
Presentations

The Philomathia Foundation Symposium at
Berkeley: Pathways to a Sustainable Energy Future

OCTOBER 1-2, 2010
9 A.M.-5 P.M. BOTH DAYS (DOORS OPEN AT 8:30 A.M.)

BERKELEY REPERTORY THEATRE

*The symposium is free and open to the public.
Registration was required.*

INTRODUCTIONS

Welcome

Graham Fleming, Vice Chancellor for Research, UC Berkeley

Climate Change and Human Usage of Energy - slides

Ralph Cicerone, President, National Academy of Sciences

Cicerone will give an overview of the physical basis of human-caused climate change and present observational data on temperatures, sea level and ice losses to demonstrate its linkage with energy usage (fossil fuels).

Environment

KEYNOTE ADDRESS:

The Velocity of Climate Change - slides

Chris Field, Co-chair, IPCC Working Group 2: Impacts, Adaptation, and



Vulnerability

The schedule for smart actions on responding to climate change depends on a number of time scales. The rate of temperature change is important, but so are the time scales of ecological and societal responses. The rate of climate change sets a pace for spatial shifts in species and ecosystems and for development of adaptation strategies by individuals, enterprises, and nations. Critical interactions with the underlying rate of climate change come from the rate at which affected systems perceive that climate is changing and convert that perception into action. Other critical interactions come from the time required to retire existing infrastructure and to develop, deploy, and scale new technologies, with costs and benefits that depend strongly on temporal and spatial scale.

PRESENTATIONS:

Advancing Climate Science for a Sustainable Energy Future - slides
William D. Collins, Head, Climate Science Department, Berkeley Lab

Given the scale of human activity, climate, energy, and land use are now tightly coupled in the Earth system, and advanced capabilities for integrated earth systems modeling are very much needed. Collins will present the development of a new integrated earth system model (iESM) in which socioeconomic and energy technology components of integrated assessment models are embedded into the fully coupled land surface-climate model. He will also discuss recent advances in our understanding of regional climate change, climate extremes and abrupt climate change.

Gauging Ecosystem Response - slides

Charles Marshall, Director, University of California Museum of Paleontology

How can we gauge the response of the biosphere to changes caused by direct and indirect uses of energy? Using the data from how past ecosystems have responded to past perturbations, Marshall will explore

the following: Are we in a sixth mass extinction? Has the globe experienced climate change with similar rates and magnitudes to those predicted for modern climate change? To what extent can these responses be generalized to the present crisis?

Carbon Capture and Storage: Discovering the Science of Carbon Dioxide - slides

Berend Smit, Professor of Chemistry and Chemical Engineering, UC Berkeley

Many energy scenarios indicate that we will continue to rely on fossil energy and, as a consequence, continue to emit carbon dioxide. Only if we capture and store the carbon dioxide can we mitigate its effects on the environment. However, carbon capture and storage (CCS) comes with a price. Smit will show some examples of state-of-the-art science that could be used to reduce the energy penalty of capture and the uncertainties associated with geological storage of carbon dioxide.

Verifying Climate Treaties - slides

Inez Fung, Director, Berkeley Institute of the Environment, UC Berkeley

Precise and ambitious goals to cut greenhouse gas emissions have been proposed by the United States, the State of California, UC Berkeley and many other entities. Virtually all planning and rule-making under consideration regulate activities – e.g., increased planting of forests, vehicle fuel efficiency standards – with the unproven presumption that changes in these activities will reduce greenhouse gas emissions and slow global warming. "Trust but verify." Fung will review current methods and discuss new approaches for estimating and verifying greenhouse gas emissions at different spatial (national, regional, global) and temporal (annual to decadal) scales. This research project is in collaboration with Ronald C. Cohen, Professor of Chemistry and Earth and Planetary Sciences and Director of the Berkeley Atmospheric Science Center.

Energy Supply

KEYNOTE ADDRESS:

Innovations in Energy Technologies – The Role of ARPA-E - slides
Arun Majumdar, Director, DOE Advanced Research Projects Agency-
Energy (ARPA-E)

We are living through a Sputnik moment in our history, as we have witnessed multiple wake up calls with regard to the need for innovating in energy technologies. ARPA-E was created to address this need with a mission to reduce energy imports, reduce energy-related emissions, improve energy efficiency of all economic sectors, and to ensure technological leadership for the United States. This mission is at the core of our national, economic and environmental security. Majumdar will describe what ARPA-E has done so far and how it is planning for the future, both in terms of technologies as well as an organization.

PRESENTATIONS:

Bioenergy - slides

Chris Somerville, Director, Energy Biosciences Institute and Philomathia
Professor of Alternative Energy, UC Berkeley

The Energy Biosciences Institute (EBI) was formed to explore the applications of modern biology to the energy sector. Since starting up at the beginning of 2008, the EBI has engaged more than 700 academics at UC Berkeley, Berkeley Lab and the University of Illinois in exploring that mandate. Somerville will outline some of the main themes that have emerged and place the research in context regarding the challenges associated with developing sustainable sources of energy.

Chemical Strategies for Converting Biomass to Fuels - slides

Alex Bell, Professor of Chemical Engineering, UC Berkeley

Bell's talk will focus on how biomass can be disassembled and converted into products compatible with gasoline and diesel without completely destroying the chemical structures present in the starting material.

The Joint BioEnergy Institute: Start-up for Advanced Biofuels - slides
Jay Keasling, CEO, Joint BioEnergy Institute, Professor of Chemical Engineering and Bioengineering, UC Berkeley

Keasling will review recent research at the Joint BioEnergy Institute, a DOE Bioenergy research center that is modeled off Silicon Valley-type start-up companies and uses synthetic biology and other cutting edge technologies to fast-track the development of advanced and sustainable biofuels.

The Carbon Cycle 2.0 Initiative at the Berkeley Lab

Paul Alivisatos, Director, Berkeley Lab

Paul Alivisatos will highlight Carbon Cycle 2.0, a Berkeley Lab initiative encompassing a broad range of energy and climate modeling research aimed at correcting the imbalance in the carbon cycle that has resulted from human activity emitting more carbon into the atmosphere than natural processes are able to remove.

Energy demand

KEYNOTE ADDRESS:

Energy Efficiency and Customer Demand Response to Time-Dependent Electricity Pricing - slides

Art H. Rosenfeld, Commissioner, California Energy Commission

US energy bills for all end uses in 2007 were \$1.2 trillion but had we followed the 'Business As Usual' trend and not responded to heightened oil prices and to energy awareness triggered by the 1973 OPEC oil embargo, we would have spent \$2.1 trillion. So our improved energy intensity is saving nearly one trillion dollars annually. California's response has been even more striking. Rosenfeld will discuss briefly the contribution of building and appliance standards, and California utility efficiency programs to these savings; and a new, profitable, measure to delay global warming: If a roof is flat it should be white (already

prescribed in California since 2005), if sloped (so visible from the street), and summers are hot, it should be "cool colored." California electric demand response on the customer side of 12 million smart meters, where the residential customer is probably represented by a smart pre-programmed communicating thermostat and commercial customers by a similar pre-programmed communicating energy management control system.

Presentations:

Energy Efficient Electronic Systems - slides

Jeff Bokor, Professor of Electrical Engineering and Computer Sciences, UC Berkeley

Bokor will present revolutionary concepts and scientific principles that would enable fundamentally new and different science for digital information processing, in order to radically reduce energy consumption. The focus will be at the heart of information processing, the basic logic switch, and the short-to-medium range communication of information between logic elements.

New Materials for the Energy Landscape - slides

R. Ramesh, Professor of Materials Science and Engineering, UC Berkeley

Ramesh will present the perspective that new materials and materials-related discoveries are the key to making quantum jumps in four key aspects of the energy landscape -- energy conversion, energy storage, efficiency of thermal systems and carbon dioxide capture.

Efficient Supply-Following Loads: The Key to a Cooperative Grid - slides

David Culler, Chair, Computer Science Division, UC Berkeley

Culler will highlight the technology and techniques for energy efficient operation of major electrical power consumers, such as buildings and industrial processes, that adapts to the availability of renewable

resources and thereby increases the penetration limit non-carbon supplies on the grid.

EcoBlocks: Creating Sustainable Neighborhoods in China - slides
Harrison Fraker, Professor of Architecture and Urban Design, UC Berkeley

Fraker will describe a prototype of a regional EcoBlock that uses an integrated whole-systems approach to generate energy from on-site renewables, recycle all of its water used, and recycle over 80 percent of its waste for onsite uses. The EcoBlock's whole-systems approach is flexible and adaptable to multiple local conditions and climates and is widely replicable as a new design of an integrated region/city.

Policy

KEYNOTE ADDRESS:

Policy Leadership to Achieve the Sustainable Energy Future - slides
Dian M. Grueneich, Commissioner, California Public Utilities Commission

Commissioner Grueneich will summarize key policies that California, other states and countries are using toward a sustainable energy future. California's leadership role in energy efficiency and renewables will be highlighted. Grueneich will discuss the gaps in current energy and climate policies and highlight key areas needing focused improvement. She will conclude with a vision of what is needed at the policy level to make sustainable energy a way of life.

PRESENTATIONS:

Fossil Fuel Supply and the Greenhouse Gas Market - slides
Severin Borenstein, Co-director, Energy Institute at Haas, UC Berkeley

Pricing greenhouse gases would reduce emissions efficiently by allowing the market to procure emissions abatement from whoever can abate most cheaply. The cost of abatement through reduced use of fossil fuels, however, moves inversely with the price of fossil fuels. A serious worldwide effort to reduce greenhouse gases would drastically lower the price of oil and significantly depress natural gas prices. Cheap fossil fuels mean that greenhouse gas prices will have to be higher in order to drive fossil fuels out of the market, much higher than current prices in the European Union or those envisioned in the United States.

Communications Strategies behind U.S. Climate Policies

Robert Collier, Visiting Scholar, UC Berkeley

What are the communications strategies behind U.S. climate policies? No matter the location or particular policy, the results seem to have been similar in the past two years. Public support for serious legislative action on climate and energy is decreasing. Even the Gulf oil spill has failed to spark increased public support for action, with much less impact than the 1989 Exxon Valdez spill or the 1969 Santa Barbara spill. Collier will discuss some overall reasons for the lagging public support.

Innovating to a Low-Carbon Economy

Dan Kammen, Director, Renewable and Appropriate Energy Laboratory, UC Berkeley

A dramatic acceleration of the transition to a low-carbon, job-creating, sustainable economy is needed for energy security, economic competitiveness, equity, and global environmental quality. To achieve this new 21st-century economy, dramatic changes in the process and pace of energy technology, energy efficiency, energy systems science, and policy innovation will be needed. Kammen will address assets in the research and development to deployment pipeline, and gaps that must be addressed to achieve this economic transformation.

Policies to Promote Energy Efficiency

Catherine Wolfram, Co-director, Energy Institute at Haas, UC Berkeley

Energy efficiency is often billed as one of the most cost-effective methods to reduce fossil fuel use, yet, in many cases, consumers have been slow to adopt energy-saving alternatives. Wolfram will discuss some explanations for the slow take-up of energy efficiency, focusing on the U.S. residential sector. She will also highlight some difficulties in obtaining reliable measures of the savings achieved with energy efficiency investments what our current state of knowledge implies for policy.

UC Berkeley

RESEARCH HIGHLIGHTS

Excellence in Research
Innovation/Entrepreneurship
Data Science
Energy, Climate & Environment
International & Area Studies
Health

FIND EXPERTISE

Faculty Expertise
Research Units

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Vice Chancellor Yelick
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Funding Opportunities
Grant Life Cycle
Research Development Office

ENSURE COMPLIANCE

Research Policies and Administration
IP & Tech Transfer

LOCATE FACILITIES

Core Facilities
Research Infrastructure Commons
Research Computing
Reserves, Field Stations & Museums

FOR VCR UNITS

ORU Policy
VCRO HR Resources

