



PIER Buildings Efficiency Advisory Panel

Chris Scruton
California Energy Commission

June 24, 2011

PIER Buildings Program: Policy Drivers



PIER Buildings Program

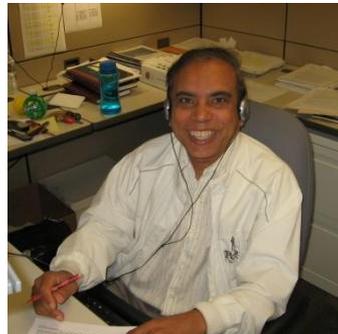
Who We Are



Brad Meister



Dustin Davis



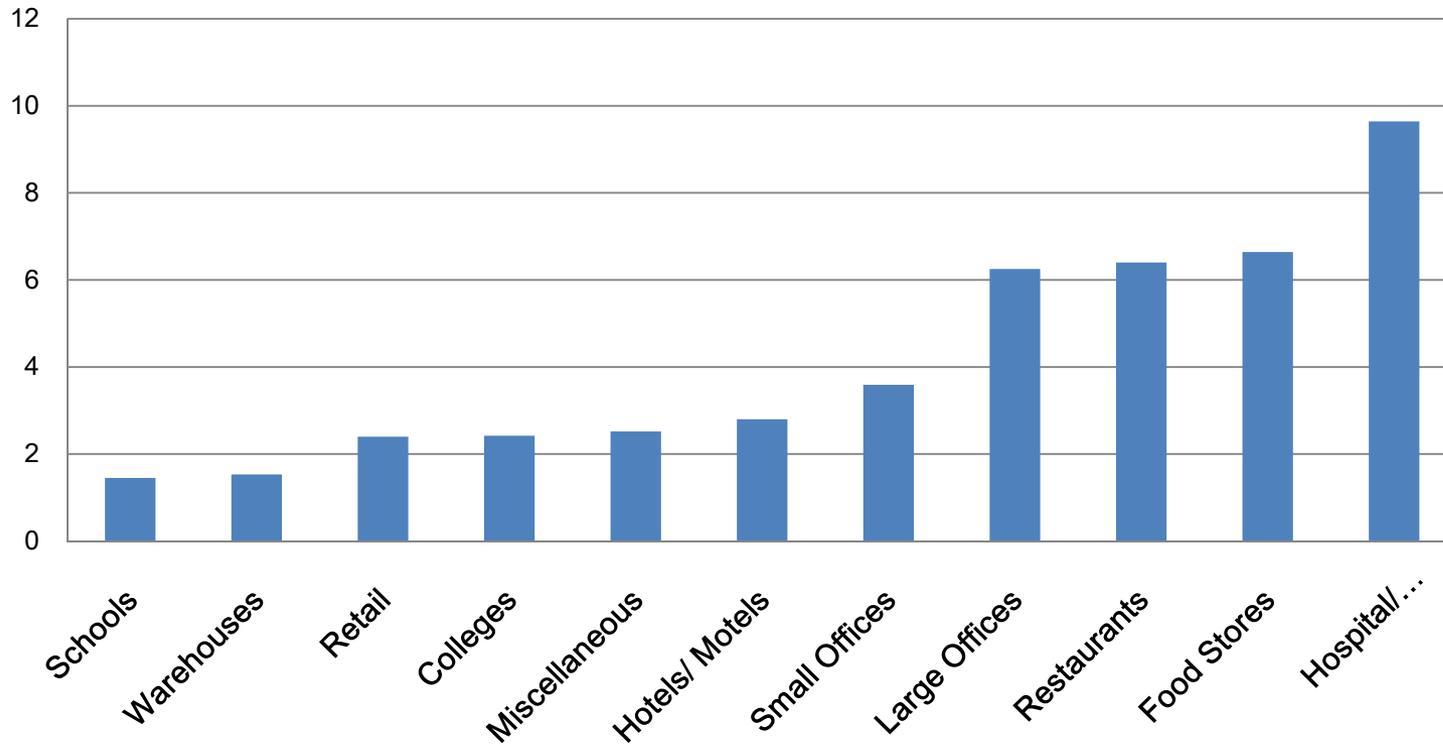
Golam Kibrya



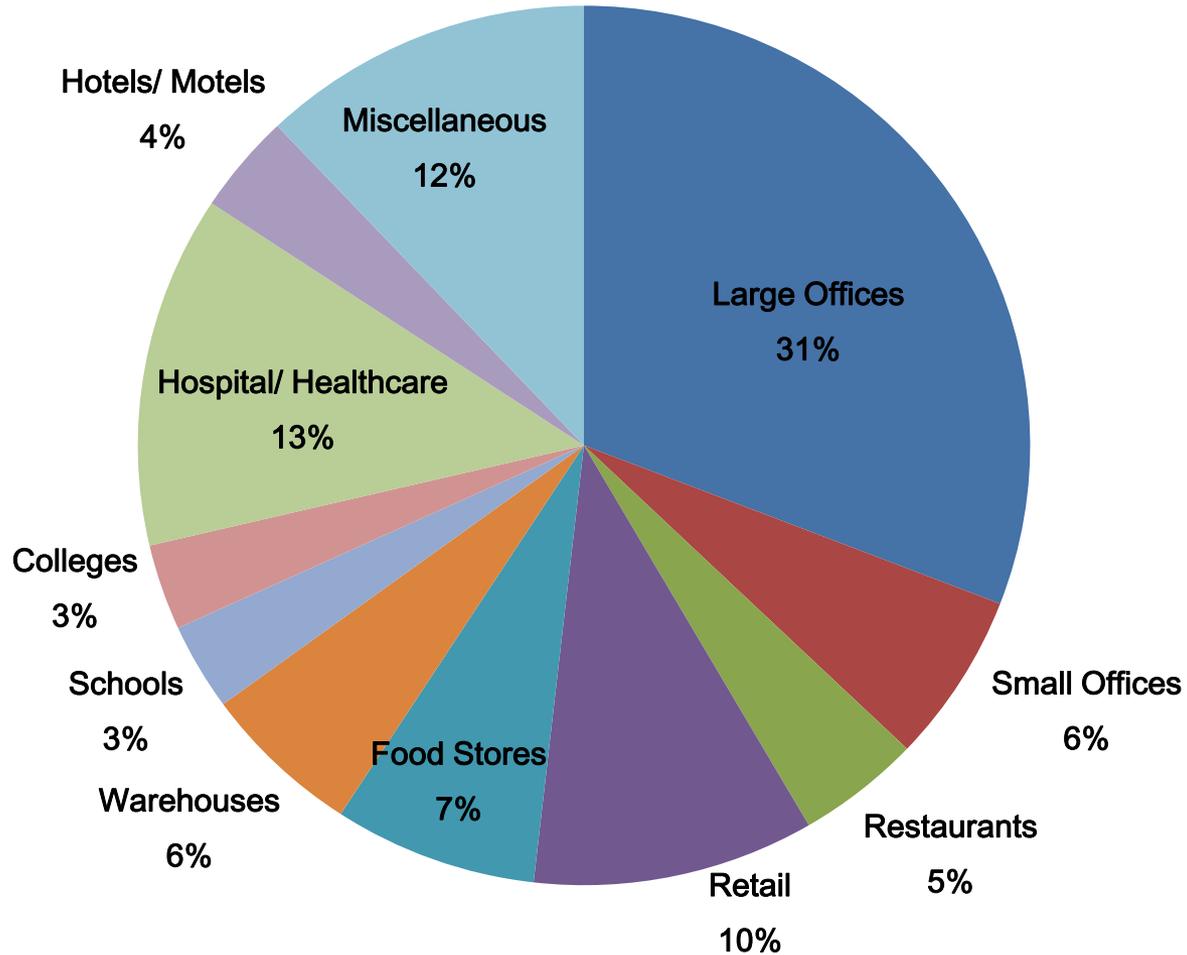
David Weightman

PIER Buildings Program: What we're targeting...

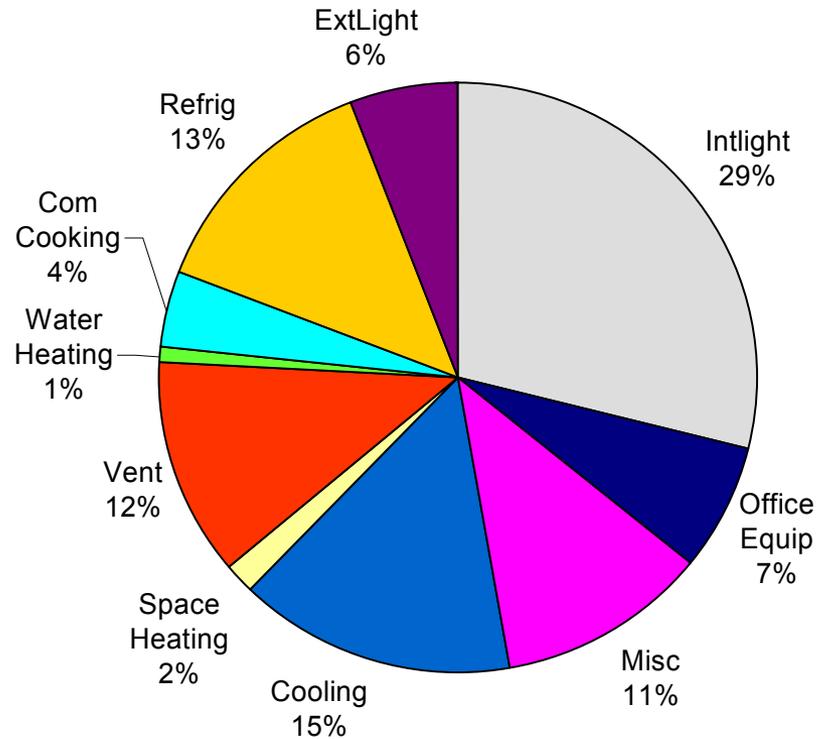
Overall Non-Res End Use Electric Intensity



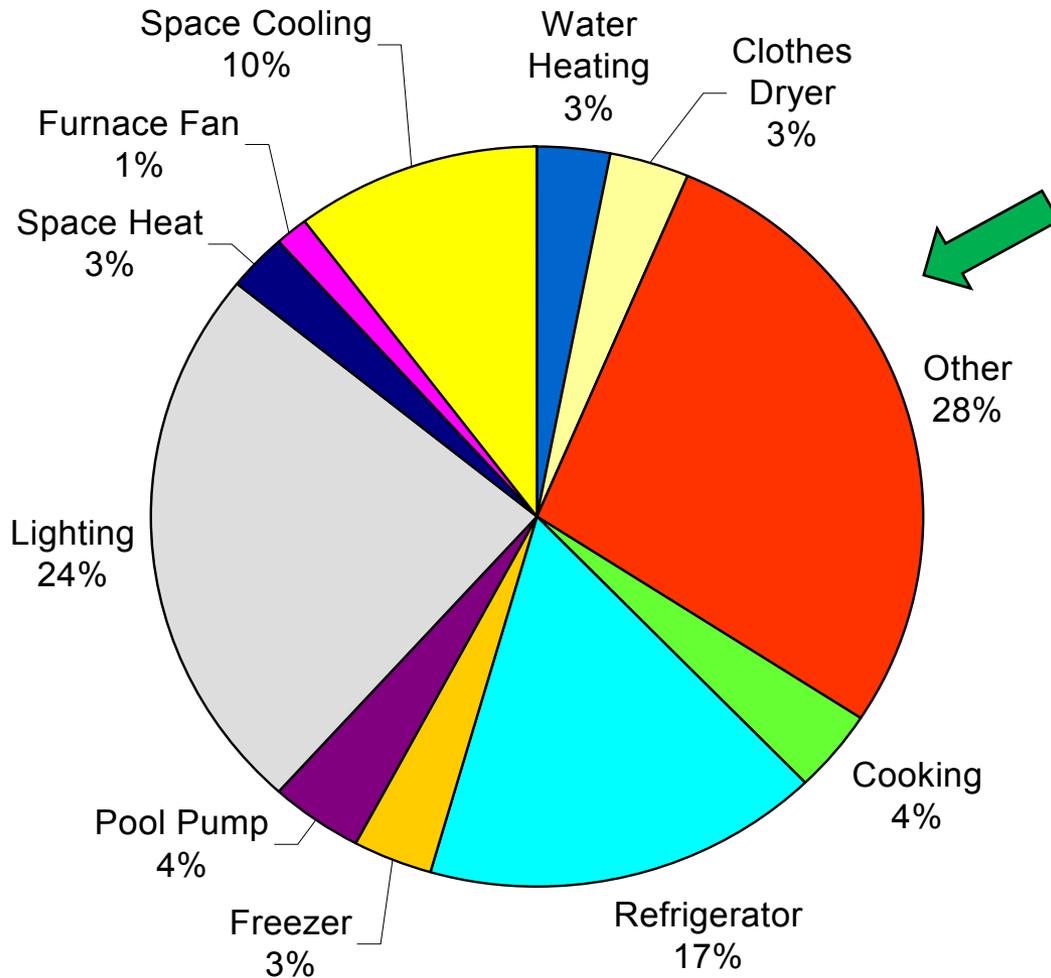
Non-Res Electric Consumption by End-Use Type



Commercial Electric Use



Residential Electricity Use



Plug Loads:
- Appliances
- Electronics

PIER Buildings Program

Most projects developed through competitive solicitation
next: example solicitation documents



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



Selection Criteria:

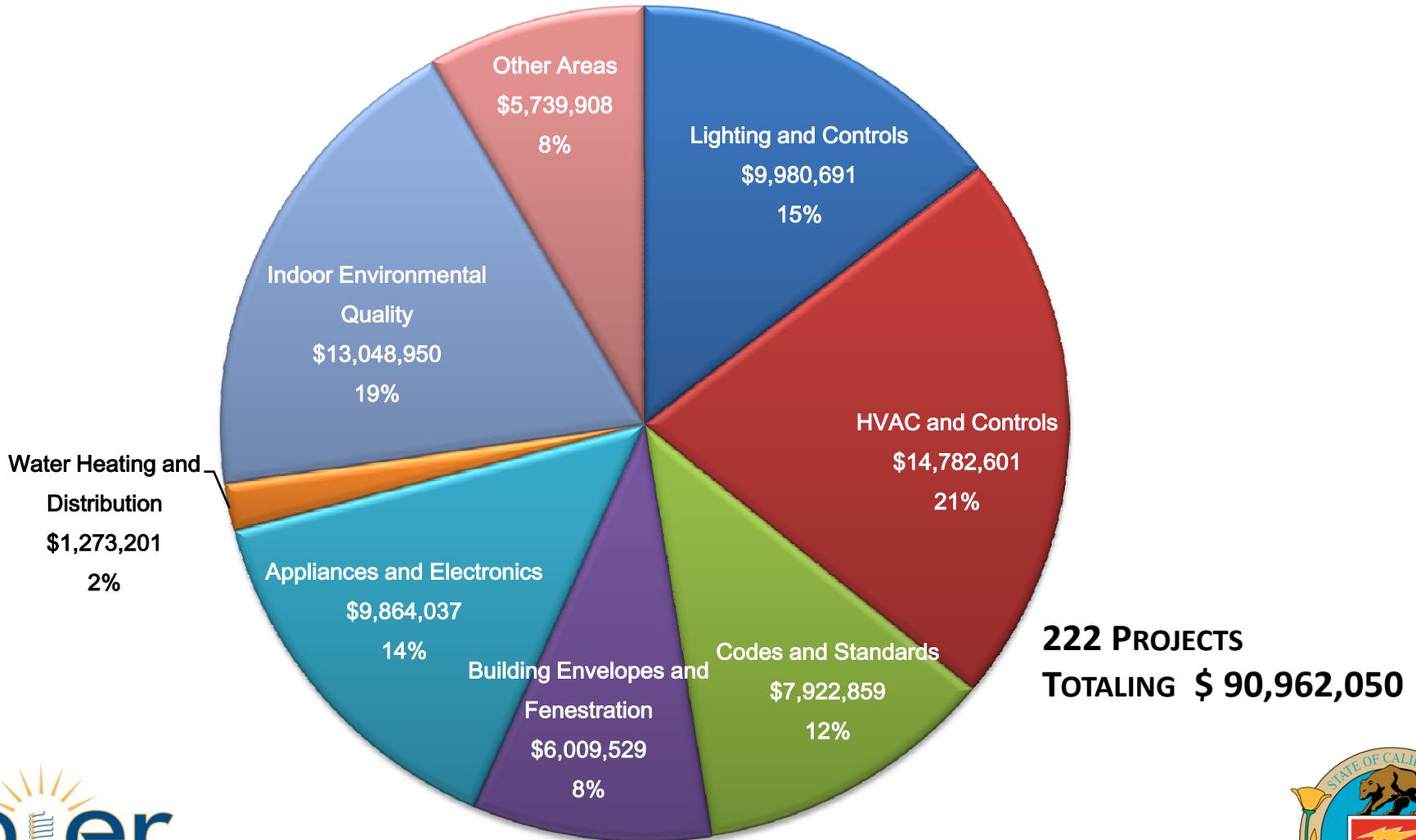
1. Does proposal address an important energy-related issue?
2. Is the issue not adequately addressed by competitive or regulated markets or by existing research?
3. Could the proposal significantly impact the issue?
4. Are the team members well qualified to carry out the proposed research and to follow through to marketplace? (commercialization, regulatory and rule making, etc)
5. Are the budget and schedule appropriate for the project?
6. Are market connections adequate?
7. Is there cost share at an appropriate level?

PIER Buildings Program

next: What PIER Buildings has funded.



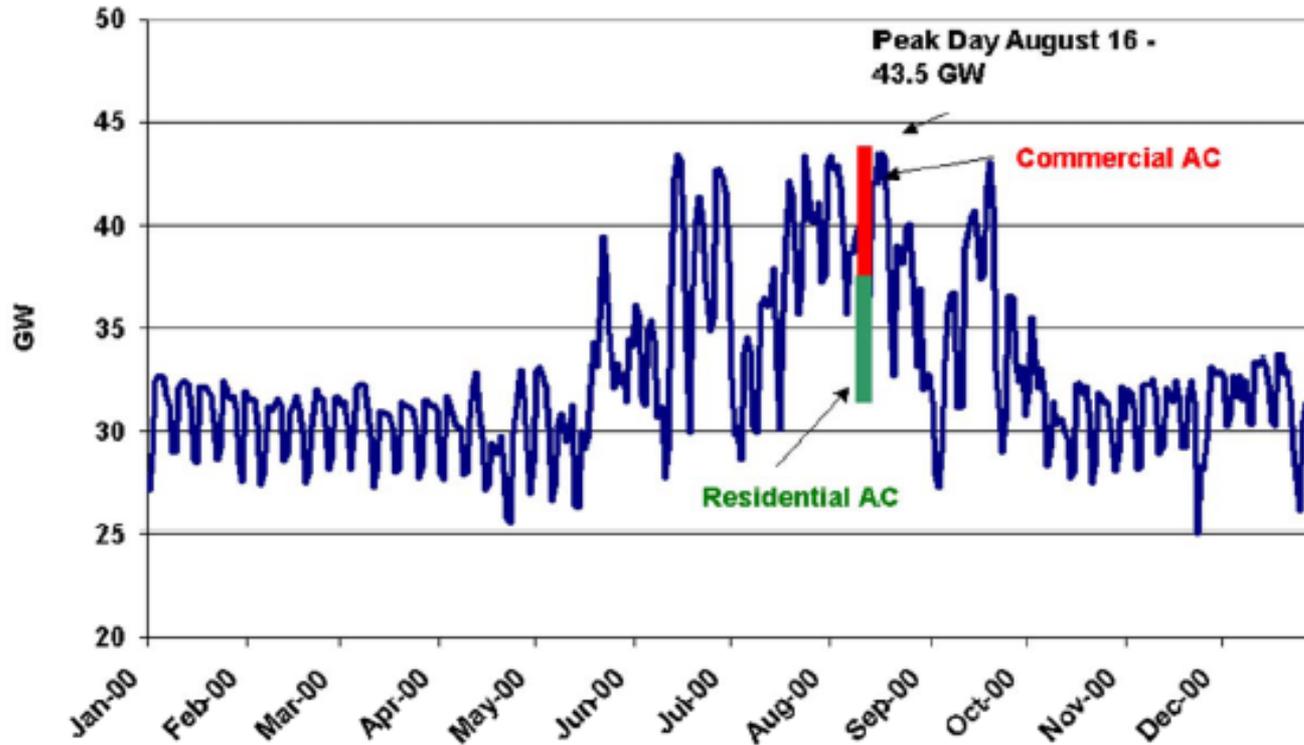
PIER Buildings Funding- Electric 2005-2011



PIER Buildings Portfolio:

Why Air Conditioning is Important

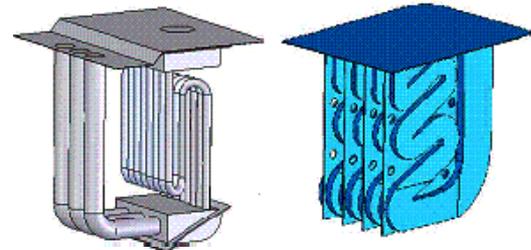
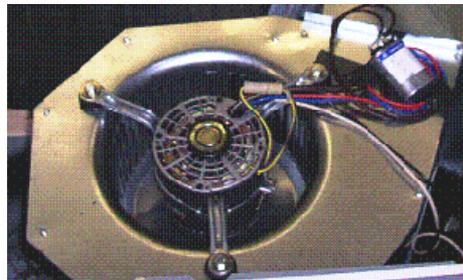
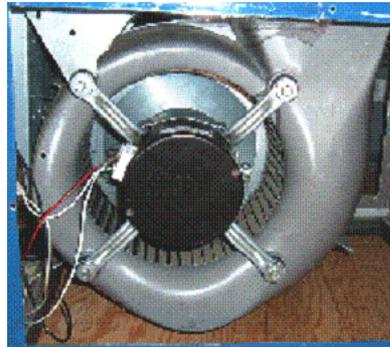
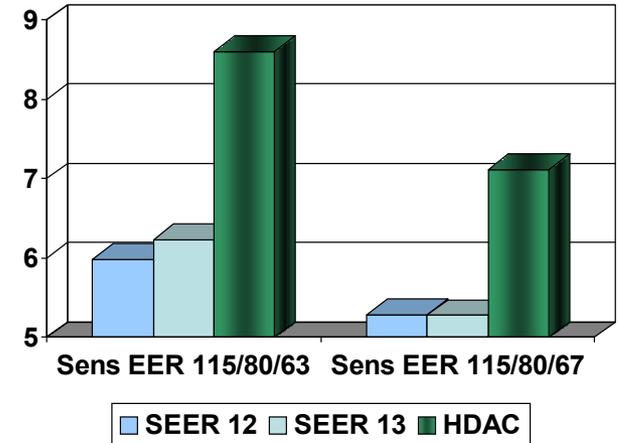
Cal ISO Daily Peak Loads
January 1, 2000 - December 31, 2000



PIER Buildings Portfolio: Some highlights...HVAC

Hot Dry Optimized Air Conditioner:

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



PIER Buildings Portfolio: Some highlights...HVAC

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

University of California, Davis
WCEC
WESTERN COOLING
EFFICIENCY CENTER

RESEARCH • INNOVATION • PARTNERSHIP



AquaChill
Ultra-Efficient Evaporative Condensing System
by



Cooling and Fresh Air System



PIER Buildings Portfolio: Some highlights...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.

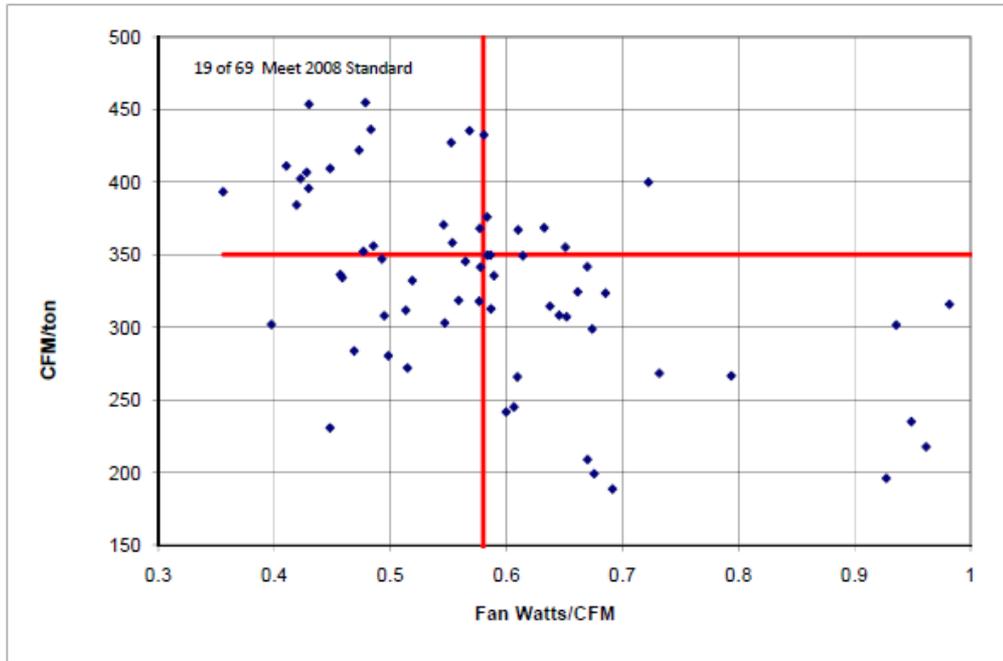

PUBLIC INTEREST ENERGY RESEARCH
"Research Powers the Future"



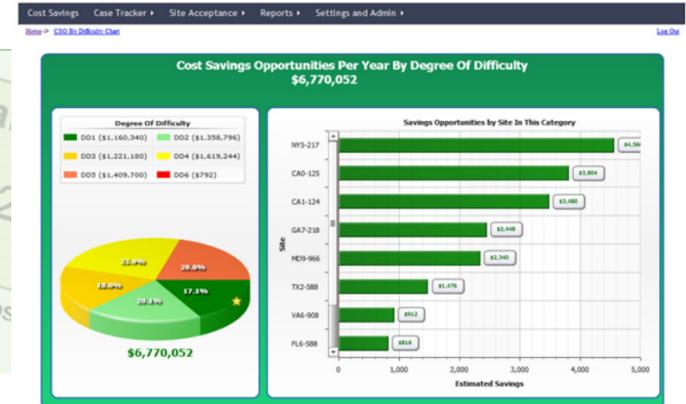
PIER Buildings Portfolio: Some highlights...HVAC Field Investigations

Could **airflow** be a problem in these ducts?

Furnace Fan Air Flow and Watts



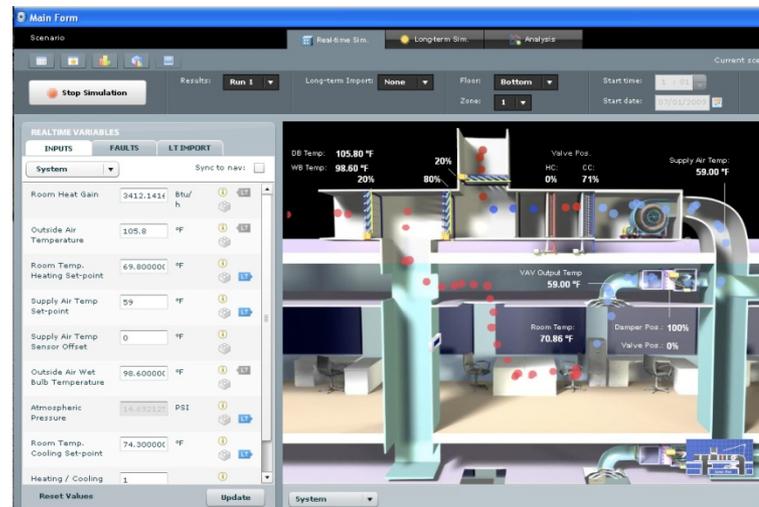
PIER Buildings Portfolio: Some highlights...HVAC Automated Diagnostics



PIER Buildings Portfolio: Some highlights...HVAC Training

LearnHVAC:

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



Proposed initiatives...HVAC

Improved diagnostics for small systems?

Improved efficiency of conventional gas furnaces?

Improved fan efficiency? Reduced air flow resistance?

Training for technicians and inspectors?

More field study?



PIER Buildings Portfolio: Some highlights...Lighting California Lighting Technology Center

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



PIER Buildings Portfolio: Some highlights...Lighting Integrated Office Lighting System



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

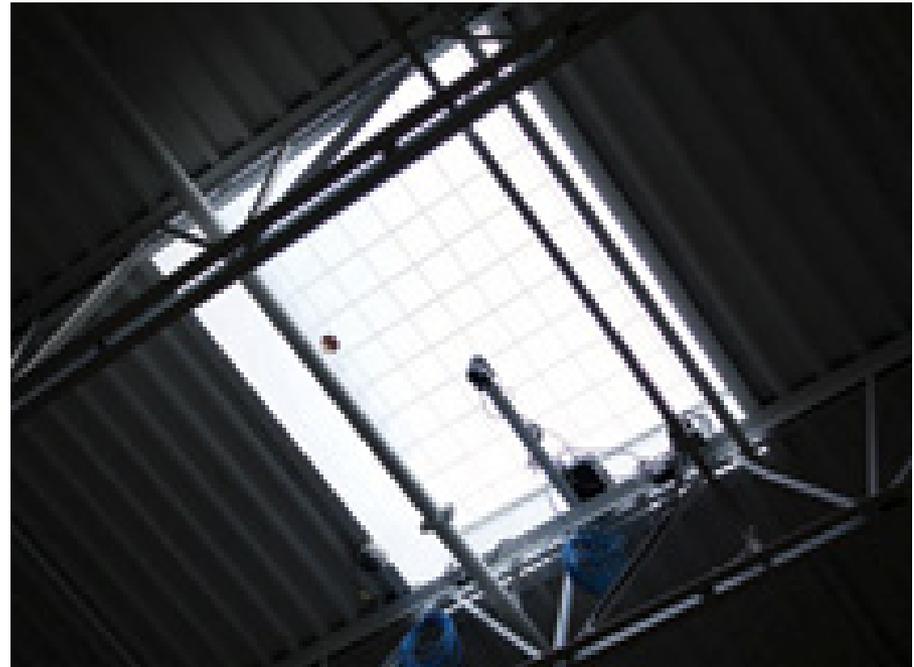


FINELITE

PIER Buildings Portfolio: Some highlights...Lighting Dual-loop photo sensor dimming



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



PIER Buildings Portfolio: Some highlights...Lighting Advanced Plasma Lighting



- Topanga
- High-output
- More efficient than LED, fluorescent, HID
- Luminaire developed



Proposed Initiatives...Lighting

Daylight integration?

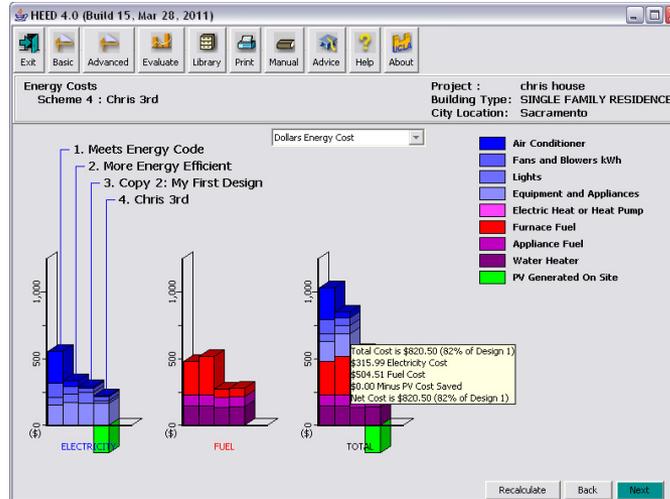
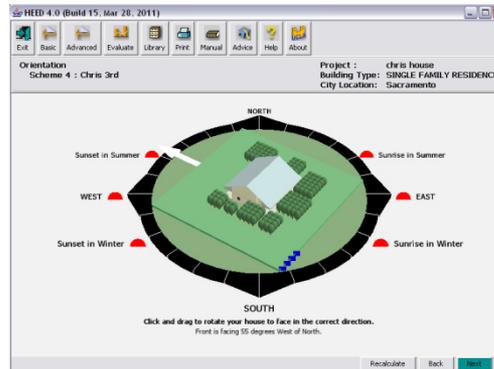
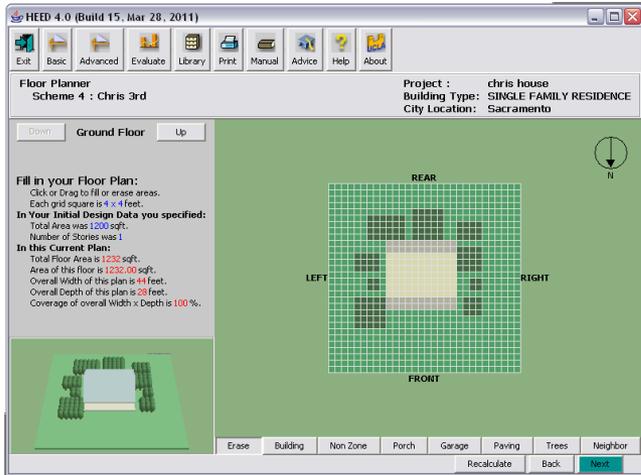
Advanced occupant awareness?

Develop advanced lighting sources? Fixtures?

Performance appraisal of lamps and fixtures ?



PIER Buildings Portfolio: Some highlights...Envelope and Design HEED (Home Energy Efficient Design) Murray Milne UCLA : Early phase design iteration



PIER Buildings Portfolio: Some highlights...Envelope and Design Heat Island Group: Cool Roofs



TIMBERLINE
COOLSERIES
ENERGY SAVING SHINGLES



[Click Here for Details](#)



[Click Here for Details](#)



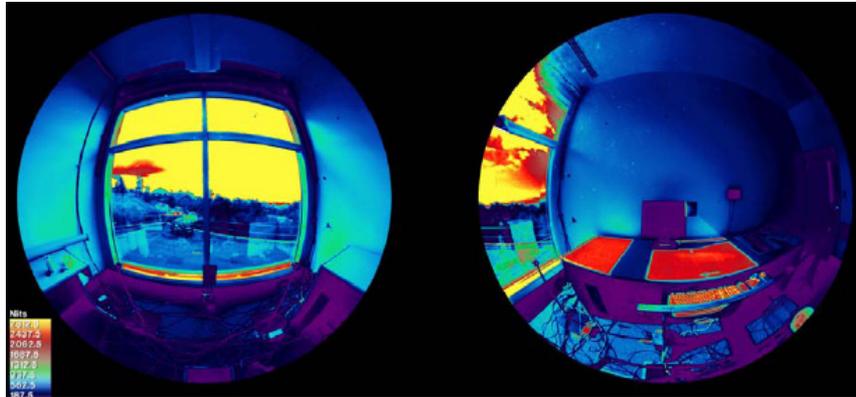
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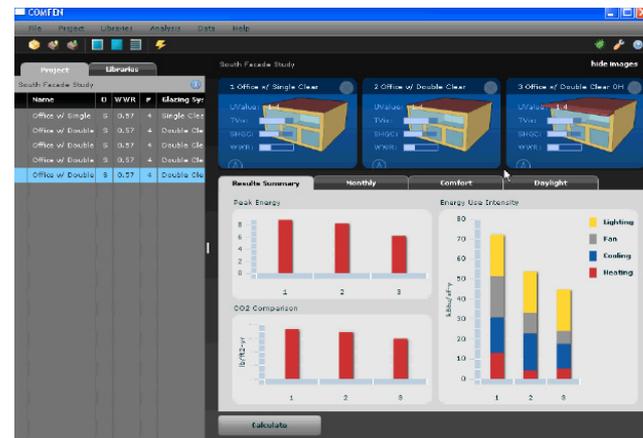
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PIER Buildings Portfolio: Some highlights...Envelope and Design Windows



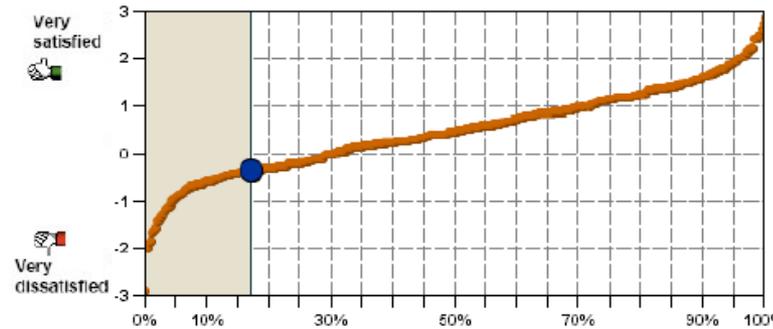
LBLN Windows Testbed



PIER Buildings Portfolio: Some highlights...Envelope and Design Center for the Built Environment: Whole Building Performance

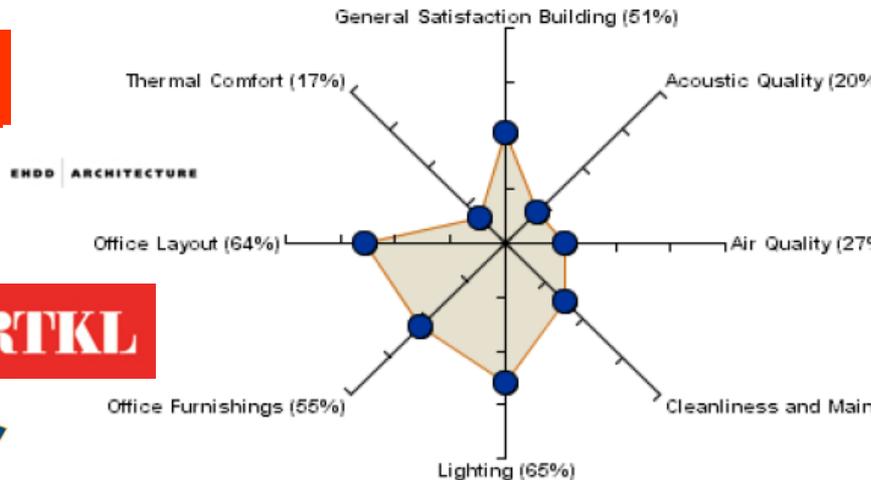


Air Quality
17%
Percentile



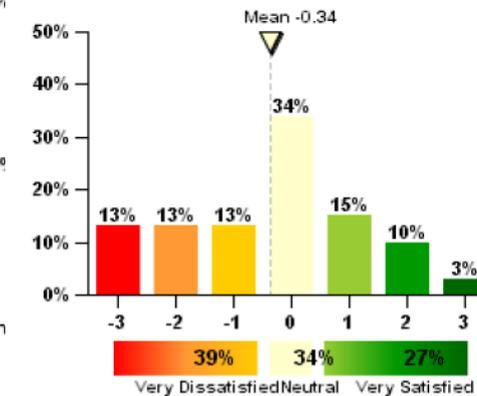
-0.34
Mean Response
27%
Satisfied

Satisfaction in Core Survey Categories



2.2 Air Quality

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



N=150

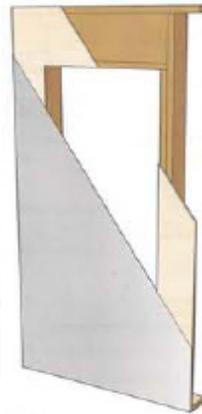




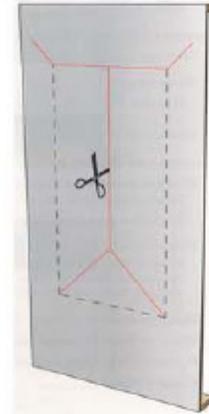
Low Harriman



Neil Leslie



Step 1
Wood frame wall with OSB and housewrap



Step 2
Cut modified "I" in housewrap



Step 3
Fold housewrap in at jamb 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

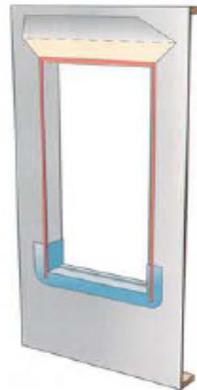
A CALIFORNIA BUILDER'S GUIDE
TO
REDUCING MOLD RISK

A REPORT TO THE CALIFORNIA ENERGY COMMISSION

Contract Number 500-03-013

April 12th, 2006

Google it!



Step 5
Apply sealant at jamb 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.

Illustration courtesy of Joseph Lefebvre, PhD.

PIER Buildings Portfolio: Some highlights...Envelope and Design LBNL: Indoor Air Quality ASHRAE 62



PIER Buildings Portfolio:

Proposed Initiatives: whole building design and performance

Develop quick measurement for envelope ratings?

Cost effective envelope retrofits? Construction techniques?

Better IAQ/IEQ test methods? Design tools?

Passive house spec (or equivalent) for California climate?

IAQ and energy benefits from Cool Community measures?



PIER Buildings Portfolio: Some highlights...Consumer Electronics



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 hybrid 19 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

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



MacBook Air: 5.7 watts idle

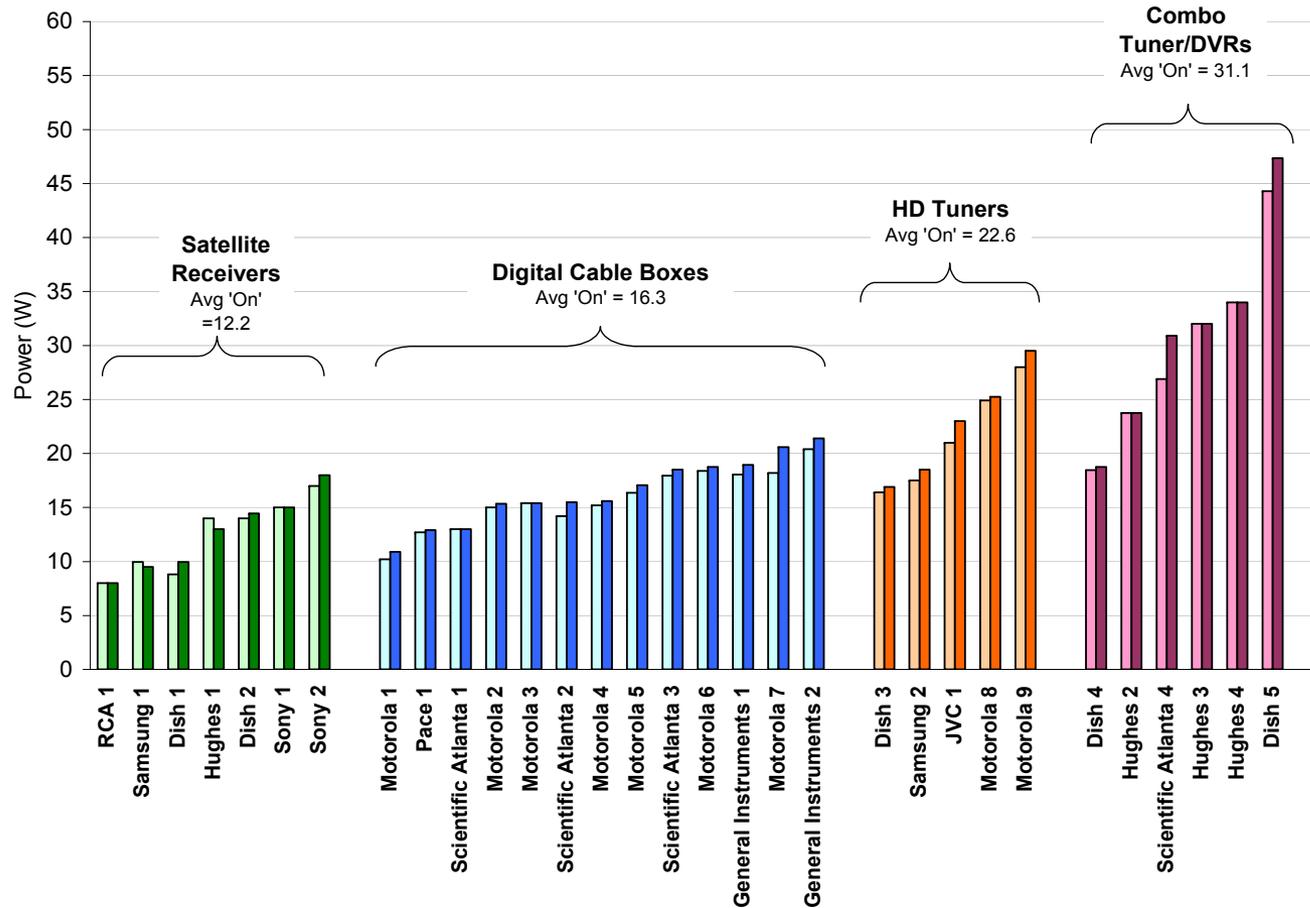
Lenovo X301: 10 watts idle

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

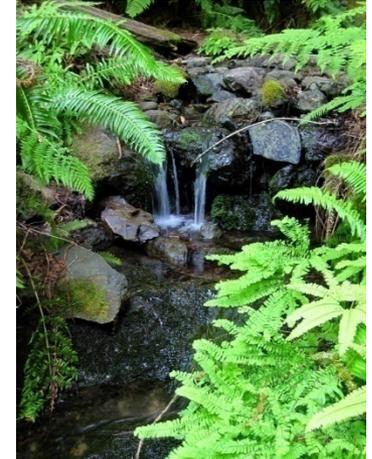
Set Top Boxes Drawing Nearly Constant Power

Power Use of Set Top Boxes When 'Off' and 'On'

Lighter color indicates 'Off' mode - Darker color indicates 'On' mode



PIER Buildings Portfolio: Proposed initiatives....Consumer Electronics



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.

UC Irvine now funded to work on plug-load energy efficiency

EPRI, Ecos, LBNL and others continue excellent work in this area.



First New idea-Game Changer: ZNE Building Demonstration

Background: Utilities and others have programs to develop high efficiency/zero net energy buildings but there may be gaps, or funding may be limited.

Goal: Fund transformational demonstrations that will help accelerate the development of ZNE buildings and communities.

Objective: Assist in deployment of advanced designs and energy efficient technology to leverage efforts of utilities and others in development of zero-net or very high efficiency buildings.



ZNE Building Demonstration

Proposed initiative:

- Demonstrations of ZNE/high efficiency bldgs/ communities
- Integration of suite of advanced energy efficiency, renewable energy and other technologies
- Leverage efforts of utilities and others in development of zero-net or very high efficiency buildings/communities
- Demonstrations for planned buildings and renovations, residential/multi family and low income and/or community scale



ZNE Building Demonstration:

- Should the focus be existing or new construction? Commercial or residential?
- What are suggestions for involving low income housing and other under served markets into the demonstrations?
- Though the desire is to integrate as many advanced technologies, what should be the priority emphasis?
- How would you measure success in a demonstration?
- Are there opportunities to collaborate or synergize? If so, with whom?



Second idea: Behavior Research

Background: Attitudes towards energy use can have a huge impact on consumption and efficiency.

Goal: improve energy efficiency by changing outlook on consumption and energy use.

Objective: Discover through research effective techniques to promote energy efficiency awareness and concern.

Robert B. Cialdini
Department of Psychology
Arizona State University



Descriptive Social Norm (3 Thieves)



No-sign Control



Lone Thief

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Thanks for your ideas!

