Program will start at 10:00 am

ETCC QUARTERLY MEETING: *RESIDENTIAL ENERGY SOLUTIONS*

November 4, 2015
California Energy Commission, Sacramento, CA
HOSTED BY: LADWP and SMUD

Wifi: xxxxx **WIFI code: xxxxx**

Welcome, Safety and ETCC Updates

Mark Fernandes

Emerging Technology Program Manager | Los Angeles Department of Water and Power

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
10:10 AM	**Welcome and Overview of California's Climate Goals and the Importance of Energy Efficiency**
10:25 AM	**Balancing the Load: Residential Plug Loads**
11:40 PM	LUNCH (provided)
12:40 PM	**Existing Residential Buildings: What's Coming Up and Lessons Learned**
1:40 PM	BREAK
1:50 PM	**Path to ZNE: Integration of Distributed Energy Resources and Energy Efficiency**
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…"

Emerging Technologies → **Programs** → **Codes and Standards**

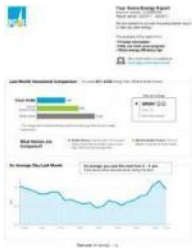
Zero Net Energy

LED Lighting

HVAC

EE Rebates

Home Energy Report

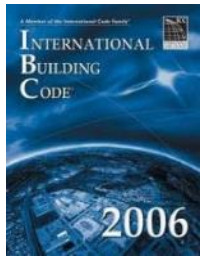


Retail and Manufacturer Strategy

Contractor Training and outreach

Appliance Standards

Building Codes



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
February 17, 2016	Q1 Meeting: Commercial	Los Angeles (SoCalGas)
April 27, 2016	Q2 Meeting: Industrial / Agriculture	Bay Area (PG&E)
Fall 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/events

CHECK OUT THE NEW ETCC WEBSITE!

EMERGING TECHNOLOGIES COORDINATING COUNCIL

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Supporting the advancement and adoption of emerging technologies

Check out the recent Project Reports

- Electrodeless HID in Warehouse Applications
- Commerical Hand Wrap Machines for Food Service Applications Field Test
- Laboratory Testing of Variable Speed Compressor and Fan Controls for RTU Optimization
- Laboratory Testing of Variable Speed Compressor and Fan Controls for RTU Optimization

Join us at an upcoming event

- Quarterly Meeting on Residential Market Segment
- ETCC Open Forum
- Quarterly Meeting: Commercial Sector
- Quarterly Meeting: Industrial/Agricultural Sector

Read the latest news

CEC Funding Opportunity: Sustainable Energy Entrepreneur Development (SEED) Initiative

CEC Announcement: EPIC Request for Information on grant funding opportunities

Don't Miss CEC's Public Workshop on 2012-2014 EPIC Investment Plan February 24th

CEC Announces Grant for Natural Gas Technologies in Industrial Sector - Deadline Jan 20

more news...

Welcome and Overview of California's Climate Goals and the Importance of Energy Efficiency

Laurie ten Hope

Deputy Director, Energy Research & Development Division | California Energy Commission

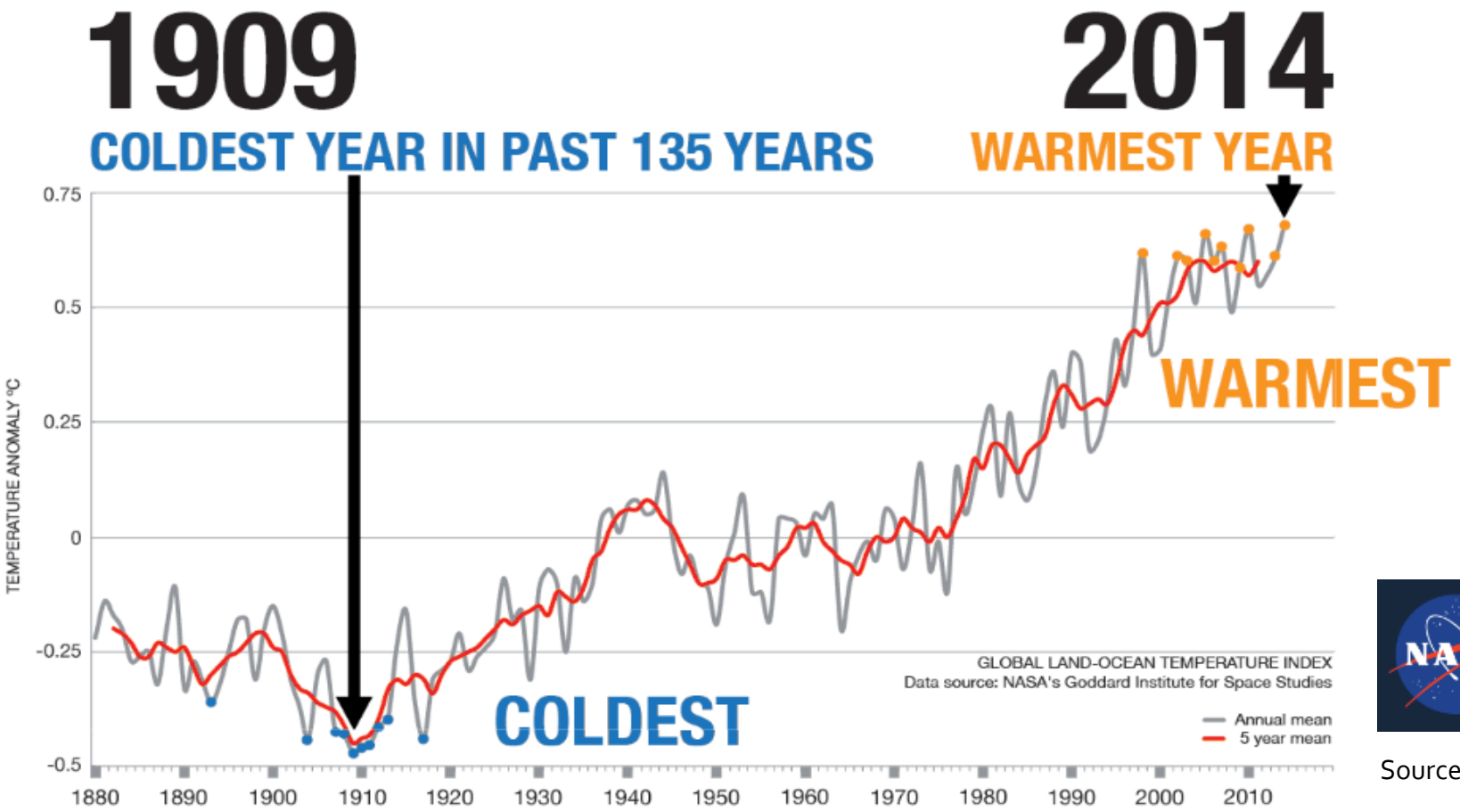
REDUCING THE RISK OF CLIMATE CHANGE WITH ENERGY EFFICIENCY INNOVATION

Laurie ten Hope, Deputy Director
Energy Research and Development

ETCC Q4 Quarterly Meeting
November 4, 2015

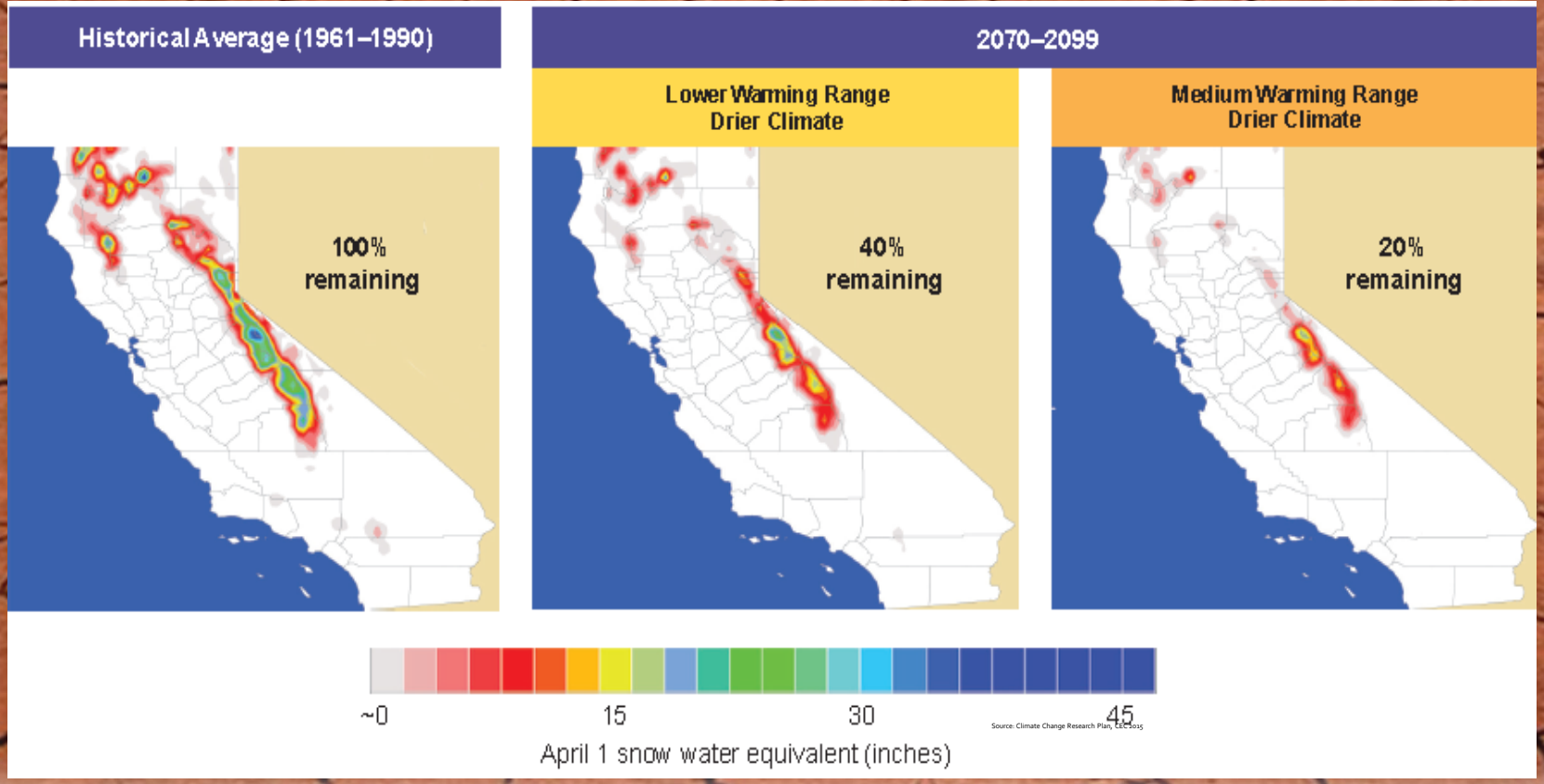

THE PROBLEM
Greenhouse gas induced climate change threatens California in significant ways:
Drought
Wildfire
Sea Level Rise

IPCC: 100% of warming over past 60 years is man-made, most due to CO_2.

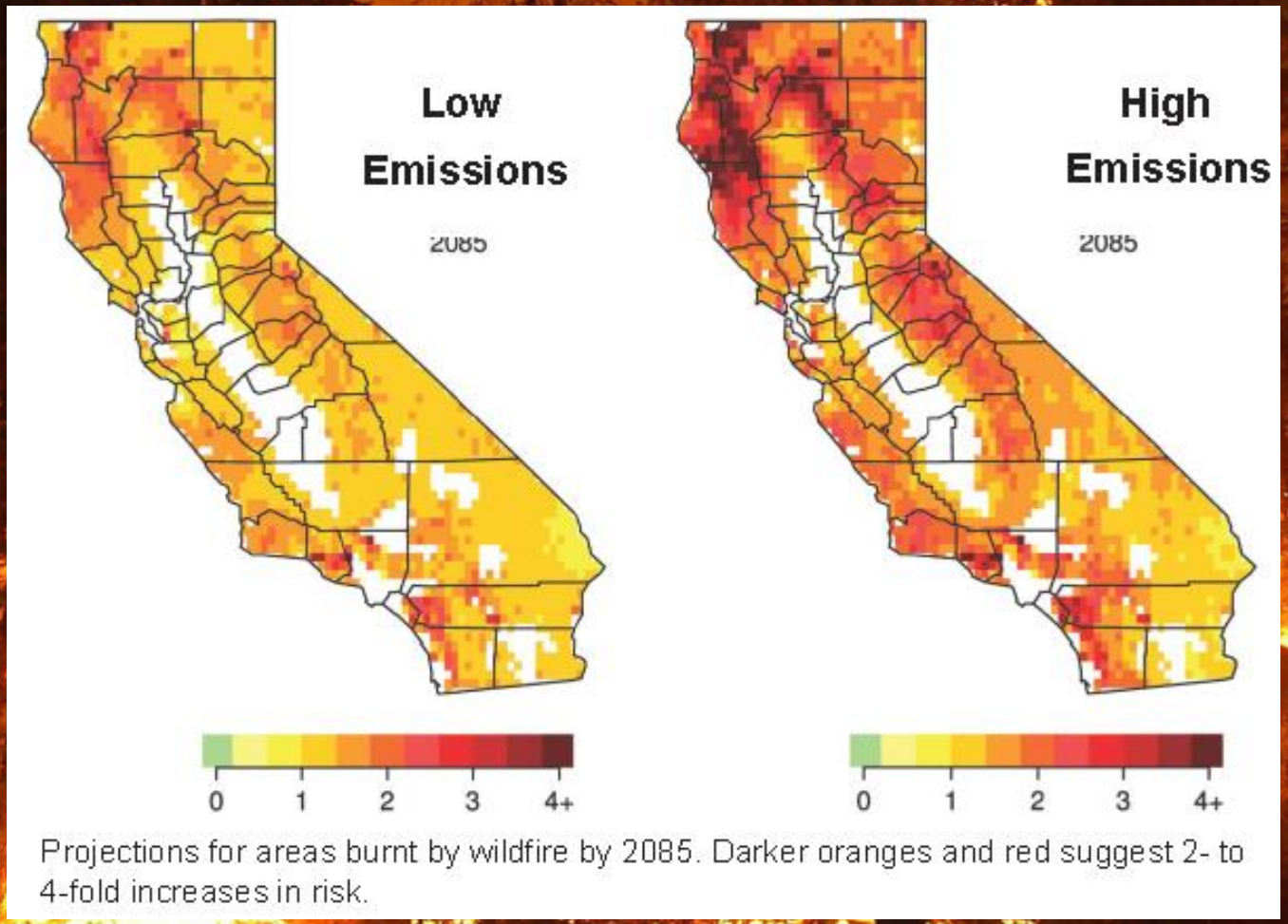


Source: NASA

RISK OF DROUGHT



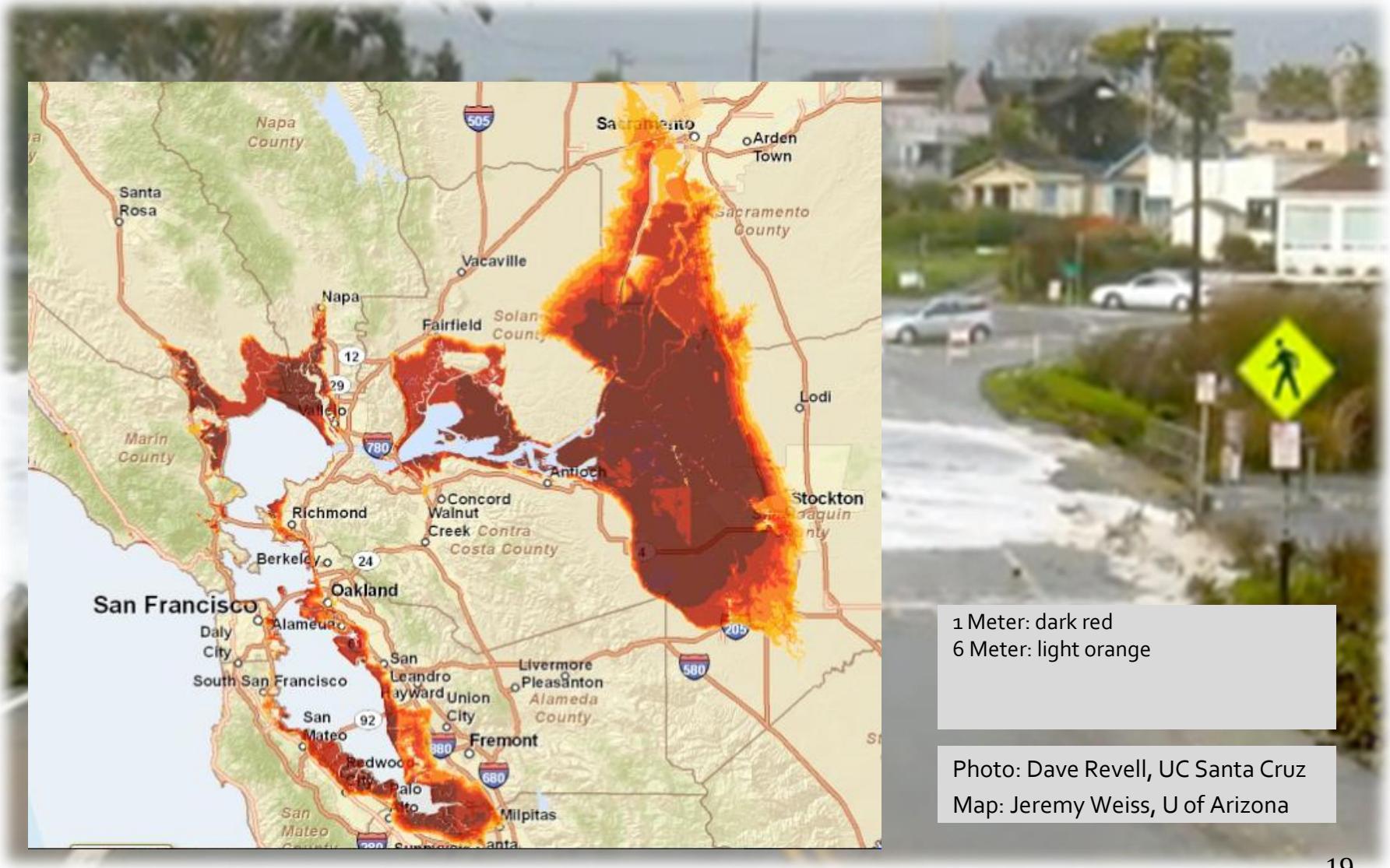
RISK OF INCREASED WILDFIRES



Projections for areas burnt by wildfire by 2085. Darker oranges and red suggest 2- to 4-fold increases in risk.

Source:
Energy Commission Climate Change Research Plan for California, May 2015

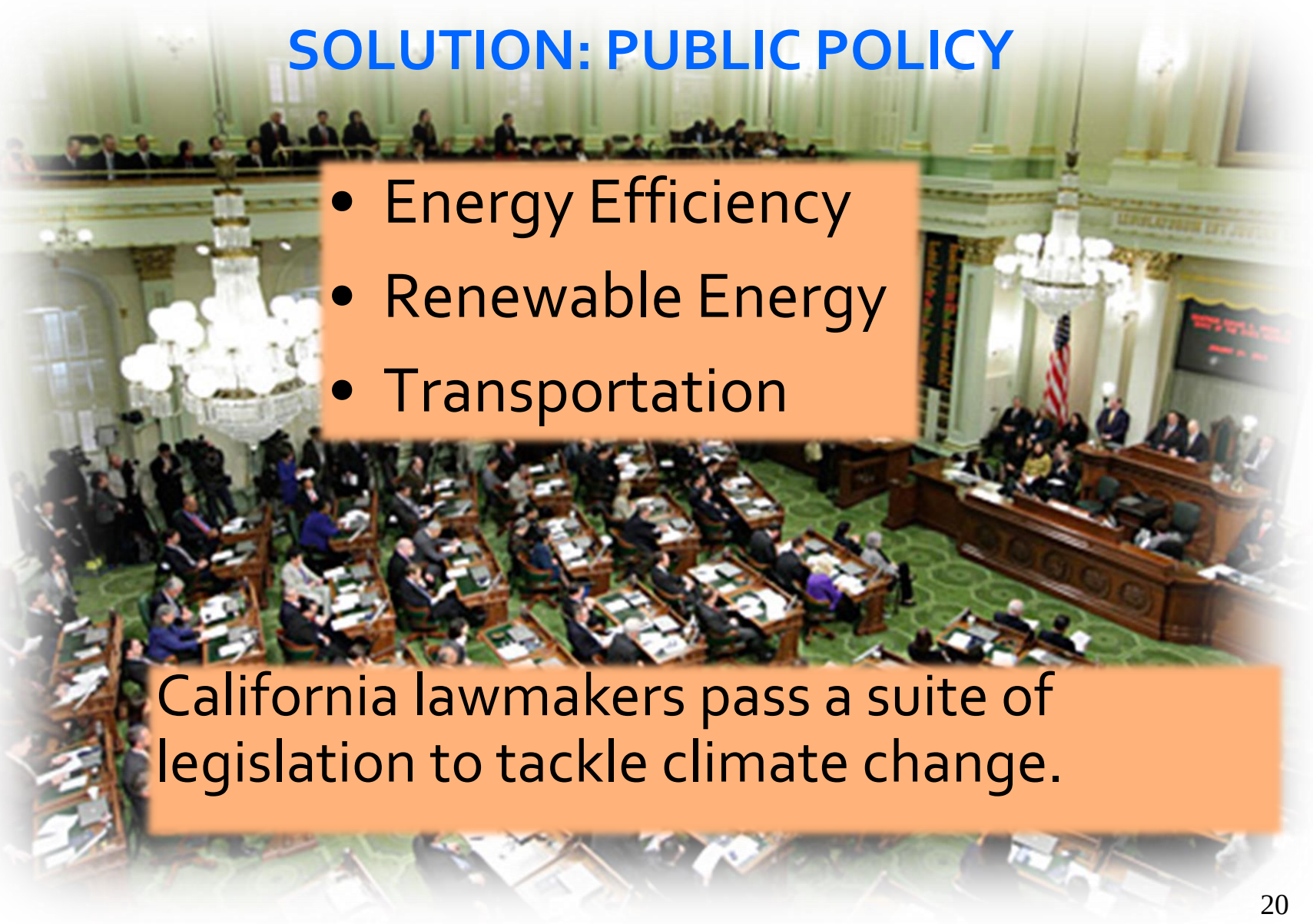
RISK OF RISING SEA LEVELS



1 Meter: dark red
6 Meter: light orange

Photo: Dave Revell, UC Santa Cruz
Map: Jeremy Weiss, U of Arizona

SOLUTION: PUBLIC POLICY



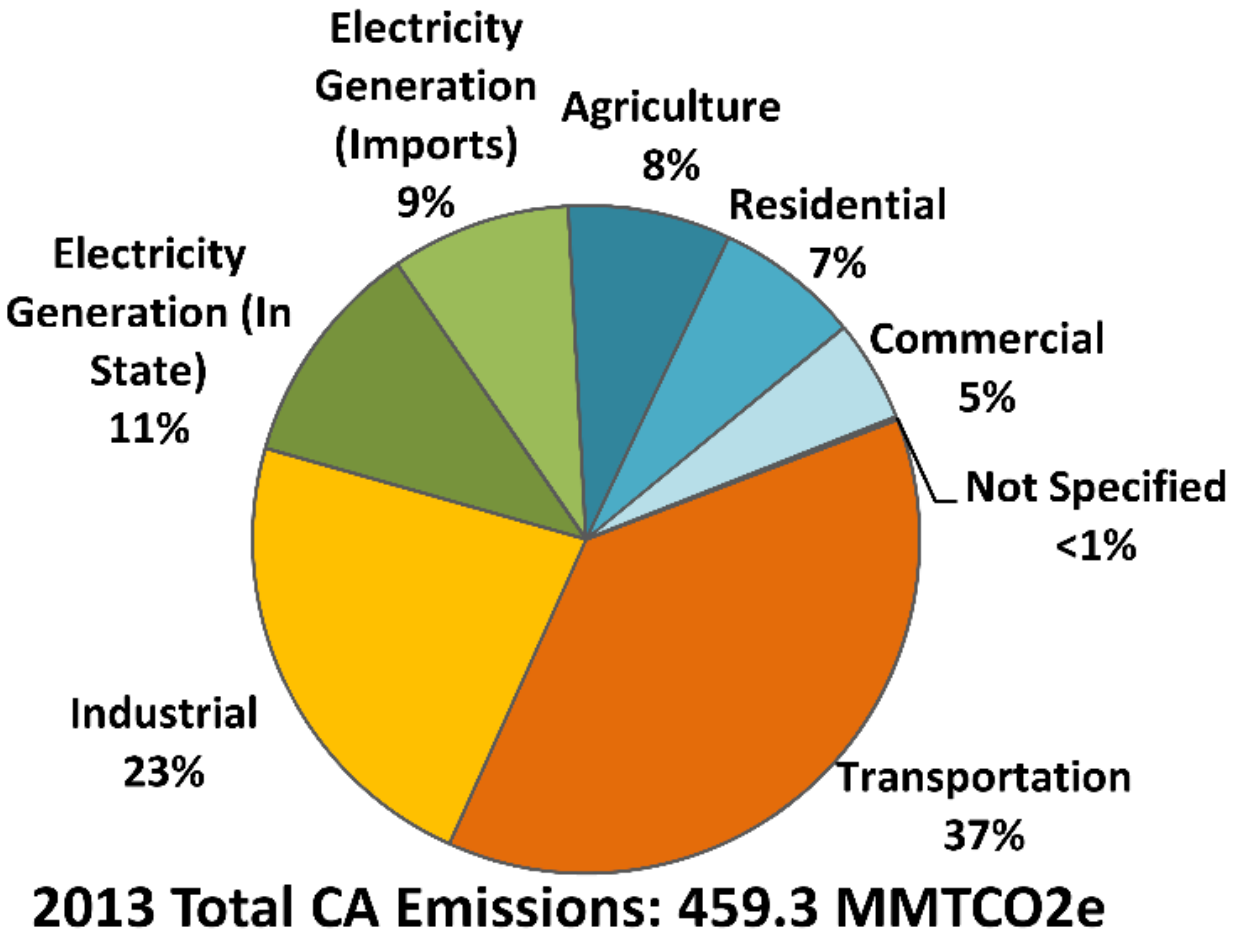
- Energy Efficiency
- Renewable Energy
- Transportation

California lawmakers pass a suite of legislation to tackle climate change.

SOLUTION: POLICY IMPLEMENTATION

- **Administer Energy Research**
  - The Energy Commission administers $127M electric RD&D and $24M natural gas RD&D.
- **Utility Program Development**
  - Utilities administer over $1B in efficiency incentives and $33M for emerging technology validation and demonstrations.
- **Business Development**
  - Energy efficiency entrepreneurs supported through angel and venture capital firms.

BUILDINGS, INDUSTRY, AND AGRICULTURE: OVER 50% OF EMISSIONS



Source:
California Air Resources Board

RESEARCH EXAMPLE 1
CENTRAL VALLEY RESEARCH HOMES

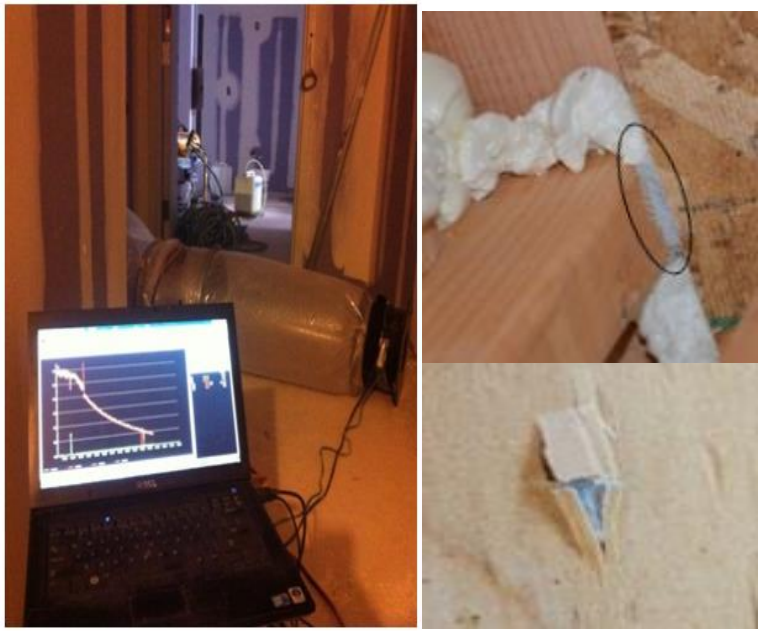
Four varied Stockton, CA homes given strategic retrofits.

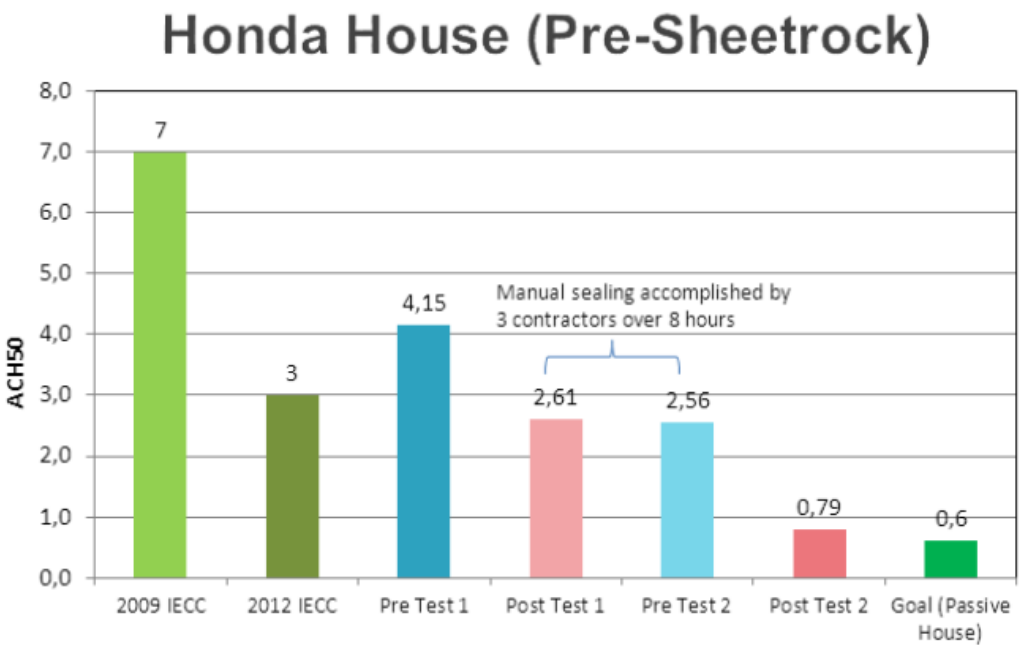



Much more detail in a few minutes!

RESEARCH EXAMPLE 2
AEROSOL SEALING FOR BUILDING SHELLS

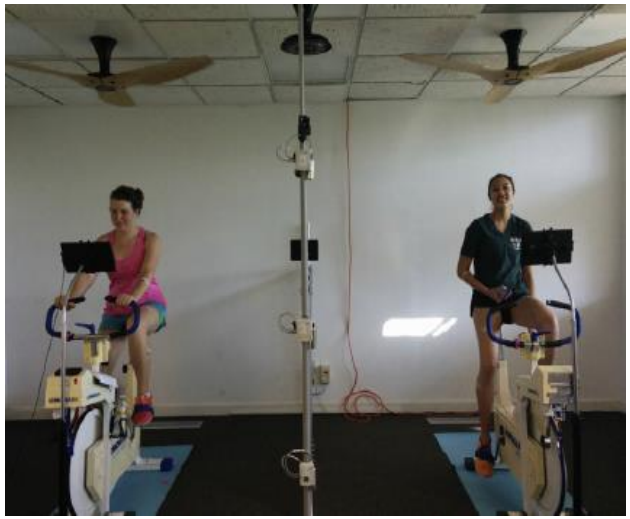
Researchers at UC Davis WCEC invent method to cost-effectively eliminate building infiltration.



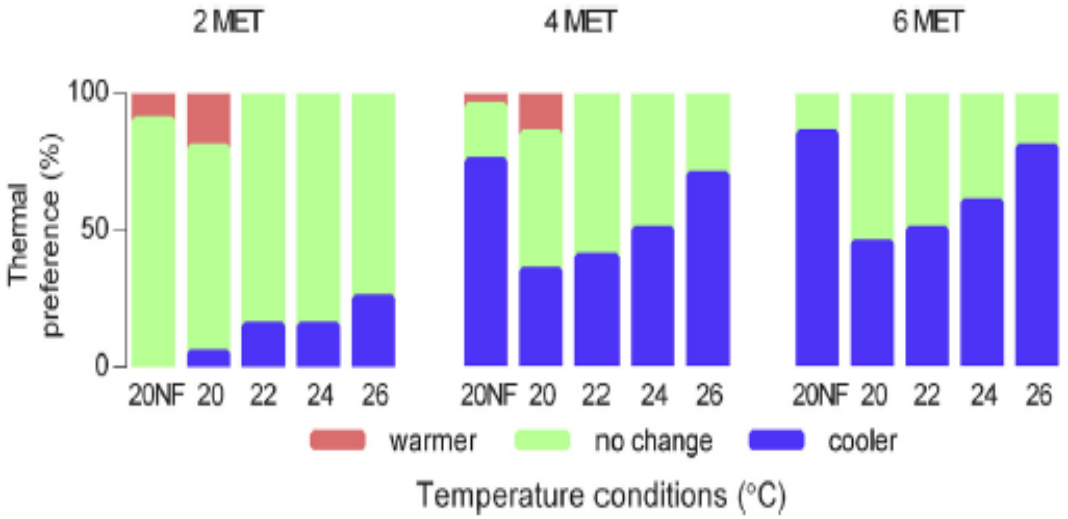


RESEARCH EXAMPLE 3
USER-CONTROLLED FANS BEAT AC FOR COMFORT

UC Berkeley's CBE showed good comfort and air quality with vigorous exercise.



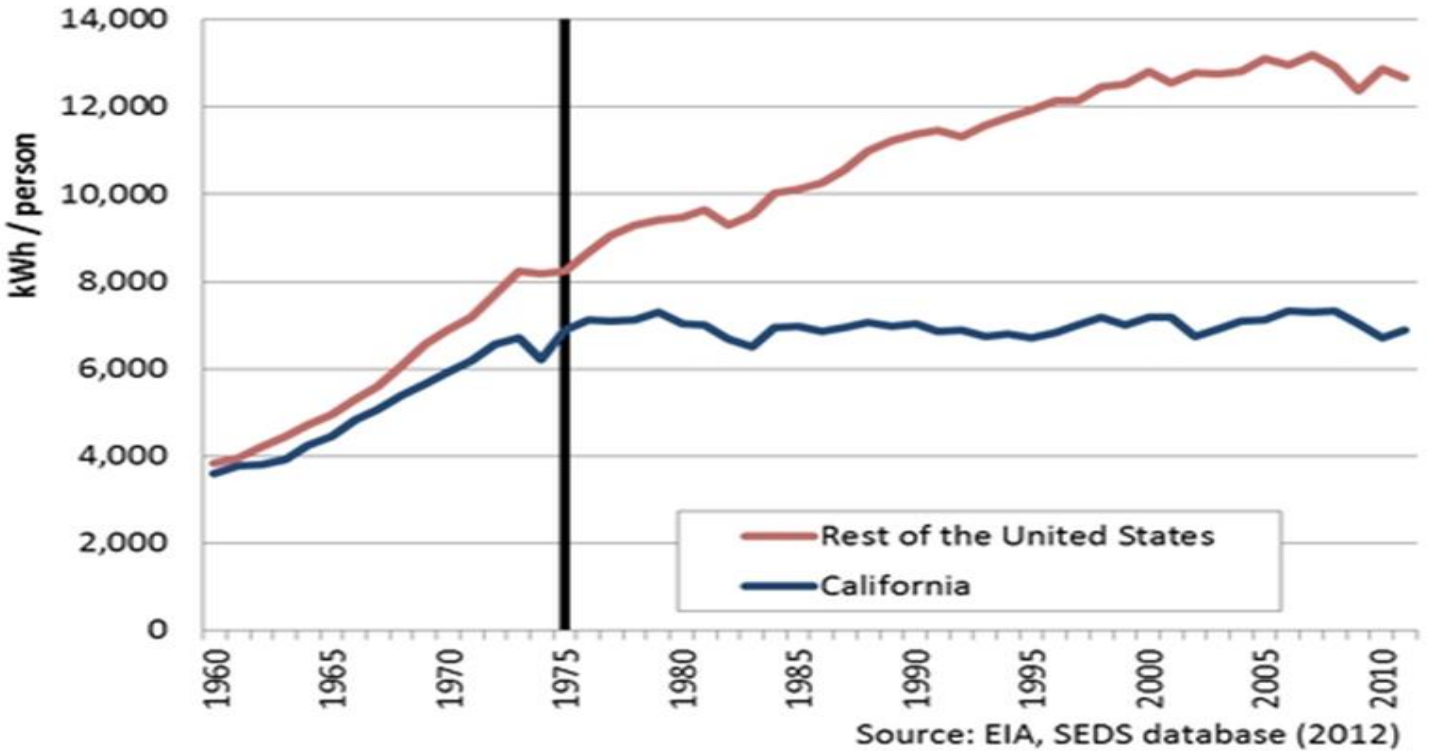
Source: Center for Built Environment, Big Ass Fans, Y. Zhai, et al http://escholarship.org/uc/item/6o18h6wz



Graph shows thermal preference of 20 subjects at 3 metabolic rates, and 4 temperatures. Left most column of each has no fan (NF).

SOLUTION: PUBLIC AND REGULATED UTILITIES

California utility programs spent over $2B to procure 3700 GWh of energy savings 2013-2014, helping to hold California energy use per capita steady. ETCC feeds the pipeline.



SOLUTION: PRIVATE SECTOR

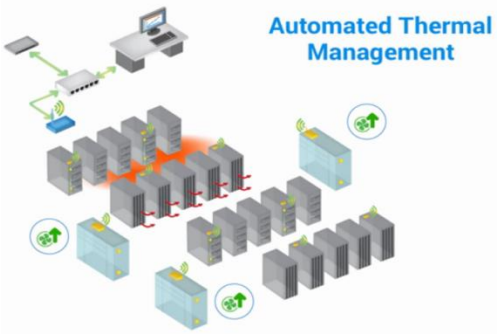
California policy has encouraged and created space for energy entrepreneurs.

TESLA

view | Dynamic Glass

Could it happen anywhere else?

Vigilent®



ADVANCING CALIFORNIA'S ENERGY INNOVATION ECOSYSTEM

- Entrepreneurs face numerous technical and non-technical barriers to bringing new technologies to market.
- New funding opportunities will help establish a coordinated statewide effort for incubating new energy innovations; further advancing the state's energy innovation ecosystem.

SUSTAINABLE ENERGY ENTREPRENEUR DEVELOPMENT (SEED) INITIATIVE

- This solicitation will award up to $33 million to one contractor to develop and manage the SEED Initiative.
- The SEED Initiative will support early-stage energy concepts in two phases:
  - **Series A:** Will provide up to $150,000 and technical consulting to help entrepreneurs establish the technical feasibility of their innovation.
  - **Series B:** Will provide up to $450,000 to the most promising Series A recipients. Series B recipients will be determined through an Annual Business Plan Competition.
- A technical advisory committee (TAC) will help guide the SEED Initiative
  - TAC members will include experts from the Energy Commission, IOUs, Innovation Clusters, Department of Energy, and other entities

REGIONAL ENERGY INNOVATION CLUSTERS

- This solicitation will award up to $5 million ($20 million total) to further advance energy innovation clusters in the following regions:
  - San Francisco Bay Area
  - Central Valley
  - Los Angeles
  - San Diego
- Each Cluster will be responsible for:
  - Leveraging the region's resources, such as innovation incubators, to enhance or expand the services available to entrepreneurs in each region.
  - Connecting energy innovations to region-specific needs.

THANK YOU!

Laurie ten Hope
Laurie.tenhope@energy.ca.gov

ETCC Q4 Quarterly Meeting
November 4, 2015

BALANCING THE LOAD: RESIDENTIAL PLUG LOADS

G.P. Li, Director and Professor, EECS | University of California Irvine – *moderator*

Stephen Palm, Senior Technical Director | Broadcom

Henry Wong, Sr. Staff Technologist | Intel

Matt Smith, Project Manager for Emerging Technologies Energy Efficiency Program | San Diego Gas & Electric

G.P. Li
Director and Professor, EECS |
University of California Irvine

BALANCING THE LOAD:
RESIDENTIAL PLUG LOADS

- **GP Li, Professor & Director of Calit2**

As a professor at the University of California, Irvine, with 3 appointments in the departments of EECS, Chemical Engineering and Materials Science and Biomedical Engineering, GP Li also serves as the division director of Calit2, as well as the director of the California Plug Load Research Center (CalPlug).

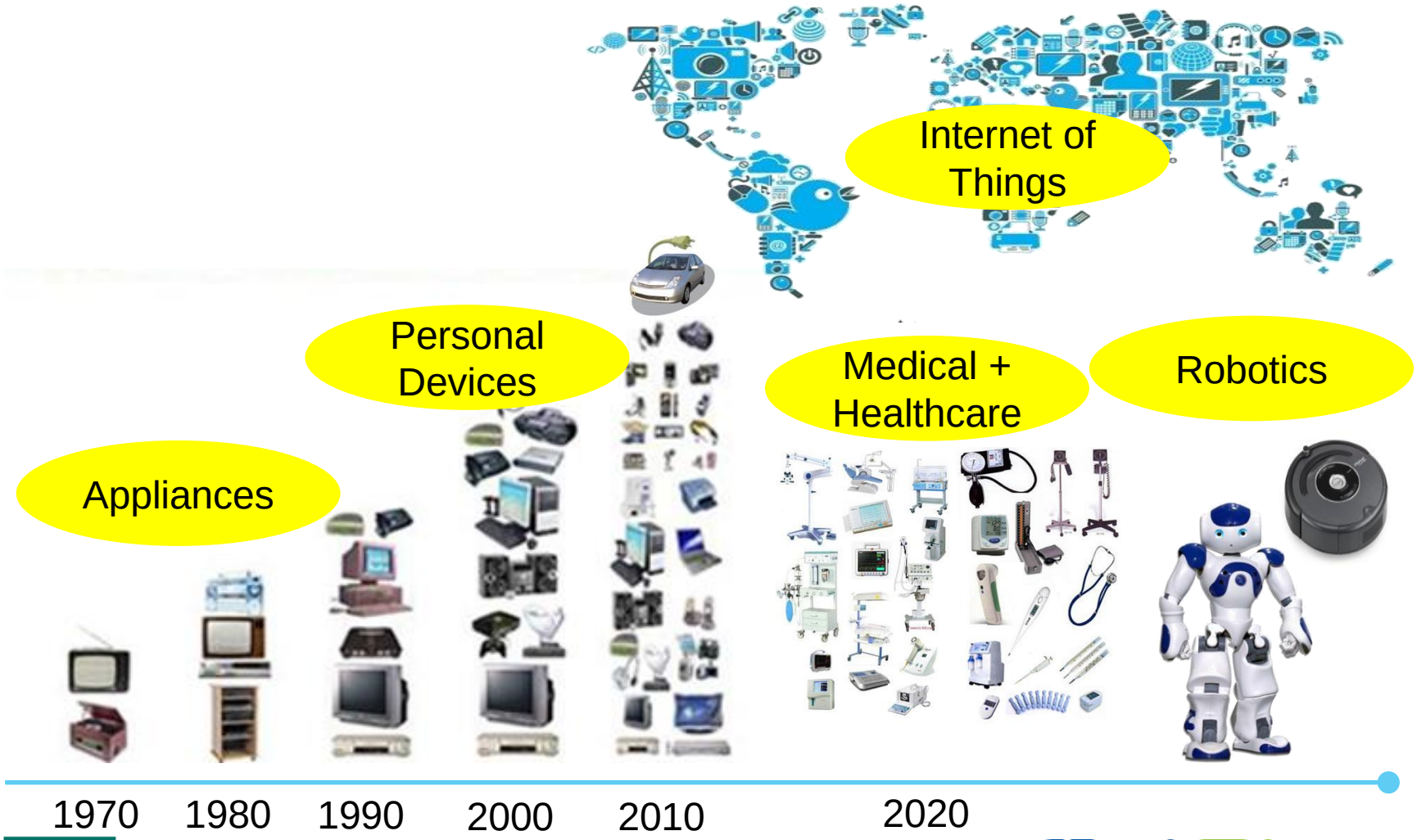
- **CALPLUG (California Plug Load Research Center)**

CalPlug was established to improve energy efficiency, without compromising lifestyles, in the use and design of appliances and consumer electric devices both in residential and commercial environments. To accomplish its mission and goals, **CalPlug conducts research to understand plug loads and human behavior, develops solutions, performs demonstrations and educates the community of stakeholders.** In having a neutral environment for all stakeholders to participate and discuss, **CalPlug fosters and facilitates exchange of information, encourages partnering and promotes collaboration.** Working together as concerned global citizens, we seek to support and advocate for a greener and healthier planet.

ETCC EMERGING TECHNOLOGIES COORDINATING COUNCIL

CalPlug
California Plug Load Research Center

RESIDENTIAL AND COMMERCIAL PLUG LOADS



EMERGING TECHNOLOGIES COORDINATING COUNCIL

CalPlug
California Plug Load Research Center

CHALLENGES AND OPPORTUNITIES

- ✓ When we (people and things) all are connected, is it a "trick or treat" for balancing the loads?
- ✓ What is the vampire power consumption of future connected devices?
- ✓ Growth of connected devices per household – are we heading for a "tele"-lifestyle: AR/VR learning (education and training), tele-streaming channel (entertainment), telecommute (work), telemedicine (health)? Balancing the plug loads vs overall efficiency of society
- ✓ Can today's Internet of plug loads, capable of collecting data from sensors→ information→ actionable intelligence, evolve into tomorrow's cognitive plug loads? Change consumers' habits but not their lifestyles
- ✓ How can we capture opportunities using actionable intelligence generated from IoT to influence unique consumer choice(s) and policy?

Stephen Palm
Senior Technical Director | Broadcom

ABOUT BROADCOM / STEPHEN PALM

A **Global Leader** in Semiconductors for Wired and Wireless Communications

One of the **Largest Volume** Fabless Semiconductor Suppliers

2014 Net Revenue of **$8.43 Billion**

~10,000 Employees Worldwide

99.98% of the world's data traffic passes through at least one Broadcom chip

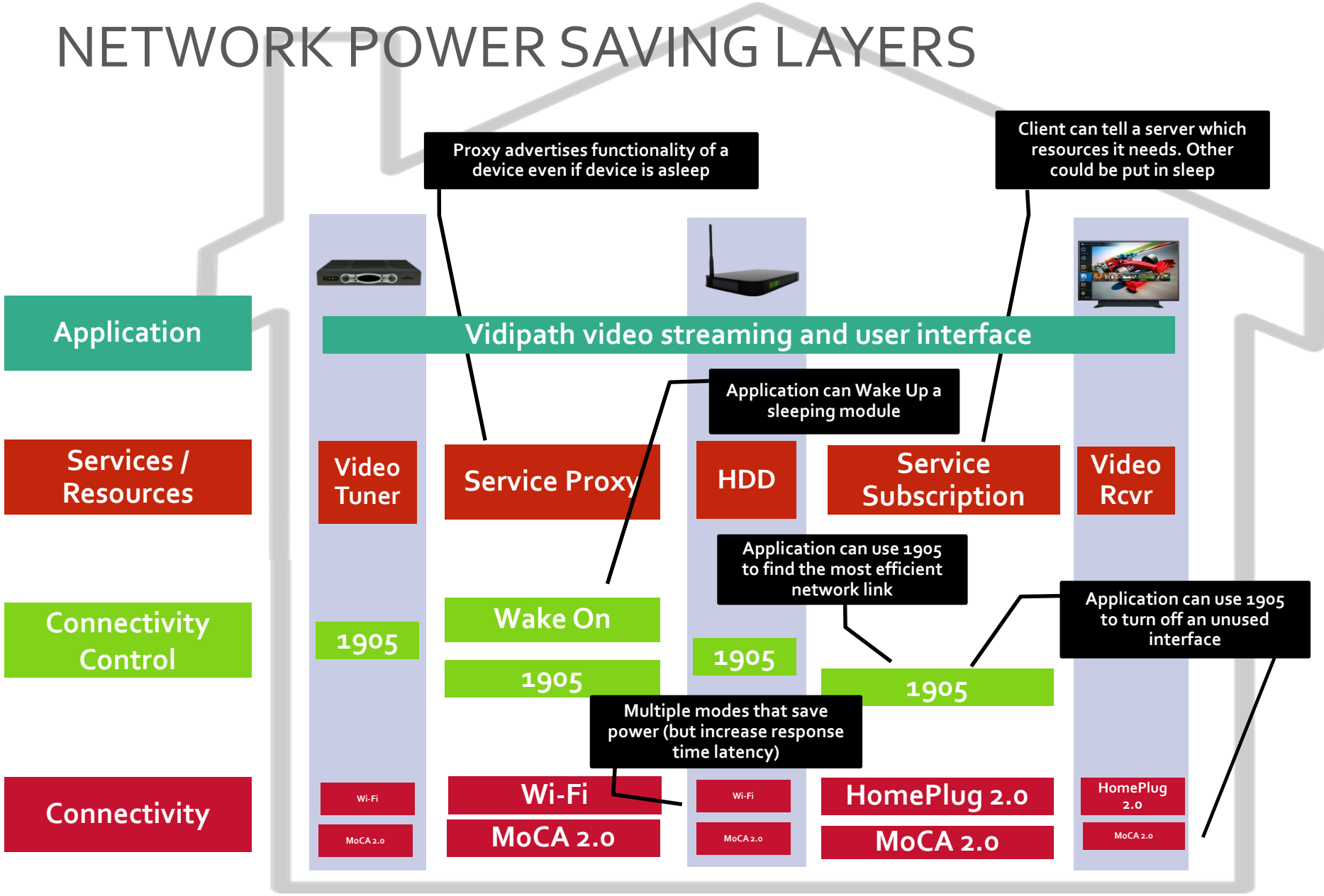
Senior Technical Director,
Broadband and Communications Group

Home Connectivity

Board of Directors in:
WI-FI Alliance, DLNA, MoCA, HomePlug, RVU, CSEP, UPnP

Lead in:
IEEE 1905, DLNA/UPnP Low Power

NETWORK POWER SAVING LAYERS



NETWORK CHALLENGES / OPPORTUNITIES

- Link Connectivity Technology Power states
  - MoCA 2.0, HomePlug AV2.0
- Modular Functionality
  - DLNA/UPnP Low Power Service Subscription
- Methods of waking up interfaces and functions
  - DLNA/UPnP Low Power Wake On
- Discovering devices that are "asleep"
  - DLNA/UPnP Low Power Proxy
- Power optimizing hybrid links
  - IEEE 1905.1

Henry Wong
Sr. Staff Technologist | Intel

INTRODUCTION

Sr. Staff Technologist
Intel Data Center Systems Group
Henry ML Wong is a senior staff technologist at Intel Corporation, enabling and evangelizing energy efficient power and thermal technologies. Mr. Wong is a 30+ year Intel veteran, with over 20 years of industry experience in digital and mixed signal processor development, and systems development including the first mobile Intel® Pentium® Processor (P54LM/P55C), advanced mobile package technologies, and system clocking networks for the Intel® Itanium® and Intel® Xeon® processor platforms. For the past 10 years, Mr. Wong has been leading Intel's support of the enterprise industry energy-efficiency initiatives, technologies, and policies with organizations such as the US EPA, US DOE, Lawrence Berkley National Labs, and The Green Grid. Mr. Wong is a 1984 graduate of Yale University with a degree in semiconductor physics.

Working with industry groups on Data Center and Server Efficiency including…

the green grid™

ISO JTC 1 IEC Information Technology Standards

ITI Information Technology Industry Council Leading Policy for the Innovation Economy

energy ENERGY STAR

Best Practice Green IT Promotion Council

BERKELEY LAB LAWRENCE BERKELEY NATIONAL LABORATORY

DatacenterDynamics Knowledge & Networking

intel Itanium inside

intel Xeon inside

INTELLIGENT EFFICIENCY (IE)

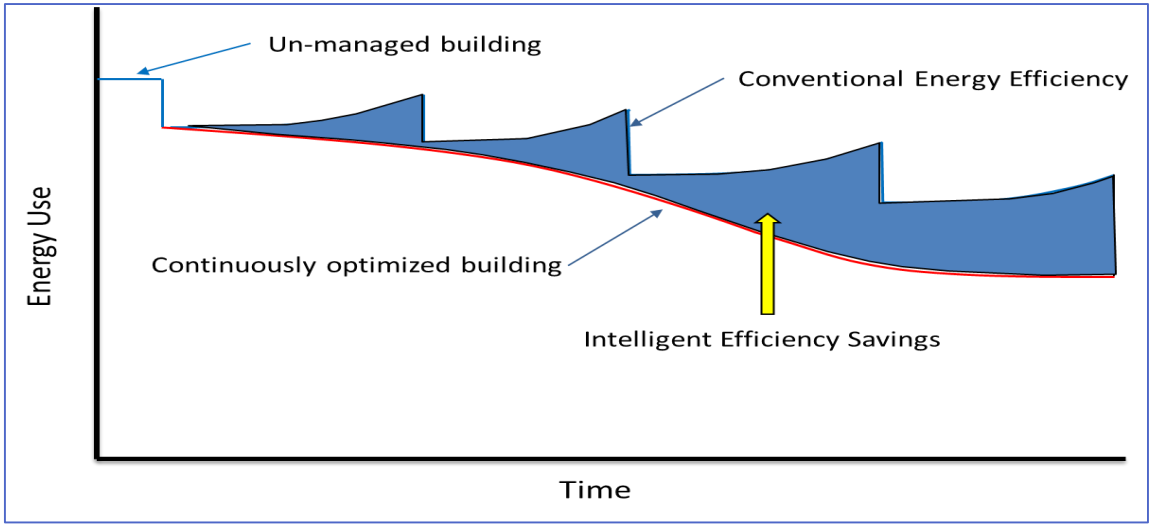
IE is ICT-enabled system-based approach (C2ES, 2015) to energy efficiency that is enabled through the networking of efficient devices and sensors to facilitate more dynamic energy management.

Intelligent efficiency savings:

- ICT: 12% (WWF), 13-22% CO_2 (GeSI)
- Semiconductor-enabled: 27% (ACEEE)
- 2050 energy efficiency: ~60% (ACEEE)

ICT resource use vs. savings:

- CO_2: 1 to 5 (GeSI); kWh: 1 to 10 (ACEEE)



Source: ACEEE

How IE saves energy?

System optimization

- Parts working better as a whole
- The whole working towards the goal

Eliminating the degradation of savings

- Early fault detection
- Continual optimization

Matt Smith
Project Manager for Emerging Technologies Energy Efficiency Program | San Diego Gas & Electric

ETCC EMERGING TECHNOLOGIES COORDINATING COUNCIL

EMERGING TECHNOLOGY PROGRAM INTRODUCTION

- Statewide program for California Investor Owned Utilities
- SDG&E has 4 full-time staff for the Emerging Technology Program and an annual budget of ~$2MM for projects in Energy Efficiency and Demand Response
- The Goal of ETP is to quantify energy savings and cost effectiveness for a technology or an approach
- Ultimate goal is to move the product and/or service into customer programs for rebates or incentives
- If a product is cost effective enough it could benefit from a new program design

WHAT ARE THE OPPORTUNITIES IN RESIDENTIAL?

- Plug Load Monitoring and Controls
  - Tier 2 Advanced Powerstrips
  - Cloud-based Smart Powerstrips
  - Smart Homes
- Whole Home Energy Disaggregation
  - Use high resolution smart meter data (10s) to identify different loads within the home

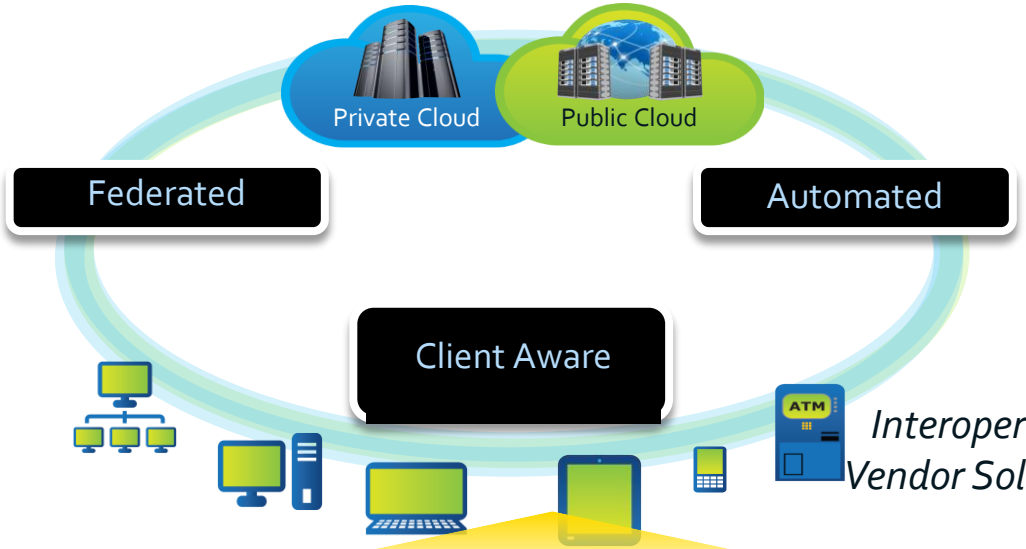
What are the challenges?

- Regulatory Approval
  - Need statistically significant results (smaller kWh savings -> more demo sites)
  - Affecting Changes in Consumer Behavior is hard to prove
  - Need to be cost effective for deployment in utility programs

DISCUSSION / Q&A

BACKUP

2015 & BEYOND: OPEN CLOUD VISION



Open Clouds
Interoperable, Built on Open, Multi-Vendor Solutions & Industry Standards

2015

- Integrated hybrid clouds
- Easy to compare services
- Automated security & resource allocation
- Expanded context awareness

Future

- Services & resources adapt to environment
- Predictive, real-time analytics
- User experience adapts to patterns/behaviors

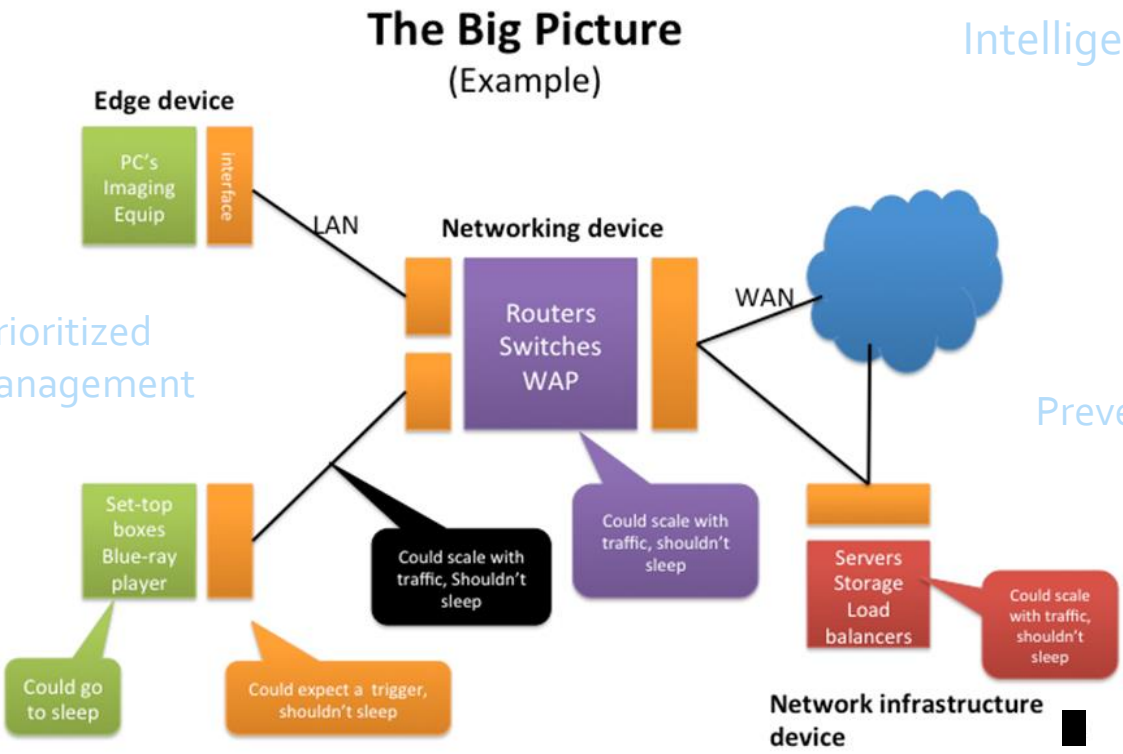
== intelligence & heuristics

EFFICIENCY ACROSS THE NETWORK

Intelligent Efficiency

Network efficiency prioritized over device power management

Prevent bottlenecks



Intelligent Efficiency key to Network wide efficiency gains

LUNCH

Program will resume at 12:40 pm

PLEASE FILL OUT EVALUATIONS!

EXISTING RESIDENTIAL BUILDINGS: WHAT'S COMING UP AND LESSONS LEARNED

Virginia Lew, Office Manager, Energy Efficiency Research Office | California Energy Commission - *moderator*

Abhilasha Wadhwa, Supervisor- Appliances and Existing Buildings Office | California Energy Commission

Martha Brook, P.E., Senior Mechanical Engineer | California Energy Commission

John Proctor, P.E., President | Proctor Engineering Group

Virginia Lew
Office Manager, Energy Efficiency Research Office | California Energy Commission

Abhilasha Wadhwa
Supervisor- Appliances and Existing Buildings Office | California Energy Commission

EMERGING TECHNOLOGIES COORDINATING COMMITTEE

OVERVIEW OF EXISTING BUILDINGS ACTION PLAN, SB 350 AND AB 802

Abhilasha Wadhwa
Existing Buildings Energy Efficiency
abhilasha.wadhwa@energy.ca.gov

November 4, 2015

OUTLINE

California Energy Efficiency Policy Updates

- Existing Buildings Energy Efficiency Action Plan (CEC, 2015)
- SB 350 (De Leon, 2015)
- AB 802 (Williams, 2015)

What it means for existing residential buildings …

EXISTING BUILDINGS ENERGY EFFICIENCY ACTION PLAN

- Current efficiency savings trajectory is insufficient to achieve CA's clean energy and emissions reduction goals

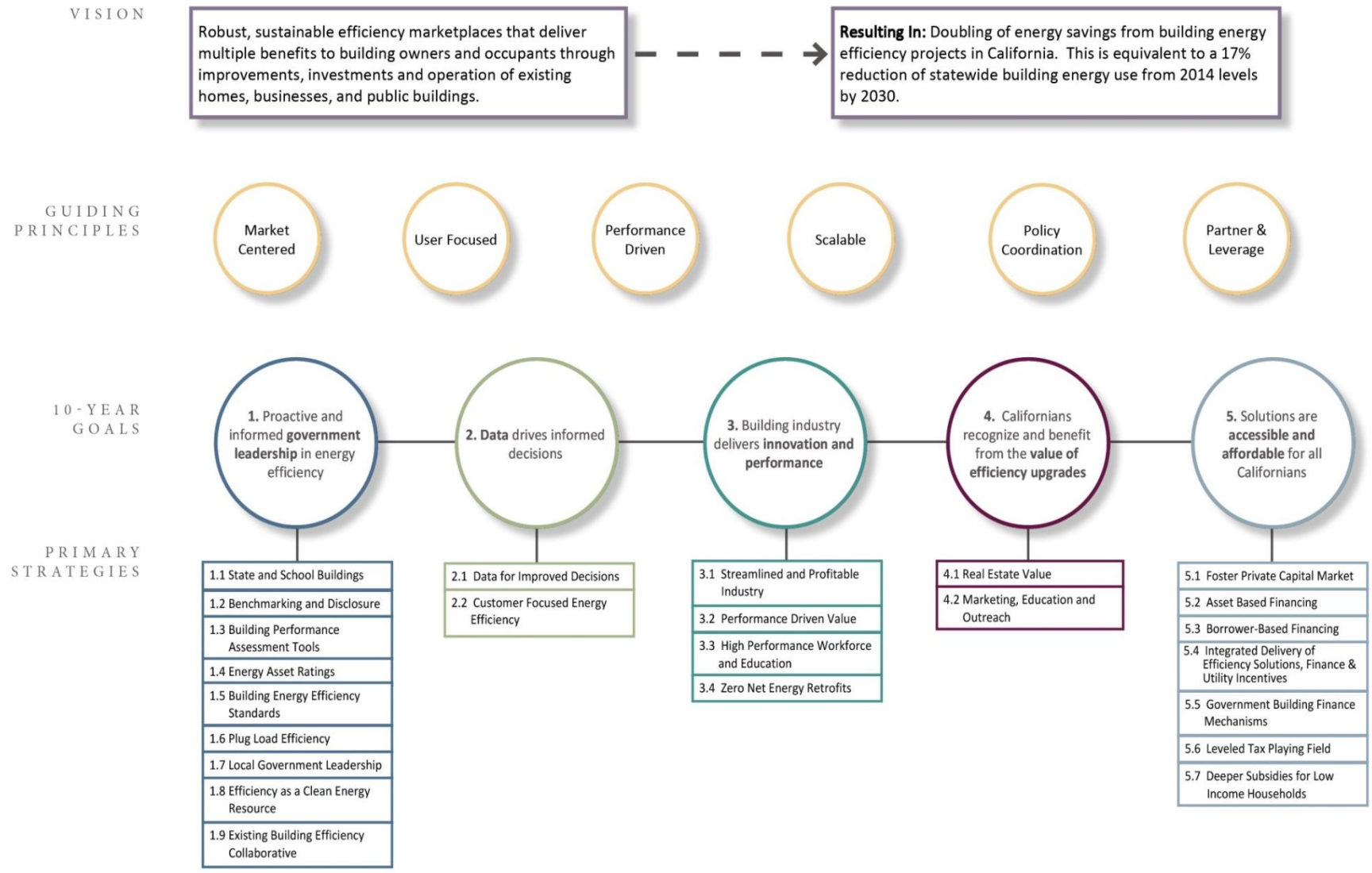
- Unlocking EE potential of existing buildings requires market focused solutions
  - Data analytics to support consumer decisions
  - Research to better predict behavior and pricing impacts
  - Goals are too large for just ratepayer & taxpayer funding
  - Leveraging private capital will be required

EXISTING BUILDINGS ENERGY EFFICIENCY ACTION PLAN

- Plan focuses on foundational efforts to ensure a credible environment for implementation of energy efficiency at scale

- Success = EE consideration and action embedded into all energy decisions

EBEE AP


VISION
Robust, sustainable efficiency marketplaces that deliver multiple benefits to building owners and occupants through improvements, investments and operation of existing homes, businesses, and public buildings.
Resulting In: Doubling of energy savings from building energy efficiency projects in California. This is equivalent to a 17% reduction of statewide building energy use from 2014 levels by 2030.
GUIDING PRINCIPLES
Market Centered
User Focused
Performance Driven
Scalable
Policy Coordination
Partner & Leverage
10-YEAR GOALS
1. Proactive and informed government leadership in energy efficiency
2. Data drives informed decisions
3. Building industry delivers innovation and performance
4. Californians recognize and benefit from the value of efficiency upgrades
5. Solutions are accessible and affordable for all Californians
PRIMARY STRATEGIES
1.1 State and School Buildings
1.2 Benchmarking and Disclosure
1.3 Building Performance Assessment Tools
1.4 Energy Asset Ratings
1.5 Building Energy Efficiency Standards
1.6 Plug Load Efficiency
1.7 Local Government Leadership
1.8 Efficiency as a Clean Energy Resource
1.9 Existing Building Efficiency Collaborative
2.1 Data for Improved Decisions
2.2 Customer Focused Energy Efficiency
3.1 Streamlined and Profitable Industry
3.2 Performance Driven Value
3.3 High Performance Workforce and Education
3.4 Zero Net Energy Retrofits
4.1 Real Estate Value
4.2 Marketing, Education and Outreach
5.1 Foster Private Capital Market
5.2 Asset Based Financing
5.3 Borrower-Based Financing
5.4 Integrated Delivery of Efficiency Solutions, Finance & Utility Incentives
5.5 Government Building Finance Mechanisms
5.6 Leveled Tax Playing Field
5.7 Deeper Subsidies for Low Income Households

SENATE BILL 350 (DE LEON, 2015)

- On or before November 1, 2017:
  - CEC, with CPUC and POUs, will establish efficiency and demand reduction goals to achieve x2 efficiency savings in *electricity and natural gas end uses of retail customers* by 2030
  - CEC (for POUs) & CPUC (for IOUs) will set annual savings targets to meet 2030 goals
- Existing and new activities may be used to meet targets
  - SB 350 includes retrocommissioning as an example

SENATE BILL 350 (DE LEON, 2015)

- Energy efficiency savings shall be measured at the meter (where *feasible and cost effective*)
- Starting in 2019, CEC will report progress toward 2030 goal in the Integrated Energy Policy Report
  - Statewide savings achievements must be reported
  - Recommendations for course corrections to achieve goals must be included

ASSEMBLY BILL 802 (WILLIAMS, 2015)

- Two new sections of state law:
  1. Energy data access for Commercial and **Multi-family** building owners; Public disclosure for certain buildings
  2. New mandate for CPUC to use existing conditions baselines in utility incentive programs

ASSEMBLY BILL 802 - BENCHMARKING

- Defines *covered buildings* for the purposes of tenant meter data aggregation and delivery to building owners:
  - Any building with no residential utility accounts, OR
  - Any building with five or more utility accounts, residential or nonresidential
- Adds new time-certain commercial and multifamily benchmarking program with public disclosure

ASSEMBLY BILL 802 - BENCHMARKING

- On and after January 1, 2016:
  - Utilities shall maintain energy usage data of *all buildings* they provide service to
- On or before January 1, 2017:
  - Utilities shall, upon request, provide building energy use data to *covered* building owners (or their agents, or to ESPM)
  - Utilities shall, WITHOUT tenant consent, aggregate utility account data for *covered* buildings if account number is 3 or higher

ASSEMBLY BILL 802 – EXISTING CONDITION BASELINES

- By January 1, 2016:
  - IOUs shall use existing condition baselines for *high opportunity projects or programs*
- By September 1, 2016:
  - CPUC shall authorize IOUs to implement efficiency programs based on existing condition baselines
  - Meter-based savings must be *considered*

RELEVANCE OF CA POLICIES TO THE RESIDENTIAL SECTOR

- Emphasis on meter-based savings approaches (as opposed to ex-ante)
- Emphasis on disadvantaged communities
- Signals development of reliable savings measurement tools for increasing private EE investment (applicable to both multifamily and single family)
- Signals development of ‘to-code’ pilots for older, inefficient residential stock

Martha Brook, P.E., Senior Mechanical Engineer | California Energy Commission

EMERGING TECHNOLOGIES COORDINATING COMMITTEE

RESIDENTIAL REAL ESTATE PROPERTY VALUATION

Martha Brook, P.E.
Existing Buildings Energy Efficiency
mbrook@energy.ca.gov

November 4, 2015

John Proctor, P.E., President | Proctor Engineering Group

CENTRAL VALLEY RESEARCH HOMES PROJECT (CVRH)

A 3 YEAR RESEARCH PROJECT OF THE CEC

PRESENTED BY: JOHN PROCTOR, PROCTOR ENGINEERING GROUP, LTD

BRUCE WILCOX, P.E.
JOHN PROCTOR, P.E.
RICK CHITWOOD

November 4, 2015

Bruce Wilcox, P. E.
Berkeley, CA
bwilcox@lmi.net

For: Energy Research and Development Division's Building End-Use Energy Efficiency Program, Contract number 500-10-014

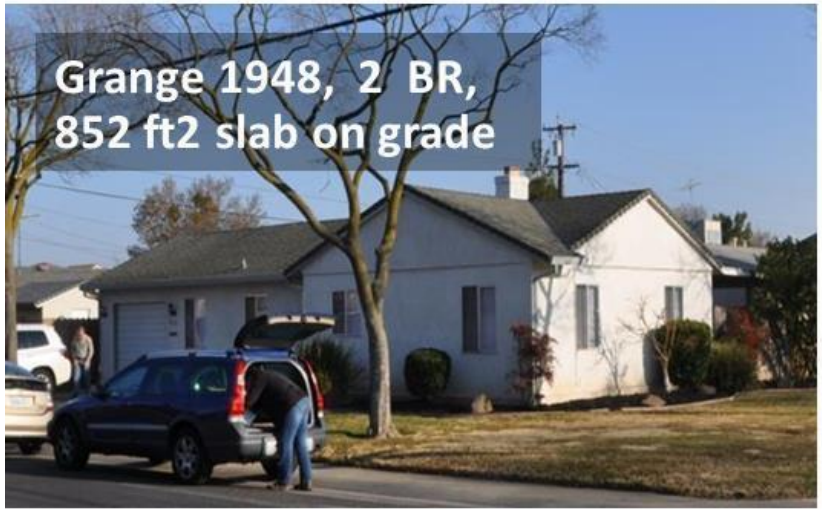
THERE ARE GOLD MINES THAT HAVE NOT BEEN TOUCHED

- California New Residential Construction progressing toward Zero Net Energy by 2020, but with smaller and smaller impact on total emissions
- **3.17 Million existing homes in 17 Central Valley counties offer huge savings potential**
  - **2.8 Million need Whole House Fans**
  - **2.5 Million need Hot Dry Air Conditioners**
  - **970 Thousand need Wall Insulation**
  - **410 Thousand need Attic Insulation**
  - **1.5 Million need Energy Efficient Windows**
  - **1.6 Million need their HVAC Ducts reconfigured**

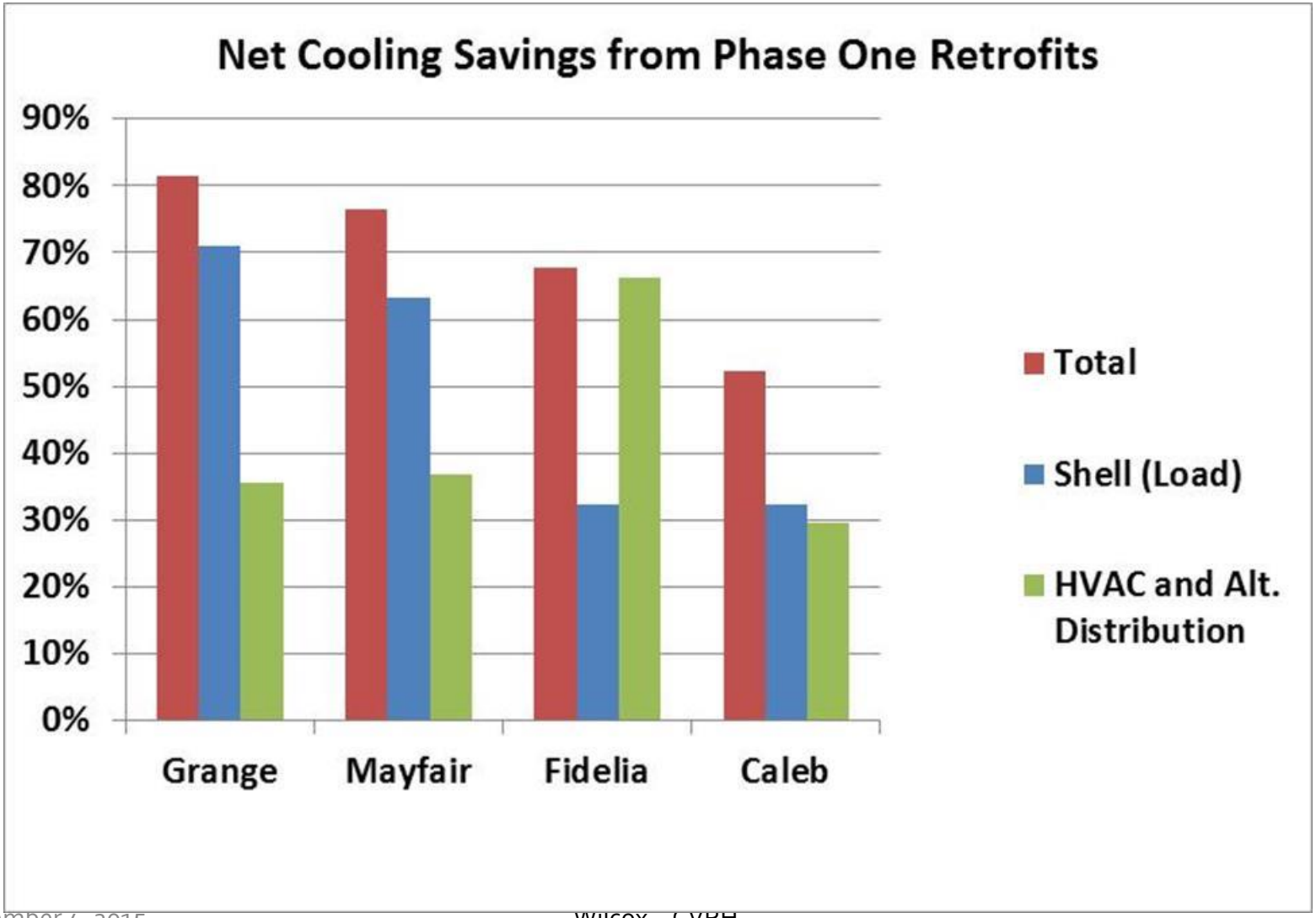
THESE OPPORTUNITIES EXIST BECAUSE THE CURRENT MARKET BASED APPROACH TO ENERGY EFFICIENCY PROGRAMS DO NOT IMPACT INDIVIDUALS WHO OWN THESE HOMES.

ASSET RATINGS ON THESE HOMES DO NOT NEED EXTENSIVE DATA OR A SIMULATION. THEY CAN SIMPLY BE A PRIORITIZED CHECKLIST.

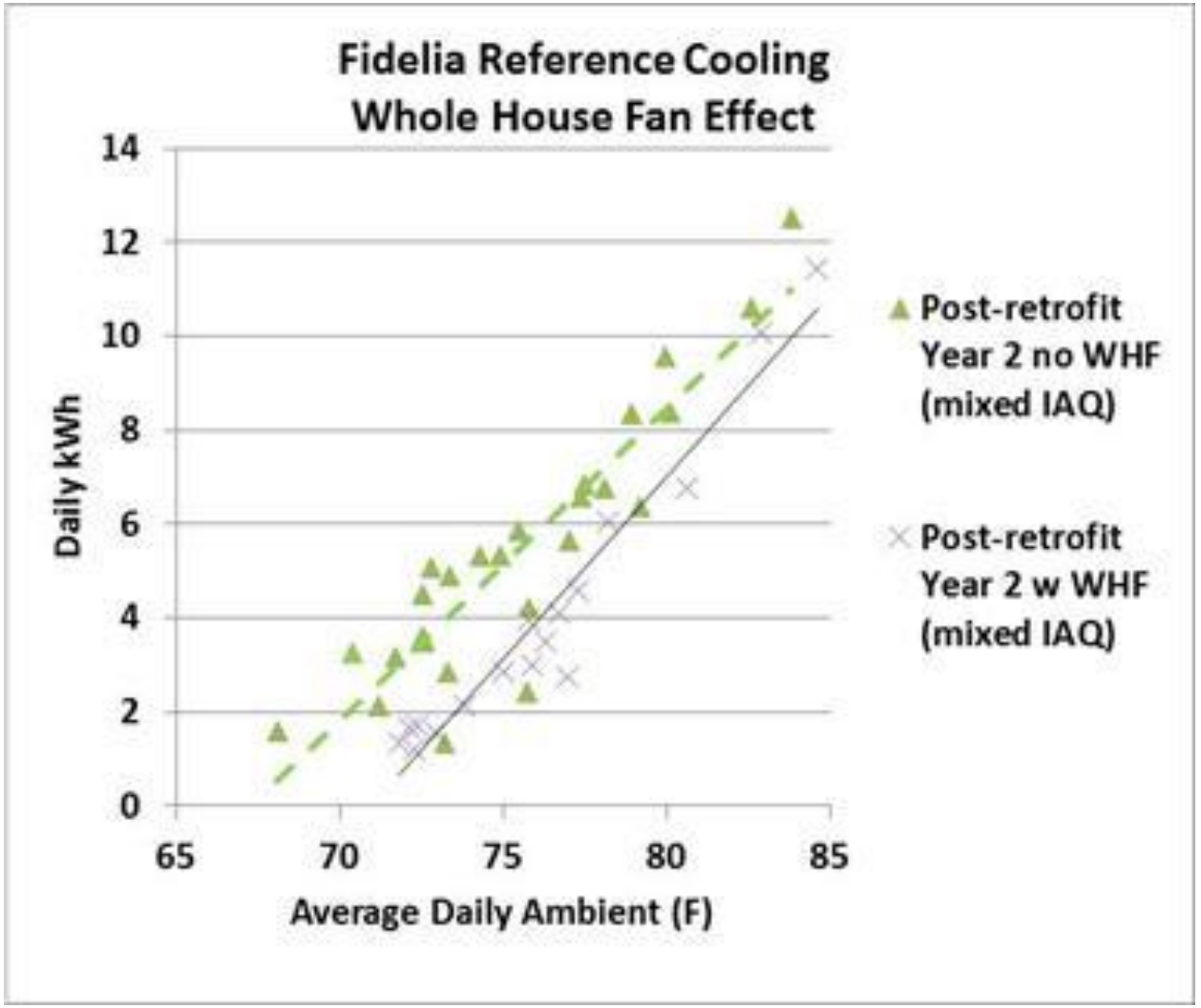
CVRH DETERMINED THE MEASURED SAVINGS IN FOUR VINTAGE HOMES



COOLING GOAL 50% TO 75% ENERGY SAVINGS WITHOUT "EXOTICS"



WHOLE HOUSE FAN



HOT DRY AC (CLIMATE APPROPRIATE) SYSTEM

Designed to take advantage of our Dry Climate

- Minimize dehumidification
- 500 to 600 CFM per ton using:
  - Shorter, Smaller Ducts
  - Air supply terminals near the center of the house
  - Reduced AC Tonnage by 40 to 57%
- Low surface area Ducts buried in attic insulation (R-30 or better)

HOT DRY AC (CLIMATE APPROPRIATE) SYSTEMS ARE NOT

A SEER 16 EER 13 Air Conditioner

They are

- Designed and installed to minimize dehumidification by using:
  - Low flow resistance coils
  - Shorter, Smaller Ducts
  - Air supply terminals near the center of the house
  - Reduced AC Tonnage with low surface area Ducts buried in attic insulation (R-30 or better)

ATTIC & WALL INSULATION

DUCT RECONFIGURATION

Multiple Ceiling Levels and Leaks from Interior Walls to Attic

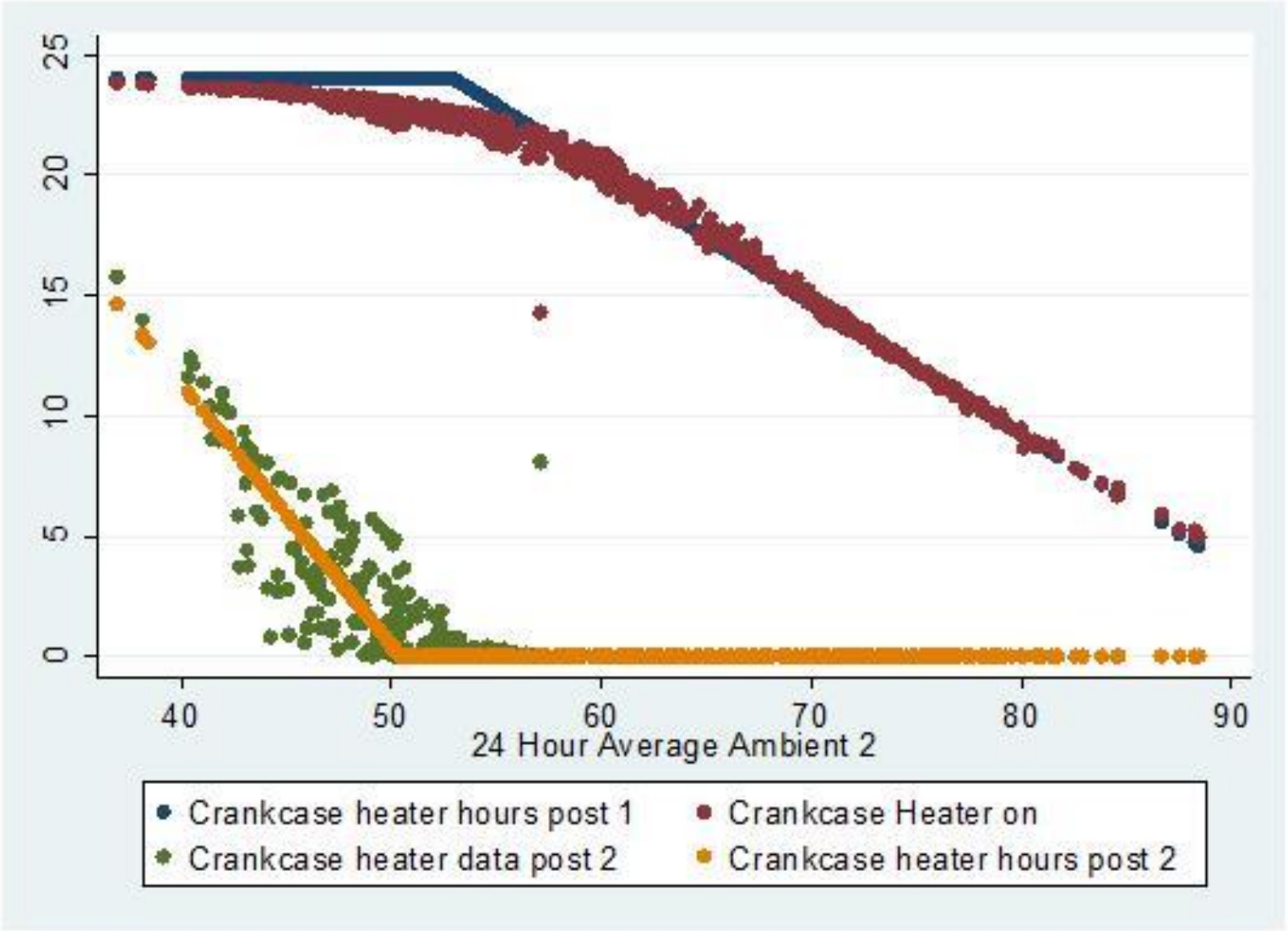
Original Ducted Upstairs Return into Chaseway to Lower Level

DUCT RECONFIGURATION & AIR SEALING

DUCT RECONFIGURATION & BURIED DUCTS

WINDOWS,
AIR SEALING & ATTIC INSULATION

CRANKCASE HEATER LOCKOUT



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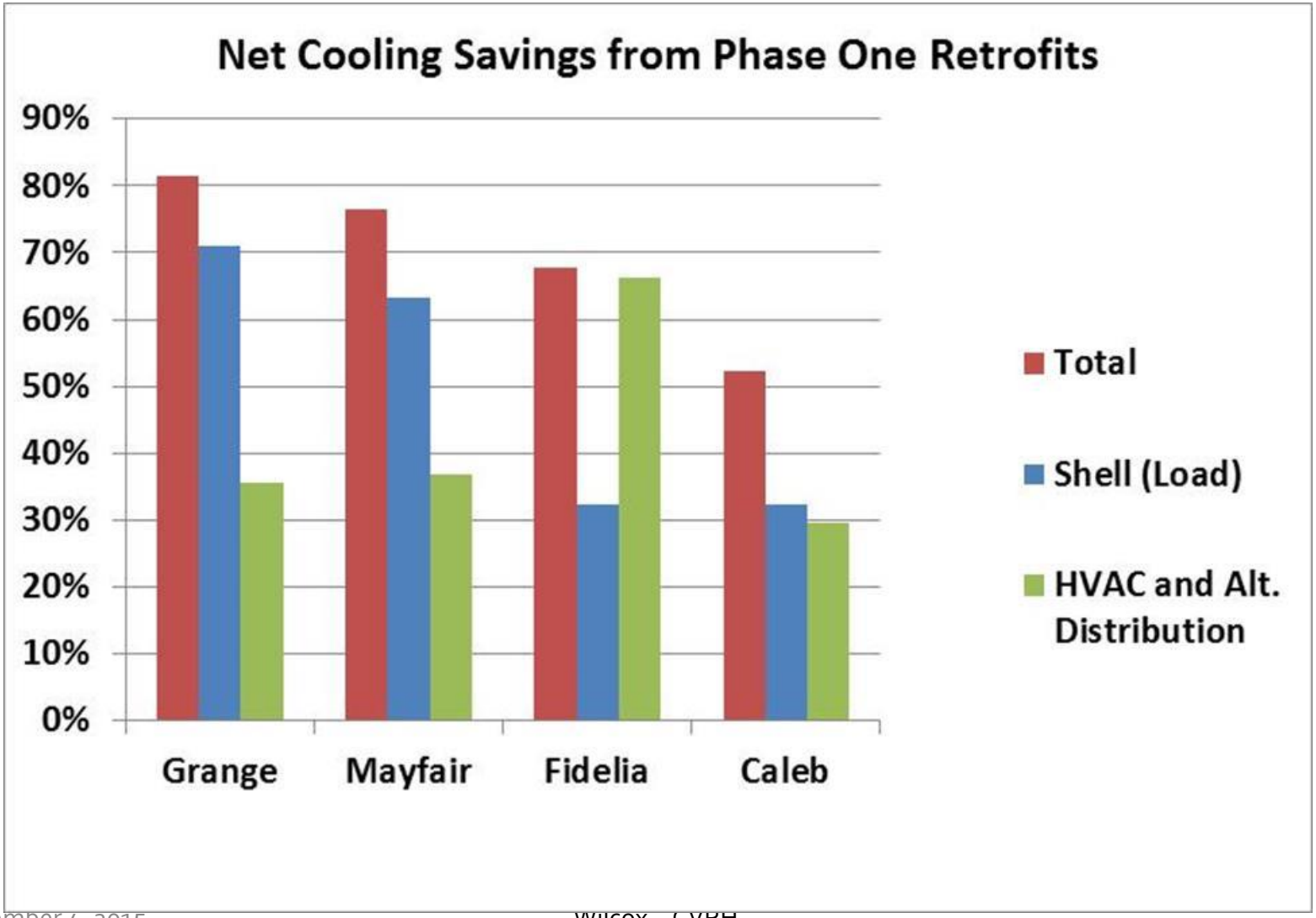

BIG OPPORTUNITIES IN THESE AREAS

3.17 MILLION EXISTING HOMES IN 17 CENTRAL VALLEY COUNTIES OFFER HUGE SAVINGS POTENTIAL

- **2.8 Million need Whole House Fans**
- **2.5 Million need Hot Dry Air Conditioners**
- **970 Thousand need Wall Insulation**
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THANK YOU

- There is more information from this study – Much more

DISCUSSION / Q&A

BREAK

Program will resume at 1:50 pm

PLEASE FILL OUT EVALUATIONS!

PATH TO ZNE: INTEGRATION OF DISTRIBUTED ENERGY RESOURCES AND ENERGY EFFICIENCY

Jonathan Livingston, President | Livingston Energy Innovations - *moderator*

Jon Fortune, Director, Regulatory & Energy Services | Sunverge

Neha Arora, Engineer / Project Manager | SCE

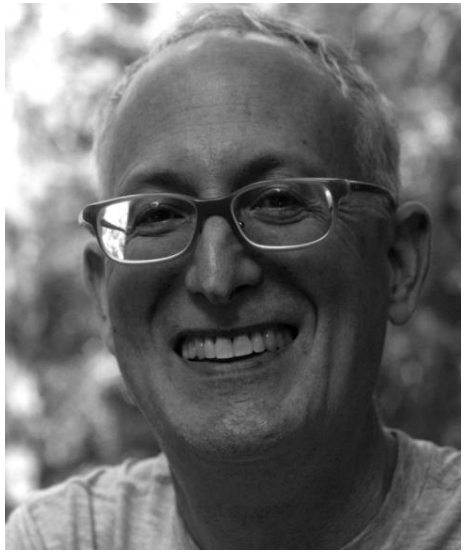
Lupe Jimenez, Senior Project Manager | SMUD

Ram Narayanamurthy, Senior Project Manager | EPRI

Jonathan Livingston
President | Livingston Energy Innovations

ETCC EMERGING TECHNOLOGIES COORDINATING COUNCIL

ABOUT LIVINGSTON ENERGY INNOVATIONS

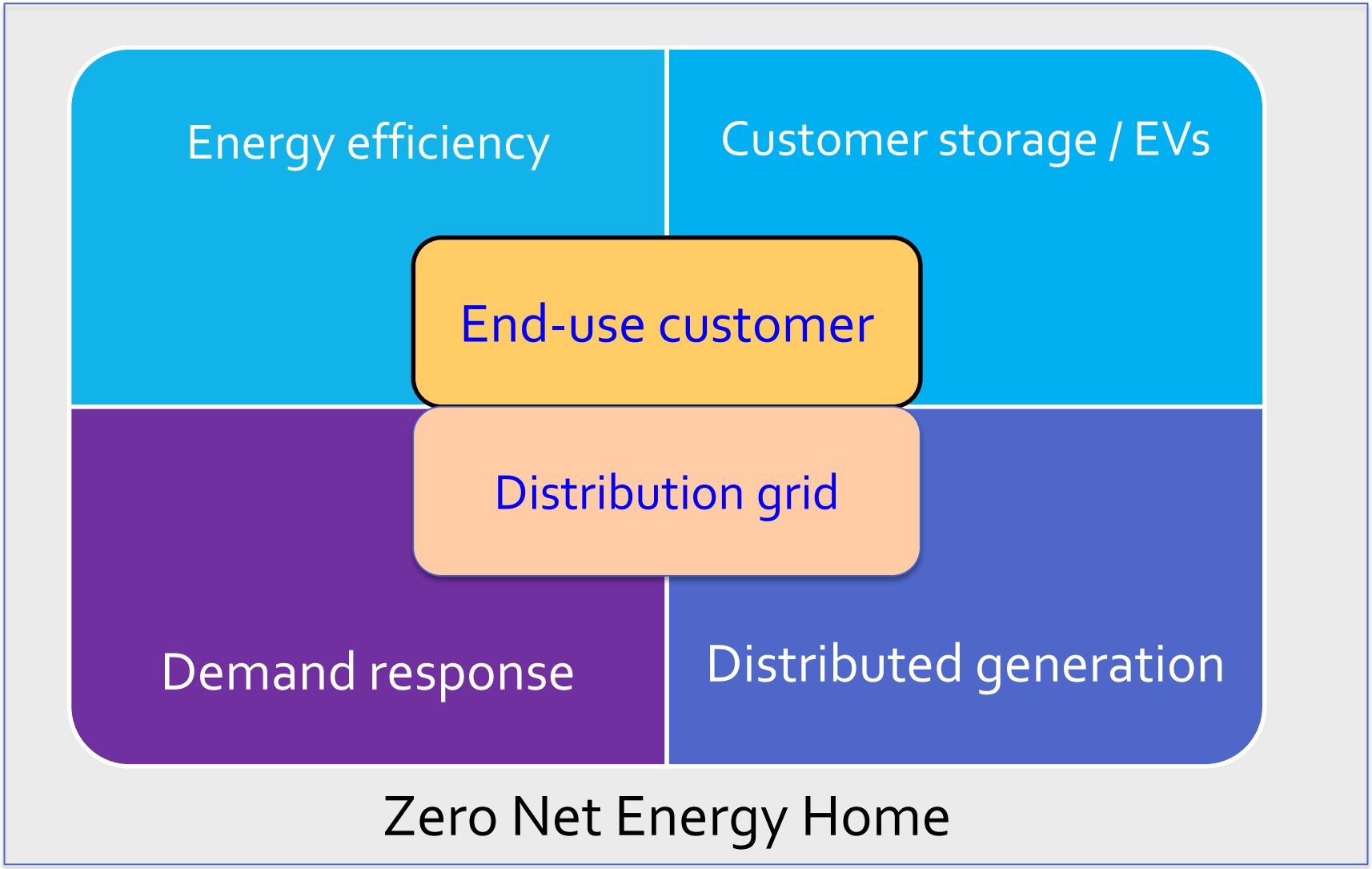


Our tagline: "*Cultivating what's next in demand-side management*"

What we do: Assist leading utilities, product and service developers and their partners bring new DSM solutions into the marketplace

Our goal: Help clients solve their toughest problems and successfully traverse the product introduction "valley of death"

ABOUT THIS SESSION



Jon Fortune
Director, Regulatory & Energy Services | Sunverge

ETCC EMERGING TECHNOLOGIES COORDINATING COUNCIL

ETCC Q4 Meeting

Jon Fortune, Director Regulatory and Energy Services

FOUNDED

2009

HEADQUARTERED IN

SAN FRANSISCO

SEED (2009)

1st DEVICE INSTALLED (2010)

SERIES A (2011)

SERIES B (2014)

EMPLOYEES

45

CUSTOMERS

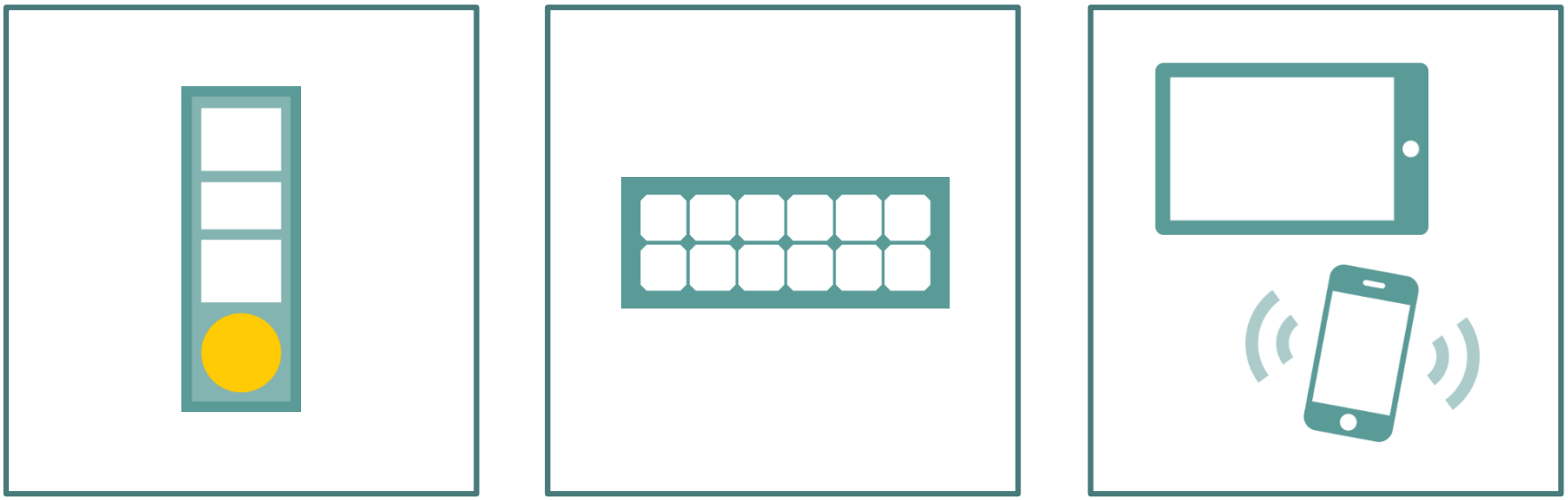
North America (AZ, CA, HI, KY, NY, NV & Canada)
New Zealand
Australia
South Korea
Germany

450+

UNITS IN PRODUCTION AROUND THE WORLD

SUNVERGE SOLAR INTEGRATION SYSTEM (SIS)

STORAGE APPLIANCE + RENEWABLE POWER + SOFTWARE-AS-A-SERVICE



SIS PLATFORM

Hybrid Inverter
Scaleable to 6 kW

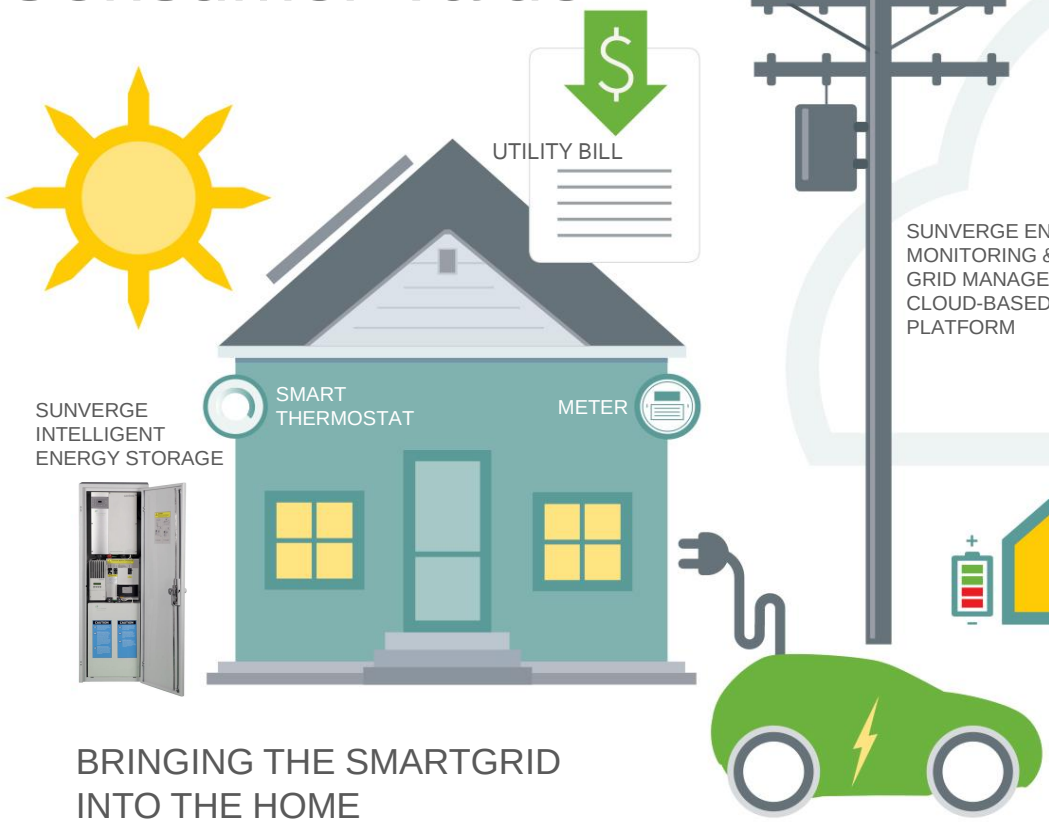
Balance of System

Application Gateway

Lithium-ion Battery
Scaleable to 19.4 kWh

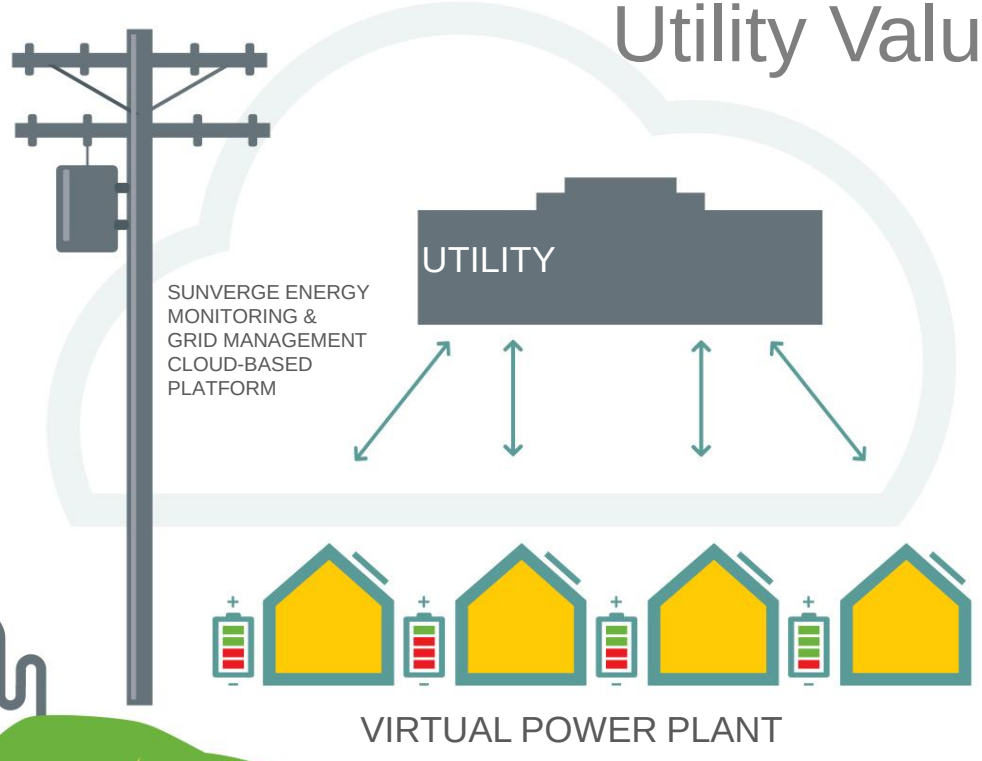
NEMA 3R Enclosure

Consumer Value



BRINGING THE SMARTGRID
INTO THE HOME

Utility Value



VIRTUAL POWER PLANT

AGGREGATE & ORCHESTRATE
FLEET OF RESOURCES

MEASURING OUR IMPACT

4.5
MWh

MWh of distributed storage under management

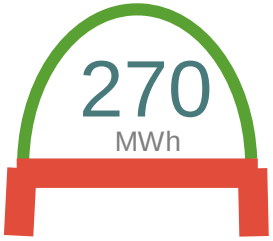
1.7
MW

MW of distributed solar under management

Customers enrolled in storage programs

15,340

Hours of backup power delivered



MWh of peak load reduction (5pm–8pm)

Average production uptime (last 30 days)

AFFORDABLE HOUSING PROJECT & SACRAMENTO MUNICIPAL UTILITY DISTRICT (SMUD)

PROJECT DESCRIPTION

34 new homes in downtown Sacramento, Calif. outfitted with a solar panel system integrated with Sunverge energy storage hardware and control software in the cloud.

PROJECT GOAL

- Cost effectively design and build affordable, zero-net-energy homes in advance of tough new state energy efficiency standards.
- Evaluate how high penetrations of

SMUD

SMUD
Sacramento Municipal Utility District

AFFORDABLE HOUSING PROJECT & SACRAMENTO MUNICIPAL UTILITY DISTRICT (SMUD)

SMUD
Sacramento Municipal Utility District

RESULTS

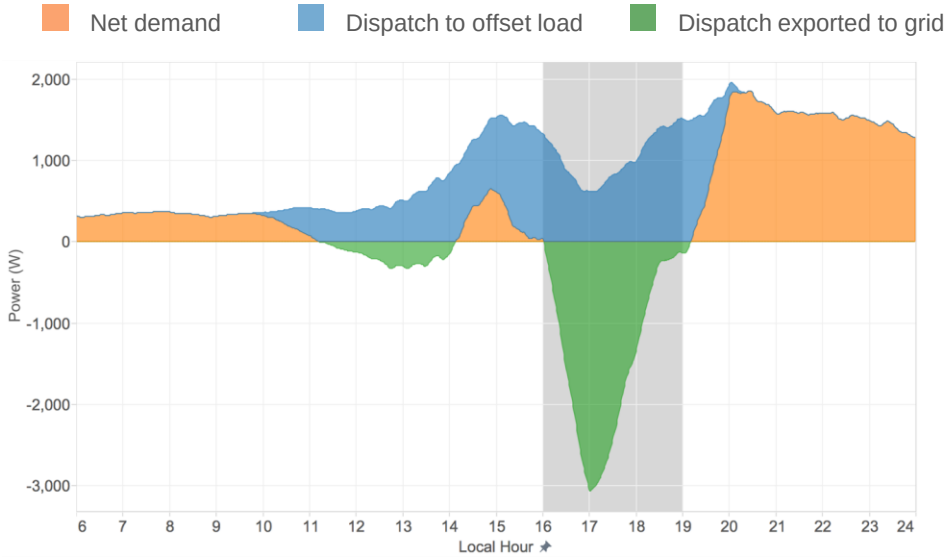
Homeowners:
Electric bills 85% lower than comparable homes.

Utility:

- Improved energy supply reliability during outages and demand reduction events.
- Provide tangible bill-reduction benefits and backup power.

Builder:
Homes sold out in less than a year (Prices: US$350,000 to US$450,000 for 1,250 to 1,700 sq. ft. homes).

DEMAND RESPONSE PERFORMANCE



SIS dispatches to offset load in homes and export maximum additional energy to utility grid during DR events

Note: Height of graph shows total energy used in the home

Graph shows average demand response performance, July - September 2014

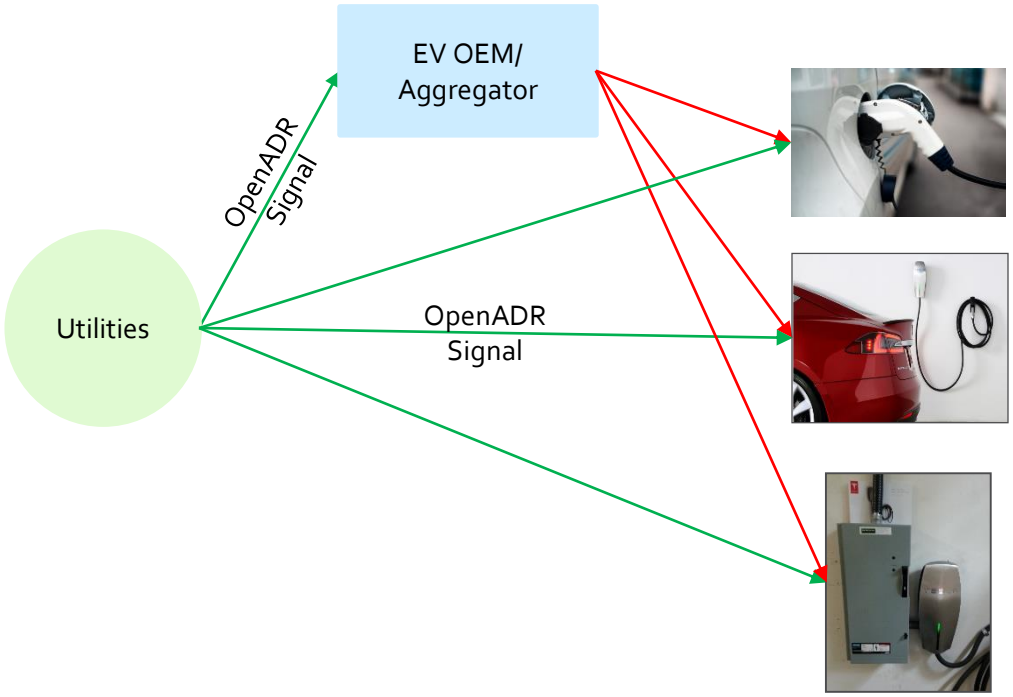
Neha Arora
Engineer / Project Manager | SCE

Neha Arora is an Engineer/Project Manager in New Program Development and Launch group at SCE. Neha works on Emerging Technologies and Emerging Markets and Technologies projects. Currently, most of her work involves electric vehicles and energy storage technologies.

Contact: Neha.Arora@sce.com

EV's, Energy Storage and ZNE…

- Electric vehicles and energy storage units can serve as a Demand Response resource.
- How is that ZNE? This is a non traditional approach to ZNE.
- Electric vehicles are more dynamic whereas energy storage is more static in nature.
- Both resources can have a fast response time making them ideal for fast and flexible DR programs of future.
- SCE is collaborating with a major EV OEM to address the impacts of distributed generation resources and test their reliability in providing grid support during under and (potentially) over generation durations.
- Scenarios are being developed to call events directly at zip code level (individual EV) and to call events to obtain system wide (aggregator approach) demand drop using geo-locational capabilities of the EVs.



105

Lupe Jimenez
Senior Project Manager | SMUD

EMERGING TECHNOLOGIES COORDINATING COUNCIL

SACRAMENTO MUNICIPAL UTILITY DISTRICT SNAPSHOT

Sacramento County in Northern California

Municipal Electric Utility

- Governed by a Board of Directors

610,000 Customers

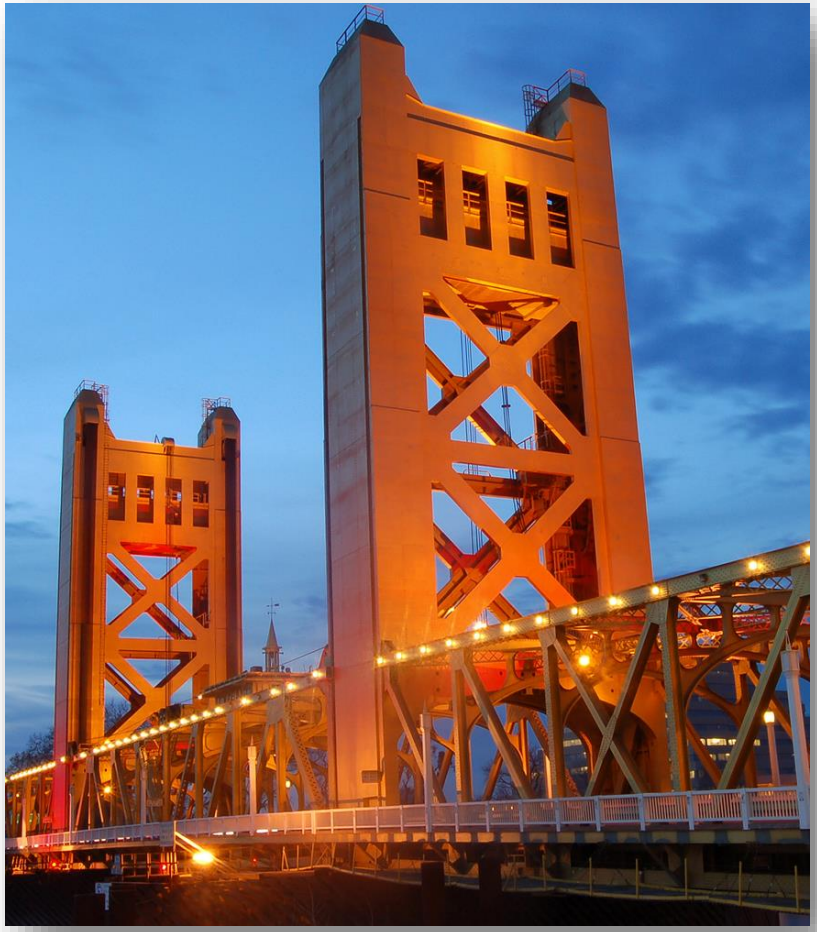
- 540,000 Residential
- 70,000 Commercial

Summer-Peaking Load (Air Conditioning)

- Residential Peak: 4-7pm June-September
- Peak load ~3000 MW, of which 400MW = 40 hours

Energy Mix

- Hydro
- Natural gas-fired generators
- Renewable energy
- Wholesale market



Ram Narayanamurthy
Senior Project Manager | EPRI

GRID INTEGRATION OF ZNE COMMUNITIES

roundbreaking event in April

Community planning to occupancy in 7 months

GO solar CALIFORNIA

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Itron CSI RD&D Program Manager

California Solar Initiative (CSI) RD&D Program

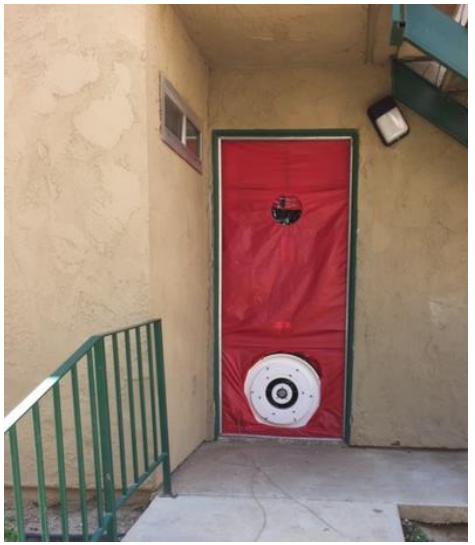
SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL Company

MeritageHomes

biraenergy

CREATING AFFORDABLE CLEAN ENERGY COMMUNITIES

Low income deep retrofit
Nearly 30 EE measures



[ZNE video on Edison.com]

ELECTRIC POWER RESEARCH INSTITUTE

A Sempra Energy utility®

TOGETHER…SHAPING THE FUTURE OF ELECTRICITY

DISCUSSION / Q&A

SESSION WRAP-UP

PLEASE FILL OUT EVALUATIONS!

UPCOMING ETCC EVENTS

Date	Event	Location & Host
February 17, 2016	Q1 Meeting: Commercial	Los Angeles (SoCalGas)
April 27, 2016	Q2 Meeting: Industrial / Agriculture	Bay Area (PG&E)
Fall 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/events