

Program will start at 10:00 am



ETCC QUARTERLY MEETING: *CHARTING THE COURSE TO INTEGRATED SOLUTIONS*

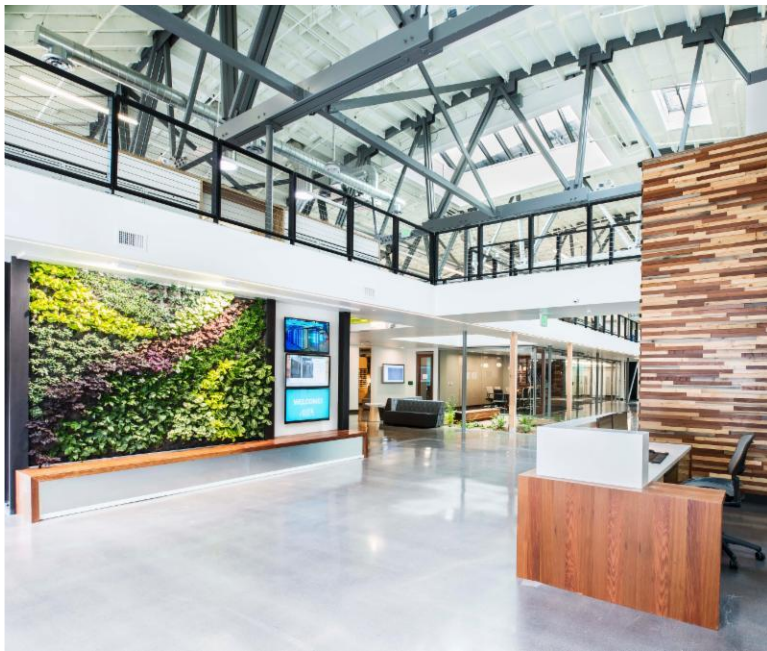
April 29, 2015

Pacific Energy Center, San Francisco, CA
HOSTED BY: Pacific Gas and Electric Company

Welcome, Safety and ETCC Updates

Mangesh Basarkar, Manager, Emerging Technologies and
Portfolio Optimization | Pacific Gas and Electric Company

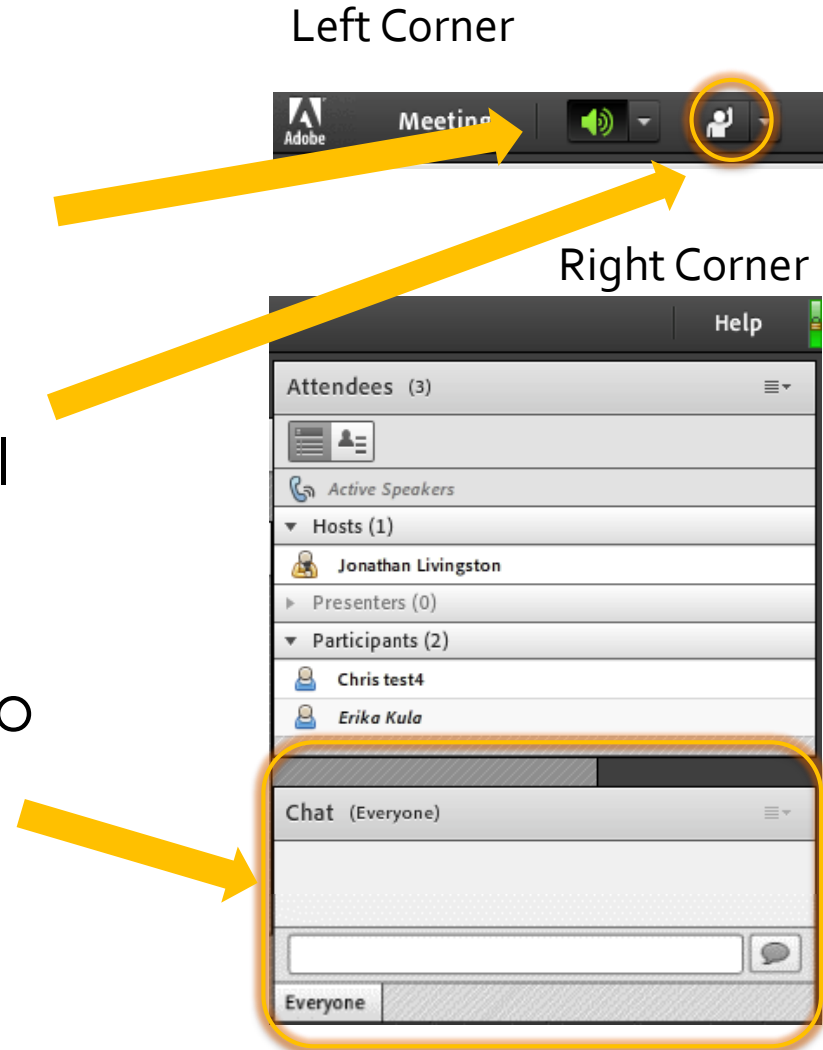
WELCOME!



Before we get started....
housekeeping and
safety

FOR OUR ONLINE MEETING PARTICIPANTS

- Quick logistics
 - Phone lines are muted, so if no sound is coming from your speakers, click here
 - Speaker check: select “raise” hand in the control panel to confirm you are able to hear
 - Please use question field to ask questions during Q&A or if any technical issues



HOUSEKEEPING FOR ALL PARTICIPANTS

- Please **turn off** or **silence** your phone, and **step outside** for any non-program conversations
- Slides will be posted to www.etcc-ca.com
- Don't forget to fill out evaluations!

SAFETY MESSAGE

- In the event of an emergency:
 - Earthquake
 - Fire
 - Other evacuation
- Meeting point
- 911
- CPR

TODAY'S AGENDA

10:00 AM Welcome, Safety & ETCC Updates

10:15 AM **Drivers for Integrated Solutions**

11:15 AM **Current State of the Art – part 1**

Noon LUNCH (*provided*)

1:00 PM **Current State of the Art – part 2**

1:45 PM **Looking Ahead**

3:00 PM Wrap Up

EMERGING TECHNOLOGIES COORDINATING COUNCIL (ETCC)

The ETCC supports the advancement of energy efficiency and demand response initiatives through its leadership, impact and influence in the emerging technology domain. It pursues this objective through strategic stakeholder engagement and effective and efficient coordination among ETCC members.

Members include:



EMERGING TECHNOLOGIES PROGRAM MISSION

“...to increase energy efficiency market demand and technology supply through evaluation of *emerging* and *underutilized* advanced technologies to increase customer savings...”



Zero Net Energy



LED Lighting



EE Rebates



Retail and Manufacturer Strategy



Appliance Standards



Building Codes



HVAC



Home Energy Report



Contractor Training and outreach

ET PROGRAM DESIGN

Technology Development Support

- Provide resources to transform early-stage technologies / concepts into saleable products
- Develop forward-looking product specifications
- Provide outreach to early-stage entrepreneurs, investors, and analysts (TRIO)

Technology Assessment

- Evaluate performance claims
- Generate energy savings and cost data required for regulatory approval of a new EE measures

Technology Introduction Support

- Conduct scaled field placements to foster market traction
- Build demonstration showcases to create visibility / market awareness
- Conduct third-party solicitations using competitive bidding (TRIP solicitation)

UPCOMING ETCC EVENTS

Date	Event	Location & Host
May 7 th	Open Forum (FLoW)	Los Angeles (SDG&E)
August 11 th	Q3 Meeting: Ag / Industrial / Water	Los Angeles (SoCal Gas)
November 4 th	Q4 Meeting: Residential	Sacramento (SMUD, LADWP, CEC)
November 5 th	Open Forum	Sacramento (SMUD)
February 2016	Q1 Meeting: Commercial	San Diego (SDG&E)
Spring 2016	Emerging Technologies Summit	Los Angeles area (SoCal Gas)

To sign up for the ETCC Insight newsletter, check the box on the sign-in / registration sheet or sign up online at: www.etcc-ca.com/subscribe

Check the ETCC website for updates: <http://www.etcc-ca.com/calendar>



DRIVERS FOR INTEGRATED SOLUTIONS

Cathy Higgins, Research Director | NBI – *moderator*

Cathy Fogel, Senior Analyst, EE Planning | CPUC

Alfred Gaspari, Principal Product Manager, Finance | PG&E

John Gajan, Vice President, Operations | Opterra

Drivers for Integrated Solutions

Cathy Higgins

NBI Research Director

ETCC Meeting
San Francisco, CA
April 29, 2015

higgins@newbuildings.org

nbi new buildings
institute



Oakland, CA

ET **CC** EMERGING
TECHNOLOGIES
COORDINATING
COUNCIL



LIFE

Senate Votes 98-1 That Climate Change 'Is Not A Hoax'

United States senators are now on the record on the question of whether climate change is "a hoax." But a majority of the Senate, including 15 Republicans, are also on record stating that human activity contributes to climate change.

The Senate on Wednesday passed a measure stating that "climate change is real and is not a hoax" by a margin of 98-1.

The New York Times

Climate Change's Bottom Line

By BURT HELM JAN. 31, 2015

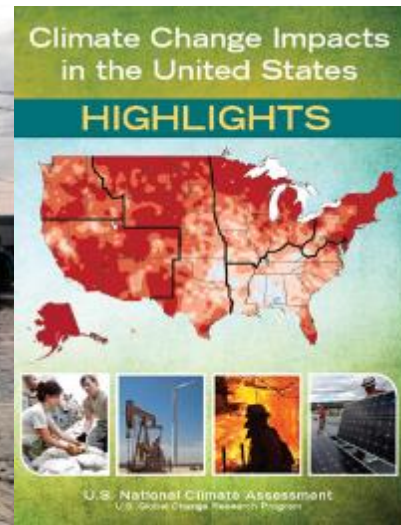


"I think it's the existential threat of our day. Once you see it as having catastrophic impact, any economic argument follows that, because you're not going to have an economy," said Robert E. Rubin, the former secretary of the Treasury under President Clinton. David McNew/Reuters



Michael R. Bloomberg, New York City's former mayor, views the work as a way to spur city governments and local businesses to work together on climate issues and not "kick the can down the road," he said.

Ivor Prickett for The New York Times



The members of the Risky Business Project are presenting research to business groups that highlights how the effects of climate change, like increased flooding, as in the streets of Queens, N.Y., could hurt business and the economy. Robert Stolarik for The New York Times



Henry M. Paulson Jr., the former chief executive of Goldman Sachs, wants companies to implement and regulators to enforce disclosure rules regarding climate risk and carbon emissions for publicly traded companies.

Todd Heisler/The New York Times



Tom Steyer, the hedge fund billionaire, sees the dollars-and-cents research as a way to neutralize conservatives' arguments that environmental regulation always hurts business.

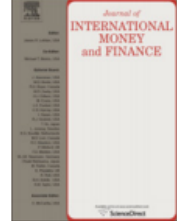
Jason Henry for The New York Times



Contents lists available at SciVerse ScienceDirect

Journal of International Money and Finance

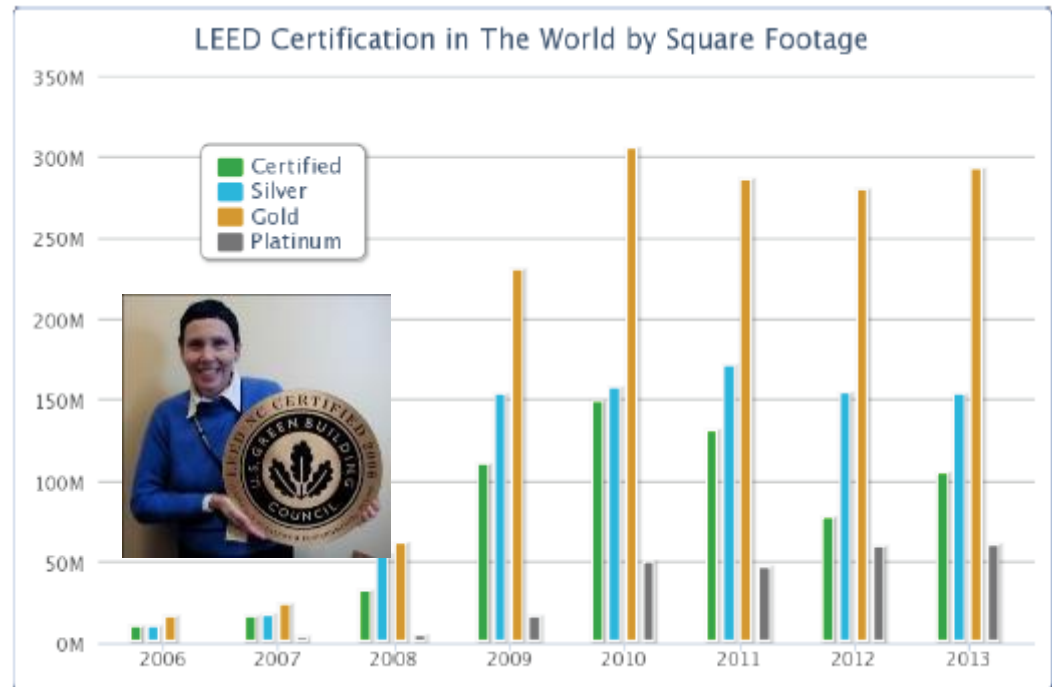
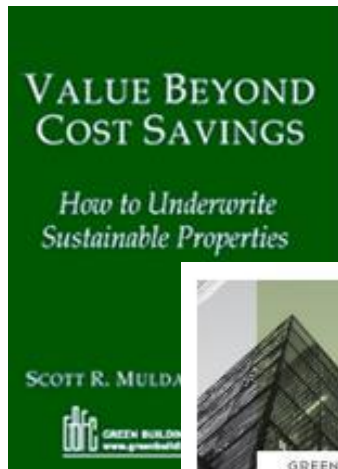
journal homepage: www.elsevier.com/locate/jimf



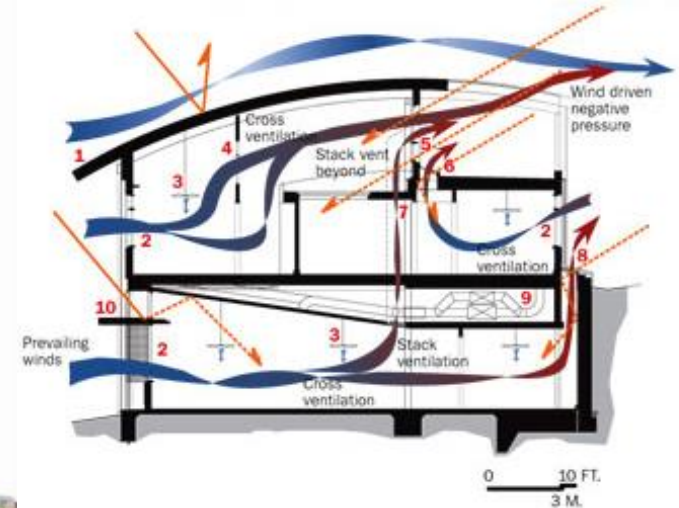
Portfolio greenness and the financial performance of REITs☆

Piet Eichholtz*, Nils Kok, Erkan Yonder

Maastricht University, Netherlands



Integrated Design Solutions!



Drivers beyond the Building

*districts, communities, grids, aggregation
resilience, storage, fuel access & price,
energy transactions, resources, scale*

DISTRICT SCALE
ENERGY SYSTEMS + WATER SYSTEM



Drivers beyond the Building

*technology, health, wealth, codes,
policy, planning, transportation,
today's occupants, bikes, dogs,
next generations*



What would nature do?



What wouldn't nature do?



Sao Paulo, Brasil

The Dialog:

- Cathy Fogel, CPUC
- Alfred Gaspari, PG&E
- John Gajan, OpTerra
- You



Bacon St. Offices



Zero Net Energy Buildings/ Integrated Demand Side Management: Where's it Headed?



ETCC Quarterly Meeting

Cathleen Fogel, Ph.D., Sr. Analyst
California Public Utilities Commission
Energy Efficiency Branch
April 29, 2015





Talk Outline

- The Good
- The Not So Good
- The Future





“The Good”





Report Findings:

- Costs for getting to zero are difficult to distinguish from overall project costs

NET ZERO AND LIVING BUILDING CHALLENGE FINANCIAL STUDY:

A COST COMPARISON
REPORT FOR BUILDINGS IN
THE DISTRICT OF COLUMBIA

PREPARED FOR:



PREPARED BY:



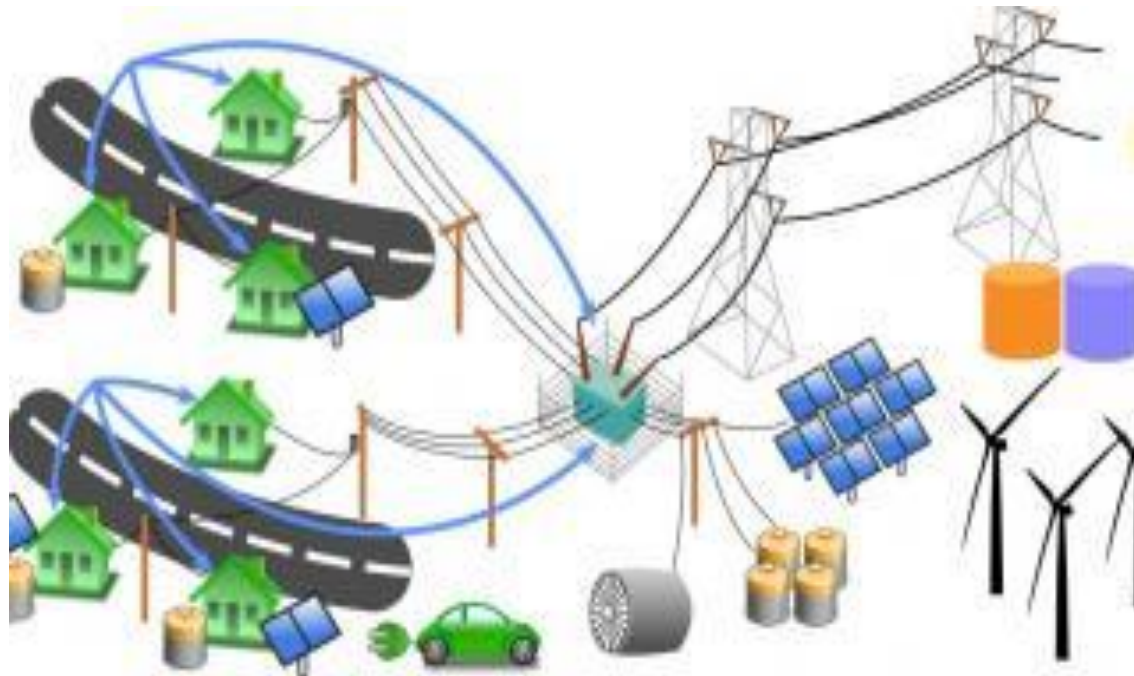


“The Not-So-Good”





“The Future” ? R. 14-10-003





“The Future” ? R. 14-10-003

- Be technology agnostic
- Result in a “major shift” in Commission demand-side management policy
- Create a “Customer Energy Solutions Framework”
- Consider a Wide Variety of Themes





Coordinate with Wide Variety of Rulemakings

- Alternative Fueled Vehicles (Rulemaking (R.) 13-11-007)
- Demand Response (R.13-09-011)
- Distributed Generation (R.12-11-005)
- Energy Efficiency (R.13-11-005)
- Energy Storage (R.10-12-007)
- Smart Grid (R.08-12-009)
- Water-Energy Nexus (R.13-12-011)
- Energy Upgrade California Marketing Education & Outreach (currently without an open proceeding)
- Residential Rate Reform (R.12-06-013)

Workshop #3: March 11-12





Some of the “Asks”

- Promote performance standards not programs for DSM portfolios
- Plan for integrated DER portfolios not technologies
- Require an Open Architecture across DER technologies
- Enable access for behind the meter assets to provide distribution services
- IOUs: focus on integration investments
- Compensate IOUs for using 3P-owned IDSM assets in lieu of utility-owned assets
- Allow distributed storage to export as part of DR service
- Prioritize DER aggregation in RFOs





The Future: Where IDSM meets DERs....

- From IDSM mandates → markets, tariffs and carbon-friendly rates?
- From incentives & programs → monetization and grid services?
- For owners: Maximize incentive payment → minimize load to maximize revenue streams from services provided to the grid?





Thank you!

Cathleen Fogel
Sr. Regulatory Analyst, CPUC
cathleen.fogel@cpuc.ca.gov



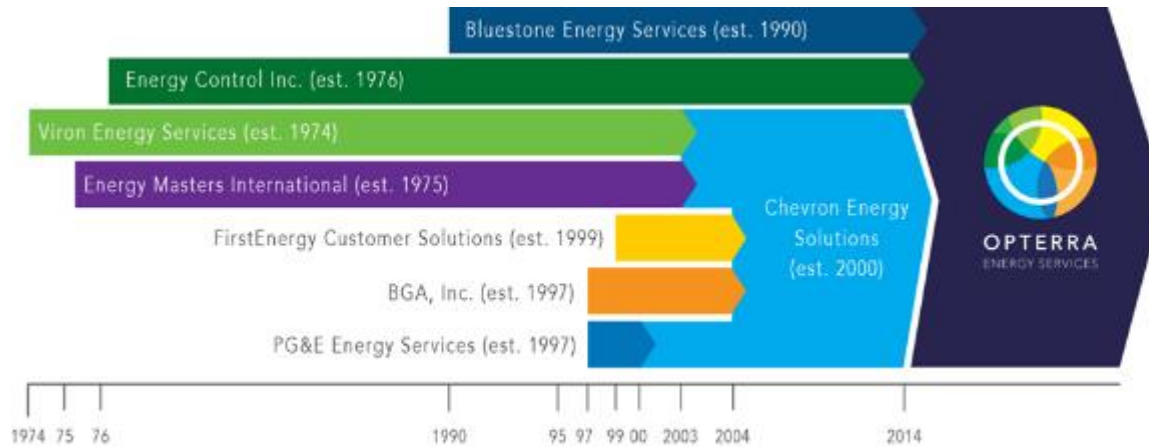
Alfred Gaspari, Principal Product Manager, Finance | PG&E

FINANCIAL AND ECONOMIC DRIVERS FOR INTEGRATED SOLUTIONS

- Finance Drivers
 - Technology and product adoption
- Economic Drivers
 - Valuation
 - Non-Energy Benefits

John Gajan, Vice President, Operations | Opterra

Introduction to Opterra Energy Services



- A legacy of over 40 years in the Performance Contracting Industry

- 33 satellite offices; 280+ employees
- Headquarters in San Francisco, CA
- Implementing 150+ major projects per year
- A leading innovator and provider of comprehensive efficiency, renewable energy, and business impact solutions to the California public sector market



PROJECT DEVELOPMENT DRIVERS FOR INTEGRATED SOLUTIONS

- Issue: *Ensuring that the Owner or organization have the information to fully value the benefits of an integrated solution*
- A comprehensive approach to Project Development that considers efficiency, renewable generation, controls, and behaviors as well as ancillary benefits
- Issue: *Will an integrated solutions approach meet the financial hurdles of the Owner or organization ?*
- The Project Developer must understand and creatively address those constraints

PROJECT DEVELOPMENT DRIVERS FOR INTEGRATED SOLUTIONS

- Issue: *Will a more complex solution or technology challenge the risk tolerance of the Owner or the Project Developer ?*
- Draw on successful in-situ case studies, pilot new technologies, use proven, reputable vendors; Developer guarantees project performance

DISCUSSION / Q&A



INTEGRATED SOLUTIONS – CURRENT STATE OF THE ART, *ROUND ONE*

Peter Turnbull, Principal – Commercial Buildings | PG&E – *moderator*

Clark Brockman, Principal – Sustainability | SERA

Carrie Brown, Senior Technical Consultant | Resource Refocus

Peter Turnbull, Principal – Commercial Buildings | PG&E

Clark Brockman, Principal – Sustainability | SERA

Reimagining a Building Through Systems Integration, Technology & Collaboration



Emerging Technologies Coordinating Council: The Current State of the Art
Clark Brockman, AIA LEED Fellow
Principal, SERA Architects

April 29, 2015



DESIGN/ANALYSIS

EAST & SOUTH ELEVATION STRATEGIES



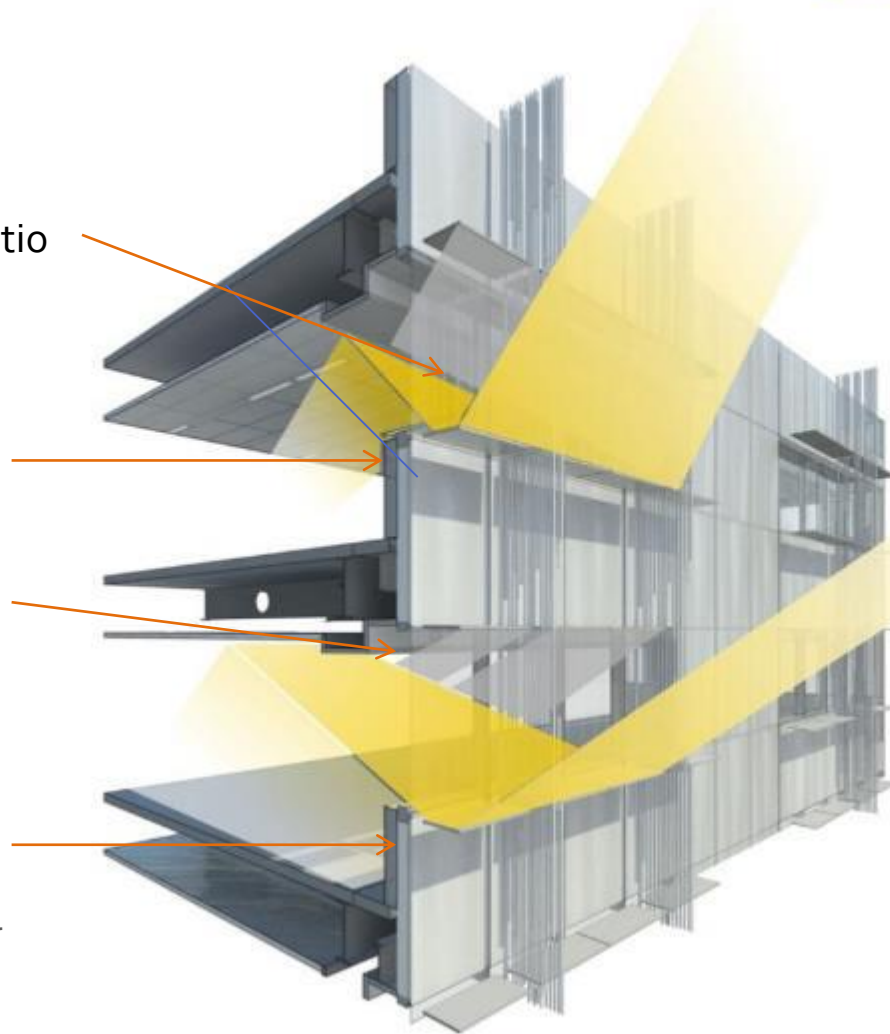
Summer mid-day sun (high angle)

Low Glazing to Wall Ratio
40% glazing

Low Infiltration Rate
0.06 CFM

Well-Insulated Wall

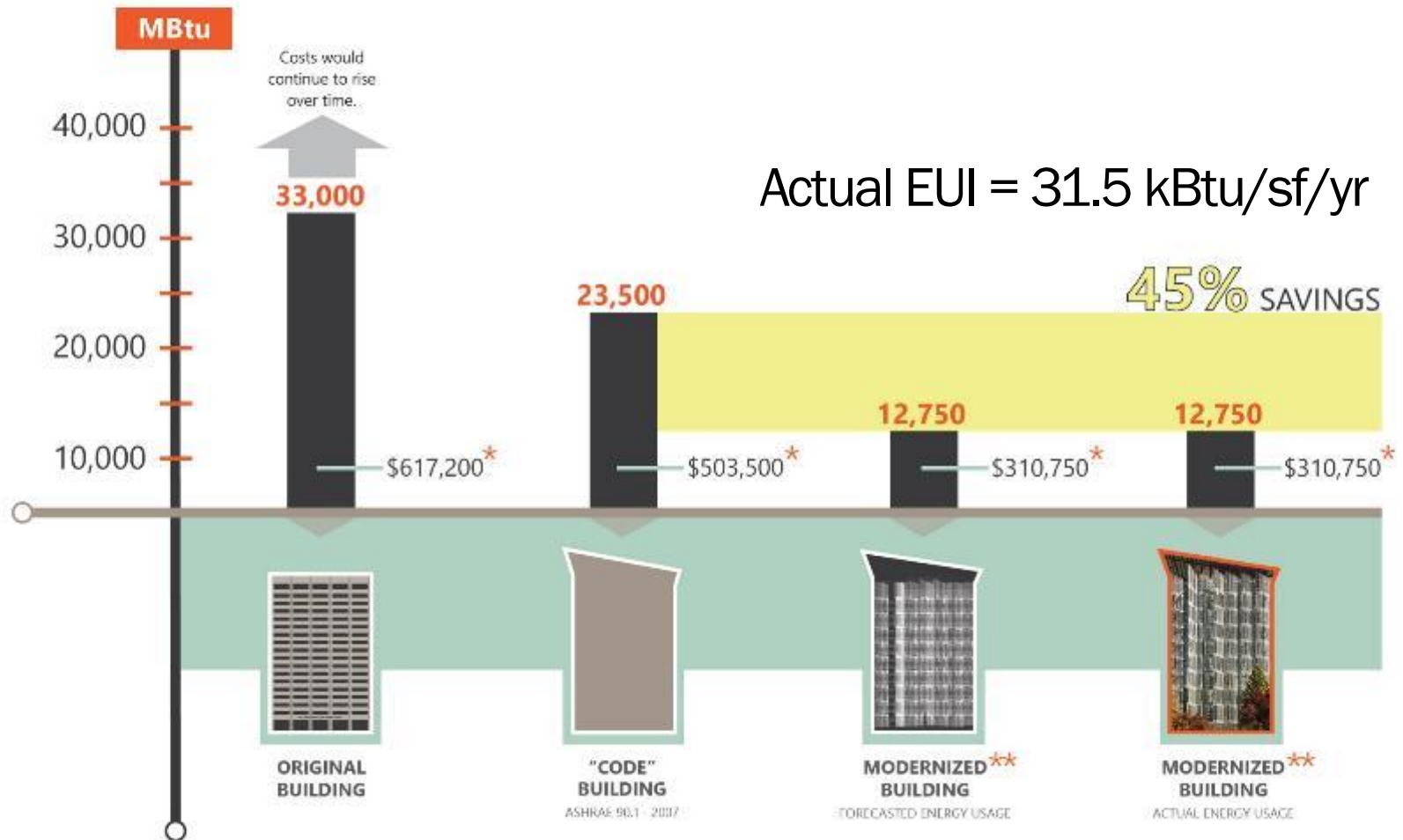
Daylighting
Light shelves bounce
light 16ft. into interior



Equinox morning sun (lower angle)

ANNUAL ENERGY USE

Calculated Based on AVERAGE Monthly Usage from October 2013 to September 2014

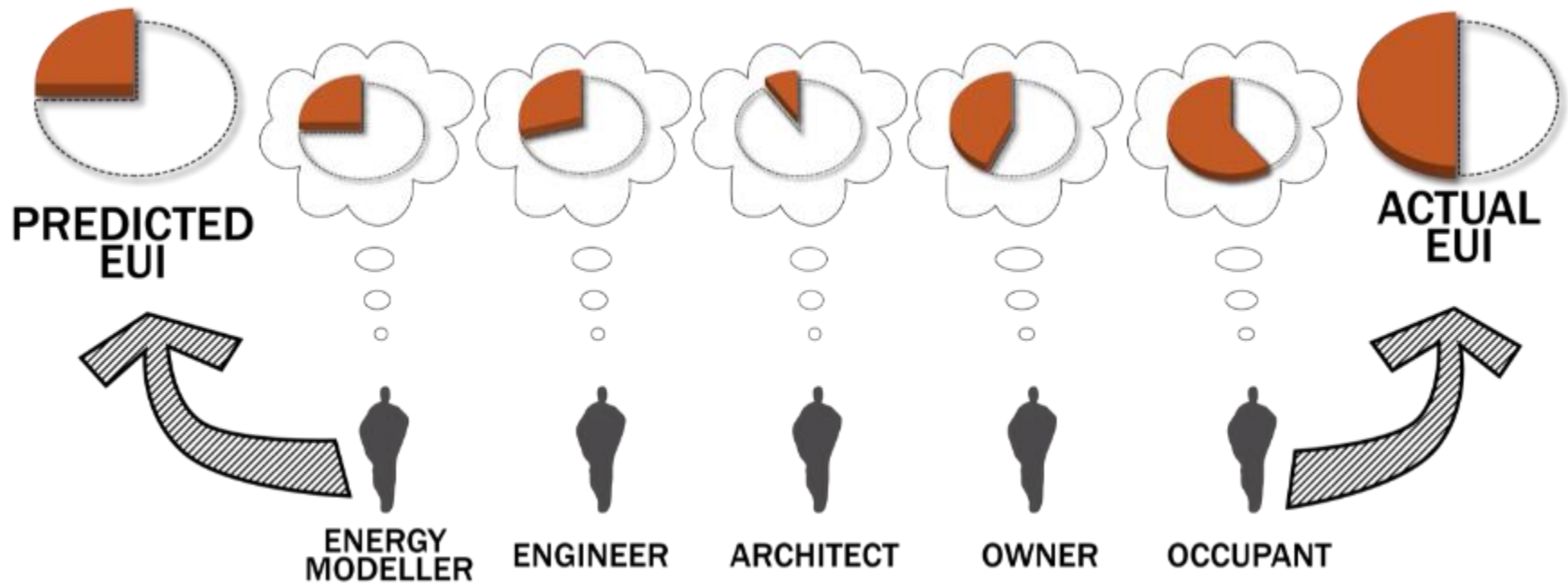


* Calculated at 2014 energy cost.

** Modernized building includes a 14% increase in leasable area compared to the original building.

ENERGY USE

PREDICTED vs. ACTUAL



SMART BUILDINGS

...IT'S STILL EARLY DAYS...



- Open
- Converged
- Normalized

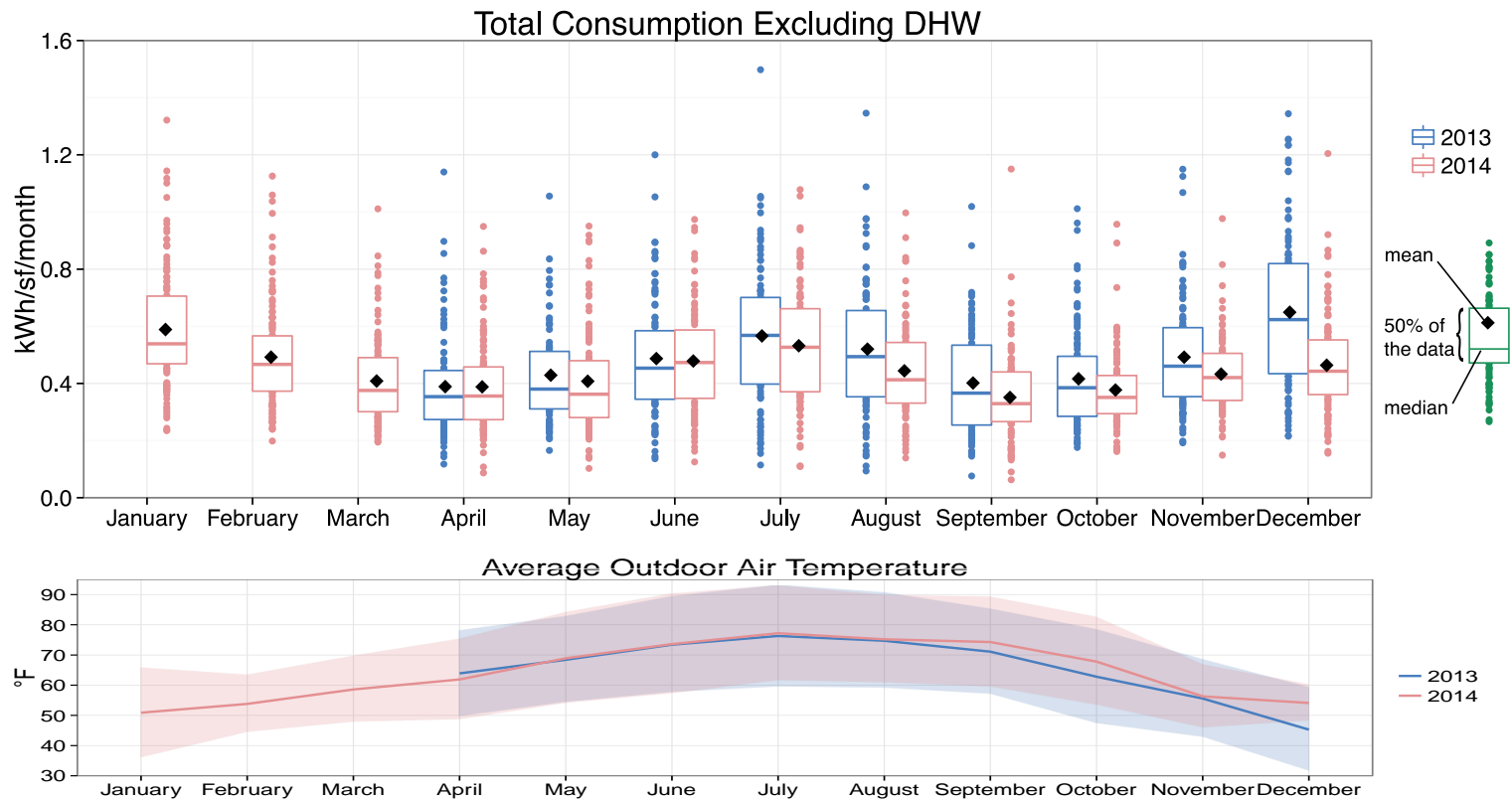
Carrie Brown, Senior Technical Consultant | Resource Refocus

RESOURCE REFOCUS LLC

- Strategic Planning
 - Identify barriers, opportunities, pathways
- Research Oversight
 - Scoping + Technical Reviews
- Outreach + Education
 - Forums, competitions, demonstration project events
- Building Performance
 - Modeling + Oversight of monitoring and evaluation
 - Example: UC Davis West Village

WEST VILLAGE, UC DAVIS

- Monitored energy consumption and production to determine the impact of **technical interventions** and **behavior engagement activities** and to determine whether this West Village sample is achieving its **ZNE goals**. (126 of 663 units)



DISCUSSION / Q&A

LUNCH

Program will resume at 1:00 pm

PLEASE FILL OUT EVALUATIONS!



INTEGRATED SOLUTIONS – CURRENT STATE OF THE ART, *ROUND TWO*

Peter Turnbull, Principal – Commercial Buildings | PG&E – *moderator*

Kevin Bates, President | SHARP Development

Jeff Arrillaga, Senior Vice President | Newmark Cornish & Carey

Peter Turnbull, Principal – Commercial Buildings | PG&E

Kevin Bates, President | SHARP Development

Jeff Arrillaga, Senior Vice President | Newmark Cornish &
Carey

DEVELOPERS GOALS

An architectural rendering of a modern, single-story building with large glass windows and a mix of light-colored panels and dark wood accents. The building is surrounded by lush greenery, including large trees and low-lying shrubs. The sky is blue with light, wispy clouds. The overall scene is bright and airy, suggesting a healthy and positive work environment.

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.

EXISTING CONDITIONS



- 30,000 SF square one-story office warehouse built in 1973
- Uninsulated concrete walls, wood roof and single pane windows
- DARK, DINGY and UNRENTABLE!

HIGH PERFORMANCE ENVELOPE



435 INDIO



PASSIVE THERMAL COMFORT



INTEGRATED ROOF PLANNING



BUSINESS CASE FOR ZERO ENERGY COST

- ADDITIONAL COST TO RENOVATE SUSTAINABLY VS. LESS EXPENSIVE STANDARD METHOD OF RENOVATING => (\$49.84 / SF)
- ADDITIONAL VALUE CREATED DUE TO A REDUCTION IN OPERATING EXPENSES AND RESERVE REQUIREMENTS => \$52.94 / SF
- ADDITIONAL VALUE DUE TO ACCELERATED LEASE-UP TIME VS. AVERAGE MARKET DOWNTIME => \$22.81 / SF
- ADDITIONAL VALUE DUE TO RECEIVING A PREMIUM IN RENT OVER THE TOP OF THE MARKET RENTS => \$34.47 / SF

435 INDIO



DISCUSSION / Q&A



LOOKING AHEAD – TECHNICAL CHALLENGES AND SOLUTIONS

Devin Rauss, Project Manager, DSM Strategic Planning | SCE – *moderator*

Cole Roberts, Associate Principal | Arup

Cindy Regnier, Group Leader, Comm'l Bldg. Systems | LBL

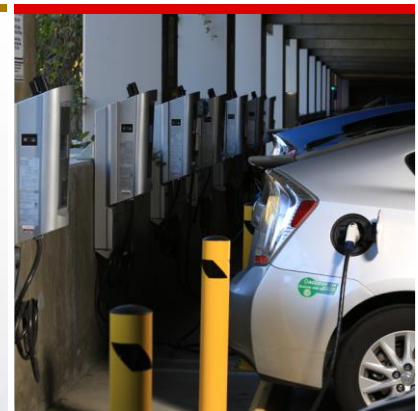
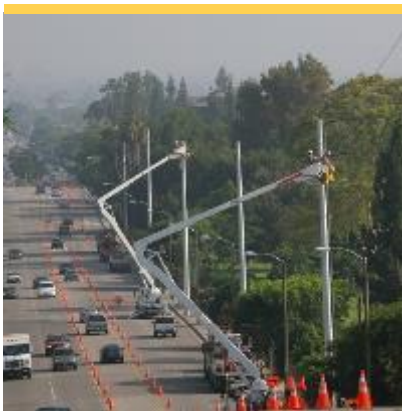
Marc Theobald, Program Manager | TRC

Aniruddha Deodhar, Senior Product Mgr., Sustainable Buildings Solutions | Autodesk

Looking Ahead- Technical Challenges and Solutions

Devin Rauss

Emerging Technologies Coordinating Council Meeting

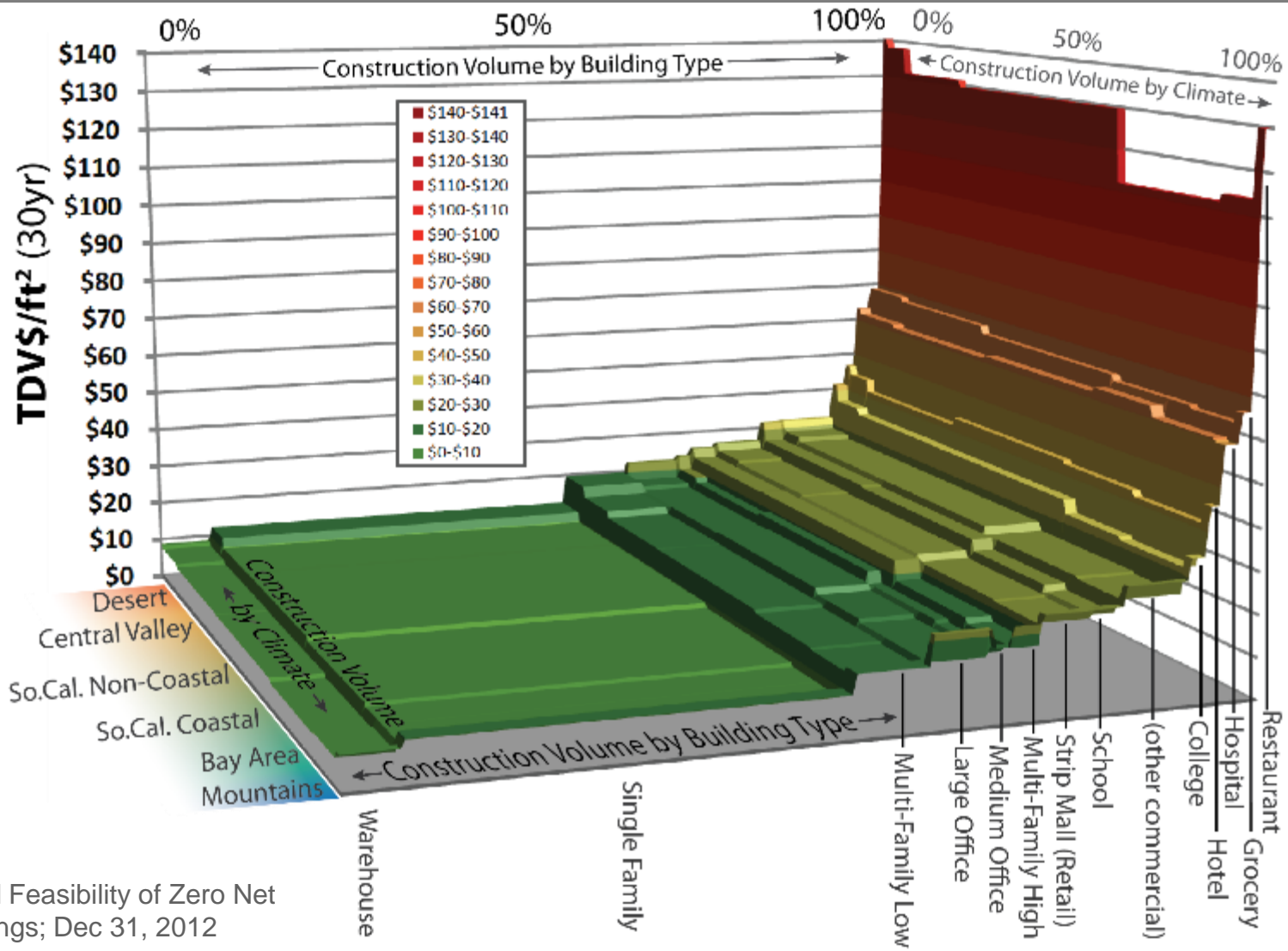


Technical Challenges

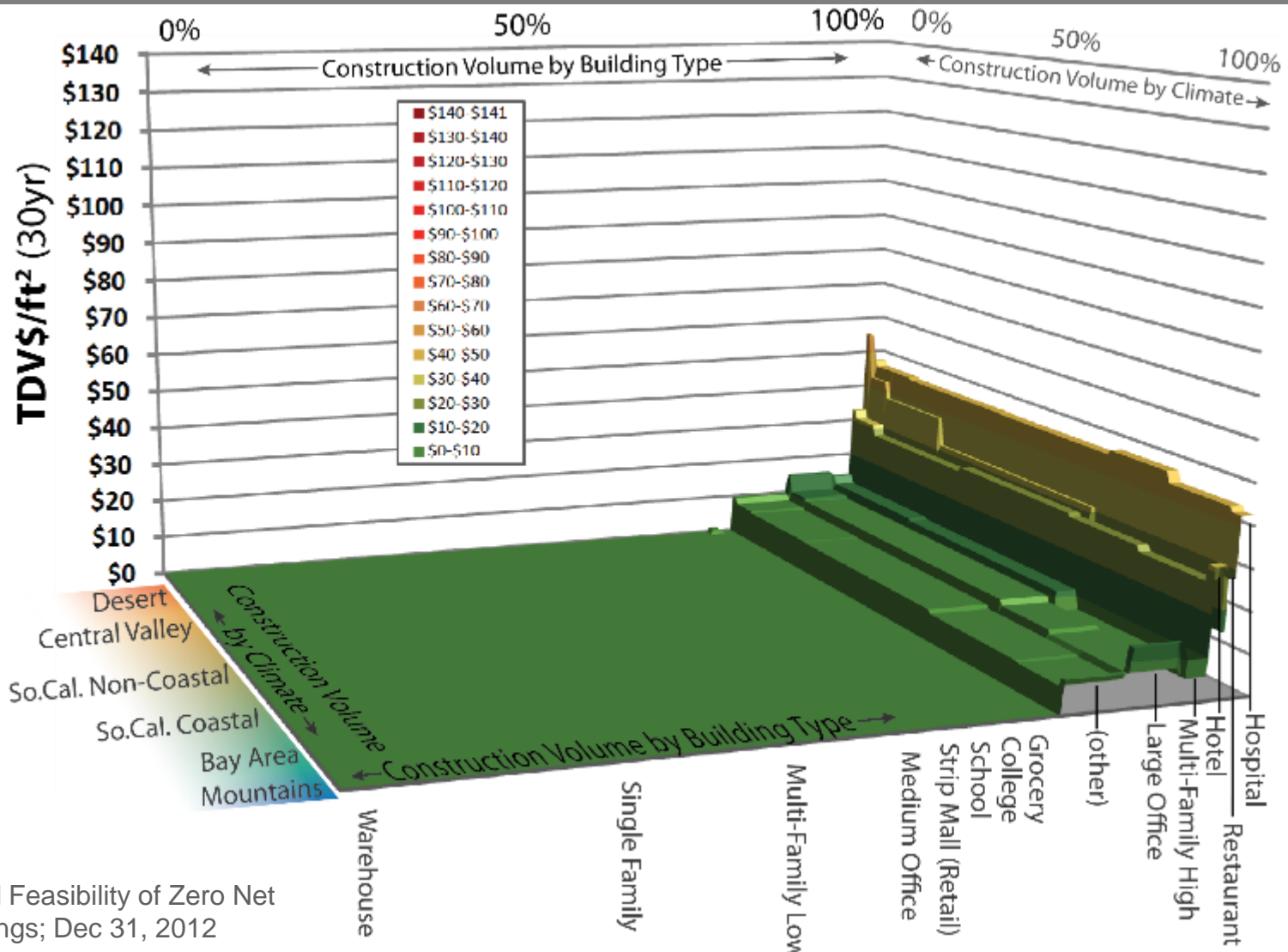
- What are system performance characteristics?
 - Assessment needed
- How do you design and operate interactive effects?
 - Dynamic tools needed for interaction
- What is appropriate system boundary?
 - Understanding problem being solved and how it impacts other layers
- Can these systems interoperate?
 - Standards are key

Cole Roberts, Associate Principal | Arup

ZNE TECHNICAL POTENTIAL



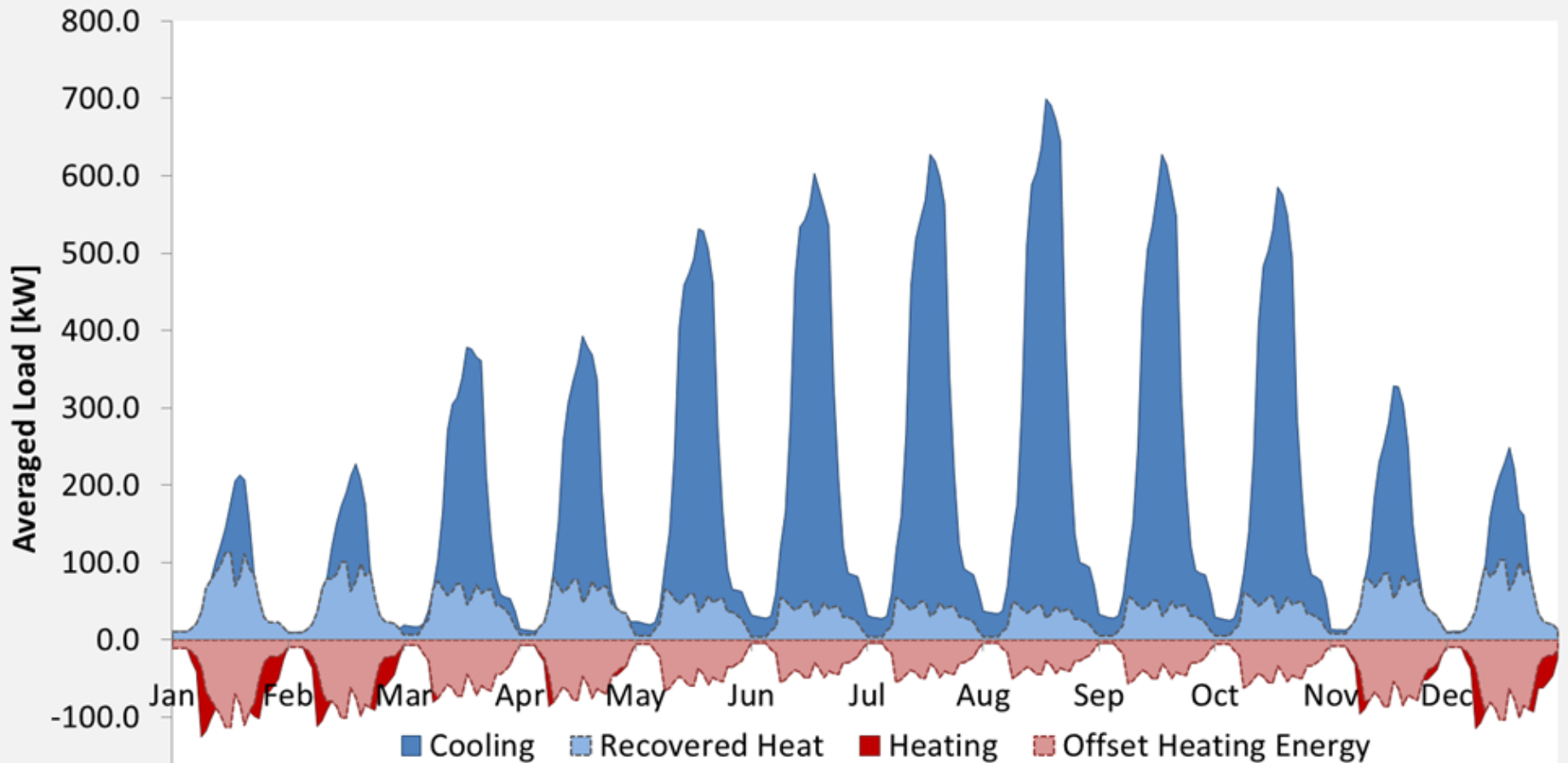
ZNE TECHNICAL POTENTIAL



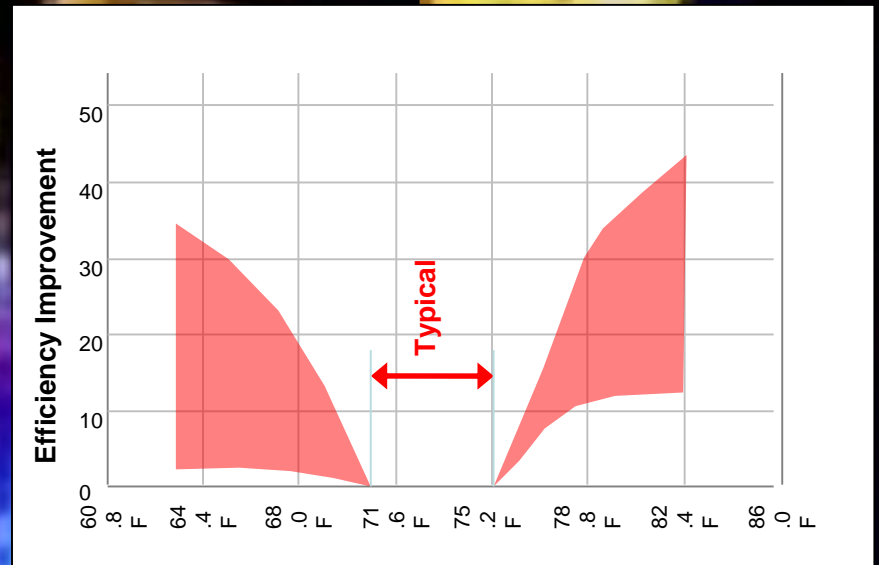
CITY HEAT INTEGRATION

Heat Recovery Potential
Typical Day/Month

ARUP



Personal Comfort Integration



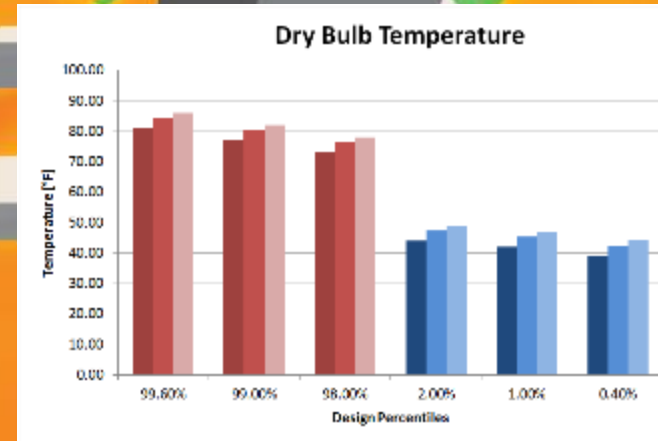
Adapted from: Hoyt, T., H.L. Kwang, H. Zhang, E. Arens, J. Webster, 2009, "Energy savings from extended air temperature setpoints and reductions in room air mixing." *International Conference on Environmental Ergonomics* 2009

Weather *SHIFT*TM

FUTURE CLIMATE INTEGRATION

WHY DESIGN WITH OLD WEATHER DATA?

ARUP

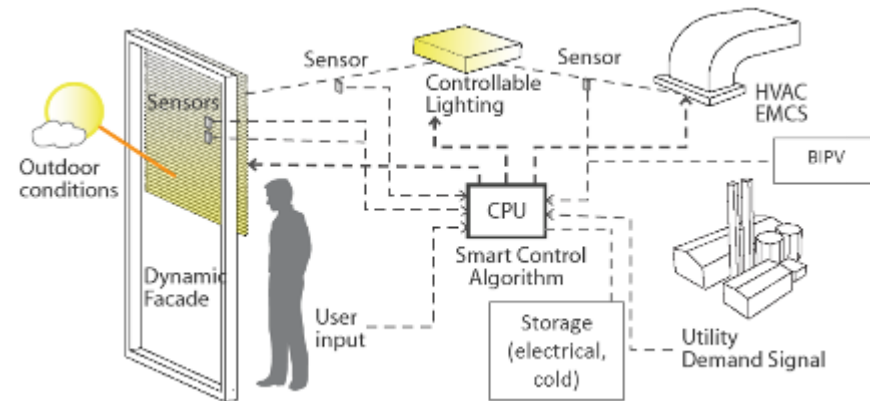


Present → + 9 deg F → Future

Cindy Regnier, Group Leader, Comm'l Bldg. Systems | LBL

CHALLENGES

- Controls Integration within the Building and with Grid
 - Complex, custom, cumbersome
- Siloed industry, disparate proprietary communication protocols stifle innovation and integration
- Integrated system design is complex – requires engineering expertise, design investment (time, \$)
- Market delivery of integrated systems - currently occurs primarily in medium to large commercial with motivated design teams; Very little penetration in small commercial



SOLUTIONS

- Development of IOT technologies and infrastructure to enable successful open interoperable solutions
 - Shading, envelope and lighting focus
 - Encompasses devices, networks, IP connectivity, data integration, applications, services
- Development of packages of integrated technologies for deployment
 - E.g. RTUs coupled with Energy Recovery Ventilators; automated shading coupled with daylight dimming
- Validated technologies, tools and processes for streamlined delivery



Marc Theobald, Program Manager | TRC



Charting the Course to Integrated Solutions

Looking Ahead – Technical Challenges and Solutions

Between 2006 and present, Marc has managed field testing and reporting for ten Emerging Technologies Coordinating Council assessments related to LED lighting and advanced lighting controls, many of which are posted on the ETCC website.

Marc Theobald, TRC
ETCC QUARTERLY MEETING
Wednesday, April 29th

Overview



Technical challenges and solutions:

- UC Davis: Integrated lighting & HVAC control
- ALCS in action: A door to demand response
- Dimming Curves Differ: How much am I saving?
- “Sensors indicate”/ “Ghosts in the Machine”
- Snap Back: Systems overload - too much to manage?



Aniruddha Deodhar
Senior Product Manager, Sustainable Buildings
Autodesk Sustainability Solutions





Sustainability Solutions

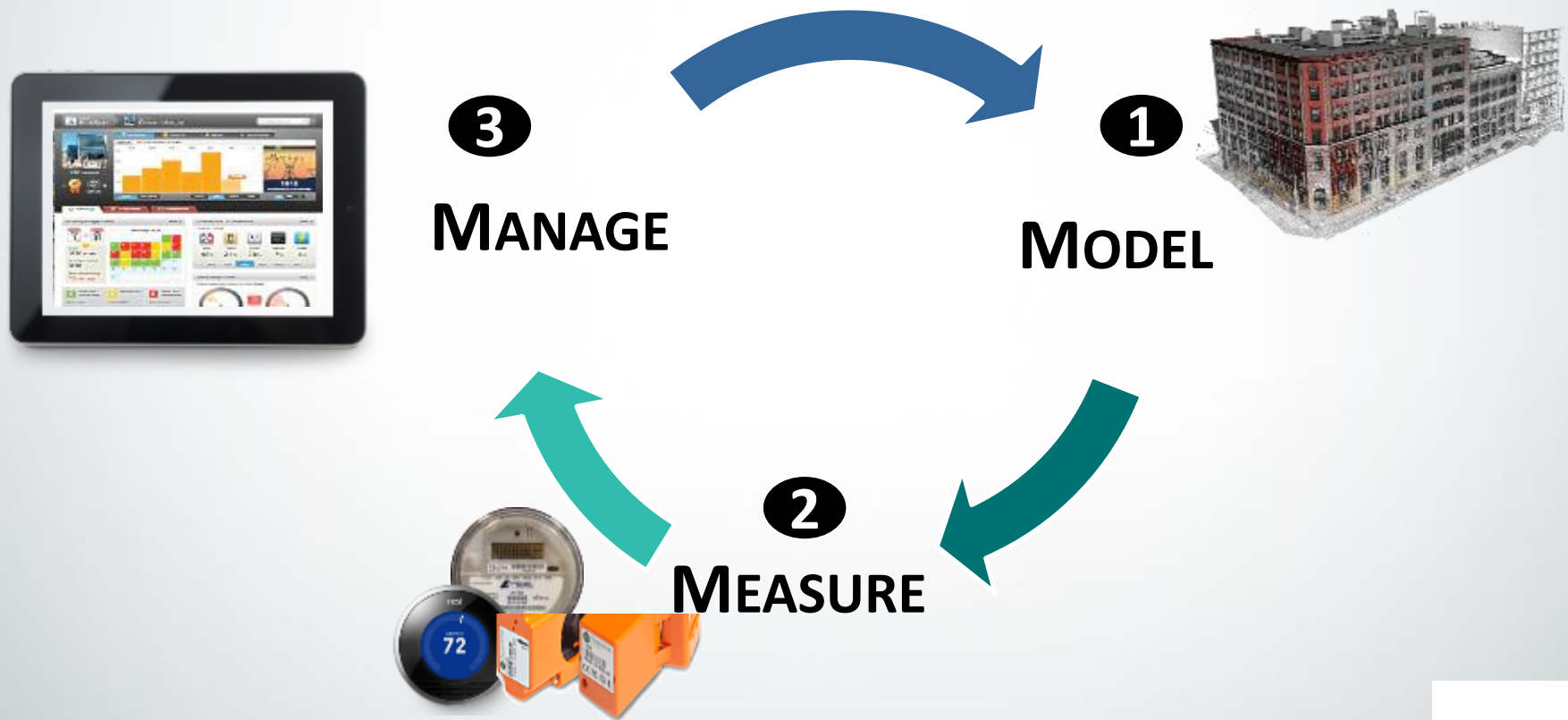
Our Vision: Make sustainability a no-brainer

Our Mission: Uncover recurring benefit from **energy**, **water**, and **materials** stewardship across the asset lifecycle for:



sustainability.autodesk.com

How do you assess a building's true potential?



DISCUSSION / Q&A

SESSION WRAP-UP

PLEASE FILL OUT EVALUATIONS!

UPCOMING ETCC EVENTS

Date	Event	Location & Host
May 7 th	Open Forum (FLoW)	Los Angeles (SDG&E)
August 11 th	Q3 Meeting: Ag / Industrial / Water	Los Angeles (SoCal Gas)
November 4 th	Q4 Meeting: Residential	Sacramento (SMUD, LADWP, CEC)
November 5 th	Open Forum	Sacramento (SMUD)
February 2016	Q1 Meeting: Commercial	San Diego (SDG&E)
Spring 2016	Emerging Technologies Summit	Los Angeles area (SoCal Gas)

To sign up for the ETCC Insight newsletter, check the box on the sign-in / registration sheet or sign up online at: www.etcc-ca.com/subscribe

Check the ETCC website for updates: <http://www.etcc-ca.com/calendar>