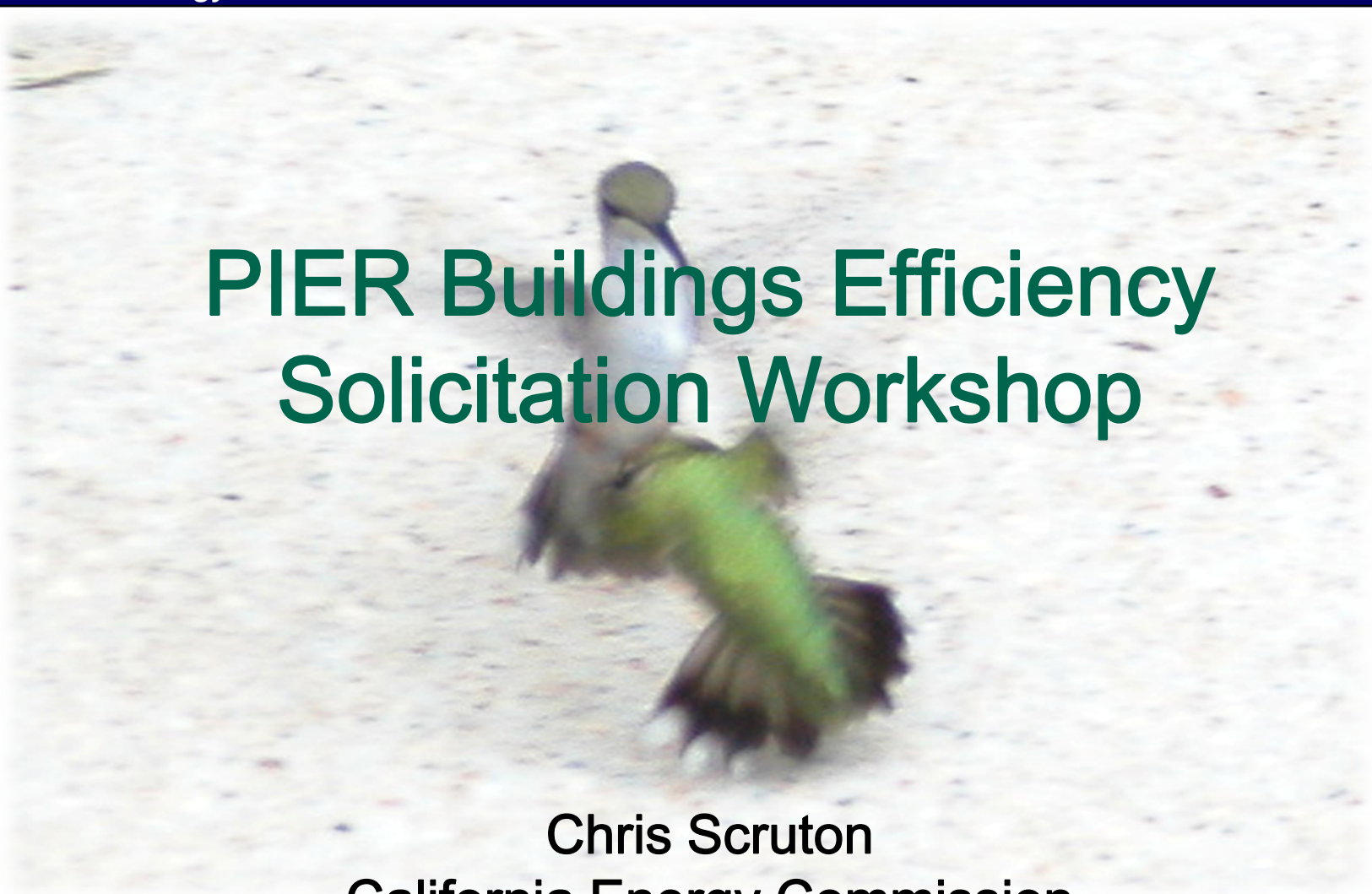

PIER Buildings Efficiency Solicitation Workshop

Chris Scruton
California Energy Commission

August 31, 2011

- **Introductions**
- Purpose of Today's Workshop
- PIER Background, Legislation and Policy
- California Energy Statistics
- Technical Research Areas
  - Assessment Criteria
  - PIER Buildings Portfolio
  - Your Input
- Administrative Section
  - Buildings Program Solicitation Plans
  - BEST Solicitation Schedule
  - Administrative Objectives
  - Your Input
- Wrap up

Agenda

Time	Topic
1:30 p.m.	• Introductions • Purpose of Workshop • PIER Background • California Energy Statistics • Public Comments
2:00 p.m.	Technical Research Areas • Assessment Criteria • PIER Buildings Portfolio • Public Comments
3:00 p.m.	Administrative Areas • Solicitation Plans • Schedule • Administrative Objectives • Public Comments
3:30 p.m.	Wrap up and Next Steps
3:45 p.m.-5:00 pm	Informal Researcher Discussions

PIER Buildings Program

Who We Are

Brad Meister

Dustin Davis

Golam Kibrya

David Weightman

PIER Buildings Program

Who Are You ?
(introductions)

PUBLIC INTEREST ENERGY RESEARCH
"Research Powers the Future"

STATE OF CALIFORNIA
ENERGY COMMISSION

Introductions

Purpose of Today's Workshop

PIER Background, Legislation and Policy

California Energy Statistics

Technical Research Areas

- Assessment Criteria
- PIER Buildings Portfolio
- Your Input

Administrative Section

- Buildings Program Solicitation Plans
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- Administrative Objectives
- Your Input

Wrap up

1. **Background on PIER and California energy**
2. **Technical program themes**
3. **Your input on research program needs**
4. **Administrative goals and plans**
5. **Your input on the process**

PIER Background, Legislation and Policy

PUBLIC INTEREST ENERGY RESEARCH
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STATE OF CALIFORNIA ENERGY COMMISSION

PIER Background, Legislation and Policy

Ratepayer Funded Program

Launched in 1996 by AB 1890

$86.5 Million Annual Budget FY 10/11

- **$62.5 million electric**
- **$24 million natural gas**

Program Research Areas

- **Energy Efficiency & Demand Response**
- **Renewable Energy & Advanced Electricity Generation**
- **Transmission & Distribution**
- **Energy-Related Climate & Environment**
- **Transportation**

PIER Background, Legislation and Policy

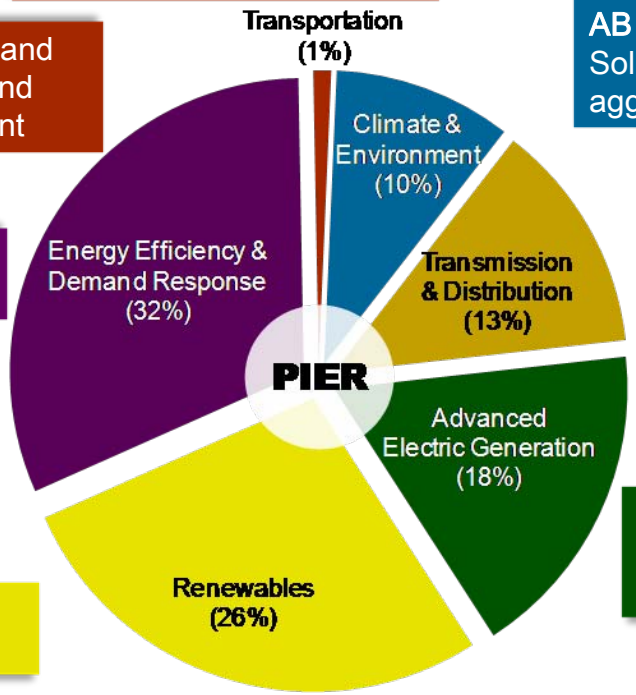
Funding Total: over $700 million from 1997 -- 2010

AB 1007 – Transportation and Alternative Fuels

SB 1368 – GHG Emissions standards for POUs

AB 118 – Alternate and Renewable Fuels and Vehicles Deployment

AB 32 – Global Warming Solutions Act of 2006; aggressive goals for 2020



SB 1250 – PIER and Renewables Incentive Programs Reauthorized

AB 2021 – Energy Efficiency for POUs

AB 2160 – Green Building Acquisition Financing for State Facilities

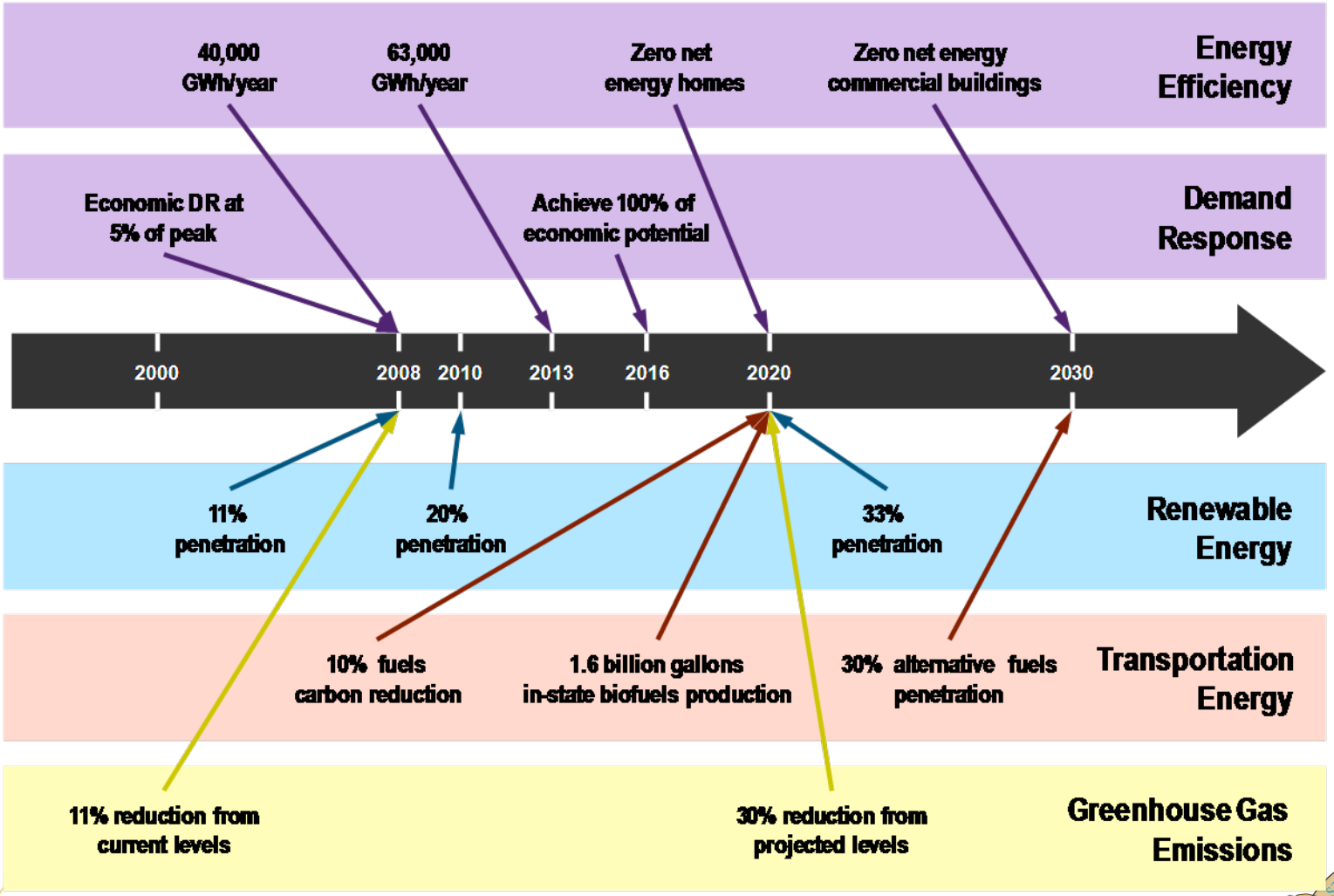
AB 2778 – Self-Generation Incentive Program for Fuel Cells and Wind

SB 107 – Accelerated RPS Goals

SB 1250 – PIER and Renewables Incentive Programs Reauthorized

SB 1 – Renewables Goals for New and Existing Residential and Commercial Structures

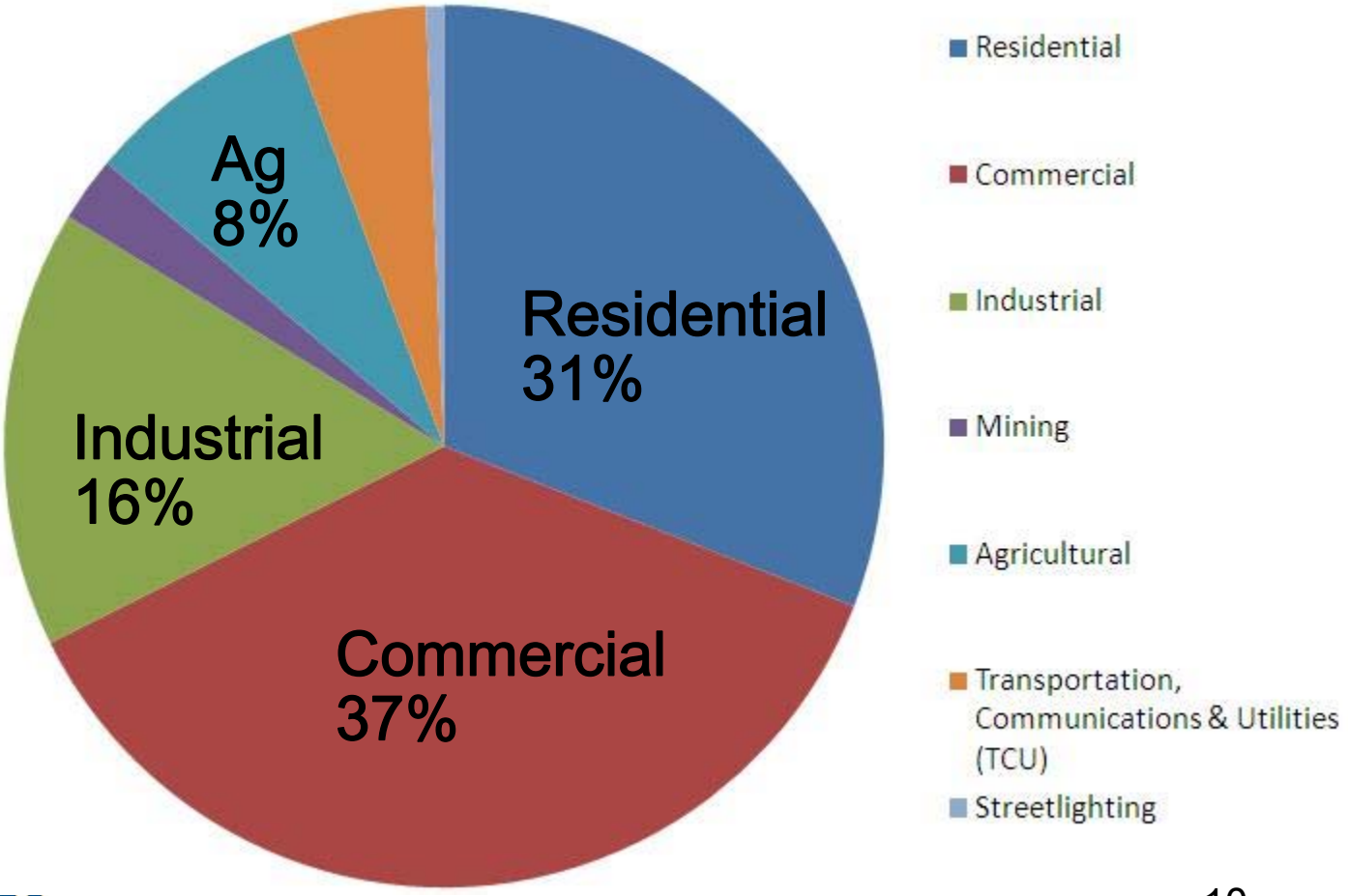
PIER Background, Legislation and Policy



California Energy Use

Total Consumption
271,000 GWh

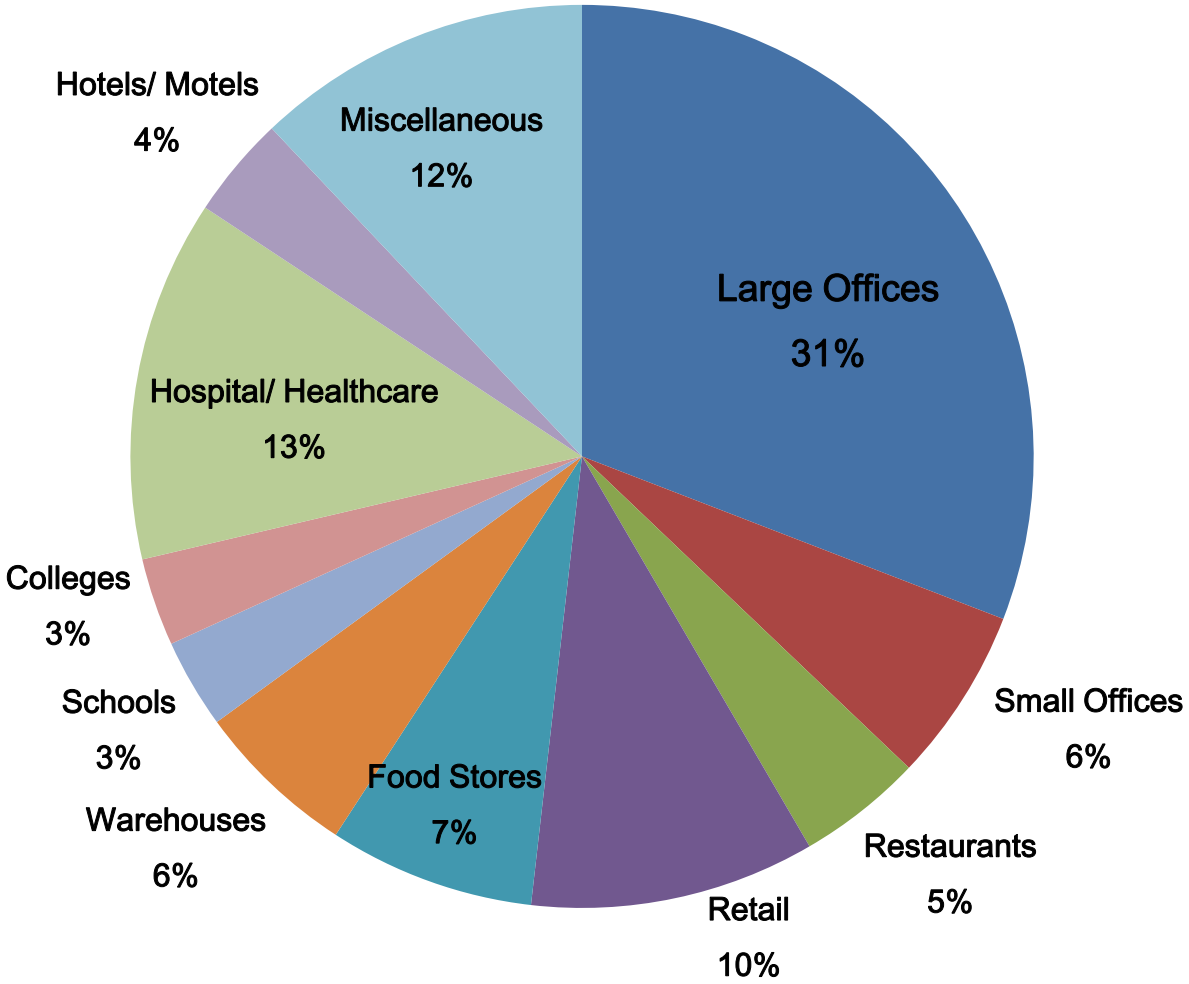
Coincident Demand
62,000 MW



1

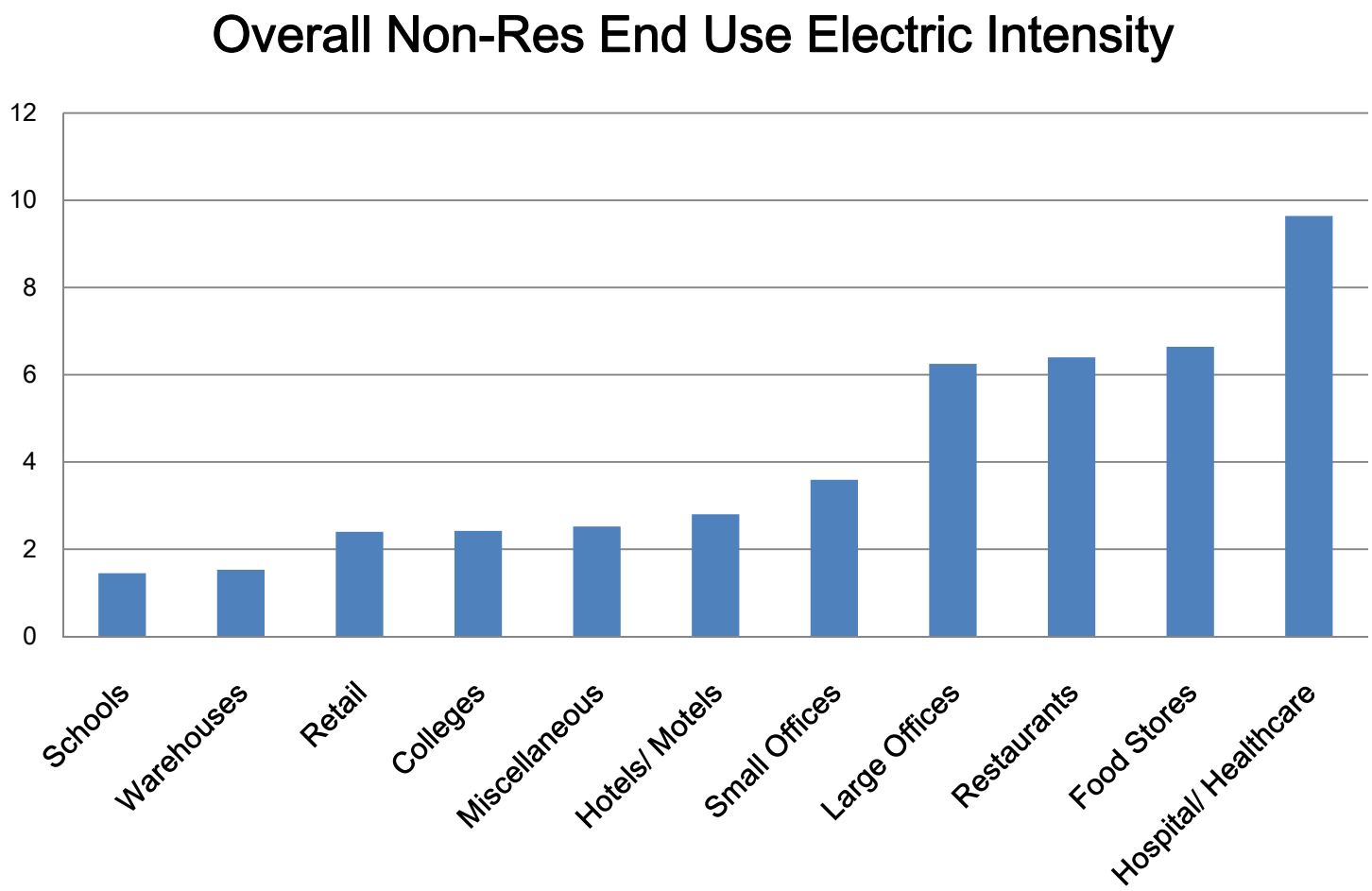
California Energy Use

Non-Res Electric Consumption by End-Use Type



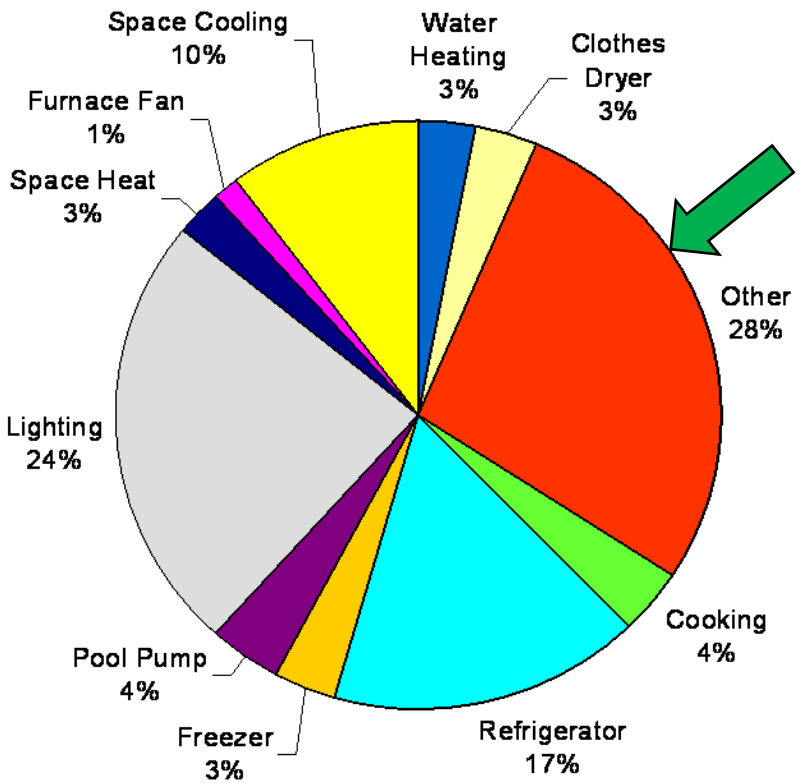
11

California Energy Use



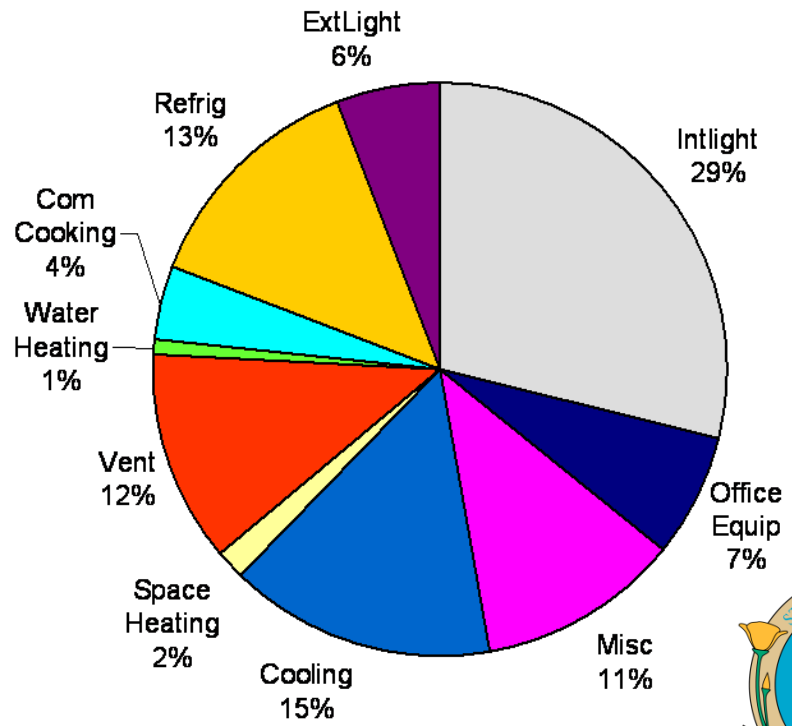
California Energy Use

Residential Electricity Use



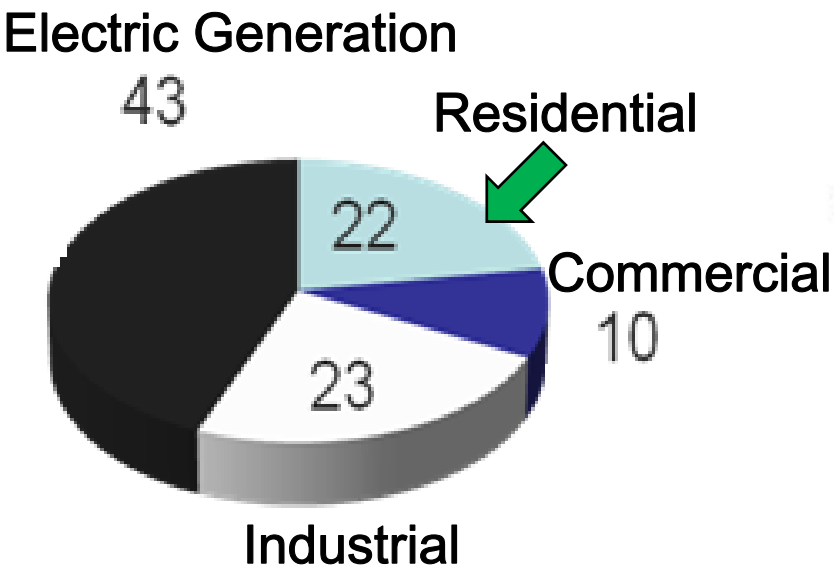
Plug Loads:
- Appliances
- Electronics

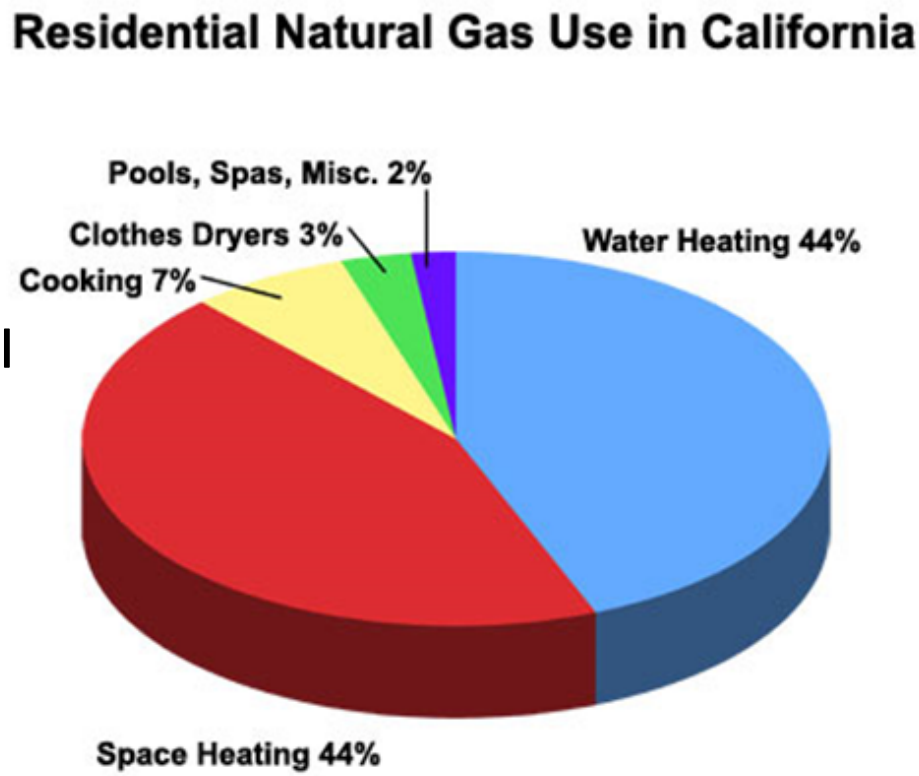
Commercial Electricity Use



California Energy Use

Natural Gas Use in California:





About 1/3 of electricity is used in residential buildings, which therefore account for about 36% of all gas in California

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- Introductions
- Purpose of Today's Workshop
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- **Technical Research Areas**
  - **Assessment Criteria**
  - PIER Buildings Portfolio
  - Your Input
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Typical Proposal Sections:

- Problem Statement
- Goal of the proposed project
- Objectives of the project
- Benefits to California ratepayers
- Narrative Scope of Work with deliverables
- Related Research
- Team
- Cost estimate
- Schedule
- Market connections, partners, and cost share

Example Selection Criteria:

1. Does project address important energy-related issues?
2. Are the issues addressed by existing research?
3. Could the project significantly impact the issues?
4. Are the team members well qualified and can they follow through to marketplace?
   (commercialization, regulatory and rule making, etc)
5. Are the budget and schedule commensurate for the scope?
6. Are there strong market connections?
7. Is there cost share?
8. Other weighting factors:
   - California based entities
   - Small business preference
   - Weighted average loaded labor rates

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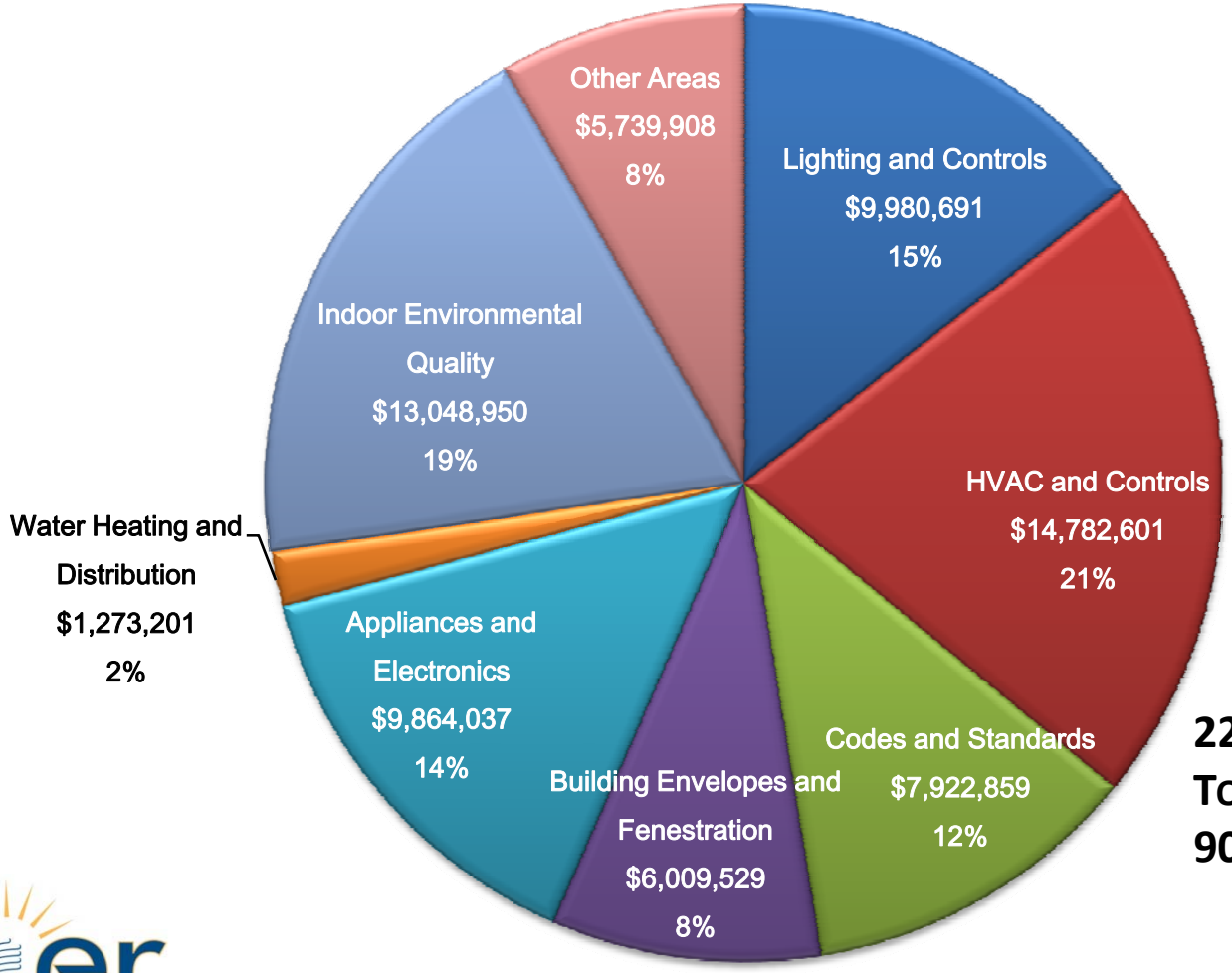
PIER Buildings Portfolio:

PIER Buildings Funding- Electric

2005-2011



222 PROJECTS TOTALING $ 90,962,050

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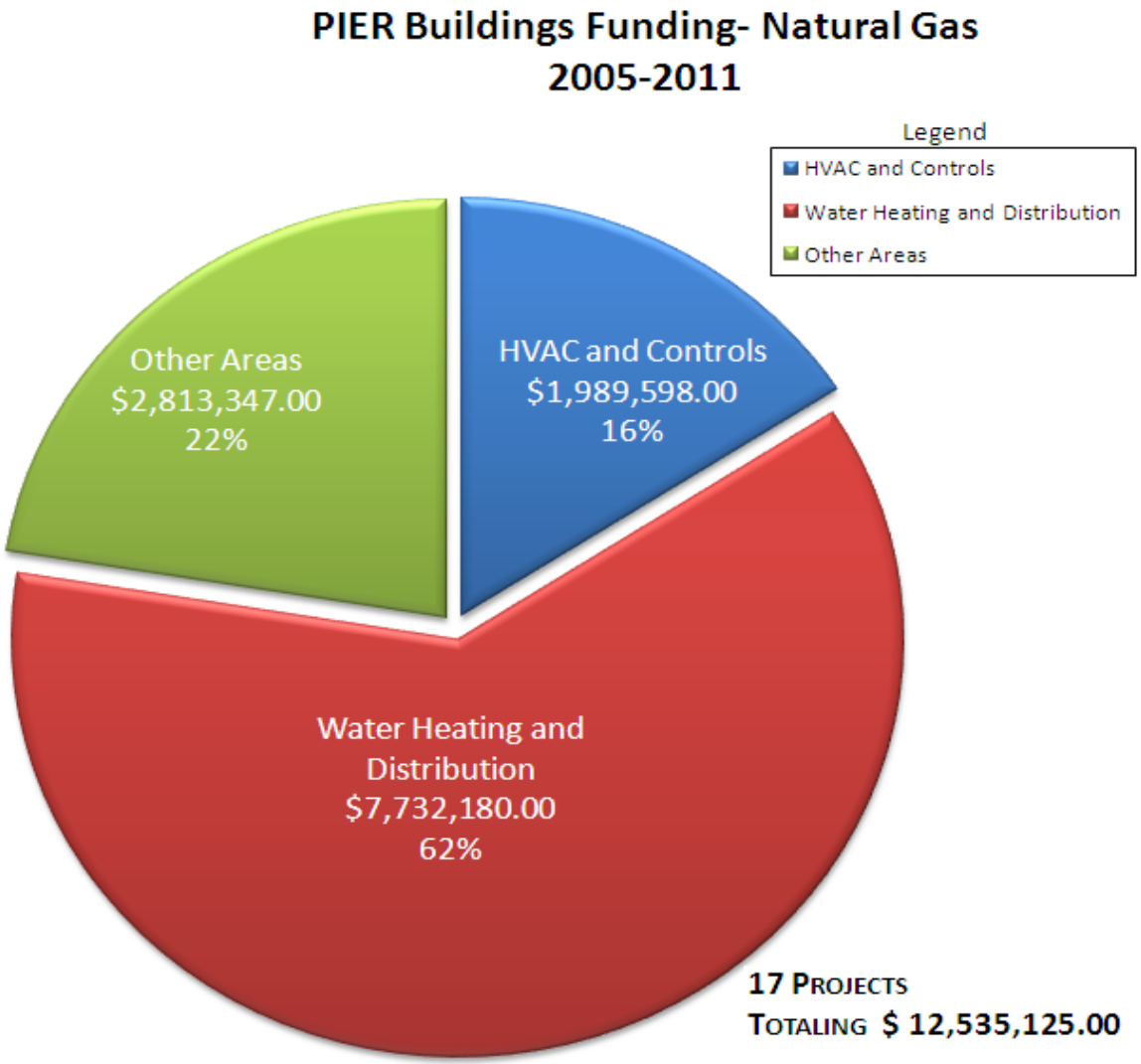
PIER Buildings Portfolio:



17 Projects
Totaling $ 12,535,125.00

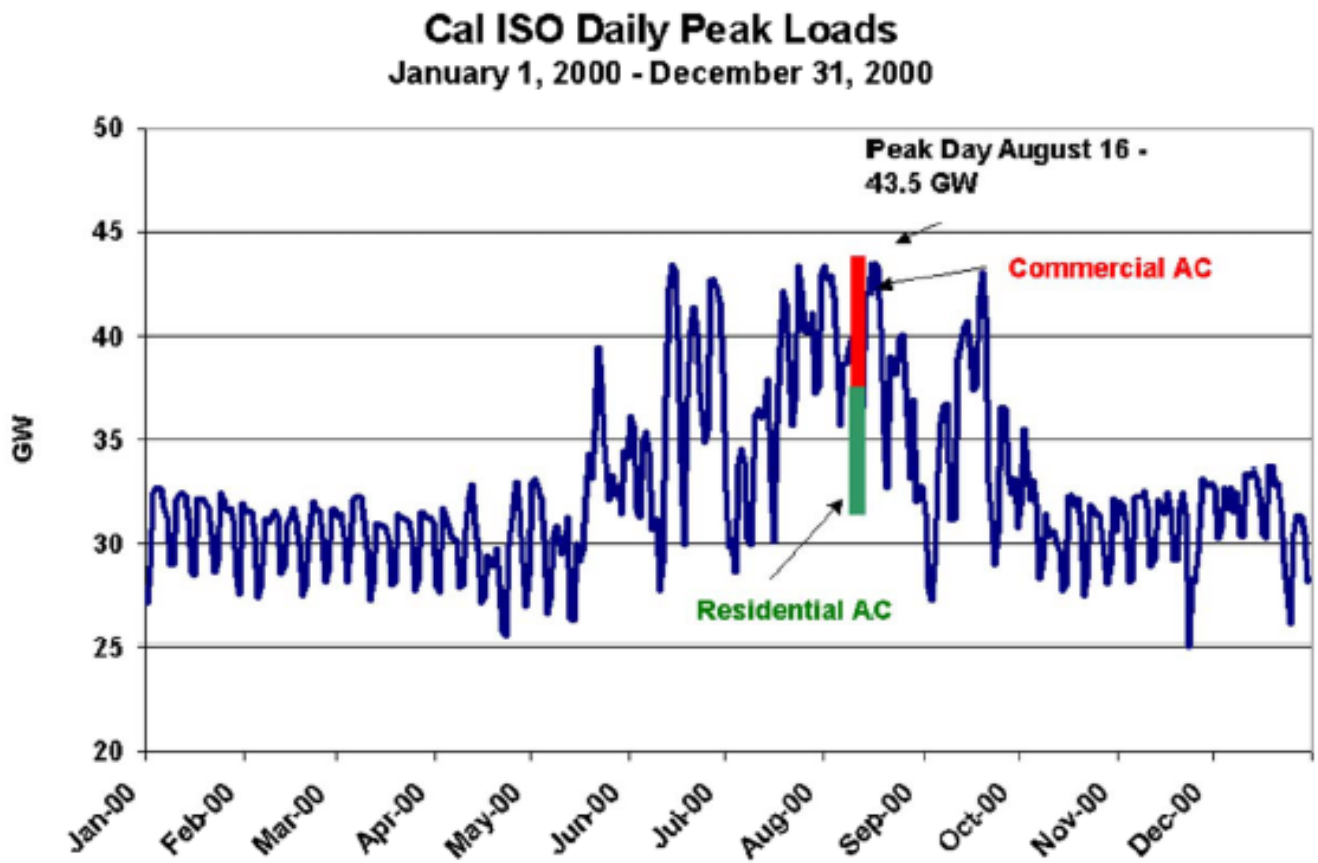
Questions?

Building Energy Efficiency Themes

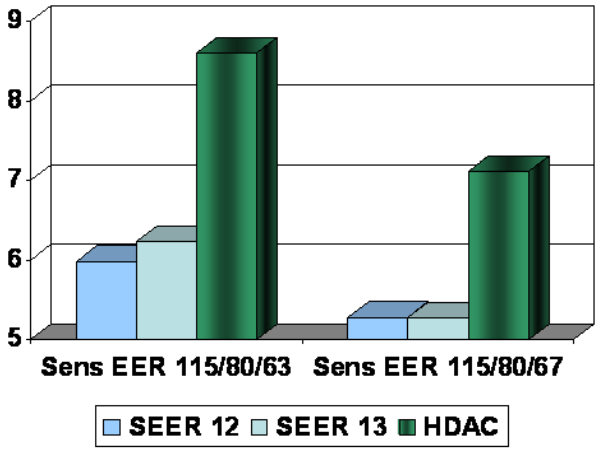
- HVAC and Controls
- Lighting and Controls
- Whole Buildings
- Plug Loads
- Hot Water and Distribution
- Commercial Cooking
- Integrated Projects
  - Zero net energy building demonstration
  - Behavior

PIER Buildings Portfolio: HVAC

Why Air Conditioning is Important

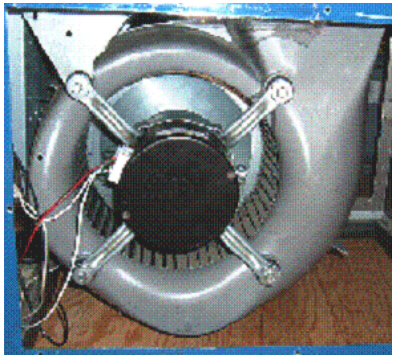


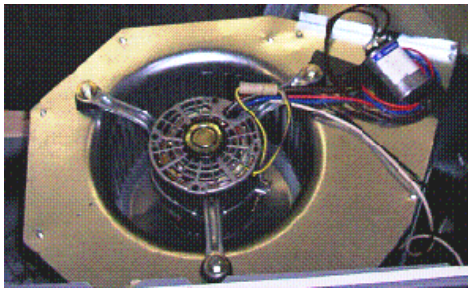
PIER Buildings Portfolio: HVAC

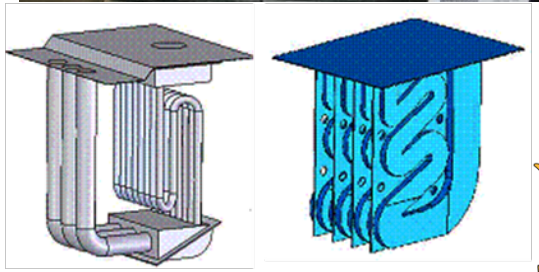


Hot Dry Optimized Air Conditioner:

- reduced dehumidification
- efficient at high temperatures
- optimized fan air flow
- commercially available components







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PIER Buildings Portfolio: HVAC

University of California, Davis
WCEC
Western Cooling Efficiency Center

Western Cooling Efficiency Center

Reduce cooling system electrical demand and energy consumption in the Western United States

- Partnering with stakeholders
- Identifying technologies
- Conducting research and demonstrations
- Disseminating information
- Implementing programs

Western Cooling Challenge Certified WCC

Coolerado

AquaChill
Ultra-Efficient Evaporative Condensing System
by
BEUTLER CORPORATION

Smartvent
Cooling and Fresh Air System

Munters

Seeley International

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PIER Buildings Portfolio: HVAC

Radiant heating and cooling:

- eliminates most fan energy
- utilizes large floor/ceiling area
- reduced temperature differentials
- large thermal mass
- Title 24 standards proposals

University of California, Davis
WCEC
Western Cooling Efficiency Center
Research • Innovation • Partnership

Walmart
Save money. Live better.

pier
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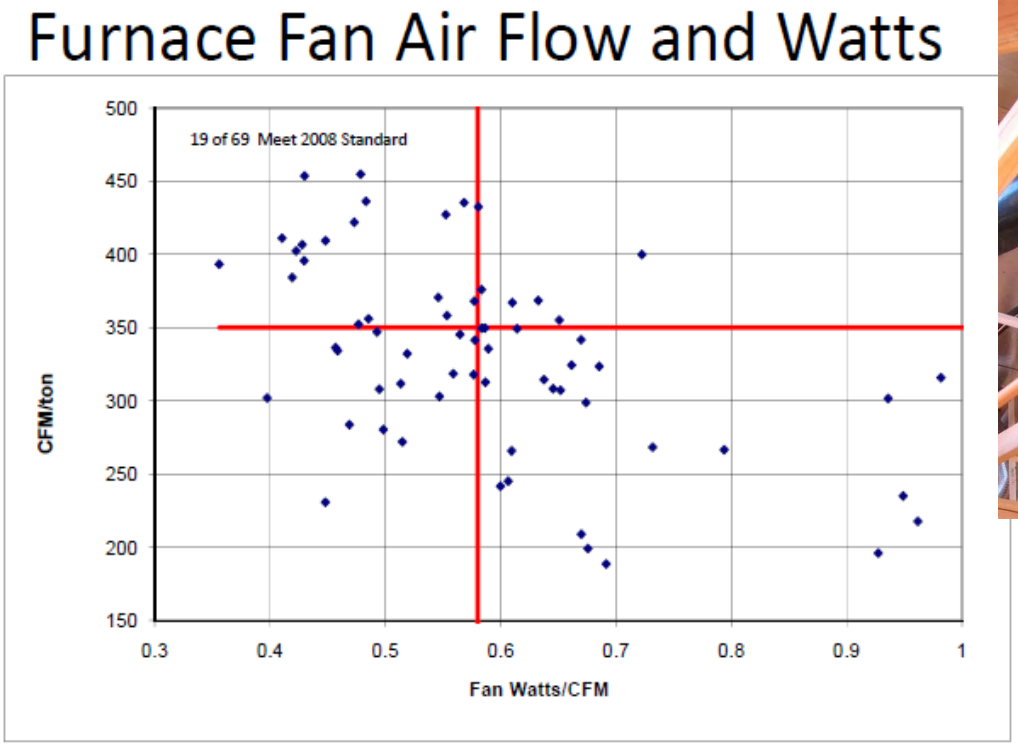
"Research Powers the Future"

State of California Energy Commission

PIER Buildings Portfolio: HVAC

Could airflow be a problem in these ducts?

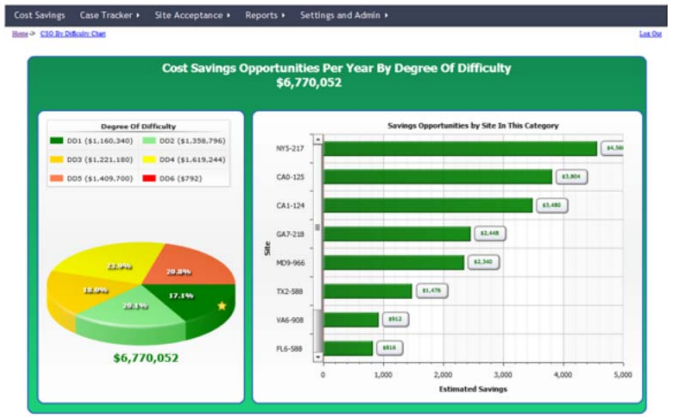


PIER Buildings Portfolio: HVAC

Field Diagnostics

Bank of America

Synergy



SENSUS MACHINE INTELLIGENCE

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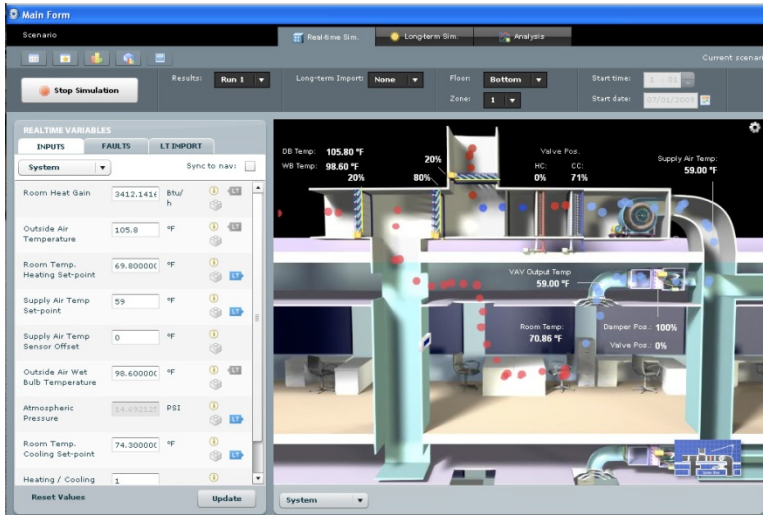
PIER Buildings Portfolio: HVAC

LearnHVAC:

- Visual training tool
- Developed PIER and NSF
- Uses building simulation
- Available free to schools
- http://www.learnhvac.org/



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Themes for this solicitation: HVAC

Air conditioning drives summer peak loads, necessitating expensive, dirty and inefficient power plants. We need

- climate-optimized systems,
- ways to ensure systems are installed and functioning optimally,
- continued emphasis on standards, training and awareness.
- Need for improved conventional space heating

PIER Buildings Portfolio: LIGHTING

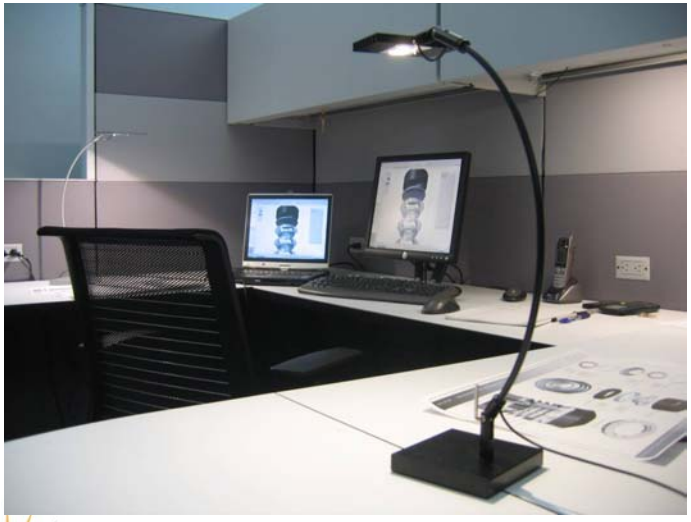
California Lighting Technology Center

- Work with manufacturers
- Practical designs developed
- Coordinate incentive programs
- Training next generation

PIER Buildings Portfolio: LIGHTING

Integrated Office Lighting System

- Finelite
- 3, 6, 9W LED fixtures
- Custom configuration
- Occupancy sensor



PIER Buildings Portfolio: LIGHTING

Dual-loop photo sensor dimming

- WattStopper
- Open- and closed-loop
- self-commissioning
- ends over-dimming

Themes for this solicitation: LIGHTING

To meet California efficiency goals it will be necessary to

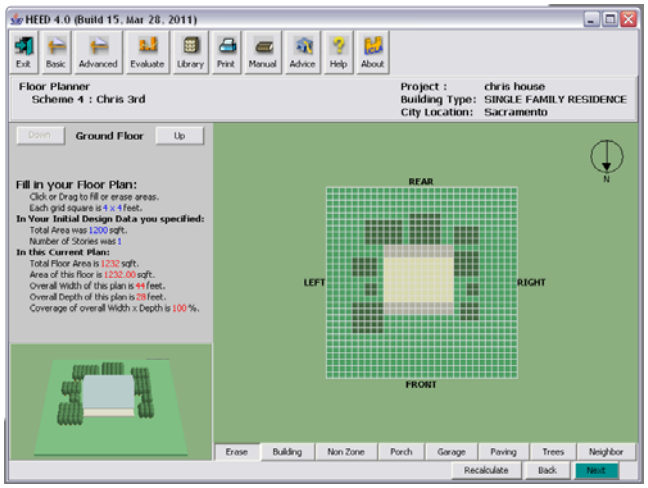
- Develop more cost-effective, high-efficiency lighting options
- Use effective methods for integration with natural lighting
- Develop cost-effective occupancy sensing and controls

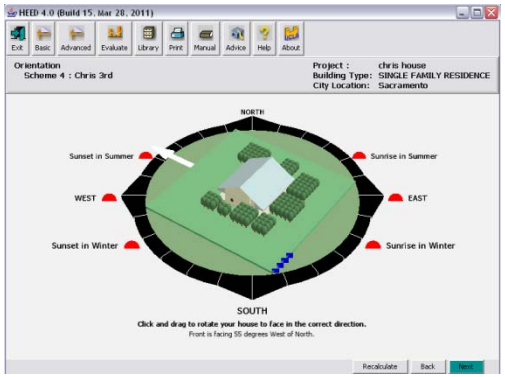
PIER Buildings Portfolio: WHOLE BUILDING

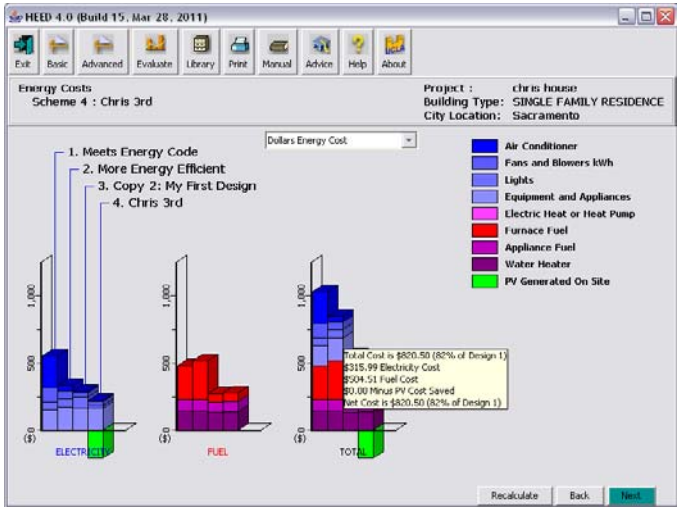
HEED (Home Energy Efficient Design)

Murray Milne UCLA :

Early phase residential design iteration







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PIER Buildings Portfolio: WHOLE BUILDING

Heat Island Group: Cool Roofs

TIMBERLINE COOLSERIES
ENERGY SAVING SHINGLES

GAF
Quality You Can Trust
From North America's Largest
Roofing Manufacturer!

CUSTOM-BILT METALS
LAST-TIME® Brand Products

CRRC
COOL ROOF RATING COUNCIL SM

pier
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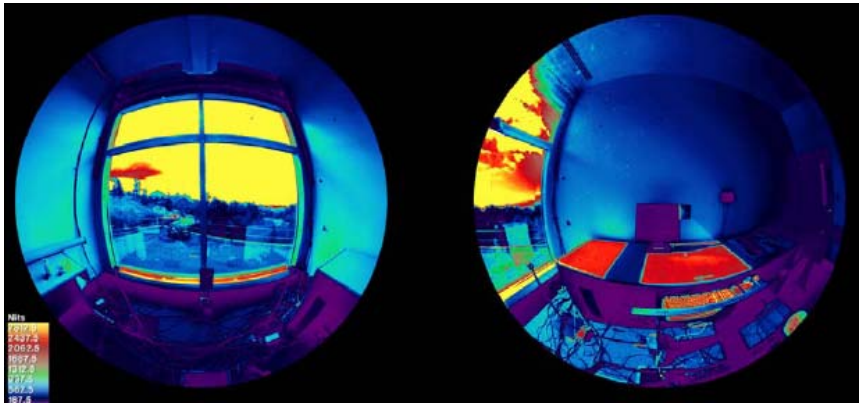
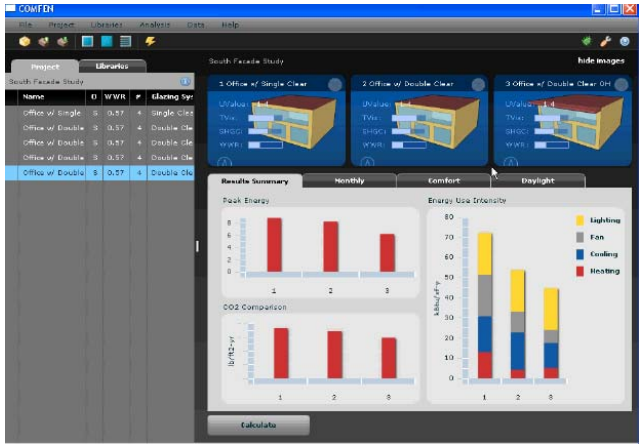
PIER Buildings Portfolio: WHOLE BUILDING



LBNL Windows Testbed



PIER Buildings Portfolio: WHOLE BUILDING

UC Berkeley Center for the Built Environment

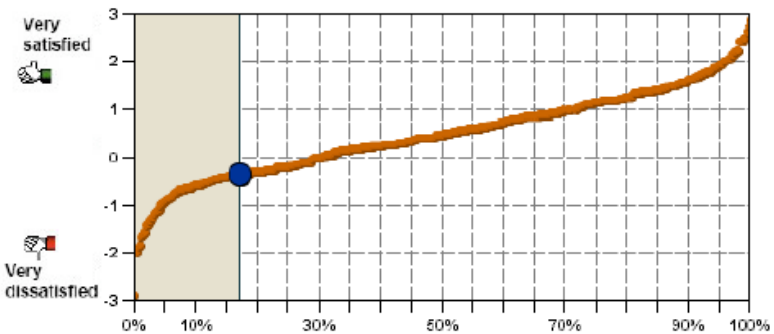
Indoor environmental evaluation

CBE

Air Quality

17%

Percentile



-0.34

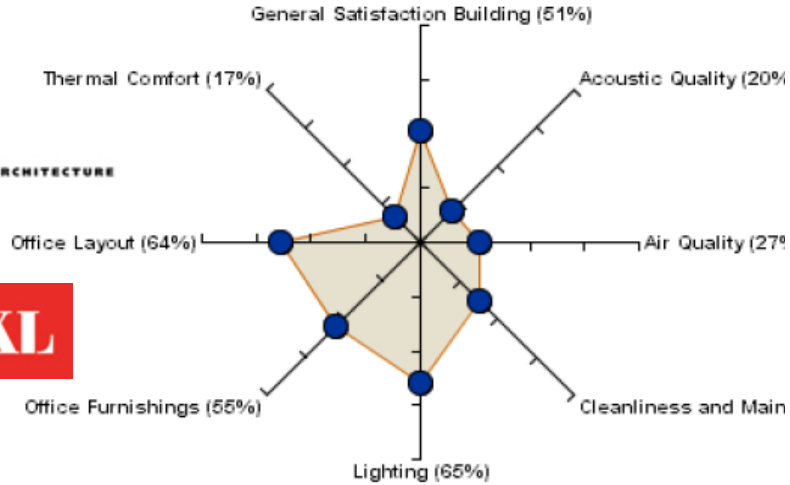
Mean Response

27%

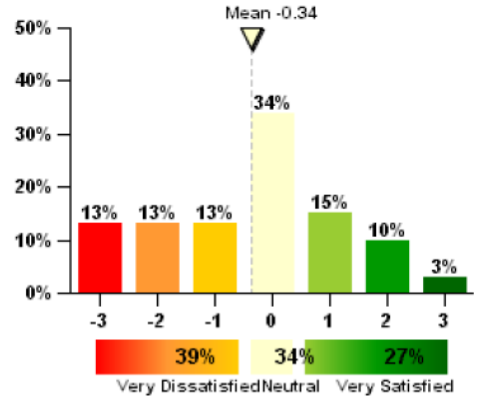
Satisfied

2.2 **Air Quality**

Satisfaction in Core Survey Categories



How satisfied are you with the air quality in your workspace?



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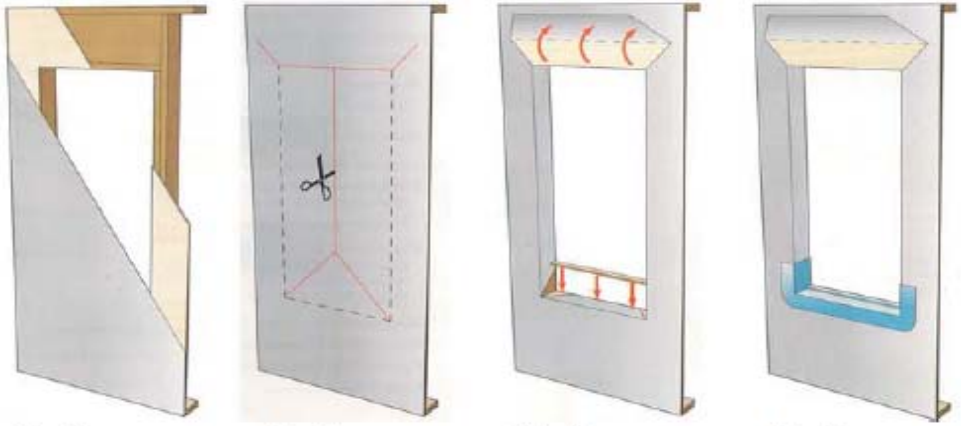
PIER Buildings Portfolio: '

Lew Harriman

Neil Leslie



Step 1
Wood frame wall with OSB and housewrap

Step 2
Cut modified "I" in housewrap

Step 3
Fold housewrap in at jambs and sill. Fold up at head, temporarily. Install backdam of sill pan.

Step 4
Install formable flashing over the sill and backdam per manufacturers instructions

A California Builder's Guide to

Reducing Mold Risk

A report to the California Energy Commission

Contract Number 500-03-013

April 12th, 2006

Illustration courtesy of Joseph Lstburek, PhD.

Step 5
Apply sealant at jambs and head. Sealants, housewrap and flashings must be chemically compatible.

Step 6
Install window plumb, level, square and fully-supported per manufacturers instructions

Step 7
Install jamb flashing and head flashing

Step 8
Fold down housewrap at head. Tape head flashing. Air-seal window around entire perimeter on the interior, with sealant or non-expanding foam.

Google it!

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PIER Buildings Portfolio: WHOLE BUILDING

LBNL: Indoor Air Quality
ASHRAE 62

Themes for this solicitation : WHOLE BUILDING

Well designed, tight, well insulated envelopes are keys to building performance. Useful developments would include:

- effective measurement techniques for envelope quality
- cost effective envelope retrofits
- greater use of advanced construction techniques
- passive house specification for California climate

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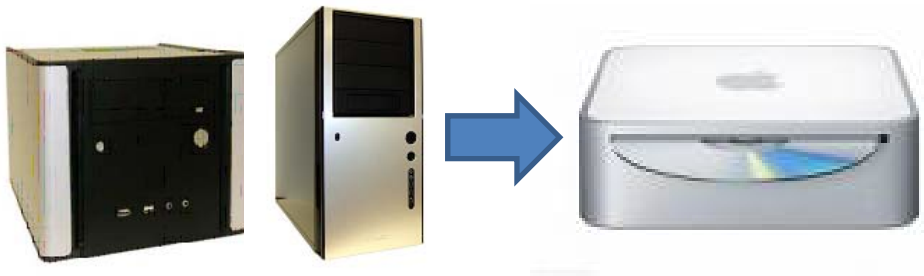
PIER Buildings Portfolio: PLUG LOADS



New Energy Efficient Computer Designs help to transform market

PIER developed efficient computer prototypes that greatly exceed ENERGY STAR requirements

The market has made dramatic advances

MAC Mini idles 13 W better than PIER hybrid19 W

PIER Research Forms Data Cornerstone for Title 20 TV standard

PIER TV research integral part of the basis for developing a new Title 20 TV standard

PIER Buildings Portfolio: PLUG LOADS

Similar Technology Now Available Commercially: Laptops with Solid State Hard Drives and Super Efficient Chipsets

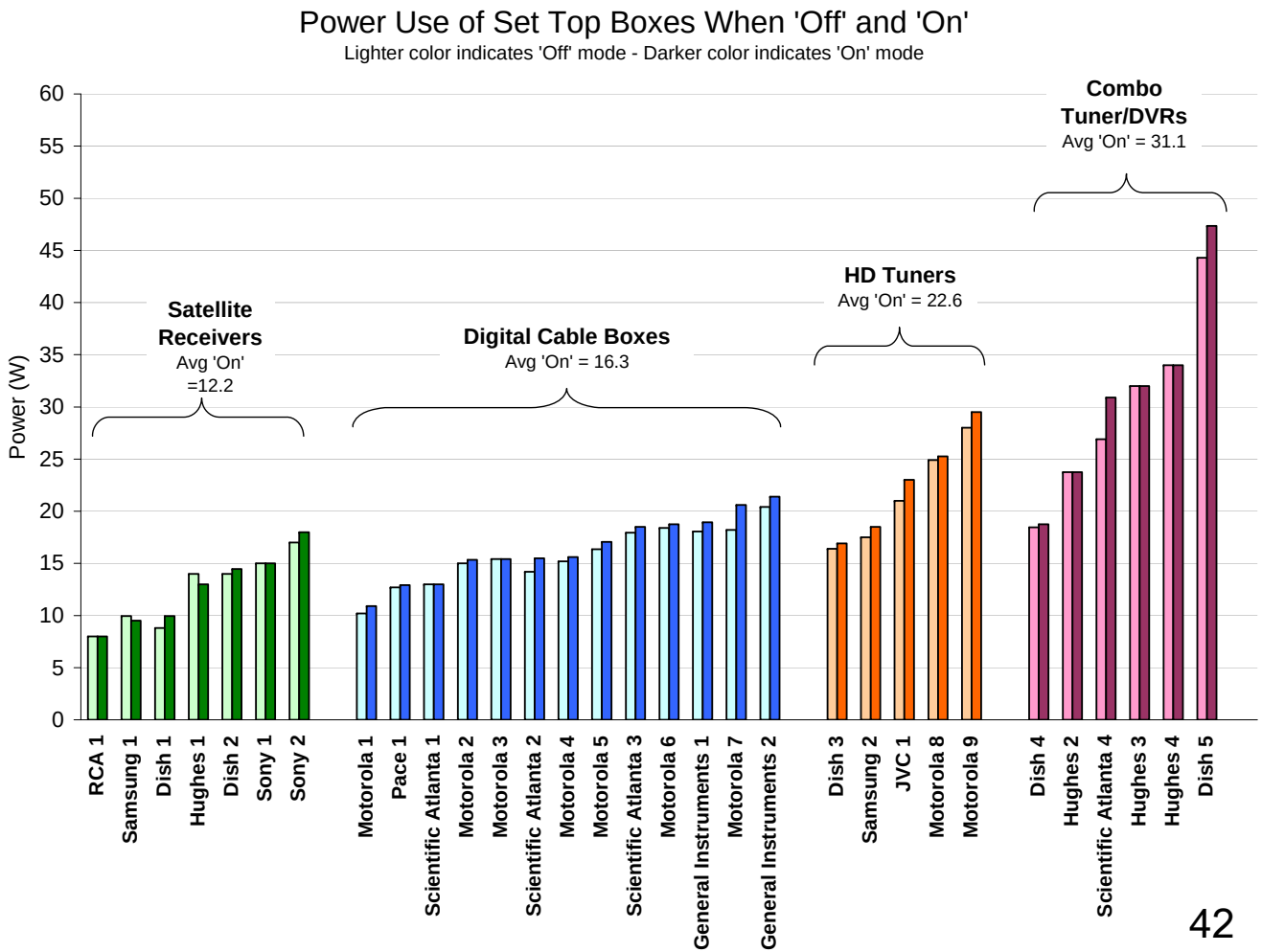
MacBook Air: 5.7 watts idle

Lenovo X301: 10 watts idle

- Both products employ LED-backlit LCD screens as well to achieve maximum battery life and minimal weight

PIER Buildings Portfolio: PLUG LOADS

Set Top Boxes Drawing Nearly Constant Power



PUBLIC INTEREST ENERGY RESEARCH
"Research Powers the Future"

Themes for this solicitation : PLUG LOADS

Plug loads and consumer electronics are a growing and fast-changing end use. To meet the challenge, research is needed on:

Active Power Research

- Improve efficiency of power supplies, battery chargers, displays, TVs, computers, TiVO players, WiFi, 3D TVs

Low Power Mode Research

- Improve enabling features of equipment, power management software, improved power strips, set top boxes, gaming consoles, inter-device control.

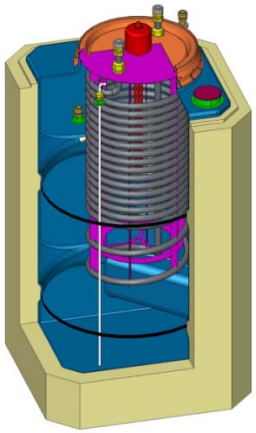
Building Networks

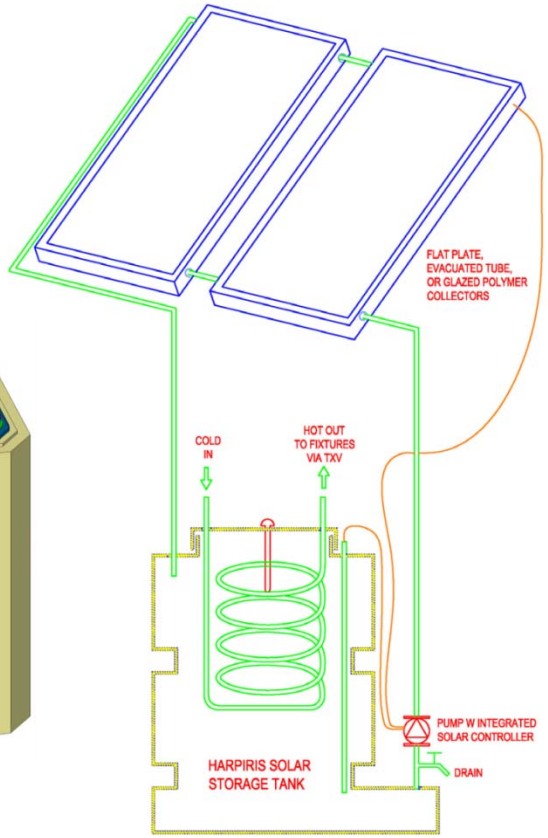
- Improve efficiency of routers, switches, Ethernet, Android technology for control of equipment, wireless controls, VOIP.

PIER Buildings Portfolio: HOT WATER

Harpiris Energy

SolarTankWorks





HSST Competitive Comparison – Domestic SWH Market

Product	SolarTankWorks TT-125	Glass-lined steel tanks from Rheem & A.O. Smith		European and US SS tanks
Capacity	125 gallon	80 gallon	120 gallon	60-120 gallon
Heat Exchanger Surface Area	25 ft^2	12 ft^2	15 ft^2	15-50 ft^2
Standard Warranty	limited lifetime	6 years		6 years - lifetime
Distributor Price	$740	$640	$740	$1,200+
Dealer Price	$990	$850	$990	$1,600+

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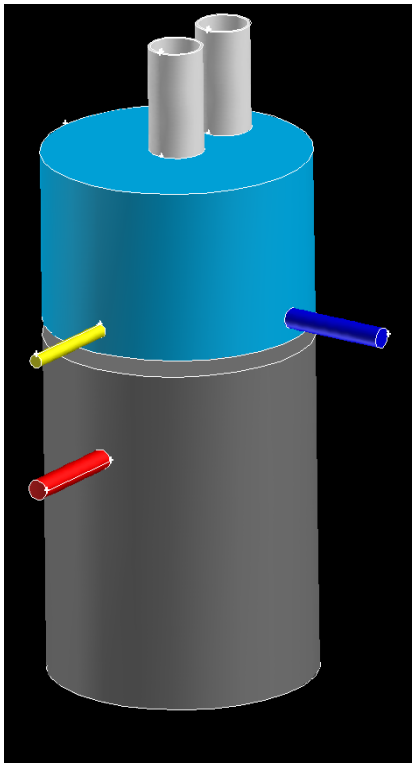
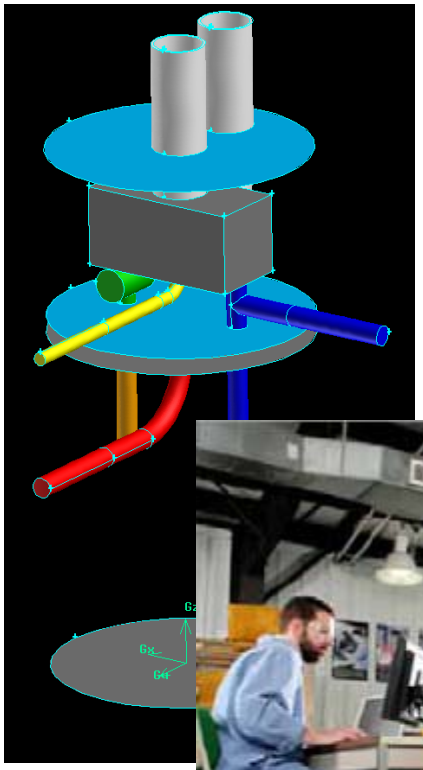
Figure 1: Hybrid WH Basic Flow Diagram

PIER Buildings Portfolio: HOT WATER

Hybrid Optimized Tankless Water Heater





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Themes for this solicitation : HOT WATER

Water heating is a significant energy consumer in California residences and businesses. Research should:

- Reduce cost of efficient gas water heating equipment
- Reduce cost of solar water heating
- Improve efficiency of hot water distribution systems.

PIER Buildings Portfolio: COMMERCIAL COOKING

INVESTOR'S BUSINESS DAILY
FRIDAY, JANUARY 12, 2007
THE NEW AMERICA

MIDDLEBY CORP. *Elgin, Illinois*

Restaurant Supplier Banks On Rocket Fryer To Eliminate Trans Fats

BY MARILYN ALVA
INVESTOR'S BUSINESS DAILY

Trans fats are the new health enemy. The experts tell us they raise bad cholesterol and lower good cholesterol, a combination that spells trouble for your heart.

Many restaurants are responding by voluntarily banning these hydrogenated fats from their fryers, even though they are convenient and cheap.

In December, New York City moved to make it illegal for restaurants to use trans fats in frying oils. Other cities are looking into taking similar action.

From a business sense, this trend is good news to Selim Bassoul. He's chief executive of **Middleby Corp.**[MIDD], a leading food- and disposed of more often, and that means added costs. the industry in regards to bringing new technology to the table — that is, the kitch-

Chef Paul Kahan uses Southbend cooking equipment, a Middleby brand, at his Blackbird restaurant in Chicago.

Middleby Corp.
middleby.com

Themes for this solicitation : COMMERCIAL COOKING

With natural gas use included , restaurants are the most energy intensive end use type. Many manufacturers are small shops without R&D budgets. Research should:

- Develop cost-effective commercial cooking equipment
- Partner with manufacturers
- Improve efficiency of commercial ventilation sytsems.

Possible Additional themes:

- **ZERO NET ENERGY BUILDING DEMONSTRATION**

  Utilities have major programs to demonstrate zero net energy buildings, which are also in the California Long Term Energy Efficiency Strategic Plan. Integration of energy efficiency, renewable energy and storage.

- **INFLUENCING BEHAVIOR**

  Choices and behavior are major factors of energy consumption. How can messages cost-effectively influence consumer choices?

Comments?

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"Research Powers the Future"

- Introductions
- Purpose of Today's Workshop
- PIER Background, Legislation and Policy
- California Energy Statistics
- Technical Research Areas
  - Assessment Criteria
  - PIER Buildings Portfolio
  - Your Input
- **Administrative Section**
  - **Buildings Program Solicitation Plans**
  - **BEST Solicitation Schedule**
  - **Administrative Objectives**
  - **Your Input**
- Wrap up

Solicitation Tentative Funding Allocation

Solicitation Title	CAM	Funding Source	Estimated Funding (In Millions)
Building Efficiency Systems and Technologies (BEST)	Golam Kibrya	Elect	$4.034
		NG	$6.529
		Total	$10.563
Building Energy Research Grant Program (BERG)	Chris Scruton	Elect	$1.000
		NG	$3.000
		Total	$4.000
Game Changer: ZNE/EE Building Integration Demonstrations	Chris Scruton	Elect	$5.000
		NG	$0.000

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Solicitation Tentative Schedule

Public Input Workshop	August 31, 2011
Release Program Opportunity Notice	November 2011
Pre-Proposal Workshop	Mid November 2011
Deadline to Submit Proposals	Mid December 2011
Notice of Proposed Awards	March 2012
Energy Commission Business Meeting Approval of Awards	June 2012

Solicitation Administrative Goals

1. This solicitation is primarily for private sector entities and those willing to use the CEC's T&C's
2. Maximum of 5 agreements
3. Applicants encouraged to form teams
4. Agreement Size Range: $1 to $5 million
5. Multiple projects in each agreement
6. Applicants encouraged to exceed minimum
7. PIER staff and others will evaluate each project
8. Projects will be ranked based on scoring criteria
9. Projects will be eliminated to fit agreement size target
10. Project proposals will be limited in page length

Your input

- Solicitation process?
- Contract development?
- Energy Commission Contract Management?

Chris Scruton

PIER Buildings End-Use Energy Efficiency

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Thanks for your ideas!