ACEEE American Council for an Energy-Efficient Economy

American Council for an Energy-Efficient Economy & Financial Research Associates Proudly Present

Ask about our government/ non-profit rates

Our Distinguished Speaking Faculty

Dan Reicher, *Director of Climate Change Energy Initiatives,* **GOOGLE**
Dian M. Grueneich, *Commissioner*, **CALIFORNIA PUBLIC UTILITIES COMMISSION**
Arthur H. Rosenfeld, Ph.D, *Commissioner,* **CALIFORNIA ENERGY COMMISSION**
Gavin Newsom, *Mayor,* **CITY OF SAN FRANCISCO** *(pending approval)*
John MacLean, *President,* **ENERGY EFFICIENCY FINANCE CORPORATION**
Phil Angelides, *Chairman,* **APOLLO ALLIANCE**
Bruce Schlein, *VP, Environmental Affairs,* **CITIGROUP**
Neil Skiver, *Senior Vice President, Energy Services,* **BANC OF AMERICA PUBLIC CAPITAL CORPORATION**
Ajit Nazre, *Partner,* **KLEINER PERKINS CAUFIELD & BYERS**
John Ravis, *Vice President,* **TD BANKNORTH**
Rich Lechner, *Vice President of Energy & Environment*, **IBM**
Tracy Wolstencroft, *Managing Director,* **GOLDMAN SACHS**
Michael Cavallo, *Domain Director, Lighting,* **CLINTON CLIMATE INITIATIVE**
Terry Fry, *Senior Vice President,* **NEXANT**
Nancy E. Pfund, *Managing Partner,* **DBL INVESTORS**
Bob Hinkle, *Vice President, Energy Efficiency,* **MMA RENEWABLES**
Roland Risser, *Director of Customer Energy Efficiency,* **PACIFIC GAS & ELECTRIC**
Neil Zobler, *President,* **CATALYST FINANCIAL GROUP, INC**
John E. Buehler, *Managing Partner,* **ENERGY INVESTORS FUNDS**
Evan Lovell, *Partner,* **VIRGIN GREEN FUND**
Rodrigo Prudencio, *Managing Director,* **NTH POWER**
Greg Kats, *Managing Director*, **GOOD ENERGIES**
Sandeep Kumar, *CEO,* **MICROSTAQ**
Kevin Dowling, *Vice President,* **PHILIPS**
Dan Adler, *President,* **CALIFORNIA CLEAN ENERGY FUND (CalCEF)**
Martha Amram, *CEO,* **HOME Z INC.**
Eric Heitz, *President,* **THE ENERGY FOUNDATION**
R. Thomas Amis, *Partner,* **ALSTON & BIRD LLP**
Mark Siegal, *Manager,* **NATIONAL GRID**
Chuck McDermott, *General Partner,* **ROCKPORT CAPITAL**
Joyce Ferris, *Founder & Managing Partner,* **BLUE HILL PARTNERS**
Steve Nadel, *Executive Director,* **AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY**
Craig Sieben, *President,* **SIEBEN ENERGY ASSOCIATES**
Claire Broido Johnson, *Senior Advisor,* **HANNON ARMSTRONG**
Brenna Walraven, *Managing Director,* **USAA REAL ESTATE COMPANY**
Gregg Ander, *Chief Architect*, **SOUTHERN CALIFORNIA EDISON COMPANY**
Gil Sperling, *Program Manager*, **DEPARTMENT OF ENERGY**
Ralph Cavanagh, *Senior Attorney & Co-director of Energy Program* , **NATURAL RESOURCE DEFENSE COUNCIL**
Everett Smith III, *CFO,* **NEW ENERGY CAPITAL**
Paul Frankel, *Managing Director,* **CalCEF INNOVATIONS**
Mark Frankel, *Technical Director,* **NEW BUILDING INSTITUTE**
Kirsten Spalding, *Senior Advisor,* **CERES**
Michael Messenger, *Senior Consultant,* **ITRON**
Tory Weber, *Energy Efficiency Regulatory Manager,* **SOUTHERN CALIFORNIA EDISON COMPANY**
John A. "Skip" Laitner , *Senior Economist for Technology Policy,* **AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY**

The 3rd Annual

Energy Efficiency *Finance Forum*

Financing, Capital & Deal Sourcing for Energy Efficiency

April 23rd & 24th, 2009

The Palace Hotel, San Francisco, CA

Forum Highlights Include:

- Surveying EE finance in light of the current economic climate
- Investors' Roundtable: Successfully investing in EE
- EE financing models & structures that work in today's market
- The stimulus plan for energy and EE: Revealed!
- Market aggregation & packaging strategies
- New green building incentives & available credits: White tags & green mortgages
- Market ready technologies & financing for upcoming EE breakthrough technologies
- Project finance roundtable: What is it that financiers are looking for?
- Climate change & EE: Understanding the financial impact & underlying connection between them
- Deal sourcing & capital building tactics
- Techniques for boosting financial backing for government utilities & ESCOs
- What does the future of EE projects, financing and implementation look like beyond 2015?

PLUS! Keynote Addresses by:

Dan Reicher, **GOOGLE**
Art Rosenfeld, **CALIFORNIA ENERGY COMMISSION**
Dian Grueneich, **CALIFORNIA PUBLIC UTILITIES COMMISSION**
Gavin Newsom, **CITY OF SAN FRANCISCO** (pending approval)
Phil Angelides, *Chairman,* **APOLLO ALLIANCE**

Conference Sponsors:

Gold: U.S. DEPARTMENT OF ENERGY

Silver: ALSTON +BIRD LLP

To Register: Call 800-280-8440 or visit us at www.frallc.com

Thank you for attending the conference!

Financial Research Associates is an accredited institution and we pride ourselves on the cutting edge presentations delivered at our conferences. We make every effort to secure advance copies of these presentations for your continued review following the close of the conference.

From time to time due to proprietary concerns or internal legal constraints, speakers are unable to submit presentations for duplication and distribution. In this rare case, we encourage you to utilize the contact details provided in their biography to request a single copy of the presentation.

If you have any additional questions or requests for information beyond what is in this document book, please feel free to contact us at any time.

Presented by Financial Research Associates & The American Council for an Energy-Efficient Economy

THE 3RD ANNUAL ENERGY EFFICIENCY FINANCE FORUM:

FINANCING, CAPITAL & DEAL SOURCING FOR AN ENERGY EFFICIENT ECONOMY

THE PALACE HOTEL, SAN FRANCISCO, CA
APRIL 23RD & 24TH, 2009

DAY ONE: THURSDAY, APRIL 23, 2009

8:00 – 8:45 *Registration and continental breakfast*

8:45 – 9:00 **Chairs' Welcome**

Chairperson:
Steve Nadel, *Executive Director*
AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY

Dan Adler, *President*
CALIFORNIA CLEAN ENERGY FUND (CalCEF)

THE GREENING OF THE OBAMA ERA

9:00 – 9:30 **Keynote Session: A New Administration & A New Outlook for Energy Efficiency**

Keynote Speaker:
Dan Reicher, *Director of Climate Change Energy Initiatives*
GOOGLE

PURE ECONOMICS & INVESTMENT "CENTS"

9:30 – 10:00 Market Conditions & Drivers of Energy Efficiency: Is Sustainability Still A Possibility?

Keynote Speaker:
Phil Angelides, *Chairman*
APOLLO ALLIANCE
Principal, Canyon Capital Realty Advisors

10:00 – 10:15 Mid-Morning Refreshment Break

THE ENERGY EFFICIENCY OPPORTUNITY: THE BIG PICTURE REVEALED

10:15 - 11:15 Preparing for New Opportunities in Energy Efficiency

Speakers:
Greg Kats, *Senior Director and Director for Climate Change Policy*
GOOD ENERGIES

Terry Fry, *Senior Vice President*
NEXANT

Ajit Nazre, *Partner*
KLEINER PERKINS CAUFIELD & BYERS

NUTS & BOLTS

11:15 – 12:00 Preparing to Set Up an Energy Efficiency & Clean Tech Fund

Speakers:
Nancy E. Pfund, *Managing Partner*
DBL INVESTORS

Chuck McDermott, *General Partner*
ROCKPORT CAPITAL

R. Thomas Amis, *Partner*
ALSTON & BIRD LLP

Moderator:
Craig Sieben, *President*
SIEBEN ENERGY ASSOCIATES

12:00 – 1:30 Networking Luncheon

LUNCHEON KEYNOTE

12:30 – 1:00 A NEW ROLE FOR ENERGY EFFICIENCY

Keynote Speaker:
Dan Kammen, *Energy and Resources Group*
UNIVERISTY OF CALIFORNIA, BERKELEY

STRUCTURING & MODELS

1:30 – 2:30 **New Innovative Financing Structures & Models**

Speakers:
Bob Hinkle

Paul Frankel, *Managing Director*
CalCEF INNOVATIONS

Stephen Compagni Portis, *CEO, Chairman*
RENEWABLE FUNDING LLC

MARKET AGGREGATION & EE FINANCE PROGRAM MODELS

2:30 – 3:15 **Does it Help to Package? What Should You Include?**

Speakers:
John MacLean, *President*
ENERGY EFFICIENCY FINANCE CORPORATION

Neil Zobler, *President*
CATALYST FINANCIAL GROUP, INC

3:15 – 3:30 *Mid-Afternoon Networking Break*

GREEN BUILDING FINANCING

3:30 – 4:30 **LEED Buildings, Energy Mortgages & Net-Zero Initiatives!**

Speakers:
Gregg Ander, *Chief Architect*
SOUTHERN CALIFORNIA EDISON

Mark Frankel, *Technical Director*
NEW BUILDING INSTITUTE

Rich Chien, *LEED, AP, CGBP, Department of the Environment*
CITY AND COUNTY OF SAN FRANCISCO

INVESTOR ROUNDTABLE!

4:30 - 5:30 **The New Investor in Energy Efficiency: Public & Private Sectors**

Panelists:
Rodrigo Prudencio, *Managing Director*
NTH POWER

Joyce Ferris, *Founder & Managing Partner*
BLUE HILL PARTNERS

Kirsten Spalding, *California Director*
CERES

Moderator:
Evan Lovell, *Partner*
VIRGIN GREEN FUND

5:30 – 7:00 *Cocktail Reception & Networking Event Immediately Following*

DAY TWO: FRIDAY, APRIL 24, 2009

7:30 – 8:30 *Continental breakfast*

8:30 – 8:45 **Chairs' Welcome & Day One Re-Cap**

Chairperson:
Steve Nadel, *Executive Director*
AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY

Dan Adler, *President*
CALIFORNIA CLEAN ENERGY FUND (CalCEF)

8:45 – 9:15 **Keynote Session: Past & Future Success in Energy Efficiency Finance**

Keynote Speaker:
Arthur H. Rosenfeld, Ph.D, *Commissioner*
CALIFORNIA ENERGY COMMISSION

CLIMATE CHANGE & LEGISLATION CHANGING THE ENERGY EFFICIENCY LANDSCAPE

9:15 – 9:45 **Analyzing Climate Change Pressures & New Legislation Affecting Energy Efficiency Programs & Projects**

Speakers:
Eric Heitz, *President*
THE ENERGY FOUNDATION

Steve Nadel, *Executive Director*
AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY

PROJECT FINANCE & COMMERCIAL BANK ROUNDTABLE

9:45 – 10:45 **FINDING CAPITAL & SOURCING DEALS**

Speakers:
Bruce Schlein, *Vice President, Corporate Sustainability Unit*
CITIGROUP

John Ravis, *Vice President*
TD BANKNORTH

Everett Smith III, *CFO*
NEW ENERGY CAPITAL

10:45 - 11:15 *Mid-Morning Refreshment & Networking Break*

CONSUMER DRIVEN MARKET

11:15 – 12:00 End-User's Roundtable: What will the consumer be asking for from you?

Speakers:
Rich Lechner, *Vice President of Energy & Environment*
IBM

Martha Amram, *CEO*
HOME Z INC.

Tory Weber, *Energy Efficiency Regulatory Manager*
SOUTHERN CALIFORNIA EDISON COMPANY

BEHIND THE SCENES!

12:00 – 1:00 Financing From & For State, Local & ESCO Utilities

Speakers:
Johanna Zetterberg
DEPARTMENT OF ENERGY

Mark Siegal, *Manager*
NATIONAL GRID

Lee Cooper, *Manager, Energy Efficiency Emerging Technologies*
PACIFIC GAS & ELECTRIC COMPANY

1:00 – 2:00 Luncheon

NEW TECHNOLOGY & OPPORTUNITIES IN ENERGY EFFICIENCY

2:00 – 3:00 Surveying the Technology Landscape: Market Ready Technologies That Attracted Financing & Produced a Success

Presenters:
Sandeep Kumar, *President & CEO*
MICROSTAQ

Michael Cavallo *Domain Director, Lighting*
CLINTON CLIMATE INITIATIVE

Kevin Dowling, *Vice President*
PHILIPS

Michael Messenger, *Senior Consultant*
ITRON

WHAT'S TO COME

3:00 - 4:00 **Looking Beyond the Now of Energy Efficiency: It's 2015 & What Does the Market Look Like?**

Speakers:
Ralph Cavanagh, *Senior Attorney & Co-director of Energy Program*
NATURAL RESOURCE DEFENSE COUNCIL

John A. "Skip" Laitner , *Director of Economic and Social Analysis*
AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY

Dr. Holmes Hummel
CLIMATE POLICY DESIGN PRO-SERIES

4:00 *Conference Adjourns*

Dear Conference Participant:

On behalf of Financial Research Associates, LLC, I would like to cordially welcome you to this industry event.

We have developed this event based on extensive industry research, structuring the topics and gathering together the speaker faculty based on feedback from numerous industry participants. Our goal is to provide you with the most up to date industry information possible, along with top-notch networking opportunities. Every effort has been made on our part to obtain the speakers presentations to be included in the PDF link that you have received via email. If a speaker's presentation is not included in the PDF link, we would ask that you contact the speaker directly. If we have failed to meet your expectations in any way, please let us know by completing the evaluation form provided at this event. Of course, we would like to hear positive feedback as well!

We appreciate that you have chosen to spend your time and training dollars with us, and we're committed to satisfying your informational needs. Again, welcome to this event and thank you for your participation – we truly value your business.

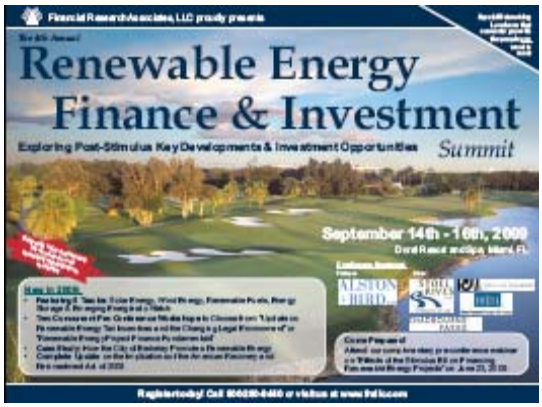
Sincerely,

Lori Medlen, President
Financial Research Associates, LLC

FinancialResearch
Associates, LLC

Upcoming Events

Please visit our website www.frallc.com for information on any of the following



If you have any additional questions or requests for information beyond what is in this document book, please feel free to contact us at any time.

A link with final speaker presentations will be forwarded via email approximately
1 – 2 weeks after the conference.

Lori Boothe
Financial Research Associates, LLC
11121 Carmel Commons Boulevard, Suite 300
Charlotte NC 28226

704-341-2376 Office
704-341-2640 Fax
lboothe@frallc.com
www.frallc.com

A Special Thanks to Our Gold Sponsor

U.S. Department Of Energy,

Office of Energy Efficiency and Renewable Energy

EFFICIENCY

ENERGY STAR

ef·fi·cien·cy (*n*)

(1) a powerful tool to realize a sustainable and secure energy future; (2) a method to reduce the need for investment in energy infrastructure, cut fuel costs, and increase economic competitiveness; (3) a way to decrease greenhouse gas emissions and reliance on fossil fuels; (4) America's greatest energy resource.

TAP INTO THE POWERFUL POTENTIAL OF EFFICIENCY

Visit: www.eere.energy.gov

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

For more information contact: EERE Information Center
1-877-EERE-INF (1-877-337-3463)
www.eere.energy.gov

EVERY DAY IS EARTH DAY

A Special Thanks to Our Silver Sponsor

Alston & Bird LLP

ALSTON+BIRD LLP

WWW.ALSTON.COM

An Integrated Approach to the Clean Energy Space

Project Development and Finance

Energy Policy and Regulation

Renewable Energy Technology

Carbon Management and Finance

A Special Thanks to Our Bronze Sponsor

energyOrbit

salesforce.com PARTNER

energyOrbit
Track, Manage & Achieve your Conservation Goals™

Recent energyOrbit Customers:

SF Environment
City of San Francisco Department of the Environment

EcologyAction

Small Business Energy Alliance

ICLEI Local Governments for Sustainability

Energy Efficiency Program Management Solution – Connecting the EE Eco System

energyOrbit is built for utilities, third-party implementers and government entities to cost effectively manage industry leading Demand Side Management (DSM) energy efficiency programs. With comprehensive EE measures calculators, and full program lifecycle management - energyOrbit is connecting the EE supply chain.

The energyOrbit solution supports:

- Full spectrum of efficiency technology measures
- Demand Response
- Audit and work-order management
- Proposal and work-order paperwork generation
- Energy savings, installation costs and rebate savings
- Detailed reporting of portfolio / program performance
- Account / Customer management
- Rate payer portals – self-audit / EE information
- Equipment management
- Contractor management (trade allies)
- Marketing Campaigns management
- Leads management
- Cases and Solutions management

On-Demand DSM on Force.com Infrastructure

The energyOrbit solution is built and delivered on the world class Salesforce.com Software as a Service (SaaS) application infrastructure. This means that energyOrbit is delivered to all of our customers as an on-demand service completely eliminating the overhead and costs associated with in-house software and hardware deployments and maintenance. energyOrbit is offered as a stand-alone solution or in conjunction with Salesforce CRM suite of products.

Member

A.E.S.P. ASSOCIATION OF ENERGY SERVICES PROFESSIONALS

energyOrbit, a crmOrbit, Inc. Product
106 Wikiup Drive. Santa Rosa, CA 95403
Call us to schedule a live demo. office 1-866-628-8744 | fax 415.462.0233
energyorbit@crmorbit.com | www.crmorbit.com/energyorbit

Financial Research Associates, LLC

A Special Thanks to Our Media Partner

SecurityStockWatch.com

Solutions • Stocks • News

Financial Research Associates and The American Council for an Energy-Efficient Economy

Proudly Presents

The 3rd Annual Energy Efficiency Finance Forum

April 23-24, 2009

The Palace Hotel
San Francisco, CA

Chairs' Welcome

Chairperson:
Steve Nadel, *Executive Director*
AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY

Dan Adler, *President*
CALIFORNIA CLEAN ENERGY FUND (CalCEF)

Steven Nadel

Steve Nadel is the Executive Director of the American Council for an Energy-Efficient Economy (ACEEE), a non-profit research organization that works on programs and policies to advance energy-efficient technologies and services. Steve has been at ACEEE for 20 years serving as Deputy Director of the organization and Director of ACEEE's Utilities and Buildings programs prior to his promotion to Executive Director in 2001. Prior to ACEEE he planned and evaluated energy efficiency programs for New England Electric, a major electric utility; directed energy programs for the Massachusetts Audubon Society, Massachusetts' largest environmental organization; and ran energy programs for the a community organization working on housing rehabilitation in the poorest neighborhoods of New Haven, CT. Steve has worked in the energy efficiency field for 30 years and has over 100 publications on energy-efficiency subjects. His current research interests include equipment efficiency standards, utility-sector energy efficiency programs and policies, and state and federal energy and climate change policy. He has a M.S. in Energy Management from the New York Institute of Technology, and a M.A. in Environmental Studies and B.A. in Government from Wesleyan University in Connecticut.

THE 3rd ANNUAL ENERGY EFFICIENCY FINANCE FORUM

Financing, Capital, & Deal Sourcing for Energy Efficiency

ACEEE American Council for an Energy-Efficient Economy

Financial Research Associates, LLC

The Energy Efficiency Finance Forum

ADVANCING THE NEXT FRONTIER IN CLEAN ENERGY INVESTING

April 12-13, 2007

New York, NY

The 2nd Annual Energy Efficiency Finance Forum

The Next Generation in Financing Clean Energy

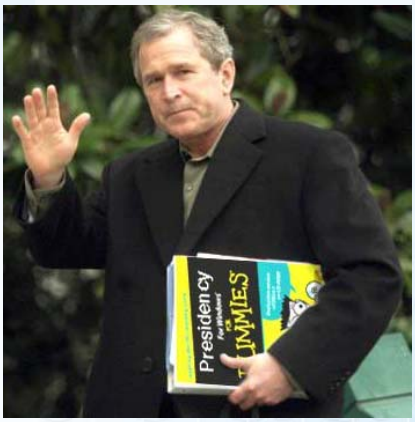
April 10-11, 2008

Arlington, VA

ACEEE American Council for an Energy-Efficient Economy

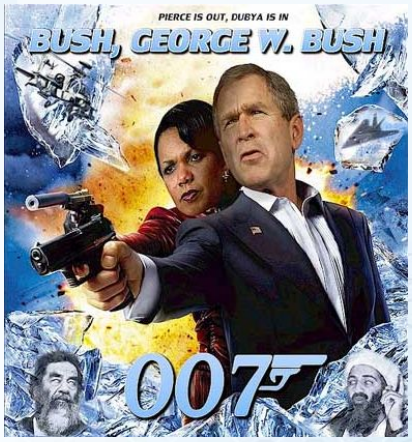
ACEEE
American Council for an Energy-Efficient Economy

Changing Faces in Washington



ACEEE
American Council for an Energy-Efficient Economy

An Alternative View



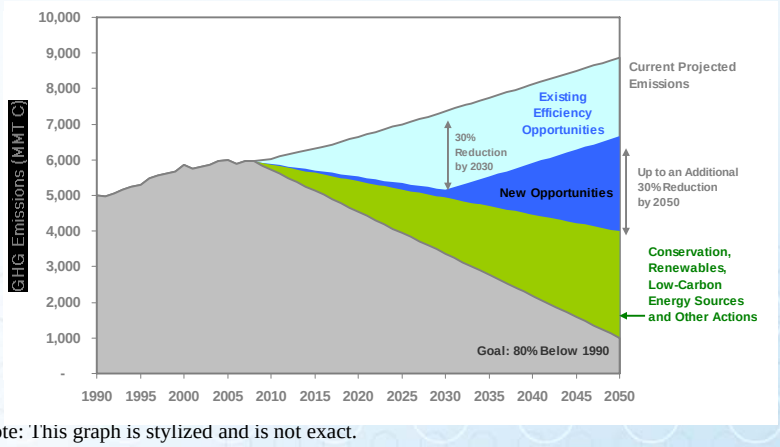
ACEEE
American Council for an Energy-Efficient Economy

Stimulus Bill

- Total stimulus package $787 billion
- Focus on spending/stimulus in 2009 and 2010, not long-term
- >$50 billion energy-related

ACEEE
American Council for an Energy-Efficient Economy

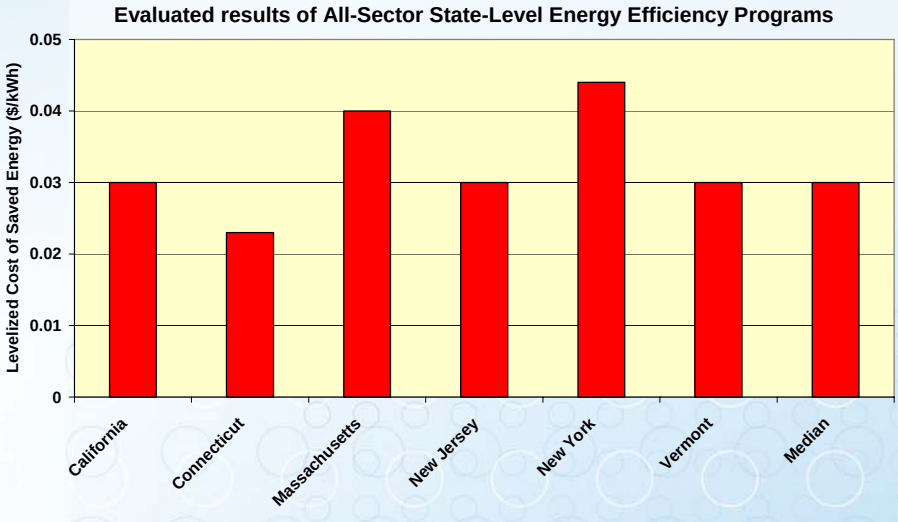
Role of Efficiency in Addressing Climate Change in the U.S.



Note: This graph is stylized and is not exact.

ACEEE
American Council for an Energy-Efficient Economy

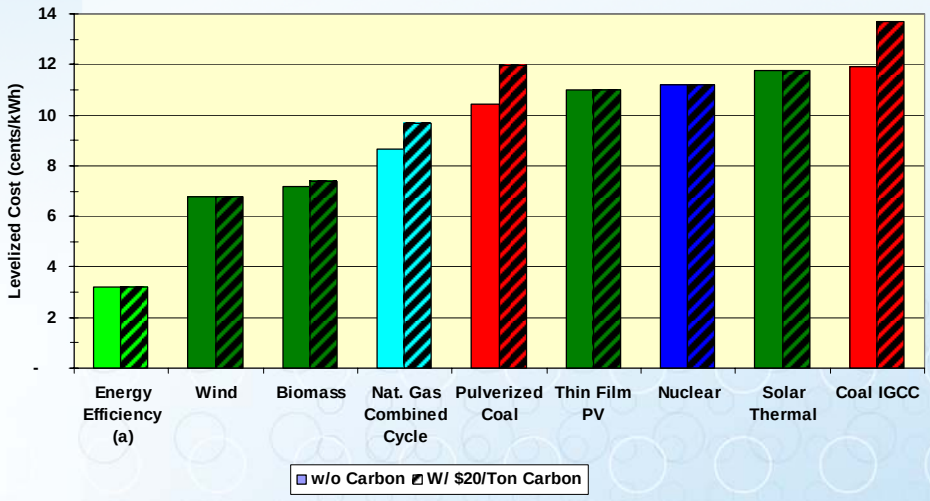
Efficiency Resources Cost Effective



Source: ACEEE, "Five Years In," 2005

ACEEE
American Council for an Energy-Efficient Economy

Cost of New Electricity Resources



Source: Lazard 2008 for NARUC (midpoint of range)

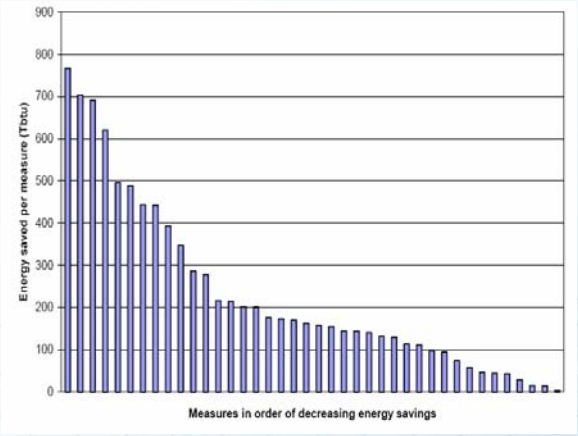
ACEEE
American Council for an Energy-Efficient Economy

Waxman-Markey Climate Change Bill

- Cap and trade – 83% GHG reduction relative to 2005 by 2050
- Contains a variety of energy efficiency policies
- Trillion dollar question -- allocation of emissions allowances to be determined in a few weeks

ACEEE
American Council for an Energy-Efficient Economy

Savings from Emerging Technologies (buildings)

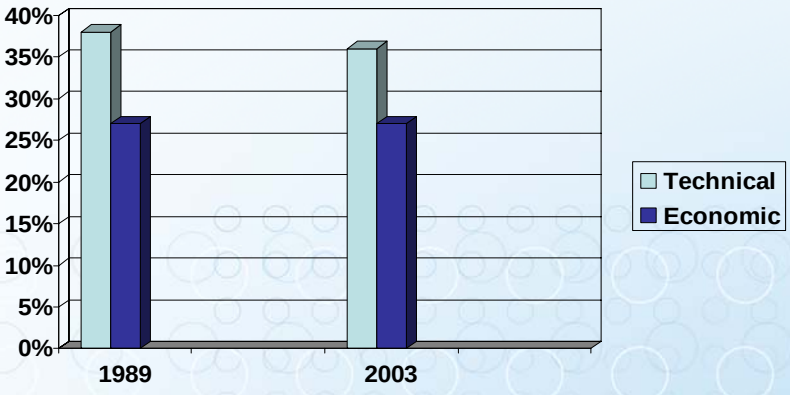


From ACEEE 2004 Emerging Tech study.

Potential savings ~ 9 quads (but some double-counting)
Only includes items likely to be commercialized soon

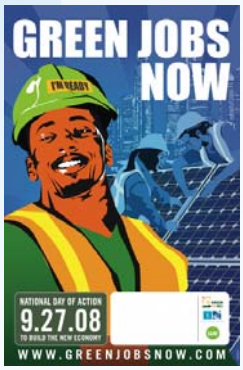
ACEEE
American Council for an Energy-Efficient Economy

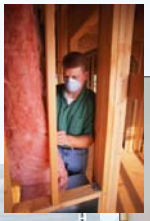
Comparison of Economic Potential in NYS – 1989 vs. 2003



Source: ACEEE 1989 and Optimal Energy 2003 analyses.

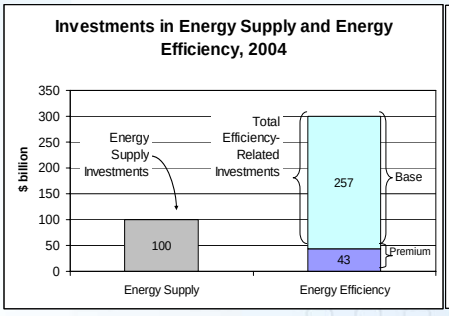
ACEEE
American Council for an Energy-Efficient Economy

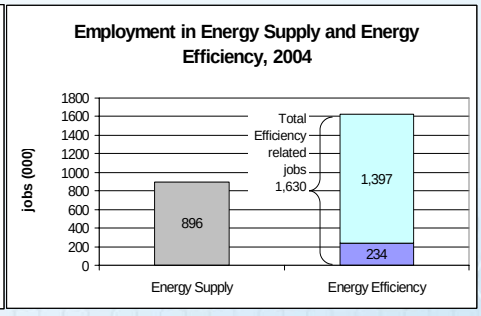




ACEEE
American Council for an Energy-Efficient Economy

The Immediate Success Story:
Something to Decidedly Build On





ACEEE
American Council for an Energy-Efficient Economy

Dan Adler is President of the California Clean Energy Fund (CalCEF), a $30 million nonprofit venture capital fund created to accelerate investment in California's clean energy economy. CalCEF Fund I, employing a fund-of-funds model, is invested in 39 young companies covering the full range of clean energy technologies. In 2006 CalCEF founded the nation's first university center on energy efficiency, the Energy Efficiency Center at the University of California at Davis, and in 2008 launched the CalCEF Clean Energy Angel Fund and an affiliated public policy and market intelligence organization, CalCEF Innovations. Prior to joining CalCEF, Mr. Adler was a senior analyst in the Division of Strategic Planning at the California Public Utilities Commission, where he was responsible for the design and implementation of California's Renewables Portfolio Standard and was senior staff for climate change policy. In addition to energy issues, Mr. Adler has professional experience in international trade policy and socially responsible investment. He has a B.A. in Political Science from the University of California at Berkeley and an M.A. in Public Policy from Harvard University.

THE GREENING OF THE OBAMA ERA

Keynote Session: A New Administration & A New Outlook for Energy Efficiency

Keynote Speaker:
Dan Reicher, *Director of Climate Change Energy Initiatives*
GOOGLE

Dan Reicher

Director for Climate Change and Energy Initiatives, Google.org

Dan W. Reicher has over 20 years of experience in business, government and non-governmental organizations focused on energy and environmental technology, policy, finance and law. He recently joined Google where he serves as Director of Climate Change and Energy Initiatives for the company's new venture called Google.org. Google.org has been capitalized with more than $1 billion of Google stock to make investments and advance policy in the areas of climate change and energy, global poverty, and global health.

Prior to his recent position at Google, Mr. Reicher served as President and Co-Founder of New Energy Capital Corp., a New England-based company that develops, invests in, owns and operates renewable energy and distributed generation projects. Mr. Reicher is also a member of General Electric's Ecomagination Advisory Board.

From 1997-2001, Mr. Reicher was Assistant Secretary of Energy for Energy Efficiency and Renewable Energy at the U.S. Department of Energy (DOE). As Assistant Secretary, he directed annually more than $1 billion in investments in energy research, development and deployment related to renewable energy, distributed generation and energy efficiency. Prior to that position, Mr. Reicher was DOE Chief of Staff (1996-97), Assistant Secretary of Energy for Policy (Acting) (1995-1996), and Deputy Chief of Staff and Counselor to the Secretary (1993-1995). He was also a member of the U.S. Delegation to the Climate Change Negotiations, Co-Chair of the U.S. Biomass Research and Development Board, and a member of the board of the government-industry Partnership for a New Generation of Vehicles. After leaving the Clinton Administration in 2001 he was a consultant to the Senate Environment and Public Works Committee and a Visiting Fellow at the World Resources Institute.

In 2002, Mr. Reicher became Executive Vice President of Northern Power Systems, a venture capital-backed renewable energy and distributed generation engineering, services and technology company with installations in more than forty-five countries. Mr. Reicher led the renewable energy sales group at Northern and also was actively involved with the company's project finance, government relations and public affairs initiatives. He also played a significant role in the successful sale of the company to Proton Energy Systems, a leading hydrogen company, and the simultaneous creation of Distributed Energy Systems, a new NASDAQ-listed holding company that now owns both Northern Power and Proton Energy.

Prior to his roles at the Department of Energy and in the business community, Mr. Reicher was a senior attorney with the Natural Resources Defense Council where he focused on the federal government's energy and nuclear programs as well as environmental law and policy issues in the former Soviet Union. He was also previously Assistant Attorney General for Environmental Protection in Massachusetts, a law clerk to a federal district court judge in Boston, a legal assistant in the Hazardous Waste Section of the U.S. Department of Justice, and a staff member of President Carter's Commission on the Accident at Three Mile Island.

Mr. Reicher currently is co-chairman of the advisory board of the American Council on Renewable Energy and a member of the boards of the American Council for an Energy Efficient Economy, the Vermont Energy Investment Corporation, the Keystone Center's Energy Program, and Circus Smirkus. He was also recently a member of the National Academy of Sciences Committee on Alternatives to Indian Point for Meeting Energy Needs.

Mr. Reicher also recently served as an adjunct professor at the Yale University School of Forestry and Environmental Studies and Vermont Law School. He holds a B.A. in Biology from Dartmouth College and a J.D. from Stanford Law School. He also studied at Harvard's Kennedy School of Government.

Mr. Reicher was a member of a National Geographic-sponsored expedition that was the first on record to navigate the entire 1888 mile Rio Grande and was also a member of the first group on record to kayak the Yangtze River in China.

Mr. Reicher is married to Carole Parker, who headed the Office of Pollution Prevention at the U.S. Department of Defense from 1994 to 1999. Carole and Dan have three children and live in Norwich Vermont. The family will be relocating to California in August 2007.

Phil Angelides

Phil Angelides has made his mark in California and the nation as an effective public leader, as a successful businessman, and as a trailblazing environmental innovator. He currently serves as the National Chairman of the Apollo Alliance, a coalition of business, labor, environmental and community leaders committed to accelerating our nation's transition to a clean energy future.

Mr. Angelides is a Principal of Canyon Capital Realty Advisors and Chairman of the Canyon Johnson Urban Communities Fund, a partnership of Canyon and Earvin "Magic" Johnson, focused on investing in, improving, and greening residential rental and mixed use properties in urban communities across America. He was the California State Treasurer from 1999-2007 and the Democratic nominee for Governor of California in 2006.

For over two decades, Mr. Angelides has been a leader in the movement for sustainable economic progress. In the 1980's, he pioneered the planning and building of smart growth communities long before the concepts of sustainability were embraced by the marketplace. Among his ventures was the town of Laguna West which was featured in *Time, Newsweek,* the *New York Times, U.S. News and World Report,* and ABC-TV's *"Good Morning America,"* and sparked a national dialogue around building more livable, environmentally responsible communities.

During his eight years in elected office, Mr. Angelides transformed the State Treasurer's Office into a force for progress, launching ground breaking policy initiatives. He directed $26 billion in state investments to promote smart growth and create jobs, housing, and opportunities in inner cities, catalyzing a wave of reinvestment in America's urban centers. He put the weight of California's $400 billion pension funds behind investment in clean energy and the fight against global warming – seeding the "green tech" investment revolution. And, he mobilized investors across the nation to usher in a new era of social and environmental responsibility.

He has received numerous awards for his work, including the National Inner City Leadership Award from the Initiative for Competitive Inner City; the California League of Conservation Voters' Environmental Leadership Award; and the Congress for the New Urbanism's Lifetime Achievement Award.

PURE ECONOMICS & INVESTMENT "CENTS"
Market Conditions & Drivers of Energy Efficiency: Is Sustainability Still A Possibility?

Keynote Speaker:
Phil Angelides, *Chairman*
APOLLO ALLIANCE
Principal, Canyon Capital Realty Advisors

Phil Angelides

Phil Angelides has made his mark in California and the nation as an effective public leader, as a successful businessman, and as a trailblazing environmental innovator. He currently serves as the National Chairman of the Apollo Alliance, a coalition of business, labor, environmental and community leaders committed to accelerating our nation's transition to a clean energy future.

Mr. Angelides is a Principal of Canyon Capital Realty Advisors and Chairman of the Canyon Johnson Urban Communities Fund, a partnership of Canyon and Earvin "Magic" Johnson, focused on investing in, improving, and greening residential rental and mixed use properties in urban communities across America. He was the California State Treasurer from 1999-2007 and the Democratic nominee for Governor of California in 2006.

For over two decades, Mr. Angelides has been a leader in the movement for sustainable economic progress. In the 1980's, he pioneered the planning and building of smart growth communities long before the concepts of sustainability were embraced by the marketplace. Among his ventures was the town of Laguna West which was featured in *Time, Newsweek,* the *New York Times, U.S. News and World Report,* and ABC-TV's *"Good Morning America,"* and sparked a national dialogue around building more livable, environmentally responsible communities.

During his eight years in elected office, Mr. Angelides transformed the State Treasurer's Office into a force for progress, launching ground breaking policy initiatives. He directed $26 billion in state investments to promote smart growth and create jobs, housing, and opportunities in inner cities, catalyzing a wave of reinvestment in America's urban centers. He put the weight of California's $400 billion pension funds behind investment in clean energy and the fight against global warming – seeding the "green tech" investment revolution. And, he mobilized investors across the nation to usher in a new era of social and environmental responsibility.

He has received numerous awards for his work, including the National Inner City Leadership Award from the Initiative for Competitive Inner City; the California League of Conservation Voters' Environmental Leadership Award; and the Congress for the New Urbanism's Lifetime Achievement Award.

THE ENERGY EFFICIENCY OPPORTUNITY: THE BIG PICTURE REVEALED

Preparing for New Opportunities in Energy Efficiency

Speakers:

Greg Kats, *Senior Director and Director for Climate Change Policy*
GOOD ENERGIES

Terry Fry, *Senior Vice President*
NEXANT

Ajit Nazre, *Partner*
KLEINER PERKINS CAUFIELD & BYERS

Gregory Kats is Senior Director and Director of Climate Change Policy for Good Energies, a global private investment firm in renewable and clean energy technologies with $ 5 billion under management. Good Energies is a member of COFRA Holding AG, Zug/Switzerland and is represented through offices in London, New York, Toronto, Washington DC and Zug (www.goodenergies.com). Mr. Kats leads the Good Energies investments in energy efficiency and green buildings. He is a founder of newresourcebank (www.newresourcebank.com) – the first US green bank, and the American Council on Renewable Energy (www.acore.org). Mr. Kats serves as Chair of the Energy and Atmosphere Technical Advisory Group for LEED (the US green building standard) and is a principal author of Green Office Buildings: a Practical Guide to Development, (Urban Land Institute, 2005) and the forthcoming book Costs and Benefits of Greening Our Built World (Island Press) is due out fall 2009. Mr. Kats served as the Director of Financing for Energy Efficiency and Renewable Energy at the U.S. Department of Energy (1996-2001). With a billion dollar budget, it is the country's largest renewable and clean technology development and deployment program. He co-founded and, from 1995 to 2001 chaired the International Performance Measurement & Verification Protocol, (www.ipmvp.org) that has served as a technical basis for $ 10 billion in building upgrades, and is translated into 10 languages.

Earlier in his career, Mr. Kats served in senior management positions for Reuters in Paris, Geneva and then London. Mr. Kats earned an MBA from Stanford University and, concurrently, an MPA from Princeton University, serves on a half dozen boards, and regularly serves as keynote speaker at national clean energy and real estate conferences.

The Energy Efficiency Opportunity: Big Picture

Greg Kats, Senior Director and

Director of Climate Change Policy

April 23, 2009

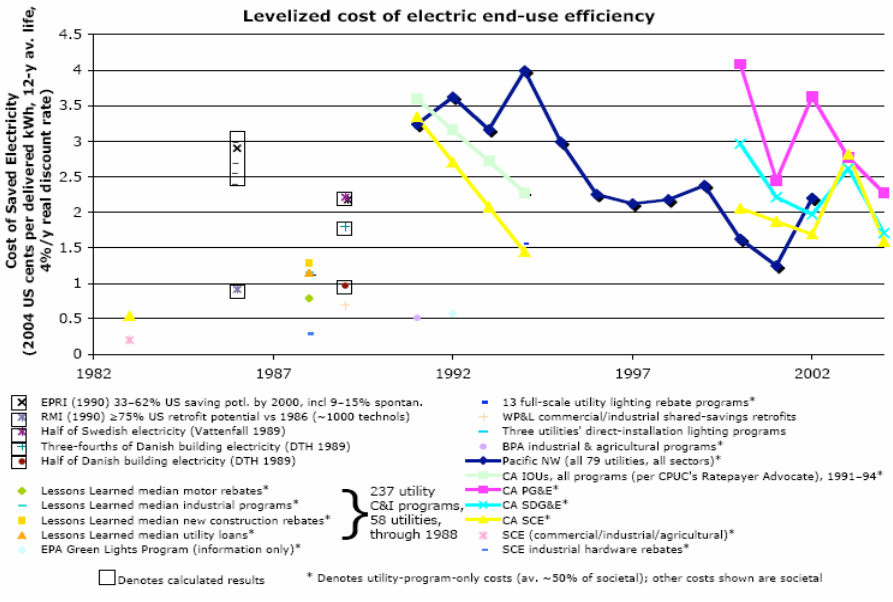
Some failed investment areas

- Five 9s/ reliability.. microturbines, flywheels
  - Benefits must be real and cheaper than alternatives
- Hydrogen/fuel cells..
  - Infrastructure threshold
  - Environmental math must work
- Ethanol.. Do the math on energy balance
  - And Federal subsidies distort

Climate Change: What is your investment thesis?

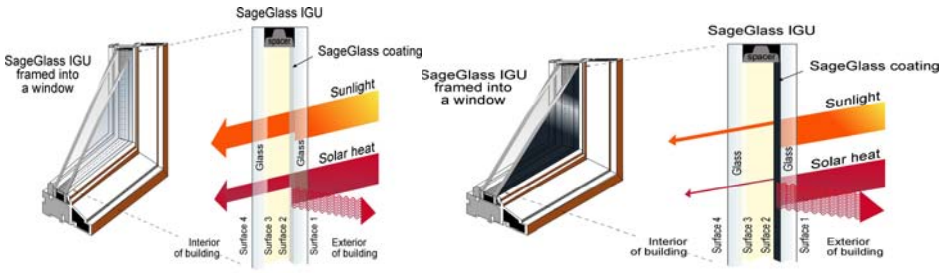
- Common view is: Big problem, one grid, national issues (security, trade deficit, employment, global warming)
- So assumption is: centralized answer eg nuclear, coal CCS
- But slow, uncertain and costly
- Real solution is opposite. Its decentralized, ie telephony and IT
- Its largely energy efficiency and we largely have the technologies.. We need to scale and deploy them
- No silver bullet.. lots of technologies and niches

Efficiency opportunities increase



Emerging technology: Sage Electrochromics

- Clear : 62% visible light and 0.48 SHGC
- Tinted: 3.5% visible light and 0.09 SHGC
- Uses less electricity per 1,500sf glass than 60w bulb
- Documented energy savings of 10-25%



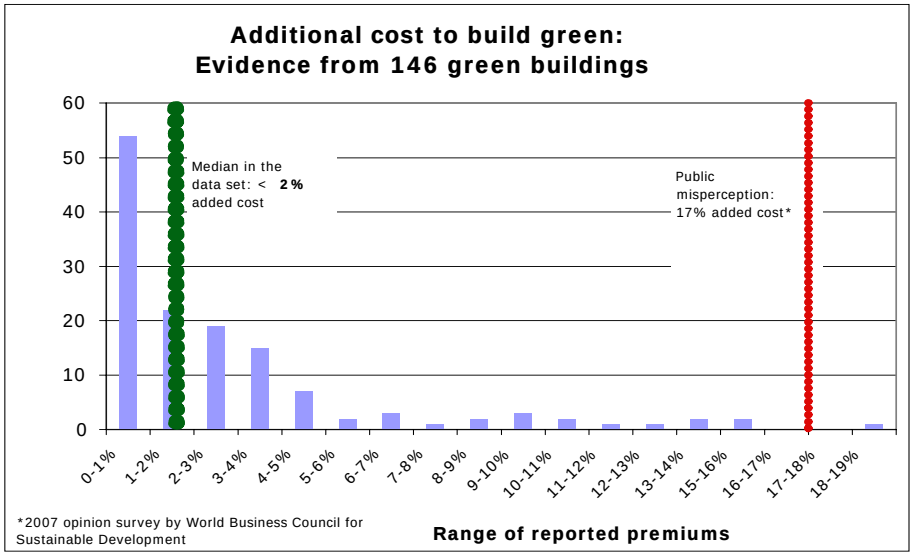
Green buildings are a good bet for efficiency

- **Delivers a lot of efficiency**
- **Sexy (at least compared with efficiency)**
- **Deals with health issues**
- **Explosive global growth**
- **Virtuous circle**
- **Lowers risk**
- **Where real estate is today**

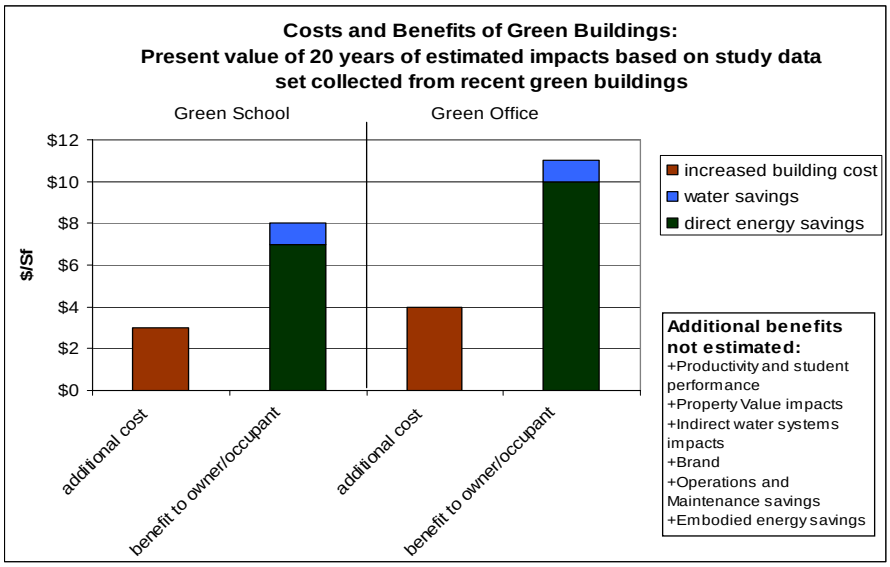
Green Building/Efficiency Study/Book Sponsors

- American Council On Renewable Energy
- American Institute of Architects
- American Public Health Association
- BOMA International
- Enterprise Community Partners
- Federation of American Scientists
- National Association of State Energy Officials
- National Association of Realtors
- Real Estate Roundtable
- US Green Building Council
- World Green Building Council

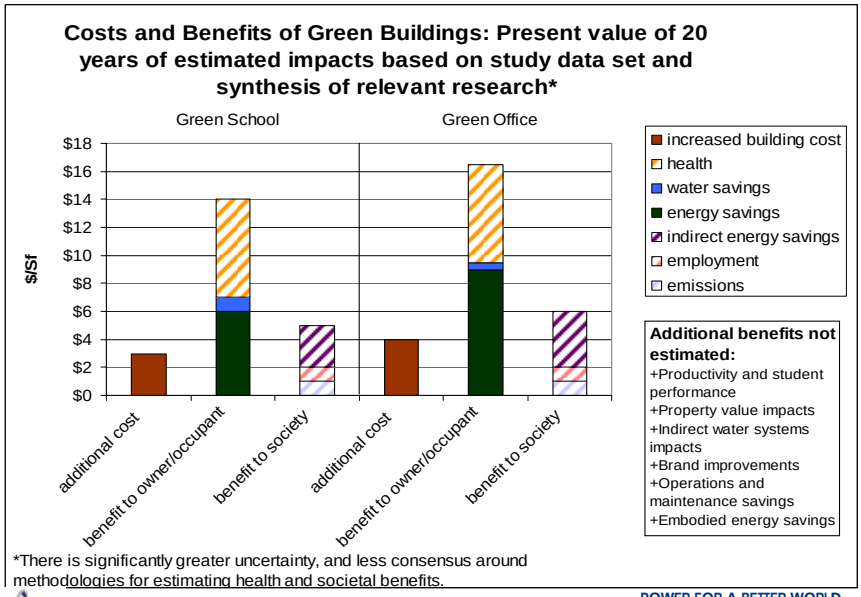
Cost of building green



Costs and benefits



Full green building benefits much greater than additional first costs



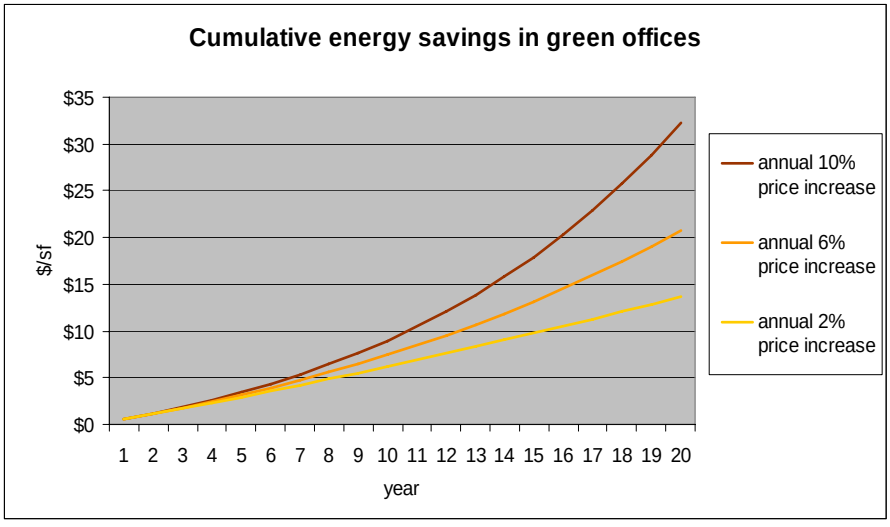
Source: Greg Kats/Good Energies

Challenges for Efficiency

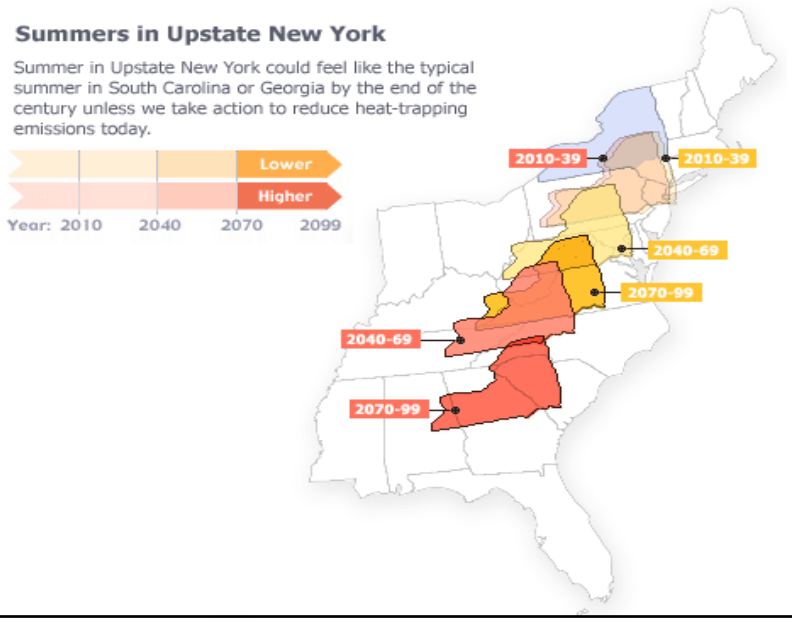
Challenges

- Institutional obstacles
- Ownership
- Timing/discount
- Actual vs modeled
- Respect!
  - Funding
  - Cap and trade treatement

Green/efficiency = risk reduction



Climate change gets personal



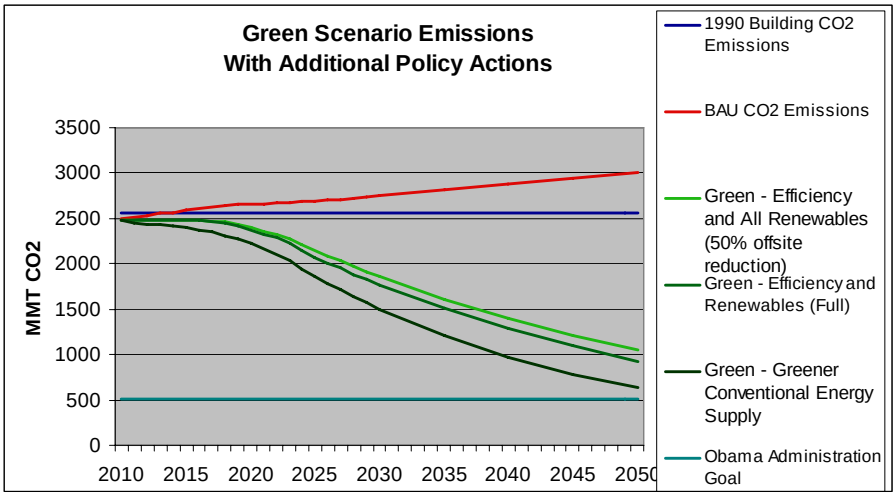
13

Climate Change matters… but maybe not how you think it does

- Climate change is real but impact is complicated… but may not be material in investment time frame
  - Who owns C02 value?
  - Large enough to matter?
- Policy Impact
- Brand Impact

POWER FOR A BETTER WORLD 14

Potential CO2 reduction impact of national green/efficient buildings program



EERE Recovery Act Funding

Office of Energy Efficiency & Renewable Energy	Recovery Act ($ Millions)
EERE RD&D	**$2,500**
Technology RD&D (Discretionary)	$1,250
Biomass	$800
Geothermal Technologies	$400
Information and Communications Technology	$50
EERE Directed Funding	**$14,350**
Energy Efficiency & Conservation Block Grants	$3,200
State Energy Program	$3,100
Weatherization Assistance Program	$5,000
Energy Star Rebates	$300
Transportation Electrification	$400
Clean Cities Alternative Fuels Pilot Program	$300
Advanced Battery & Hybrid Components Manufacturing	$2,000
EERE Subtotal	**$16,800**

Some suggestions

- Oil prices not = electricity prices
- Technology impact should be large – not marginal
- Must consider all alternatives.. on both side of the meter
- Over time public costs matter
- Efficiency (inc CHP) is not sexy.. But it is a good bet
- Green buildings is a powerful efficiency trend
- Technologies that enable renewables make sense
- Engage on:
  - Funding allocation in DOE
  - Efficiency in cap-and-trade

Important Disclaimer

Contacts

Greg Kats
Senior Director and
Director of Climate Change Policy
Good Energies Inc.
Greg.kats@goodenergies.com

Emely Lora
Good Energies Inc.
Emely.lora@goodenergies.com

Good Energies
POWER FOR A BETTER WORLD

power for a better world

Mr. Fry is a Sr. Vice President in Nexant's Energy & Carbon Management group in San Francisco and an active proponent of efficient energy production and use. He has focused on energy industry restructuring policies and regulations that encourage energy efficiency—with particular emphasis on demand-side management (DSM), environmentally friendly technologies, and private sector services. Terry directs energy efficiency program services and strategic consulting studies throughout North America, where his staff members conduct dozens of strategic studies and hundreds of energy performance analyses annually. His staff in Nexant's California offices support public-goods funded DSM programs implemented as utility core programs and provide turnkey design and implementation of numerous third-party programs. His staff in Nexant's Washington, D.C. office support international energy policy and consulting projects, which he oversees directly in China and East Asia. Terry holds an M.Phil in Economics from Cambridge University and a B.S. in Mechanical Engineering from Stanford University.

Energy Efficiency Opportunities in China

Big Picture Implications for other Developing Countries (and the World)

Energy Efficiency Finance Forum

San Francisco, April 23, 2009

Nexant

Presentation

- China energy perspective
- Overview of energy and economic development
- China's energy efficiency financing initiatives
- Implications

China Energy Perspective

- Per capita electricity consumption is rising quickly

Electricity Consumption (kWh/cap) and Growth

	1984	2007	Growth (annual)
US	10,237	13,826	35% (1.3%/yr)
China	344	2,302	569% (8.6%/yr)

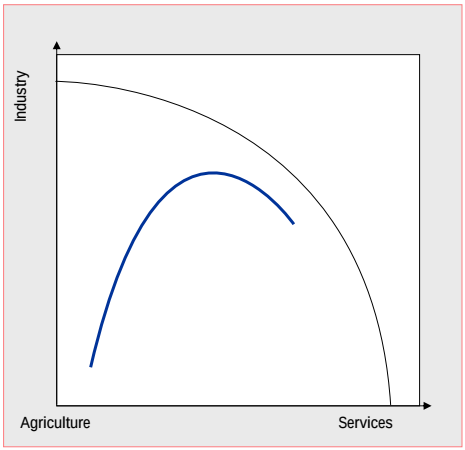
- Even with modest population growth, the implications are staggering
  - A coal plant per week
  - 400,000 premature deaths a year to associated respiratory illnesses
  - China has caught US as largest carbon emitter
- Why is this happening and what are the implications for energy efficiency?

Nexant

2

Energy and Economic Development

- As an economy develops, employment shifts away from agriculture during industrialization, and toward services as modernization continues

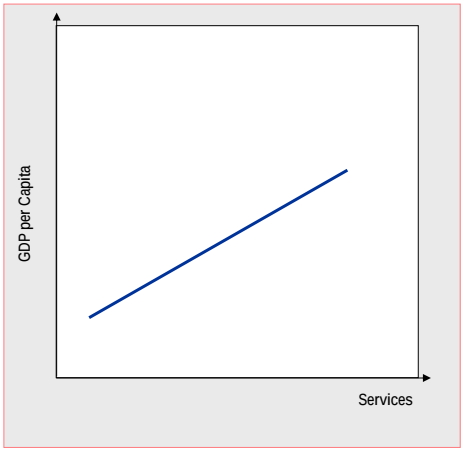


Nexant

3

Energy and Economic Development

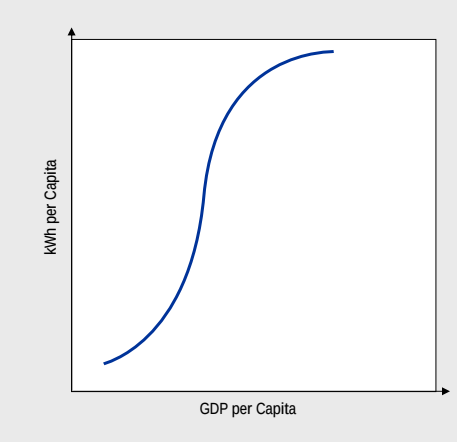
- During the industrialization and modernization process, economic income — measured in GDP per person — rises steadily



Nexant

Energy and Economic Development

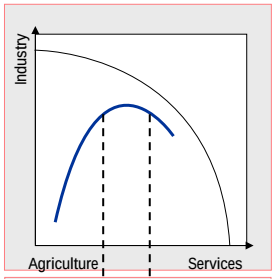
- As GDP per capita increases, the amount of energy consumed per person also rises



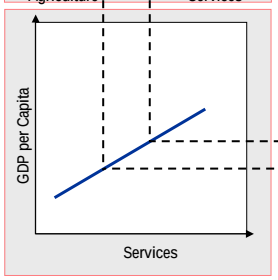
- Energy use rises especially fast as consumers achieve the range of middle income, and then begins to level off at upper income levels

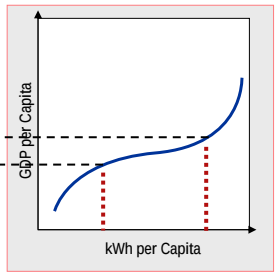
Nexant

Energy and Economic Development



- During the industrialization and economic development process, per capita energy use can rise very rapidly
- Industrial development and energy use continue to increase; commercial and residential end uses increase quickly



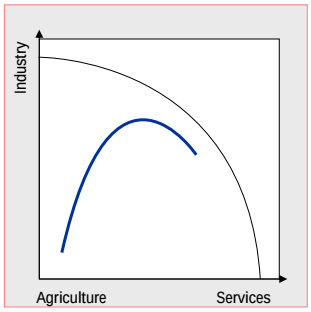


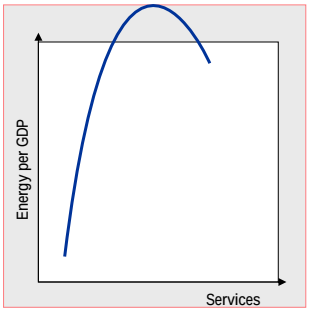
Nexant

6

Energy and Economic Development

- Macroeconomic shifts cause shifts in economic energy productivity (energy/GDP) and peak demand intensity (peak kW/capita)





Industry

↓

Services

– Chemicals and building materials industries (steel, cement)
– Buildings (commercial and housing)
- Export oriented manufacturing (appliances, electronics)
- Commerce, banking, etc.

Energy per GDP
hi
↓
low

Peak kW per capita
low
↓
high

Nexant

7

Good News is that China Appreciates the Challenge

- Jiangsu "Efficiency Power Plant" resource assessment illustrates the energy efficiency opportunities are significant
- Jiangsu example identifies EPP potential at 8% of electrical energy growth and 15% of peak demand growth

JIANGSU

	Electricity Savings (at Generation Voltage)					
	Energy (GWh/yr)			Peak Demand (MW/yr)		
Cumulative annual	**2006**	**2010**	**2015**	**2006**	**2010**	**2015**
1. Industrial motor drive system	203	3,453	9,583	51	863	2,396
2. Industrial non-motor efficiency	146	2,486	6,900	24	414	1,150
3. Transformers	0	159	1,119	0	27	193
4. & 5. Lost opportunity cooling, heating and lighting [see Note]	28	707	3,559	17	476	2,412
6. Commercial new construction	-	619	3,327	-	225	1,209
7. Cooling, heating and lighting retrofit	103	1,831	3,822	101	1,794	3,598
8. Residential lighting and appliance	73	1,041	2,324	46	574	1,176
Total Programs	**553**	**10,296**	**30,633**	**240**	**4,374**	**12,133**

- Industrial energy savings is current focus and will remain important
- Efficiency and demand response in peak-intensive end uses will become increasingly important

Nexant

8

Status of China Energy Efficiency Financing Initiatives

- Policy support provides a foundation
  - High level objective statement: target 20% improvement in energy per unit GDP during 2006-2010 FYP
  - Medium and Long Term Energy Conservation Policy (2005)
  - Revisions to Energy Conservation Law (2007)
  - Statistics and benchmarking on energy intensities
  - Special funds for energy savings
    - 200-250 RMB/TCE incentive established by NDRC & MoF
    - Provincial level funds established in Hebei, Jiangsu, Guangdong
  - Building codes and appliance standards
- Energy efficiency finance programs
  - World Bank programs (1997 to present)
  - IFC China Utility Energy Efficiency Finance Program (2006)
  - ADB Guangdong EPP Project (2007)
  - ADB Multi-project Financing Program

Nexant

9

Donor-Funded Energy Efficiency Financing Initiatives

- World Bank programs
  - Phase 1: ESCO Development (1997)
    - Loans, grants, technical assistance
    - Beijing, Shandong Province, Liaoning Province Energy Management Companies (ESCOs)
    - Demonstrate performance contracting model
  - Phase 2: Loan Guarantees (2004)
    - Loan guarantees to local banks through China National Investment and Guarantee Company; 90% of bank's principal is guaranteed
    - EMC Association formed—100+ members; more than 40 have received loan guarantees
  - Phase 3: Energy Conservation Program (2005)
    - Focus on large industrial projects
    - $200 million loan through MoF to participating local banks for on-lending to projects up to $25M

Donor-Funded Energy Efficiency Financing Initiatives (cont'd)

- IFC China Utility Energy Efficiency Finance Program (2006)
  - Loss sharing agreement with banks (Industrial Bank and Bank of Beijing)
    - 75/25 on "first losses" ; 40/60 on "second losses"
  - Partnership agreement with utility companies (Xin'ao Gas)
  - Second phase using utility bills for loan payments and collections, with credit enhancement threat of gas service curtailment
- ADB Guangdong EPP Project
  - $100 million sovereign loan, on-lent to Guangdong to establish loan fund
  - ESCO and users eligible to borrow
  - Guangdong ETC implementing and Guangdong Fiscal Bureau managing fund
- ADB Multi-project Financing Program (details tbd)
  - 50% partial credit guarantee to partner banks
  - Technical partner provides technical due diligence to banks (e.g., Standard Charter Bank)
  - Vendor finance agreements between partner banks and EE equipment vendors (e.g., Johnson Controls)

Implications for Energy Efficiency Finance

- Opportunities now:
  - Participation in donor-funded programs
  - Private industry and commercial buildings; led by multinational company operations and facilities
- Future Opportunities
  - Buildings will be enormously important in future
    - Urban migration expected to bring 600 million *more* people into cities
    - 50,000 new high rises
    - Building structures, mechanical equipment, and appliance efficiencies are all critical
  - Industry will continue to offer significant potential (still more than half of national electrical consumption)
  - Building construction industries (cement, steel) will continue to have ravenous energy appetites and require process efficiency improvements
- Implications for other developing countries and the world
  - If China can get this right, others can, too
  - If China doesn't get this right…

Nexant

Contact Information

Terry Fry
Senior Vice President,
Energy and Carbon Management
Nexant, Inc.
www.nexant.com

+1 415 369 1021 tel
tmfry@nexant.com

Nexant

Ajit joined Kleiner Perkins Caufield & Byers as a partner in 2003. His areas of investment include enterprise software and services, new materials and greentech. Ajit also leads KPCB's India investment initiative.

Ajit presently sits on the board of 7 private companies and is a board observer in 7 additional companies. To date, KPCB has invested in 8 companies in India.

Ajit came to KPCB from SAP. At SAP he worked for Dr. Hasso Plattner, CEO, Chairman and co-founder, SAP. Ajit co-founded SAPMarkets in 2000, a fully owned company of SAP, and was Managing Director of SAPMarkets Americas. In 2002, he was SVP of SAP's New Venture Unit, SAP Inspire.

Prior to SAP Ajit worked in the medical device industry, first at Zimmer, Inc., a division of Bristol Myers and Squibb, and then at Mathys AG (Synthes) in Switzerland.

Ajit has an undergraduate degree in Mechanical Engineering from the College of Engineering Poona (COEP), India. He holds an MS in Mechanical Engineering from Michigan Tech, a PhD in Biomechanics from the Technical University of Hanover, Germany, and an MBA from the Harvard Business School. Ajit holds 7 US and 6 international patents and has published several articles in peer reviewed journals.

NUTS & BOLTS

Preparing to Set Up an Energy Efficiency & Clean Tech Fund

Speakers:

Nancy E. Pfund, *Managing Partner*
DBL INVESTORS

Chuck McDermott, *General Partner*
ROCKPORT CAPITAL

R. Thomas Amis, *Partner*
ALSTON & BIRD LLP

Moderator:

Craig Sieben, *President*
SIEBEN ENERGY ASSOCIATES

Nancy E. Pfund is a Managing Partner of DBL Investors, an investment firm focused on delivering strong financial returns together with positive social, environmental, and economic impact. Ms. Pfund currently sponsors or sits on the board of directors of private companies including; Tesla Motors, Pandora Corporation, BrightSource Energy, Solar City and eMeter. Originally a regional venture capital group within JPMorgan, DBL Investors spun out as an independent firm in January 2008. Ms. Pfund joined JPMorgan (then Hambrecht & Quist) in 1984 as a securities analyst and later joined its venture capital department as principal and then Managing Director. Ms. Pfund is a member of the board of directors of the California Clean Energy Fund (CalCEF), and is also a member of the Advisory Board of the UC Davis Center for Energy Efficiency. She is a founding officer and director of ABC^2, a foundation aimed at accelerating a cure for brain cancer. Ms. Pfund received her BA and MA in anthropology from Stanford University, and her MBA from the Yale School of Management.

Charles J. “Chuck” McDermott

General Partner
RockPort Capital Partners

Chuck began his cleantech career over 20 years ago helping to launch in 1984 the nation’s first independent bulk electric power trading company, the predecessor to Citizens Power. In 1986, having directed the successful campaign of Congressman Joseph Kennedy II, Chuck served two terms as his Chief of Staff. He then joined Waste Management, the world’s largest environmental services company, as Vice President for Government Affairs. During his 12 years of senior level energy and environmental policy work in Washington, DC Chuck established strong administrative and strategic relationships that have put him at the forefront of cleantech policy deliberations today. He brought this public/private sector experience to RockPort when he joined in 1998. Chuck studied at Yale University before beginning a 14 year career in the music business as a songwriter, performer and recording artist.

He currently serves on the Boards of Directors of Advanced Electron Beams, Project FROG, Renaissance Lighting, Soliant Energy, Sustainable Spaces, and Tioga Energy. He is also a director and executive committee member of the GridWise Alliance, a member of the Smart Grid Policy Center Advisory Council, a member of the National Renewable Energy Laboratory Capital Advisory Committee, and a member of the Energy Future Coalition Advisory Council.

R. Thomas Amis

Partner

tom.amis@alston.com

Tom Amis is a partner in Alston & Bird's Washington office where he co-heads the firm's Renewable Energy Group. He has developed and financed projects in a number of industry sectors over the course of his career, with an emphasis on electric power projects. For the past six years, his practice has focused on the renewable energy sector.

Mr. Amis leads an integrated renewable energy practice, incorporating expertise in project development and finance, renewable energy policy, carbon management and renewable energy technology. This synergistic approach positions the group to add significant value to renewable energy transactions.

Acting for both developers and lenders, he has negotiated joint development agreements; joint venture, partnership, and other ownership documentation; turbine supply contacts; balance of plant contracts, REC sales agreements; transmission and interconnection agreements; operating agreements; financing documents; and land use agreements. He also is highly experienced in developing projects structured around CERs generated pursuant to the Kyoto protocol.

R. Thomas Amis
The Atlantic Building
950 F Street, NW
Washington, D.C. 20004-1404
Phone: 202-756-3480
Fax: 202-654-4840

Recognized energy authority Craig Sieben, founder and President of Sieben Energy Associates, is a leading expert on energy efficiency and pioneer in the modern, rapidly-growing field of professional energy management for over two decades.

Today, Sieben Energy offers a uniquely comprehensive range of services to a broad spectrum of large and small businesses, together with a range of other institutional clients, who seek to responsibly contain their energy costs at a time of heightened concern for the environment.

Craig traces his interest in energy efficiency, both as a business and a public policy issue, to the oil shocks of the 1970s and to the highly-publicized nuclear accidents at Three Mile Island and Chernobyl. With the supply side of the international energy equation clearly vulnerable, he correctly saw that drilling the demand side made more sense and would be more profitable. The recent extraordinary bounces in oil prices, plus global warming, as urgent international concerns underscore the practicality of Sieben's insight.

During his undergraduate years at Hampshire College in Massachusetts – where he graduated with a B.A. in Energy Policy in 1983 – Craig served in Washington as a summer intern at the House Subcommittee on Energy Conservation and Power, as well as the Department of Energy's Office of Solar Energy.

Following graduation, he worked as a research and marketing assistant at Daniel Yergin's Cambridge Energy Research Associates; founded the Super-insulation Information Service, a consultancy to building professionals; and was vice president for marketing at The Lighting Corporation before founding Sieben Energy Associates in his native Chicago in 1990.

Sieben Energy continues to innovate and expand on its pre-eminence in the field that its founder pioneered. Craig has emerged as a national opinion leader, an experienced and deeply knowledgeable expert on energy efficiency and conservation in the built environment, which generates half the U.S.greenhouse emissions.

He speaks often on what he calls the "second Saudi Arabia" waiting to be tapped in America's building stock, and on the profound potential impact that enlightened energy efficiency practices and programs could have on the economy and the environment.

Craig and his wife Amy live in Chicago with their two young children.

LUNCHEON KEYNOTE
A NEW ROLE FOR ENERGY EFFICIENCY

Keynote Speaker:
Dan Kammen, *Energy and Resources Group*
UNIVERISTY OF CALIFORNIA, BERKELEY

Daniel M. Kammen

Daniel M. Kammen is the Class of 1935 Distinguished Professor of Energy at the University of California, Berkeley, where he holds appointments in the Energy and Resources Group, the Goldman School of Public Policy, and the department of Nuclear Engineering. He works on energy and environmental science, policy and analysis, and has extensive field experience in Latin American, southeast Asia and China, and in Africa, which has been a focal point of his work for two decades.

Kammen is the founding director of the Renewable and Appropriate Energy Laboratory (RAEL).

Kammen is the Co-Director of the Berkeley Institute of the Environment.

Kammen is the Director of the Transportation Sustainability Research Center.

Kammen received his undergraduate (Cornell A., B. ’84) and graduate (Harvard M. A. ’86, Ph.D. ’88) training is in physics After postdoctoral work at Caltech and Harvard, Kammen was professor and Chair of the Science, Technology and Environmental Policy at Princeton University in the Woodrow Wilson School of Public and International Affairs from 1993 – 1998. He then moved to the University of California, Berkeley.

The focus of Kammen’s work is on the science and policy of clean, renewable energy systems, energy efficiency, the role of energy in national energy policy, international climate debates, and the use and impacts of energy sources and technologies on development, particularly in Africa and Latin America. Kammen has published five books, over 200 journal articles and 30 research reports. He has testified many times to the U. S. House and Senate, and to the legislatures in California, Connecticut, Minnesota, New York, and Washington. He is an advisor to the UK and Swedish governments on energy and environment, and the Secretary General of the United Nations as well as UNEP and UNDP. He advises California Governor Schwarzenegger on energy issues, and works closely with Mary Nichols of the California Air Resources Board. Kammen’s team helped to develop the Low Carbon Fuel Standard

Daniel Kammen is a coordinating lead author for the Intergovernmental Panel on Climate Change (IPCC), which won the Nobel Peace Prize in 2007.

In 1998 was elected a Permanent Fellow of the African Academy of Sciences. In 2007, Kammen received the Distinguished Citizen Award from the Commonwealth Club of California.

Kammen is a primary author and serves on the executive committee of the $500 million Energy Biosciences Institute funded by BP. The institute is a joint venture of the University of California, Berkeley, the University of Illinois at Urbana Champaign, and Lawrence Berkeley National Laboratory.

Business Leadership

Kammen is the chair of the research board of Enphase Energy, a solar and energy efficiency company. Kammen is the director of Baseload Energy and is a research director for Direct Carbon, a fuel cell company. He is on the board of EDP-Renewables (Lisbon, Portugal), Greenwala (San Francisco), and is a Member of the Copenhagen Climate Council for Business Leadership.

Notable Activities

Coordinating lead author for the Intergovernmental Panel on Climate Change (IPCC) Special Report on Renewable Energy Sources and Climate Change Mitigation (2008 – 2010).

Host/'Energy Czar' of the six part *Science Channel* TV series 'Ecopolis' (2008). Air date December 8, 2008

President-elect, American Association for the Advancement of Science Section X, Societal Impacts of Science and Technology (2008).

Developed 'Berkeley First" energy efficiency and solar energy financing plan – to permit installation of clean energy systems on residences with no up-front costs (service on the Measure G Advisory Committee for the City of Berkeley, 2007 – present).

Co-Author of the California Low Carbon Fuel Standard (Executive Order S-7-1).

Chairman of the Research Board, Enphase Energy (Petaluma, CA), company to develop solar energy systems.

Nobel Peace Prize (2007), Intergovernmental Panel on Climate Change, Contributing Lead Author on IPCC Reports (1999 – present).

Distinguished Citizen Award, Sustainable Energy, Commonwealth Club of California (2007).

Energy Biosciences Institute, Proposal lead-author and Executive Committee Member, $500 million BP funded institute on sustainable biofuels.

Worked with Assemblywoman Fran Pavely on the development of AB32, the California Global Warming Solutions Act (2007).

Conducted first ever field-based exposure-response study on traditional biofuels, cooking, and health (Laikipia, Kenya, 1993- 2002). Project publications: *The Lancet*, *Science, Scientific American.*

21st Century Earth Award (Japan, 1993): for research addressing the amelioration or solution of such global environmental problems as climate change, deforestation or biodiversity preservation.

Author of a text on energy and environmental risk assessment, *Should We Risk It* (Princeton University Press, 1999).

Media

Kammen has appeared on *60 Minutes* (twice), *Frontline*, and the evening news of all the major networks. He is a frequent commentator in *Newsweek*, *Time*, *The Guardian*, and *The Financial Times.*

Personal

Kammen was born in Cambridge, Massachusetts and grew up in Ithaca, New York. He is married to Bamidele Fayemi Kammen, a pediatric radiologist from Nigeria. They were married in Ondo State, Nigeria, and live in Oakland, California. He has two daughters, Folasade (11), “Sade”, and Omolara (5) “Lara”.

STRUCTURING & MODELS

New Innovative Financing Structures & Models

Speakers:
Bob Hinkle

Paul Frankel, *Managing Director*
CalCEF Innovations

Stephen Compagni Portis, *CEO, Chairman*
RENEWABLE FUNDING LLC

Bob Hinkle is serving as Entrepreneur in Residence for the California Clean Energy Fund (as part of CalCef Innovations) to identify and implement new business models for energy efficiency. He is a pioneer in the creation of Efficiency Services Agreements and is forming a new company to provide financing and efficiency services for retrofit projects at large industrial, manufacturing, and commercial facilities. Previously, Mr. Hinkle served as Vice President of Energy Efficiency at MMA Renewable Ventures and was responsible for managing the company's overall energy efficiency financing business as well as identifying, developing, and negotiating investment opportunities. Mr. Hinkle was also responsible for managing relationships with electric utilities, industry associations, and large-scale commercial and industrial energy users. He has more than 15 years of experience in the energy industry and worked for 10 years at Nexant (formerly part of Bechtel Corporation) with responsibility for developing and managing over $150 million of energy efficiency projects and programs for utilities, energy end-users, and international donor agencies. He has extensive experience in evaluating the financial viability of energy efficiency investments and programs both in the U.S. and abroad. Mr. Hinkle has a Masters degree in International Business from the Fletcher School, Tufts University and a Bachelor of Arts in International Politics and Economics from Middlebury College.

METRUS ENERGY

Efficiency Services Agreements (ESA) for Large-scale EE Retrofit Projects

ACEEE Energy Efficiency Finance Forum
April 2009

ESA Emergence Coincides with National EE Push

National Recognition of Vast Market Potential and Benefits of EE

- EE is the most cost effective and quickest route to meeting energy demand and reducing GHG emissions
- Adverse economic conditions and competitive pressures increase the need to reduce operating expenses
- Growing level of utility, state, and federal financial incentives for EE

ESA can help address a large — but highly underserved — market for EE

- EE potential in the private, commercial & industrial market > $250B
- Focus of large ESCOs has been on federal/municipal/public sector facilities
- Lack of financing options compound first cost barriers to EE for end-users
- High volume of unmet demand for projects with paybacks of two to six years

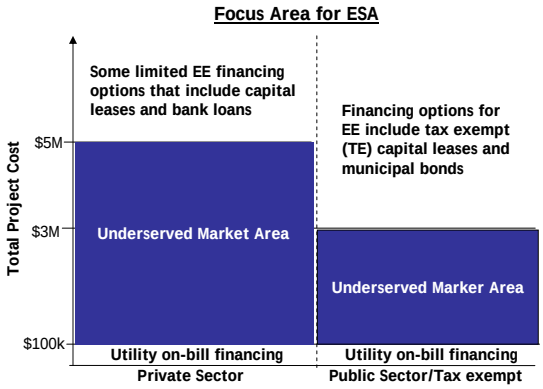
Overview of the Efficiency Services Agreement

The ESA is an innovative financing solution that fills a major void for implementing large-scale EE retrofit projects

- Front-end Cost: No capital outlay by customers to implement EE measures
- Operating Costs: ESA charge is inclusive of maintenance, measurement & verification, and repair/replacement of selected EE assets
- Property Ownership: ESA provider takes title to project-related assets; Customer has periodic buyout options
- ESA Charge: Cost per avoided energy unit with a fixed escalation rate
- Contract Duration: Typical length of five to 10 years
- Project Size: Average transaction of $1-5M with ability for larger deals
- Replication Potential: ESA structure lends itself to implementing EE projects at multiple customer facility sites

ESA Addresses a Large Underserved Market for EE

The ESA can be utilized to target an underserved portion of the EE marketplace that represents a significant amount of energy savings



Target End-user Segments

- Food & beverage
- Heavy industry & manufacturing
- Chemicals and pharmaceuticals
- Private healthcare
- Lodging & hospitality
- Private higher education
- Office buildings
- Retail stores
- Data centers

METRUS ENERGY

Start-up company that delivers energy efficiency services through ESAs to large commercial, industrial, manufacturing, and institutional customers

- Finance and own EE projects by making cash equity investments and securing debt facilities to fund large portfolios of individual EE projects
- Partner with ESCOs and energy service providers (ESPs) that can install and maintain project-related EE assets
- Utilize ESAs to capture added economic benefits from EE, including:
  - Environmental credits (reduced GHG emissions) from EE projects
  - Avoided capacity payments for demand reduction resulting from EE
- Provide asset management, monitoring, and billing services for operational EE projects

ESA Structure Mitigates Key Project Risks

EE projects are based on two contracts: 1) ESAs with customers, and 2) EEPC with ESCOs/ESPs — Contracts are designed to mitigate key risks

Efficiency Services Agreement (ESA)

Ways risks are mitigated in the ESA:

- *Customer pays for realized savings*
- *Customer-Metrus Energy agree on M&V protocols prior to ESA signing*
- *ESA services charge (and escalation rate) is fixed for contract duration*
- *ESA contains buyout options and provisions for early termination*
- *Metrus Energy receives license to access a facility to ensure proper O&M of EE assets*

EPC & Maintenance Contract

Ways key project risks are mitigated:

- *Metrus Energy enters into a fixed price, turn-key EPC contract*
- *Performance guarantee from savings during ESA term. ESCO/ESP pays Metrus Energy for any shortfall*
- *Maintenance and any M&V service expense is fixed for entire ESA term*
- *ESCO/ESP responsible for repair & replacement of selected EE assets that fail outside of warranty*

Key Benefits to Customers

The ESA structure provides customers with numerous financial and operational benefits, including:

- Funding comprehensive facility upgrades without capital outlay
- Enhancing the reliability of key energy-consuming equipment
- Limiting exposure to project performance and energy price risks
- Preserving scarce capital resources for investment in core business areas
- Lowering operating expenses and providing immediate cash savings
- Enabling off-balance sheet accounting treatment for EE assets
- Receiving asset management services that can include valuable information on key aspects of EE asset and overall facility performance

Future Growth of the ESA

The demand for ESAs will rapidly increase and serve as a catalyst for the aggregation of EE projects and deployment of new technologies

- ESA is an aggregation vehicle to develop large portfolios of EE assets that encompass avoided carbon emissions and capacity reductions
- Potential to integrate ESA structure within utility level EE programs
- Natural extension to deploying monitoring technologies and systems that:
  - Increase accuracy and lower cost of measuring energy savings
  - Provide customers with valuable source of data on the efficiency of key energy-consuming equipment and overall facility performance
- ESA benefits could be enhanced by providing EE assets with the same tax benefits and depreciation treatment afforded to renewable energy

Contact Information:
Bob Hinkle
Metrus Energy, Inc.
Email: bob.hinkle@metrusenergy.com
Phone: 415-203-5367

Paul Frankel is Managing Director of CalCEF Innovations, which develops and implements novel policy, technology, and finance tools to accelerate clean energy markets. Prior to that, Paul was co-founder and Managing Director of Ecosa Capital where he advised companies in the areas of clean tech and sustainable business on fundraising, investment and management strategy.

In 1999, he co-founded and was vice-chairman of the Wi-Fi Alliance. At 3Com Corporation as a member of 3Com Ventures, Paul was responsible for mergers and acquisitions, venture capital investments, and technology licensing related to wireless technologies.

He is an industry fellow at the Center for Entrepreneurship and Technology at Berkeley and an associate at the Center for the Study of Fiduciary Capitalism at St. Mary's College. He was the fundraising chair for the 2007 California Cleantech Open and judging chair of the renewable energy committee for the competition in 2006. At UC Berkeley, Paul taught innovation & entrepreneurship at the College of Engineering and social entrepreneurship at the Haas School of Business. He also taught environmental entrepreneurship at Stanford University in the Earth Systems and Political Science departments.

After graduating with a degree in political science and economics from the University of Arizona, he earned a MBA from the Thunderbird School of Global Management and holds FINRA Series 7 registration.

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Innovative Financing Models

3rd Annual Energy Efficiency Finance Forum

Paul Frankel, Managing Director
paul.frankel@calcef.org

Business Snapshot

Overview

- CalCEF is a family of entities formed to develop and implement novel policy, technology, and finance tools that accelerate clean energy markets. We analyze gaps and barriers, develop market strategies and policy suggestions, pilot test commercial models, and invest in solutions.

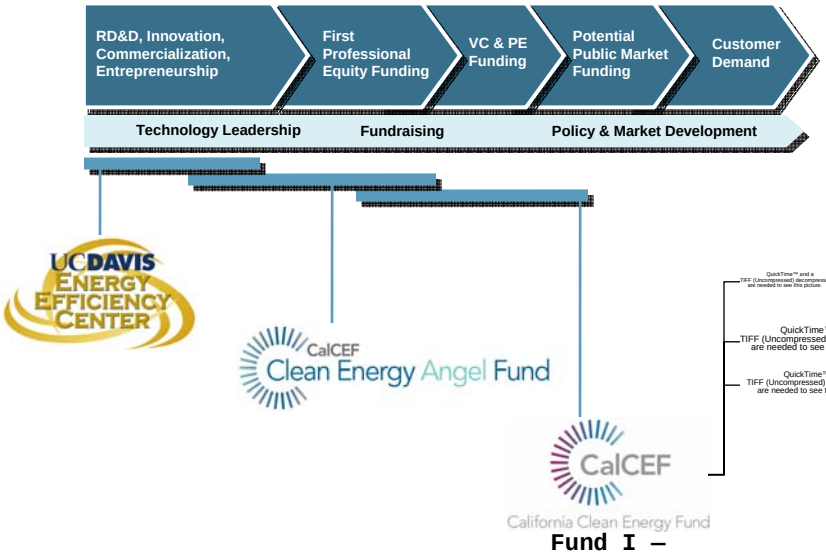
CalCEF Innovations' Mission

- Identify and address crucial challenges impacting the transformation to a clean energy economy, including the formation of enterprises, the continued flow of capital into technologies and infrastructure, and the broadening of policy support for the clean energy transition.

CalCEF's Mission

- Create a series of investment vehicles that serve as catalysts for advancing California's clean energy economy.

Business Snapshot



Programatic Elements & Partners

Barriers to EE Adoption

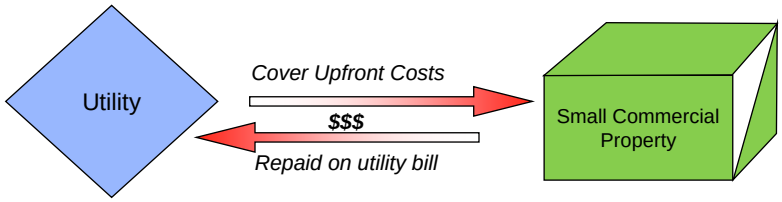
- High upfront costs
- Long payback periods
- Uncertain savings potential
- Split incentives
- Transaction costs
- Information asymmetries

Solution: ***Aggregation***

Aggregation Strategies

- **Financial**
  - On-bill financing
  - Shared equity notes for EE
  - Efficiency services agreements
  - AB 811 / 1709 / SB 279
- **Geographic**
  - Cambridge Energy Alliance
  - Clinton Foundation Climate Change Initiative
  - In California: Berkeley, Palm Desert, Chula Vista, Santa Barbara
  - New York, Pennsylvania, Vermont, and others....
- **Technological**
  - Whole-building retrofits
  - Workforce & administrative training
- **Programmatic**
  - EnergyStar + weatherization
  - Integration with California Solar Initiative
  - SDGE New Solar Homes Partnership
  - Tie to carbon and climate policy: AB 32
  - California loading order

On-Bill Financing



- Creates approval process and project criteria
- Provides energy survey and usage report
- Finances EE measures
- Tariff attaches repayment obligation to the *meter*
- Applies for financing
- Selects contractor & upgrades based on utilities' criteria
- Repays *tariff* or *loan* via utility bill
- Tariff repayment obligation *transfers with tenancy*

Some On- and Off-Bill Models

Conventional Off-Bill Financing Programs

- Sacramento Municipal Utility District
- Minnesota Center for Energy and Environment
- Efficiency Vermont
- Vermont Gas Systems
- Nebraska Energy Office
- New York State Energy Research and Development Authority
- Viewtech Financial Services
- AFC First Financial Corporation
- Cambridge Energy Alliance

On-Bill Financing Programs

- Manitoba Hydro
- First Electric Cooperative
- Midwest Energy
- Maui Electric Company

Terminated Programs

- BC Hydro's Home Improvements Program
- California Energy Efficiency Loan Fund
- New Hampshire Electric Cooperative's SmartSTART
- NW Natural's On-bill Financing

OBF Issues & Improvements

Limited scope and reach
- Support only specific EE measures and customer segments

Programs generally do not service residential owners or renters
- Particularly, those with low incomes or poor credit

Utilities generally do not want to play banker & are averse to credit risk
- Inadequate legacy billing systems
- Compliance with consumer lending laws
- Utility bill repayment history as a proxy

Third-party financing
- Repayment allocation priority generally is utility first, which increases the risk to a lender

Savings > Payments not guaranteed
- Negative IRR if financing bill is greater than new utility bill
- Customers want guaranteed reductions
- Audit & analysis, M&V are critical

- *Streamlined processes*
  - Simplify & Coordinate
  - Provide turnkey solutions by building type & climate zone
- *Partnership with contractors*
  - Recruitment, training, qualification
  - Regular communication
  - Comprehensive measures
  - Financing sales channel
- *Cooperate with commercial lenders*
  - Banks loan to utility customers for EE; maintain liabilities on bank B/S
  - Utilities evaluate projects, market to customers, collect & forward payments to banks
- *Pair OBF with state public benefit funds to:*
  - Buy down an interest rate
  - Establish a loss reserve to cover potential customer payment defaults
  - Provide capital for a revolving loan program
  - Provide rebates to reduce project costs and consequently shorten payback periods

Shared Equity Notes for EE

- Shared equity investment into owner-occupied residential real estate
- Financing alternative to for new home purchase, refinancing, and restructuring of troubled mortgage obligations or, to help finance other transactions in place of a home equity loan
- Existing homes are refurbished and made energy efficient, which add value to both the home and the environment.
- The result of private investors working alongside local government and workforce groups at the grass roots level can have a tremendous positive impact on our communities and advance residential EE deployment.
- Products and secondary markets are under development by multiple vendors.
- In the U.S. market there are
  - ~ 105 million private homes
  - ~ 15 million mortgage transactions per year
  - ~ $8 trillion in non liened home equity

Shared Equity — How It Works

- **Not** a traditional mortgage or shared appreciation loan
- **Are** an *at risk* equity investment in a fraction of a home's value, purchasing the economic rights to a defined portion of the principal and appreciation of the home in return for cash.
- Investor is taking a bullish position in the residential RE market
- Investor is entitled to a defined percentage of the proceeds upon the sale of the home or pre payment — receives a proportionate loss if a home's value falls and a disproportionate gain if it appreciates.
- Notes are priced utilizing a proprietary FICO*esque* score
- Notes secured through a Deed of Trust and perfected lien on the home
- Title, tax deductions, maintenance obligations, sale rights, and costs of sale remain with the occupying homeowner.
- Notes are paid off based on the *gross value* of the home at the time of a liquidating event.

Benefits of Shared Equity for EE

- No monthly payment; no accrued interest
- Reduces the cash flow obligation of home owner
- Enhances home value and reduces operating costs from EE retrofits
- Decreases homeowner's default risk
- Helps stabilize residential market by reducing the supply of homes and expanding the universe of qualified buyers
- Creates new jobs in the local community

More Information

- **Alliance to Save Energy**
  - "State Energy Efficiency Policies"
  - http://ase.org/section/_audience/policy/statepolicies
- **CalCEF Innovations**
  - "New Business Models for Energy Efficiency"
  - http://calcef.org/innovations/activities/nbm-eir.htm
- **UC Berkeley Energy & Resources Group**
  - "Enabling Investments in Energy Efficiency"
  - http://rael.berkeley.edu/publications

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Innovative Financing Models

3rd Annual Energy Efficiency Finance Forum

Paul Frankel, Managing Director
paul.frankel@calcef.org

Stephen Compagni Portis is the Chairman and CEO of Renewable Funding, an investment firm pioneering the emerging field of clean energy municipal financing. Compagni Portis is a serial entrepreneur and a prolific financier, originating buyouts of operating companies, and launching ventures in investment banking, enterprise software and aircraft leasing. He has closed more than fifty equity and debt transactions and is an angel investor in numerous early stage companies. Stephen has worked and lived in London, Tokyo, Milan, San Francisco, and New York City and has served as the Chairman or CEO at Vx Capital Partners, Leveraged Equity Management, Kettle Restaurants, and Yellow Giant Corporation. Compagni Portis studied engineering at Cornell (BS ’80) and attended the Stanford Graduate School of Business (MBA ’84). He is currently a Renewable Energy Finance Scholar at the University of California, Berkeley, and sits on the boards of Quantal International, Creative Growth Art Center, and the Alameda County Community Food Bank. Stephen lives in Oakland with his wife Natalie, teenage son Julian, and their dogs Lucy and Ruby.

MARKET AGGREGATION & EE FINANCE PROGRAM MODELS

Does it Help to Package? What Should You Include?

Speakers:

John MacLean, *President*
ENERGY EFFICIENCY FINANCE CORPORATION

Neil Zobler, *President*
CATALYST FINANCIAL GROUP, INC

John MacLean is an investment banker with a background in municipal finance and energy project finance. He has 26 years commercial finance experience with a wide range of investment structures, mainly for senior debt, and also for municipal bond, leasing, factoring, subordinated debt, guarantees, project equity and corporate equity transactions and has worked on financing energy efficiency projects and companies throughout his career. For the last twelve years, he has worked internationally as a financial advisor with the International Finance Corp., World Bank, Asian Development Bank, UNEP, UNDP and others to develop, structure and implement energy efficiency and renewable energy investments and finance programs. He graduated from Yale University in 1980 in economics and teaches sustainable economics at The Evergreen State College and can be contacted at jmaclean@eefinance.net.

Energy Efficiency Finance Program Models & Scale-up Strategies

ACEEE Energy Efficiency Finance Forum
April 23, 2009

John MacLean
Managing Director, Energy Efficiency Finance Corp.,
Olympia, WA (USA)
jmaclean@eefinance.net
phone = 1-360-339-3936

EE Finance Programs: Definition

- EE market characteristics:
  - Large numbers of small, dispersed projects
  - Diverse market segments with many financing instruments
- Debt finance for project/equipment assets
- Distinguish: Transactions, Programs & Scale-up
- An EE finance program organizes & systematically delivers EE project development services and financing to implement *multiple* projects/transactions in a specific market sector
- Programmatic approach is essential to meet challenges of replication & scale-up
- Substantial body of experience

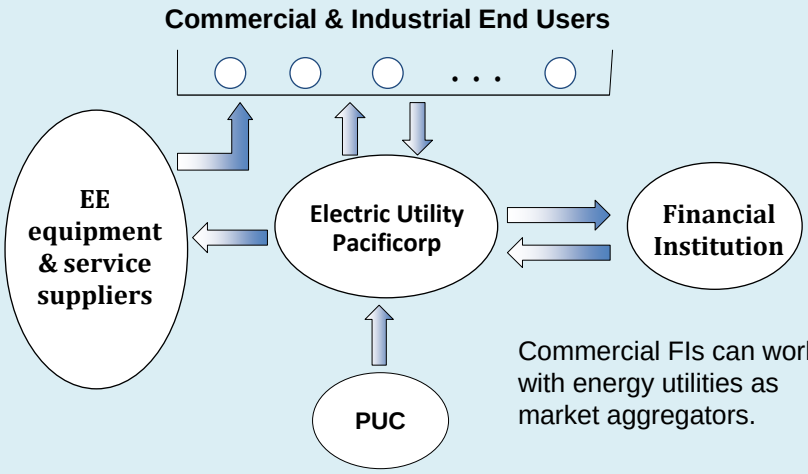
EE Finance Programs: Summary Elements

- Combine finance with marketing, project development services & delivery mechanisms → "one-stop shop"
- Include market organization plan & market aggregator partners
- Range of end-user sectors = variety of financing structures
- Credit structure & collections mechanism
- Combine public/development finance to mobilize & leverage commercial finance
  - Meet lender criteria: transaction costs, capital demand, credit
  - Credit enhancement facilities can be effective
- Build on existing capacities & institutional structures; define & allocate all roles & risks through the full project cycle
- Work force training
- Carbon finance

Market Aggregation Partners & Strategies

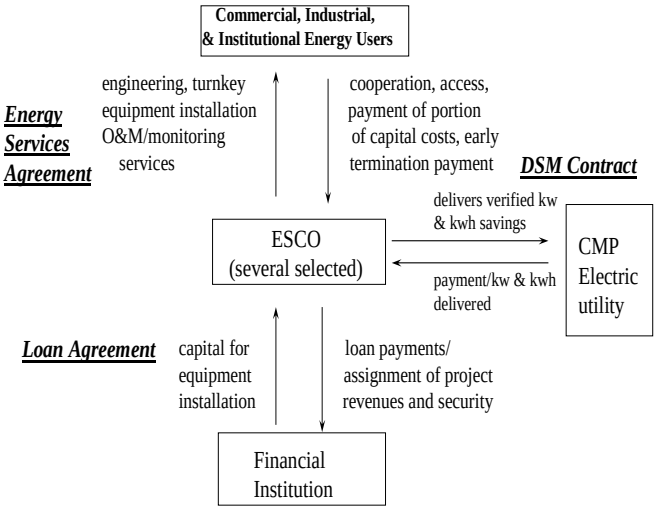
- Utilities
- Governments: Federal, State & local
- End-user Associations
- End-users managing multiple facilities
- EE equipment manufacturers & vendors
- ESCOs
- Pooled procurements and assistance to get end-users purchase decision ready

Utility-based EERE Finance Program
Pacificorp (USA) Energy Finanswer



Commercial FIs can work with energy utilities as market aggregators.

Central Maine Power DSM Program:
Utility Purchase of Delivered Energy Savings



Key Features:

• 15 MW implemented 1990-92

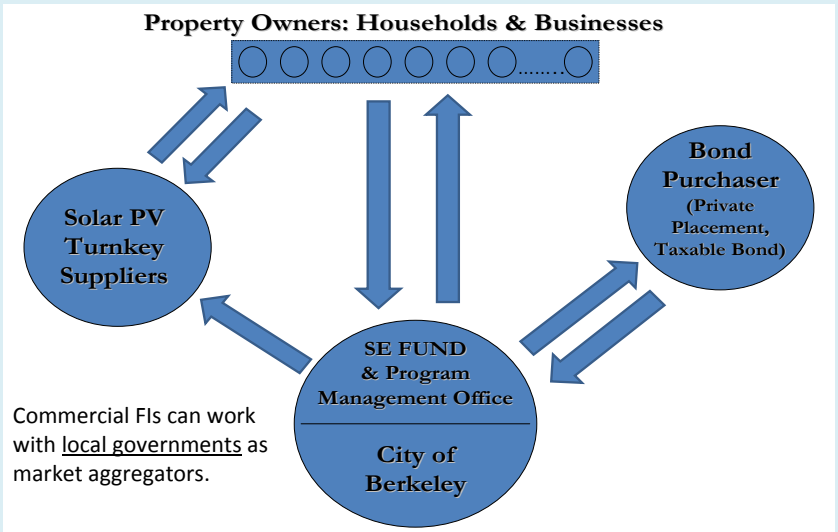
• Two revenue streams to ESCO

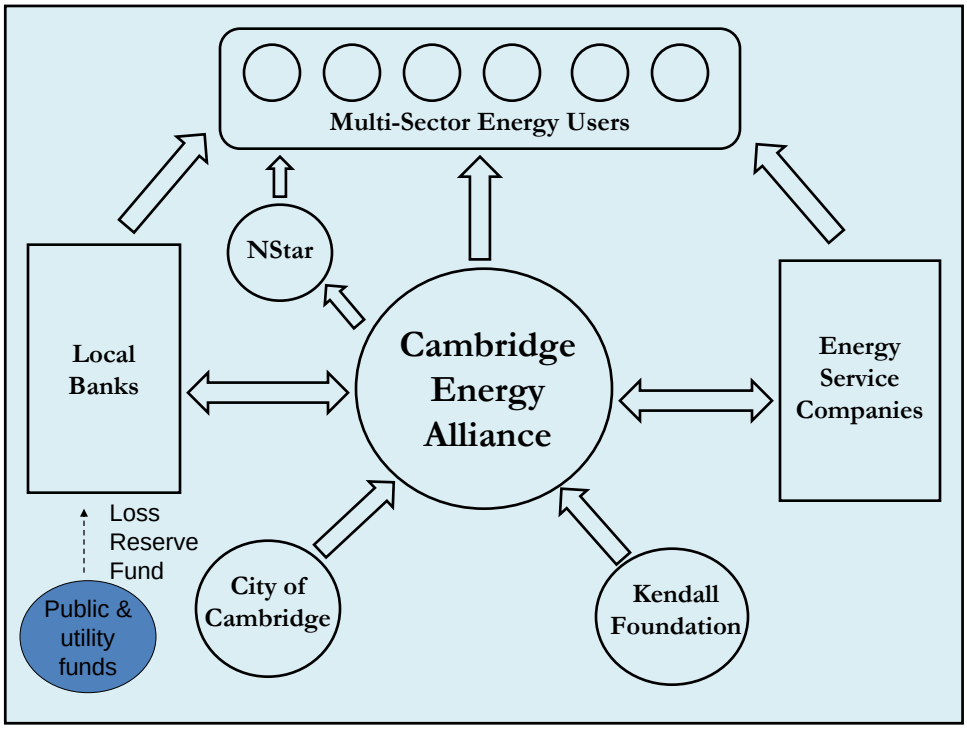
• Rapid sales process; ESCO becomes channel for end-user to receive utility subsidy

• Utility value per kw determined based on value to utility; could have been lower, based on level required to induce end-user project investment decisions

•Many similar programs around USA: PG&E, PSE&G, etc.

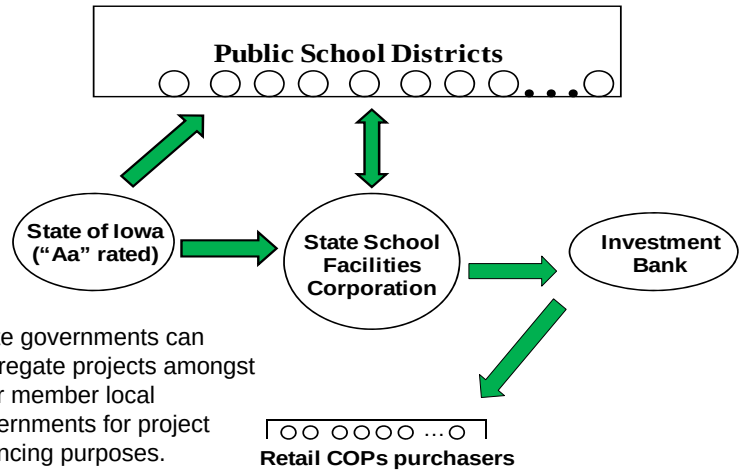
Sustainable Energy Financing District
Berkeley, California
Example of City-based Pooled Procurement





Pooled EE Finance Program, USA

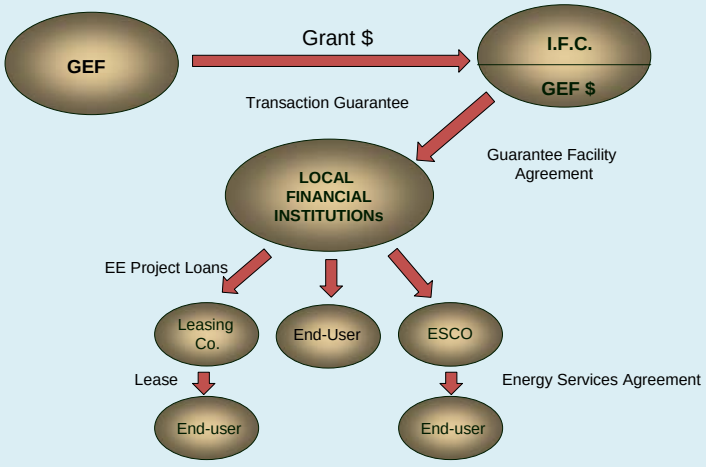
Pooled Lease Purchase Financing:
State of Iowa Public School EE Project Lease Program



State governments can aggregate projects amongst their member local governments for project financing purposes.

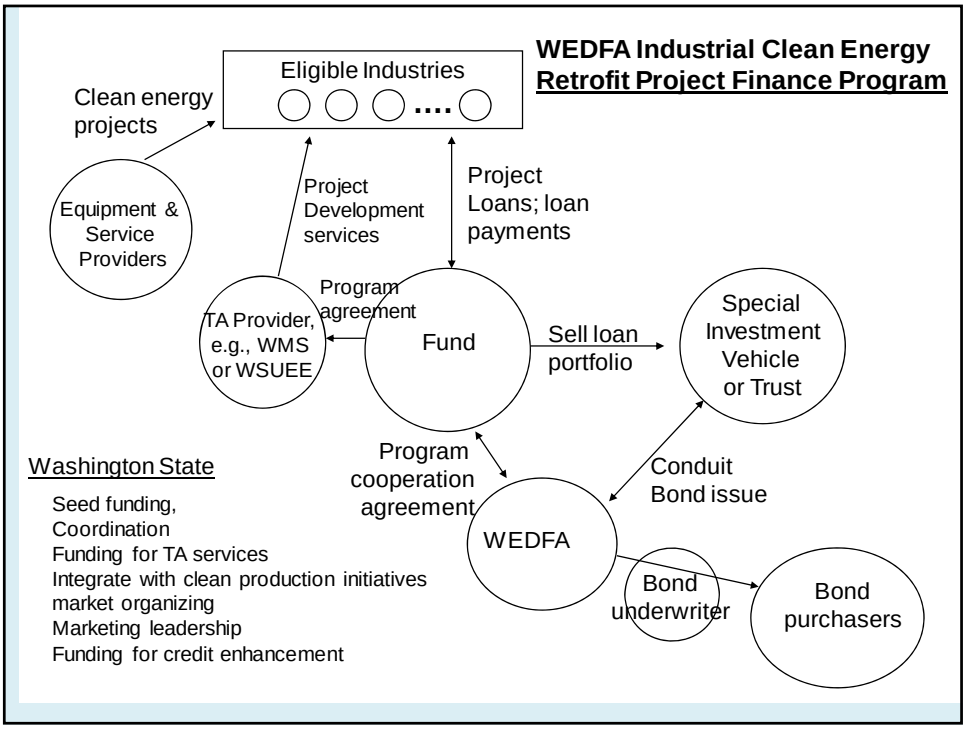
IFC EE Finance Guarantee Programs:

Development Finance Institution
Mobilizing Commercial Bank Financing



State-Chartered Bond Authorities

- Tax-exempt bonds, typically long tenors
- Eligible borrowers
  - Industry & manufacturing
  - Health care & Higher education
  - Low income & multi-family housing
- Eligible use of proceeds includes EE/RE retrofits in facilities of eligible borrowers
- Authorities exist in every State; these capacities can be used for EE finance



Energy Efficiency Conservation Block Grants

- $3.2 billion: $2.8 billion formula grants + $400,000 competitive grants
  - 68% Local Governments: Cities pop. > 35,000, Counties pop. > 200,000
  - 16% Local Governments below above threshold to be distributed by States
  - 12% State Energy Program
  - 2% Tribes
  - 2% Competitive Grants through State
- Obligate in 18 months, spend in 36 months, Applications due June 25, 2009 (Direct Grants)

EECBG Eligible Uses: Wide Range

- Developing an energy efficiency & conservation strategy
- Residential and commercial building energy audits
- Financial incentive programs
- Energy efficiency retrofits
- Transportation programs, etc.

EECBG Criteria

- Programs, not just Projects
- Leveraging of funds
- Use of innovative financial mechanisms which lead to market transformation & sustained investment levels
- Coordination across jurisdictions
- EEFC is presently designing programs using EECBGs as credit enhancement, using a loan loss reserve structure

Proposal for a New Federal EE Finance Facility

- Recent new federal clean energy loan guarantee programs cover renewables, smart grid, but not EE
- Opportunity for scale up of various support
- Support primary market for EE finance, with credit enhancement, e.g., loan loss reserve funds. Work with range of financial institutions, structure & market aggregators
- Support development of secondary market for EE loan portfolios with guarantees
- Proposal in front of US Senate Energy Committee, being considered as part of new Energy Bill

EE Finance Scale Up Ideas

- Ready for scale up!
  - Needs public investment, development & commercial finance
  - Credit enhancement is one effective means

- **EE Finance Toolkit**
  - Knowledge management
  - Open source toolkit, with on-line access
  - Build capacities at multiple levels
    - development & government agencies & DFIs (int'l & nat'l)
    - commercial parties: CFIs, EE firms, utilities, end-users
    - applications *services* recommended to get resources used
    - toolkit as a living document

EEFC's EE Finance Business Tools: Examples

- Energy Services Agreements, various structures
- Utility DSM contracts
- Energy Sales Agreements; other types of off-take contracts
- Construction contracts; Operations & Maintenance Contracts
- Project Development & Planning Agreements (pre-ESA)
- Project financial analysis spreadsheets, various structures & p.o.v.
- Lender risk analyses, due diligence & underwriting guidelines, for various EE financial products
- Equipment lease, master lease, vendor finance, multi-project, subordinated loan, and forfeiting term sheets & agreements
- RFPs & Procurement Documents, various types
- Credit enhancement & Guarantee Agreements
- ESCO Business Plans; Equity & Debt Placement Memoranda
- Carbon finance methodologies
- Program models combining concessional/commercial finance
- Sample legislation on public sector EE project development & financing
- Narrative descriptions, how to guides & case studies for the above

Thank You!

John MacLean
Energy Efficiency Finance Corp.
Olympia, Washington USA
jmaclean@eefinance.net
1-360-339-3936

Neil Zobler, President

Catalyst Financial Group, Inc.
152 Deer Hill Ave, Suite 208
Danbury, CT 06810

203-790-4177

nzobler@catalyst-financial.com

Neil has been designing energy finance programs and arranging project-specific financing for energy efficiency and renewable energy projects since 1985. Catalyst, a specialist in energy and water conservation projects, has arranged financings for over $1 billion. His clients include U.S. EPA ENERGY STAR, the Inter-American Development Bank, over 20 electric and gas utilities (including Con Edison Co. of NY, PG&E, TVA), engineering companies and vendors, and hundreds of individual companies and organizations. Neil has trained over a thousand marketing and sales people on how to use financing to sell their products.

He speaks regularly for organizations including the Government Finance Officers Association, the Association of School Business Officials, National Association of State Energy Officers, Association of Government Leasing & Finance, Eastern Association of Equipment Lessors, and the Council of Great City Schools and is on the task force of The American College & University Presidents Climate Commitment/Clinton Climate Initiative program.

He has written over 25 articles on financing energy efficiency published in a variety of media including the *Government Finance Review*, *Energy User News*, *Energy & Power*, *Monitor*, *Electroindustry*, and others. Neil has just written a chapter appearing in a new book called "*Energy Project Financing – Resources and Strategies for Success*," The Fairmont Press, Inc., 2008

Neil is fluent in Spanish and helped design financing programs for energy projects in Mexico, Peru and El Salvador. Neil has a BA in Finance from Long Island University (LIU) and has completed post-graduate studies in marketing at the Arthur T. Roth Graduate School at LIU.

ACEEE American Council for an Energy-Efficient Economy

Financial Research Associates, LLC

Energy Efficiency Finance Forum
MARKET AGGREGATION & EE FINANCE PROGRAM MODELS

E^2 Finance Packaging and ARRA

April 23, 2009

Presented by:
Neil Zobler
President

ENERGY STAR

Catalyst FINANCIAL GROUP INC.

Working in support of EPA ENERGY STAR's Program

Catalyst Financial Group, Inc.

- Independent Financial Services Firm
- Design/Implement Financial Programs
  - Energy & Water
  - Traditional & Non-traditional
- Investment Banking
- Consulting & Training
- Domestic and International
- Incorporated 1992

Catalyst

Catalyst Clients Include:

- Edison Electric Institute
- Excel Energy
- Consolidated Edison Co. of NY
- InterAmerican Development Bank
- National Grid (NEES & KeySpan)
- Pacific Gas & Electric
- Tennessee Valley Authority
- **US EPA ENERGY STAR®**

Catalyst

Financial Crisis!

How is it Affecting E2 Projects?

Financial Crisis!

- US Banks Facing Liquidity Crisis
  - Shorter Terms
  - Lower Risk Tolerance
    - Tighter Credit Criteria
    - Lower Credit Limits
  - "High" Rates to Borrowers
- Clients
  - Limited Borrowing Capacity
    - Hold onto Credit Lines

Catalyst

Who is Lending?

- Current Bank
- Large National Banks
  - Special Energy Groups
- Community Banks
- Leasing Companies
- Specialty Funds
  - Private Equity/Debt Funds
  - Utilities
  - State

Catalyst

Logos after the Crisis

Recognize this Symbol?

"We are paying for energy efficiency projects *whether or not* we do the projects!"

EPA

Energy Performance Contracting

EPA

Components of a Performance Contract

ENERGY STAR

Related but Independent Documents

- Project Development Agreement
- Energy Services Agreement
    - Finance Agreement

EPA

Components of a Performance Contract

ENERGY STAR

Related but Independent Documents

- Project Development Agreement
- Energy Services Agreement
    - Finance Agreement

EPA

Energy Performance Contract Defined

ENERGY STAR

- "Energy performance contracts are generally **financing or operating leases** provided by an Energy Service Company (ESCo) or equipment manufacturer. What distinguishes these contracts is that they provide a guarantee on energy savings from the installed retrofit measures, and they usually also offer a range of associated design, installation, and maintenance services."

  -US DOE

- "An EPC is a method of implementation and project financing, whereby the operational savings from energy efficiency improvements is amortized over an agreed-upon repayment period through a **tax-exempt lease purchase arrangement…"**

  -NYSERDA

- "An energy savings performance contract is an agreement between an energy services company (ESCO) and a building owner. The owner uses the energy cost savings to reimburse the ESCO and to pay off **the loan** that financed the energy conservation projects."

  -OREGON DEPT OF ENERGY

EPA

Combining Funding Sources

- Commonly done
  - Bonds, Internal Budgets, Leases, State and Local Funds, etc.
  - No reason why you can't add the Stimulus Funds to the list
- Rethink your project
  - Faster Paybacks = Financing
  - Longer Payback = Stimulus Funds
- Financing leverages Labor

Catalyst

Lease Financing

EPA

Leasing: "Creative Financing"

First Amendment Lease
Capital Lease
TRAC Lease
PRO Lease
Synthetic Operating Lease
True Lease
Step Lease
Municipal Lease
Master Lease
Tax Lease
Operating Lease
Skip Lease
Tax Exempt Lease Purchase

EPA

Commercial vs. "Municipal"

ENERGY STAR

- Commercial Leases (tax strategy)
  - Long-term rental agreement w/ Purchase Option
    - Capital vs. Operating (FASB 13)
    - True (Tax)
- "Municipal" Leases (budget strategy)
  - Conditional Sales Agreement
    - Tax Exempt Rates (lower)
    - Conditional Sales Agreements
    - "Renews" yearly
  - Not considered "Debt" in most states
    - Non-Appropriation or Abatement Language

EPA

Anatomy of a Financing

Catalyst

ENERGY STAR
Tools and Resources

Helping to Realize
the Financial Benefits of
Energy Improvements

EPA

Learn more at energystar.gov

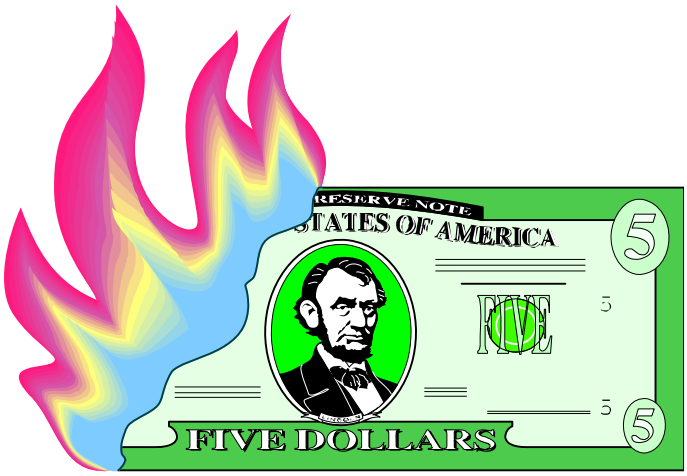
Financial Tools and Resources

- Portfolio Manager (on line)
  - Statement of Energy Performance/Rating
  - Lenders Due Diligence
- Building Value Manager (Excel)
  - Developed with BOMA
  - Financial impact on office properties
- Financial Value Calculator (Excel)
  - Public Companies
  - Key Financial Metrics (profit margins, earnings per share & shareholder value)
- Cash Flow Opportunity Calculator (Excel)
  - Cost of Delay
  - All Sectors

EPA

Quantifying the COST OF DELAY

ENERGY STAR



EPA

What is the CFO Calculator ?

ENERGY STAR

An energy efficiency financial decision-making tool, built on Microsoft Excel™

- Instructions
- Four analysis spread sheets
- A summary report

Helps quantifies the costs of delay.

EPA

What Does it Do?

ENERGY STAR

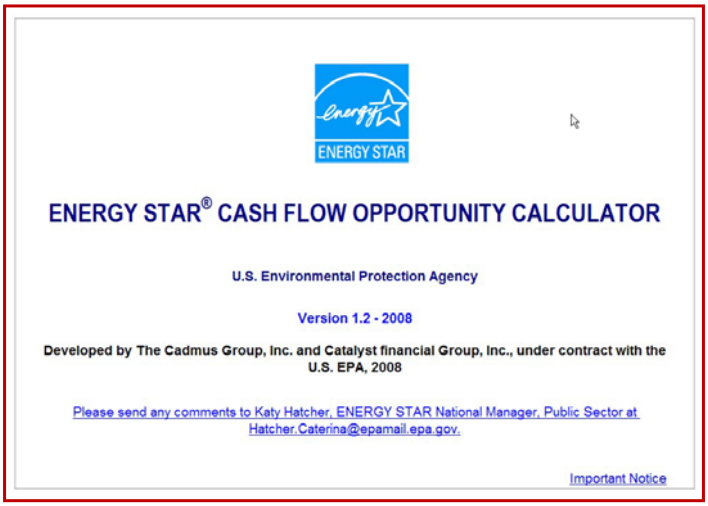
Addresses three critical questions about installing energy efficiency projects:

1. How much new energy efficiency equipment can be purchased from the anticipated savings?
2. Should this equipment purchase be financed now or is it better to wait and use cash from a future budget? (avoid paying interest)
3. Is money being lost by waiting for a lower interest rate?

EPA

Energy Efficiency: A *Cash Flow Opportunity*

ENERGY STAR


ENERGY STAR

ENERGY STAR® CASH FLOW OPPORTUNITY CALCULATOR

U.S. Environmental Protection Agency

Version 1.2 - 2008

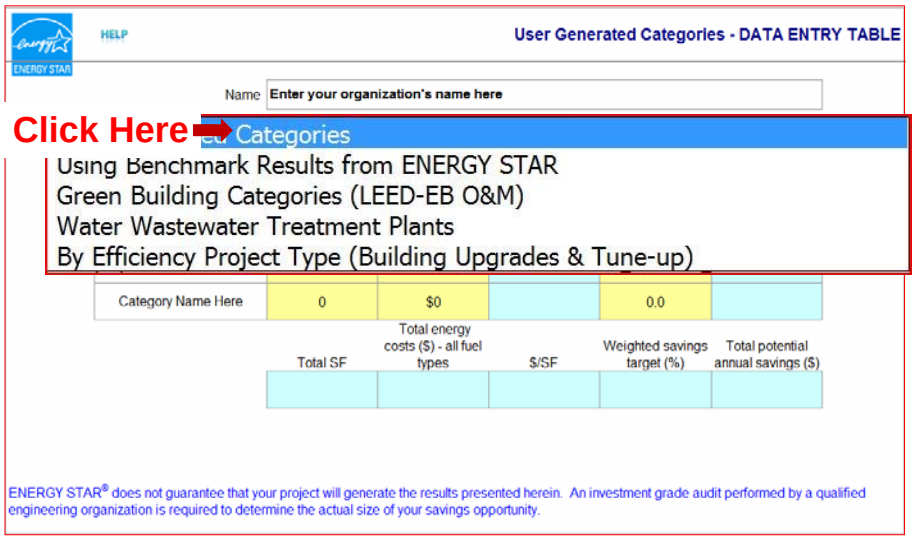
Developed by The Cadmus Group, Inc. and Catalyst financial Group, Inc., under contract with the U.S. EPA, 2008

Please send any comments to Katy Hatcher, ENERGY STAR National Manager, Public Sector at Hatcher.Caterina@epamail.epa.gov.

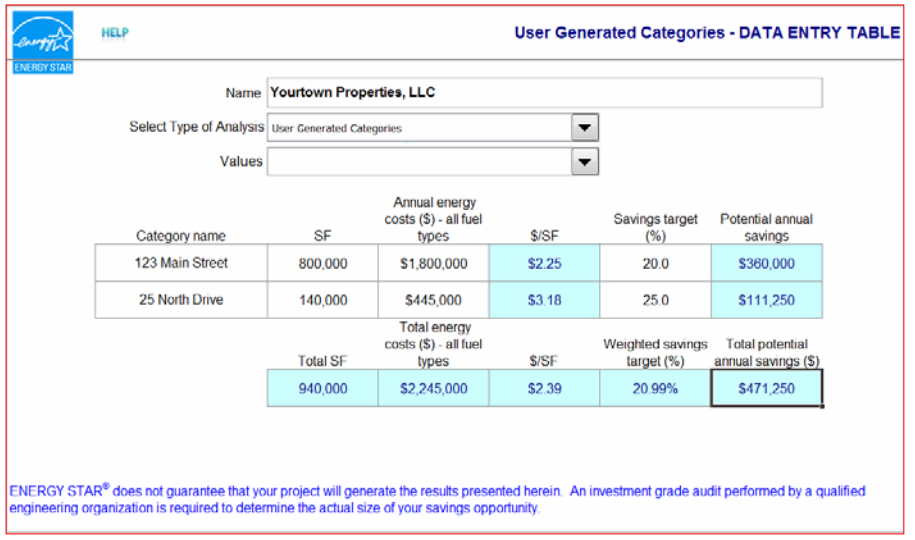
Important Notice

EPA

"Data Entry" Tab



"Data Entry" Tab



"Investment Values" Tab

HELP SAMPLE VALUES — INVESTMENT OPPORTUNITY

Potential Annual Savings = Cash Flow Opportunity

	123 Main Street	25 North Drive	Total energy costs ($) - all fuel types
Annual energy costs	$1,800,000	$445,000	$2,245,000
Potential annual savings	$360,000	$111,250	$471,250

What Can This Annual Cash Flow Buy? — Calculate

Assuming an interest rate of	8.00	%
Assuming a term of	7	Year(s)
Savings used to pay energy/retrofit investments	90.0	%
Taken from operating funds, these savings could finance energy/retrofit projects equal to:		without increasing today's capital and operating budgets.
Simple Payback		Year(s)
		Month(s)

Consider blending short- and long-term projects to maximize use of the savings.

Important Notice

"Investment Values" Tab

HELP SAMPLE VALUES — INVESTMENT OPPORTUNITY

Potential Annual Savings = Cash Flow Opportunity

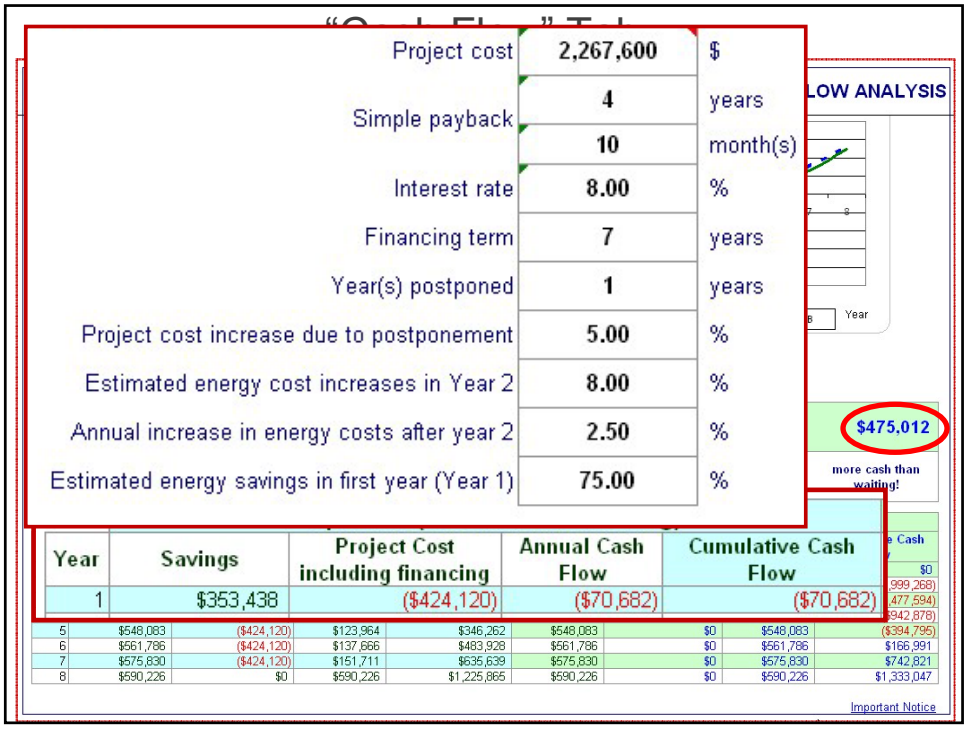
	123 Main Street	25 North Drive	Total energy costs ($) - all fuel types
Annual energy costs	$1,800,000	$445,000	$2,245,000
Potential annual savings	$360,000	$111,250	$471,250

What Can This Annual Cash Flow Buy? — Reset

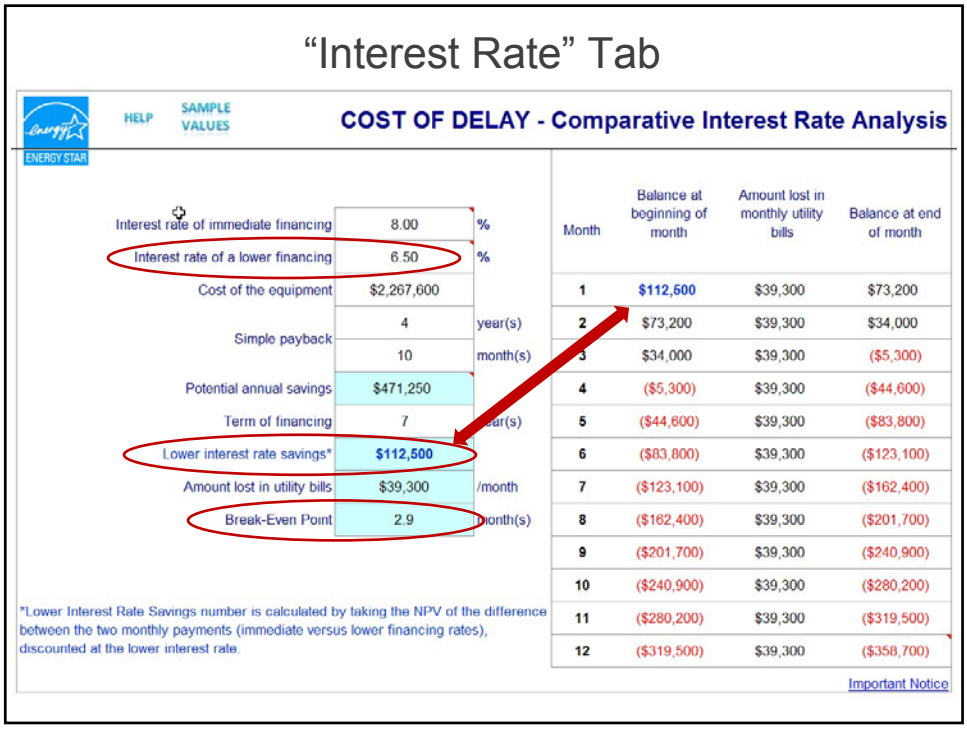
Assuming an interest rate of	8.00	%
Assuming a term of	7	Year(s)
Savings used to pay energy/retrofit investments	90.0	%
Taken from operating funds, these savings could finance energy/retrofit projects equal to:	$2,267,600	without increasing today's capital and operating budgets.
Contribution that your operating budget can make towards energy improvements	$2.412	/SF
Simple Payback	4	Year(s)
	10	Month(s)

Consider blending short- and long-term projects to maximize use of the savings.

Important Notice



"Interest Rate" Tab



Reminder

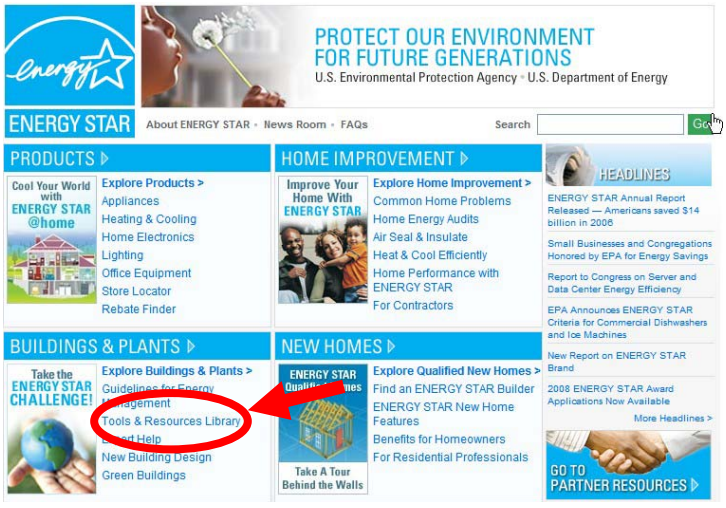
ENERGY STAR

An investment grade audit performed by a qualified engineering company will be required to determine the actual size of your savings opportunity.

EPA

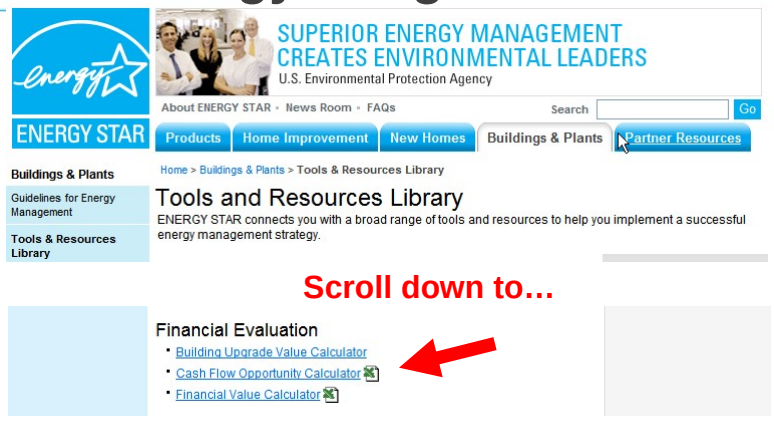
Cash Flow Opportunity Calculator
www.energystar.gov

ENERGY STAR



EPA

Cash Flow Opportunity Calculator
www.energystar.gov



Scroll down to…

Or, go directly to:
http://www.energystar.gov/ia/business/cfo_calculator.xls

EPA

Catalyst Contact

Neil Zobler, President

Catalyst Financial Group, Inc.
(an EPA ENERGY STAR Subcontractor)

152 Deer Hill Ave., Suite 208
Danbury, CT 06810

203-790-4177

nzobler@catalyst-financial.com

www.catalyst-financial.com

EPA

GREEN BUILDING FINANCING
LEED Buildings, Energy Mortgages & Net-Zero Initiatives!

Speakers:
Gregg Ander, *Chief Architect*
SOUTHERN CALIFORNIA EDISON

Mark Frankel, *Technical Director*
NEW BUILDING INSTITUTE

Rich Chien, *LEED, AP, CGBP, Department of the Environment*
CITY AND COUNTY OF SAN FRANCISCO

Gregg D. Ander, FAIA
Bio

Gregg D. Ander, FAIA, is the Chief Architect of Southern California Edison. He was the Executive Producer of six environmentally focused television programs for NBC, CBS, and PBS. One program, "Greener Buildings/Bluer Skies," won a 2006 Emmy award.

Mr. Ander is a member of American Institute of Architects (AIA), Illuminating Engineering Society of North America (IESNA), American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and serves on the Board of Directors of the Sustainable Building Industry Council (SBIC), the New Buildings Institute (NBI), the Collaborative for High Performance Schools (CHPS), and the California Commissioning Collaborative (CCC). He has authored over 70 technical and design related articles and has won awards for various energy related projects from AIA, ASHRAE, Department of Energy (DOE), and the National Academy of Television Arts and Sciences, and was one of the first funders of the United States Green Building Council (USGBC). He is the author of the book "Daylighting Performance and Design," published by John Wiley & Sons.

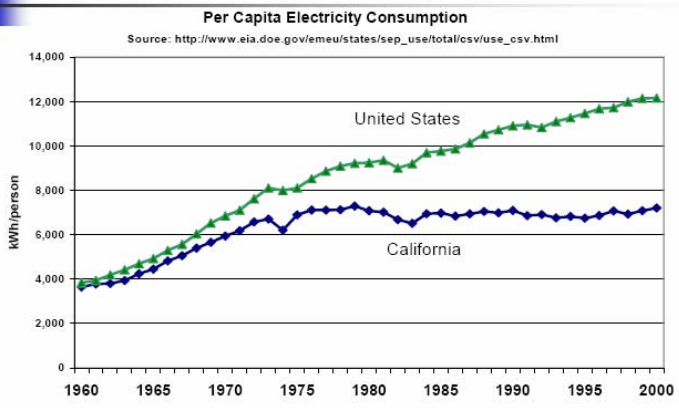
The Role of Utilities in Integrated Demand Side Management Technology Assessment, Adaptation, and Market Transformation

Gregg D. Ander, FAIA

Chief Architect
Southern California Edison
April 23, 2009

1

California versus U.S. Electricity Consumption



Source: CA Energy Commission

2

Latest Energy Policies in California

- AB 32 Green House Gas
- California Long Term Energy Efficiency Strategic Plan
- California Big and Bold Initiatives
- California Solar Initiative
- Enabling Utilities Polices
  - Decoupling/Cost recovery/Share holder earning

3

Energy Efficiency Programs

2009-2011 Energy Efficiency Budget and Projected Savings				
	Budget	Projected Savings (Electricity and Natural Gas)		
	(In Million)	GWH	MW	MTH
PG&E	$ 1,803	4,941	972	119,000
SCE	$ 1,343	3,529	741	-
SDG&E	$ 322	762	145	14,028
SCG	$ 273	-	-	97,581
Total	**$ 3,741**	**9,232**	**1,858**	**230,609**

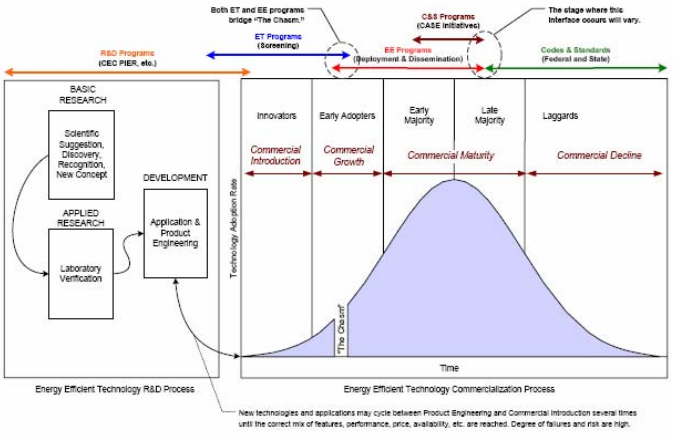
4

Energy Efficiency Programs

2006-2008 Energy Efficiency Budget and Projected Savings				
	Budget	Projected Savings (Electricity and Natural Gas)		
	(In Million)	GWH	MW	MTH
PG&E	$ 867	3,020	562	51,756
SCE	$ 675	3,292	714	-
SDG&E	$ 258	1,022	213	9,537
SCG	$ 169	-	-	60,696
Total	**$ 1,969**	**7,334**	**1,489**	**121,989**

5

ENERGY EFFICIENCY FRAMEWORK



Key Energy Efficiency Strategies

- Zero Net Energy New Buildings and Existing Buildings
- Transform business through increase energy improvement processes
- Transform HVAC
- Adaptation of emerging measures
- Stringent cost-effective energy codes and standards
- Reach codes
- Expand the role of Low-Income Energy Efficiency programs
- Integrated Demand-Side Management

7

Utility Energy Efficiency Programs

- Incentive Programs provide rebates to help transform the market
  - Customer
  - Mid-stream
  - Upstream
  - Non resource programs
    - Emerging technologies
    - Education/training

8

Residential Programs

- Consumer Electronics
- Advanced Consumer Lighting
- Home Performance
- Appliance Recycling
- Basic CFL Lighting
- Home Energy Efficiency Rebates

9

Business Programs

- Audits
- Comprehensive HVAC
- Direct Install
- Rebates and Incentives
- Pump Tests
- Data Centers
- Monitoring Based Commissioning

10

New Construction

- Green Building Certification
- Design Team Incentives
- Savings by Design
- California New Homes

11

Partnerships and Other

- New Energy Leader Model
- Integrated DSM
- Financing
- Community

12

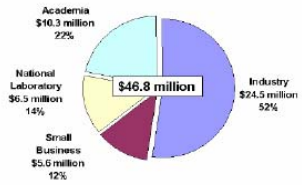
Emerging Technology Program

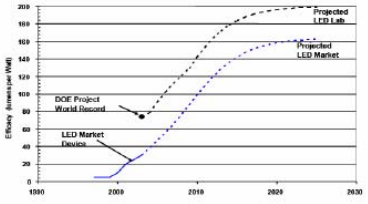
- Technology Assessment – Verify the performance
- Demonstration Showcase – Demonstrate Emerging Technologies to Customers
- Scale Field Placement – Large scale demonstration of technologies
- Market and Behavior Studies – Study market potential and customer behavior on new technologies
- Technology Resource Incubator Outreach - providing training and networking for entrepreneurs and companies providing energy saving technologies
- Zero Net Energy Test Center
- Product Development Support
- Market and Behavior Studies

13

LED Lights

- 2005 R&D Funding from DOE was $46.8 million
- LED Efficiency is Comparable to Fluorescent Lamp
- Products are Coming Out into the Market





14

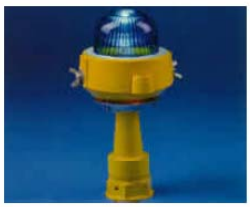
Lighting Technologies

- Solid State Lighting
  - LED
  - Flexible Light Panel LEC (CeeLite)
  - OLED TV 1,000,000:1 Contract Ratio
- Induction Lamps
- Addressable Dimming Ballast

15

LED Lighting Technologies

- LED for Refrigerated Display Cases
- Linear LED Signage (2.1W/LF vs. 8.75W/LF)
- LED Channel Lights
- LED Street Lights (Save 30-40%, Last twice long)
- Hybrid LED Exterior Lights
- LED Under Cabinet Lights
- LED Task Lights
- LED Taxiway Lights (6W LED vs. 42W)
- LED "Open" Signs (15W LED vs. 46W Neon)



16

Technologies for Refrigeration Systems

- High Efficiency Medium Open Display Cases
- Fiber Optic Lighting System for Display Cases (535kWh Lighting, 562kWh Ref. /Door)
- LED Lighting for Display Cases
- Frictionless Refrigeration Compressor/Chillers (Turbocor)
- Optical Defrost System

17

Solid State Lighting Technologies

- LED Refrigerated Display Cases
- Linear LED Signage
- LED Channel Lights
- LED Street Lights
- Hybrid LED Exterior Lights
- LED Under Cabinet Lights
- Office of the Future Phase II
  - Class A, AA, B
  - Integrated approach
  - SCE, PG&E, ConEdison, National Grid, NSTAR, SEMPRA, BC Hydro, DOE, Industry, (partial list)

18

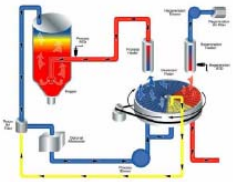
Emerging Technologies for Residential & Commercial (Partial List)

- HVAC Diagnostic System
- Residential Ductless Air-Conditioning
- Water Treatment Strategies for Evaporative Cooling Systems
- Residential Multi-Zoning System
- Bi-Level Switching of Stair Lights
- Communicating Thermostats
- Night Breeze for Low Income Residential
- Residential Lighting Fixtures
- Computer Network Control
- Dynamic Window Shading Systems

19

Emerging Technologies for Industrial & Agricultural (Partial List)

- Variable Speed Milking System
  - Interlock of Pulsation unit with Dairy Milking vacuum Systems
- Variable Speed Compressed Air System
- Advanced Control for Plastic Granulators
- Variable Speed Dust Collection System
- Automatic Fume Hood Sash Control



20

ET Successful Story

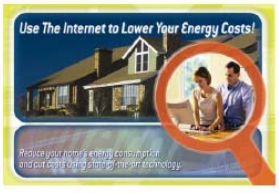
Automatic Control of Fume Hood Sash

- Automatic Sash Control for Fume Hood – Lower the fume hood sash when nobody is running testing
- Tested at Amgen Biotech Company
- Test Results prove the technology is cost effective (payback in less than two years)
- New company, Todd Zilinski of SashSentry, is developing a simpler sash closing device at a lower cost

21

Demand Response Projects (Partial List)

- Pool Pump Pilot Using SCE RF Communication Infrastructure
- DR Enabling Technologies for Small Commercial Customers
- Two-Way Connectivity with a Controllable Lighting System as a DR Resource
- ZigBee Enabled Residential Pool Pumps
- DR Strategies for Battery Charging Banks
- ZigBee Enabled Commercial Ice Machine Controls



22

Major Areas of Interest

- **Lighting**
  - Simple
  - Large market potential
  - Major progress in LED
- **Residential Market**
  - Cost effective attributes
- **HVAC/Refrigeration**
  - Large market potential
- **Industrial Market**
  - No standards
  - Big savings
  - Untapped

23

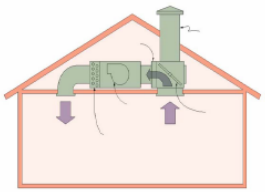
Emerging Technologies for Residential & Commercial

- Hotel/Motel Occupancy Night Light (100kWh/yr)
- Hotel/Motel Energy Saving Systems (Card Key- 45% savings)
- Kitchen Hood Exhaust/Make-Up Air System
- Computer Network Control
- Anti Corrosion Condenser Coil Coating
- Bi-Level Switching of Stair Lights (63% savings High-rise vs. 26% Low-rise Office)
- Bi-Level Area Lights (38% savings)
- Communicating Thermostats

24

Emerging Technologies for Residential & Commercial (Cont'd)

- HVAC Diagnostic System
- Residential Ductless Air-Conditioning
- Residential Multi-Zoning System
- Night Breeze for Low Income Residential (PIER)
- Residential Lighting Fixtures



25

Emerging Technologies for Industrial & Agricultural

- High Volume Low Speed Fan
- Variable Speed Milking System
- Variable Speed Compressed Air System
- Advanced Control for Plastic Granulators
- Variable Speed Dust Collection System (45-60% savings)
- Automatic Fume Hood Sash Control ($2400/Hood/yr)
- Optimizing Solids Retention Time and Dissolved Oxygen
- Electrodialysis Control of Tatrate in Wine (0.108kWh/gall.)

26

Contact Information

Gregg D. Ander, FAIA
Chief Architect
Manager, Design & Engineering Services
Phone: 626-633-7160/42160
Gregg.Ander@sce.com

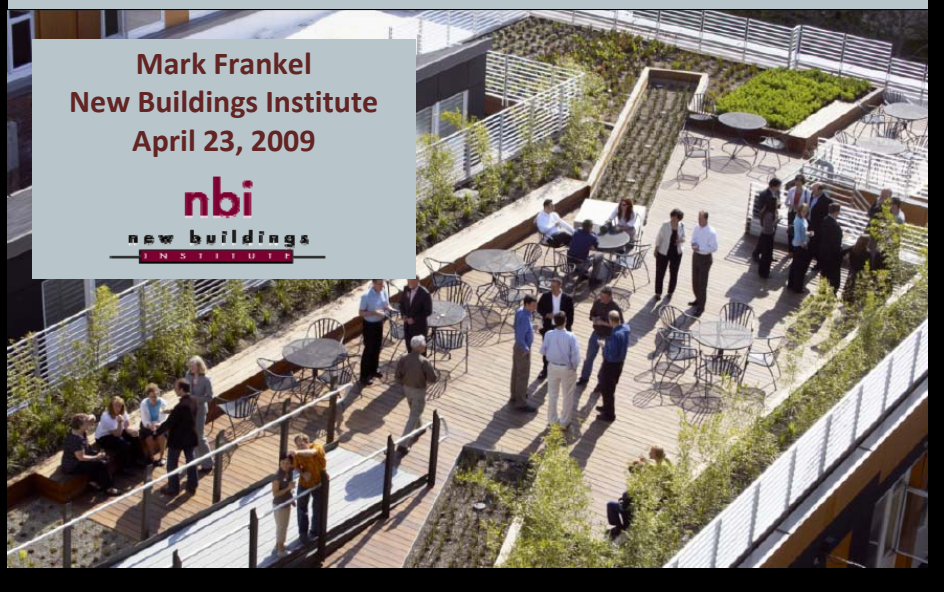
27

Mark Frankel is the Technical Director for the New Buildings Institute. NBI develops programs, policy, training, and research on high performance buildings and energy efficiency for organizations all over the country. Mark led the development of the Advanced Buildings Core Performance program, a prescriptive energy program for savings of 20-30% over code. Mark also co-authored a recently released study of LEED building energy performance. Currently Mark is involved in national coalitions to improve and encourage building performance feedback to the design community, and is consulting on a number of aggressive performance programs and projects around the country.

Mark Frankel has been consulting on energy efficiency and sustainable design for over 18 years. Mark's work in this period has encompassed a broad range of technical topics, including lighting and daylighting, passive and high performance mechanical systems, building and site design, indoor air quality, stormwater management, efficient irrigation strategies, and others. This work has included extensive evaluation of comparative life cycle costs for a range of public and private development models. Mark has consulted on hundreds of capital projects, ranging in scale from single and multi-family residential projects to large commercial buildings all over the country. Mr. Frankel also has extensive experience with the USGBC's LEED program, both as consultant to projects successfully seeking LEED ratings, and as a technical consultant to the USGBC to develop and implement the LEED program.

Mr. Frankel serves on the Board of Directors of the Cascadia Green Building Council, is a licensed architect in Washington, a member of AIA and ASHRAE, and a LEED accredited professional.

Green Building Performance Economics



Mark Frankel
New Buildings Institute
April 23, 2009

nbi
new buildings
INSTITUTE

- Green building attributes affect the bottom line
- Market leaders are recognizing this as an opportunity
- Market transformation processes will change the way we do business in this area

How do green building attributes affect the bottom line?

- **Cost**
- **Energy**
- **Productivity**
- **Perception**

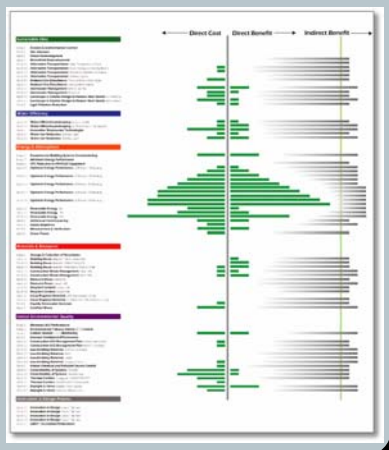
Green Building Cost Issues

First Cost Drivers:

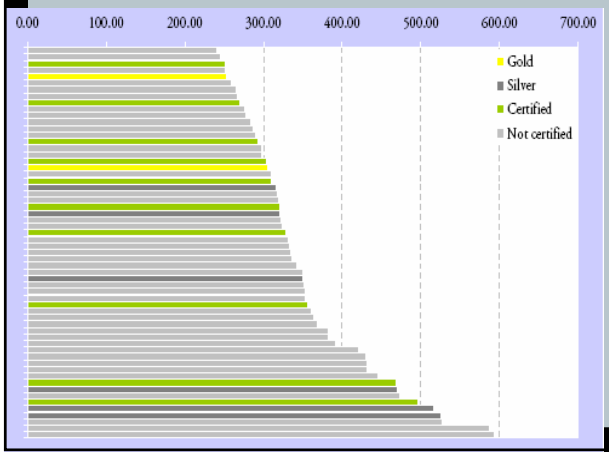
- Feature Set
- Design/Construction Team Experience

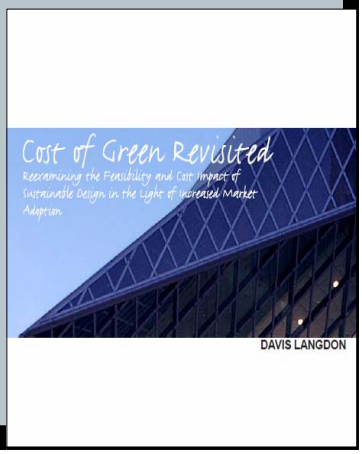
Total Cost Drivers:

- Performance Feature Set
- Building Operating Characteristics
- Energy Price



Cost of Green Revisited:
Re-examining the Feasibility and Cost Impact of Sustainable Design in the Light of Increased Market Adoption,
Davis Langdon, July 2007



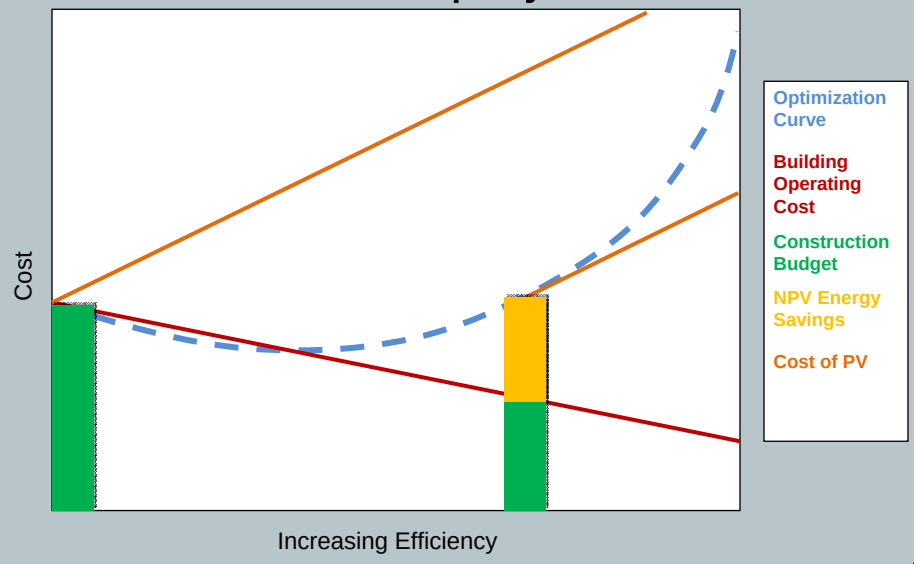


Study Conclusions…

- Less experienced design teams approach sustainable design as an added feature; with added cost
- Building program variables have more impact on cost than sustainability

"We continue to see project teams conceiving of sustainable design as a separate feature. This leads to the notion that green design is something that gets added to a project – therefore they must add cost. This tendency is especially true for less experienced teams that are confronting higher levels of LEED certification (Gold and Platinum)."

OPTIMIZING project costs



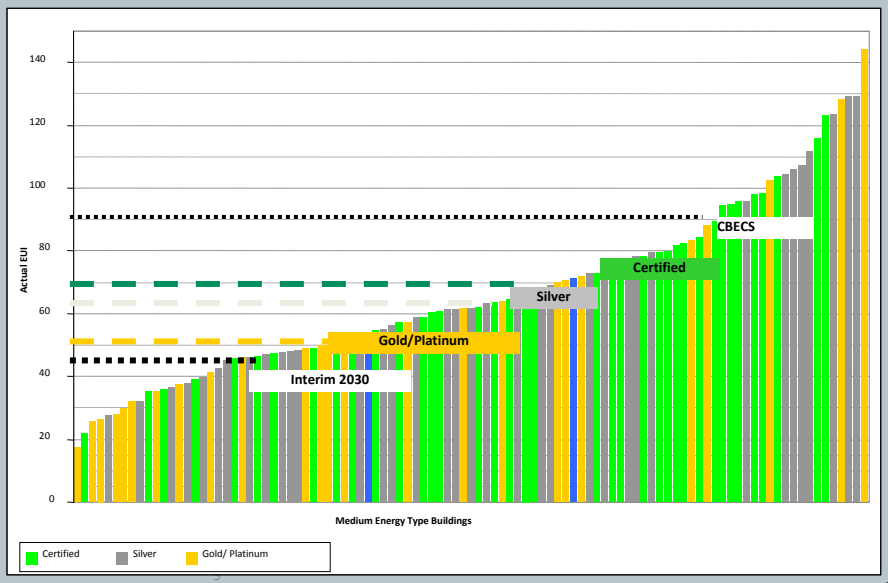
LEED Building Performance Study NBI, 2008

- **The average LEED building uses less energy than it's conventional building counterpart**
- **Results are highly variable**

Energy Performance of LEED NC Buildings

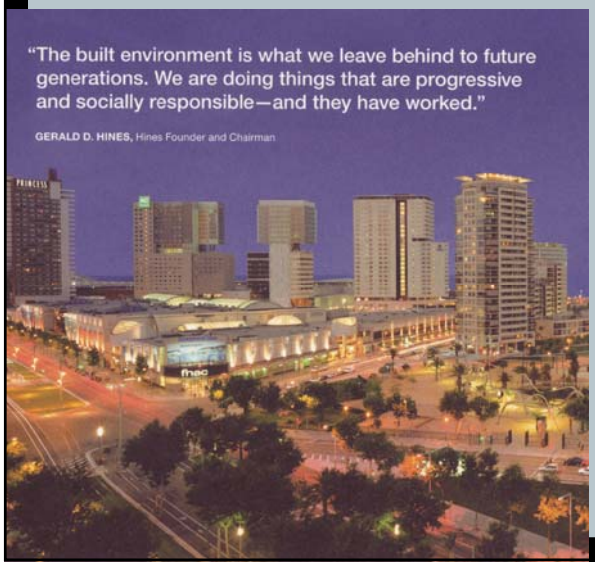
Celebrating 10 Years
nbi
new buildings
INSTITUTE

Study Results



Market Players Recognize Other Bottom Line Issues

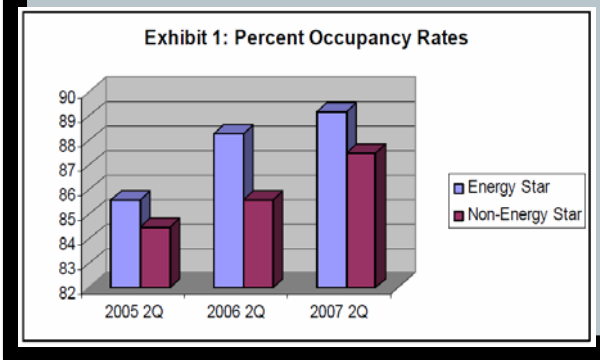
Hines



- 80 Million sf. of Energy Star Buildings in Portfolio
- Estimated annual savings of $1.37/sf.
- 64 Million sf. of LEED Buildings in Portfolio

Energy Star and LEED Certified Buildings

- **Higher Occupancy Rates**
- **Higher Direct Rental Rates**
- **Higher Sales Price per Square Foot**

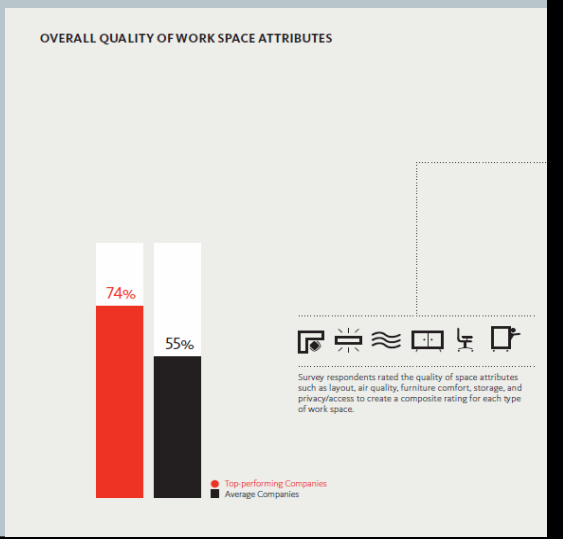


Does Green Pay Off?
Miller, Spivey, Florance; CoStar; 2008

CoStar GROUP

Productivity

2008 Study by Gensler



Controls at West Bend Insurance

Features

•Personal Work Stations

•Temperature control

•Lighting control

Benefits

•40% reduction in absenteeism for annual savings of $126,000

•16% jump in productivity for annual savings of $500,000

•Thermal complaints dropped from 40 to 2 a day

School Building Impacts

- Higher test scores
- Reduce absenteeism
- Reduce health risks
- Reduce stress
- Increase staff satisfaction
- Decrease turnover

Building Characteristics

Top 4 building factors affecting performance

Comfort

IAQ

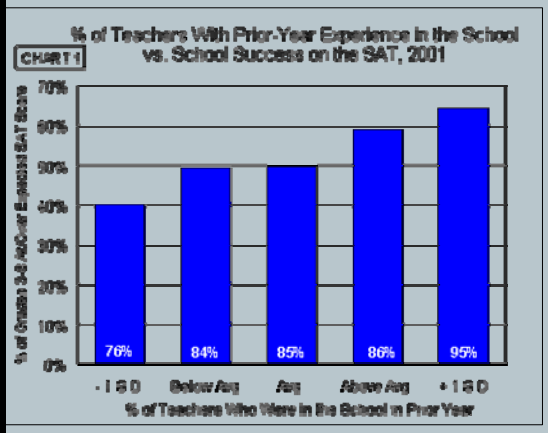
Lighting

Acoustics

District Costs

- Lower operating costs
- Lower Cost of Ownership
- Reduced student emigration
- Reduce staff turnover
- Reduce liability

Teacher Retention



High levels of teacher turnover create significant decreases in student performance

Cost of Teacher Turnover

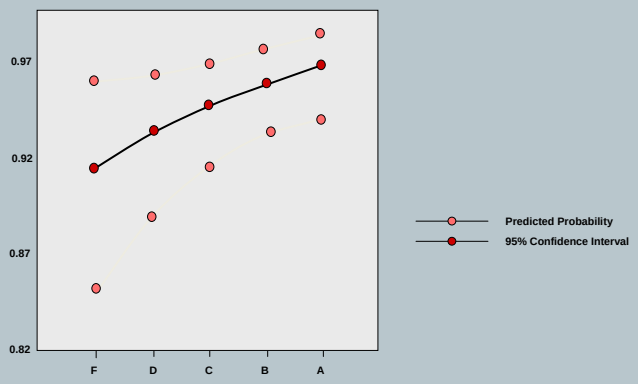
	North Texas District	Panhandle District	South Texas District	West Texas District	Central Texas District	State Average
Teacher turnover rate	16.4%	13.8%	11.7%	11.7%	22.8%	15.5%
Teachers lost	755	300	175	184	223	40,260
All teachers having the following years of experience:						
0 years	$37,429,125	$12,600,000	$7,612,500	$7,866,000	$8,108,280	$1,590,533,844
5 years	$38,295,488	$12,822,750	$8,039,438	$8,474,304	$9,493,110	$1,809,747,067
10 years	$41,639,760	$15,178,500	$9,734,550	$9,309,480	$11,282,685	$2,108,311,853
15 years	$45,314,723	$16,992,000	$10,963,838	$10,479,168	$12,630,720	$2,351,741,191
20 years	$50,228,640	$18,360,000	$11,220,038	$11,388,588	$13,647,600	$2,535,807,831
All teachers with average salary	$44,790,375	$16,393,950	$10,057,425	$9,855,132	$11,349,925	$2,148,893,474

The Texas Center for Educational Research (TCER) researchers calculate teacher turnover costs for the 1998-99 school year

Pragmatic estimates **$447,686,140**

Conservative estimates **$2,148,893,474**

Building Impact on Teacher Retention



Study indicates an increase in probability of a teacher deciding to stay at her job were she moved from a school with the lowest facility quality to one with the highest

Alley 24

- 10.3% increase in net fee revenue per person
- 2nd largest tenant: 30% decrease in sick days
- 90% leased in 3 months; consistently over 95% occupied
- Lease rates among highest in city for comparable space
- Key recruiting tool for occupant firms

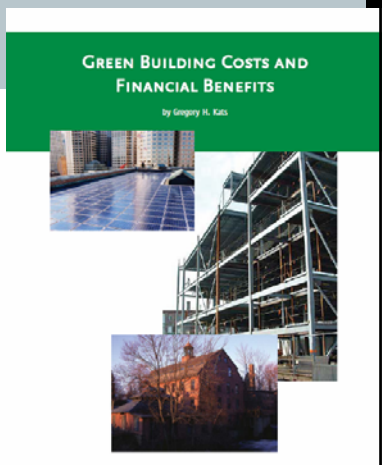
Green Building Costs and Financial Benefits,

Capital E, 2007

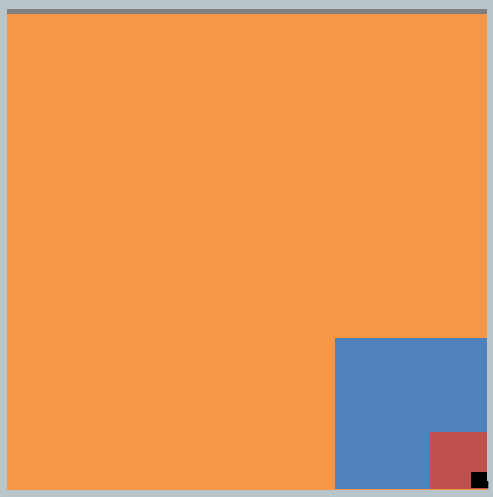
Figure 3
Financial Benefits of Green Buildings
Summary of Findings (per ft^2)

Category	20-year Net Present Value
Energy Savings	$5.80
Emissions Savings	$1.20
Water Savings	$0.50
Operations and Maintenance Savings	$8.50
Productivity and Health Benefits	$36.90 to $55.30
Subtotal	$52.90 to $71.30
Average Extra Cost of Building Green	(-3.00 to -$5.00)
Total 20-year Net Benefit	$50 to $65

Source: Capital E Analysis



Annual Commercial Construction



Performance Feedback

Real-Time Performance Information

Published Performance Data

DRIVETRAIN LAYOUT	Front engine, FWD	Front engine, FWD
ENGINE TYPE	I-4, alum block/head	I-4, alum block/head
VALVETRAIN	SOHC, 4 valves/cyl	DOHC, 4 valves/cyl
DISPLACEMENT	109.8 cu in/1799 cc	138.0 cu in/2261 cc
COMPRESSION RATIO	10.5:1	9.7:1
POWER (SAE NET)	140 hp @ 6300 rpm	156 hp @ 6500 rpm
TORQUE (SAE NET)	128 lb-ft @ 4300 rpm	150 lb-ft @ 4500 rpm
REDLINE	6800 rpm	6500 rpm
WEIGHT TO POWER	19	19.3 lb/hp
TRANSMISSION	5-speed automatic	5-speed automatic
AXLE/FINAL-DRIVE RATIOS	4.44:1/2.33:1	3.86:1/2.67:1
SUSPENSION, FRONT; REAR	anti-roll bar	coil springs, anti-roll bar
STEERING RATIO	13.7:1	14.6:1
TURNS LOCK-TO-LOCK	2.7	2.9
BRAKES, F;R	10.3-in vented disc; 10.2-in disc, ABS	11.8-in vented disc; 11.0-in disc, ABS
WHEELS	6.5 x 16 in, cast aluminum	6.5 x 17 in, cast aluminum
TIRES	205/55R16 89H M+S, Bridgestone Turanza EL 400	205/50R17 88V M+S, Goodyear Eagle RSA
DIMENSIONS		
WHEELBASE	106.3 in	103.9 in
TRACK, F/R	59.0/60.2 in	60.2/59.6 in
LENGTH X WIDTH X HEIGHT	176.7 x 69.0 x 56.5 in	177.6 x 69.1 x 57.7 in
TURNING CIRCLE	35	34.1 ft
CURB WEIGHT	27	2,904 lb
WEIGHT DIST., F/R	60/40%	62/38%
SEATING CAPACITY	5	5
HEADROOM, F/R	38.1/	38.1/37.0 in
LEGROOM, F/R	42.2/34.6 in	41.1/36.3 in
SHOULDER ROOM, F/R	53.6/52.3 in	54.9/54.0 in
CARGO VOLUME	12.0 cu ft	11.5 cu ft

Technical Characteristics

Occupant Features

TEST DATA		
ACCELERATION TO MPH		
0-30	3.2 sec	2.9 sec
0-40	4.8	4.5
0-50	7.0	6.3
0-60	9.4	8.5
0-70		
0-80	16.7	15.0
0-90		
PASSING, 45-65 MPH		
QUARTER MILE	17.1 sec @ 81.4 mph	16.6 sec @ 84.1 mph
BRAKING, 60-0 MPH	127 ft	112 ft
LATERAL ACCELERATION	0.81 g (avg)	0.86 g (avg)
MT FIGURE EIGHT	28.5 sec @ 0.58 g (avg)	27.5 sec @ 0.61 g (avg)
TOP TRUE SPEED @ 6500 RPM		
CONSUMER INFO		
BASE PRICE	$19,345	$20,830
PRICE AS TESTED	$20,145	$23,315
STABILITY/TRACTION CONTROL	No/no	Yes/yes
AIRBAGS	Dual front, front side, f/r curtain	Dual front, front side, f/r curtain
BASIC WARRANTY		36,000 miles
POWERTRAIN WARRANTY		60,000 miles
ROADSIDE ASSISTANCE	N/A	3 yrs/36,000 miles
FUEL CAPACITY	13.	5 gal
EPA CITY/HWY ECON	25/	2/29 mpg
CO_2 EMISSIONS	0.67 lb/mile	0.79 lb/mile
MT FUEL ECONOMY	25.0 mpg	21.5 mpg

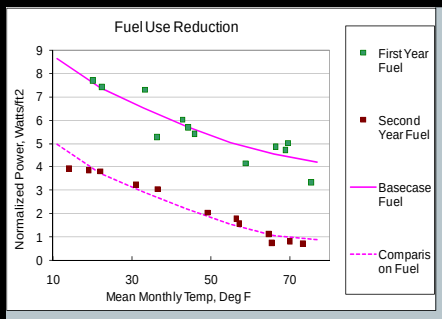
Standardized Performance Data

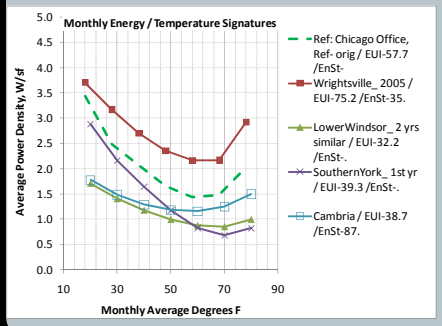
Operational Efficiency

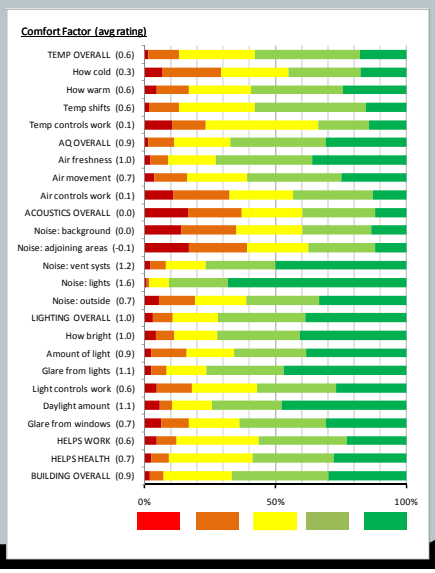
From Motor Trend
2009-2010 New Car Buyers Guide

Feedback to Building Occupants

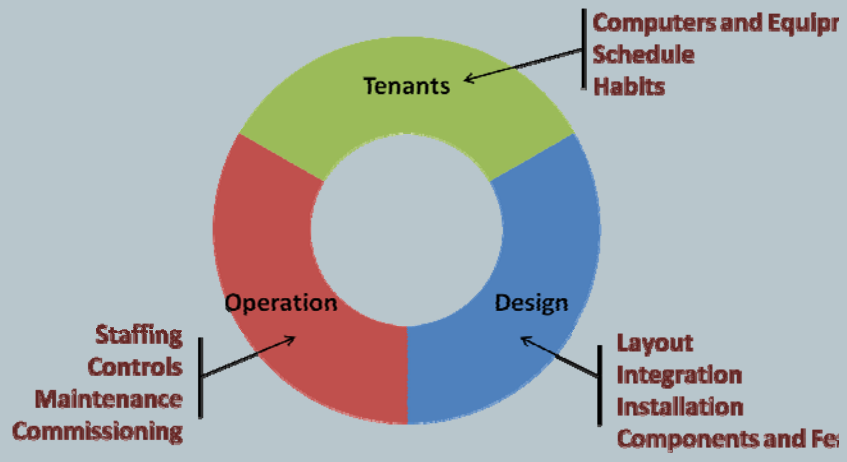
‘Key Performance Indicators’



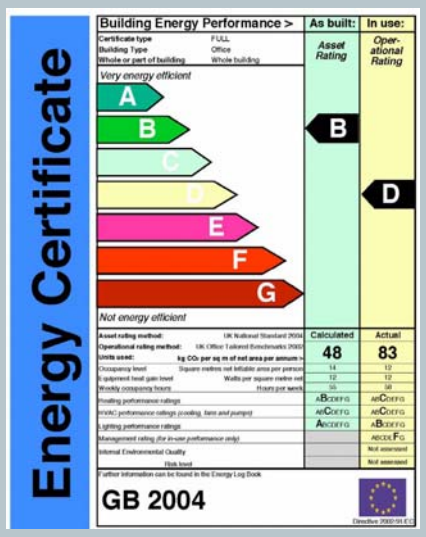




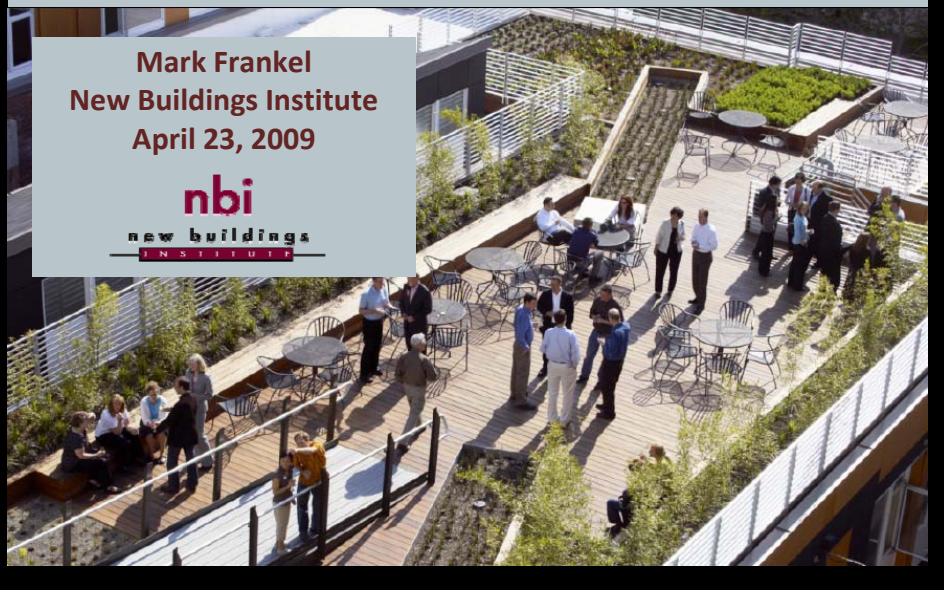
What Drives Building Performance?



Building Labeling



Green Building Performance Economics



Mark Frankel
New Buildings Institute
April 23, 2009

nbi
new buildings
INSTITUTE

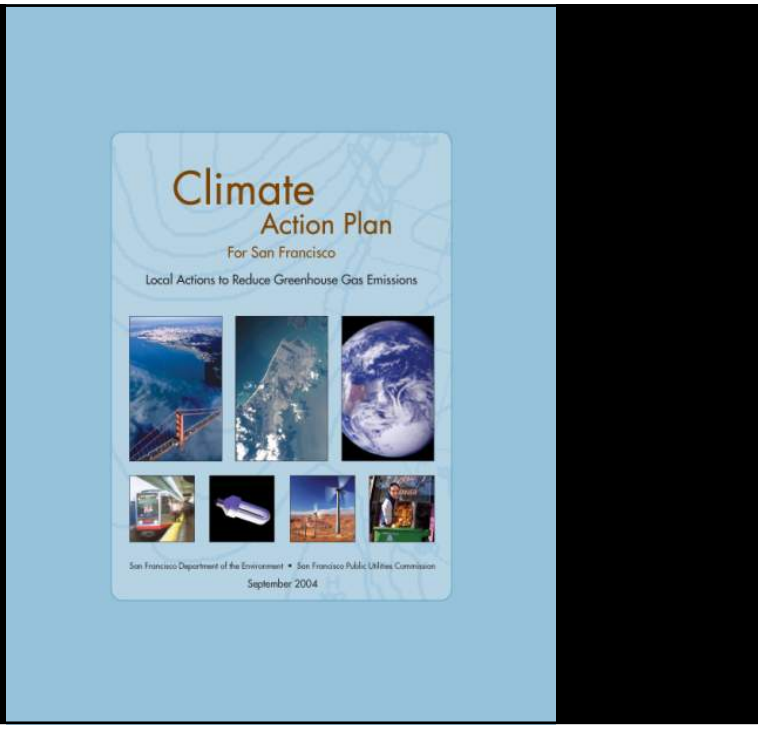
Rich Chien
Department of the Environment
City and County of San Francisco

Rich Chien is the Private Sector Green Building Coordinator with the City and County of San Francisco's Department of the Environment. Working closely with government agencies, industry professionals, and nonprofits, Mr. Chien provides outreach, technical assistance, and develops policy initiatives to green commercial and residential buildings in San Francisco. Most recently he led an industry stakeholder process to develop and pass the City's groundbreaking green building code for new construction, and is currently leading a similar process to accelerate energy and resource efficiency in existing buildings. In his previous role with the City's municipal green building program, Mr. Chien helped to implement its LEED® Silver ordinance by developing green design tools and resources, administering a training program for City design professionals, and providing project support for municipal construction projects. Prior to joining the department, Mr. Chien was a city planner for the City of Hayward, and practiced architecture, construction, and LEED/sustainability consulting in Bay Area design firms. Rich received a B.A. in Urban Planning/Environmental Design from University of California, San Diego.

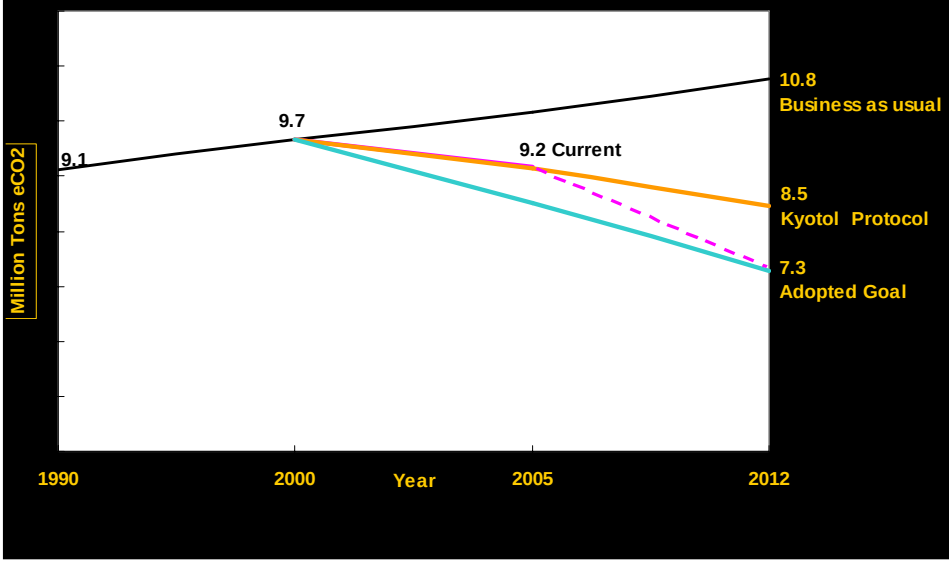
Building Green in San Francisco

ACEEE 3RD ANNUAL
ENERGY EFFICIENCY FINANCE FORUM
April 23, 2009

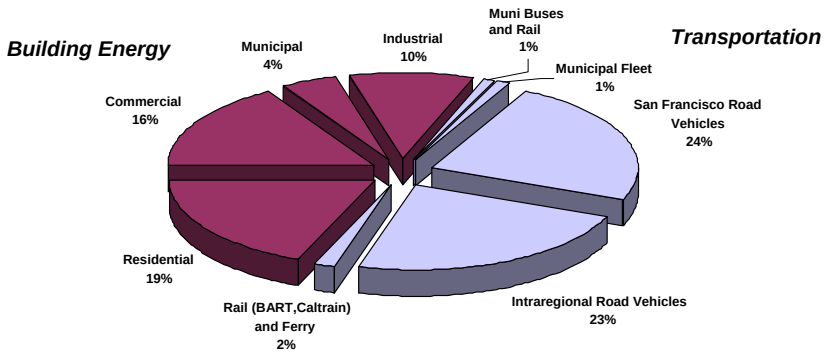
Rich Chien
SF Environment
City and County of San Francisco
(415) 355-3700



San Francisco GHG Reduction
Target + Status

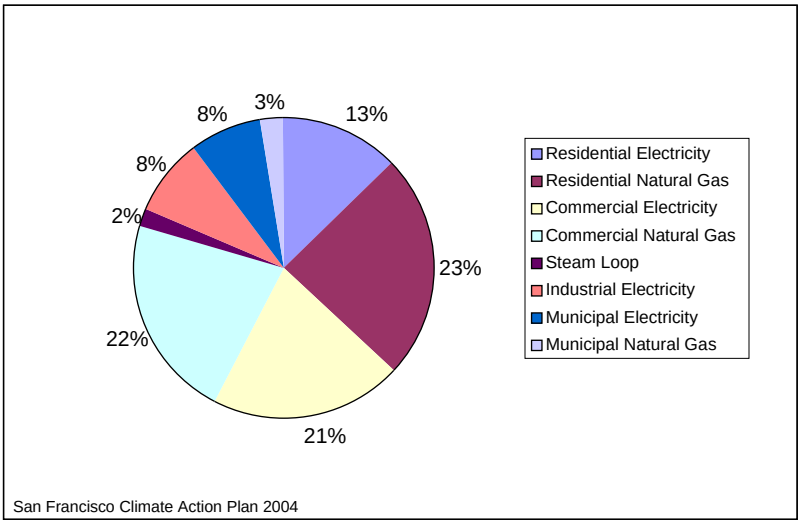


S.F. Greenhouse Gas Emissions
(eCO_2)
1990

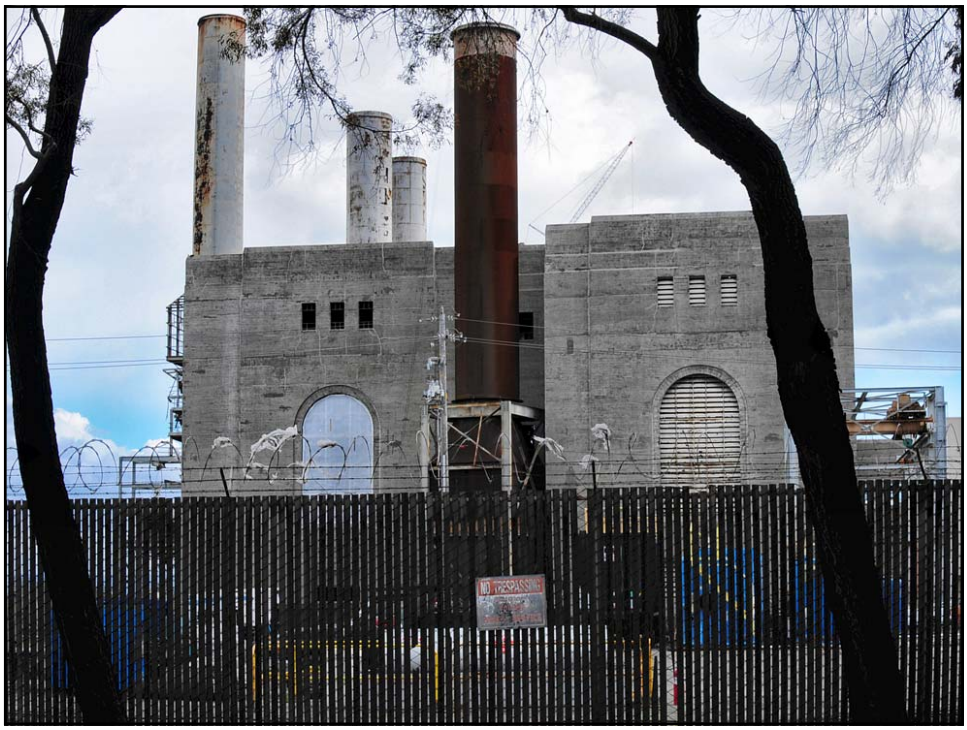


1990 Baseline Greenhouse Gas Emissions. Total = 9.1 million tons eCO_2 per year
Sources: PG&E, Hetch Hetchy Water and Power, CA. Dept of Transportation, MTC, Muni, BART.

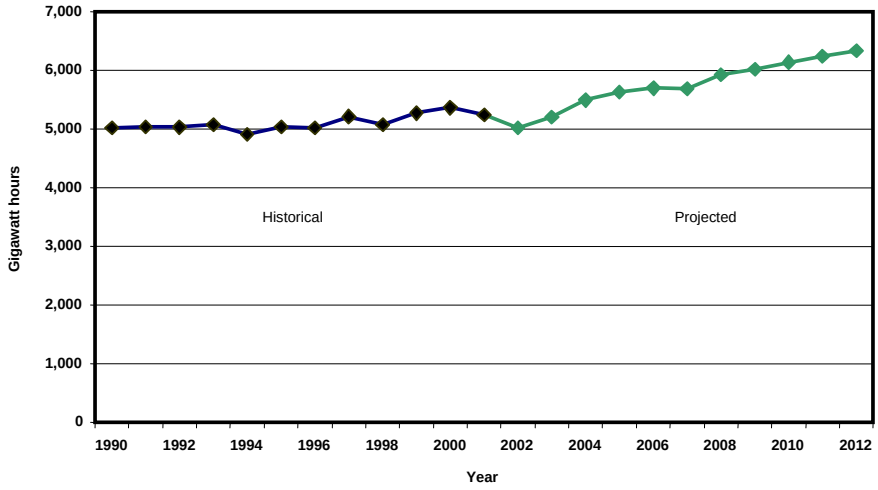
S.F. GHG – Building Sector



San Francisco Climate Action Plan 2004



San Francisco Electricity Use



Sources: 1990 -2001 PG&E, 2002 -2012 adjusted based on CEC *California Energy Demand 2003-2013 Forecast Staff Draft Report.* Feb 11, 2003.

CA Energy Efficiency Goal

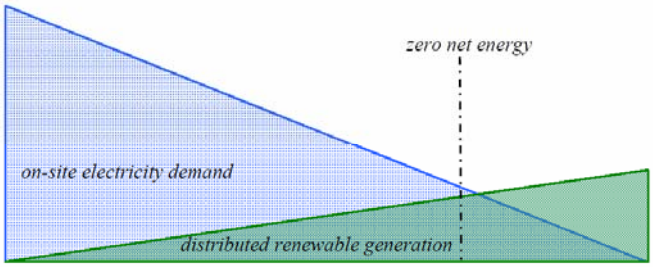
Goal: "50% of existing buildings will be equivalent to zero net energy buildings by 2030 through achievement of deep levels of energy efficiency and clean distributed generation."

Implication: Retrofit 1/20th of existing space per year - through 2030 - to zero-net energy.

Source: California Long Term Energy Efficiency Strategic Plan (2008 CA Public Utilities Commission)

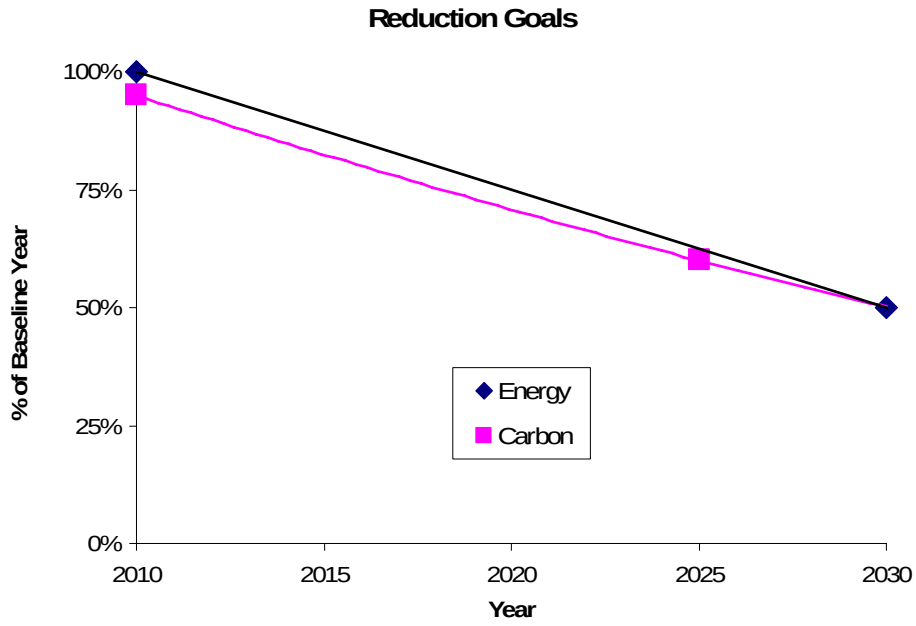
WHAT IS ZERO NET ENERGY?

Zero net energy is a general term applied to a building with a net energy consumption of zero over a typical year. To cope with fluctuations in demand, zero energy buildings are typically envisioned as connected to the grid, exporting electricity to the grid when there is a surplus, and drawing electricity when not enough electricity is being produced.



- The amount of energy provided by on-site renewable energy sources is equal to the amount of energy used by the building.
- A ZNE building may also consider embodied energy – the quantity of energy required to manufacture and supply to the point of use, the materials utilized for its building.[29]

Source: California Long Term Energy Efficiency Strategic Plan (2008 CA Public Utilities Commission)



Energy & Carbon Goals Are Similar

(For the Near and Mid-term)

	Average Energy Use Reduction, 2010 – 2020
Energy Reduction	2.4%
Carbon Reduction	2.5%

Government Initiatives

Municipal Green Building Ordinance

- **1999 Municipal Green Building Ordinance**
- **Chapter 7 of Environment Code (9/04)**
  - **Requires that new municipal buildings and significant renovation projects of 5,000 sq. ft. or more must be LEED Silver or better**
  - **Interdepartmental (REB) Task Force**
  - **10 Pilot Projects**

Priority Permit Process (LEED Gold)

Environmental Review and Building Permit

Current Timeframe

0 — 6 - 9 months

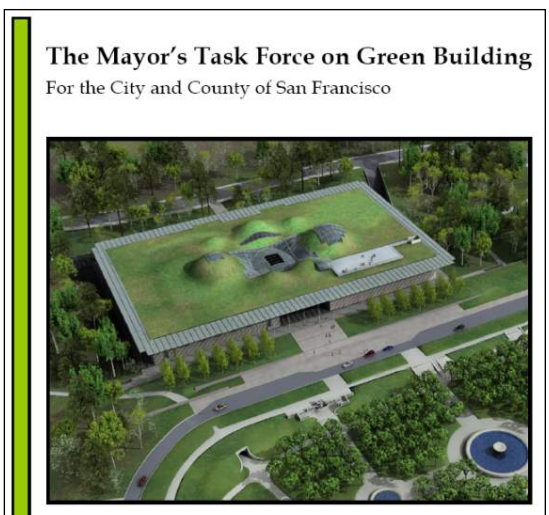
Proposed Timeframe

0 1 month

SAN FRANCISCO DEPARTMENT OF BUILDING INSPECTION

City and County of San Francisco
Planning Department

SF Environment
Our home. Our city. Our planet.



The Mayor's Task Force on Green Building
For the City and County of San Francisco

REPORT AND RECOMMENDATIONS

June 2007

Task Force Focus

- Commercial and Residential New Construction

Composition

- Owners
- Developers
- Financial
- Architects
- Engineers
- Contractors

Emphasized

- Predictability
- Substantive requirements
- Design Flexibility

Green Building Requirements

	Current	2009	2010	2011	2012
New Commercial					
Large ≥25k ft	LEED Certified	LEED Silver			LEED Gold
Mid-Size 5k – 25k sq ft	LEED checklist + Local Priority Measures				
Tenant Improvements					
First Time Tenant >25k sq ft	LEED Certified	LEED Silver			LEED Gold
Major Alteration >25k sq ft	LEED Certified	LEED Silver			LEED Gold
New Residential					
High Rise ≥75' height	LEED Certified		LEED Silver		
Midsize 5+ units	GreenPoints Checklist	25 GreenPoints	GreenPoint Rated	GreenPoint Rated - 75 Points	
Small ≤4 units	GreenPoints Checklist	25 GreenPoints	GreenPoint Rated		GreenPoint Rated - 75 Pts

Comparative Studies on Rents

CoStar Group
Real Estate Information

	Miller, Spivey, & Florance	Fuerst and McAllister	Eicholtz, Kok & Quigley
Green Buildings			$29.80(+4.4%)Regression controlled
Energy Star	$30.50	$29.34	
LEED	$42.15	$27.07(+9.4%) Regression controlled	
Control Sample	$28.00	$24.68 (all sample)	$28.16

Comparative Studies on Occupancy

CoStar GROUP
Real Estate Information

Occupancy Rate	Miller, Spivey, Florance	Fuerst and McAllister	Eicholtz, Kok & Quigley
Green Buildings			88.99%
Energy Star	91.5%	88.40% (median)	
LEED	92.0%	88.40% (median)	
Control Sample	87.8%	86.06% (all median)	81.35%

RealGreen Index 4th Quarter 2008
San Francisco - Oakland - Certified Projects

LEED Project Name (1)	Address	Floor(s)	City	Total Bldg Size (2)	LEED Project Size	LEED Ratio (3)	LEED Cert. (4)	Certified Space Vacancy RSF	Asking Rent/ RSF/Yr
Method	637 Commercial St	Entire Building	San Francisco	24,469	24,469	100%	Certified	0	N/A
Allsteel/Gunlocke Showroom	Four Maritime Plaza	Entire Building	San Francisco	12,300	12,300	100%	Silver	0	N/A
Nixon Peabody Law Offices	One Embarcadero Center	16–19th Floors	San Francisco	767,137	80,697	11%	Certified	0	N/A
Accenture San Francisco *	560 Mission St	12th & 13th Floors	San Francisco	667,782	45,000	7%	Silver	0	N/A
ChongPartnersArchitecure (Stantec)	405 Howard St	5th Floor	San Francisco	503,576	43,254	9%	Gold	0	N/A
HOK San Francisco Office	One Bush St	2nd & 3rd Floors	San Francisco	298,080	17,044	6%	Certified	0	N/A
Natural Resources Defense Council Office	111 Sutter St	20th Floor	San Francisco	284,000	15,530	5%	Gold	0	N/A
NAI BT Commercial *	201 California St	8th Floor	San Francisco	240,546	14,550	6%	Certified	0	N/A
GLUMAC International, Inc.	150 California St	3rd Floor	San Francisco	201,787	14,105	7%	Certified	0	N/A
Beverly Prior Architects	222 Sutter St	9th Floor	San Francisco	108,691	14,039	13%	Gold	0	N/A

NAI BT Commercial
Commercial Real Estate Services, Worldwide.

For information, please contact:
David A. Klein, SIOR LEED AP, dklein@naibt.com, (415) 677-0456
Bryan Courson, Managing Partner, bcourson@naibt.com, (415) 677-0454
Jennier Horn Essner, Associate, jessner@naibt.com, (415) 677-0432
201 California Street, Suite 800, San Francisco, CA 94111
fax 415 956 3381
www.naibtcommercial.com

SAN FRANCISCO energy watch

- San Francisco Energy Watch
  - Partnership between SF and PG&E - $6.7m / year
  - Existing buildings: Non-residential and multifamily
  - More info: **sfenergywatch.org**
- Federal Stimulus
  - Energy Efficiency Block Grants for local energy projects over 18 months
  - Competitive solicitations for additional funds
- Existing Commercial Buildings Task Force

2009 Federal Tax Credits - Energy

BUILDING FUNDAMENTALS

This is the first step to improving your home's energy efficiency. By sealing up your home's building envelope and improving insulation, you can reduce energy usage by 20%-40%.

TAX CREDIT DETAILS:

- **Up to $1500 for improvements***
- Covers qualifying insulation, air sealing windows, doors and roofs
- Pays 30% of cost of materials

MAJOR SYSTEMS

The next step toward a home that is highly energy efficient is optimizing your heating and cooling systems. Once you've fixed the fundamentals, you save money by buying smaller, and more efficient, systems for heating, air conditioning and water heating.

TAX CREDIT DETAILS:

- **Up to $1500 for improvements***
- Covers high efficiency furnaces, boilers, air conditioners, water heaters, air source heat pumps and biomass stoves
- Pays 30% of cost of installation (labor and materials)

RENEWABLES

Finally, adding renewable energy to your efficient building envelope and high efficiency systems allows you to take full advantage of the ADDITIONAL incentives available for onsite renewables, like solar and wind power.

TAX CREDIT DETAILS:

- **No $ cap for improvements**
- Covers solar photovoltaics, solar water heating, onsite small wind, and geothermal heat pumps
- Pays 30% of cost of installation (labor and materials)

* Cap covers both building fundamentals and major systems combined. Limited to one household for 2009 through 2010.

Image: Sustainable Spaces

Solar Subsidies

- GoSolarSF: Free solar and efficiency retrofit assessment
- Incentives adding up:
  - Fed Tax Credit – 30%
  - State – California Solar Initiative
  - SFPUC
- Reviewing RFP responses for on-tax-bill financing of renewables *and energy efficiency*

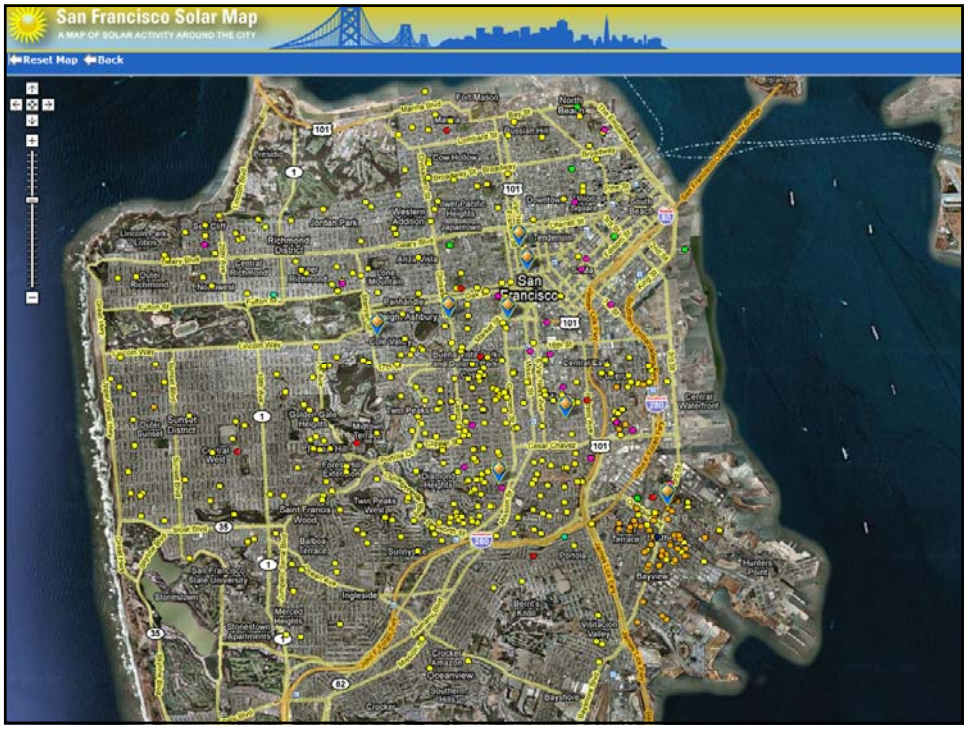
GoSolarSF

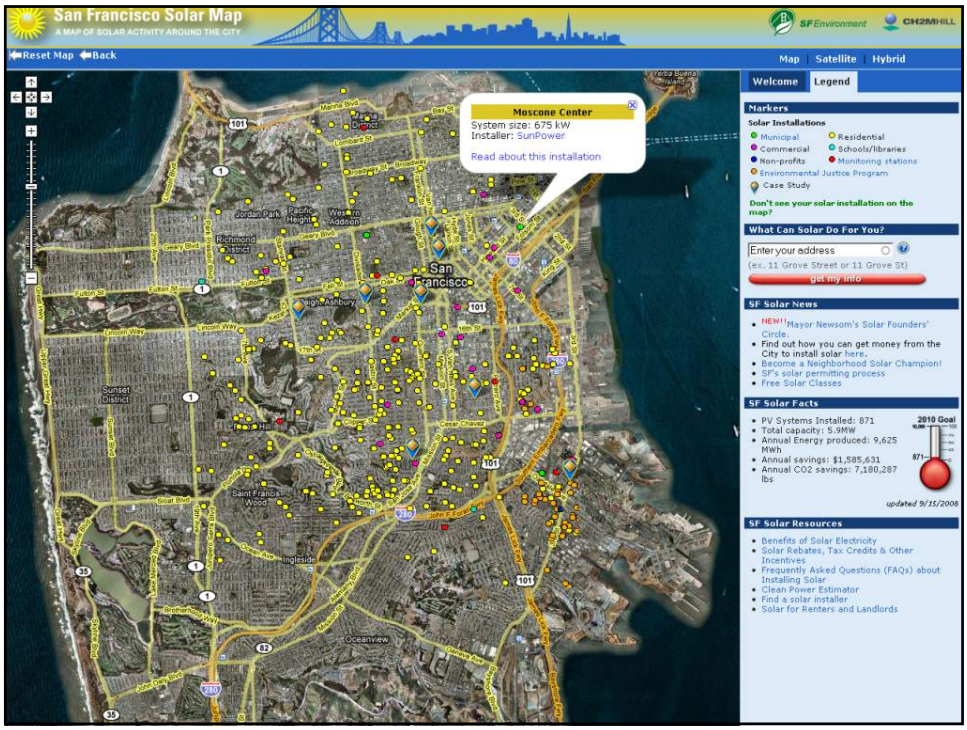
Updated 2/1/09

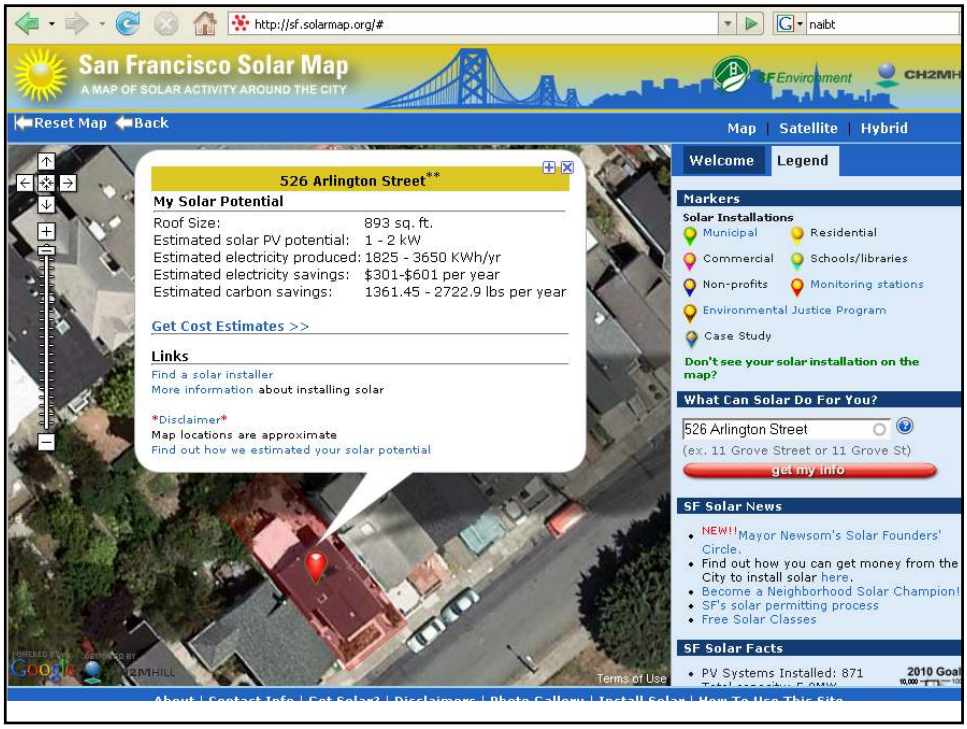
Incentives	**Old**	**New**
Basic	$3,000	$2,000
City Installer	$4,000	$3,000
Environmental Justice	$5,000	$3,500
Workforce Development	$6,000	$4,000
Low-Income	$5,000	$7,000

A completed application package includes:

- A completed GoSolarSF application form, including ALL required signatures
- A copy of the completed California Solar Initiative (CSI) application
- A copy of the CSI reservation letter.


San Francisco Solar Map
A MAP OF SOLAR ACTIVITY AROUND THE CITY
Reset Map
Back
San Francisco


San Francisco Solar Map
A MAP OF SOLAR ACTIVITY AROUND THE CITY
SFEnvironment
CH2MHILL
Reset Map
Back
Map | Satellite | Hybrid
Welcome
Legend
Moscone Center
System size: 675 kW
Installer: SunPower
Read about this installation
Markers
Solar Installations
Municipal
Residential
Commercial
Schools/libraries
Non-profits
Monitoring stations
Environmental Justice Program
Case Study
Don't see your solar installation on the map?
What Can Solar Do For You?
Enter your address
(ex. 11 Grove Street or 11 Grove St)
get my info
SF Solar News
NEW!! Mayor Newsom's Solar Founders' Circle.
Find out how you can get money from the City to install solar here.
Become a Neighborhood Solar Champion!
SF's solar permitting process
Free Solar Classes
SF Solar Facts
PV Systems Installed: 871
Total capacity: 5.9MW
Annual Energy produced: 9,625 MWh
Annual savings: $1,585,631
Annual CO2 savings: 7,180,287 lbs
2010 Goal
5MW
871
updated 9/15/2008
SF Solar Resources
Benefits of Solar Electricity
Solar Rebates, Tax Credits & Other Incentives
Frequently Asked Questions (FAQs) about Installing Solar
Clean Power Estimator
Find a solar installer
Solar for Renters and Landlords
San Francisco



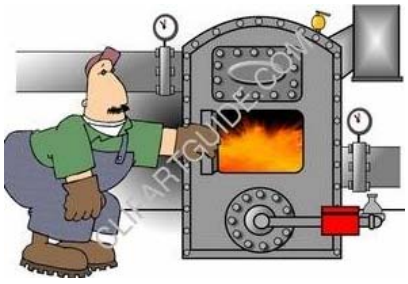
ARRA Goals

- Quick start
- Local green jobs
- Build local capacity
- Fill gaps
- Environmental Impact
- Sustainable (post-stim)
- Position for future funds

Power Source

- ⇨ Private Capital
- ⇨ Rebates & tax credits
- ⇨ ARRA - EECBG
- ⇨ Mello-Roos tax-lien financing
- ⇨ Law

e.g. Heating Systems



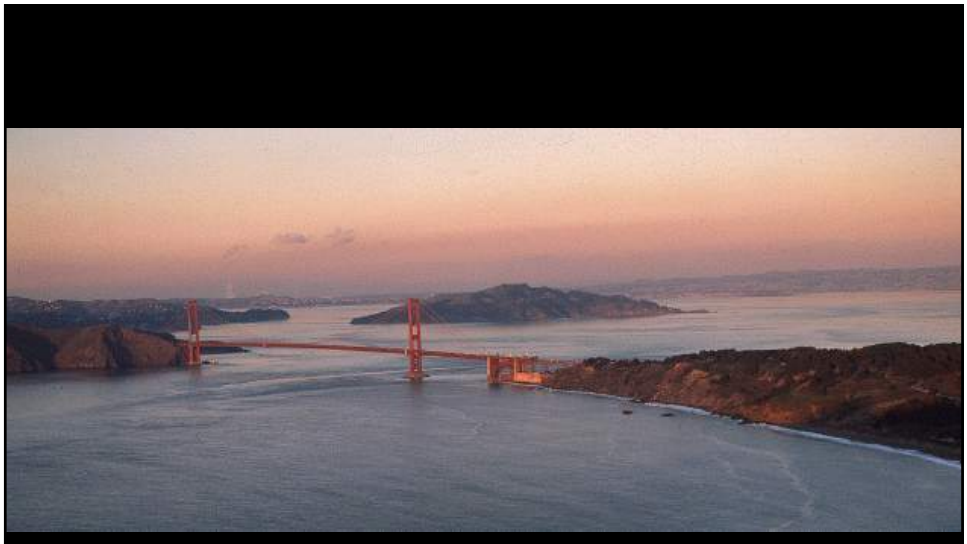
Pipe Fitters
(Workforce, Capacity)

Law
(Ordinance, Date certain)

Rebate $
(EnergyWatch, etc.)

Stimulus $
(ARRA/EECBG, SEP, etc.)

Tax-Lien Financing $
(Longer term, ongoing)



Thank You!

INVESTOR ROUNDTABLE!

The New Investor in Energy Efficiency: Public & Private Sectors

---

Panelists:

Rodrigo Prudencio, *Managing Director*
NTH POWER

Joyce Ferris, *Founder & Managing Partner*
BLUE HILL PARTNERS

Kirsten Spalding, *California Director*
CERES

Moderator:

Evan Lovell, *Partner*
VIRGIN GREEN FUND

Rodrigo Prudencio
Partner, Nth Power

Rodrigo Prudencio is a Partner with Nth Power and is involved in all aspects of the firm's operations including investments, investor relations, and portfolio management. Rodrigo sits on the board of Synapsense, and is an observer of the boards of Terrapass and Imara.

Earlier in his career, Rodrigo worked for the Department of State where he focused on a variety of global environmental negotiations, including preparations for the Kyoto round of the Climate Change Convention. Rodrigo was also Director of the international trade program at the National Wildlife Federation where he led NWF's environmental advocacy to reform the rules of international trade.

Rodrigo received his MBA from the Haas School of Business, UC Berkeley, where he served as president of his class and concentrated on energy markets including outside research at Lawrence Berkeley Laboratory. His bachelor's degree in international relations was earned from Middlebury College in Vermont.

Joyce M. Ferris

Joyce M. Ferris, is a Founder and Managing Partner of Blue Hill Partners LLC, a private investment firm focused exclusively in the Green Technology sector. Blue Hill has built an investment portfolio around energy efficiency technologies and services for application in commercial and industrial buildings. The portfolio includes companies with technologies and services related to reducing the costs of lighting, air conditioning, monitoring and control and providing cost effective solutions for on-site power generation.

Joyce has over 24 years of experience in building and financing green technology companies and projects. She has had principal roles as an investor, technology and equipment provider, financial advisor and as a project developer. Joyce's project experience includes energy efficiency and on-site generation projects, biomass and agricultural waste fired energy projects, industrial waste disposal facilities, waste-coal fired power plants, geothermal, and hydroelectric projects. Joyce was a senior founding executive of Reading Energy Company where she managed financial transactions totaling over $500 million. Joyce was a major shareholder and Director of Business Development for Energy Products of Idaho, a combustion technology firm specializing in the conversion of a wide variety of solid waste material. Joyce has held numerous board positions and is currently on the board of Princeton Energy Systems, E3 Bank and Aircuity Inc. She is a frequent speaker at industry conferences in the US and Europe. Joyce is a member of the Advisory Board of the Pennsylvania Green Growth Partnership, the National Wildlife Federation Business Council and the Cleantech Venture Network. Joyce is also on the board of Philadelphia Outward Bound. She holds a B.A. from Reed College and an M.S. from the University of Pennsylvania in Energy Management and Policy.

Kirsten Snow Spalding, Esq.

Ms. Spalding is the California Director for Ceres, a coalition of investor groups, environmental organizations and investment funds that engages directly with companies on environmental and social issues. She served as Chief Deputy Treasurer under California Treasurer Phil Angelides and Director of the Treasurer's environmental financing authorities. Prior to her government service, Ms. Spalding worked in the labor movement as a policy consultant, and lawyer. She directed a policy research center at UC Berkeley and taught at Boalt Hall School of Law. She holds a BA from Yale College in music and a JD from Hastings College of Law.

Evan Bio for Conferences

Evan Lovell is a founding Partner of Virgin Green Fund and a member of its Investment Committee. VGF is a private equity fund focused on growth capital investments in the renewable energy and resource efficiency sectors. Prior to VGF, Evan was an investment professional with TPG and a partner in TPG's Aqua Fund, which focused on growth capital investments in the water and renewable energy sectors.

Evan currently serves on the board of DuraTherm, Inc. and Seven Seas Water.

Prior to joining TPG, Evan was the Director of International Development for Culligan Water Technologies which was at the time a portfolio company of Apollo Management, L.P.

Evan previously served on the boards of Eden Springs and Grupo Rotoplas.

Evan is a graduate of the University of Vermont with a BA in Political Science and International Affairs

Chairs' Welcome & Day One Re-Cap

Chairperson:
Steve Nadel, *Executive Director*
AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY

Dan Adler, *President*
CALIFORNIA CLEAN ENERGY FUND (CalCEF)

Steven Nadel

Steve Nadel is the Executive Director of the American Council for an Energy-Efficient Economy (ACEEE), a non-profit research organization that works on programs and policies to advance energy-efficient technologies and services. Steve has been at ACEEE for 20 years serving as Deputy Director of the organization and Director of ACEEE's Utilities and Buildings programs prior to his promotion to Executive Director in 2001. Prior to ACEEE he planned and evaluated energy efficiency programs for New England Electric, a major electric utility; directed energy programs for the Massachusetts Audubon Society, Massachusetts' largest environmental organization; and ran energy programs for the a community organization working on housing rehabilitation in the poorest neighborhoods of New Haven, CT. Steve has worked in the energy efficiency field for 30 years and has over 100 publications on energy-efficiency subjects. His current research interests include equipment efficiency standards, utility-sector energy efficiency programs and policies, and state and federal energy and climate change policy. He has a M.S. in Energy Management from the New York Institute of Technology, and a M.A. in Environmental Studies and B.A. in Government from Wesleyan University in Connecticut.

Dan Adler is President of the California Clean Energy Fund (CalCEF), a $30 million nonprofit venture capital fund created to accelerate investment in California's clean energy economy. CalCEF Fund I, employing a fund-of-funds model, is invested in 39 young companies covering the full range of clean energy technologies. In 2006 CalCEF founded the nation's first university center on energy efficiency, the Energy Efficiency Center at the University of California at Davis, and in 2008 launched the CalCEF Clean Energy Angel Fund and an affiliated public policy and market intelligence organization, CalCEF Innovations. Prior to joining CalCEF, Mr. Adler was a senior analyst in the Division of Strategic Planning at the California Public Utilities Commission, where he was responsible for the design and implementation of California's Renewables Portfolio Standard and was senior staff for climate change policy. In addition to energy issues, Mr. Adler has professional experience in international trade policy and socially responsible investment. He has a B.A. in Political Science from the University of California at Berkeley and an M.A. in Public Policy from Harvard University.

Keynote Session: Past & Future Success in Energy Efficiency Finance

Keynote Speaker:
Arthur H. Rosenfeld, Ph.D, *Commissioner*
CALIFORNIA ENERGY COMMISSION

BIOGRAPHY
Arthur H. Rosenfeld
Commissioner, California Energy Commission

Feb. 2009

Art Rosenfeld received his Ph.D. in Physics in 1954 at the University of Chicago under Nobel Laureate Enrico Fermi, and then joined the Department of Physics at the University of California at Berkeley. There he joined, and eventually led, the Nobel prize-winning particle physics group of Luis Alvarez at Lawrence Berkeley National Laboratory until 1974. At that time, he changed his research focus to the efficient use of energy, formed the Center for Building Science at Lawrence Berkeley National Laboratory (LBNL), and led it until 1994.

From 1994 -1999 Dr. Rosenfeld served as Senior Advisor to the U. S. Department of Energy's Assistant Secretary for Energy Efficiency and Renewable Energy. In 2000 California Governor Gray Davis appointed him Commissioner at the California Energy Commission, and in 2005 he was re-appointed by Governor Arnold Schwarzenegger. He is responsible for the Public Interest Energy Research program, with an annual budget of $82 M; for Energy Efficiency, including the California energy efficiency standards for buildings and for appliances; and collaborates with the California Public Utilities Commission to oversee California's Energy Efficiency Program with an annual budget of $1 billion.

Dr. Rosenfeld is the co-founder of the American Council for an Energy Efficiency Economy (ACEEE), and the University of California's Institute for Energy and the Environment (CIEE).

He is the author or co-author of nearly 400 refereed publications, received the Szilard Award for Physics in the Public Interest in 1986, the Carnot Award for Energy Efficiency from the U.S. Department of Energy in 1993 and the Berkeley Citation in 2001 from the University of California. **He is most proud to have received the Enrico Fermi Award, the oldest and one of the most prestigious science and technology awards given by the U.S. Government. He received this prestigious award on June 21, 2006 from the Department of Energy, Secretary Samuel W. Bodman, on behalf or the president of the United States, for a lifetime of achievement ranging from pioneering scientific discoveries in experimental nuclear and particle physics to innovations in science, technology, and public policy for energy conservation that continue to benefit humanity. This award recognizes scientists of international stature for their lifetimes of exceptional achievement in the development, use, control, or production of energy. As mentioned, this award is particularly important to Dr. Rosenfeld because he was Enrico Fermi's last graduate students.**

On Oct 30, 2008, in London, the Economist magazine awarded him Innovator of the Year in the field of Energy and Environment.

Art's website at the California Energy Commission is
http://energy.ca.gov/commission/commissioners/rosenfeld.html
or just Google "Art Rosenfeld".

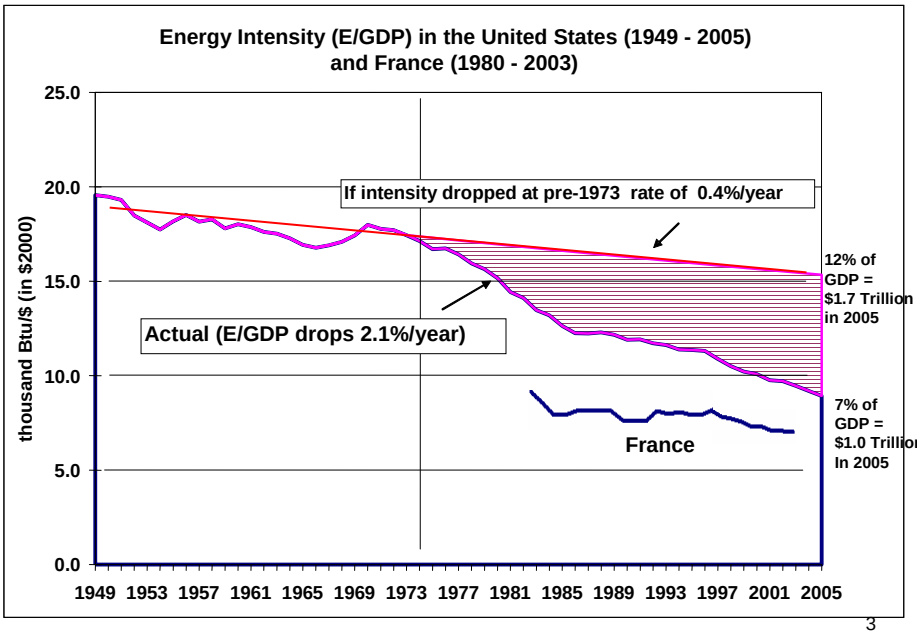
Financing Energy Efficiency in California, The First Priority

ACEEE/ FRA ROSENFELD Session
April 24, 2009

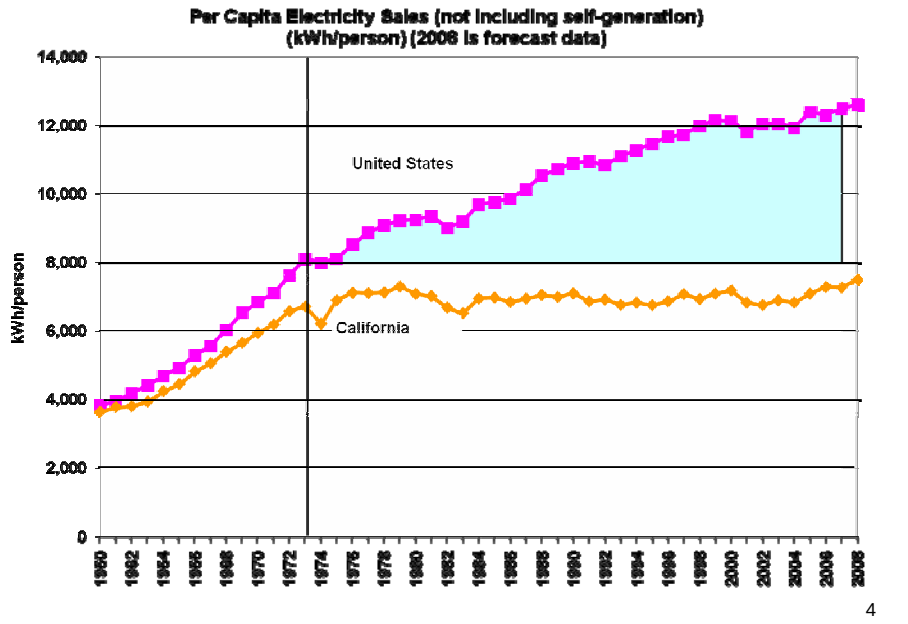
Arthur H. Rosenfeld, Commissioner
California Energy Commission
(916) 654-4930
ARosenfe@Energy.State.CA.US

http://www.energy.ca.gov/commissioners/rosenfeld.html
or just Google "Art Rosenfeld"

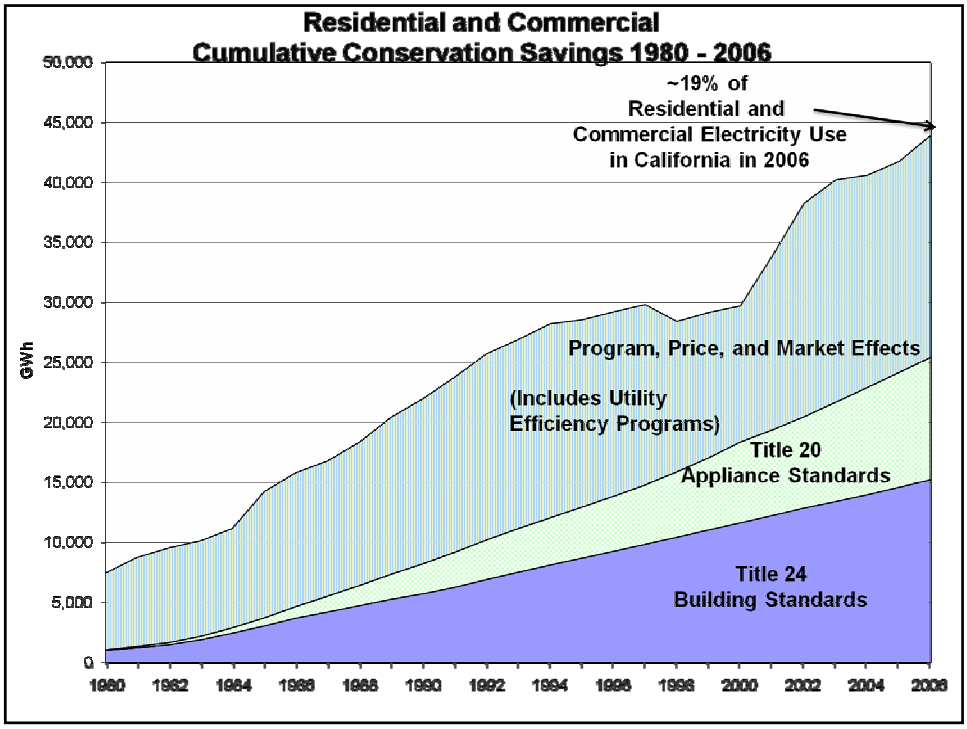
Does Anyone See A Problem With This Picture?


Energy Intensity (E/GDP) in the United States (1949 - 2005)
and France (1980 - 2003)
thousand Btu/$ (in $2000)
25.0
20.0
15.0
10.0
5.0
0.0
1949 1953 1957 1961 1965 1969 1973 1977 1981 1985 1989 1993 1997 2001 2005
If intensity dropped at pre-1973 rate of 0.4%/year
Actual (E/GDP drops 2.1%/year)
France
12% of GDP = $1.7 Trillion in 2005
7% of GDP = $1.0 Trillion In 2005

3


Per Capita Electricity Sales (not including self-generation)
(kWh/person) (2008 is forecast data)
kWh/person
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
United States
California

4



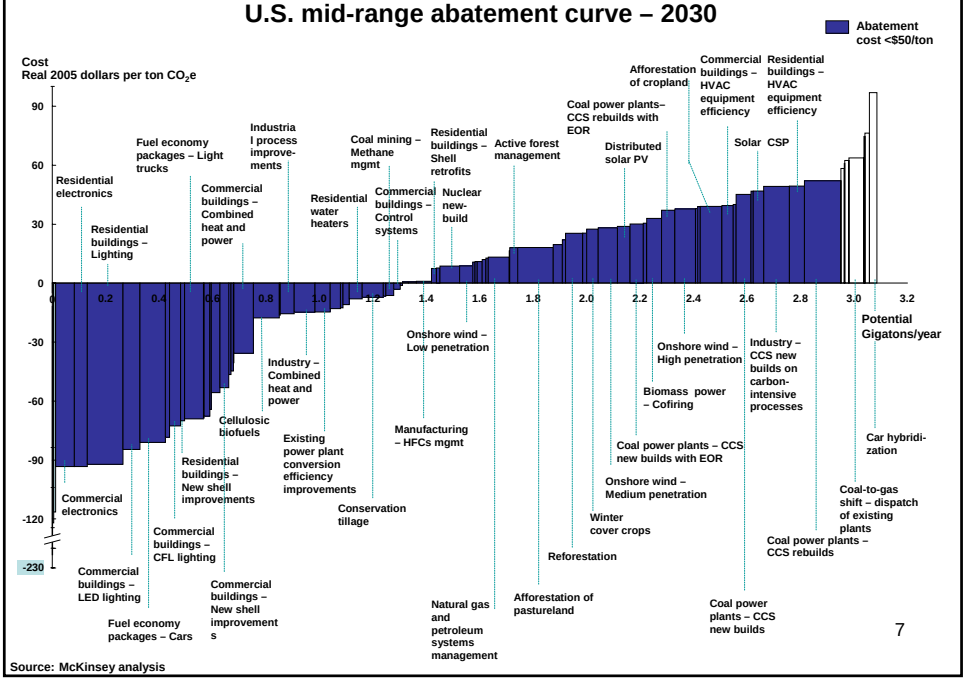
Reducing U.S. Greenhouse Gas Emissions: *How Much at What Cost?*

US Greenhouse Gas Abatement Mapping Initiative

December 12, 2007

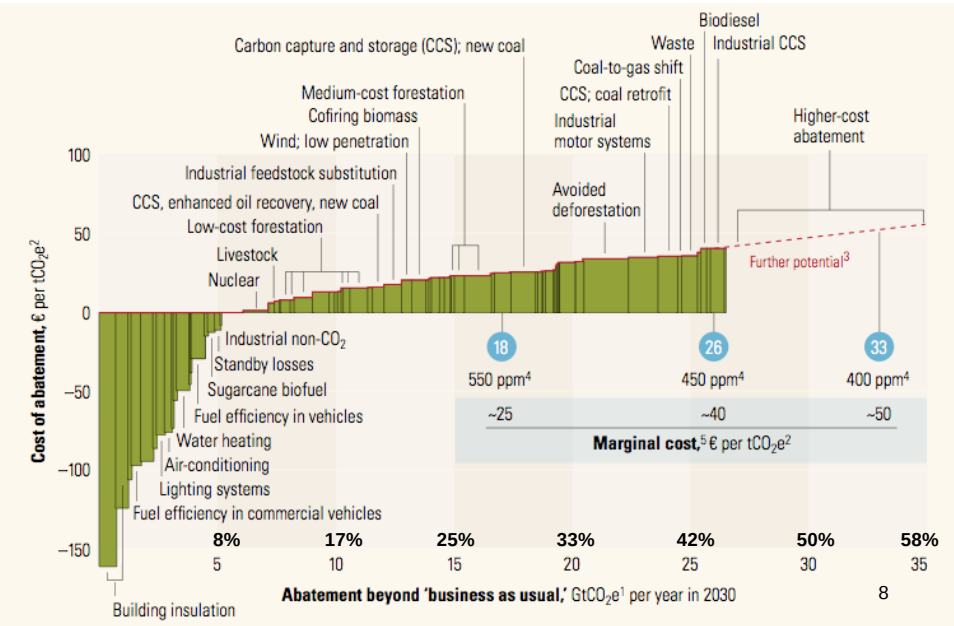
McKinsey&Company

U.S. mid-range abatement curve – 2030



Source: McKinsey analysis

Global CO2 Abatement Curve - 2030



Municipal Finance Districts

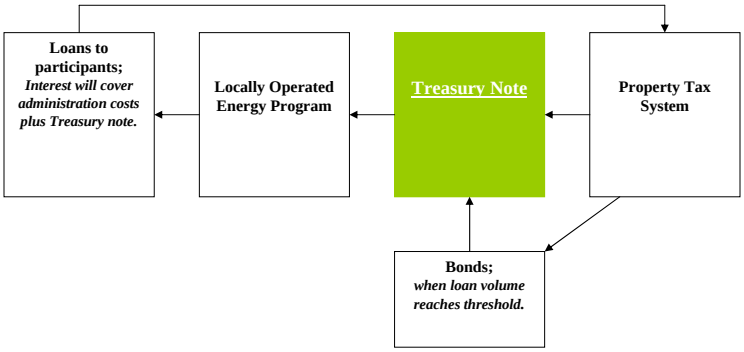
AB 811 (Levine), July 2008

AB 811 – BACKGROUND

- Governor signed AB 811 (Levine) as an urgency measure
- Program enters into agreement with property owner to fund energy and water improvements to existing residential and commercial property
- **Property owner agrees to a contractual assessment on property tax bill for up to 20 years**
- Criteria for loan approval
  - No “Clouds” on Property Title
  - Current on Property Taxes
  - Current on Mortgage(s)
- Property secures the loan and stays with property

Source: Rod Dole – Auditor, Controller, Treasurer, Tax Collector, Sonoma County

AB 811 – FINANCES



Source: Rod Dole – ACTTC, Sonoma County

AB 811 – FINANCES

- Treasury invests in a series of notes
- Proceeds of the notes are used to finance loans to participants
- Participant payments come in via property tax system, paying the loan principal plus an interest rate to cover program operational expenses – analogous to a bank loan
- Bonds or other long term investment repays the note in full
- With long term financing, Treasury can invest in a new series of notes

Source: Rod Dole – ACTTC, Sonoma County

AB 811 – TECHNOLOGY

- **Energy Efficiency**
  - **High-efficiency HVAC**
  - **High-efficiency windows & Insulation**
- Renewables
  - Photovoltaic (PV)
  - Fuel Cells
  - Geothermal exchanges
- **Water Conservation**
  - **Tankless water heaters**
  - **Low-flow devices**
  - **Rain cisterns**
  - **Smart irrigation systems (e.g. moisture sensors)**

Source: Rod Dole – ACTTC, Sonoma County

AB 811 – Relation to Stimulus

DOE	US ($Million)	CA ($Million)	Administered By
Weatherization (low income)	5,000	186*	Community Services Development (CSD)
SEP (State energy Program)	3,000	226	Energy Comm'n (CEC)
EERE (Energy Eff. And Renewables)	7,000	---	
EEC BG (EE & Conservation Block Grants)	---	352	Large Cities, Counties, CEC

* California **IOU's (Investor-Owned Utilities's)** Low-Income Weatherization funding is $200 M/yr

AB 811 – Benefits

- Enabling Residential/Commercial/Industrial Property Owners to make responsible and affordable energy and resource conservation improvements to existing structures
- Provide unique financing and repayment vehicle to the Property Owner to fund Improvements
- Provide job opportunities in the energy and resource conservation improvement fields

Source: Rod Dole – ACTTC, Sonoma County

AB 811 – How Can We Sweeten the Deal?

- Current programs like weatherization have income tests (<200% of poverty level)
  - How do we reach the next income tier who may fall in the gaps?
  - How do we deal with landlord-tenant problems?
  - What about repossessed/empty homes?
  - What about using performance-based (M&V) incentives?

“Berkeley First” Program

Table 2. Net present value for average California home

Project type	Annual energy price escalation		
	EIA forecast (inflation only)	+2%	+4%
Solar installation only	($2,690)	($1,492)	$87
Energy-efficiency improvement only	$185	$1,017	$2,120
Solar installation and energy-efficiency improvement	($2,812)	($852)	$1,738
Solar installation, energy-efficiency improvement, and $30/ton carbon dioxide	($1,818)	$142	$2,732

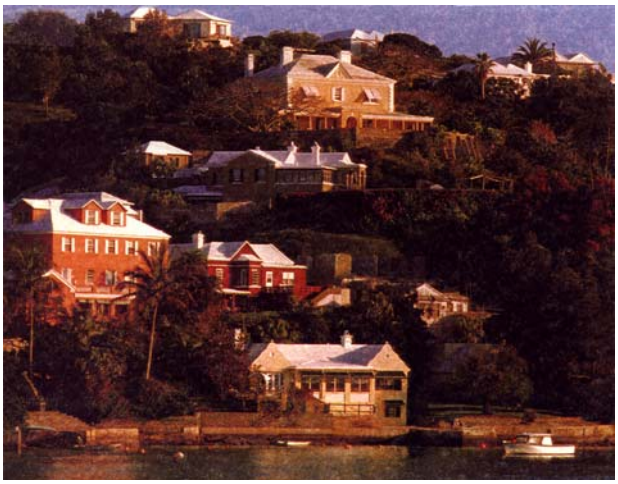
NOTE: EIA=Energy Information Administration. Parentheses indicate negative net present value, base case highlighted.

Source: Merrian C. Fuller, Stephen Compagni Portis, and Daniel M. Kammen, *“Toward a Low-Carbon Economy: Municipal Financing for Energy Efficiency and Solar Power”* Environment Magazine, Online

“Berkeley First” Per Home Assumptions

- Baseline assumptions based on EIA data for 2006:
  - 7000 kWh/yr electricity
  - 276 therms/yr natural gas
- Savings assumptions are:
  - 5% Electricity and 25% Natural Gas from the first $4000 spent on homes (minimum required for program participation)
  - Higher payback measures such as resetting thermostats, replacing light bulbs, or purchasing high efficiency appliances are not included in this study.

White is ‘cool’ in Bermuda



and in Santorini, Greece

and in Hyderabad, India

…and in Gujarat, India

- *To be published in Climatic Change 2009*

- **Global Cooling: Increasing World-wide Urban Albedos to Offset CO2**

July 28, 2008

Hashem Akbari and Surabi Menon
Lawrence Berkeley National Laboratory, USA
H_Akbari@lbl.gov
Tel: 510-486-4287

Arthur Rosenfeld
California Energy Commission, USA
Arosenfe@energy.state.ca.us
Tel: 916-654 4930

- **A First Step In Geo-Engineering Which Saves Money and Has Known Positive Environmental Consequences**

100m^2(~1000 ft$^{2)}$ of a white roof, replacing a dark roof, offset the emission of 10 tonnes of CO_2

How to Relate to 10 Tons of CO2

- First – This is 10 tons ONCE, not 10 tons/year;
- But familiar measures are usually in terms of tons/**year**;
- So we will look at how many years of emissions 10 tons will offset

	Tons CO2/Yr	Years Equivalent to 10 Tons
Average US House Emits	10	1
Average US Car Emits	5	2
Average Global Car Emits	4	2.5
Average CFL **Saves**	.05=1/20	200

25

CO_2 Equivalency of Cool Roofs World-wide (Tropics+Temperate)

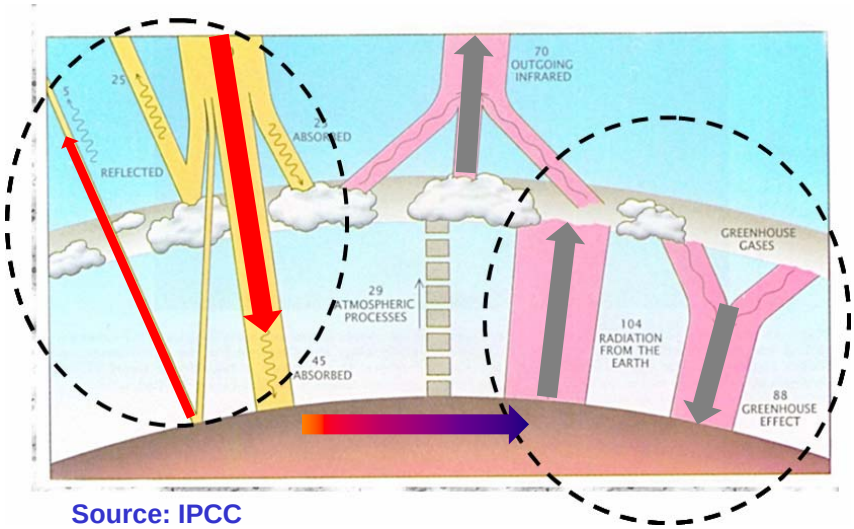
- Cool Roofs alone could offset a total of 24 Billion Tons (Gt) CO2, = world emissions this year !!!!
- Worth > €240 Billion (Pre-recession was €600B)
- To Convert 24 Gt CO2 one-time into a rate
- Assume 20 Year Program, thus 1.2 Gt CO2/year
- Average World Car emits 4 tCO2/year,

equivalent to 300 Million Cars off the Road for 20 years.

(600 million cars in the world)

26

Solar Reflective Surfaces Also Cool the Globe



Source: IPCC

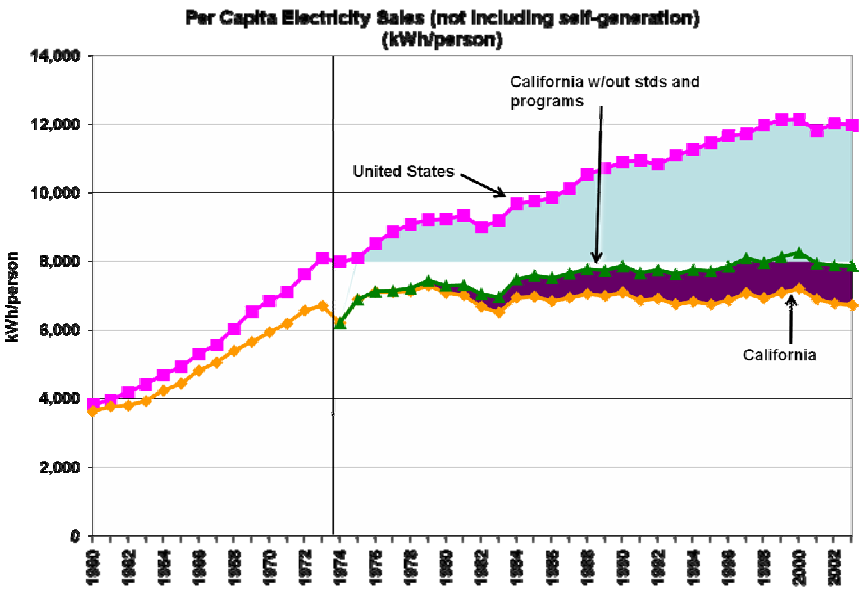
California Appliance and Buildings Efficiency Standards (Title 20 and 24)

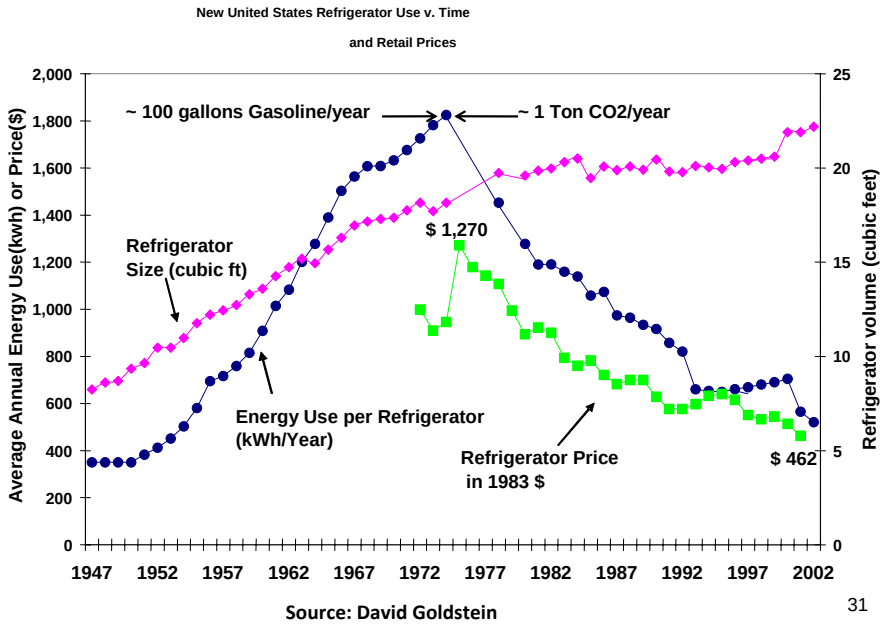
How Much of The Savings Come from Efficiency

- Some examples of estimated savings in 2009 based on 1974 efficiencies minus 2009 efficiencies

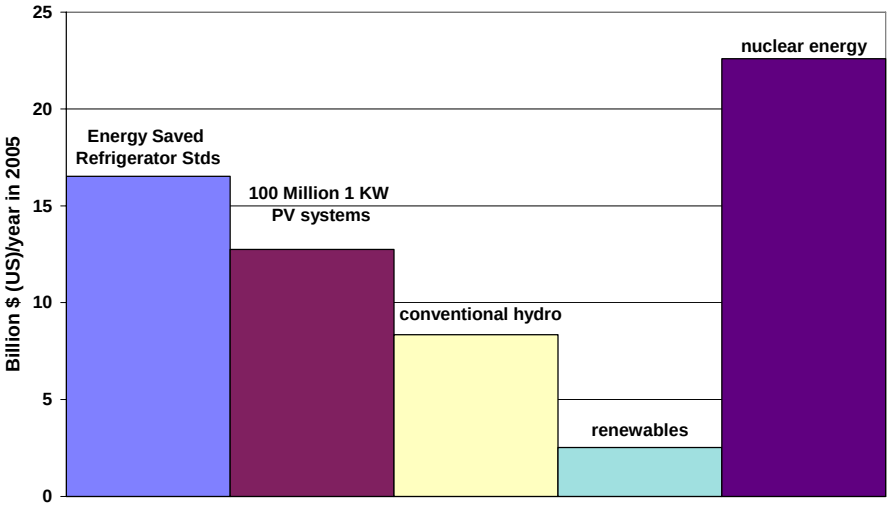
	Billion $/Yr
Space Heating	40
Air Conditioning	30
Refrigerators	15
Fluorescent Tube Lamps	5
Compact Fluorescent Lamps	10
Total	**100**

- Beginning in 2007 in California, reduction of "vampire" or stand-by losses
  - This will save $10 Billion when finally implemented, nation-wide
- Out of a total **$700 Billion**, a crude summary is that 1/3 is structural, 1/3 is from transportation, and 1/3 from buildings and industry.

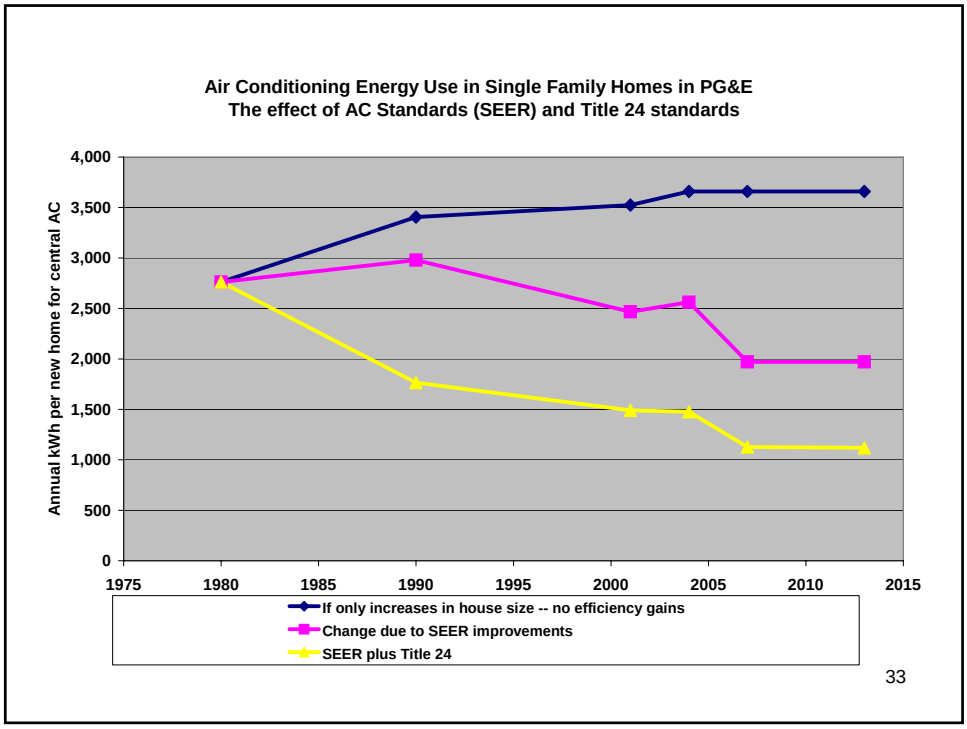



New United States Refrigerator Use v. Time
and Retail Prices
~ 100 gallons Gasoline/year
~ 1 Ton CO2/year
Refrigerator
Size (cubic ft)
$ 1,270
Energy Use per Refrigerator
(kWh/Year)
Refrigerator Price
in 1983 $
$ 462
Average Annual Energy Use(kwh) or Price($)
Refrigerator volume (cubic feet)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
25
20
15
10
5
0
1947
1952
1957
1962
1967
1972
1977
1982
1987
1992
1997
2002
Source: David Goldstein

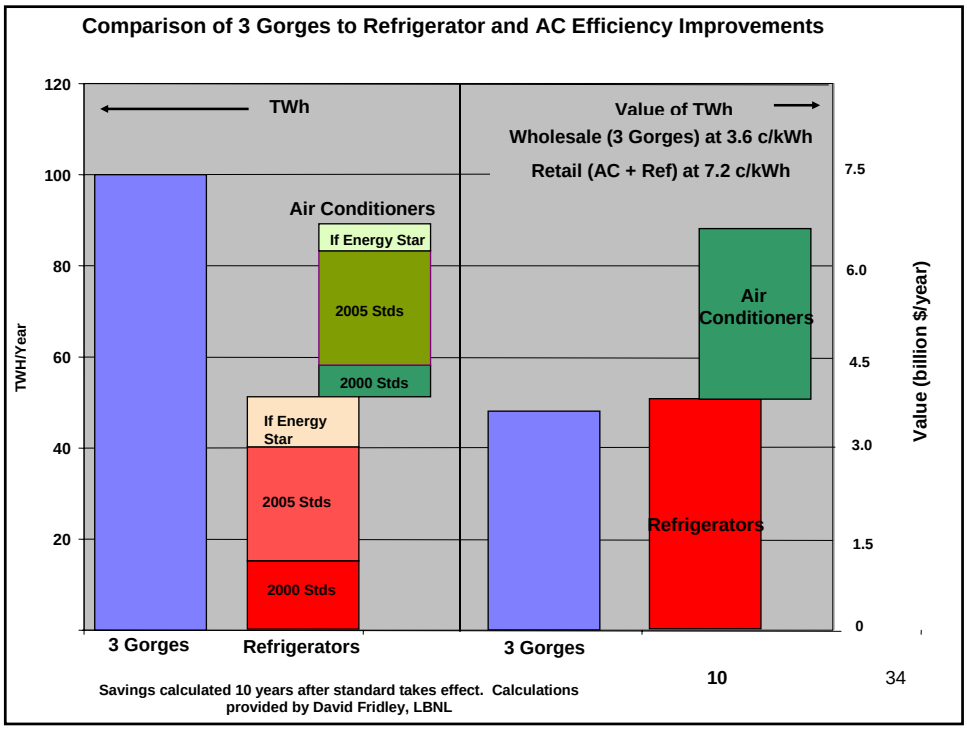
31


In the United States
Value of Energy to be Saved (at 8.5 cents/kWh, retail price) vs.
Several Sources of Supply in 2005 (at 3 cents/kWh, wholesale price)
Billion $ (US)/year in 2005
25
20
15
10
5
0
Energy Saved
Refrigerator Stds
100 Million 1 KW
PV systems
conventional hydro
renewables
nuclear energy

32



33



Savings calculated 10 years after standard takes effect. Calculations provided by David Fridley, LBNL

10

34

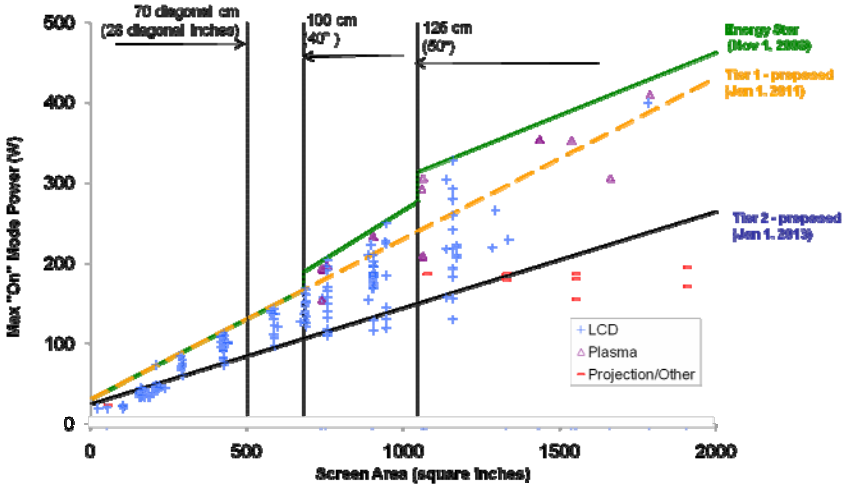
TV Power Trend

- Sales of conventional (CRT) televisions are rapidly declining in favor of flat screen technology (LCD) .
- TV load is now 5-10% of total residential electricity load and is growing ~ 3-4% per year.
- Standards will cap or reverse growth!

Power Consumption by TV vs Total Residential in CA

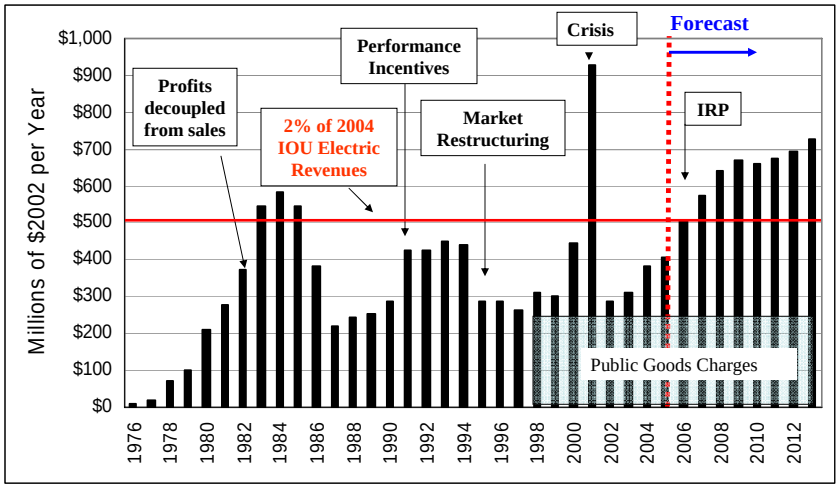
	Power Use (W) by Average Size TV	CA Energy Consumption Per Year in BkWh/year
CRT (Cathode Ray Tube)	101	4
LCD (Liquid Crystal Display)	144	3
Other	---	2
Total	245	9
Total Residential Power Consumption		90

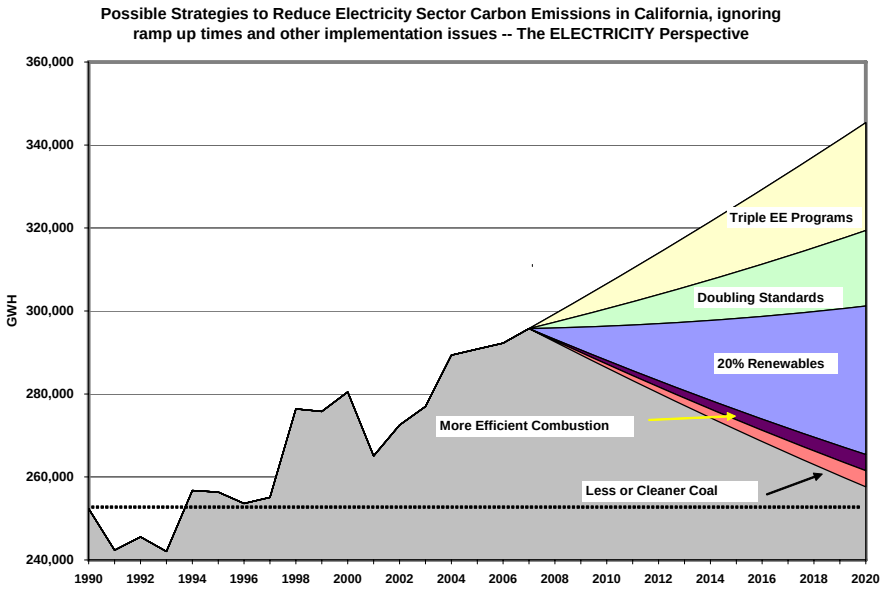
Proposed Standards and Energy Star Data



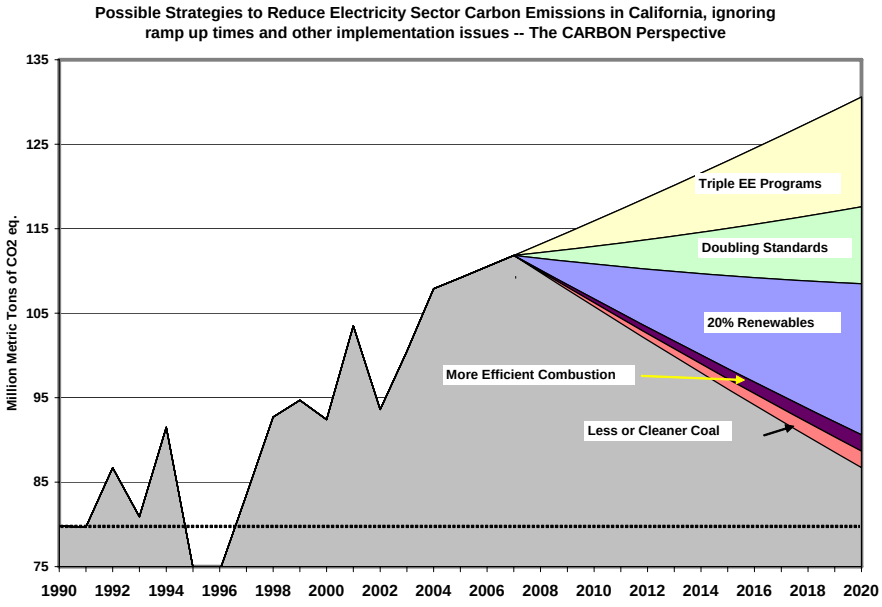
Incandescent Lamp Plot

California IOU's Investment in Energy Efficiency





Source: Pat McAuliffe



Source: Pat McAuliffe

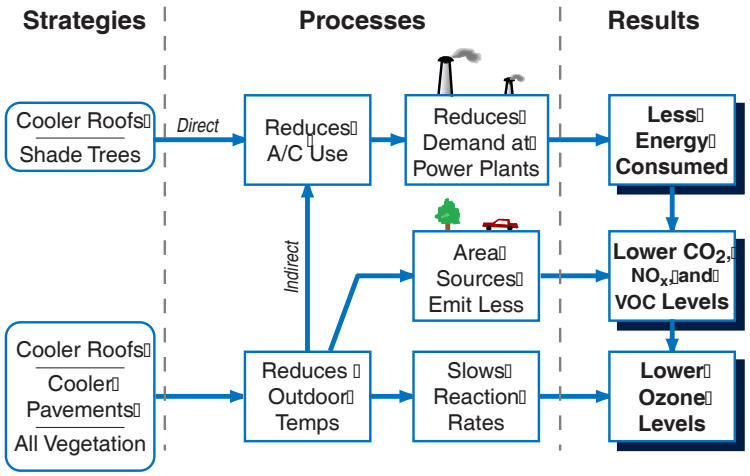
The End

For More Information:

http://www.energy.ca.gov/commissioners/rosenfeld_docs/index.html

or just Google "Art Rosenfeld"

Methodology: Energy and Air-Quality Analysis



Cool Roof Technologies

Old

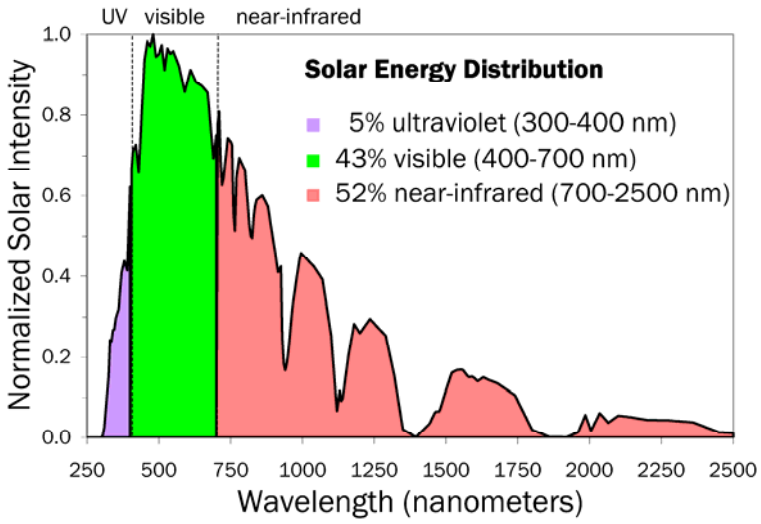
flat, white

pitched, white

New

pitched, cool & colored

Cool Colors Reflect Invisible Near-Infrared Sunlight



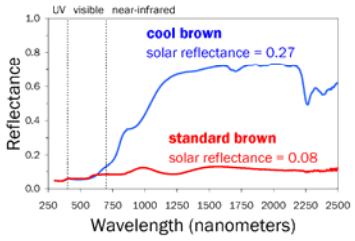
Cool and Standard Brown Metal Roofing Panels

- Solar reflectance ~ 0.2 higher
- Afternoon surface temperature ~ 10ºC lower

Courtesy BASF Coatings

solar reflectance = 0.27
thermal emittance = 0.85
roof temp – air temp = 36ºC (65ºF)

solar reflectance = 0.08
thermal emittance = 0.85
roof temp – air temp = 45ºC (81ºF)



CLIMATE CHANGE & LEGISLATION CHANGING THE ENERGY EFFICIENCY LANDSCAPE

Analyzing Climate Change Pressures & New Legislation Affecting Energy Efficiency Programs & Projects

---

Speakers:

Eric Heitz, *President*
THE ENERGY FOUNDATION

Steve Nadel, *Executive Director*
AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY

Eric Heitz

Eric Heitz is the President of the Energy Foundation. Mr. Heitz has been with the Foundation since its launch in 1991, first as a program officer, then Executive Vice President before taking on his current role as President in 2002. Before joining the Energy Foundation, from 1988 to 1990, Mr. Heitz was project manager for TEM Associates, a consulting firm specializing in domestic and international energy projects. Projects managed by Mr. Heitz included support to Egypt's New and Renewable Energy Authority to develop wind power in Egypt and a U.S. Agency for International Development project to encourage electrical generation from biomass in developing countries. From 1987 to 1988, Mr. Heitz worked on the conservation and load management programs for the City of Palo Alto Utilities, a municipal utility in Northern California. Prior to 1987, he sold and installed residential-scale solar systems in Colorado. Mr. Heitz has a B.S. in Energy and Environmental Planning and a MS degree in Civil Engineering, specializing in energy planning. Both degrees are from Stanford University.

EE Finance Forum

The Energy Foundation

April 24, 2009

16 ENERGY FOUNDATION PARTNERS

Foundations (8)

- **The ClimateWorksFoundation**
- **The William and Flora Hewlett Foundation**
- **The Sea Change Foundation**
- **The David and Lucile Packard Foundation**
- **The Doris Duke Charitable Foundation**
- **The McKnight Foundation**
- **The KresgeFoundation**
- **The Mertz Gilmore Foundation**

Individuals (8)

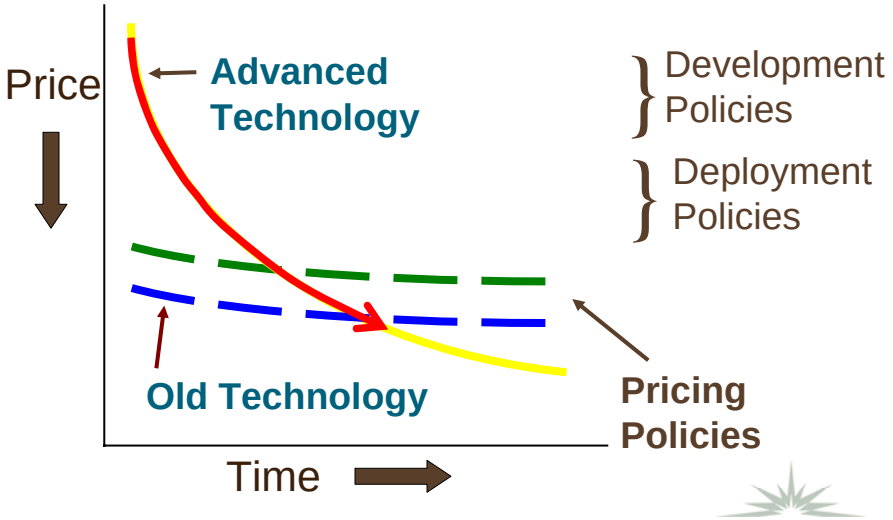
- **Wendy and Eric Schmidt**
- **Randi and Robert Fisher**
- **George and Cynthia Mitchell**
- **Elizabeth Simons and Mark Heising**
- **Noel Perry**
- **The Grousbeck Family Foundation**
- **The Kohlberg Family Foundation**
- **TOSA**

VISION

New energy technologies—especially energy efficiency and renewable energy—enable economic growth with enhanced energy security and less pollution.

3

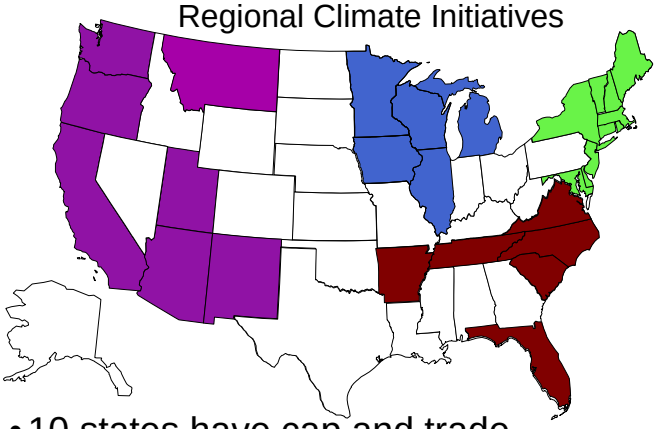
POLICY CATALYZES MARKETS



4

STATE POLICY DRIVES EFFICIENCY

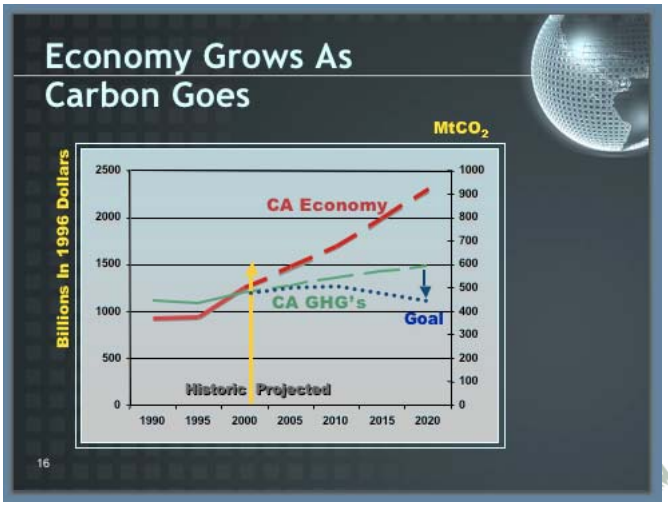
Regional Climate Initiatives



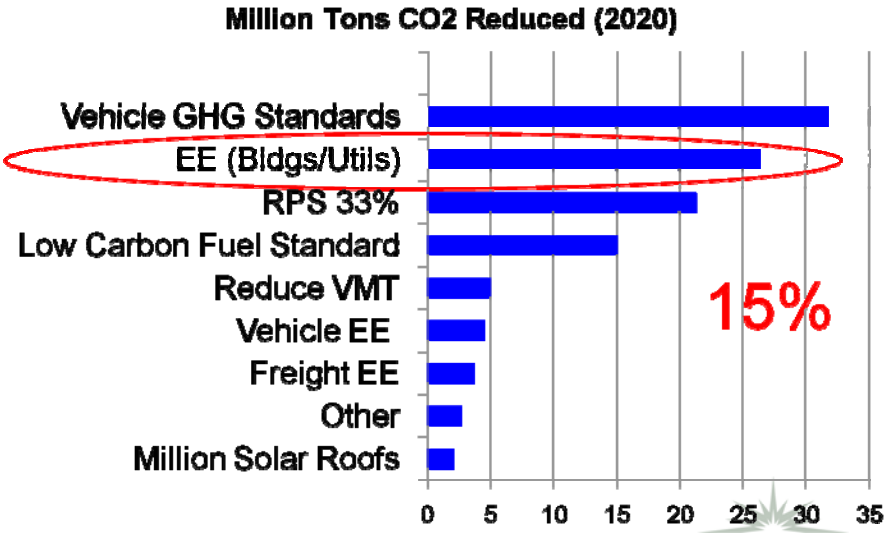
- 10 states have cap and trade
- 24 states working on cap-and-trade

AB 32: CALIFORNIA'S HISTORIC POLICY

First mandatory 2020 target in the world

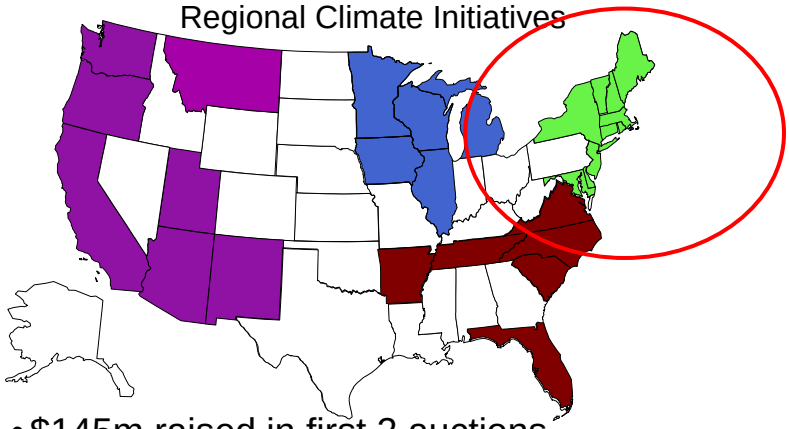


CA Climate Policy Drives EE Markets



7

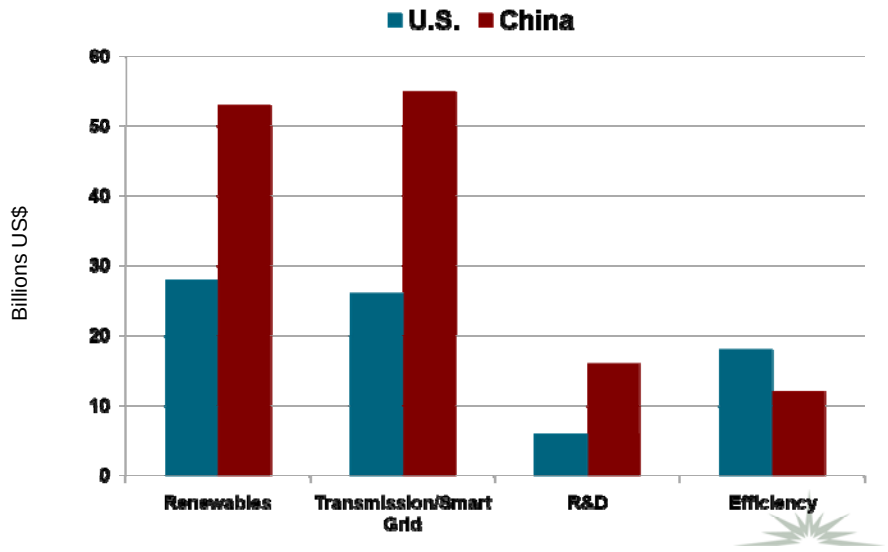
AUCTION $ FUND EE: RGGI



- $145m raised in first 2 auctions
- Could raise up to $400m in 2009
- Goes to EE, RE, low-income in RGGI states

8

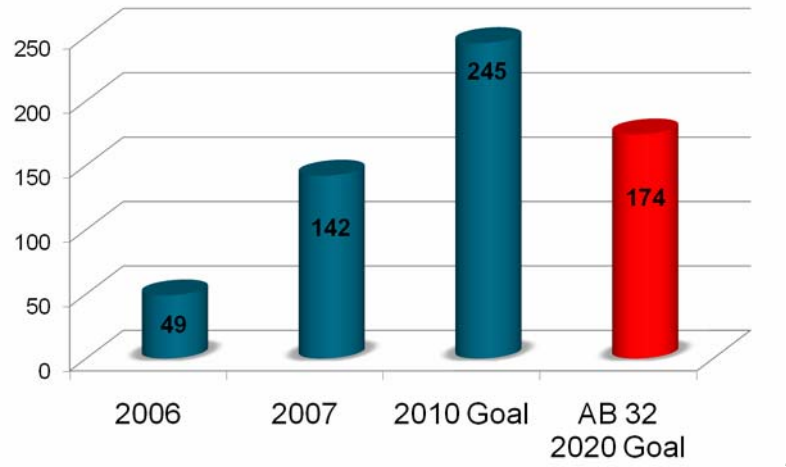
U.S. & CHINA STIMULUS PLAN



9

CHINA: TOP-1000 INDUSTRY EE PROGRAM

Annual CO_2 reductions (million tons)

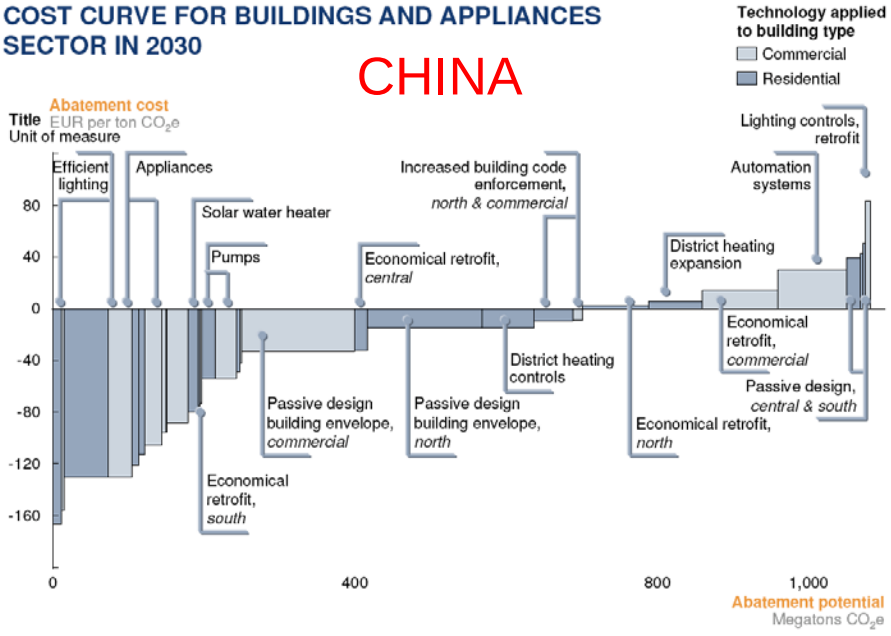


10

Exhibit 23

COST CURVE FOR BUILDINGS AND APPLIANCES SECTOR IN 2030

CHINA



Steven Nadel

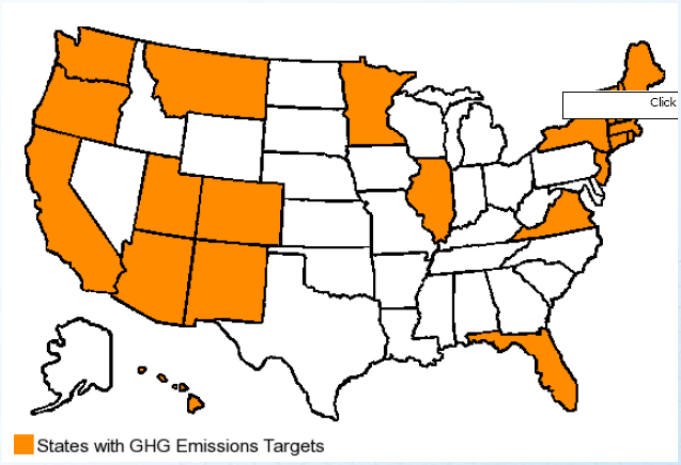
Steve Nadel is the Executive Director of the American Council for an Energy-Efficient Economy (ACEEE), a non-profit research organization that works on programs and policies to advance energy-efficient technologies and services. Steve has been at ACEEE for 20 years serving as Deputy Director of the organization and Director of ACEEE's Utilities and Buildings programs prior to his promotion to Executive Director in 2001. Prior to ACEEE he planned and evaluated energy efficiency programs for New England Electric, a major electric utility; directed energy programs for the Massachusetts Audubon Society, Massachusetts' largest environmental organization; and ran energy programs for the a community organization working on housing rehabilitation in the poorest neighborhoods of New Haven, CT. Steve has worked in the energy efficiency field for 30 years and has over 100 publications on energy-efficiency subjects. His current research interests include equipment efficiency standards, utility-sector energy efficiency programs and policies, and state and federal energy and climate change policy. He has a M.S. in Energy Management from the New York Institute of Technology, and a M.A. in Environmental Studies and B.A. in Government from Wesleyan University in Connecticut.

ACEEE
American Council for an Energy-Efficient Economy

Energy Efficiency and Climate Change Policy

Steven Nadel
ACEEE
April, 2009

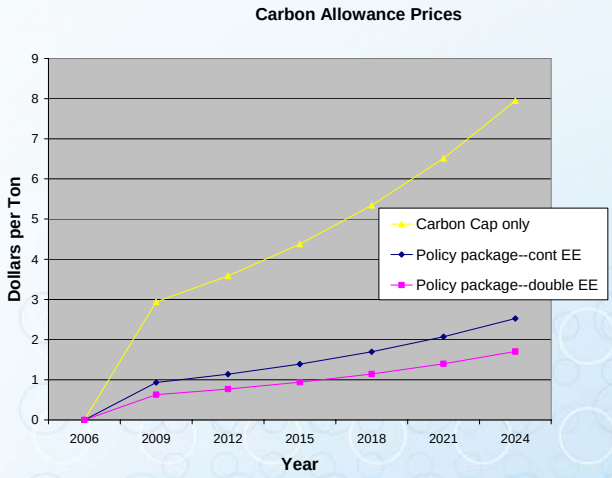
States With Greenhouse Gas Emissions Targets



Source: Pew Center for Global Climate Change, March 2009

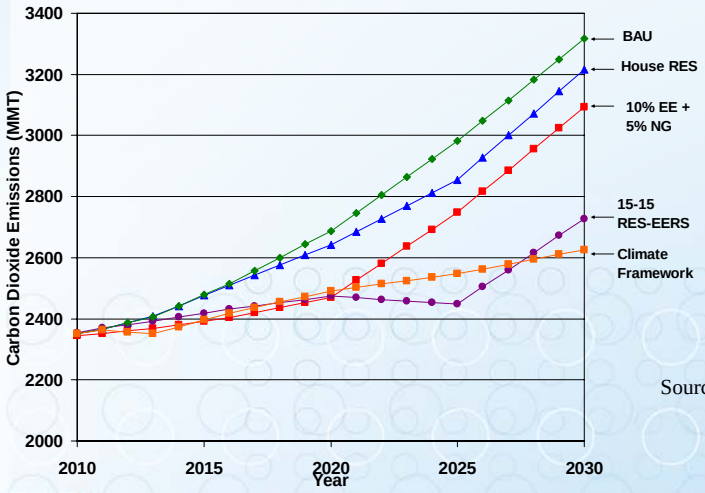
ACEEE
American Council for an Energy-Efficient Economy

Modeling Results from NE Regional Greenhouse Gas Initiative



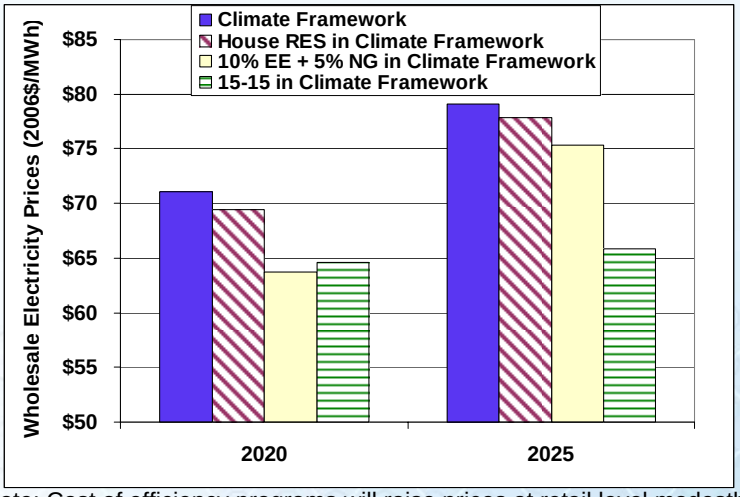
Source: ACEEE report, April 2006

CO2 Emissions in BAU and Clean Energy Scenarios



Source: ACEEE Dec. 2007 study.

National Wholesale Electricity Prices in Climate Framework and Clean Energy Scenarios

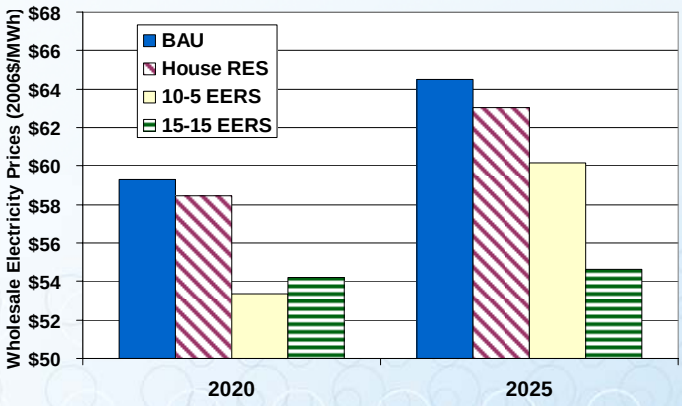


Note: Cost of efficiency programs will raise prices at retail level modestly.

ACEEE American Council for an Energy-Efficient Economy

Source: ACEEE Dec. 2007 EERS-RES study

Midwest Wholesale Electricity Prices in Business as Usual & Efficiency Scenarios



Source: ACEEE Dec. 2007 EERS-RES study

ACEEE American Council for an Energy-Efficient Economy

Carbon Taxes or Cap and Trade Alone Won't Spur Efficiency

Low elasticity of demand – doubling prices produces roughly 10% reduction in energy use (per EIA AEO 2008)

- Price elasticity effects of carbon prices are blunted by income elasticity & market barriers

Caps placed upstream lock out downstream emission reductions from trading markets

- The indirect-reduction/double-counting problem

ACEEE
American Council for an Energy-Efficient Economy

Promoting Efficiency in Climate Change Legislation

Within Cap & Trade

- Allowances to sell to fund efficiency programs
- Allowances awarded based on efficiency accomplishments
- Allowances based on policy adoption (e.g. building codes, decoupling)
- Etc.

Complementary Policies

- Federal EERS (with or without RES)
- Building code requirements
- New efficiency standards
- Transportation provisions
- Etc.

ACEEE
American Council for an Energy-Efficient Economy

Senate Energy Bill: Potential Efficiency Policy Provisions

Energy efficiency resource standards

Appliance and equipment standards

- New standards
- Refinements to decision-making

Manufacturing title

Job training – IAC, BAC

Improved building codes – 30%, 50% savings

Residential and commercial retrofits

Building labeling

ACEEE American Council for an Energy-Efficient Economy

Energy Efficiency Resource Standards

Analogous to a Renewable Portfolio Standard

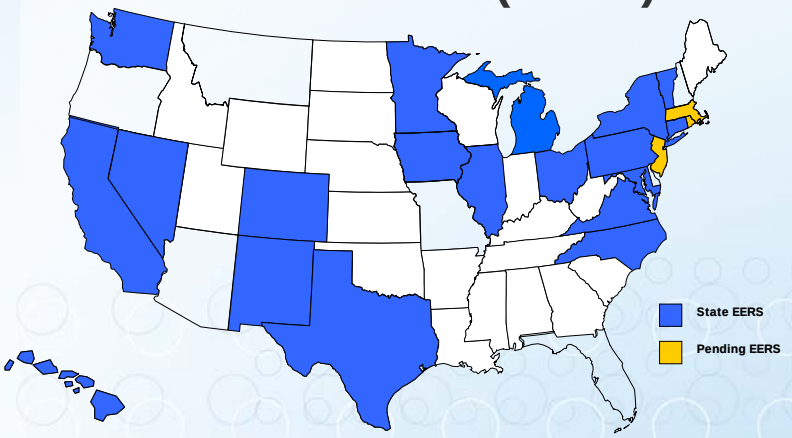
Electric and/or gas savings targets for utilities

- Includes end-use efficiency and sometimes combined heat & power (CHP) and codes/standards
- Targets generally start low and increase over time

Savings must be documented in accordance with evaluation rules established by regulators

ACEEE American Council for an Energy-Efficient Economy

States with Energy Efficiency Resource Standards (EERS)



These plus BAU EE will save ~5% nationally by 2020

ACEEE
American Council for an Energy-Efficient Economy

Federal EERS: Markey H.R. 889, Schumer S. 548, Waxman-Markey

- 15% electric, 10% gas savings by 2020
- Includes CHP, recycled energy, codes and standards
- Similar to Obama campaign platform
- DOE to establish M&V protocols
- States implement if “willing and able”
- States can set higher targets if they want
- 5 cents/kWh, 50 cents/therm buyout option – to states for EE programs

ACEEE
American Council for an Energy-Efficient Economy

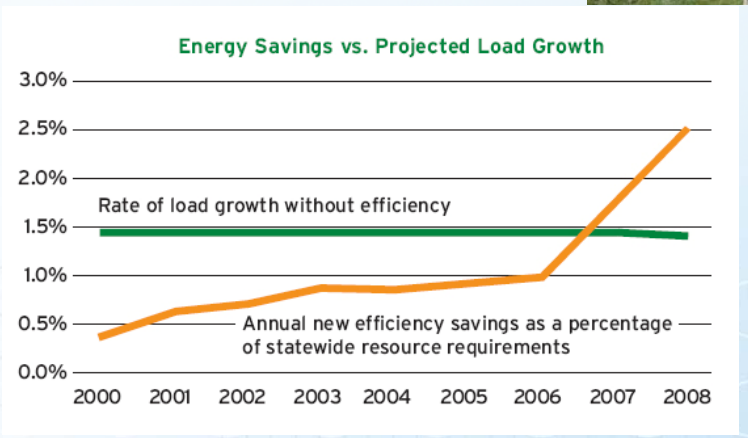
Impacts of a Federal EERS

(15% electric, 10% gas by 2020; savings over and above existing state EERS's; includes codes & standards)

- Peak demand savings of 117,000 MW (390 power plants, 300 MW each)
- CO2 emissions down 262 MMT in 2020 (equivalent to taking 48 million vehicles off the road for a year)
- 222,000 net jobs created
- Net savings of $169 billion (B/C ~3:1)

ACEEE
American Council for an Energy-Efficient Economy

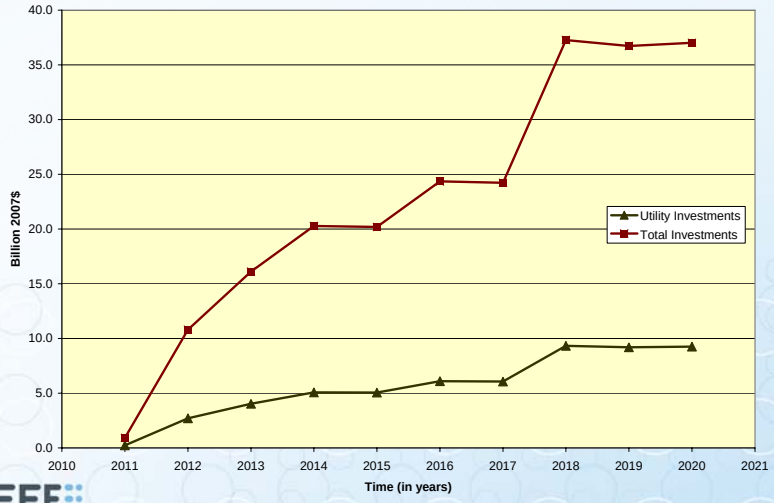
Vermont – Raising Efficiency to a New Level



ACEEE
American Council for an Energy-Efficient Economy

Source: Efficiency Vermont and VT Dept of Public Service

Utility and Total Investments for a National EERS

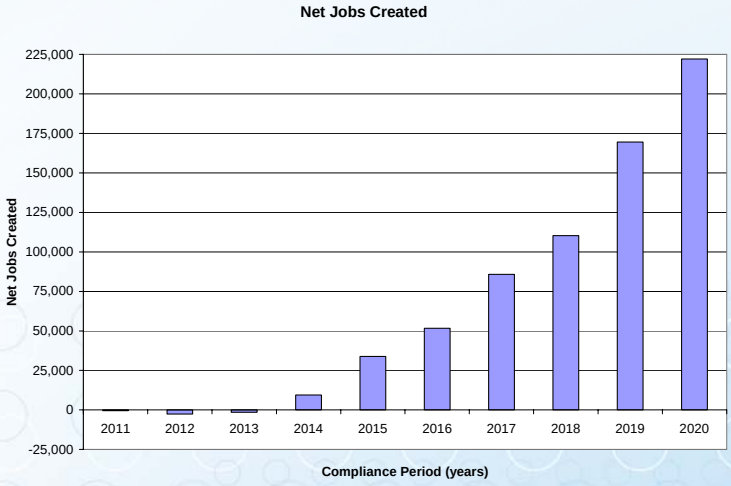


ACEEE American Council for an Energy-Efficient Economy

Source: ACEEE March 2009 EERS report

Efficiency Programs Generate Jobs

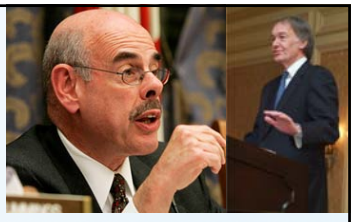
(Federal 15% electric, 10% gas EERS in 2020)



ACEEE American Council for an Energy-Efficient Economy

Source: ACEEE March 2009 EERS report

Waxman-Markey Bill



- Cap and trade – 83% GHG reduction relative to 2005 by 2050
- Contains EERS, codes, standards, buildings labeling and retrofits, transportation planning, emissions standards for vehicles
- Clean coal provision
- Payments to heavily impacted industries (Inslee-Doyle)
- Allocation of emissions allowances to be determined in a few weeks

ACEEE
American Council for an Energy-Efficient Economy

Dingell-Boucher (2008)

Allocations to:	Option A			Option B			
	2012-2013	2014-2016	2017-2025	2012-2013	2014-2016	2017-2020	2021-2025
Industrial Sector	0.5	14.75	14.75	0.5	26.75	26.75	26.75
Electricity Sector (LDCs)	44.25	38.0	38.0	44.25	21.0	14.0	7.0
Independent Coal Generators	4.75	4.0	4.0	4.75	2.0	1.5	0.75
Energy Efficiency Programs	13.5	10.5	9.5	12.75	12.75	12.5	12.0
Clean Technology Deployment	10.75	11.0	12.0	10.75	13.0	15.75	16.25
Early Action Recognition	3.0	2.0	2.0	3.0	2.0	2.0	2.0
Low-Income Consumers	10.0	10.0	10.0	10.0	10.75	11.5	11.0
Other Consumers						5.0	14.0
Deficit Reduction Fund	8.0	6.0	6.0	8.0	7.25	6.75	5.25
Green Jobs				1.0	1.0	1.0	1.0
Supplemental GHG Reductions	5.0	3.0	3.0	4.5	3.0	3.0	3.0
National Adaptation Program							
International Obligations							
Management Fund	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Allocations to:	Option C				Option D		
	2012-2013	2014-2016	2017-2020	2021-2025	2012-2013	2014-2016	2017-2025
Industrial Sector	0.5	22.5	18.5	16.5			
Electricity Sector (LDCs)	43.0	18.0	14.0	5.0			
Independent Coal Generators	4.75	1.75	1.25	0.5			
Energy Efficiency Programs	13.5	13.0	12.25	11.5	13.5	10.5	9.5
Clean Technology Deployment	10.75	13.25	15.25	16.25	10.75	11.0	12.0
Early Action Recognition	3.0	2.0	2.0	2.0	3.0	2.0	2.0
Low-Income Consumers	10.0	11.0	12.0	13.0	5.0	5.0	5.0
Other Consumers					45.0	50.0	50.0
Deficit Reduction Fund	8.0	8.75	9.25	11.0	17.75	17.5	17.5
Green Jobs	1.0	1.0	1.0	1.0			
Supplemental GHG Reductions	4.5	3.0	3.0	3.0	5.0	3.0	3.0
National Adaptation Program		3.0	7.0	12.5			
International Obligations		2.0	3.5	7.0			
Management Fund	0.5	0.5	0.5	0.5	0.5	0.5	0.5

ACEEE
American Council for an Energy-Efficient Economy

Boxer (2009)

Has suggested simple bill, leaving most of the details to agencies

But to get 60 votes in Senate need to:

- Assure rust belt and other Senators won't hurt local economies
- Return substantial revenues to tax payers

Now waiting to see how House debate progresses

ACEEE
American Council for an Energy-Efficient Economy

Prognosis

Leadership will make serious effort to enact climate legislation in 2009

But CC legislation is complex and needs time to gestate

More likely to have energy bill in 2009, climate bill in early 2010

ACEEE
American Council for an Energy-Efficient Economy

Contact Information

Steven Nadel
snadel@aceee.org
202-507-4000
www.aceee.org

ACEEE
American Council for an Energy-Efficient Economy

PROJECT FINANCE & COMMERCIAL BANK ROUNDTABLE
FINDING CAPITAL & SOURCING DEALS

Speakers:
Bruce Schlein, *Vice President, Corporate Sustainability Unit*
CITIGROUP

John Ravis, *Vice President*
TD BANKNORTH

Everett Smith III, *CFO*
NEW ENERGY CAPITAL

Bruce Schlein joined Citi in 2006 as Vice President of the Corporate Sustainability Unit after having worked as a sustainability specialist for Bechtel on oil and gas and civil projects in China and Romania. Previously, he worked for international development agencies including Save the Children, Catholic Relief Services in Bosnia Herzegovina, and the U.S. Peace Corps in Papua New Guinea. Bruce is a graduate of Cornell University and holds a Masters in International Affairs from Johns Hopkins Nitze School of Advanced International Studies.

TD Bank Project Finance

John G. Ravis
Vice President Project Finance

John Ravis is Vice President of Project Finance at TD Bank. For the past 12 years, TD Bank has been a leader in financing projects in the renewable energy and renewable fuels sectors as well as in related industries. Currently, TD Bank's portfolio includes investments in wind, geothermal, hydro, landfill gas, biomass, solar PV electric production, combined cycle natural gas, coal, and ethanol projects.

Mr. Ravis has over 18 years of experience in energy project finance and development as a lender, an adviser, an investor and as a developer. He joined TD Bank in 2005. Prior to joining TD Bank, he was a Vice President with a Boston-based investment bank advising clients developing and financing renewable energy projects. Previously, Mr. Ravis worked with ABB Energy Capital, where he managed a group financing projects in the renewable energy, power generation, and energy infrastructure sectors. Mr. Ravis has also worked in Project Finance at Raytheon Engineers and Constructors, Constellation Energy and ABB/Combustion Engineering.

Mr. Ravis received a BS in Engineering and an MBA, both from the University of Michigan.

John G. Ravis | TD Bank Project Finance

101 Post Road East **|** Westport, CT 06880
203.291.6637 [O] **|** 203.291.6652 [F] **|** 203.571.8289[C]

john.ravis@TDbanknorth.com

Everett Smith, CFO of New Energy Capital and Managing Partner of its successor organization NEC Energy Resources, joined NEC after serving for 15 years in a variety of senior executive positions at GE Capital, including Managing Director and Executive Vice President in the GE Structured Finance Group ("SFG"), the business unit responsible for GE's energy and infrastructure investment activities. Among his roles, Mr. Smith led business development for SFG with focus on asset and business acquisitions as well as the development of new business platforms and channels to market. Previously, he was head of SFG-International, with responsibility for the group's investment activities outside North America building a $1.5 billion financing and private equity portfolio with clients in the energy, infrastructure, transportation and telecommunications sectors. He was involved in the establishment of the $1.2 billion AIG-GE Capital Latin America Infrastructure Fund and was a member of the Fund's Investment Committee for 8 years during which time the Fund made numerous energy and infrastructure investments. Earlier, Mr. Smith was based in Singapore and responsible for SFG's Asian investment activities, closing multiple energy focused private equity investments including Indonesia's first independent power plant as well as investments in China, India and the Philippines. Mr. Smith joined GE Capital Services in 1989 with investment responsibility for U.S. utility and utility affiliated energy companies, providing debt and private equity capital for corporate and project finance transactions. During this time he co-developed and financed a number of cogeneration facilities including a development joint-venture with Pacific Gas & Electric and Bechtel which led to GE Capital's largest private equity investments in power at that time. Prior to joining GE Capital, Mr. Smith spent over a decade at Chemical Bank (now JP Morgan Chase) where he ultimately became a Vice President in Energy & Minerals Group focused on utility corporate and project finance and financings for the independent oil and gas industry. Following GE, Mr. Smith was a Partner at Coller Capital, a private equity secondary investment firm. He also previously served as a Venture Partner in the CleanTech Group at VantagePoint Venture Partners, NEC's parent company. Mr. Smith is a graduate of Vassar College (BA, Economics) and the University of Houston (MBA).

CONSUMER DRIVEN MARKET

End-User's Roundtable: What will the consumer be asking for from you?

Speakers:

Rich Lechner, *Vice President of Energy & Environment*
IBM

Martha Amram, *CEO*
HOME Z INC.

Tory Weber, *Energy Efficiency Regulatory Manager*
SOUTHERN CALIFORNIA EDISON COMPANY

Rich Lechner BIO:

Rich Lechner was named vice president, Energy & Environment in September 2008. In this role, he leads IBM's efforts in helping clients address the issues and opportunities around energy, the environment, and sustainability. He is responsible for defining strategy and managing the broad portfolio of capabilities and offerings that leverage IBM's technology innovation, deep industry insight, and business process strategy.

Mr. Lechner has a strong track record for driving key cross IBM initiatives that deliver value to clients of all sizes including virtualization, Project Big Green, and IBM's New Enterprise Data Center Strategy. Previously, he was vice president for Enterprise Systems addressing IBM's large enterprise customer base and market opportunity by bringing to market a unified set of systems, software and services designed to optimize large-scale IT infrastructures. He has held a number of other senior leadership positions at IBM across the hardware, software, and services organizations including: IT Optimization, Storage Systems, Mainframes, Software Strategy, and Systems Management. Mr. Lechner spent ten years as a programmer for IBM and began his career as a micro-code programmer in the Financial Services Industry.

Martha Amram is the CEO of HomeZ Inc., which provides homeowners with advice and services for saving energy and water.

Amram has had a varied career in business and academia. She is an experienced consultant, speaker and author. As a consultant, she has worked with Fortune 500 companies and startups on the value of R&D projects, managing the R&D pipeline, valuation of joint ventures and more. Amram has worked in wide range of industries, including semiconductors, pharmaceuticals, consumer goods and oil exploration. The co-author of /Real Options /(Harvard Business School Press, 1999) and /Value Sweep/ (Harvard Business School Press, 2003), she is a frequent speaker on valuation and growth strategy.

Recent startup experience includes serving as the interim CEO of Vocomo Software and as the chief economist of PLX Systems (where her algorithms for valuing intellectual property were written into the company’s software product.) Amram co-founded Glaze Creek Partners, a consulting firm, which she sold to Navigant Corporation in 1999. At Navigant, she led the real options practice area. Amram has also prepared expert testimony on valuation and risk while a vice president at Analysis Group Inc. and was an assistant professor at Boston University.

Amram is a graduate of the University of Washington in mathematics and economics and holds a Ph.D. from MIT in Applied Economics.

TORY S. WEBER
Manager of Business Performance
Energy Efficiency Division
Southern California Edison Company

Summary

Tory Weber is the Manager of Business Performance in Southern California Edison's Energy Efficiency Division. In this capacity, Tory guides SCE's reporting, policy, and other aspects of SCE's $200+ million portfolio of Energy Efficiency, Low Income Energy Efficiency, and Rate Assistance programs. He has worked in support of SCE's energy efficiency programs for 16 years. Tory holds Bachelor of Arts degrees in Business Administration and Economics and a Master of Business Administration degree from the Anderson School at UCLA.

Overview

During his tenure at Southern California Edison, Tory has worked in the Customer Service, Power Contracts, and Energy Efficiency divisions.

In the energy efficiency division, he has worked on all matters related to energy efficiency policy, including energy efficiency shareholder incentives, measurement and evaluation, cost effectiveness, and energy efficiency potential, among others. He serves as a subject-matter expert on energy efficiency policy and programs both within the company as well as in forums around the nation.

Southern California Edison is an investor-owned electric utility and a subsidiary of Edison International. SCE is one of the nation's largest investor-owned utilities and serves over 13 million California residents in a 50,000 square-mile area of central, coastal and Southern California. SCE has approximately 15,000 employees.

BEHIND THE SCENES!

Financing From & For State, Local & ESCO Utilities

Speakers:

Johanna Zetterberg, *Energy Specialist-Market Transformation*
DEPARTMENT OF ENERGY

Mark Siegal, *Manager*
NATIONAL GRID

Lee Cooper, *Manager Energy Efficiency Emerging Technologies*
PACIFIC GAS & ELECTRIC COMPANY

Johanna Zetterberg is a Presidential Management Fellow in the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE). Within EERE, she is on the State and Local Team in the Office of Weatherization and Intergovernmental Programs, which received $11.3 billion in Recovery Act Funds for the Weatherization Assistance Program, the State Energy Program, and the new Energy Efficiency and Conservation Block Grant Program.

Johanna holds a Master of Environmental Management from the Yale School of Forestry and Environmental Studies. She has previous experience at the California Public Utilities Commission, the Rockefeller Brothers Fund, and the Sierra Club Angeles Chapter.

U.S. Department of Energy
Energy Efficiency and Renewable Energy

Scaling Up for Market Transformation

ACEEE 2009 ENERGY EFFICIENCY FINANCE FORUM
San Francisco April 23-24, 2009

Johanna Zetterberg, State and Local Team
Office of Weatherization and Intergovernmental Programs

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

Current Environment

- Drivers from the White House
  - Make the U.S. a leader on climate change
  - Deploy the cheapest, cleanest, fastest energy source – energy efficiency
  - Pick up the fruit on the ground
- Need
  - Deep market penetration
  - Comprehensive, deep retrofits in each home/building
- Focus
  - Built environment – homes/buildings use 71% electricity in U.S.

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

Market Transformation

- Lasting structural and behavioral changes in the marketplace (Consortium for Energy Efficiency)
- Continuous intervention in the market becomes unnecessary (Blumstein et al. 2000)
- 3-Part Solution:
  1. Financing models
     - Emphasize strategies that stretch amortization periods, buy down risk, and attach value to property, not owner
  2. Comprehensive programs
     - Triggers and incentives that bring more participants in
  3. Policy drivers at Federal-state-local levels
     - Need a seamless policy framework that builds on jurisdiction's strengths and responsibilities

3

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

Deeper Savings - Financing Models

- Obstacles
  - First cost barrier
  - Owner discounting future value of energy and $ savings
  - Expensive to borrow money
- Strategies
  - Amortize loan over longer period
    - Property tax assessments
    - On-bill financing – utilities or municipalities
    - EE Mortgage products
  - Access to low or no cost money
    - Buy down interest rate
    - Reduce administrative and transaction costs through aggregation
    - Risk reduction – secure/guarantee loans

4

More Participants – Comprehensive Programs

- Obstacles
  - Voluntary participation – restricted to "Early Adopters" 12-20%
  - High transaction costs
- Strategies
  - Permit or loan triggers audits and improvements
    - Time-of-Sale
    - Renovation permits
    - Property tax assessments
  - Aggregation
    - ESCOs
    - Forward Capacity Markets (ex: ISO New England)
    - Turn key efficiency services from big box/retailers – including financing
  - Expand existing programs
    - Weatherization, HPwES, community development

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

State and Local Examples

- State/Regional
  - RGGI
  - Public benefit funds
  - ISO New England Forward Capacity Markets
  - Oregon Trust and Efficiency Vermont
  - Pennsylvania Home Energy Loan Program Great Bear Bank/AFC First
  - California AB 811, AB 32, CPUC loading order
- Local (Clean Energy Municipal Financing)
  - Berkeley FIRST (CA)
  - San Francisco Clean Energy Loan Program (CA)
  - Palm Desert Independence Loan Program (CA)
  - Montgomery County HELP – Home Energy Loan Program (MD)
  - Boulder ClimateSmart Loan Program (CO)
  - Annapolis EZ (Energy Zone) Loan Program (MD)

Federal Level – National Scope

- Policy framework
  - EE portfolio standard
  - Carbon cap
  - Align utility rules to allow non-utility aggregators of EE to compete as power providers
- Sources of capital
  - Carbon cap (Markey/Waxman Clean Energy and Security Act)
  - National green bank (bonds) (Van Hollen bill)
  - National revolving loan fund (Van Hollen bill)
  - Loan guarantees
  - Recovery Act funds

7

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

Recovery Act as Catalyst

- EERE - $16.8 billion
  - 10-Fold Increase in Budget
- OWIP - $11.6 B
  - Steward of 70% of EERE Recovery Act Funds
  - Significant investment in State and Local Govt's
    - Weatherization Assistance $ 5.0 B
    - State Energy Program $ 3.1 B
    - EECBG Program Formula $ 2.8 B
    - EECBG Program Competitive $ 400 M
    - Appliance Rebate Program $ 300 M

8

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

Recovery Act as Catalyst

- Flexible money; grantees decide how to use
- State Energy Program ($3.1B)
  - Funds state energy priorities
- Energy Efficiency and Conservation Block Grant Program ($3.2B)
  - New program; over direct 2,300 grant recipients
  - To assist state, local, and tribal governments in implementing strategies to:
    1. reduce fossil fuel emissions;
    2. reduce total energy use;
    3. improve energy efficiency in the transportation, building, and other appropriate sectors.

9

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

EECBG Program – Eligible Activities

- Primarily for energy efficiency and energy conservation
- Community-wide; not just municipal buildings and facilities
- Don't have to do capital *projects,* can do *programs*
- Prioritize activities that pay dividends year after year

1. Strategy Development
2. Building Energy Audits & Retrofits
3. Financial Incentive Programs
4. Energy Efficiency and Conservation Programs for Buildings and Facilities
5. Development and Implementation of Transportation Programs
6. Building Codes and Enforcement
7. Energy Distribution Technologies for EE including CHP & district heating and cooling
8. Material Conservation Programs including source reduction, recycling, and recycled content procurement programs
9. Reduction and Capture of Methane and Greenhouse Gases
10. Traffic Signals and Street Lighting
11. Renewable Energy Technologies on Government Buildings
12. Any Other Appropriate Activity

10

Recovery Act as Catalyst

- DOE is promoting:
  - Prioritize EE as cheapest, cleanest, fastest to deploy
  - Benefits beyond 3-year grant period
  - Dividends in energy and dollars saved for multiple payback periods
  - Leverage funds with public and private sources
  - Coordinate across and between levels of government
  - Policies that transform markets and increase investments
  - Comprehensive and strategic planning
  - Invest funds for economic stimulus effect now ***and*** to meet long-term energy goals

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

How to Synthesize?

- Many parallel efforts at Federal, state and local level
- How to work together, integrate, and make programs complementary?
- Build on strengths and responsibilities of each jurisdiction

Thank You

Johanna Zetterberg
State and Local Team
Office of Weatherization and Intergovernmental Programs
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
(202) 586-8778
Johanna.Zetterberg@ee.doe.gov
http://www.eere.energy/gov/wip
http://www.energy.gov/recovery

MARK SIEGAL NATIONAL GRID BIO

Mark Siegal is the Manager of Implementation for the Energy Efficiency Program at National Grid. Mark is responsible for the Small Business and Large Business Programs both of which utilize On-Bill Financing. Mark has been with National Grid for approximately fifteen years.

On bill financing – one utility's experience

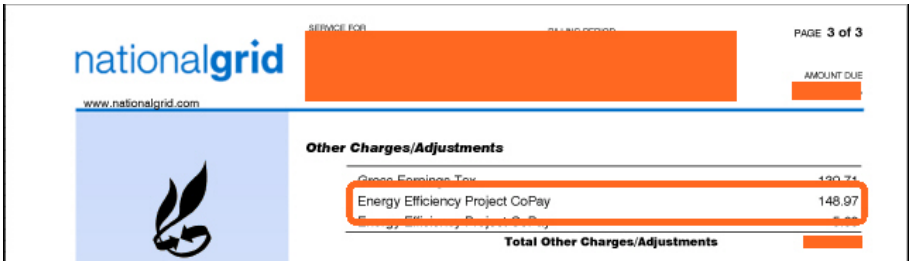
nationalgrid
The power of action:

About National Grid and Energy Efficiency

- **UK based company that has purchased six electric and gas utilities in the Northeast over last ten years – NY, MA, RI & NH**
- **Focused on energy delivery business with approximately 4.4 million electric customers and 3.4 million gas customers**
- **Has delivered electric and gas efficiency programs since 1987 and 1997 respectively with no interruptions, saving customers over $250 million annually at an average cost per kwh saved of 3.4 cents**
- **Invested more than $1.5 billion in energy efficiency over the last 20 years with budgets expected to more than double in the next 3 to 5 years and expand to include a portfolio of programs for our upstate New York customers**

nationalgrid
The power of action:

Customer Perspective of On Bill Financing


nationalgrid

www.nationalgrid.com

PAGE 3 of 3

AMOUNT DUE

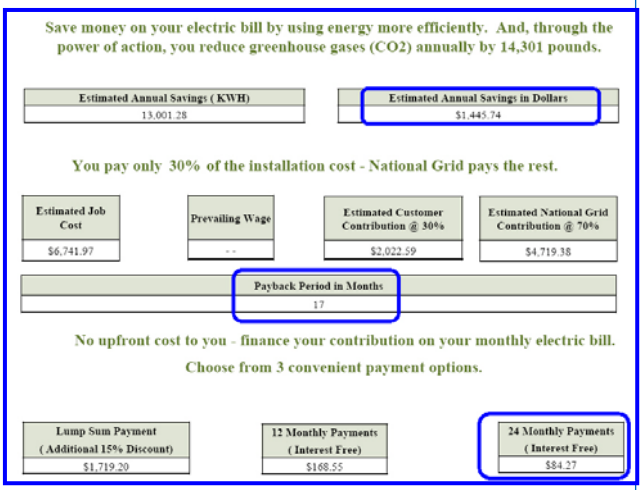
Other Charges/Adjustments

Energy Efficiency Project CoPay	148.97
Total Other Charges/Adjustments	

nationalgrid
The power of action:

Small Business Program

- **Available for 20 years to small business customers**
- **Financed $2.2 million at zero interest last year**
- **Source of funds is systems benefit charge dollars**
- **Vendors "it sells the program", improving close rate by 25% to 50%**
- **Sixty percent of customers representing 45% of dollars opted for 1-time quick pay.**


Save money on your electric bill by using energy more efficiently. And, through the power of action, you reduce greenhouse gases (CO_2) annually by 14,301 pounds.

Estimated Annual Savings (KWH)	Estimated Annual Savings in Dollars
13,001.28	$1,445.74

You pay only 30% of the installation cost - National Grid pays the rest.

Estimated Job Cost	Prevailing Wage	Estimated Customer Contribution @ 30%	Estimated National Grid Contribution @ 70%
$6,741.97	- -	$2,022.59	$4,719.38

Payback Period in Months
17

No upfront cost to you - finance your contribution on your monthly electric bill.

Choose from 3 convenient payment options.

Lump Sum Payment (Additional 15% Discount)	12 Monthly Payments (Interest Free)	24 Monthly Payments (Interest Free)
$1,719.20	$168.55	$84.27

nationalgrid
The power of action:

Looking forward over the few years...

- **In a number of states, program administrators are tasked with capturing as much cost effective energy savings as possible, resulting in significantly increased program savings' goals. On bill financing is clearly one tool to help achieve these goals.**
- **Resolution of on bill financing features such as funding sources, assignment of obligation, creditworthiness tests, and disconnect for nonpayment have significant impacts on implementation.**
- **Consistent, state-wide, operating procedures and standards will assist in implementing these new models.**

nationalgrid
The power of action:

Thank you.

Mark Siegal

Manager of Energy Efficiency

National Grid

Mark.Siegal@us.ngrid.com

nationalgrid
The power of action.

Lee C. Cooper
Manager, Emerging Technologies

Lee Cooper is Manager of the Emerging Technologies (ET) team at Pacific Gas and Electric Company (PG&E). Lee leads a team of energy efficiency ET project and portfolio managers, and represents PG&E on the Emerging Technologies Coordinating Council.

Prior to joining PG&E, Lee worked at SAP, Oracle, MITRE Corporation, and Raytheon Company in a variety of management and technical roles. Lee holds a B.S. in Electrical Engineering from Cornell University and an M.S. in Electrical and Computer Engineering from Northeastern University.

Utilities &

Energy Efficiency Financing

Lee Cooper
Manager, Energy Efficiency Emerging Technologies

Pacific Gas and Electric Company™

PG&E Service Area

- 70,000 square miles
- 15 million people
  - about 1 in every 20 Americans
- 6 million customers
  - 87% residential
  - 13% non-residential
- 139,000+ circuit miles of electric lines
- 45,800+ miles of natural gas pipeline
- Summer Peak (2007): 20,258 MW
- 2007 Electricity Sales: 86,313 GWH

Pacific Gas and Electric Company

1

Utility Financing

- Different motivations
  - From enabling energy efficiency to new service opportunity
- Benefits
  - Addresses first cost barrier
  - Association with service
- Variables
  - Customer segment, measure, source, interest, terms

PG&E Financing Over 30 Years

- 5 different (off-bill) financing programs for residential and small business customers
- Lessons Learned from past programs
  - Program selection and design need careful consideration to minimize risk
  - Utilities need to be careful when assuming risks
  - A successful financing program involves a compromise in risk versus the availability of the program to customers

Off-bill vs. On-bill Financing

	Off-bill	On-bill
Ease of implementation	*simpler*	*complex*
Transactional costs	*higher*	*lower*
Number of bills	*2*	*1*
Value connection	*weaker*	*stronger*
Default rate	*higher*	*lower*

Pacific Gas and Electric Company

4

Our benchmarking on utility financing

- Benchmarked 21 of 35 utilities in North America with programs
- Default rates: <1% (66%); remainder 1-3% with one utility at 5%
- Generally speaking, ratepayer-funded programs are designed to support energy efficiency, while shareholder-funded programs tend to be designed to bring in revenue or retain customers (while covering costs)
- Common attributes among the successful programs
  - 64% of programs had “low” interest rates of 0-3%
  - 71% used ratepayer/shareholder money for the loans
  - 79% used a combination of financing and energy efficiency rebates
  - 71% of the programs used on-bill loan repayment

Pacific Gas and Electric Company

5

Attributes from disbanded programs

- Source of loan funding:
  - 75% of programs used 3rd party
  - 25% used shareholder funding
- 100% provided finance only, without rebates
- 75% were Off-bill
- All charged comparatively “high” interest rates
  - 50% of programs = 13%-15%
  - 50% of programs = 6%-8%

Pacific Gas and Electric Company

6

Early results from current financing programs in California

- Low default rates
- Slow adoption rates for all programs – financing energy efficiency is a lengthy sales process
- Market research is crucial to ensuring that your customers want and will adopt the product you want to provide

Pacific Gas and Electric Company

7

Looking forward

- Utility program designers
  - Start slow to build competence in billing, collections, measures offered to build a cost-effective program
- Financial institutions
  - Design for win/win
- Customers
  - Take advantage
  - Understand utility goals

Questions?

NEW TECHNOLOGY & OPPORTUNITIES IN ENERGY EFFICIENCY

Surveying the Technology Landscape:
Market Ready Technologies That Attracted Financing & Produced a Success

---

Presenters:

Sandeep Kumar, *President & CEO*
MICROSTAQ

Michael Cavallo *Domain Director, Lighting*
CLINTON CLIMATE INITIATIVE

Kevin Dowling, *Vice President*
PHILIPS

Michael Messenger, *Senior Consultant*
ITRON

SANDEEP KUMAR | CEO

Mr. Kumar is a semiconductor industry veteran. In his 20+ year career, he has started and led several companies: Ambrado (integrated multimedia solutions for HDTV & IPTV markets), Anthron (robotic software for entertainment and service robots), and Adimos (wireless multimedia connectivity solutions). His considerable experience spans the areas of: leading R& D teams, successfully commercializing emerging technologies, developing new businesses, M&A, forging strategic partnerships, and private equity investments. At TI, his 15-year tenure included responsibilities as GM (Cable Broadband Communications), Business Development Manager (DSP Group), WW Development Manager (Microcontroller Group). He was a Venture Partner at Crimson and Executive Advisor to Jerusalem Venture Partners.

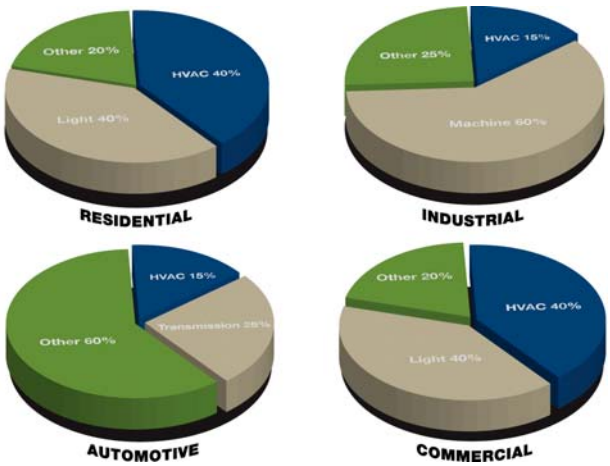
microstaq
Innovations that flow

Breakthrough in MEMS – leveraging semiconductor technology to solve practical Energy Efficiency issues

Microstaq® has changed all the rules.

microstaq
Innovations that flow

Major Energy Consumers



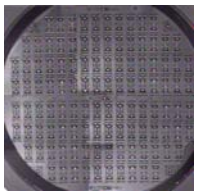
Critical Question…..

What if energy usage could be reduced by 10-30 percent for the world's largest 'consumers' of energy (electrical or fuel)?

- AND -

What if these dramatic savings could be achieved by applying current semiconductor technology to a widely used – **but overlooked** – component in HVAC, Refrigeration, Automotive, Industrial and Process Control Systems?

MEM's – an overview



Micro Electro-Mechanical Systems (MEMS):
- created by silicon processing industry
- differ from integrated circuits because they incorporate miniature mechanical devices

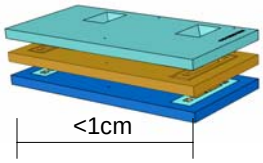
Everyday uses include:
- accelerometers which trigger automotive air bags
- microfluidic mixers and pumps used in the medical fields for drug delivery
- air pressure sensors for tires
- gyroscopes for notebook computer, gaming and automotive applications

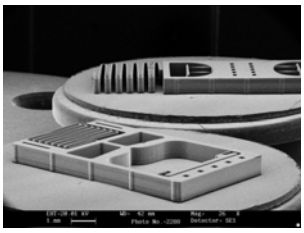
Limitations of today's MEM's solutions:
- flow control for liquids or gases… micro-liters/minute today (which limits majority of the practical applications)

Microstaq Changes the rules…

Breakthrough:

- Stacking multiple etched substrates together to provide extra dimension





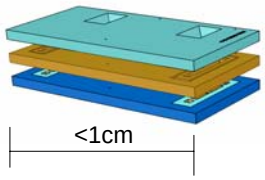
Results:

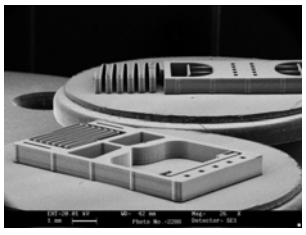
- Flow control increases from micro-liters/minute to 100s of liters/minute
- Capable of supporting High or Low Flow AND High Pressure
- Immediate energy efficiency benefits (power savings)

Silicon Control Valve (SCV)

Powerful Fluid Control Microtechnology

- Three-Layer Bonded Silicon
- Electro-Thermal Actuation
- High or Low Flow Capability
- High Pressure Capability
- Quick Response Time
- Fine Control Resolution
- IC Type Packaging





Standard MEMS Processes

- DRIE, KOH Etch, Photolithography
- Multi-Wafer Bond

Silicon Control Valve (SCV)

The Microstaq SCV can be operated digitally or proportionally to bring a new level of control accuracy to system engineers – applicable across a wide range of media, flow rates and pressure ranges.

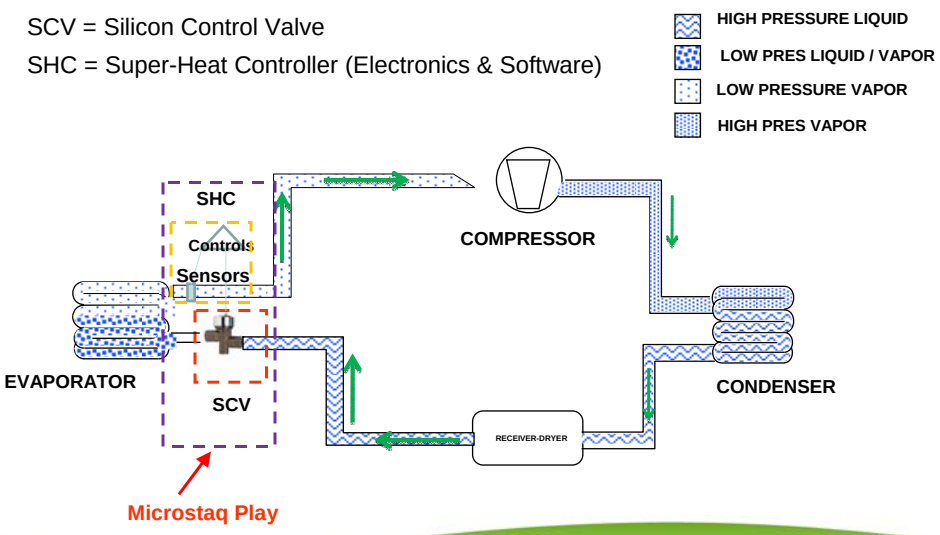
Microstaq's versatile SCV can be used in a wide range of control systems, a brief sampling includes:

- HVAC & Refrigeration
- Automated assembly systems (pneumatic)
- Automated machining centers (hydraulic/pneumatic)
- Semiconductor process equipment
- Pick and place machines
- Food and beverage processing
- Air and hydraulic cylinder control

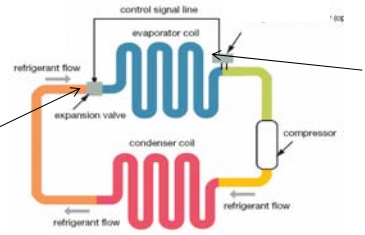
HVAC & Refrigeration

SCV = Silicon Control Valve

SHC = Super-Heat Controller (Electronics & Software)

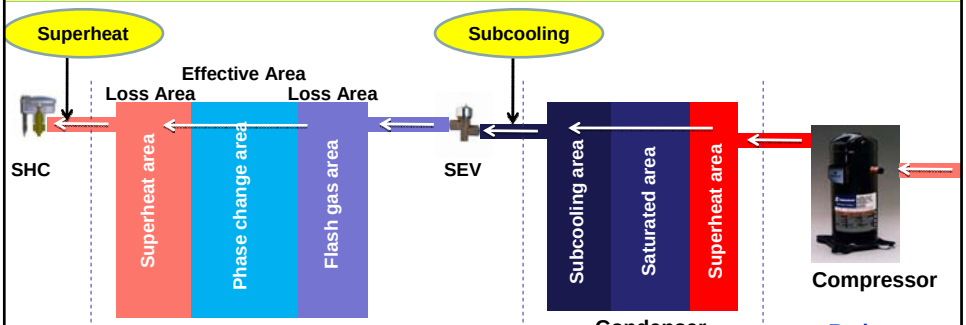


Microstaq Product in HVAC/R



SHC measures temperature and pressure at the exit of the evaporator coil, calculates refrigerant superheat, and transmits the appropriate command to the SCV

Efficiency Gains in HVAC/R



Increase Coil Efficiency
Low Superheat
5-10% gains

Increase Coil Efficiency
Low Subcooling
3-5% gains

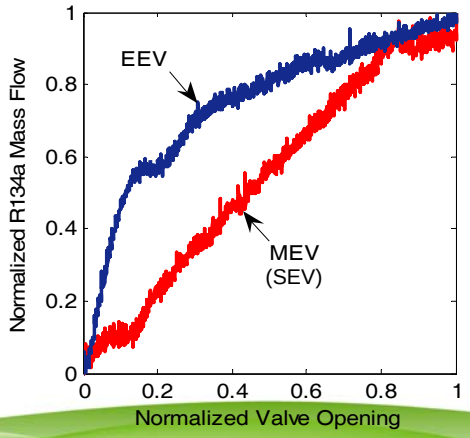
Reduce Compressor Power
Optimized flow, Low return gas temp. Higher suction press. Low discharge press.
10-20% gains

Total Gains: 5-30%

Independent Validation

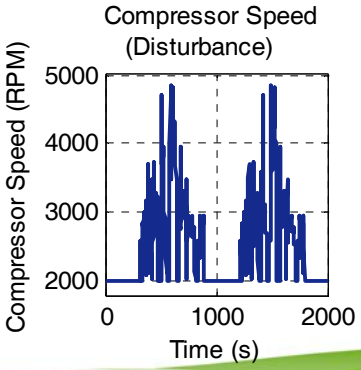
Below are the results of a study by Dr. Bryan Rasmussen at Texas A&M University comparing the response characteristics of the Microstaq SEV and a traditional Electronic Expansion Valve (EEV/EXV)

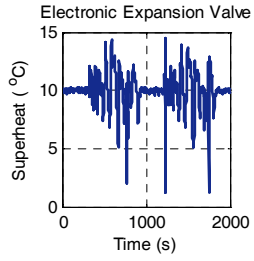
"The Microstaq valve has a more linear response than the EEV. Additionally, the EEV has a more significant delay time. Both of these make the Microstaq valve superior for control applications."

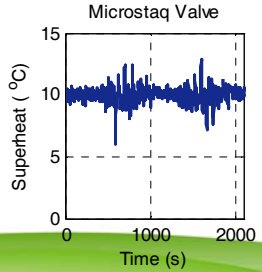


Independent Validation

In another study by Dr. Rasmussen, a severe set of compressor speed changes was used to test disturbance rejection. The SEV performed significantly better than a traditional EEV/EXV.

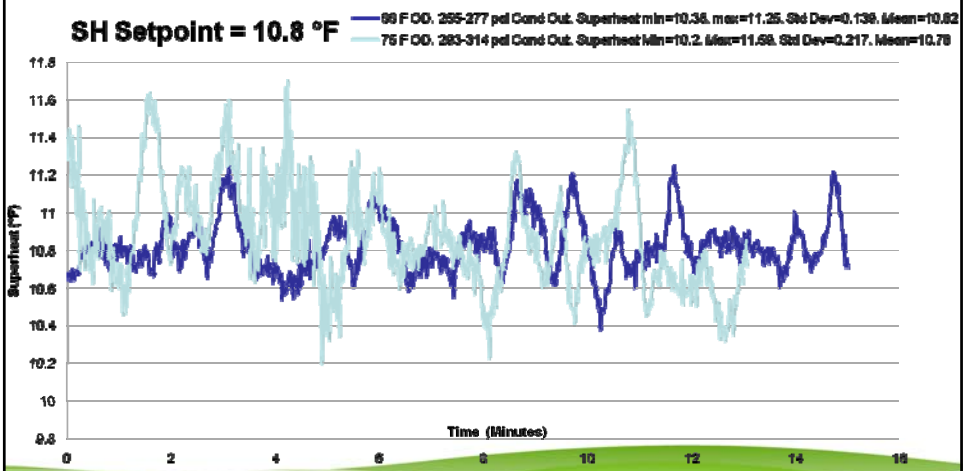




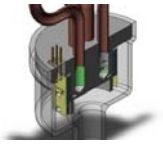


Unprecedented Superheat Control

The graph below shows the superheat control capability of the SEV (with the Microstaq Superheat Controller) over different outdoor ambient conditions.



Full Range of System Coverage

RESIDENTIAL & REF. PROGRAM		MULTI-CIRCUIT PROGRAM	COMMERCIAL PROGRAM	
				
Ton Range	**0.25 - 1.5**	**1.5 - 6.0**	**0.75/Circuit**	**6.0 – 10.0**	**10.0-15.0**
Segment	**Residential AC & Heat Pump Commercial Refrigeration**		**Residential AC & Heat pump**	**Light Commercial AC Commercial Refrigeration**	**Large Commercial AC Commercial Refrigeration**

Commercial HVAC

Unitary Split  Indoor  Outdoor	Heat Pump 	Scroll Chiller 	Helical Rotary Chiller 
Unitary Rooftop 	Self Contained 	Centrifugal Chiller 	Air Cooled Chiller 

TRANE

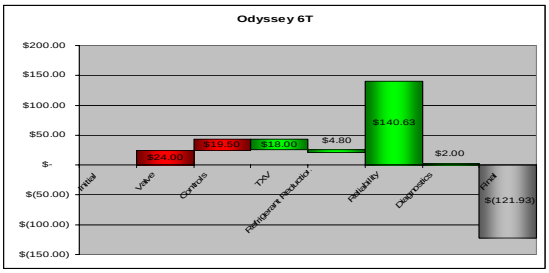
Carrier
A United Technologies Company

OEM Savings

Objectives
- 2010 HFC
- Efficiency
- Reliability/Quality

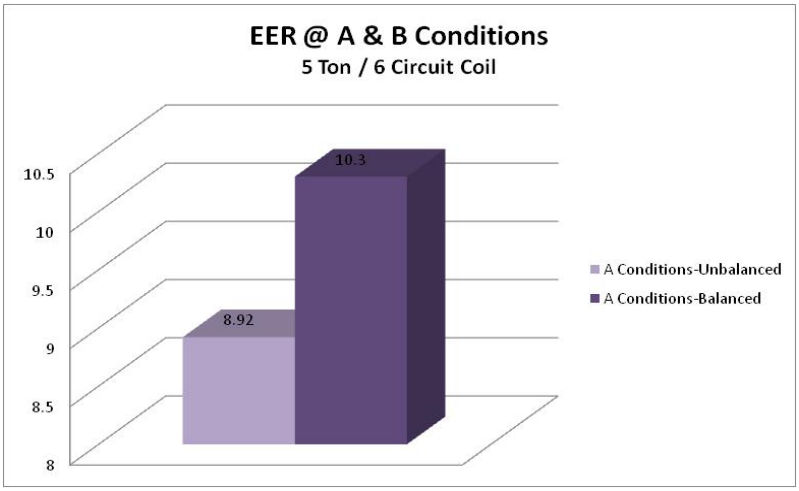
CTQs	R/Y/G
Efficiency	G
Capacity	G
Cabinet size	G
Cost	G

Cost Analysis



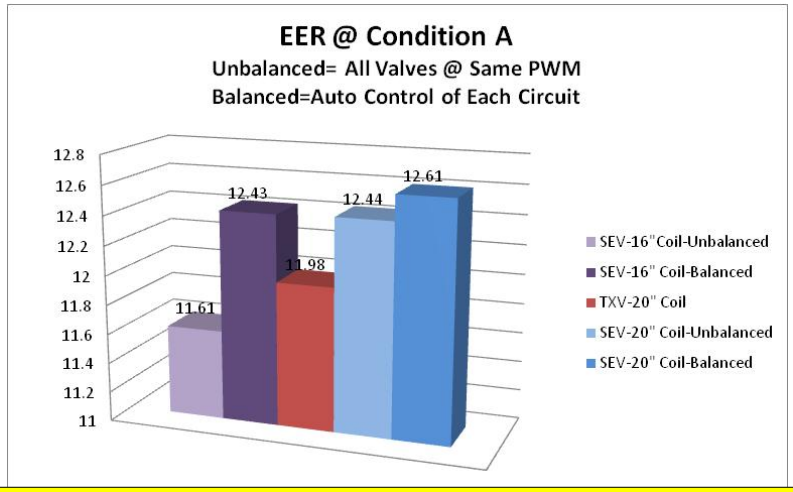
6-Ton Commercial HVAC

Energy Savings - Residential



Microstaq's Multi-circuit Control Delivers Approx 1.5 EER Gain

OEM Savings - Residential



Microstaq's SEV Enables <u>Both</u> EER Gain & Coil Size Reduction

Refrigeration - Retail

Walk In Coolers & Freezers

Supermarket Display Cases

Transportation / Mobile

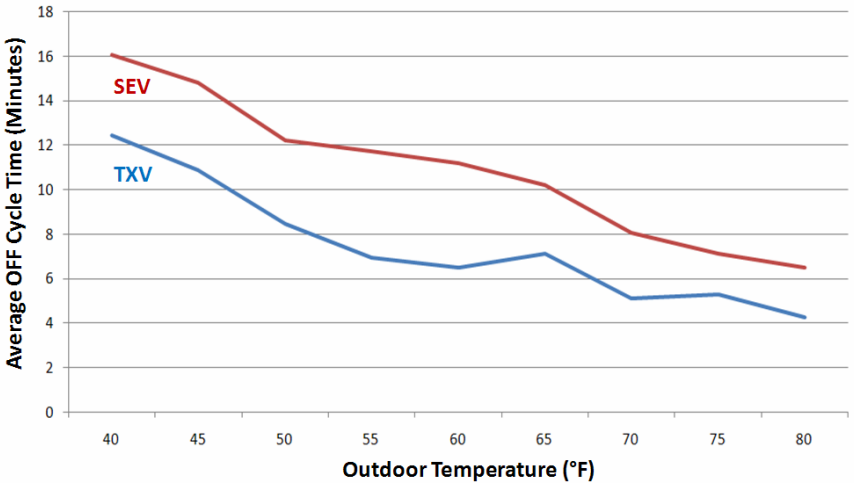
Ice Machines

Ice Cube Flake Ice Nugget Ice

H-E-B

LENNOX
INDOOR COMFORT SYSTEMS
Innovation never felt so good.™

Energy Savings – Refrigeration



SEV has 20-30% longer OFF cycle time vs TXV

Retailer Savings – Grocery Store

Valve	Date	Outdoor Temp	KW Hours	Average	
TXV	7-Feb-09	68	51.368	50.46	
	9-Feb-09	70	50.028		
	10-Feb-09	68	53.594		
	13-Feb-09	69	50.71		
	18-Feb-09	70	47.508		
SEV	18-Mar-09	67	36.768	39.1214	22.5%
	19-Mar-09	66	37.60		
	21-Mar-09	67	38.529		
	22-Mar-09	74	43.089		
	23-Mar-09	74	39.621		

Average Temperature 69°

Yearly Average for Schertz, TX (test store)

Estimated Yearly Energy Savings

Partners

Created by MangoStrategy, LLC

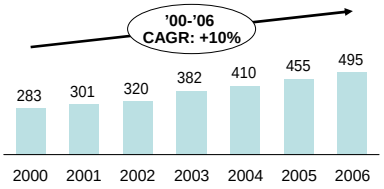
中国绿色科技 China Greentech Initiative

Uncover, Create and Promote Greentech Opportunities in China

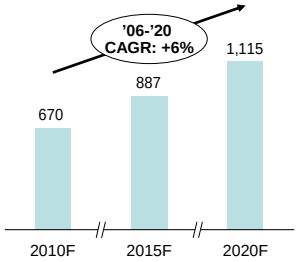
Strategic Advisors *(signed & committed agreements)*

China

Historic Energy Consumption[1], *Million Tons Standard Coal Equivalent*



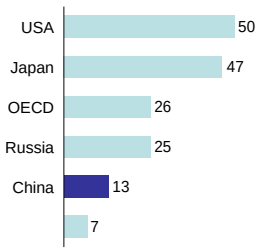
Projected Energy Consumption[2,*], *Million Tons Standard Coal Equivalent*



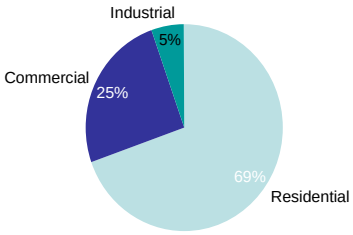
China's building energy consumption has grown rapidly since 2000 and is expected to continue strong growth

China

Per Square Meter Energy Consumption in Buildings, 2004[1], *Kg. SCE per Sq. M*



Energy Consumption in Buildings in China by Market Segment[2,*], 2004, *%*



China's building energy intensity is lower than that of developed countries and consumption is concentrated in residential segment

China

LEED Certified Projects[1], Feb. 2009

#	Project name	Location
1	ACCORD21	Beijing
2	Beijing Olympic Village	Beijing
3	HOK Beijing	Beijing
4	MMoser Associates	Beijing
5	Nokia BDA Campus	Beijing
6	Prosper Center	Beijing
7	Richen International	Beijing
8	25/F Shui On Plaza	Shanghai
9	26/F Shui On Plaza	Shanghai
10	BHP Billiton	Shanghai
11	HOK Shanghai Interior	Shanghai
12	InterfaceFLOR	Shanghai
13	Plantronics Factory	Suzhou
14	Plantronics Office	Suzhou
15	Siemens	Guangzhou
16	LeSang Shopping Mall	Harbin
17	TaiGe Appartments	Shenzhen
18	Wuhan Tiandi	Wuhan

MOHURD Certified Projects[2], Feb. 2009

#	Project name	Location
1	Institute of Science and Technology Research Center	Shanghai
2	2010 World Expo Center	Shanghai
3	Lv Di Hui Chuang	Shanghai
4	Feng Xian Lv Di Jade	Shanghai
5	OCT Sports Center	Shenzhen
6	Vanke City 4	Shenzhen
7	Jindu Cheng Shi Xin Yu	Hangzhou
8	Jindu Han	Wuhan

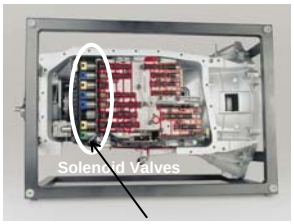
Eighteen LEED and eight MOHURD Green Building projects have been certified as of February 2009

Source: 1. US Green Building Council, *LEED Registered Projects Directory*, Accessed March 2009
2. MOHURD, *Announcement of "Green Building Label" Project Names*, 2008

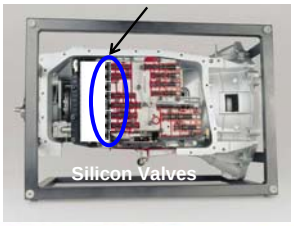
Automotive Transmission

Automatic Transmission control

- 6-10Kg weight savings
- Integrated sensing and control
- 0.5-2mpg fuel efficiency gains



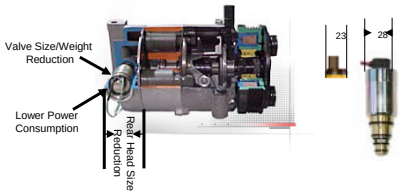
Before silicon
Auto trans bottom view
After silicon



Automotive A/C

Air Conditioning compressor control

- 1-4 mpg fuel economy gain over non-electronically controlled compressor
- 300g weight reduction
- Compressor outer package size optimization



Last Thoughts

We supply components to OEM's who then supply equipment to stores, consumer or building owners.

Incentive programs are focused on consumers or buildings.

Creating Market Pull (vs pushing the technology) is the challenge & opportunity (and we need everyone's help)

- Branding
- Value Enhancement for OEM
- Retrofit pull
- Utility pull ?
- Government regulations
- Government incentives
- Government Labs

Bio, Michael Cavallo

Michael Cavallo is Domain Director, Lighting for the Clinton Climate Initiative, established by Bill Clinton to assist cities in acquiring energy-efficient technology and reduce CO2 emissions. He currently serves on the Boards of the Fund for Constitutional Government and the Project on Government Oversight. Previous positions include: President of Cavallo Capital Management, CFO of Trenza, Executive Director of the United States Chess Federation, and Commissioner of the Massachusetts DPPC. He holds an MBA from Harvard.

Kevin Dowling, Ph.D.
Vice President, Innovation
Philips Solid State Lighting Solutions

As Vice President of Innovation, Dr. Dowling oversees many programs and initiatives designed to keep Philips Solid State Lighting Solutions at the forefront of LED lighting. His previous company, Color Kinetics, was acquired by Philips in August of 2007. He joined Color Kinetics in early 1999 as Director of Engineering, and continues to be integral to the research and development fueling many of Color Kinetics' successful products, technologies and market applications. He is an inventor and co-inventor on many Color Kinetics patents, and also leads the company's government and university programs.

Beyond his work at Color Kinetics, Dr. Dowling actively engages with many industry organizations to advance adoption of LED lighting, including the creation of much-needed industry standards. He was a founder and served as Chairman of the National Electrical Manufacturers Association (NEMA) Solid-State Lighting Section, and was Past-Chairman of the Next Generation Lighting Industry Alliance (NGLIA). He also helped found the Solid-State sub-committee within the Illuminating Engineering Society (IES) Testing Procedures Committee (TPC). Dr. Dowling is also active within the education community, taught lighting at the New England Institute of Art and has lectured at many University lighting and design programs.

Prior to Color Kinetics, Dr. Dowling was Chief Robotics Engineer for PRI Automation, the leader in advanced factory automation systems and software for the semiconductor industry. He has over 15 years of experience in advanced robotics engineering at the Field Robotics Center of Carnegie Mellon University, where, as a scientist, he led a number of projects including a Lunar Rover demo, robots for Space Shuttle Inspection and Shuttle ground operations at NASA's Kennedy Space Center, and the Mars Rover Project. Dr. Dowling has also consulted for many companies, including Shell Oil and Apple Computer, and was a founding principal of a medical robotics company.

Dr. Dowling received his undergraduate degree in Mathematics and masters and Ph.D. degrees in Robotics from Carnegie Mellon University.

PHILIPS

sense and simplicity

American Council for an Energy Efficient Economy - Finance Forum

San Francisco
April 24th, 2009

Kevin Dowling, VP Innovation
Past-Chair Next Generation Lighting Industry Alliance (NGLIA)
Chair IES, Solid-State Lighting Section
Chair NEMA Solid-State Lighting Committee

PHILIPS

Philips Solid-State Lighting

COLOR KINETICS

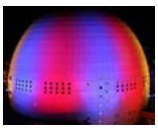
Focus:

Design and market LED-based lighting systems and technologies

Customers:

- High performance color
- Specialty white light
- OEM products
- Over 20,000 installations worldwide

LED Lighting Systems


Outdoor


Hospitality


Entertainment


Shops

PHILIPS

Painting Clouds

PHILIPS

Example: Energy Conservation

- Los Angeles International Airport (LAX)
  - Expects to cut energy consumption by 75%
    - Annual electric bill from $73K to $18K
  - Expects to reduce annual maintenance costs from $1M to $20K
  - Based on CK calculation, entire cost of installation is recovered in ~28 months

4

PHILIPS

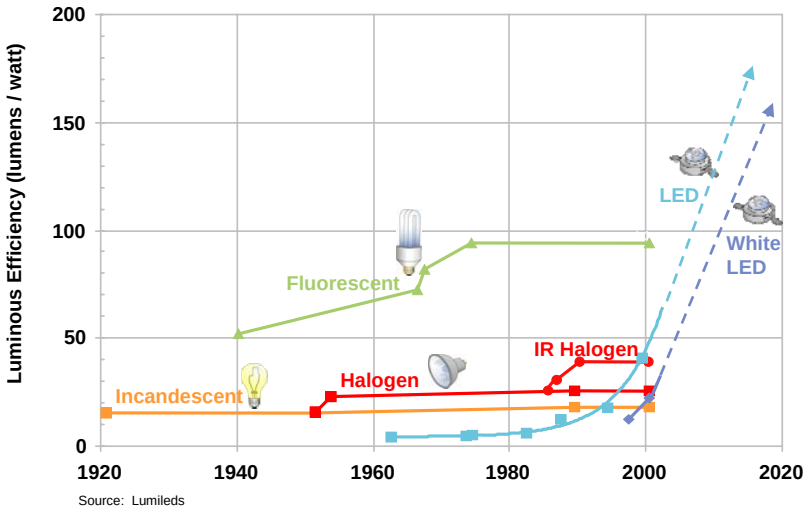
Example: Energy Conservation

- Hardrock Hotel and Casino
  - Expects to reduce annual operating costs by $41,000
  - Previous metal halide fixtures consumed $18,000 per year
  - LED-based units projected to draw about $1,900 per year
  - Previous fixtures cost about $25,000 per year for maintenance, not including filters and ballasts
  - LED-based units are expected to run only $600 per year for maintenance

5

PHILIPS

Market Trends: LEDs Eclipsing Traditional Technologies

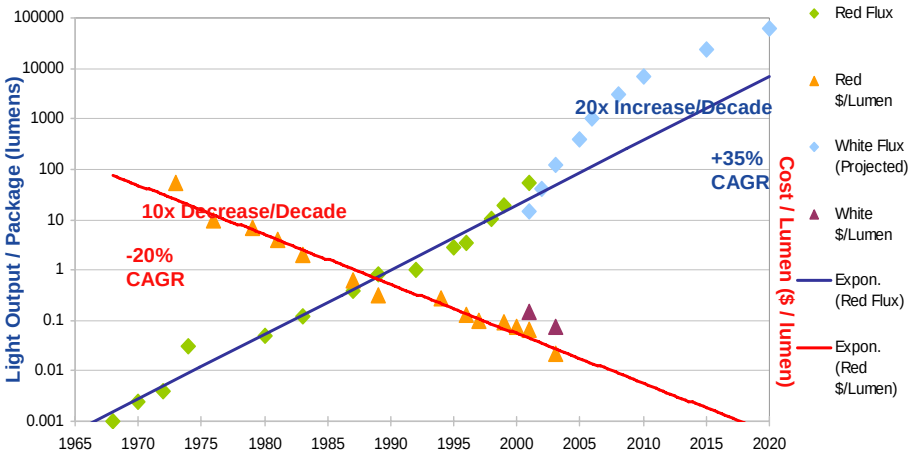


Source: Lumileds

6

PHILIPS

Haitz' Law: LED Output Up/ Cost Down

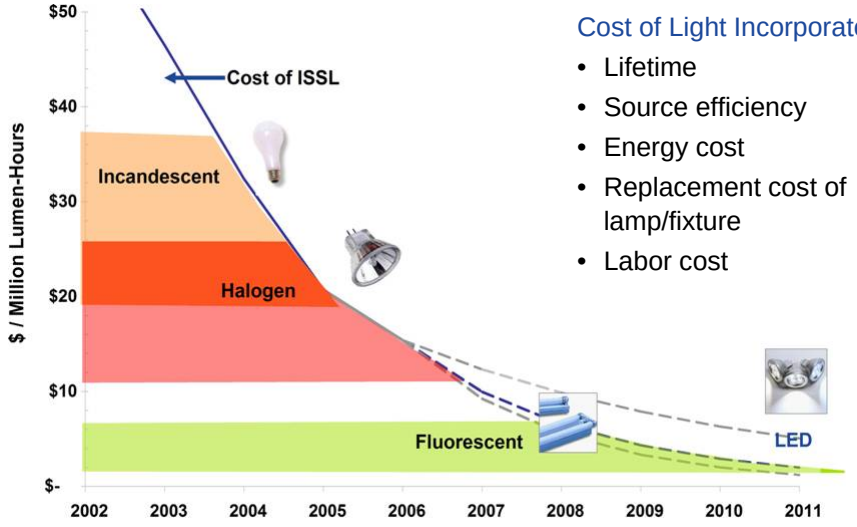


Source: Roland Haitz & Lumileds

7

PHILIPS

Market Trends: Sharply Falling Cost of LED Light



Cost of Light Incorporates

- Lifetime
- Source efficiency
- Energy cost
- Replacement cost of lamp/fixture
- Labor cost

Source: Color Kinetics: research w/ only white LEDs

8

PHILIPS

LED Trends

- Additional LED benefits
  - Better quality of light than CFL
  - Control capability including dimming and CT control
  - Longer lifetimes, less maintenance
  - No Mercury
  - Operates very well in cold environments
  - Directional sources (Task or useful lumens)
- The scale will ultimately tip in favor of LEDs

9

PHILIPS

10

PHILIPS

Financial Trends

"Engineering-economic analysis demonstrates that white solid-state lighting already has a lower levelized annual cost (LAC) than incandescent bulbs. The LAC for white solid-state lighting will be lower than that of the most efficient fluorescent bulbs by the end of this decade." [Azevedo 2009]

Rebates necessary to make LED lighting LAC similar to incandescent and fluorescent lamps [Azevedo 2009]

QuickTime™ and a decompressor are needed to see this picture.

[Azevedo 2009] Azevedo, I.L., Morgan, M.G., Morgan, F., "The Transition to Solid-State Lighting," Proceedings of the IEEE, March 2009. V97, No. 3. pp 481-510.

11

PHILIPS

Utility Cost-Effectiveness ($/ton CO_2)

QuickTime™ and a decompressor are needed to see this picture.

Source: Azevedo 2009

12

PHILIPS

The Non-Financial Issues

- Quality
  - Color Temperature
  - Color Rendering
  - Chromaticity
  - Beam
  - Uniformity
  - Dimming
  - Instant-on
  - Flicker
- Consumer Behavioral Issues

QuickTime™ and a decompressor are needed to see this picture.

QuickTime™ and a decompressor are needed to see this picture.

These metrics matter to designers, specifiers and consumers!

13

PHILIPS

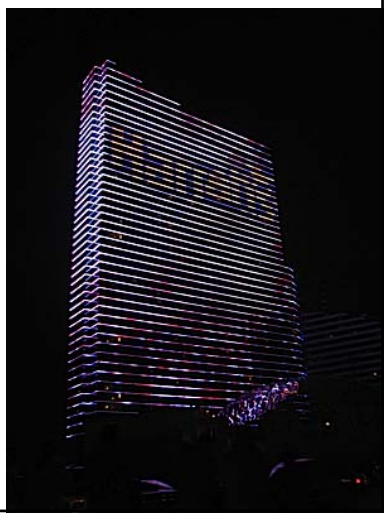
Interim Solution?

14

PHILIPS

Added Benefits: Monitoring and Control

- Onboard intelligence exists for effects lighting
  - Addressable
  - Easily commissioned
  - Connected to Internet Protocol (IP)
- Potential of added intelligence
  - Ability to flatten peak loads
  - Sensing and Action
- Beyond monitoring to controlling



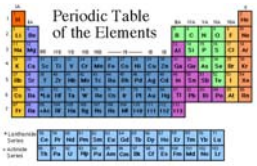
PHILIPS

LEDs and Control

- LEDs in Freezer Applications - Wal-Mart 92% savings
- Sensing and control will provide even greater benefit than LEDs alone

PHILIPS

Life Cycle Analysis



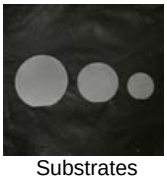
Precursor Gases

Materials

Reactors/Epitaxy

Wafers Die Package Array Luminaire

Energy



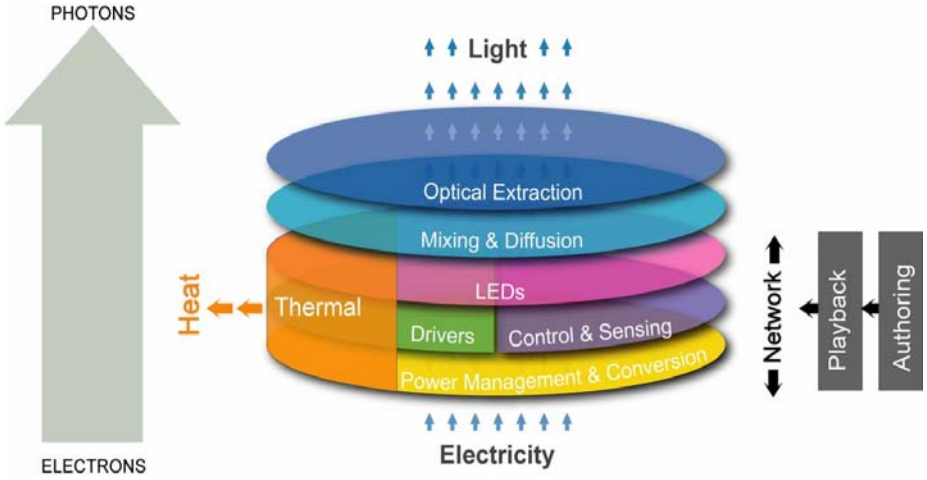
Substrates

Commissioned by NGLIA

17

PHILIPS

LED Lighting Systems

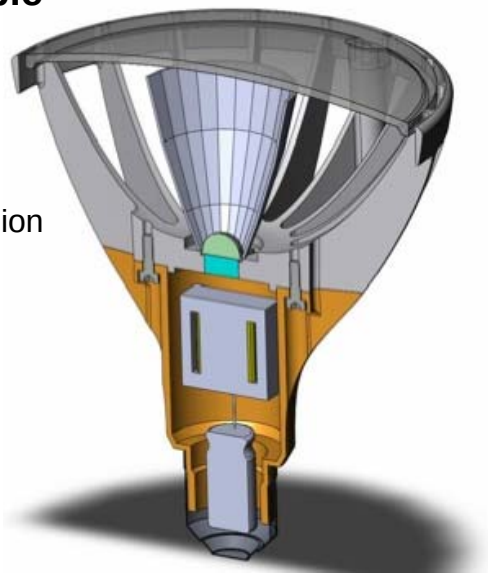


18

PHILIPS

System Design Example

- Standard form
- Multi-chip LED
- Efficient narrow optic
- 92% efficient power conversion
- Instant-on *and* dimmable
- High power factor
- Low parts count



19

PHILIPS

20

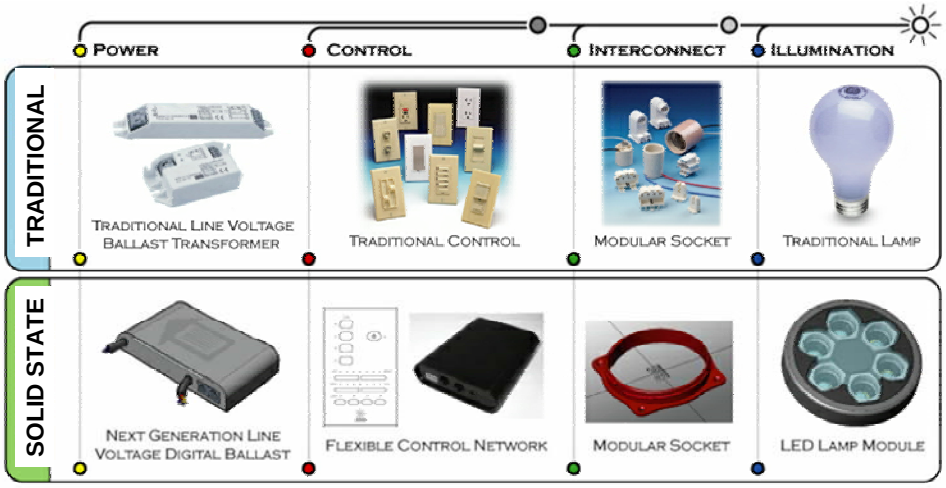
PHILIPS

Legacy

21

PHILIPS

Lighting System Architecture: Old and New



22

PHILIPS

New Lamp Form Standards Needed

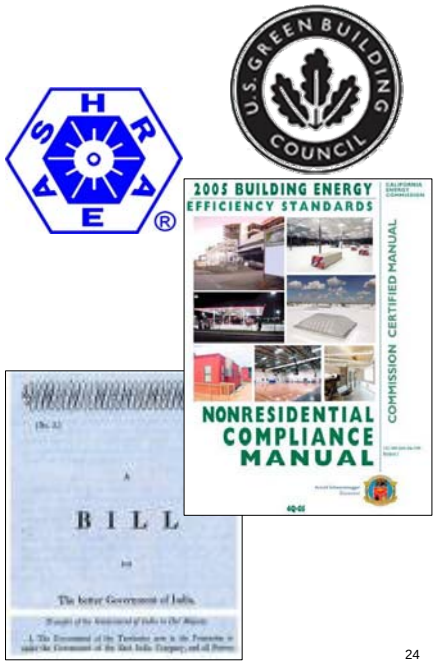
New generation components allow
- Replacements
- Upgrades
- Mechanical support
- Electrical connections
- Thermal connection
- Communications & networks
- Optimized performance
- New lighting options

23 23

PHILIPS

Legislation and Guidelines

- US Initiatives
  - CA Title 24, ‘05, ‘08, & ‘11
  - US EISA 2007 mandates
  - ASHRAE 90.1
  - LEED
- Increasing number of initiatives
- Raising efficacy mandates
  - Effectively 45 lpw in 2020
- Critical need for standards



24

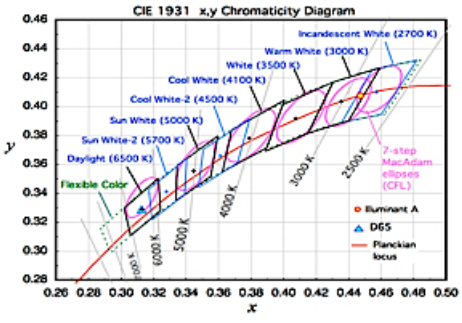
PHILIPS

25

PHILIPS

Technology & Standards Evolving Rapidly

- **LED Performance**
  - Continues to Increase
  - Color Quality improving (>80 CRI)
  - Efficacy much improved (50-100lpw)
  - Costs continue to improve
- **SSL Standards**
  - Rapidly coming out in 2008
  - Chromaticity ANSI C78.377
  - Luminous Flux IES LM-79
  - Lumen Maintainance IES LM-80
  - More in process



26

PHILIPS

US Department of Energy Activities

www.ssl.energy.gov

R&D Portfolio
SSL Quality Advocates
Energy Star for SSL
CALiPER testing program
Standards Development
GATEWAY Demonstrations
Design Competitions
Technical Information Network
Using LEDs

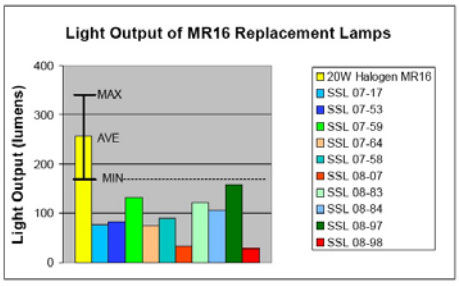
QuickTime™ and a decompressor are needed to see this picture.

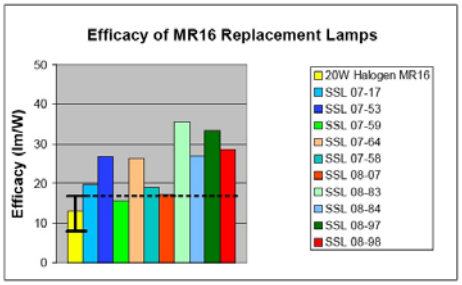
27

PHILIPS

DoE Caliper Testing Program

- 'Consumer Reports' for LED product testing
- Objective product performance
- Over 120 Product tests
- Support Energy Star
- Help guide development of testing procedures
- www.netl.doe.gov/ssl/



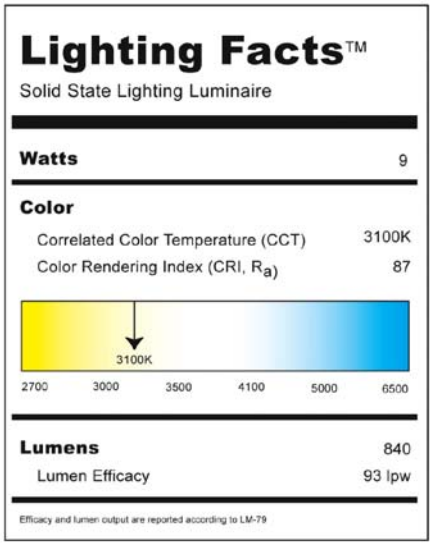


28

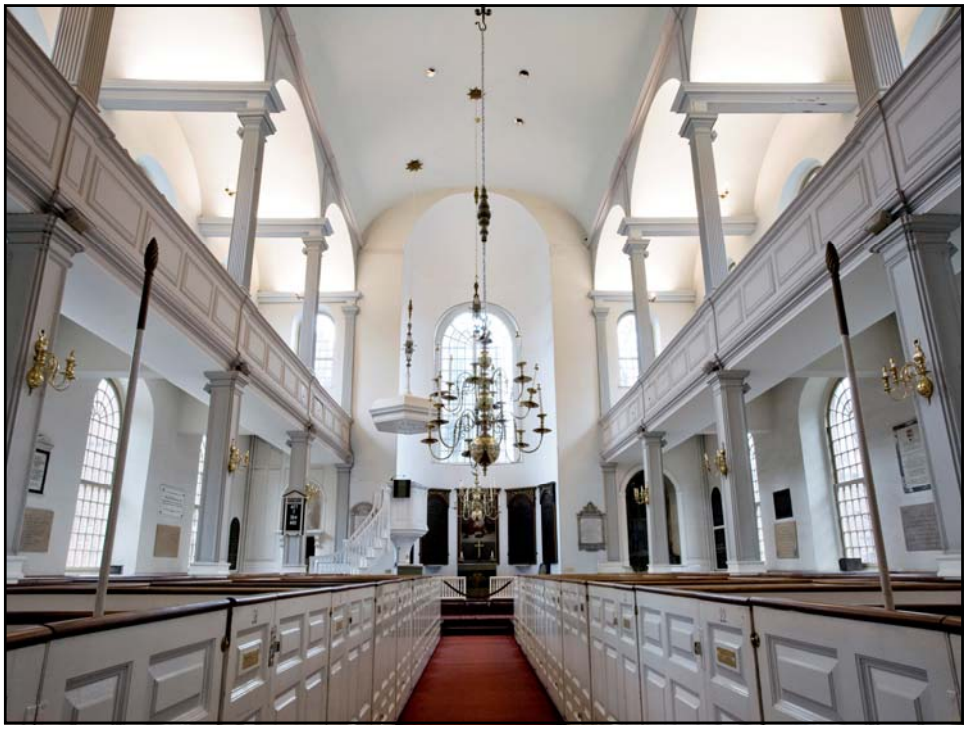
PHILIPS

Labeling

- Assure better product quality
- Provide useful information
- Mandate standards testing



29



Michael Messenger. Mr. Messenger is a senior principal consultant at Itron specializing in the design and evaluation of energy efficiency and demand response programs and the development of policy frameworks and funding mechanisms to support them. Prior to joining Itron, Mr. Messenger served for over twenty five years at the California Energy Commission as:

- Chief Policy Advisor for three California Energy Commissioners
- Lead analyst responsible for developing and evaluating the impacts of appliance efficiency standards in the 1980's ,
- Lead for evaluation for utility and state energy efficiency and Demand Response programs in the 1990's,
- Demand Response Program leader and Member of the California Board for Energy efficiency from 1998 to 2006
- Project leader for the CEC of the development of the nation's largest and most comprehensive evaluation of the load impacts of Critical Peak Pricing rates in California in 2003 and 2004

Mike has just returned from working at the Ontario Power Authority (from mid 2006 to mid 2007) where he helped develop a program evaluation framework and protocols for evaluating the impacts and effectiveness of energy efficiency programs.

Mike has a Bachelor of Science from Princeton University and a Master of Science from the University of California at Berkeley. He is a member of the Board of Directors for the Association for Energy Service Professionals and the planning committee of the International Energy Program Evaluation Conference.

Opportunities for Energy Efficiency Technology Development in Tandem with the Roll Out of Smart Grid Networks

Michael Messenger
Senior Principal Energy Consultant
Itron

Presentation to Third Annual Energy Efficiency Finance Forum

April 23 & 24, 2009
San Francisco, CA

Outline of Presentation

- My Biases and Perspectives
- Role of Networks in Stimulating Technology Development
- Evolution of functionality requirements for Metering Systems over time
- Key Questions to ask before investing
- Technology Opportunities- Displays, Controls, Neural Networks,
- Key Policy Issues - “Nudge”- Opt in vs. Opt out tariffs first, control systems later. Customer will evolve to automated energy management systems with minimal customer oversight
- Summary - Predictions and themes

My Biases and Experience

- Degrees in Economics and Resource Management
- Consultant, Regulatory staff, Facilitator
- Forecaster of energy trends and likely outcomes
- Public policy advocate for increasing level of demand response since 1992
- Wrote first California Action plan to increase Demand Response in 2000 and led critical peak pricing pilots

Environmental Drivers

- Challenges facing global energy providers are intensifying.
- There is a ever-growing demand for resources. By 2025:
  - > Global population will increase 30 percent to 8 billion
  - > Demand for electricity will double
  - > Demand for natural gas will increase 67 percent

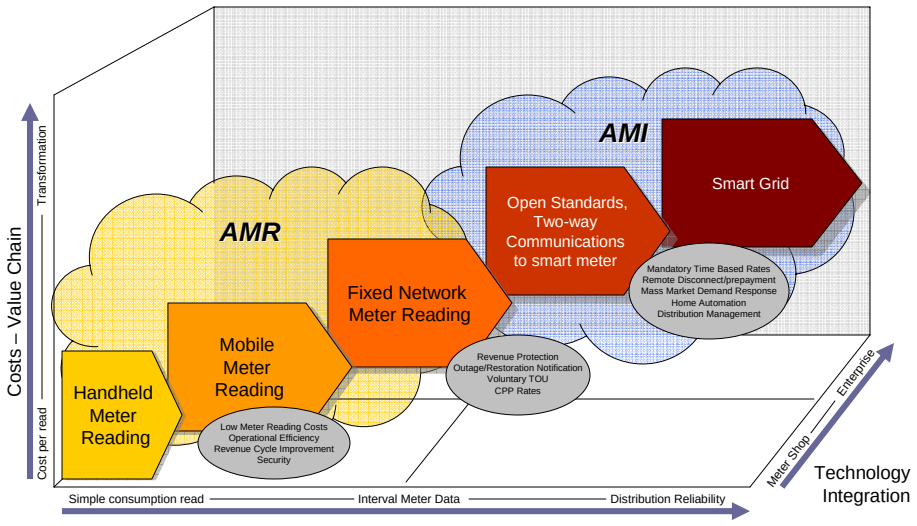
70% of U.S. electricity generation is derived from burning fossil fuels, contributing over 1/3 of U.S. global GHG emissions.

"Smart meters are a smart – and essential – way to stop global warming." Ashok Gupta, Natural Resources Defense Council

The Role of Networks in Stimulating Development

- Networks have played a pivotal role in the development of human society and technology
  - > Tools-Humans emerged from caves to hunt in networks- (teams and communication)
  - > Trade-Marco Polo goes to China- (using “silk” road network)
  - > Transportation - The Interstate Highway System
  - > Berlin Wall and the Soviet Union crumble - TV, Cell phones and the internet networks
- Will Smart(er) Electricity Grids have a similar influence?
  - > 2015-Electricity crisis “solved”?
  - > 2020- Renewables hit 20% share in North America without major integration problems?

Evolution of Network Functionality

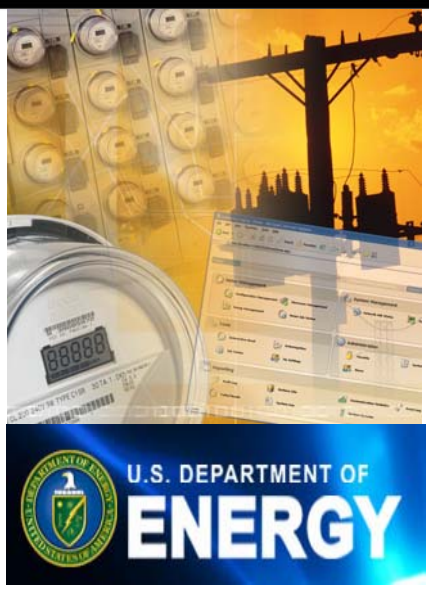


Electric / Gas / Water

Itron

The Smart Grid

- Smart Grid Characteristics Defined:
  1. Enabling informed energy use management by customers
  2. Enabling new products, services and markets
  3. Optimizing asset utilization and operating efficiently
  4. Providing the power quality for the range of needs in the 21st century
  5. Operating resiliently against physical and cyber attacks and natural disasters
  6. Accommodating all generation and storage options
  7. Addressing disturbances-automated prevention, containment and restoration



* National Smart Grid Workshop, June 2008

Electric / Gas / Water

Itron

AMI is a *Foundational* Technology Enabling the Smart Grid

- Creation and collection of hourly usage data
- Intelligent rates to incentivize behavior change
- In-home devices & tools
- Consumer displays & customer portals provide feedback

Enabling Informed Participation by Customers

Functions Desired over Time by Most Clients

- Increase Operational Savings and Revenue collection - short term
  - > Automated Meter Reading - Mobile to fixed network to flexible mesh networks
  - > Streamlined revenue collection - More frequent reads and theft protection
  - > Automation of Distribution Collection of useful nodal status reads
  - > Opportunity to gather more data on system connectivity and order preventative maintenance
- Increase Asset Utilization and reduce emissions on peak - medium term
  - > Capability to Transmit price and status information to network nodes
  - > Integrate on site data collection (loads and generators) with system wide data collection on transmission and central units
  - > Switch around nested outages
  - > Verify load drops from direct load control equipment
  - > Smart Meter/network that will support more flexible and or dynamic tariffs - Reach 20% of the demand responsive customers

Functionality Evolution (continued)

- Improve customer service - long term
  - > Reduced outage times
  - > Real time graphics/displays of usage - tips?
  - > Re-connect with alienated customers by enabling green options
- Increase Business Opportunities - long term + higher risk
  - > Meter as gateway to on site energy management = business opportunity for utilities?
  - > Meter as foot in the door to offer higher value added services in partnership opportunities with other network vendors?

Key Questions to Ask before Investing

- Is network flexible and capable of supporting applications not yet available in the market today?
- Are the results of the business case, benefit cost analysis robust under a variety of futures?
- How will the smart grid be paid for, usage vs. system access charges?
- Will network enable home automation and automated demand response to reduce costs of meeting peak/dealing with emergencies?
- Will network increase asset (generation and transmission) utilization and improve cash flow?

Four Key Questions to Ask Before Financing a Smart Grid Project

- Who is the Primary Customer/Driver for the AMI system?
- Who will pay for the system and what is the consequence if costs exceed expected benefits?
- What are the network owner's critical business needs now and how are they likely to change in future?
- How will changing market/regulatory structure affect network manager's ability to maintain and add new functionality to system over time?

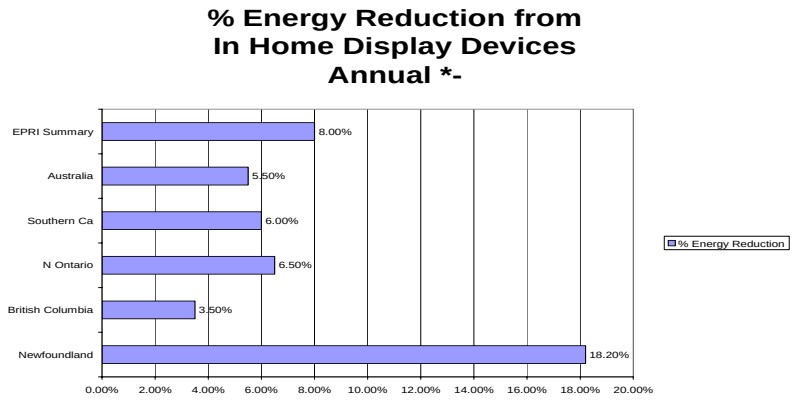
Technology Opportunities - Meter Networks

- Only 6.7 million of the 144.5 million meters in the United States today are AMI capable today (FERC)
- Networks with 20 million “smart” meters are under development
- Market share of AMI is less than 1% worldwide
- Market will eventually be replacing upgrading 100 million meters per year= $ 5 -10 billion per year in short term

Technology Opportunities - Home Controls

- First entrants are in home displays and communicating thermostats
- Automated or communicating home energy management systems will come eventually
- 2020 target - 20% of households in U.S and Europe with some form of home energy controls - At $200/home * 20% *400 million households = $ 16 billion over a ten year period

Results from In Home Displays



Other Technology Opportunities

- **Supply Concerns** – Shifting from central to distributed generation systems/more storage?
- **Reliability** – **From Manual diagnosis to SCADA to** Intelligent "diagnostic "grid to self healing grid
- **Public Policy** – From Demand Response (save peak only) to Active Energy Management (more annual efficiency or savings)
- **M&A Strategies** – From generation economies to transmission economies, Automation is key to achieving financial results sought through utility mergers
- **Meter Data Management** – Beginning to be seen as a key strategic resource for savvy utilities or service companies
- **Capital Replacing Labor in Most Networks**

Key Policy Issues Related to Smart Grids

- Pure choice “Opt in” vs. societal nudge - ”Opt out” will matter in rate design and technology deployment. Inertia on both sides; customers and regulators
- Policy is moving toward nudge – Retirement – mandatory with opt out example, healthcare as well? See Richard H. Thaler, and Cass R. Sunstein **Nudge**: Improving Decisions About Health, Wealth, and Happiness: (Amazon, 2008)
- Customer backlash potential - Big Brother (automated DR invasion of privacy)
- Rate of Depreciation in Network Investments and keeping regulated and unregulated business separate.

Who Will Pay for the Smart Grid Networks?

- Choice of how to finance system depends on certainty of cost recovery, balance of risk/rewards (ratepayer-shareholder), and regulatory climate (who captures the operational savings?)
- Financing Options - Rate base, Rate base with adjustments base on shared savings/cost formulas
- Collection Options - Fixed monthly payments (operational benefits) or adder to energy costs if Demand response is key driver
- Expected Useful Life - Is the life of an AMI network similar to an Interstate highway (30 years) or a network server (3 years) 10-15 years is compromise

Five C words for the 21st Century (Desired by Most Customers)

- Convenience - set it and forget it (automated load control first/recommendations on buying strategies later)
- Control (of my bills and my lifestyle)
- Choices (want tariffs and programs that fit my lifestyle)
- Sense of Community (customers long to contribute to social goals/environmental quality, witness green rates, "we can do this")
- Credibility – Programs/firms deliver what they promise

Prediction 1- Advanced AMI Networks Will Be Used to Involve More Customers or Their Machine Agents in Demand Management

- First wave - responsive to emergency signals -1990's
- Second wave - responsive to price changes or rebates to buy peak reductions - 2000-2010
- Third wave - Automated demand responses (load drops) with customer input/programming 2010-2020
- Fourth wave - Networks send out control messages to optimize electricity flow and reduce locational peaks- 2015 and onwards

Prediction 2- Network Products Supportive of the Five C's Will Thrive

- First wave - Devices that communicate via web with network and manage energy use based on price and historic usage data - Ubiquitous programmable communicating thermostats by 2012-2015
- Second wave - Devices that communicate with web servers and send customers feedback on strategies and tips to customers and local supplier network on how to make money
- Third Wave - Networks that benchmark efficiency performance of customer nodes (kwh/ service deliver) and later charge higher prices to inefficient nodes/customers

Summary

- Functionality requirements for metering networks continue to become more complicated over time.
- Technology opportunities are a derivative to what customers want and are willing to pay for in the future. Need more research on customer willingness to pay for devices directly or thru network fees.
- Policy makers want to use smart grids to achieve energy efficiency and environmental goals.
- Utilities want to use networks to reduce costs first but unintended spillover benefit is usually transformation of their business.
- Biggest unresolved question: who owns and who pays for the new infrastructure/technologies on the customer side of meter?

Advanced Metering/ Demand Response Web Sites

- Demand Response Research Center
  http://drrc.lbl.gov/drrc-ron-7-21-05.html
- Federal Energy Regulatory Commission
  http://www.ferc.gov/industries/electric/indus-act/demand-response.asp
- SCE Smart Connect Web Page
  http://www.sce.com/PowerandEnvironment/ami
- Utility Home Area Network (HAN) use cases
  http://sharepoint.ucausersgroup.org/OpenHAN/default.aspx

WHAT'S TO COME

Looking Beyond the Now of Energy Efficiency: It's 2015 & What Does the Market Look Like?

Speakers:

Ralph Cavanagh, *Senior Attorney & Co-director of Energy Program*
NATURAL RESOURCE DEFENSE COUNCIL

John A. "Skip" Laitner , *Director of Economic and Social Analysis*
AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY

Dr. Holmes Hummel
CLIMATE POLICY DESIGN PRO-SERIES

BIOGRAPHICAL SUMMARY FOR RALPH CAVANAGH

RALPH CAVANAGH is a senior attorney and co-director of NRDC's energy program, which he joined in 1979. Ralph has been a Visiting Professor of Law at Stanford and UC Berkeley (Boalt Hall), and a Lecturer on Law at the Harvard Law School; he has also been a faculty member for the University of Idaho's Public Utility Executives Course for more than a decade. From 1993-2003 he served on the U.S. Secretary of Energy's Advisory Board. His current board memberships include the Bipartisan Policy Center, the Bonneville Environmental Foundation, the California Clean Energy Fund, the Center for Energy Efficiency and Renewable Technologies, the Energy Center of Wisconsin, the Northwest Energy Coalition, and the Renewable Northwest Project. He is a member of the National Commission on Energy Policy, which the William and Flora Hewlett Foundation established in 2002. Ralph has received the Heinz Award for Public Policy, the National Association of Regulatory Utility Commissioners' Mary Kilmarx Award, the Yale Law School's Preiskel-Silverman Fellowship, the Lifetime Achievement in Energy Efficiency Award from California's Flex Your Power Campaign, the Northwest Energy Coalition's Headwaters Award, and the Bonneville Power Administration's Award for Exceptional Public Service. He is a graduate of Yale College and the Yale Law School. He is married to Deborah Rhode, who is the MacFarland Professor of Law at Stanford Law School.

CONTACT INFORMATION:

Natural Resources Defense Council, 111 Sutter Street, 20th Floor
San Francisco, CA tel. 415-875-6100 [rcavanagh@nrdc.org]

John A. "Skip" Laitner

John A. “Skip” Laitner is the Director of Economic and Social Analysis for the American Council for an Energy-Efficient Economy (ACEEE). He previously served almost 10 years as a Senior Economist for Technology Policy for the US Environmental Protection Agency (EPA), but chose to leave the federal service in June 2006 to focus his research on developing a more robust analytical characterization of energy efficiency resources for energy and climate policy analyses and within economic policy models.

In 1998 Skip was awarded EPA's Gold Medal for his work with a team of other EPA economists to evaluate the impact of different strategies that might assist in the implementation of greenhouse gas emissions reduction policies. In 2003 the US Combined Heat and Power Association gave him an award to acknowledge his contributions to the policy development of that industry. In 2004 his paper, “How Far Energy Efficiency?” catalyzed new research into the proper the characterization of efficiency as a long-term resource.

Author of more than 200 reports, journal articles, and book chapters, Skip has more than 38 years of involvement in the environmental and energy policy arenas. He’s been invited to provide technical seminars in diverse places as Australia, Canada, China, France, Germany, Korea, South Africa, and Spain. He has served as an adjunct faculty member for the Virginia Polytechnic Institute and State University and the University of Oregon, teaching graduate courses on the Economics of Technology. He has a master’s degree in Resource Economics from Antioch University in Yellow Springs, OH.

John A. "Skip" Laitner
Director of Economic and Social Analysis
American Council for an Energy-Efficient Economy (ACEEE)
Washington, DC
o: (202) 507-4029
c: (571) 332-9434
email: jslaitner@aceee.org

ACEEE
American Council for an Energy-Efficient Economy

How Big Energy Efficiency?

*Exploring Future Investment Opportunities**

John A. "Skip" Laitner
Director of Economic and Social Analysis
American Council for an Energy-Efficient Economy (ACEEE)

The 3rd Annual Energy Efficiency Finance Forum
"Financing, Capital, & Deal Sourcing for Energy Efficiency"

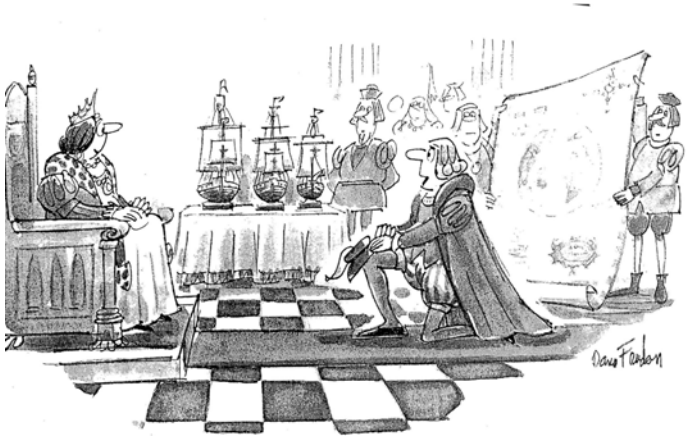
San Francisco, California
April 24, 2009

*** In the spirit and tradition of Nobel Laureate and former Caltech physicist Richard Feynman, in his 1959 visionary talk, "There's Plenty of Room at the Bottom." See, http://www.its.caltech.edu/~feynman/plenty.html.**

Some Acknowledgments

- This presentation draws on the many ideas that have evolved from wide-ranging discussions with a variety of friends, colleagues, and collaborators over the years, including: *Bob Ayres, Steve Bernow, Fatih Birol, Bruce Biewald, Marilyn Brown, George Burmeister, Penelope Canan, Tom Casten, Ken Colburn, Laura Cozzi, Stephen DeCanio, Catherine Dibble, Jerry Dion, Karen Ehrhardt-Martinez, Neal Elliott, Andrew Fanara, Lorna Greening, Bill Halal, Don Hanson, Alan Heeger, John Hoffman, Tina Kaarsberg, Jon Koomey, Mark Levine, Amber Leonard, Irving Mintzer, Dick Munson, Steve Nadel, Lynn Price, Bill Prindle, Wendy Reed, Art Rosenfeld, Matthias Ruth, Alan Sanstad, Elizabeth Wilson, Ernst Worrell, and many others*.
- The support of our funders has also proved invaluable. We deeply appreciate financial backing for our research in this critical area from the Energy Foundation, the Sea Change Foundation, the Semiconductor Industry Association, and others.
- ***Any and all mistaken views are decidedly mine alone, however. . . .***

ACEEE
American Council for an Energy-Efficient Economy



"Your Majesty, my voyage will not only forge a new route to the spices of the East, but it will also increase jobs and fleet productivity by 3.2 percent."

An Overview in the Road Ahead

- What is energy efficiency? And how far have we come? In short, how big efficiency?
- What is the magnitude for spurring more productive investment in new technologies?
- Perhaps more critically, what is the magnitude for long-term employment opportunities?
- And with the potentially significant benefits associated with the efficiency resource, will we choose to develop it?

ACEEE
American Council for an Energy-Efficient Economy

An Opening Commentary

- Energy efficiency many be the farthest reaching, least-polluting, and fastest growing energy success story of the last 50 years. But it is a highly invisible success story. . . .
- We've accomplished a lot, but it is just the tip of the investment potential and market opportunity.
- Net gains in employment will be a function of greater energy productivity, and a cost-effective move away from capital-intensive energy production to the purchase of labor-intensive goods and services made possible by energy bill savings.
- Needed are policies and investments that create systematic improvements driven by the right economic motivation, and the innovative spirit.

ACEEE
American Council for an Energy-Efficient Economy

Working Definition: Energy Efficiency Investments

- The cost-effective investment in the energy we don't use to produce our nation's goods and services.
- Examples include:
  - New electronic ballasts and lamps, sensors, building and piping insulation, and heat recovery systems installed to primarily save energy
  - The mix of semiconductor-related, broadband, and information and communication technologies (ICT) whose secondary value increases overall energy productivity
  - Combined heat and power (CHP) and recycled energy systems with efficiencies of 70-90 percent, or more
  - Investments in innovative, high value-added industries and technology services that power structural change, but in ways that also lower the nation's energy-intensity
- The common denominator in all these examples is productive investment and behavior!

ACEEE
American Council for an Energy-Efficient Economy

A Short Historical Perspective

ACEEE
American Council for an Energy-Efficient Economy

The year 1970 is not an especially important one in the history of the U.S.

- In 1970 the movies “Love Story” and “M*A*S*H” drew crowds to air-conditioned theaters. The Chicago Seven were acquitted and Janis Joplin died.
- And, in 1970, James Nasworthy actually did reinvent the wheel and it popularized skateboarding.
- But, in 1970 there were no personal computers or cellular phones. Slide rules were still used for engineering calculations rather than hand-held calculators. In 1970 fax machines did not exist other than for highly specialized uses such as weather mapping.
- There were no catalytic converters on automobiles, no VCRs or CD players in our homes. Technologies such as electronic ballasts, solid state lighting, low-emissivity windows and industrial “high-lift” heat pumps had yet to be invented.
- In 1970 Intel was still one year away from releasing the first microchip.

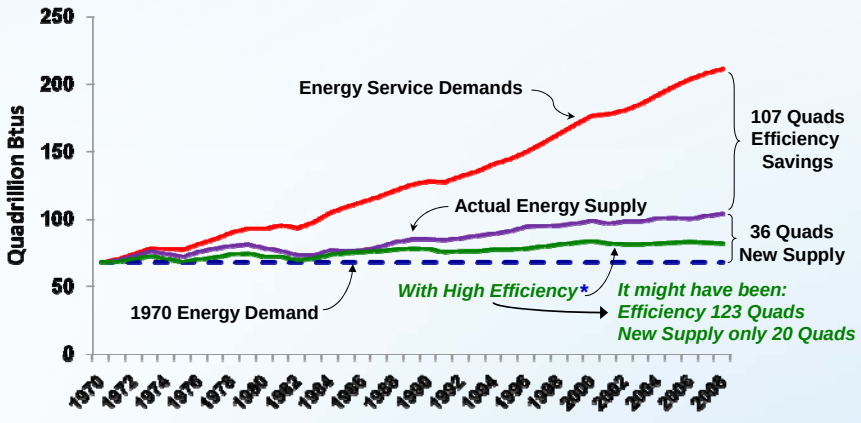
ACEEE
American Council for an Energy-Efficient Economy

The year 1970 is not an especially important one in the history of the U.S.

- In 1970, the world had yet to hear of names like Chernobyl, Three-Mile Island and the Exxon Valdez. Perhaps more important, global climate change and ozone depletion were unthinkable prospects.
- FedEx was still several years away, and the Internet consisted of just four university sites that had been connected only the previous fall. Carbon nanotubes were not discovered until 1991.
- And 1970 was also the year when the U.S. Environmental Protection Agency was created, and it was about the time when I began my own career.
- ***The roughly 40-year period since 1970 is about the same period of time (i.e., 2010 through 2050) that most scientists and policy analysts now believe that we have remaining to effectively resolve the emerging energy constraints and global climate change. This is a daunting prospect.***

ACEEE
American Council for an Energy-Efficient Economy

The Historical Energy Efficiency Contribution and the Lost Potential



*Working estimate that assumes smart policies informed past investments and market structure

ACEEE
American Council for an Energy-Efficient Economy

The *Future* of Energy Efficiency

ACEEE
American Council for an Energy-Efficient Economy

Might Energy Efficiency Be The Lurking Opportunity?

Some, quite understandably, may be taken by this cover story on Shaun White's business acumen. . . .

But lurking in this issue may be the more interesting story

Wireless Electricity Is Here (Seriously)*

ACEEE
American Council for an Energy-Efficient Economy

*with many other efficiency opportunities also overlooked as we shall see. . .

Examining the Emerging Evidence*

*With these and many other recent stories, we ask the question: might the journalists and magazines be ahead of the nation's policy analysts.

Let's examine just one story a little more closely

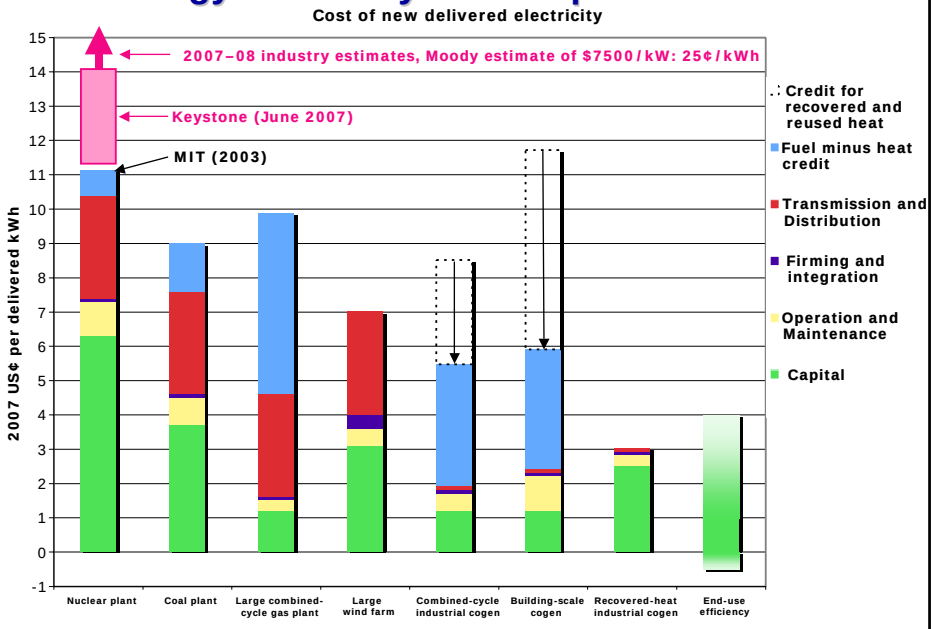
ACEEE
American Council for an Energy-Efficient Economy

One Very Big Example of Possible Energy Efficiency Gains

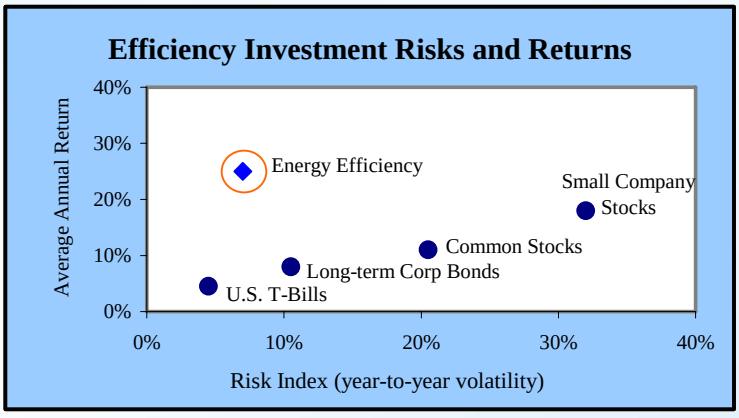
- In 2008 we wasted about two-thirds of all energy used in the generation and transmission of electricity – just short of 28 Quads.
- This rate of inefficiency is essentially unchanged since 1960. . . .
- What we waste in the production of electricity is more than Japan uses to power its entire economy.
- As Tom Casten and Phillip Schewe write in the latest issue of American Scientist (cover story in the previous slide), the cost-effective recycling of waste heat might provide as much as 20 percent of current electricity use.

ACEEE
American Council for an Energy-Efficient Economy

Energy Efficiency: A Cheaper Resource



Energy Efficiency Investments: A Low Risk, High Return



Source: ACEEE estimates adapted from the U.S. EPA and the Vanguard Group

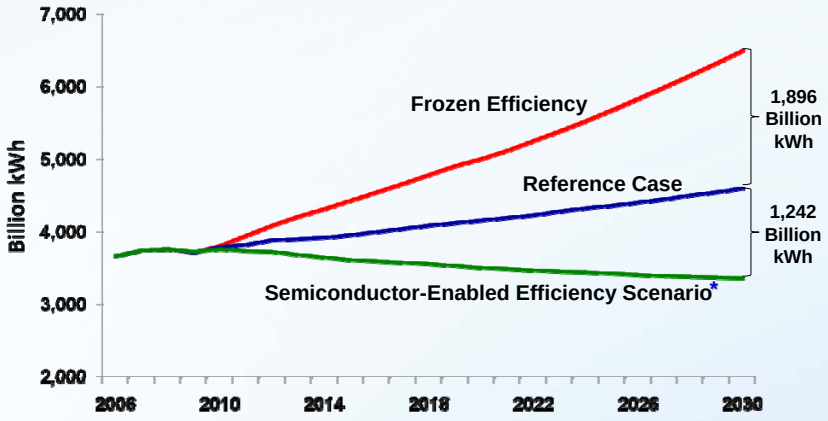
ACEEE
American Council for an Energy-Efficient Economy

Exploring Future Efficiency Gains

- Since 1976 semiconductor-related technologies have improved overall productivity to enable a net electricity savings equivalent to 184 large coal-fired power plants.
- Under the current mix of prices and policies, semiconductor–related investments will enable further productivity gains that reduce the need for electricity.
- However, if we enact new policies that stimulate just a one percent increase in normal investments for high tech equipment and infrastructure, the accelerated efficiency gains could reduce electricity demands by about 27 percent compared to the standard reference case or BAU projections for the year 2030.

ACEEE
American Council for an Energy-Efficient Economy

Exploring Future Efficiency Gains



*Accelerated investments in semiconductor-related technologies stimulated by smart policies (from a forthcoming ACEEE assessment for the Semiconductor Industry Association)

ACEEE
American Council for an Energy-Efficient Economy

Exploring Future Efficiency Gains

- Under a semiconductor-enabled efficiency scenario, policies would stimulate an added market investment on the order of $500 billion over the period 2010 through 2030.
- The savings to consumers and businesses would likely grow to nearly $1.3 trillion over that same period of time.
- Our estimates indicate that this higher level of energy and overall productivity would stimulate a net annual increase of 500,000 jobs.
- Carbon dioxide emissions would decrease by an annual average of ~400 million metric tons.

ACEEE
American Council for an Energy-Efficient Economy

Examples of Untapped Efficiency Markets

- End-use technologies
  - Windows: (>$50 B) low-e>>photochromics>>electrochromics
  - Lighting: (>$300 B) incandescent>>fluorescent>>solid state
  - Storage: (>$300 B) batteries>>high-performance capacitors
  - Building Integrated Photovoltaic Systems (~$300 B potential)
- Semiconductor-Enabled or platform technologies
  - Information and communication technologies (ICT)
  - Electricity grid modernization
  - Building automation/control systems
- Business models
  - Project development for CHP systems (>$50 B potential)
  - Recycled energy development (> $100 B potential)
  - Performance contracting (~$5 B/yr)
  - Smart grid technologies (~$500 to $800 B potential)
  - Utility program delivery (~$2 B/yr)

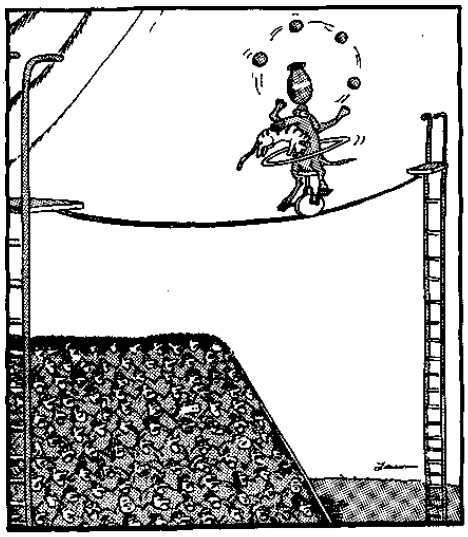
ACEEE
American Council for an Energy-Efficient Economy

Note: all dollars values presented here are only intended to provide working estimates of scale rather than precision. New and more reliable values to be developed by mid-June 2009.

The Good News About Energy Efficiency Investments and Climate Change Policies

- It is does not have to be about ratcheting down our economy;
- Rather, it can be all about:
  - using innovation and our technological leadership;
  - investing in more productive technologies (including both existing and new technologies); and
  - developing new ways to make things, and new ways to get where we want to go, where we want to work, and where we want to play.
- ***Most previous economic studies appear to assume the former – to the detriment of smart energy and climate policy.***

ACEEE
American Council for an Energy-Efficient Economy



High above the hushed crowd, Rex tried to remain focused. Still, he couldn't shake one nagging thought: He was an old dog and this was a new trick.

The difficulty lies not with the new ideas, but in escaping the old ones. . . .

John Maynard Keynes

Contact Information

John A. "Skip" Laitner
Director, Economic and Social Analysis
jslaitner@aceee.org

American Council for an Energy-Efficient Economy (ACEEE)
National Press Building
529 14th Street NW, Suite 600
Washington, DC 20045
o: (202) 507-4029

For more information and updates visit:
http://www.aceee.org

Dr. Holmes Hummel

After serving as a Congressional Science Fellow, Dr. Hummel launched a popular Climate Policy Design Pro-Series that has won praise from professionals at utilities, investment firms, and entrepreneurial start-ups. Prior to moving to Washington, D.C., Dr. Hummel designed corporate energy strategies for clients of the energy intelligence software firm Itron and later consulted with the Google Energy & Climate team. Recognized by the Environmental Leadership Program as a “visionary, action-oriented” emerging leader, Dr. Hummel leverages expertise in technology analysis and strategy to benefit change-makers in both the public and private sector working toward a clean energy economy.

Rules Make Markets:
Outlook for Financing Energy Efficiency

Prepared for the
Energy Efficiency Finance Forum
San Francisco, CA
April 24, 2009

Holmes Hummel, PhD
hummel@stanfordalumni.org

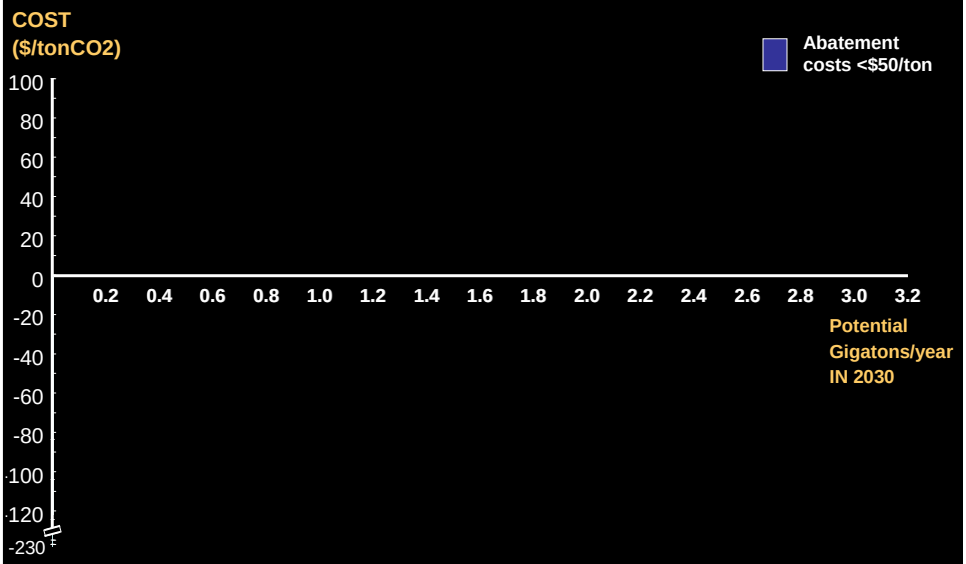
Rules Make Efficiency Markets

- Moving from Stranded Potential to Seized Potential

- Major Movements: Opening Opportunity

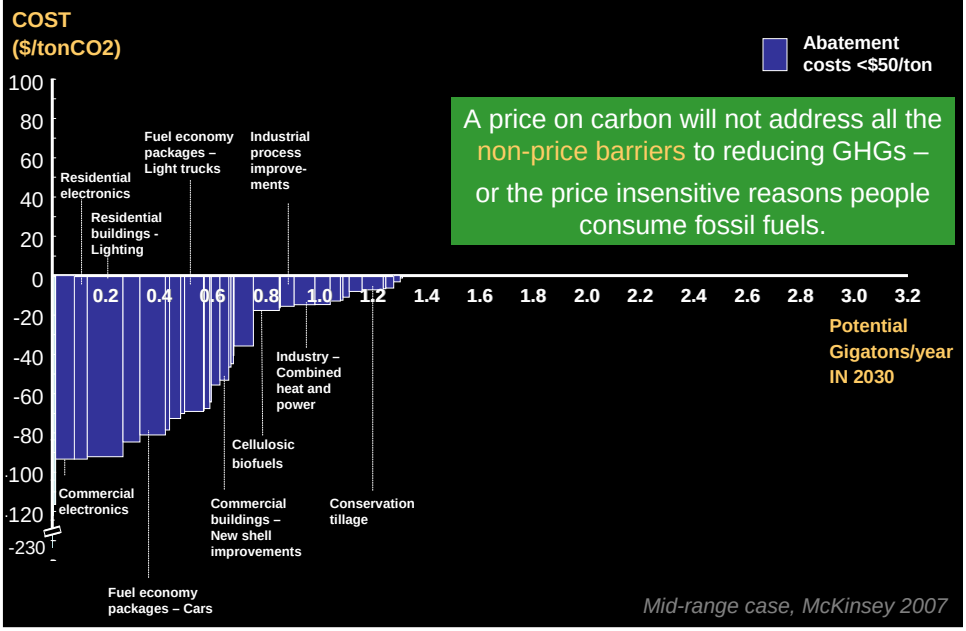
- Efficiency Financing – Driven by Climate Policy

Rules Make Markets.



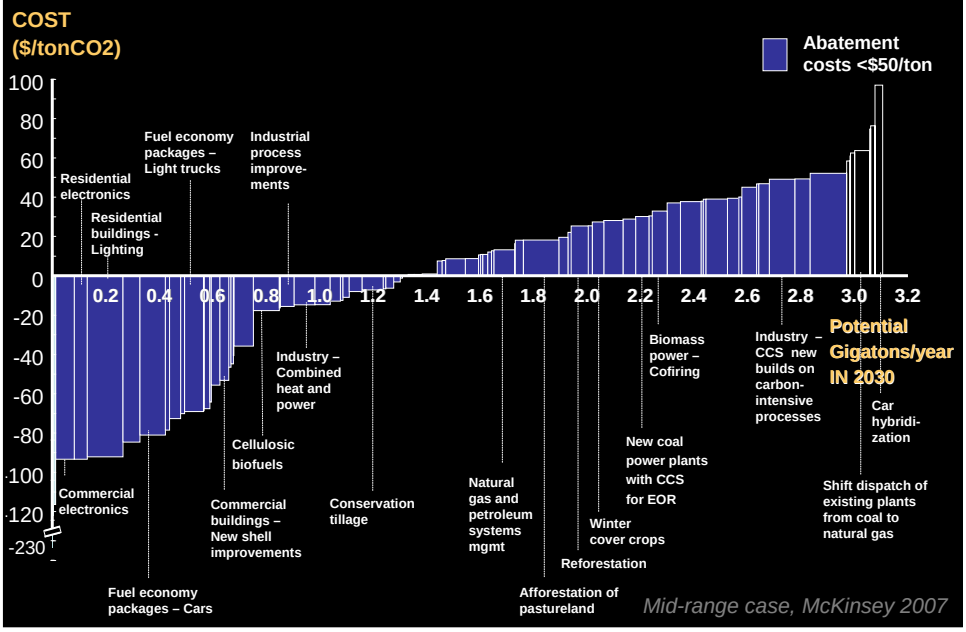
Mid-range case, McKinsey 2007

Rules Make Markets.

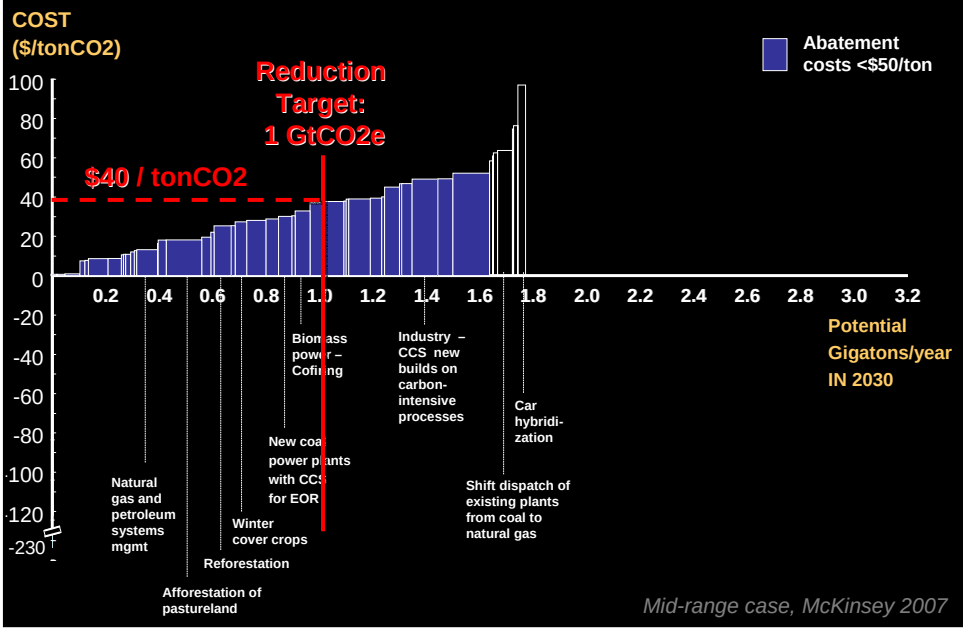


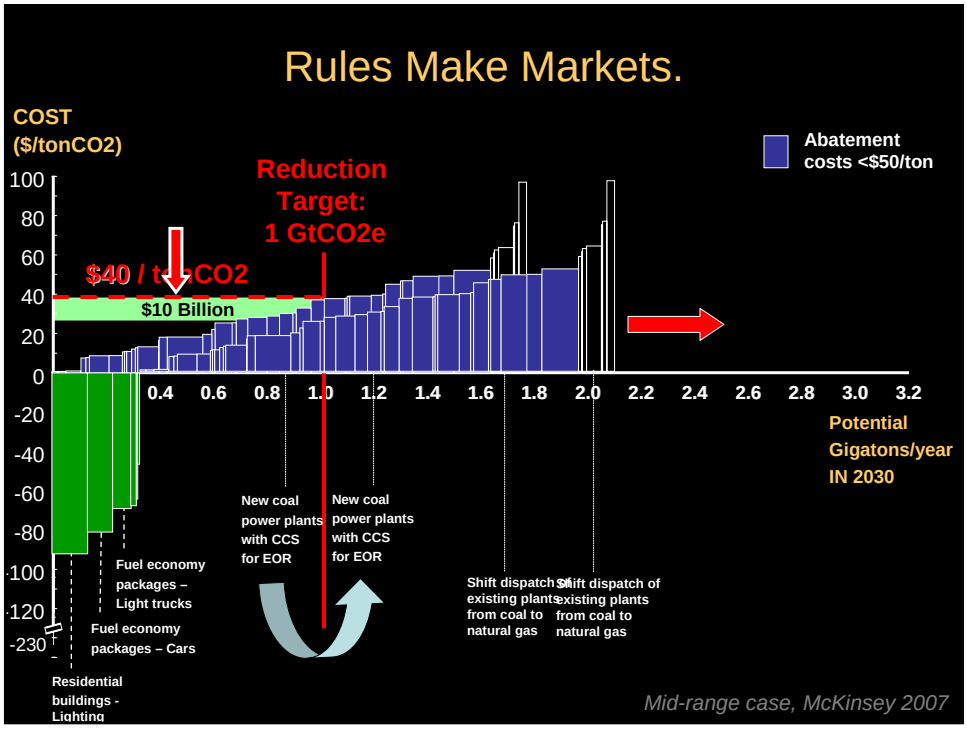
Mid-range case, McKinsey 2007

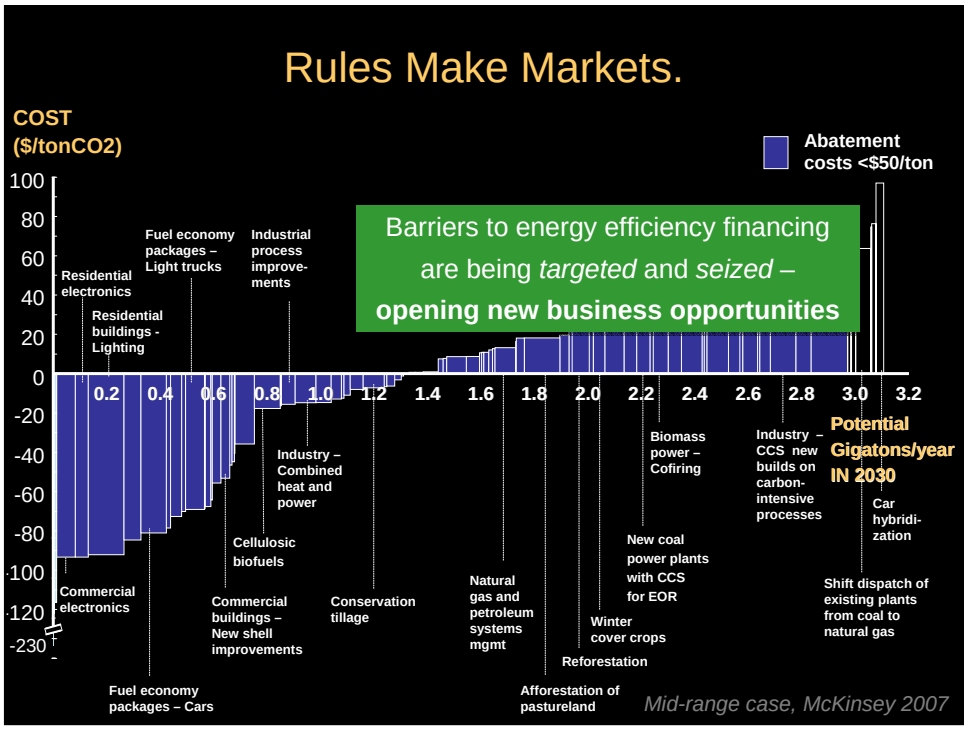
Rules Make Markets.



Rules Make Markets.



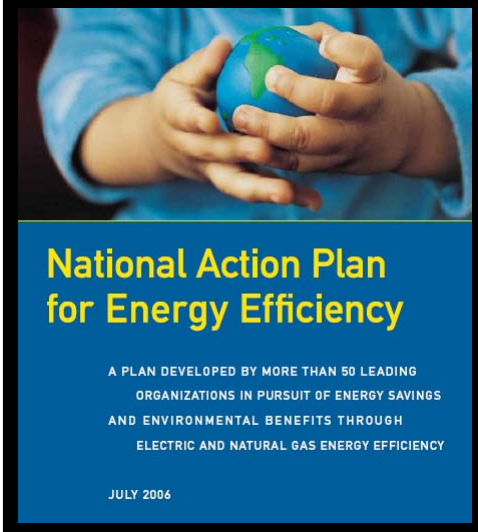

Rules Make Markets.
COST ($/tonCO2)
Abatement costs <$50/ton
Reduction Target: 1 GtCO2e
$40 / tonCO2
$10 Billion
100
80
60
40
20
0
-20
-40
-60
-80
-100
-120
-230
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0
3.2
Potential Gigatons/year IN 2030
Residential buildings - Lighting
Fuel economy packages – Cars
Fuel economy packages – Light trucks
New coal power plants with CCS for EOR
New coal power plants with CCS for EOR
Shift dispatch of existing plants from coal to natural gas
Shift dispatch of existing plants from coal to natural gas
Mid-range case, McKinsey 2007


Rules Make Markets.
COST ($/tonCO2)
Abatement costs <$50/ton
Barriers to energy efficiency financing are being *targeted* and *seized* – **opening new business opportunities**
100
80
60
40
20
0
-20
-40
-60
-80
-100
-120
-230
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0
3.2
Potential Gigatons/year IN 2030
Residential electronics
Residential buildings - Lighting
Fuel economy packages – Light trucks
Industrial process improve-ments
Commercial electronics
Fuel economy packages – Cars
Commercial buildings – New shell improvements
Cellulosic biofuels
Industry – Combined heat and power
Conservation tillage
Natural gas and petroleum systems mgmt
Afforestation of pastureland
Reforestation
Winter cover crops
New coal power plants with CCS for EOR
Biomass power – Cofiring
Industry – CCS new builds on carbon-intensive processes
Car hybridi-zation
Shift dispatch of existing plants from coal to natural gas
Mid-range case, McKinsey 2007

Rules Make Efficiency Markets

- Moving from Stranded Potential to Seized Potential
- Major Movements: Opening Opportunity
- Efficiency Financing – Driven by Climate Policy

Major Movements: Opening Opportunity



- Market barriers
  – split incentives & transaction costs
- Customer barriers
  – lack of information & capital
- Public policy barriers
  – reward formula for utilities
- Utility, state, and region planning barriers
  – EE not integrated in planning
- Energy efficiency program barriers
  – limited reach, investment

Major Movements: Opening Opportunity

Strategies for the Commercialization and Deployment of Greenhouse Gas Intensity-Reducing Technologies and Practices

January 2009

Climate Change Technology Program
Dept of Energy

Barrier Category	Sub-barriers
Cost Effectiveness	• High Costs • Technical Risks • Market Risks • External Benefits and Costs • Lack of Specialized Knowledge
Fiscal Barriers	• Competing Fiscal Priorities • Fiscal Uncertainty
Regulatory Barriers	• Competing Regulatory Priorities • Regulatory Uncertainty
Statutory Barriers	• Competing Statutory Priorities • Statutory Uncertainty
Intellectual Property Barriers	• IP Transaction Costs • Anti-competitive Patent Practices • Weak International Patent Protection • University, Industry, Government Perceptions
Other Barriers	• Incomplete and Imperfect Information • Infrastructure Limitations • Industry Structure • Misplaced Incentives • Policy Uncertainty

Major Movements: Opening Opportunity

Strategies for the Commercialization and Deployment of Greenhouse Gas Intensity-Reducing Technologies and Practices

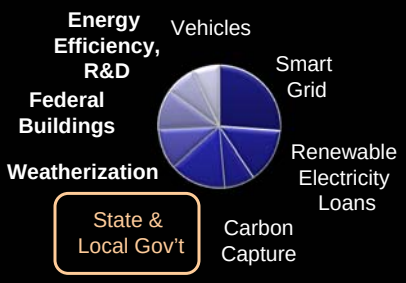
Climate Change Technology Program
Dept of Energy

CCTP Goal Area	Technology Strategies	Education, labeling and information dissemination	Tax policy and other financial incentives	Market conditioning including government procurement	Technology demonstration	Codes and standards	Legislative act of regulation	Risk mitigation
Energy End-Use and Infrastructure	Transportation	54	29	16	12	10	7	1
	Buildings	58	21	20	6	14	6	3
	Industry	45	14	4	6	2	1	2
	Electric Grid and Infrastructure	19	7	4	6	1	3	1

Major Movements: Opening Opportunity

Recovery Act

$16 Billion for EERE



Section 410: To receive full fundin

Governor must certify that the following *will occur*:

1.Prioritization of energy efficiency & renewable energy

2.Adoption of 2007 building codes

3.Earnings opportunities for utilities for delivery of efficiency

Rules Make Efficiency Markets

- Moving from Stranded Potential to Seized Potential
- Major Movements: Opening Opportunity
- Efficiency Financing – Driven by Climate Policy

America's Climate & Energy Security Act

Electricity

Energy Efficiency Resource Standard

Smart Grid / Peak Demand Reduction Incentives

Renewable Electricity Standards (25% by '25)

Emissions Standard for New Power Plants

Wires Charge for Carbon Sequestration Development

Long-Term (Green) Power Purchase Authority for Federal Gov't

Transportation

Low Carbon Fuel Standard

State Transportation Efficiency Plans

America's Climate & Energy Security Act

End-Use Efficiency

Building Codes

Lighting & Appliance Standards

Industrial Efficiency Standards

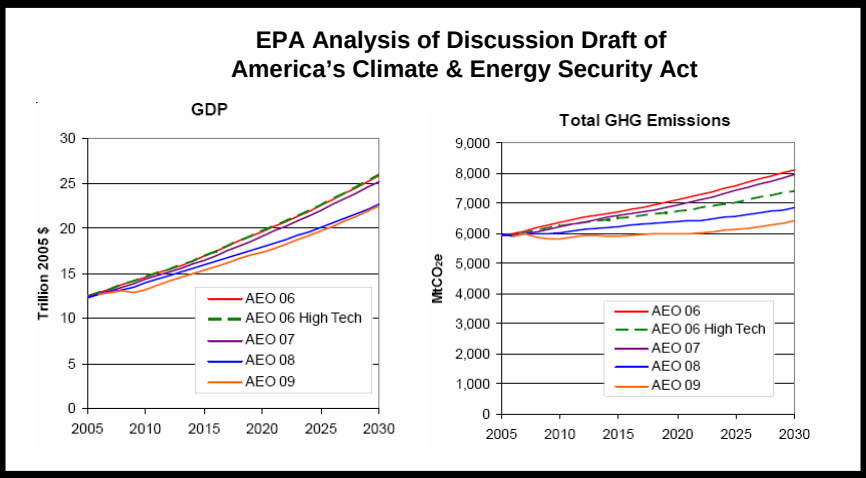
Best-In-Class Product Incentives

All of the Above

State Energy & Environment Development (SEED) Fund

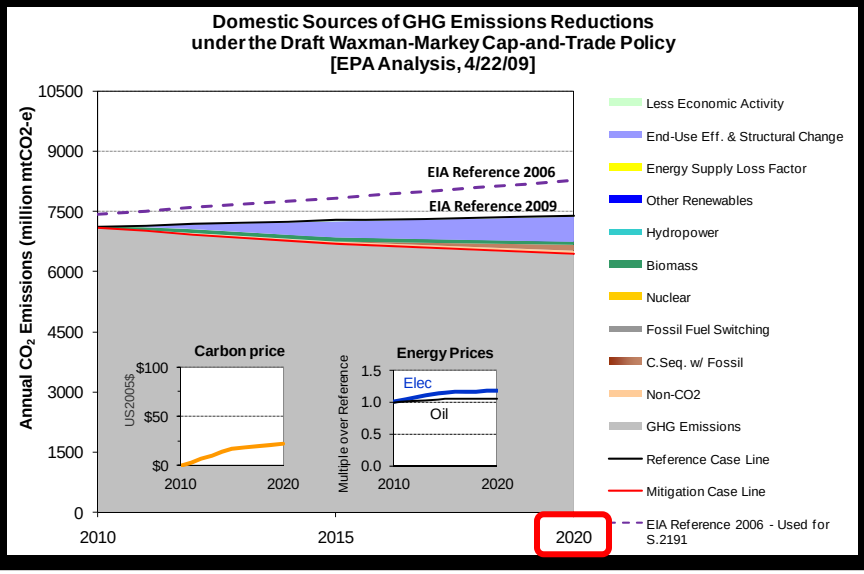
Can Channel Funds After the Recovery Act…

Efficiency & Renewables Policies are Driving Down Emissions and a Price on Carbon

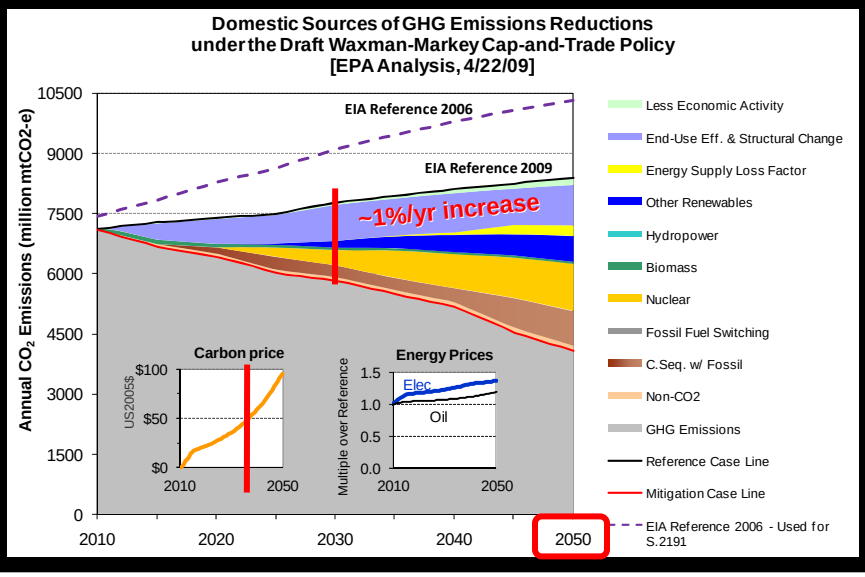


The reduction in **GHG** emissions across forecasts is even larger than **GDP**, showing that significant down payments on our energy and climate objectives have been made through the **Energy Independence & Security Act** and state actions.

EPA Analysis of ACESA (Waxman-Markey) Indicates **2/3** of Mitigation to **2020** Target is **Demand Reduction**



Efficiency & Renewables Policies are Driving Down Emissions and a Price on Carbon



Rules Make Markets:
Outlook for Financing Energy Efficiency

Prepared for the
Energy Efficiency Finance Forum
San Francisco, CA
April 24, 2009

Holmes Hummel, PhD
hummel@stanfordalumni.org