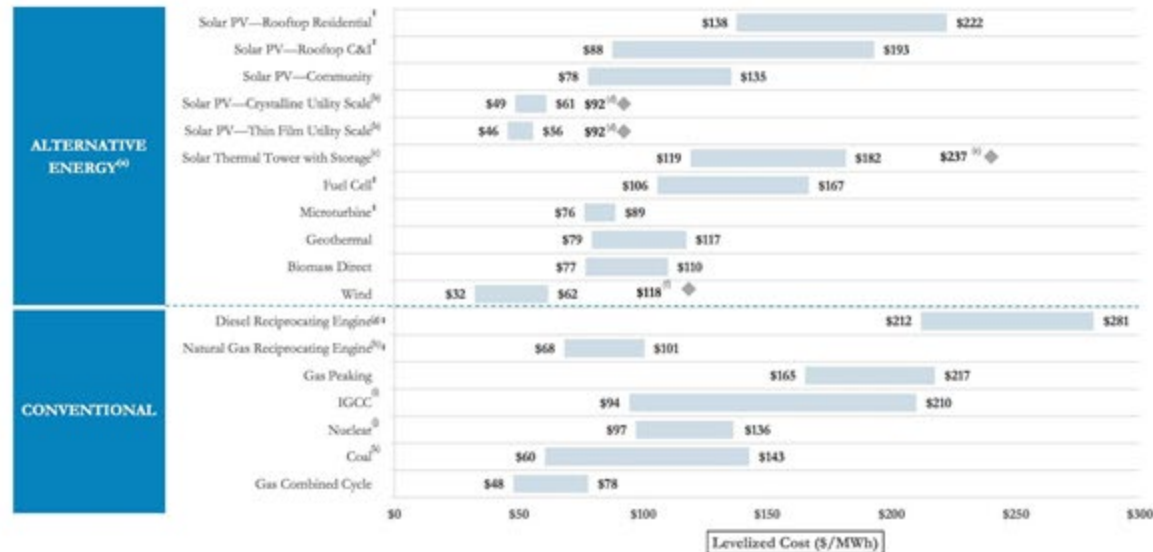
- Simple Solutions
- Innovations are overpriced – AT First
- Technology continues to improve efficiency
- Net zero buildings can be profitable
- Building controls are STILL out of control
- Heat Pumps offer the best hope for getting buildings off of carbon
- Focus on the Building Envelope

We will never run out of oil

LAZARD'S LEVELIZED COST OF ENERGY ANALYSIS—VERSION 10.0

Unsubsidized Levelized Cost of Energy Comparison

Certain Alternative Energy generation technologies are cost-competitive with conventional generation technologies under some scenarios; such observation does not take into account potential social and environmental externalities (e.g., social costs of distributed generation, environmental consequences of certain conventional generation technologies, etc.), reliability or intermittency-related considerations (e.g., transmission and back-up generation costs associated with certain Alternative Energy technologies)



San Francisco

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San Francisco, CA 94104

PointEnergyInnovations.com

Energy 2.0:
Reimagining all
things Energy

Let's Discuss...

The Business Case for Net Zero Energy



Speculative Office Building at 435 Indio Way

Kevin Bates | SHARP Development Company

435 Indio – Actual Economic Results

-The additional cost to renovate to meet Developer Goals	(\$49.84/SF)
-The Value of Actual operating expense savings (\$.45/SF/mo.) at a 6.5% market capitalization rate	\$83.08/SF
-The Value of above market rent achieved (\$.20/SF/mo.) at a 6.5% market capitalization rate	\$36.92/SF
-Additional rent received due to early lease-up (3 mos. vs. avg. market time of 18 mos.)	\$22.81/SF
-Additional leasable SF due to 6" of exterior insulation (building grew 326 SF)	<u>\$7.32/SF</u>
Total Additional value if sold the day after occupancy	\$100.29/SF
Potential Value of lower reserve requirements (HVAC replacement, TI reserves, etc.)	\$29.85/SF

DEVELOPERS GOALS

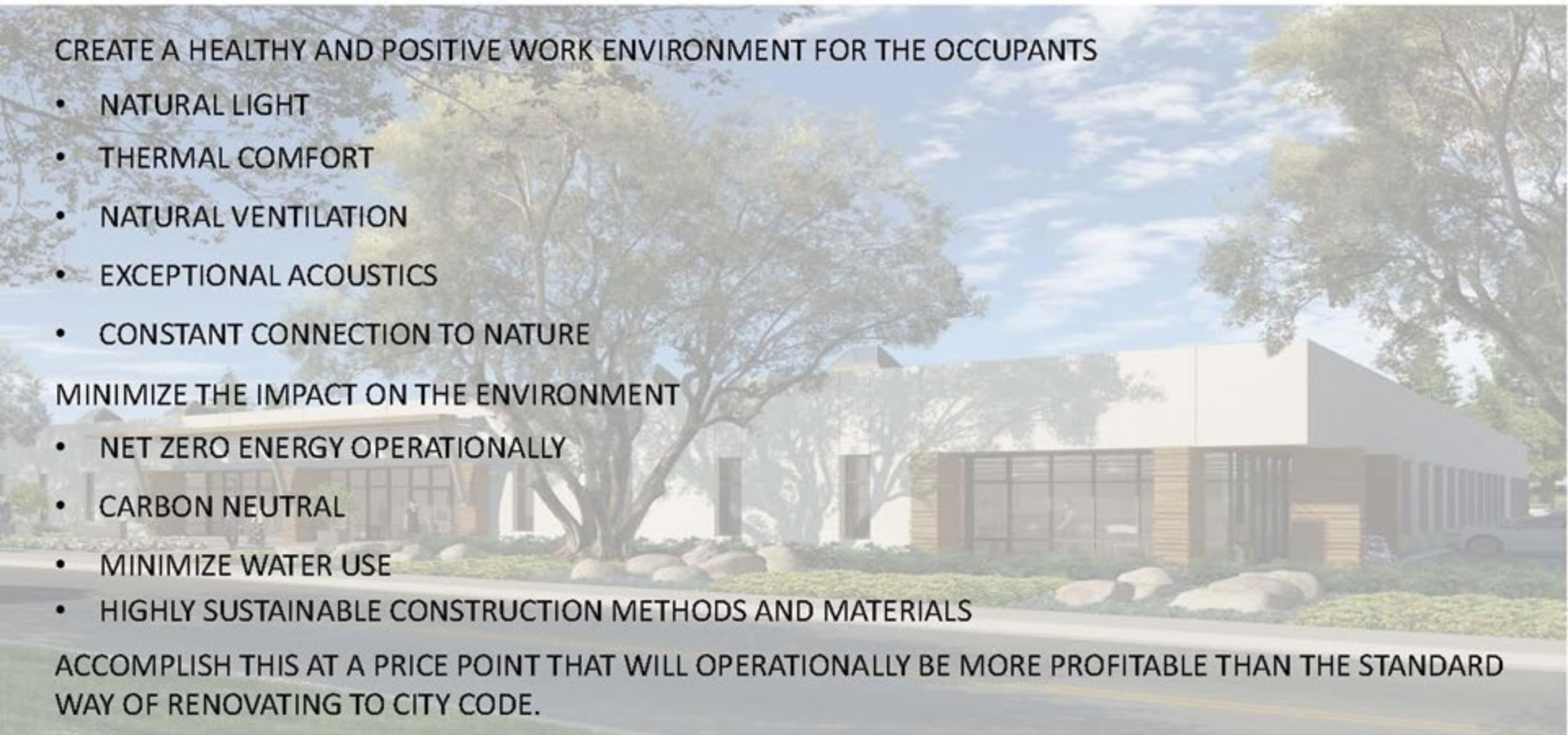
CREATE A HEALTHY AND POSITIVE WORK ENVIRONMENT FOR THE OCCUPANTS

- NATURAL LIGHT
- THERMAL COMFORT
- NATURAL VENTILATION
- EXCEPTIONAL ACOUSTICS
- CONSTANT CONNECTION TO NATURE

MINIMIZE THE IMPACT ON THE ENVIRONMENT

- NET ZERO ENERGY OPERATIONALLY
- CARBON NEUTRAL
- MINIMIZE WATER USE
- HIGHLY SUSTAINABLE CONSTRUCTION METHODS AND MATERIALS

ACCOMPLISH THIS AT A PRICE POINT THAT WILL OPERATIONALLY BE MORE PROFITABLE THAN THE STANDARD WAY OF RENOVATING TO CITY CODE.



I wouldn't know where to start.

Minimize the amount of PV needed by lowering the Energy Use Index (EUI)

HVAC:

- Insulate the outside walls to R-20 with insulation and electrochromic glass.
- Insulate the roof to R-40 with 1.5" of foam and reflective coating outside and 10" of BAT inside.
- Utilize exposed interior concrete thermal mass as your AC.
- Install ceiling fans, operable skylights and windows for natural air exchange and night flushing.
- HVAC dropped from 100 tons to 22 tons, resulting in significant first-cost savings.

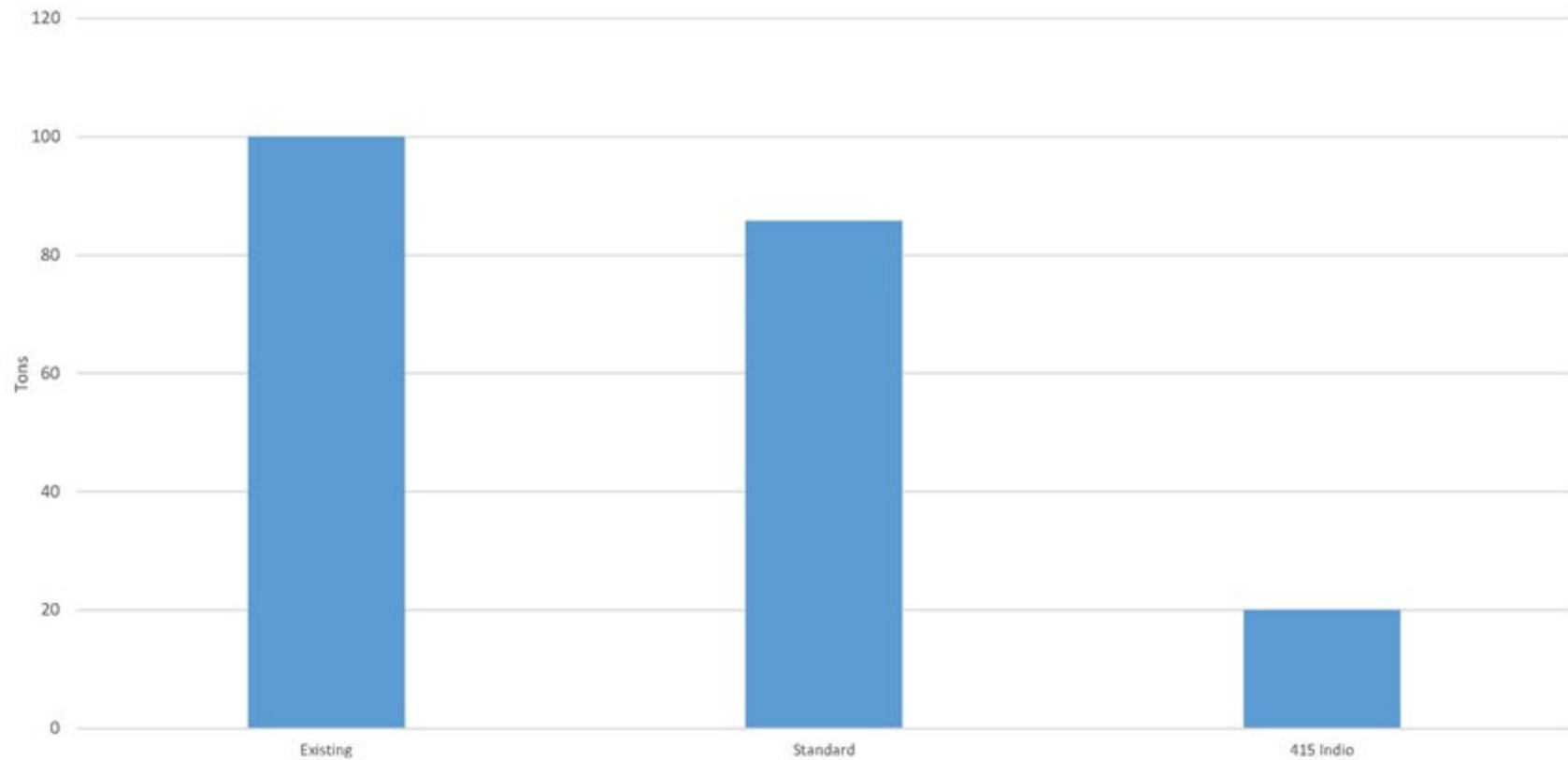
Light Loads:

- We designed South Facing skylights to maximize daylight harvesting 365 days a year while minimizing thermal gain.
- Electrochromic glass eliminates the need for blinds.
- We get an average of 19 fc of light from an hour after sunrise to an hour before sunset all year long, reducing the need for artificial light.

EUI and PV:

- By completing the above, our EUI dropped from 91 to 22.5. This dropped our energy generating need to 25% of what it was, resulting in a PV array which was 25% the size and cost to achieve a NZE bill.

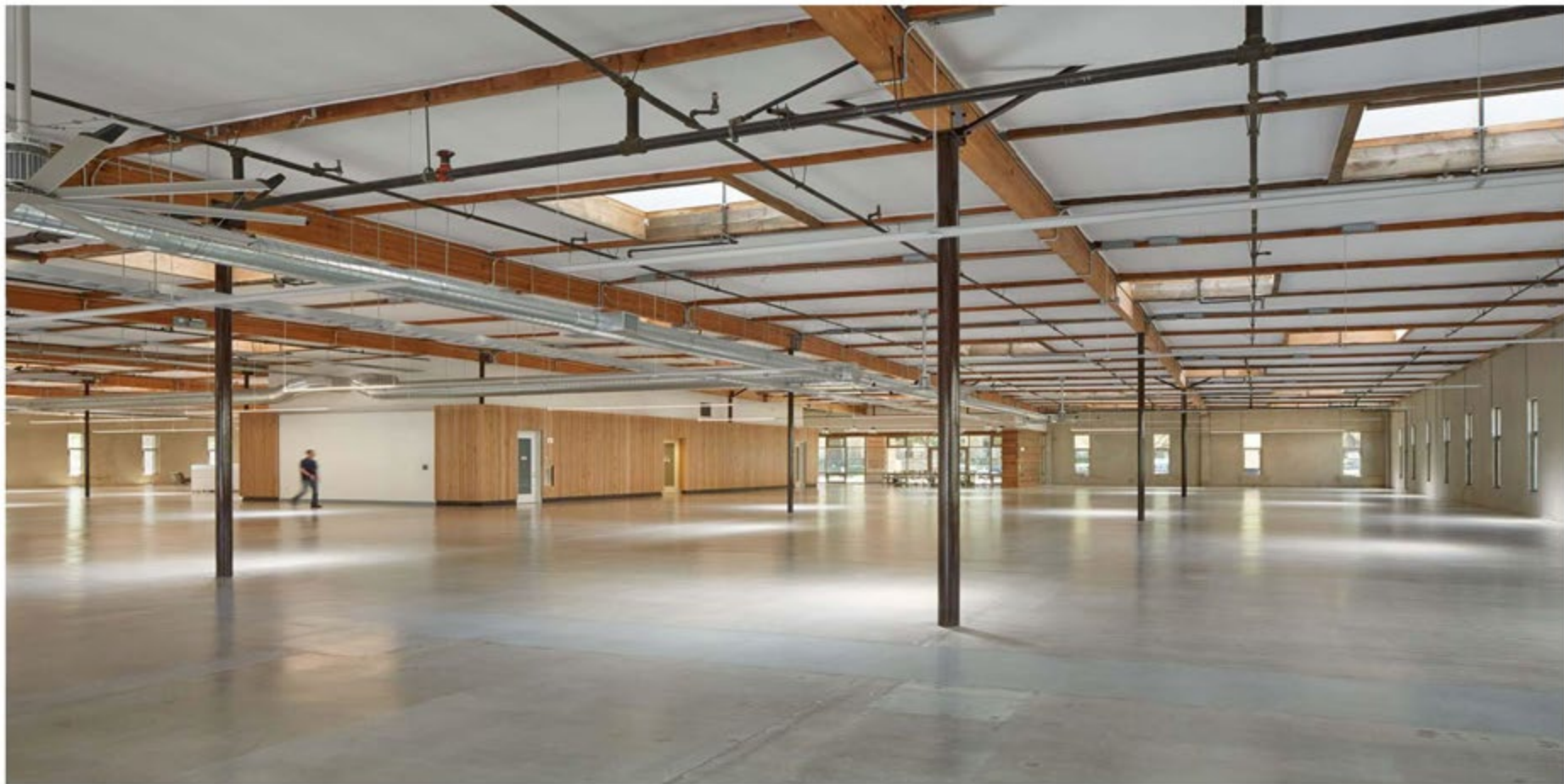
REDUCED HVAC SIZE



Utilizing Natural Light - 435 Indio before the ZNE renovation with no lights on.



Utilizing Natural Light - 435 Indio after the ZNE renovation with no lights on at the same time of day.



47951 Westinghouse Dr. – 82,408 SF Manufacturing Building

1) Reduce EUI

- LED Lights
- Optimized HVAC Tune-Up
- Insulation
- Window Film
- Reflective Insulated Roof

2) Generation

- Rooftop Solar
- Parking lot Canopies
- 1.02 million kW System
- Generates > 1.6 MM kWh/yr.



Economic Results

ROI for the Building Owner:

- Total Investment Cost: \$3,332,988
- Less tax Incentives: \$1,366,535
- Net Cost after Year 1: \$1,966,453
- Annual Utility Savings: \$421,000
- Return on Net Cost: 21.4%
- Simple payback (years): 4.67
- Increased Building Value: \$6,415,385

Benefits to Manufacturing Tenant:

- Cost of Power set at \$0 for next 20 years
- Competitive advantage when pricing L-T contracts
- Increased Profits (lower future power costs)
- Reduced maintenance costs (roof, lights, HVAC)
- Good Corporate Citizen – 100% clean powered

Benefits to the Environment:

- Offsets the burning of over 95 Million Gallons of Gasoline over a 20 year period.



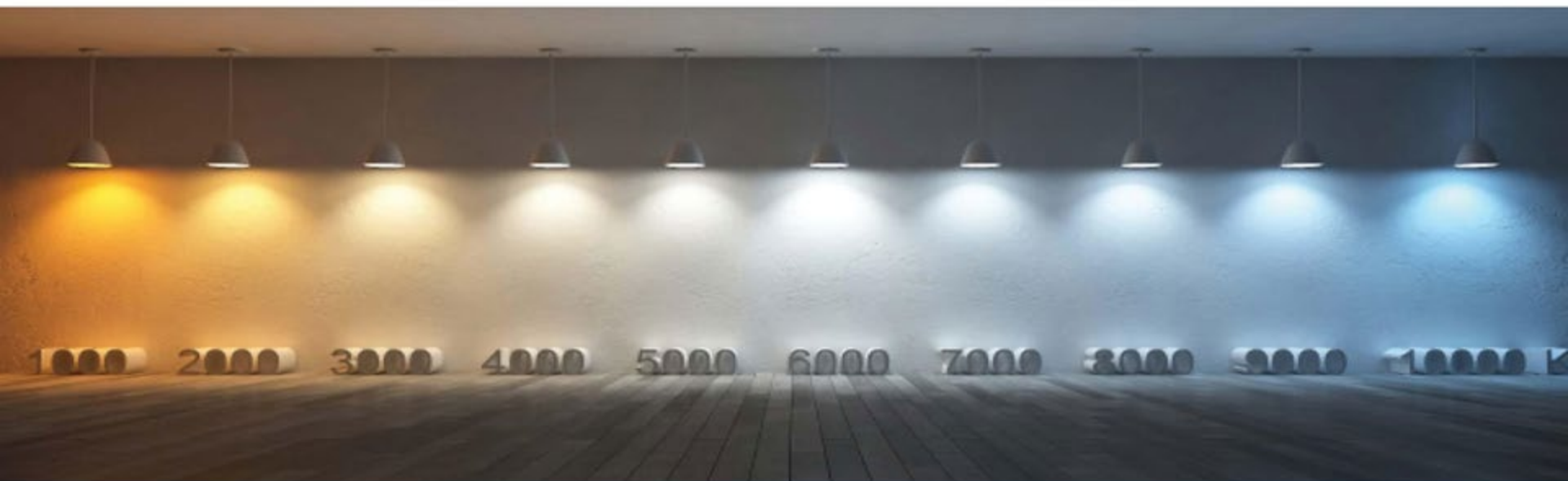
What if it doesn't work? It's too Risky.

- With reduced HVAC and lighting loads there is less equipment to wear out and break.
- Solar has become a very reliable source of energy.
- You have a built-in hedge against increasing power rates.
- From a marketing standpoint, you have significantly differentiated yourself from the market at large.
- These buildings are becoming the new definition of "Class A".
- If you are not a NZE, highly sustainable building, you will be left behind those who adapt to this building method.
- We have proven that they work, the economics speak for themselves, and the only risk is not adopting and being left behind.

Where things are going?

380 N Pastoria - The color of the artificial light inside the building mirrors the color of the natural light outside and the light coming through the skylights, helping to keep the occupants circadian rhythm naturally in sync.

Basically, your body thinks that it worked outside all day.



Kelvin Tunable Lighting

Indoor / Outdoor Workspaces

Water tight, bifacial solar canopy creates a protected, usable outdoor workspace with filtered light while generating a third of the buildings needed power. Full rental rate was achieved on 100% of covered patio.



Power Over Ethernet

Every light, fan, actuator, exit sign, etc., is powered by an ethernet communication line. We have over 700 IP addresses in the ceiling grid alone.



Let's Discuss...

Welcome to LinkedIn



880 W. Maude:

Laboratory for Energy Efficiency & Employee Engagement



- 40,000 sq. ft.
- Occupied by Software Engineers

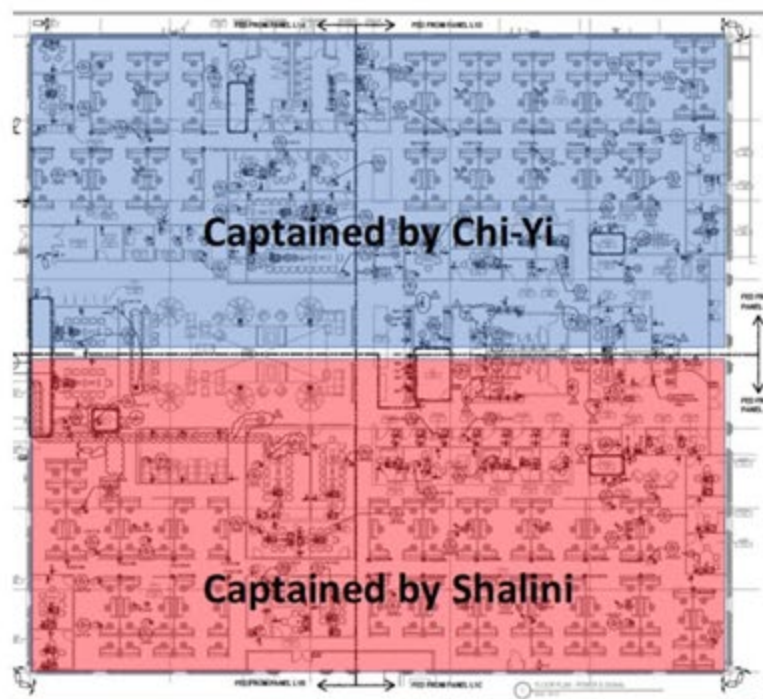
880 W. Maude:

Delivers Numerous Environmental Benefits

Building Features	Green Benefits
• Re-use of 1980s building	• Much smaller carbon footprint than new build
• 245 kW solar panel array	• Replaces fossil fuel with clean energy
• 20 skylights and LEDs	• ~60% less lighting energy than standard building
• 17 Smart Fans to increase air movement	• Reduces AC energy use as air flow allows higher indoor air temp
• Ultra-efficient HVAC with VFR and DOAS	• 30% more energy efficient than standard system
• 4 inches of extra roof insulation	• Reduces need for HVAC throughout year
• Sensors + Smart Controls + Dashboard	• Enables real-time monitoring, response, and continuous improvement of energy, water and waste impacts
• Recycled and salvaged interior features	• More sustainable materials footprint
• 16 EV Charging Spots	• Supports clean commuting
• Conference Rooms with VC	• Promotes 'virtual travel' to avoid auto and air travel
• Bike bank, indoor storage, showers	• Promotes carbon-free travel to and within campus

880 W. Maude:

Empowers Occupants to Hack Energy Use



- Mobilized building occupants to 'hack' energy consumption
- 23% energy reduction
- maintained for past 7 months



Total savings
1,254 kWh

Difference
↓ 23 % reduced

Participants
2 buildings



Team Chi-Yi
↓ 25.7% reduced



Team Shalini
↓ 20.2% reduced

0% 5% 10% 15% 20% 25%

All-Electric Building Experience

- Economics of all electric building
- Utility billing
- Solar production
- Creature comfort
- Sub-meters and occupant engagement
- Other insights

Let's Discuss...

Next 'Watts' Meeting....

Energy Storage!



Thank You!!!



SVCleanEnergy.org



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