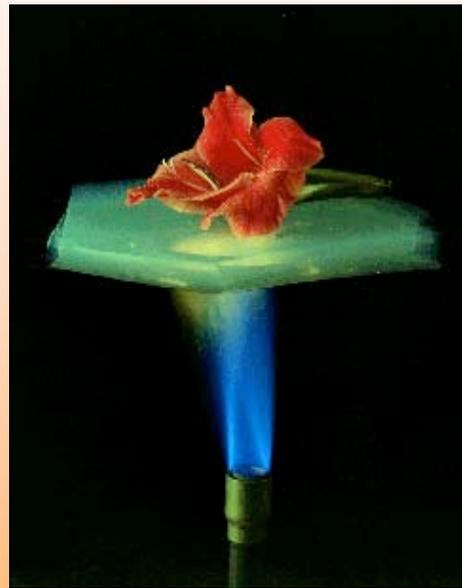


Linking Energy Management and Risk Management: Tapping Win-Win Synergisms

Why Insurance Companies are Promoting Energy Efficiency



Evan Mills, Ph.D.

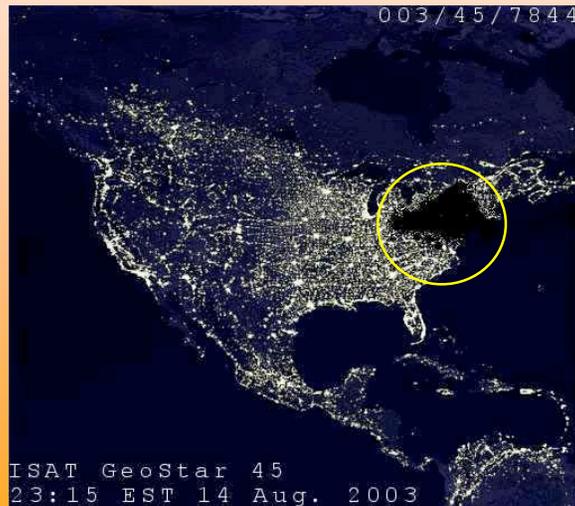
Lawrence Berkeley National Laboratory

Presentation at Sustaining the Future

PCEA Conference • 26 September 2003



The End of the Age of Innocence: “Risk Management” becomes a household word



Why Look at Linkages with Insurance & RM?

- **Adverse risk implications can scuttle an energy-efficiency project; benefits can be a boon!**
- **Risk management has vastly more corporate status than does energy management**
- **Common goals can yield lower implementation costs**
- **Insurers increasingly concerned about rising disaster-related losses due to global climate change**

Physical Perils Addressed by Energy-Efficient and Renewable Energy Tech's & Strategies

(78 technologies & procedures)

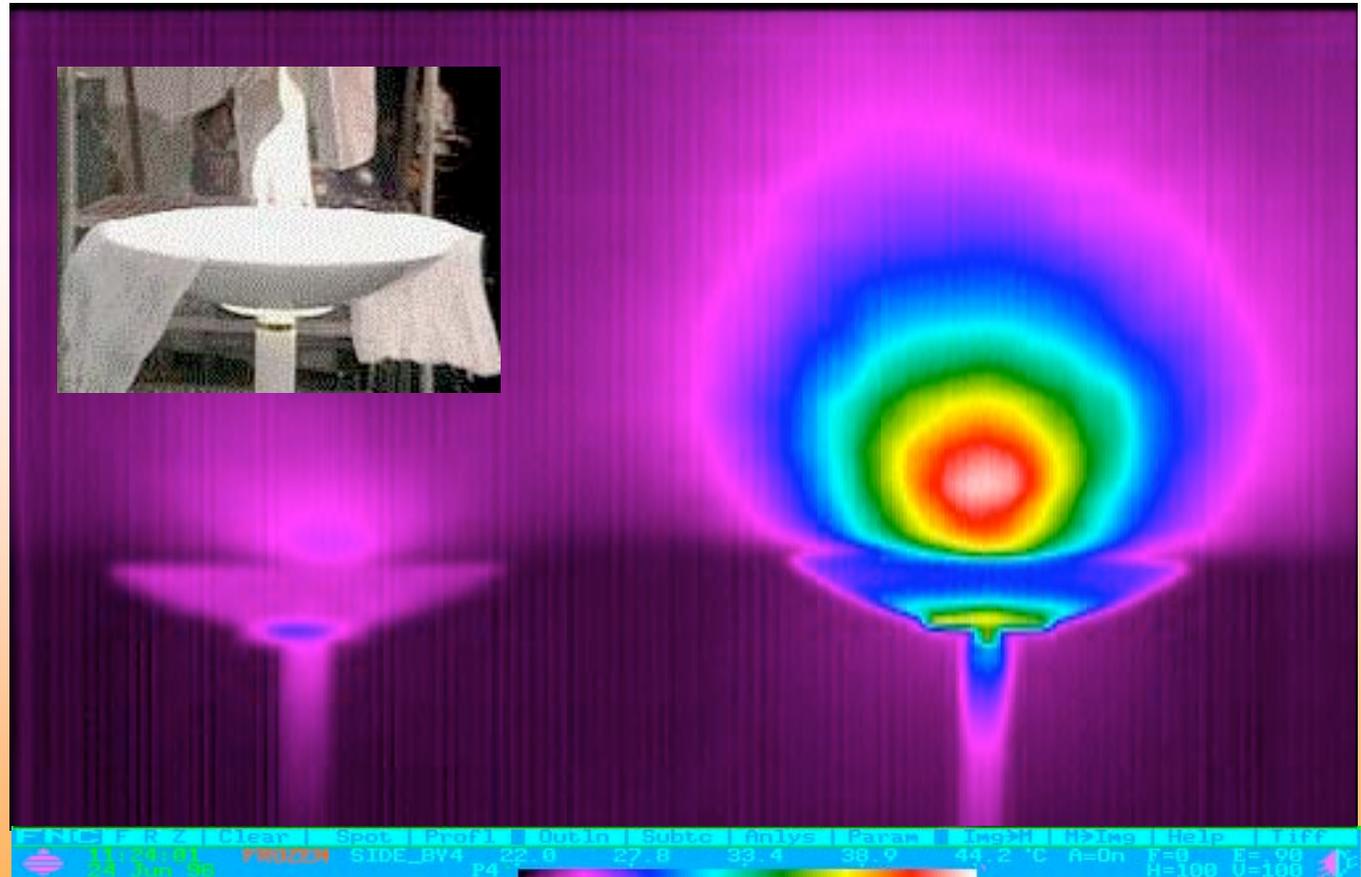
	Number of measures offering benefit ¹
Physical Perils	
Extreme Temperature Episodes	16
Fire & Wind Damage	38
Home or Workplace Indoor Air Quality Hazards	38
Home or Workplace Safety Hazards	21
Ice & Water Damage	17
Outdoor Pollution or Other Environmental Hazard	17 ²
Power Failures	35
Theft and Burglary	6

Insurance Coverage Addressed by Energy-Efficient and Renewable Tech's & Strategies

	Number of measures offering benefit ¹
Insurance Coverage — Commercial Lines	
Boiler & Machinery	15
Builder's Risk	4
Business Interruption	21
Commercial Property Insurance	36
Completed Operations Liability	14
Comprehensive General Liability	45
Contractors Liability	14
Environmental Liability	12
Health /Life Insurance	39
Product Liability	5
Professional Liability	19
Service Interruption	21
Workers' Compensation	35
Insurance Coverage — Personal Lines	
Health /Life Insurance	35
Homeowners Insurance	26

Efficient Torchiere Light Fixtures Reduce Fire Risk

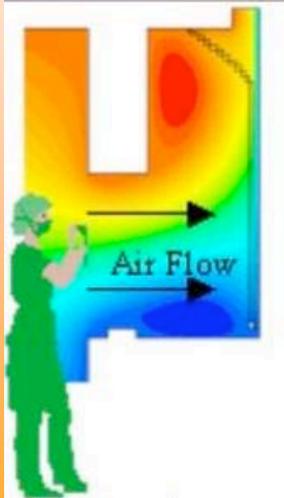
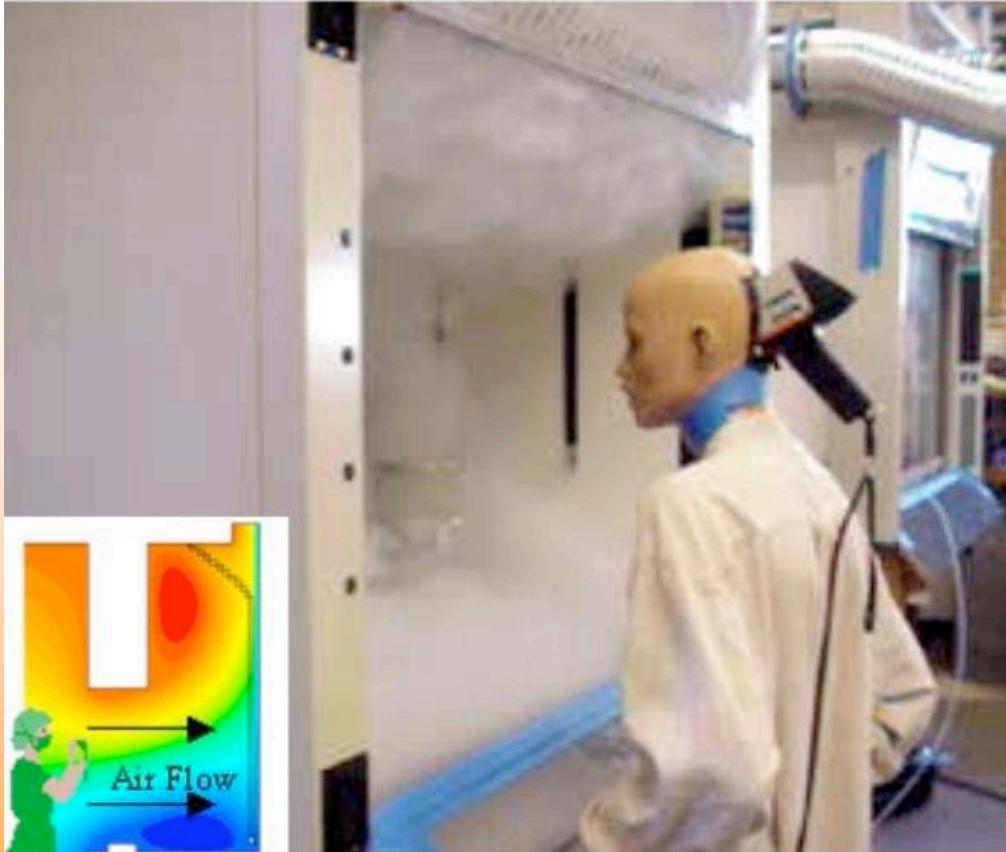
- Compact fluorescents are low-temperature light sources
- Halogen fixtures caused 350 known house fires, plus >100 in colleges



38W 2D CF Bulb

300 W Halogen Bulb

Laboratory Fume Hoods to Enhance Workplace Safety

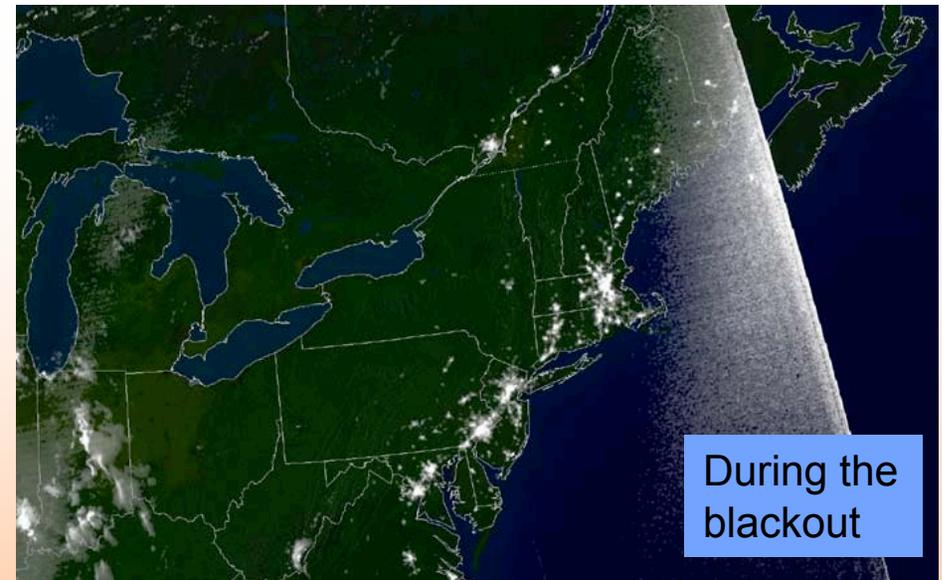
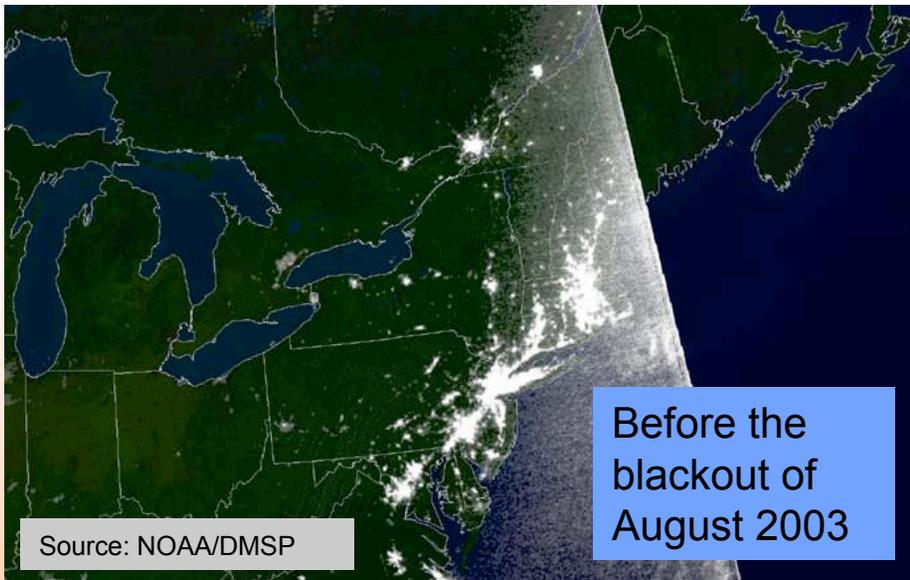


Airflows in a standard hood.

Fume hoods are intended to contain dangerous gases and particles, but do so poorly and with high energy use

New design with low-velocity “air divider” improves containment with 75% energy savings (approx \$3k/hood-yr.)

Electric Reliability & Business Interruption



The US Northeast Blackout of 2003 is the first such event to be characterized as an “insurance disaster”.

- Est. insured losses \$3b (vs. \$0.002b for the NY blackout of 1977)



Building Commissioning to Reduce A&E Professional Liability Claims

- **DPIC Investigation of HVAC-related Claims**

- #1 cause of claims (>700/year)

- #1 cost of claims (avg. ~\$500,000/claim)

- Closed-claims review: 44 cases (\$24 million)

- » Cx would have avoided or reduced many claims: “irrefutable benefits”

- » But few A&Es familiar with or practicing Cx; most think it should be done

- Survey of 40 Customers: Reasons for Commissioning

- » Energy savings: 13%

- » **Reduce litigation: 30%**

- » Building performance: 19%

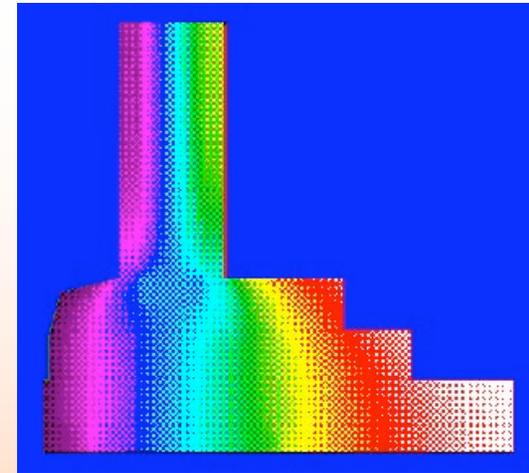
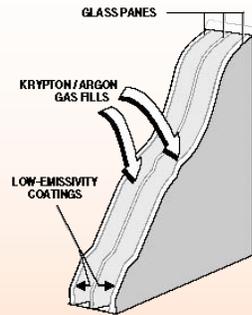
- » Client satisfaction: 19%

- » Requested by client: 19%

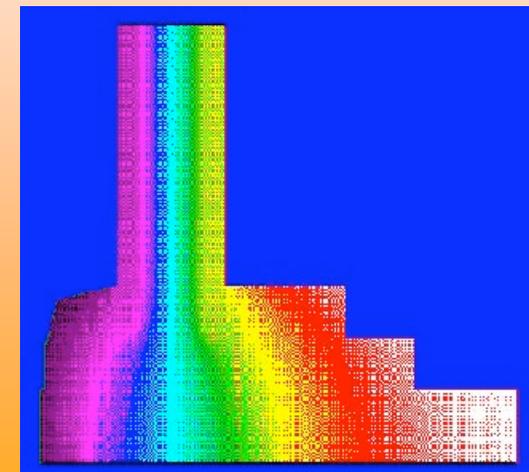
- DPIC now offers a 10% premium credit to their customers (insureds) who obtain training in commissioning

Energy-Efficient Windows to Reduce Fire, Wind/Water Damage, Shattering

- **Multiple panes, “low-e” coatings, efficient frames reject heat**
—> **delayed breakage during fire (Pilkington study); enhanced comfort**
- **Retrofit films add shatter-resistance**
—> **less damage in earthquake, wind storms; theft deterrence**

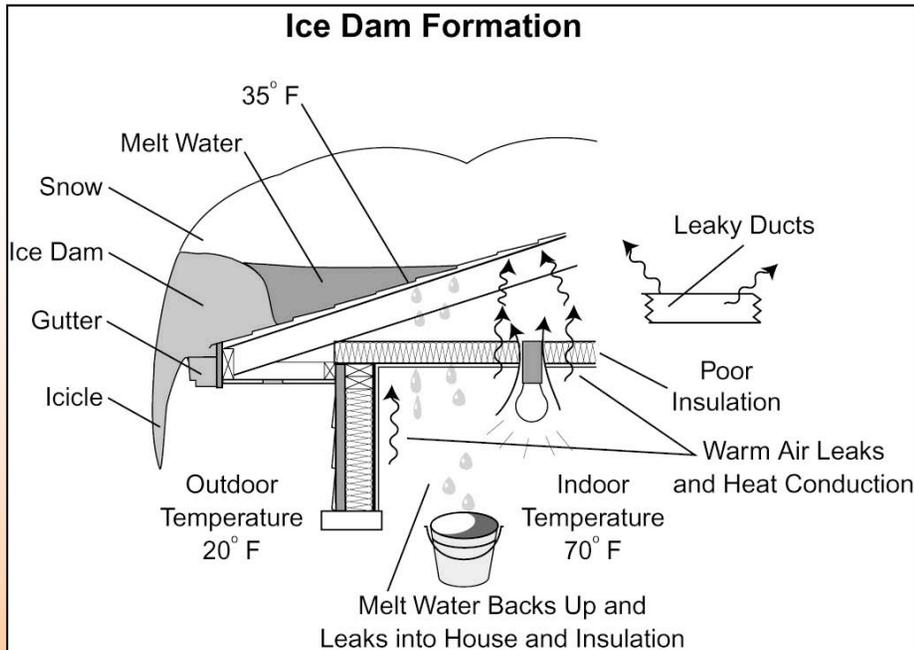


Wood frame, aluminum spacer



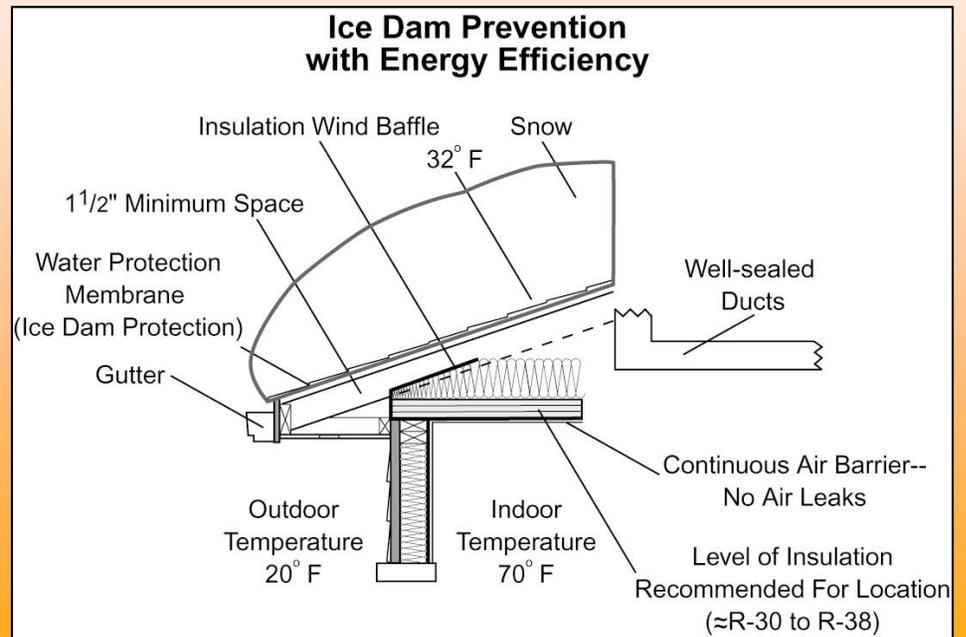
Wood frame, insulating spacer

Efficient Building Envelope to Reduce Formation of Ice Dams



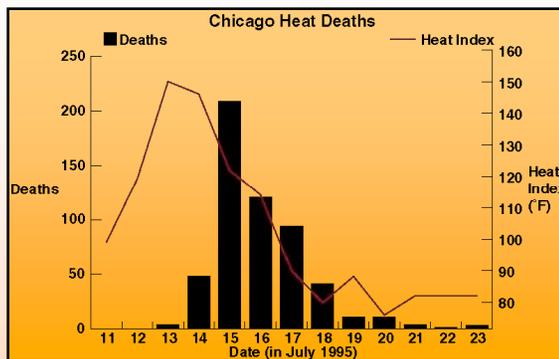
Solutions: Reduce thermal gains to attic, exfiltration, duct leakage, etc >>>

<<< Problem: Ice formation causes property damage, injury, business Interruption, slip/fall hazards

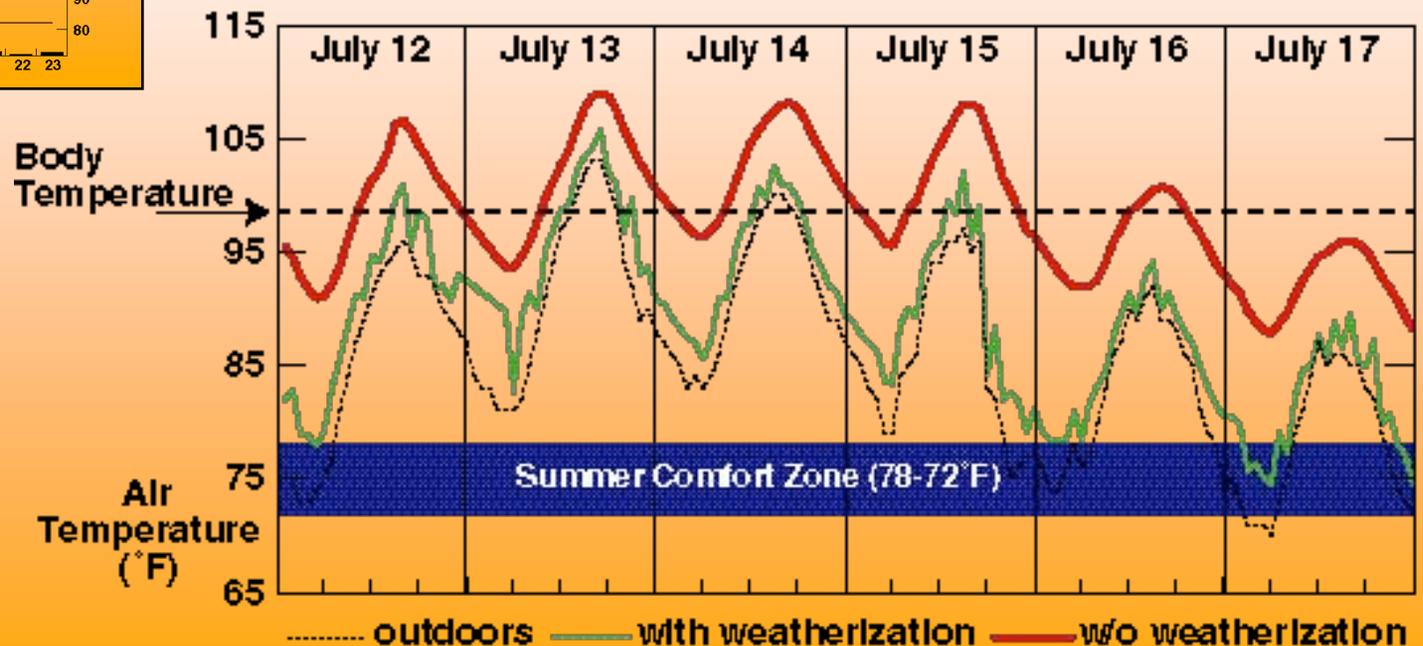


Weatherization to Reduce Health Impacts of Urban Heat Catastrophes

**5300 deaths from 12 major U.S. heat storms;
700 heat deaths in Chicago, Summer 1995**



Performance of Weatherized and Unweatherized Apartments During Chicago Summer Heatwave in 1995



Duct Sealing to Reduce Carbon Monoxide, Fire, Radon, & Ice Dam Risks

“Aeroseal” Duct-Sealing Technology (now Carrier)

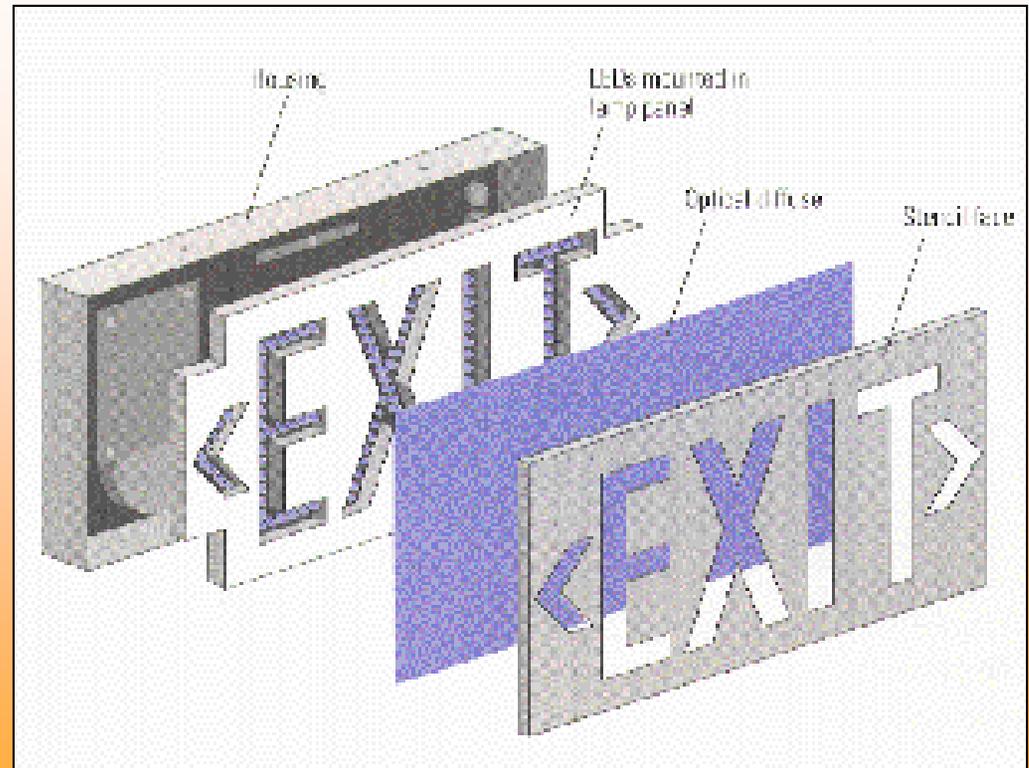
- **Leaky ducts (com’l & resid’l) cause negative building pressurization**
 - > back-drafting of carbon monoxide gas; flame roll-out; radon entry**
- **Leaks can cause moisture and heat introduction into attics**
 - > mold problems; ice dams; etc.**



Efficient LED Exit Signs Improve Visibility, Reduce Maint. Injuries; Increase Up Time

Of the ~100 Exit million signs in the US, 20-70% don't work

- **LED signs offer far more time between lamp changes**
—> **reduced risk of maintenance injuries**
- **LED signs have improved visibility, lower power**
—> **easier evacuation; longer operation on backup power supply/batteries**

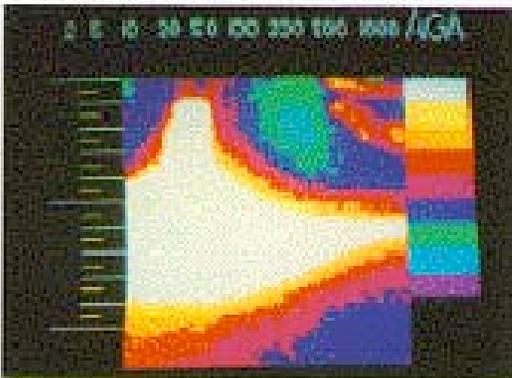


Infrared Cameras: A Tool for “Energy and Safety Surveys”

Excerpt from Munich Re Brochure on use of infrared cameras to detect leaking hot water pipes

3 Thermographic inspections in the construction trade and water installations

Insulation faults, heat build-up, and excessive moisture in masonry and roof structures can be identified by means of a special application and this can contribute to energy savings.



Thermogram of a leak in a warm water pipe laid in the floor

Leaks in heating installations, water systems, and sanitary installations can be located quickly and accurately.

• A leak in the warm water system in the sanitary area of a commercial firm would have necessitated opening up large areas of the floor in order to find the leak if had not been for thermography. An infrared in-



Leak after opening up the floor

spection showed up the leak as a “warm spot” in a bend. All that had to be done was open up a floor slab measuring 60 by 90 cm in order to gain access to the place where the water was coming out and repair the leak.

This example shows that once leaks have been located using thermography, repaired repairs can be carried out, thus avoiding the high cost of tearing apart and replacing expensive floor coverings.

4. Gibson remarks

Thermography can be used to draw the thermal profile of technical objects while they are in service. Precise analysis of the data gathered in the inspection reveals thermal faults before they can cause a loss. Infrared thermography should therefore be viewed both by insurers and by their clients as a valuable part of the toolkit for non-destructive loss prevention.

LED “Way-Lighting” to Improve Visibility & Highway Safety



Outside Stockholm

Insurance Industry Implementation Options

- **Provide new types of consumer information, education, and risk-management services**
- **Offer economic inducements based on risk reduction: premium credits; lower deductibles; innovative insurance products; financing**
- **Partner with existing market-oriented programs (e.g. building standards; rating & labeling; energy utilities)**
- **Participate in R&D & market transformation; Development and enforcement of Codes & Standards**
- **“Lead by Example” — improving own buildings**

Exemplary Activities Among 52 Leading Insurance Companies

	Country	Information, Education, & Demonstration	Financial Incentives	Specialized Policies & Products	Direct Investment	Customer Services & Inspections	Codes, Standards, & Policies	Research & Development	In-House Energy Management	Carbon Insurance
INSURANCE & REINSURANCE COMPANIES										
American International Group (AIG)	US		.	.						
American Modern Insurance Group	US	.								
Aon Risk Services	US			.						.
Bankers Insurance Group	US							.		
Blue Cross & Blue Shield Mutual of Ohio	US							.		
Boiler Inspection & Insurance Company	CA			.						
CGNU (formerly General Accident)	UK							.		
Chubb	US			.		.		.		
Connecticut Mutual Life Insurance Home Office	US							.		
Continental Insurance	US							.		
Delta Lloyd Verzekeringsgroep NV	NL							.		
Developers Professional Insurance Company (DPIC)	US		.							
Employers Re	US			.						
First Treasury	CA			.						
FM Global (formerly Arkwright Mutual)	US	.						.		
Gerling	UK				.					.
Grange Mutual	US									
Guy Carpenter and Company	US							.		
Hanover	US		.							
Harleysville Mutual Insurance Company	US							.		
Hartford Steam Boiler (HSB/IPT & Canadian Subsidiary)	US			.		.		.		
Independent Insurance	UK							.		
ITT Hartford Group, Incorporated	US							.		
Johnson & Higgins	US							.		
Lloyds of London (NatureSave Insurance)	UK	.			.	.				
Milwaukee Insurance	US							.		
Minnesota Mutual Life Insurance Company	US							.		
Munich Re	D	.								
Nationwide Mutual Insurance Company, Inc.	US							.		
New York Life Insurance & Annuity Corp.	US							.		
North American Capacity Insurance Co. (owned by Swiss Re)	US			.						
Pennsylvania Blue Shield	US							.		
Phoenix Home Life Mutual Insurance Co.	US							.		
Progressive Auto Insurance	US		.					.		
Provident Life & Accident Insurance Co.	US							.		
Prudential Assurance	UK							.		
Prudential Insurance Company of America, Inc.	US							.		
Reinland Versicherungen	D		.							

CASE STUDIES

Information & Education

Insurers' well-established channels of communication with home and business owners, practitioners, and governments are almost unparalleled

- United Nations Environment Program (promotion of energy efficiency in climate negotiations and other fora)
- USAA (homeowner guides)
- NREL and NAII workshop on renewables
- Arkwright Mutual (now FM Global) & BECo (fire safety through efficient lighting torchieres)

Loss-Prevention Example: fire danger from light fixtures

LBNL & Arkwright Mutual Insurance Company (now FM Global) Demonstration:

- Replaced standard halogen torchieres with fire-safe CFL versions at Northeastern University; follow-up seminars for risk managers

Results

- Fire hazard eliminated
- Savings of \$50-100/apt-yr;
6-month (energy) payback
- Workshops for
risk managers



Arkwright Mutual Website on Torchieres



Netscape: Arkwright Mutual Insurance Company - SHEDDING THE LIGHT ON HALOGEN LAMPS

Back Forward Reload Home Search Guide Images Print Security Stop Netscape

Location: http://www.arkwright.com/library/news_room/releases/970811.htm

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SHEDDING THE LIGHT ON HALOGEN LAMPS:

Free Pamphlet Available from Arkwright Mutual Insurance Company

WALTHAM, August 11, 1997 – Halogen lamps, popular fixtures in most campus dorms, are cheap, bright, convenient ... and responsible for at least 189 fires and 11 fire-related deaths, according to the U.S. Consumer Product Safety Commission. The danger begins when students place halogen lamps too close to curtains or bedding, or drape clothes over the bulbs to dry them quickly, or for ambiance. Since the tubular bulbs of halogen lamps can reach nearly 1,100 degrees Fahrenheit, they can cause fabric to ignite. As a result, colleges are reporting dozens of on-campus fires.

As college students return to school this month, what can be done to prevent a devastating fire? Free advice on this topic is available in a pamphlet from Arkwright Education, a dedicated unit of Arkwright Mutual Insurance Co., property insurer of some of the nation's most prestigious colleges and universities. The pamphlet, called "Shedding the Light on Halogen Lamps," incorporates fire-safety information and web-site addresses from groups including the Campus Lighting Efficiency Project, U.S. Environmental Protection Agency, U.S. Consumer Product Safety Commission and Lawrence Berkeley National Laboratory.

CASE STUDIES

Financial Incentives

Premium credits, dynamic deductibles, preferential terms can serve as financial inducements

- Hanover Insurance -- 10% credit; fire safety via reduced heating system on-time in efficient and solar homes
- Massachusetts insurers -- 10% credit for homeowner completing workshop on weatherization and maintenance
- Developers Professional Insurance Company -- 10% credit to architects and engineers practicing commissioning (reduced liability exposure)

CASE STUDIES

Specialized Products

New types of insurance policies and terms that promote risk-reduction through energy efficiency

- Several insurers offer *energy savings insurance* policies, reduce risk for ESCOs and building owners
- Surepower & AIG: Fuel Cells + Business Interruption insurance
- Willis Corroon -- Indoor air quality policies and protocols

CASE STUDIES

Efficiency Codes & Standards

Long historical involvement of insurers in building codes for safety and disaster resilience

- US insurance industry's Institute for Business and Home Safety (IBHS) has endorsed stronger energy codes, code official training, and code enforcement
- Building Codes Assistance Project (BCAP)

CASE STUDIES

Research & Development

Insurance-related technical organizations have played an historical role in technology assessment and R&D

- IBHS, State Farm, Chubb -- Analysis of mechanisms of roof failure during windstorms (focus on effects of energy efficiency features)
- IBHS -- Low-energy ultraviolet water disinfection technology (UV Waterworks) for disaster recovery

CASE STUDIES

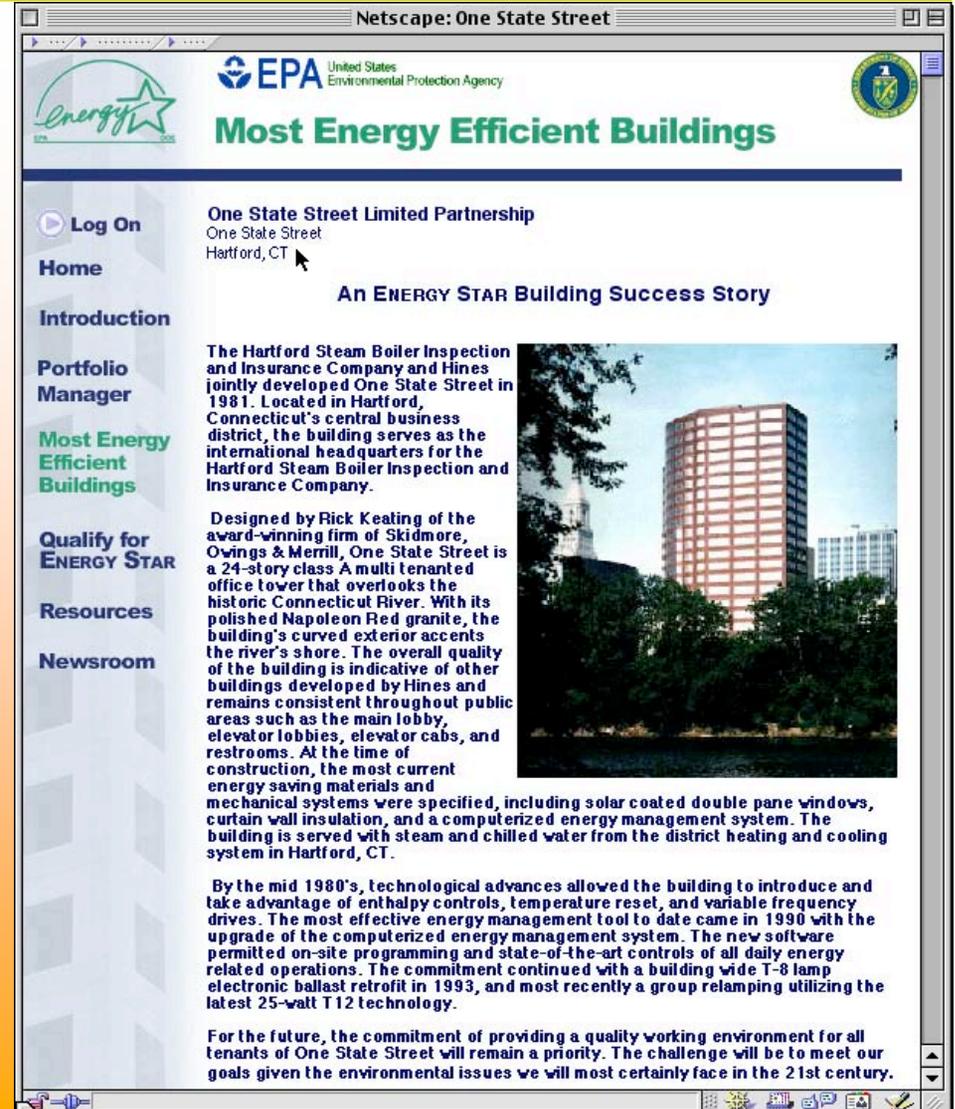
In-House Energy Management

The insurance industry is one of the world's most significant real estate owners (\$100 billion in assets for top 10 companies; \$1.5 billion annual energy bill)

- West Bend Mutual -- Analysis of productivity gains (lower claims handling error rates) after efficiency retrofits to their headquarters
- Delta Lloyd, CGU, Independent Assurance, Prudential -- participants in the IEA efficient photocopier procurement
- U.S. insurers -- joining ENERGY STAR

In-House Energy Management

- Hartford Steam Boiler Insurance and Inspection Co. HQ among the first ENERGY STAR-labeled Buildings



Netscape: One State Street

  United States Environmental Protection Agency

Most Energy Efficient Buildings

[Log On](#) **One State Street Limited Partnership**
One State Street
Hartford, CT

[Home](#)

[Introduction](#)

[Portfolio Manager](#)

Most Energy Efficient Buildings

[Qualify for ENERGY STAR](#)

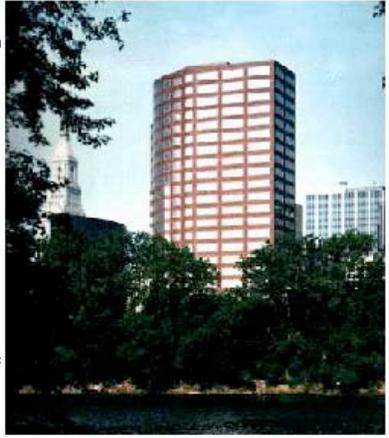
[Resources](#)

[Newsroom](#)

An ENERGY STAR Building Success Story

The Hartford Steam Boiler Inspection and Insurance Company and Hines jointly developed One State Street in 1981. Located in Hartford, Connecticut's central business district, the building serves as the international headquarters for the Hartford Steam Boiler Inspection and Insurance Company.

Designed by Rick Keating of the award-winning firm of Skidmore, Owings & Merrill, One State Street is a 24-story class A multi tenanted office tower that overlooks the historic Connecticut River. With its polished Napoleon Red granite, the building's curved exterior accents the river's shore. The overall quality of the building is indicative of other buildings developed by Hines and remains consistent throughout public areas such as the main lobby, elevator lobbies, elevator cabs, and restrooms. At the time of construction, the most current energy saving materials and mechanical systems were specified, including solar coated double pane windows, curtain wall insulation, and a computerized energy management system. The building is served with steam and chilled water from the district heating and cooling system in Hartford, CT.



By the mid 1980's, technological advances allowed the building to introduce and take advantage of enthalpy controls, temperature reset, and variable frequency drives. The most effective energy management tool to date came in 1990 with the upgrade of the computerized energy management system. The new software permitted on-site programming and state-of-the-art controls of all daily energy related operations. The commitment continued with a building wide T-8 lamp electronic ballast retrofit in 1993, and most recently a group relamping utilizing the latest 25-watt T12 technology.

For the future, the commitment of providing a quality working environment for all tenants of One State Street will remain a priority. The challenge will be to meet our goals given the environmental issues we will most certainly face in the 21st century.

CASE STUDIES

Value-Added Customer Services

Purveying the risk-management benefits of efficiency offers new profit centers within insurance firms

- Chubb & Munich Re -- Infrared cameras help identify safety problems and energy losses (refrigerant leakage, broken district heating lines, etc.)
- Storebrand -- Building inspection services and advice on indoor air quality and energy savings

CASE STUDIES

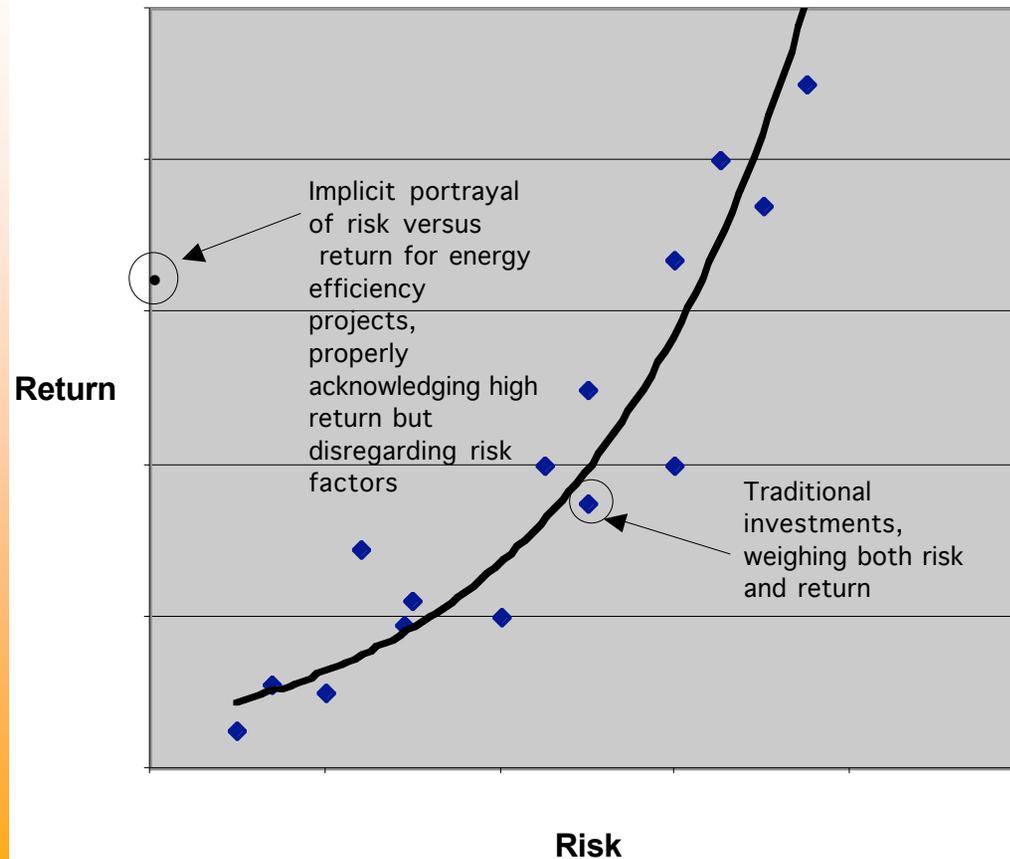
Insurer Investment to Promote Efficiency

Insurers are among the more significant players in world financial markets

- Life insurers were key funder of wind energy in the 1980s.
- Storebrand-Scudder Environmental Value Fund -- \$133 million in mutual fund; securities picked using environmental “screen”. Founding shareholders include Storebrand, Swiss Re, Gerling, Trygg-Hansa

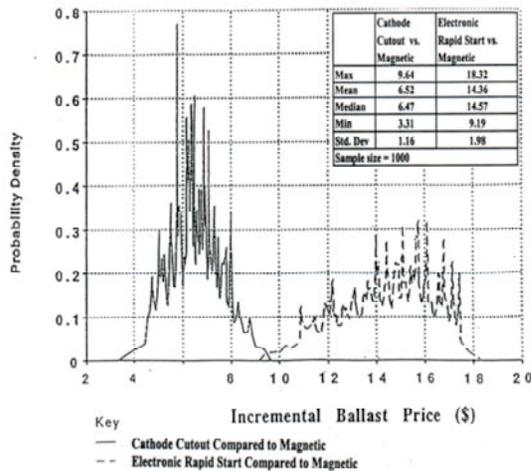
New Opportunities: Actuarial Valuation of Energy Retrofits

The Incomplete Risk-Return Portrayal of Energy Efficiency

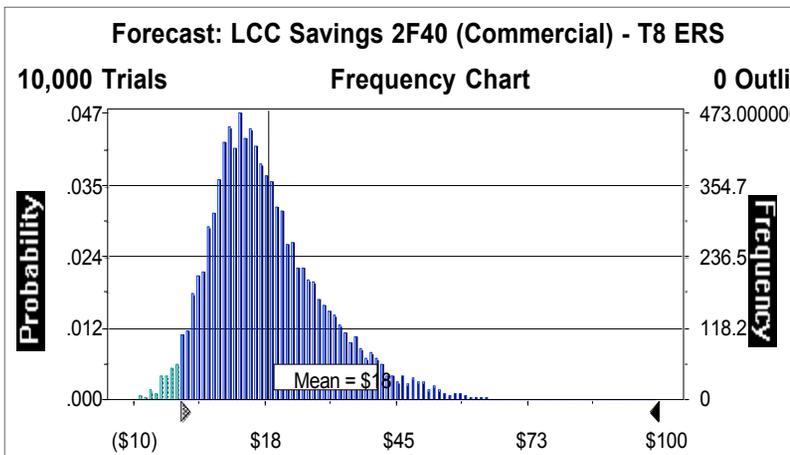


Portfolio Approach to Risk Spreading

Variability in U.S. Lighting Ballast Prices

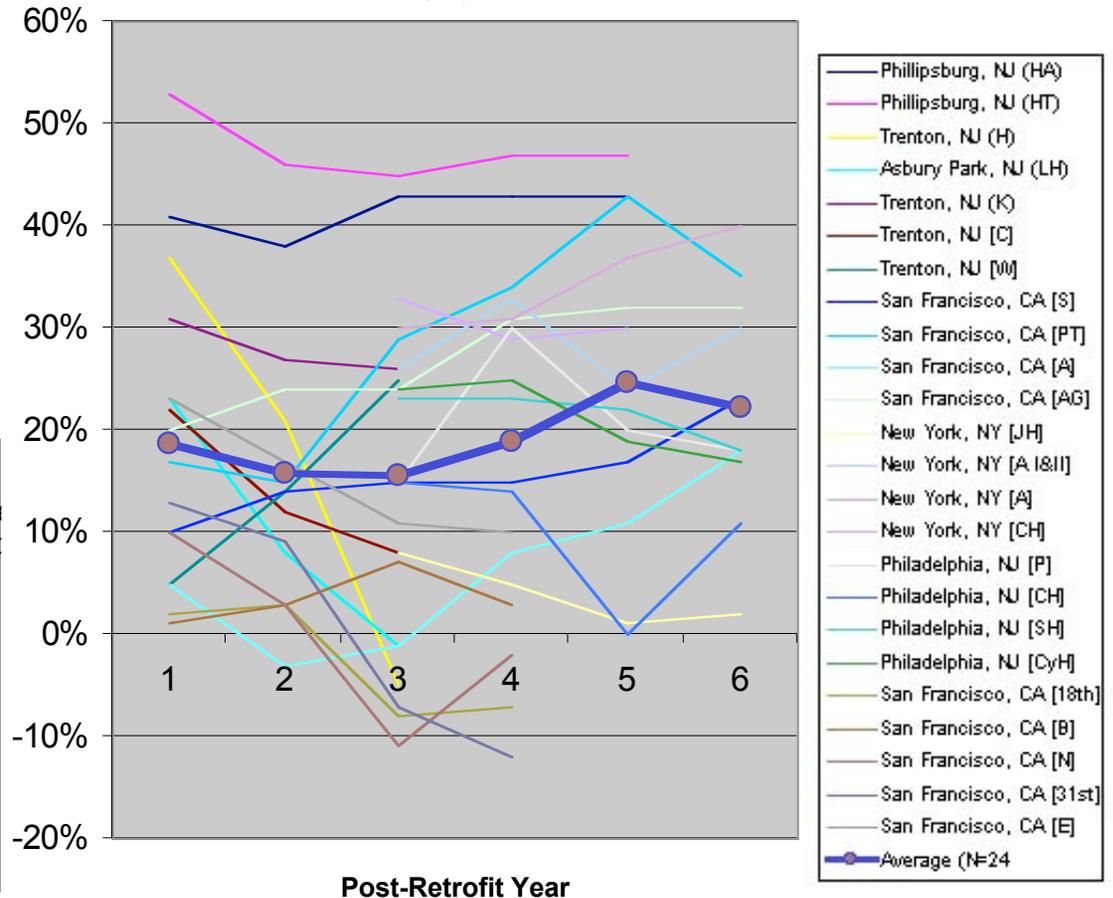


Distribution of Possible Lifecycle Costs for Electronic Lighting Ballasts



Accounting for distributions on all inputs

Variation in Weather-Normalized Energy Savings in 24 Public Housing Projects, versus Portfolio (%)



CHALLENGES

- **Technical**

- Lack of proper “actuarial” documentation
- Insurers rarely involved in R&D and technology
- Downsides of sustainable energy technologies (real and perceived)
- Fragmentation of effort within and among government agencies; selective emphasis on “market transformation” -- minimal focus on R&D and integrated, cross-sector assessments

CHALLENGES

- **Nature of Insurance Industry and Marketplace**
 - Highly competitive; disincentive to take risks
 - Fragmented (many types of insurers, plus reinsurers, brokers, agents, self insurers, etc.)
 - Negative perceptions re: environmentalism (i.e. Superfund)
 - Potential regulatory barriers to new investments, incentives...

CHALLENGES

- **Energy/Environment Community Perceptions of Insurance Industry**
 - Cash cow
 - High margins, can easily cut premiums
 - A monolith
 - Will promote energy efficiency because it prevents natural disasters
 - Major owner of real estate (only the Life companies, as landlords)

CHALLENGES

- **Insurance Industry Perceptions of Energy/Environment Community**
 - NGOs: litigate or cooperate?
 - Does not “understand” the insurance business
 - Efficiency may be viewed as “Trojan Horse” for politicizing insurers around the climate change issue

Opportunities

- **Within Insurance Community**

- Identify ways that energy efficiency improves competitiveness
- Identify ways that energy efficiency addresses acute issues (e.g. construction defects litigation; IAQ problems; mold; electric reliability)
- Practical, no-regrets climate change response

- **Within Energy Community**

- New arguments for government energy R&D/Implementation, utility programs, etc.
- New constituency for building and appliance standards
- Innovative financing and partnerships

Potential Insurer-Utility Collaborations

- **Common Goals**

- Disaster-resilient buildings; avoiding business interruption; ensuring code compliance
- Economic solvency of customers
- Customer-retention
- Risk management

- **Potential Collaborations**

- Joint data collection efforts & customer audits
- Research and development
- Bundled energy and risk-management services

Forging the Link

1. Build relationship with in-house risk managers
2. Document potential benefits of EE projects
3. Communicate non-energy benefits “up the chain”
4. Insurance brokers can be your ally (customer advocate)
5. Make pitch to the insurer (benefits should be reflected in terms, pricing)

Mahalo!

More Information:

<http://eetd.lbl.gov/insurance>

EMills@lbl.gov

510-486-6784