

Campus Views and Activities on energy efficiency needs



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Points to Cover Today

- *Why me?*
- *The University view*
- *R&D—State and utilities*
- *What we're doing*
- *Broader applications*



Why Me?



- *Where I work*
- *What that is*
- *What I do*
- *People I work with*



Campuses and Energy Efficiency



- State's green building requirements
- State's zero-energy goals
- Campuses as innovation leaders
- Constant new construction
- High priority on efficiency in rehabs
- CEC loans and technical assistance
- Tie-in with seismic retrofitting

Campuses and Utilities

Close partners for efficiency

- Utility energy efficiency incentives
- Emerging Technologies programs
- Campuses as test sites
- Major effort to reduce power bills
- Solar/efficiency opportunities



What's the PIER Program?



- R&D program at CEC
- Electric \$62MM/yr, gas \$18MM
- Funded by utility bill charge
- Broad range of topics
- 300-400 active projects
- Focused on improving energy supply impacts and uses

Improved Buildings
Industry, Agriculture, Water
Power Delivery
Advanced Generation
Renewables
Clean Transportation
Environmental Issues
Energy Systems Integration
Innovative Small Grants



Bridging over the “Valley of Death”

...Getting from the lab to the real world

CEC-PIER Program, managed by CIEE/UCOP

- *with CLTC for Lighting and AEC for HVAC*

Partnering with Campuses

- *improves RD&D process and accelerates adoption*

Pipeline of new technologies

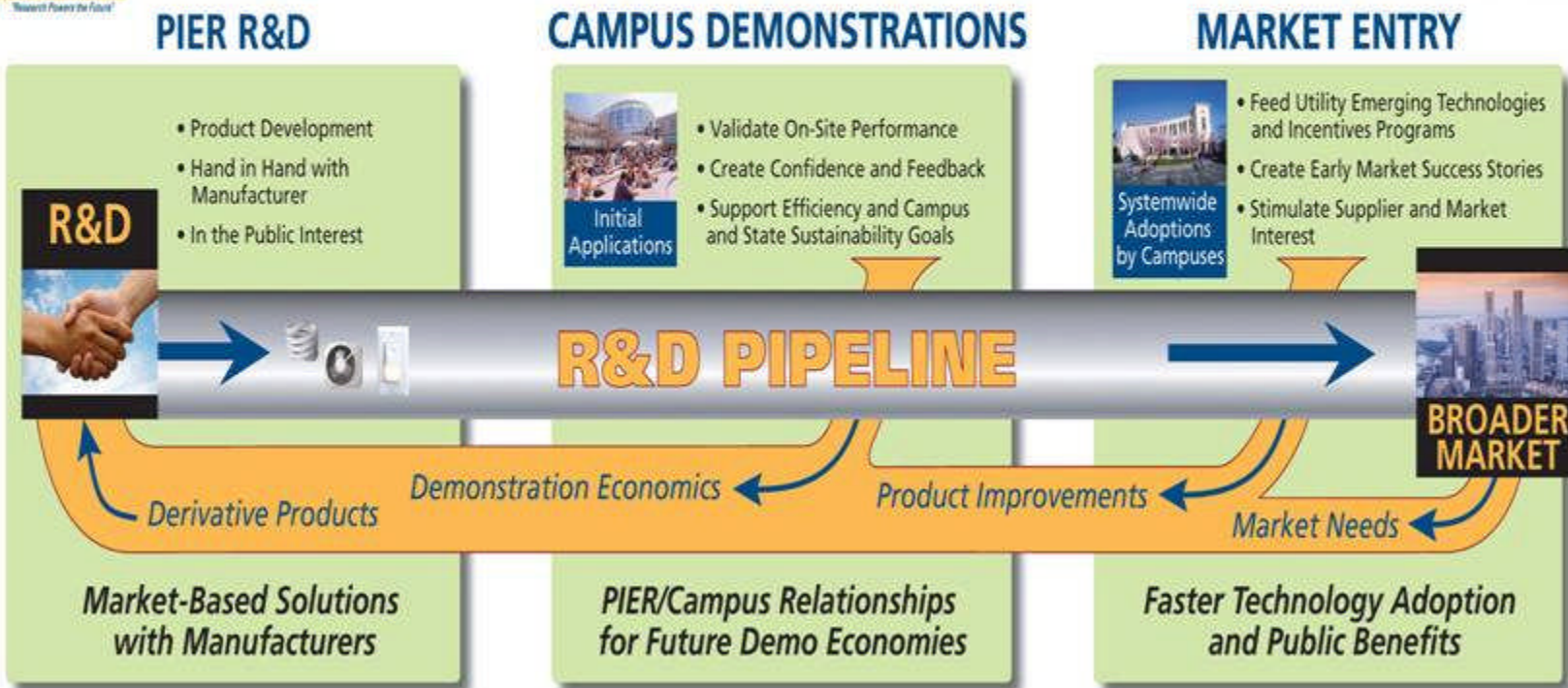
- *for campuses, utility programs and state facilities*



New Products Tested on Campuses



CAMPUS ENERGY EFFICIENCY INNOVATIONS PROGRAM ...successful R&D delivery



2008-2010 Program Plans for moving PIER technologies into use

- Continue to evaluate and demonstrate new PIER technologies 2007-2010
- Expand to Campus Auxiliaries
- Expand to New Construction
- Pilots with DGS and CA Green Buildings Initiative
- Pilots with Silicon Valley Mfrs. Leadership Group (SVLG))



Potential Impacts

(just for California University Campuses)

...for only seven of the PIER innovations:

- Energy savings of nearly 50 million kW/yr
- Atmospheric carbon reductions = 2,250 cars removed

Many times more for all commercial buildings



Many Campus Demonstrations

Bi-Level Stairwell Light	8
Smart Bathroom Switch	2
Smart Bathroom Fixture	2
Classroom Ltg System	3
Retrofit Downlights	1
Hybrid Outdoor Fixture	2
Outdoor Cutoff Fixture	1
SC Photocell/Dayltg	2

VS Exhaust Hood Control	1
VAV Air Handler Control	3
Airflow Measuremt/Control	2
Large Duct Sealing	2-3
Pkgd Unit Diagnostics	Need site
Load Shed Ballast	1
DALI Ltg Control Devices	In 2007
<i>...and more coming!</i>	

30 Demonstrations, on 15 Campuses



Results and Benefits

- Case studies, fact sheets, reports, specifications, tools
- Leveraging user resources to get more done, better
- Accelerating adoption in campus & commercial buildings
- Results feed into 2006-2008 CPUC Partnership Program

Leads to derivative technologies, group purchases, tipping points, pipeline to Emerging Technologies programs and other market segments

PIER and New Technologies

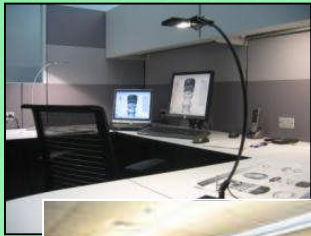
PIER Pilot Demo Program at CCC's

- Demonstration projects complete; proven new products available
 - *Three Lighting innovations*
 - *Demand Control Kitchen Ventilation*
- PIER Partnership works with CCC Partnership to develop projects with new PIER technologies



PIER Products in Lighting

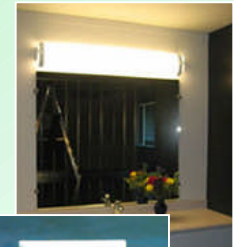
Major energy savings, early paybacks



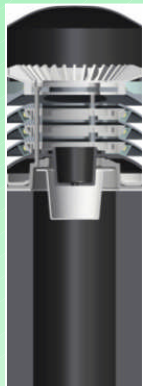
IOLS & ICLS – energy savings well below Title 24. **Available now**



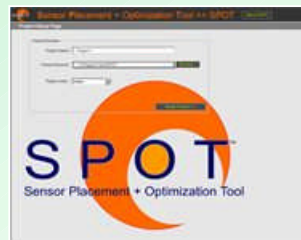
Smart Switch and Fixture – LED nightlight, occupancy sensor; 45-70% energy savings. **Available now**



Bi-Level Stair Fixture – Reduces light when unoccupied. **Available now**



LED Bollard – New Product Showcase item at Lightfair 2007. **Available now**



SPOT – Optimal photosensor placement tool. **Available now**

Retrofit CFL Downlight - <1 yr payback. **Available now**



PUBLIC INTEREST ENERGY RESEARCH
"Research Powers the Future"

PIER Products in HVAC

More big energy savings in major energy uses



**Speed Control for
Kitchen Exhaust –**
Over 50% energy
savings in demo.
Available now

DART™ –
Wireless
conversion of
CV to VAV
Available now



SAV with InCITE™ –
Improved VAV control
system; ~25%
energy savings
shown

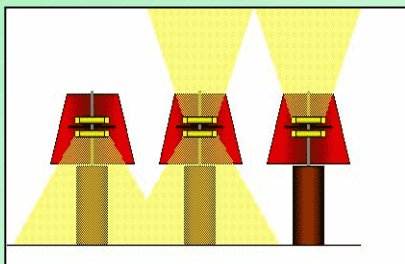
Available now



More PIER Innovations Coming!



Smart Parking Lot Fixture –
Fall pre-demo with partners
Gardco and Lithonia.



Consumer Torchiera –
Design modifications.

Smart Wall Pack –
All LED version
w/sensors (late
fall). **SMUD demo**



Hybrid LED Porch Light –
Big box retail agreement
pending.



Load Shed Ballast–
With demand control,
fast payback



Other Products On the Way

- ★ EEM-EAM Energy and Asset Monitoring Program
- ★ DART – Discharge Air Regulation Technique
- ★ Hybrid Fixtures for Bathrooms/Healthcare
- ★ DALI lighting devices with NEMA
- ★ Advanced VAV Design Guidelines
- ★ Hot/Dry Climate Air Conditioners
- ★ AHU Diagnostics to retrofit with existing EMS

...and other PIER RD&D efforts “in the pipeline”

Some to be available this year



Active Outreach to Users

- ▶ Demonstration evaluation reports/summaries
- ▶ Regular program status communications
- ▶ Displays at relevant conferences
- ▶ Site “sales” visits, calls, assistance
- ▶ Group purchase initiatives to reduce prices
- ▶ Website with technologies, reports, status

<http://ciece.ucop.edu/>



Looking Farther Ahead

Lighting California's Future (by 2010)

- *Tubular Daylight Device Diffuser Metrics*
- *Two Demand Response Projects (powerline, utility signals)*
- *Wireless Controls with Sensors*
- *Retrofit Classroom Lighting*
- *Four LED Projects (downlights, fan lights, sconce)*

Daylight Plus (by 2010)

- *Daylight Metrics*
- *Achievable Office Daylighting*
- *Retail Re-visioning*
- *Lighting and Health*

High Performance Glazing & Façades (by 2009)



Energy Use in Buildings

<i>Sector</i>	<i>Quads '05</i>	<i>Percent</i>	<i>Past 50 years</i>
Residential	21.2	21.3%	+307%
Commercial	17.5	17.6%	+463%
Industrial	33.2	33.3%	+183%
Transport	27.8	27.8%	+306%
TOTALS	99.7	100%	

Highest Growth—Commercial Buildings

Also very high peak demands and variability

Urgent need for improved energy performance



Building Bridges to the Market

- ✓ **Integrated business/technical approach**
- ✓ **Variety of new technologies available now**
- ✓ **More in the pipeline**
- ✓ **Close collaboration with manufacturers and utilities**
- ✓ **Expand at campuses and apply to other sites**



...More Effective Public Goods R&D



Summary

State's colleges leading in energy efficiency

State mandates and partnerships with CEC-PIER and utilities

Advanced technologies from PIER, more coming

Big savings and other benefits shown at UC and CSU campuses

Results distributed widely

Campuses, utilities, state agencies and businesses

Accelerated application

Feeding into the CPUC Partnership Program for 2008-2010

Applicable to thousands of commercial buildings

PIER products entering mass market for broad use



Questions? Ask Anytime!



*Thanks for
your interest in
our efforts!*

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