

International Symposium on Near-Term Solutions for Climate Change Mitigation in California

2007

2008

2009

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March 5 - 7, 2007
Byron Sher Auditorium
Cal/EPA Headquarters
1001 I Street, Sacramento

SYMPOSIUM PROGRAM
California Environmental Protection Agency
Air Resources Board



International Symposium on Near-Term Solutions for Climate Change Mitigation in California

March 5 - 7, 2007

CONTENTS

WELCOME LETTER	1
AGENDA AT A GLANCE	2
CONFERENCE AGENDA	3
SPEAKER AND MODERATOR BIOGRAPHIES	7

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Linda S. Adams
Secretary for
Environmental Protection

Air Resources Board

Robert F. Sawyer, Ph.D., Chair
1001 I Street • P.O. Box 2815
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Arnold Schwarzenegger
Governor

Dear Colleagues,

On behalf of the California Air Resources Board, welcome to Sacramento and the *International Symposium on Near-Term Solutions for Climate Change Mitigation in California*.

Evidence is overwhelming that human activities are inducing changes in the earth's climate. Observed impacts on California include higher average temperatures, a rise in sea level, a decrease in the Sierra Nevada snow pack and earlier spring run-off. These impacts are predicted to intensify and will affect many aspects of California agriculture, air quality, forestry, and ecosystem health. California has proactively assumed an environmental leadership role to address these issues. In 2005, Governor Schwarzenegger's Executive Order established greenhouse gas emission reduction targets. The California Global Warming Solutions Act of 2006 then set the Governor's reduction target in statute. The Climate Action Team, a multi-agency team chaired by the Cal/EPA Secretary evaluates strategies to meet the Governor's emission reduction targets. The California Air Resources Board (CARB) is charged with working with the Climate Action Team as well as a broad spectrum of stakeholders to develop a comprehensive program to meet the ambitious emission reduction targets established by the Legislature and the Governor.

The objective of this symposium is to identify technologically feasible and cost-effective strategies for reducing greenhouse gas emissions with an emphasis on identifying regulatory or non-regulatory actions that can be implemented in the near-term. We want to absorb the lessons learned from others and identify potential mitigation strategies that may apply to California. The symposium agenda is organized by pollutant to parallel the structure of the California greenhouse gas emission inventory. Topics covered during the symposium generally reflect the largest sources reported in the inventory.

It is clear that the threat posed by climate change is very real and calls for identifying and implementing a suite of creative strategies. Your participation in this symposium will ensure its success and assist CARB in defining near-term actions that Californians can take to reduce their emissions of greenhouse gases.

Sincerely,

Robert F. Sawyer, Ph.D.
Chair

AGENDA AT A GLANCE

MONDAY MARCH 5	TUESDAY MARCH 6	WEDNESDAY MARCH 7
<p>11:00 am Registration Opens</p>	<p>7:30 am Registration Opens</p>	<p>8:00 am Registration Opens</p>
<p>1:00 pm Welcome and Introduction <i>Robert F. Sawyer, Ph.D.</i> <i>Chair, California Air Resources Board</i></p> <p><i>Secretary Linda S. Adams</i> <i>California Environmental Protection Agency</i></p>	<p>8:00 am Methane Mitigation <i>Overview</i> <i>Landfills</i> <i>Manure Management</i> <i>Wastewater Treatment</i></p>	<p>8:30 am Control Programs in Other Countries <i>Australia</i> <i>Canada</i> <i>Germany</i> <i>Japan</i></p>
<p>1:30 pm Carbon Dioxide Mitigation (Section 1) <i>Overview</i> <i>Transportation Industry</i></p>	<p>10:15 am Break</p> <p>10:35 am Nitrous Oxide Mitigation <i>Agricultural Soil Management</i> <i>Nitrogen Fertilization</i> <i>Manure Management</i></p>	<p>10:20 am Break</p> <p><i>Mexico</i> <i>United Kingdom</i> <i>Early Reduction Opportunities</i></p>
<p>3:00 pm Break</p>	<p>12:20 pm Lunch</p>	<p>12:00 pm Lunch</p>
<p>3:20 pm Carbon Dioxide Mitigation (Section 2) <i>Electricity Generation</i> <i>Residential and Commercial</i></p>	<p>1:30 pm High-GWP Gas Mitigation (Section 1) <i>Overview</i> <i>Stationary Sources</i> <i>Mobile Sources</i></p>	<p>1:30 pm International Roundtable on Implementing Policy and Concluding Remarks</p>
<p>4:50 pm Summation</p>	<p>3:10 pm Break</p> <p>3:30 pm High-GWP Gas Mitigation (Section 2) <i>Perfluorocarbons</i> <i>Sulphur Hexafluoride</i></p>	<p>3:30 pm End of Symposium</p>
	<p>4:30 pm Summation</p>	

CONFERENCE AGENDA

MONDAY, MARCH 5

11:00 am – 3:00 pm

Registration

1:00 pm – 1:05 pm

Welcome & Housekeeping Announcements

INTRODUCTION AND BACKGROUND

1:05 pm – 1:25 pm

Robert F. Sawyer, Ph.D.

Chair, California Air Resources Board

Linda S. Adams

Secretary for California Environmental Protection Agency

NEAR-TERM SOLUTIONS FOR MITIGATION OF CARBON DIOXIDE

1:25 pm – 1:30 pm

Opening Remarks

Moderator: Dr. Art Rosenfeld

Commissioner, California Energy Commission

1:30 pm – 2:00 pm

Overview

Energy Efficiency and Cool Communities Come First – Programs and Examples

Dr. Art Rosenfeld

Commissioner, California Energy Commission

2:00 pm – 2:30 pm

Transportation

Options to Reduce Greenhouse Gas Emissions from Road Transport

Dr. Axel Friedrich

Head, Environment, Transport, and Noise Division, German Environmental Protection Agency

2:30 pm – 3:00 pm

Industry

Near-Term Solutions for Mitigation of Industrial Sector Carbon Dioxide Emissions in California

Lynn Price

Scientist and Deputy Group Leader, International Energy Studies Group, Energy Analysis Department, Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory

3:00 pm – 3:20 pm

Break

3:20 pm – 3:50 pm

Electricity Generation

Combined Heat and Power: A Proven Strategy for Cost-Effective Carbon Dioxide Emission Reductions

Kim Crossman

Team Leader, U.S. Environmental Protection Agency Combined Heat and Power Partnership

3:50 pm – 4:50 pm

Residential and Commercial

The Continuing Evolution of Sustainable Facilities at Wal-Mart

Charles Zimmerman

Vice President, Prototype and New Format Development, Wal-Mart Stores, Inc.

4:50 pm – 5:00 pm

Summation

CONFERENCE AGENDA

TUESDAY, MARCH 6 (MORNING)

7:30 am – 9:00 am

Registration

8:00 am – 8:05 am

Welcome & Housekeeping Announcements

NEAR-TERM SOLUTIONS FOR MITIGATION OF METHANE

8:05 am – 8:10 am

Opening Remarks

*Moderator: Mark Leary
Executive Director, California Integrated
Waste Management Board*

8:10 am – 8:40 am

Overview

Methane Capture and Use: A Proven Near-Term Solution for Reducing Greenhouse Gas Emissions

*Chris Voell
Program Manager, Climate Change Division,
U.S. Environmental Protection Agency*

8:40 am – 9:10 am

Landfills

Mitigation of Greenhouse Gas Emissions from Landfills

*Mark McDannel
Supervising Engineer, Los Angeles County
Sanitation Districts*

9:10 am – 9:40 am

Manure Management

Mitigating Methane Emissions from Dairies – The California Challenge

*Allen Dusault
Program Director of Sustainable Agriculture,
Sustainable Conservation*

9:40 am – 10:10 am

Wastewater Treatment

City of Millbrae Grease Receiving and Cogeneration Project

*Greg Chung, P.E.
Kennedy/Jenks Consultants*

10:10 am – 10:15 am

Summation

10:15 am – 10:35 am

Break

NEAR-TERM SOLUTIONS FOR MITIGATION OF NITROUS OXIDE (N₂O)

10:35 am – 10:40 am

Opening Remarks

*Moderator: Cynthia L. Cory
Director, Environmental Affairs, California
Farm Bureau Federation*

10:40 am – 11:10 am

Agricultural Soil Management

Management Practices to Mitigate N₂O Emissions from Agricultural Soils

*Dr. Ardell D. Halvorson
Soil Scientist, Agricultural Research Service,
U.S. Department of Agriculture*

11:10 am – 11:40 am

Nitrogen Fertilization

Mitigating N₂O Emissions through Alternative Management Practices with Fertilizer Use

*Dr. Changsheng Li
Complex Systems Research Center, Institute
for the Studies of Earth, Oceans, and Space;
University of New Hampshire - Durham*

11:40 am – 12:10 pm

Manure Management

Mitigation Solutions for Nitrous Oxide Emissions from Animal Waste

*Dr. Frank Mitloehner
Director, Agricultural Air Emission Center,
Animal Science Department, University of
California, Davis*

12:10 pm – 12:20 pm

Summation

12:20 pm to 1:35 pm

Lunch

CONFERENCE AGENDA

TUESDAY, MARCH 6 (AFTERNOON)

NEAR-TERM SOLUTIONS FOR MITIGATION OF GASES WITH HIGH GLOBAL WARMING POTENTIAL

1:35 pm – 1:40 pm

Opening Remarks

Moderator: *Kevin J. Fay*
Executive Director, International Climate Change Partnership

1:40 pm – 2:10 pm

Overview

Overview of High-GWP Gases and Mitigation Options

David S. Godwin, P.E.
Stratospheric Protection Division, Alternatives and Emissions Reduction Branch, U.S. Environmental Protection Agency

2:10 pm – 2:40 pm

Stationary Sources

How to Limit Significantly Direct and Indirect Emissions of GHGs in Commercial Refrigeration

Dr. Denis Clodic
Deputy-Director, Center for Energy and Processes, Ecole des Mines De Paris, France

2:40 pm – 3:10 pm

Mobile Sources

Opportunity for Reducing GHG Emissions from Mobile Air Conditioning

Kristen Taddonio, Manager
Strategic Climate Projects, U.S. Environmental Protection Agency

Elvis Hoffpaur

President and COO, Mobile Air Conditioning Society

Ward Atkinson

Sun Test Engineering

3:10 pm – 3:30 pm

Break

3:30 pm – 4:00 pm

Perfluorocarbons and Sulphur Hexafluoride Perfluorocarbon Emissions Reduction in the Semiconductor Industry

Dr. Sébastien Raoux
President & CEO, Transcarbon International Corporation

4:00 pm – 4:30 pm

Technologies and Approaches to Reduce Sulfur Hexafluoride (SF₆) Emissions in Electric Transmission

Sven Thesen
Supervisor, Electric Drive Group, Pacific Gas and Electric

4:30 pm – 4:40 pm

Summation

CONFERENCE AGENDA

WEDNESDAY, MARCH 7

8:00 am – 9:00 am

Registration

PRESENTATIONS AND DISCUSSION OF CONTROL PROGRAM IN OTHER COUNTRIES

8:30 am – 8:45 am

Opening Remarks

*Moderator: Robert F. Sawyer, Ph.D.
Chair, California Air Resources Board*

8:45 am – 9:10 am

The Australian Experience of Greenhouse Gas Mitigation

*Jean-Bernard Carrasco
Director*

Greenhouse Challenge Plus, Australian Greenhouse Office, Department of the Environment and Water Resources

9:10 am – 9:35 am

Canadian Approach to Climate Change (and Clean Air) Mitigation

*Robert Arnot, P. Eng, M.B.A.
Assistant Director, Energy Technology Policy,
Energy Technology Policy Directorate*

9:35 am – 10:00 am

The German Experience in Climate Change Mitigation

*Dr. Axel Friedrich
Head, Environment, Transport, and Noise Division, German Environmental Protection Agency*

10:00 am – 10:25 am

Japanese Experiences in Greenhouse Gas Emission Mitigation

*Kayo Hayai
Energy Conservation Center*

10:25 am – 10:45 am

Break

10:45 am – 11:10 am

Mitigation Options Identified in the Third National Communication of Mexico

*Israel Laguna, MSc
Deputy Head of Research, the Climate Change Programme, National Institute of Ecology*

11:10 am – 11:35 am

United Kingdom View of Carbon Reduction Policy and Potential in Automotive Sector

*Andrew Whittles
Project Development Manager
CENEX – UK Centre of Excellence for Low Carbon and Fuel Cell Technologies*

11:35 am – noon

Technological Opportunities for Early Emissions Reduction: Lessons from Other Jurisdictions

*Dr. Irving Mintzer
Global Business Network*

noon – 1:30 pm

Lunch

INTERNATIONAL ROUNDTABLE ON IMPLEMENTING POLICY AND CONCLUDING REMARKS

*Moderator: Chuck Shulock
Program Manager for Greenhouse Gas Reduction, California Air Resources Board*

1:30 pm – 3:30 pm

Roundtable Discussion and Concluding Remarks

3:30 pm

End of Symposium

SPEAKER AND MODERATOR BIOGRAPHIES

Linda S. Adams

Secretary for California Environmental Protection Agency

Linda Adams, former director of the California Department of Water Resources, was appointed by Governor Arnold Schwarzenegger in May 2006 as Secretary of the California Environmental Protection Agency – making her the first woman to serve as head of the agency.

As Cal/EPA's Secretary, Adams oversees the environmental activities of the Air Resources Board, California Integrated Waste Management Board, State Water Resources Control Board, Office of Environmental Health Hazard Assessment, Department of Toxic Substances Control, Department of Pesticide Regulation, and the approximately 4,500 employees that serve the state's diverse environmental programs.

During Adams' 32 years of service to the State of California, she has acted in a number of key positions in both the Executive and Legislative branches, most recently as a member of the Central Valley Regional Water Quality Control Board.

Prior to her serving as Director of the Department of Water Resources, Adams joined Governor Davis' staff in 1999 as Chief Deputy Legislative Secretary, where her primary responsibilities were negotiating legislation related to environmental protection and natural resources. Adams' most notable accomplishments include the "Clean Cars/Clean Air" legislation, earning her the "Environmental Hero Award" from the California League of Conservation Voters.

Robert F. Sawyer, Ph.D.

Chair, California Air Resources Board

Robert F. Sawyer, Ph.D., left the University of California as a faculty member to accept the appointment by Governor Schwarzenegger to head the California Air Resources Board in 2006. He had previously served on the Board in the 1970s as the automotive engineer member. Dr. Sawyer also served as a senior policy advisor at the U.S. EPA. He has served on and chaired numerous committees for the National Academy of Sciences and the National Research Council. Dr. Sawyer was president of the International Combustion Institute. He served as chair of the Bay Area Air Quality Management District Advisory Council. He is a Fellow of the Society of Automotive Engineers, Associate Fellow of the American Institute of Aeronautics and Astronautics, and a member of the Air and Waste Management Association, American Society of Mechanical Engineers, and American Association of University Professors.

During his 40-year career at Berkeley as a professor of mechanical engineering, Dr. Sawyer's teaching and research included rocket propulsion, energy conversion, combustion, air pollution, and regulatory policy. He was Vice Chairperson for Graduate Studies of the Department of Mechanical Engineering and Chairperson of the Energy and Resources Group. He is the author or co-author of more than 350 technical publications and two books. Dr. Sawyer was selected to the first Class of 1935 Professor of Energy. He is a graduate of Stanford and Princeton universities. Dr. Sawyer is a recipient of the Berkeley Citation and the American Society of Mechanical Engineers' Soichiro Honda Medal.

SPEAKER AND MODERATOR BIOGRAPHIES

Ward J. Atkinson

Sun Test Engineering

Mr. Atkinson is currently with Sun Test Engineering, a company that provides consulting services to the automotive industry. Sun Test has worked for numerous auto manufacturers in both passenger car and truck divisions. Mr. Atkinson worked for General Motors for 30 years as a staff engineer where he directed divisional and corporate development activities for electrical, engine cooling, heating, ventilation and air conditioning systems for passenger cars and light trucks. He has chaired international committees, given numerous presentations, and received the U.S. EPA Climate Protection Award in both 2003 and 2005.

Robert Arnot

Department of Natural Resources, Canada

Robert has spent the past 20 years working in a variety of public policy development capacities at both the provincial and federal levels, with the majority of his time invested in policy related to air and waste management with an emphasis on sustainability. He has also been actively involved in management system development with a particular focus on performance measures and accountability at central agencies for both levels of government. He holds an undergraduate degree in Chemical Engineering and Masters in Business Administration.

Jean-Bernard Carrasco

Australia Greenhouse Office, Department of the Environment and Water Resources

Jean-Bernard Carrasco is the Director of the Greenhouse Challenge Plus programme – a partnership programme between the Australian Government and industry to monitor, report and reduce greenhouse gas

emissions. The programme is run by the Australian Greenhouse Office, Department of Environment and Water Resources.

Mr. Carrasco joined the Australian Greenhouse Office in 1999 and has worked in a range of programme and policy areas on monitoring, reporting and verifying corporate and project level greenhouse gas emissions. Mr. Carrasco spent three years negotiating Australia's international climate change commitments under the UNFCCC, AP6 and various bilateral climate change partnerships.

Before joining the Australian Greenhouse Office, Mr. Carrasco held a number of positions in other government agencies and private business, and worked in the UK on the UK Government's Energy Efficiency Commitment.

Greg Chung, P.E.

Kennedy/Jenks Consultants

Greg Chung is an Environmental Engineer with Kennedy/Jenks Consultants in Palo Alto, California. He received his Bachelor of Science in Civil Engineering from the University of Hawaii and a Masters of Science in Environmental Engineering from the University of California, Berkeley. He is a licensed Civil Engineer in the State of California and Hawaii. He has over 11 years of experience in a wide range of Civil and Environmental projects but has focused on energy recovery at wastewater treatment plants for the past four years with an emphasis on optimization of anaerobic digestion and biogas utilization.

Denis Clodic, Ph.D.

Ecole des Mines de Paris

Since 1993, Dr. Denis Clodic has been Deputy Director of the Center for Energy and Processes, Ecole des Mines de Paris.

SPEAKER AND MODERATOR BIOGRAPHIES

For the last 22 years, he has been performing R&D work at the Center in the field of Thermodynamics and Heat Transfer. He and his team have developed a number of innovative systems to improve energy efficiency of domestic appliances, commercial refrigeration, heat pumps, and a method for CO₂ capture. A number of those innovative systems are patented. Dr. Clodic is a member of ASHRAE and of the Technical Options Report on commercial refrigeration under the Technical and Economics Assessment Panel (TEAP) of the Montreal Protocol. He is Chapter Lead Author of the IPCC/TEAP 2005 Report, and the author or co-author of a large number of papers and reports on refrigerants, refrigerating systems, and air-conditioning systems. He wrote two books published by ASHRAE, one on refrigerant recovery (1994) and the other on refrigerant containment (1998). He obtained his Ph.D. in Mechanical Engineering at Ecole des Mines de Paris.

Cynthia L. Cory

California Farm Bureau Federation.

Ms. Cory is the Director of Environmental Affairs, Government Affairs Division, for the California Farm Bureau Federation (CFBF), a non-profit agricultural trade association with more than 91,500 members in 53 counties in California. She has been associated with the agricultural community for over 30 years; the past 17 years have been at CFBF working on state and federal matters including air quality, biotechnology, climate change, transportation and renewable bioenergy issues. Ms. Cory has an M.S. in International Agricultural Development and a B.S. in Agronomy. She is also a member of the USDA Agricultural Air Quality Task Force and serves on several advisory committees including the Governor's Environmental Advisory Task Force, the California Energy Commission's Climate Change Advisory Committee, and their Biodiesel Working Group.

Kim Crossman

U.S. Environmental Protection Agency

Ms. Crossman is the Team Leader for the U.S. Environmental Protection Agency (EPA) Combined Heat and Power (CHP) Partnership. She has worked for more than 10 years in the field of energy services including energy engineering and sales, construction project management, and utility demand-side management programs. Prior to coming to U.S. EPA, Ms. Crossman worked as a CHP project developer for commercial, industrial, and institutional facilities in California. Her primary role within the Partnership is as lead strategist in EPA's efforts to decrease the environmental impact of power production by facilitating the deployment of highly efficient CHP and other clean distributed generation projects.

Allen Dusault

Sustainable Conservation

Allen manages the Sustainable Agriculture Program including a renewable fuels initiative which aims to promote sustainably produced biodiesel, biomethane and bioethanol in California. He has been instrumental in 12 new digesters being built in California. He has launched a conservation tillage initiative to transform how irrigated crops are grown in California and is currently developing carbon reduction/offset programs for both row crops and dairies. He has over 20 years of experience in water quality issues, waste management, transportation, agriculture and energy generation that spans the public, private and non-profit sectors. Prior to his current position, he was a consultant to companies and government agencies focusing on cost effective pollution prevention. Allen received an MBA from the University of Redlands, an M.S. in Resource Management from the University of Guelph in Ontario, Canada, and a B.S. in Soil Science from the University of Wisconsin, Madison.

SPEAKER AND MODERATOR BIOGRAPHIES

Kevin J. Fay

International Climate Change Partnership

Mr. Fay, President of Alcalde & Fay, one of the largest independent public affairs firms in the United States, is an internationally recognized expert on environmental and energy issues with particular emphasis on governmental policies involving the atmosphere and climate. He has more than two decades experience of work in the U.S. and with governments around the world on climate change, stratospheric ozone depletion, clean air and energy issues. Mr. Fay has twice been recognized by the U.S. EPA for leadership in global environmental protection. Currently, he serves as Executive Director of the International Climate Change Partnership, a coalition of companies and trade associations working to develop international policies on the global climate change issue. He has also been active as Counsel to the Alliance for Responsible Atmospheric Policy and with the Safe Buildings Alliance. He is a member of the Virginia State Bar. He received his J.D. from American University in Washington DC and is an Honors graduate from the University of Virginia.

Axel Friedrich, Ph.D.

German Environmental Protection Agency

Axel Friedrich currently heads the Environment, Transport, and Noise Division of the German Environmental Protection Agency. Dr. Friedrich was the moving force behind the initial adaptation by Germany, and later Europe, of stringent standards for vehicles and fuels. His willingness to share his knowledge and expertise with the international community has helped reduce air pollution not only in Europe but also the Americas and Asia. Dr. Friedrich has been a moving force in guiding the European Union toward its adaptation and implementation of aggressive programs to address greenhouse gas emissions and global climate change. As the global threats

posed by air pollution became more evident, he helped to launch World Bank programs to reduce air pollution in Asia and Latin America. Dr. Friedrich was awarded the 2006 Haagen-Smit Clean Air Award because of his passionate interest in confronting air pollution and climate change on a global scale with comprehensive and multi-faceted approaches.

Dr. Friedrich is a Technical Chemist from the Technical University of Berlin. He has been with the Umweltbundesamt (UBA), the Federal Environment Agency of Germany for more than 27 years.

David S. Godwin, P.E.

U.S. Environmental Protection Agency

Dave Godwin, an environmental engineer, has been with the Stratospheric Protection Division of the U.S. EPA for six years. The focus of his work is to evaluate and implement alternative technologies and processes to reduce emissions of greenhouse gases and ozone-depleting substances. He works with industry, governments, and other organizations in the phaseout of ozone-depleting substances. He leads reviews of alternative, ozone-friendly refrigerants under the U.S. EPA's Significant New Alternatives Policy (SNAP) Program and models the emission of greenhouse gases, primarily HFCs, used as substitutes for ozone-depleting substances.

Prior to U.S. EPA, Mr. Godwin was with the Air-Conditioning and Refrigeration Institute (ARI) for nine years. Mr. Godwin is a member of ASHRAE and was the chair of ASHRAE's Technical Committee on Global Climate Change. He holds an engineering degree from the University of Pennsylvania and is a registered Professional Engineer.

SPEAKER AND MODERATOR BIOGRAPHIES

Ardell D. Halvorson, Ph.D.

U.S. Department of Agriculture, Agricultural Research Service, Fort Collins, Colorado

Dr. Halvorson has been a Soil Scientist with the USDA-ARS for over 35 years and has held leadership roles such as Research Leader, Laboratory Director, and Lead Scientist during this time. He received the “2006 Soil Science Applied Research Award” from Soil Science Society of America. His research has emphasized the effects of cropping and tillage systems and nitrogen fertility on crop yield, nutrient use efficiency, soil carbon sequestration, economic sustainability, greenhouse gas emissions, and environmental quality. Dr. Halvorson received a B.S. from North Dakota State University in 1967, and a Ph.D. in 1971 from Colorado State University (Agronomy, Soil Chemistry). He is currently with the Soil-Plant-Nutrient Research Unit, USDA-ARS in Fort Collins, CO.

Kayo Hayai

Energy Conservation Center, Japan
(Biography not available at printing)

Elvis Hoffpauir

Mobile Air Conditioning Society

Mr. Hoffpauir is currently President and COO of MACS. He has worked in the automotive air conditioning and cooling industry since 1979, and has been with MACS since it was founded in 1981, first serving as managing director, then vice president and president since July 2000. He has coordinated all of MACS programs and projects, including EPA-mandated certification in refrigerant recycling and service procedures offered by MACS as required by Section 609 of the Clean Air Act, and other technician training offered at annual conventions and service clinics held throughout the U.S. He is a member of the Society of Automotive Engineers and the American Society of Assoc. Executives.

Israel Laguna Monroy

National Institute of Ecology, Ministry of Environment and Natural Resources of Mexico

Mr. Laguna earned a Master’s Degree in Engineering in the energy area in 1998 from the Faculty of Engineering at the National Autonomous University of Mexico. He is a Mechanical Electrical Engineer by that same Institution (1995).

Mr. Laguna has worked for the public, private, and academic sectors. He has been Deputy Director of Mitigation Methods and Studies on Climate Change in the Energy Sector at the National Institute of Ecology (INE) since 2002. In his role as Deputy Director, he is responsible for coordinating, integrating, assessing, and disseminating national research on technologies and methodologies to calculate reductions in GHG emissions, as well as of the emissions inventory. In 2001 he was Head of Department in the Directorate of Climate Change at INE, Coordinator of the Assessment Project for Technologies to Mitigate Greenhouse Gas Effects of the U.S. National Renewable Energy Laboratory Division (NREL) and INE during 2000-2001; Project Engineer for B&W Mexicana S.A. (US Babcock & Wilcox Representative) in 1999.

Mark E. Leary

California Integrated Waste Management Board

Mark E. Leary has served as the Executive Director of the California Integrated Waste Management Board since September 2001. He has over 26 years experience in the environmental protection within both public and private sectors. Previous service includes serving as deputy director of the Board’s Special Waste Division where he was responsible for all programmatic efforts related to waste tires, used oil, and household hazardous waste. This included

SPEAKER AND MODERATOR BIOGRAPHIES

permitting, enforcement, market development, and hazard mitigation. Mr. Leary also held the position of branch chief of the Board's Office of Local Assistance. With over 16 years with the California Environmental Protection Agency (Cal/EPA), Mr. Leary has also held positions with the Regional Water Quality Control Board, and the Department of Toxic Substances.

Mr. Leary received a Masters Degree in Environmental Engineering from the University of Illinois in 1980 and a Bachelor of Science Degree in Biology from Bradley University, Illinois in 1978.

Changsheng Li, Ph.D. *University of New Hampshire*

Dr. Changsheng Li has been a Research Professor with the University of New Hampshire since 1992. He is engaged in international projects of greenhouse gas inventory and mitigation for agro-ecosystems in North America, Europe, Asia and Oceania. Dr. Li has developed biogeochemical models for quantifying greenhouse gas inventory and mitigation effect for agricultural and forest ecosystems. He is the author of the DNDC model, coordinating greenhouse gas-related research projects supported by NSF, NASA, EPA, USDA and NOAA since 1989. Prior to 1992, Dr. Li was with The Bruce Company where he consulted with the U.S. EPA on Global Climate Change programs. Dr. Li received his Ph.D. of Biogeochemistry at the University of Wisconsin in 1988.

Mark McDannel *Los Angeles County Sanitation Districts*

Mark McDannel is a Supervising Engineer with the Los Angeles County Sanitation Districts, where his section develops projects to recover energy from methane gas generated by the Districts landfills and water reclamation plants. His section is also

responsible for the sale and purchase of electricity, purchase of natural gas, and energy conservation. Prior to joining the Sanitation Districts, Mr. McDannel spent 21 years in air pollution and combustion consulting to the power industry.

Mr. McDannel holds an M.S. in Mechanical/Environmental Engineering from the University of California Irvine, is a licensed Mechanical Engineer, and is a Board Certified Environmental Engineer.

Irving Mintzer, Ph.D. *Global Business Network*

Dr. Irving Mintzer is an internationally recognized expert on the impacts of energy technologies and climate change on human societies and natural ecosystems. Irving has consulted on these issues for transnational corporations and multilateral financial institutions and has provided testimony on the linkages among energy policies, air pollution, and economic development to committees of the U.S. Congress as well as the British, Italian, German, and European Parliaments. Irving is currently working with the California Energy Commission to analyze the implications of alternative transportation policies designed to accelerate market penetration of advanced vehicle technologies and alternative fuels, and to understand the impact of such policies on the state's electric power and natural gas industries.

Frank Mitloehner, Ph.D. *Agricultural Air Emission Center, University of California, Davis*

Dr. Frank Mitloehner serves as director for the Agricultural Air Quality Center at UC Davis and is an Associate Air Quality Cooperative Extension Specialist in the Department of Animal Science. His current research activities are in the area of air emission estimates from dairies and other agricultural sources and emission mitigation

SPEAKER AND MODERATOR BIOGRAPHIES

(focus on greenhouse gases, volatile organic compounds, ammonia, and particulate matter). His extension efforts are largely related to teaching various stakeholders (from regulatory staff to farmers) air quality related information and assisting them in air quality compliance issues.

Lynn Price

Lawrence Berkeley National Laboratory

Lynn Price is a Scientist and Deputy Group Leader of the International Energy Studies Group of Lawrence Berkeley National Laboratory. Ms. Price has an M.S. degree in Environmental Science from the University of Wisconsin-Madison. She has been a contributing and lead author for a number of reports by the Intergovernmental Panel on Climate Change (IPCC). She is a lead author for the industrial sector chapter of the IPCC's upcoming Fourth Assessment Report on Mitigation of Climate Change. Ms. Price has led a number of projects for the California Energy Commission, including technical analyses in support of the California Climate Action Registry, analysis of electricity emissions factors for California, and analysis of the potential role of product life-cycle optimization to reduce GHG emissions in California. Since 1999, Ms. Price has provided technical assistance to the Energy Foundation's China Sustainable Energy Program.

Sébastien Raoux, Ph.D.

Transcarbon International Corporation

Dr. Raoux is the President and CEO of Transcarbon International Corporation, an independent consulting firm dedicated to the transfer of climate change mitigation technologies and the implementation of sustainable development practices. With over 15 years of experience in the optoelectronic, semiconductor, solar, and nanomanufacturing industries, Dr. Raoux is a recognized leader in the development of

environmental technologies. He is the inventor of 20 patents, the author of 30 technical journal articles, and a frequent presenter at international conferences.

Dr. Raoux has received numerous awards including, on behalf of Applied Materials, the U.S. EPA Climate Protection Award for environmental leadership in the semiconductor industry. Dr. Raoux is a co-author with the Intergovernmental Panel on Climate Change (IPCC) for the 2006 revised guidelines for reporting PFC emissions from semiconductor, liquid crystal display, and photovoltaics manufacturing.

Dr. Raoux received an M.S. in Electrical Engineering and a Ph.D. in Physics from the University of Bordeaux, France. He is currently a Juris Doctor candidate at Santa Clara University School of Law where he specializes in international environmental policy.

Art Rosenfeld, Ph.D.

California Energy Commission

Dr. Arthur H. Rosenfeld was appointed to the California Energy Commission by Governor Davis in April 2000, and reappointed by Governor Schwarzenegger in January 2005.

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

Dr. Rosenfeld received the Szilard Award for Physics in the Public Interest in 1986, and the Carnot Award for Energy Efficiency

SPEAKER AND MODERATOR BIOGRAPHIES

from the U.S. Department of Energy in 1993. In 2006, Dr. Rosenfeld received the prestigious Enrico Fermi Award, the oldest and one of the most prestigious science and technology awards given by the U.S. Government.

Charles M. Shulock

California Air Resources Board

Charles Shulock is the Program Manager for Greenhouse Gas Reduction at ARB. He is currently project leader for the Board's implementation of the California Global Warming Solutions Act of 2006. He also serves as project leader for implementation of AB 1493, the California legislation that directed the Board to adopt regulations to reduce greenhouse gas emissions from motor vehicles. Prior to those assignments he worked on the California Zero Emission Vehicle regulation. In 2004 Mr. Shulock received the ARB Award of Excellence for lifetime achievement.

Previous experience for Mr. Shulock includes serving as Chief Deputy Director of the Office of Environmental Health Hazard Assessment, and Assistant Secretary for Policy Development at Cal/EPA.

Mr. Shulock has a Masters degree in Public Policy from the University of California, Berkeley, and a Bachelor of Arts degree from Georgetown University, Washington DC.

Kristen Taddonio

U.S. Environmental Protection Agency

Kristen Taddonio is the Manager of Strategic Climate Projects at the U.S. EPA Climate Protection Partnerships Division. She organizes public-private partnerships for environmental innovation, harmonizes international standards to speed technology market penetration, and directly promotes technology transfer with information,

leadership pledges, and conferences. She earned a Masters Degree in International Science and Technology Policy and a Bachelors Degree in International Environmental Resources from the George Washington University. She also earned degrees in Scientific and Technical Communication and Liberal Arts.

Sven Thesen

Pacific Gas and Electric

Mr. Thesen has a Bachelor of Science in Chemical Engineering from North Carolina State University. During his 17-year career in the environmental field, he has held various environmental positions in industry and consulting. At present, he is the Supervisor of PG&E's Electric Drive Group.

Mr. Thesen's SF₆ emission reduction expertise is utilized in leading PG&E's SF₆ Reduction Team. Major contributions as a leader of PG&E's SF₆ Reduction Team include a case study on PG&E's emissions reduction techniques, co-authored with U.S. EPA; the utility SF₆ emission estimation protocols for the United Nation's IPCC (coauthor); and the recently obtained CCAR certification for PG&E's 2004 and 2005 SF₆ emissions.

Chris Voell

U.S. Environmental Protection Agency

While at EPA, Chris has been responsible for assisting in the development of methane use projects in the landfill gas and anaerobic digester fields. Chris has provided assistance to projects all across the U.S., as well as in Russia and Ukraine through the U.S. government's Methane to Markets initiative. Prior to joining EPA, Chris worked for 15 years in the solid waste management field in the non-profit and private sectors. Chris was also Executive Director of a national trail organization – the American Discovery Trail Society.

SPEAKER AND MODERATOR BIOGRAPHIES

Chris has degrees in forestry from Paul Smiths College and natural resources management from the University of Maryland. Chris has a wife and three kids and lives in Frederick, Maryland.

Andrew Whittles

Centre of Excellence for Low Carbon and Fuel Cell Technologies (CENEX), United Kingdom

Andrew Whittles is the Project Development Manager at the UK's national Centre for Excellence for Low Carbon and Fuel Cell Technologies (CENEX). CENEX is involved in a number of projects including electric vehicles, hybrids, biofuels, hydrogen fuel, ultra light rail, and carbon off-setting strategies. Mr. Whittles was involved in winning the inclusion of the first Low Emission Strategy on a public highway in the UK.

Mr. Whittles prior position was Air Quality Management Officer and has been a Senior Air Quality Policy Advisor to the Mayor of London. He set precedent by establishing that a residential area in London was unfit for habitation due to poor air quality. He designed the first Low Emission Zone in the UK, and integrated air quality and carbon considerations into large-scale regeneration projects in the London Thames Gateway. He chaired the London Working Group on Planning and Air Quality, producing Best Practice Guidance on reducing emissions from construction sites.

Mr. Whittles graduated from Salford University in 1991 as an Environmental Health Officer.

Charles Zimmerman, P.E.

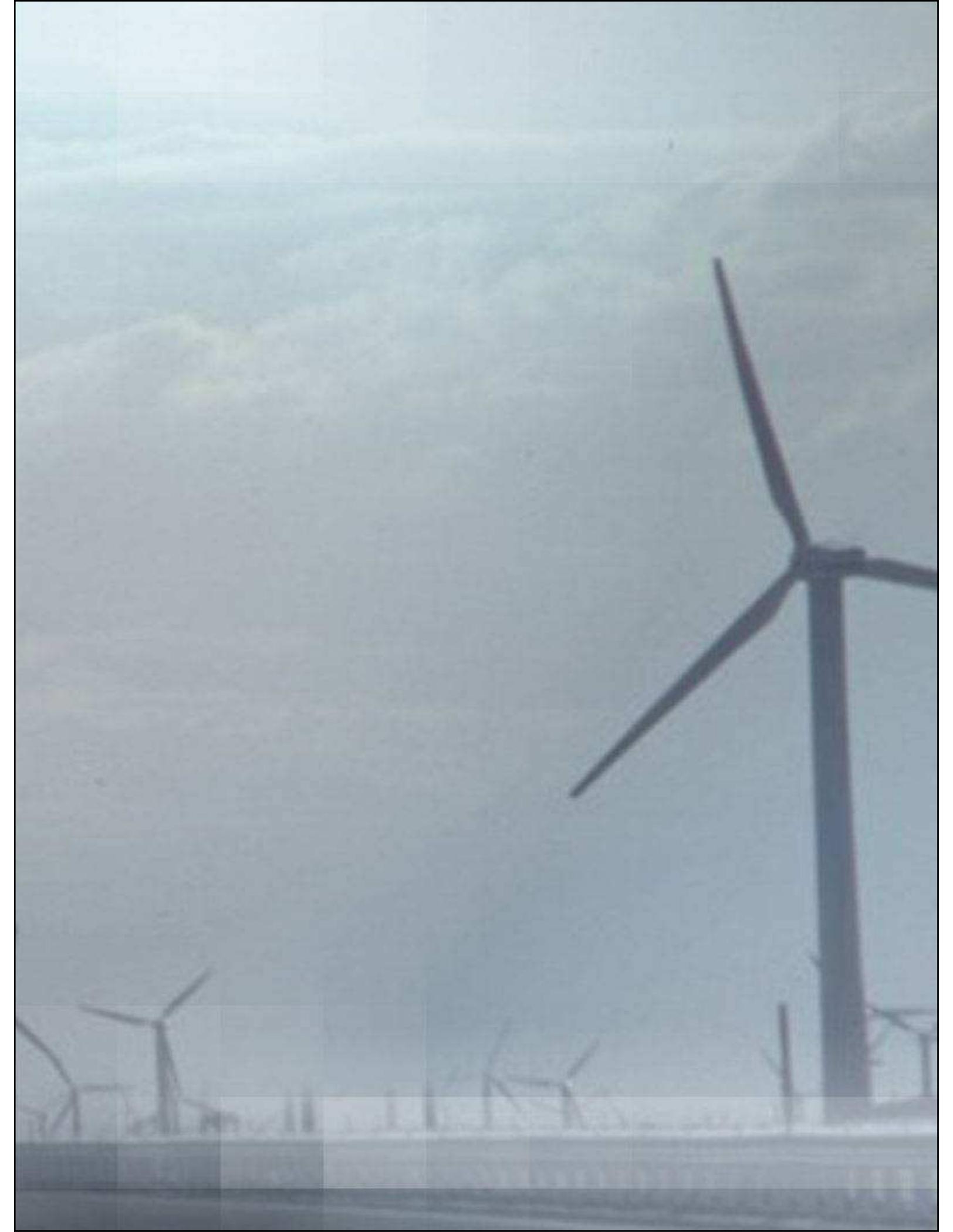
Wal-Mart Stores, Inc.

Charles R. Zimmerman is currently the vice-president of Prototype and New Format Development for Wal-Mart Stores, Inc. Mr. Zimmerman is also leading the "Sustainable Buildings Network" at Wal-Mart. This network, among other things, is charged with increasing the overall energy efficiency of new and existing buildings by 20-30 percent. Prior to his current role, Mr. Zimmerman worked in the International Division for Wal-Mart Stores as Director of Design and Construction. Mr. Zimmerman has worked for Wal-Mart since 1997. Previously, he worked in both the consulting industry as well as for the Texas State Department of Highways. Mr. Zimmerman is a graduate of the University of Arkansas, a registered Professional Engineer, and member of the Arkansas Academy of Civil Engineers.

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