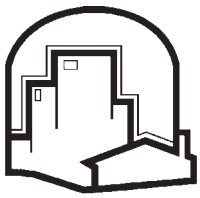
2000 ACEEE SUMMER STUDY ON ENERGY EFFICIENCY IN BUILDINGS



Efficiency & Sustainability

PROCEEDINGS

9 Energy and Environmental Policy

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Foreword

Responding to the theme of this Millennium Summer Study—"Efficiency and Sustainability"—professionals from around the world discussed the technological basis for and practical methods of implementing efficient and (hopefully) sustainable energy use in buildings. Issues, trends, challenges, and accomplishments were discussed. Each volume in this proceedings focuses on specific issues that encompass global visions for the future and discussion of future trends.

The 2000 Summer Study continued to emphasize new trends in buildings, equipment, markets, and social issues. Topics ranged broadly from the ENERGY STAR® program for new construction to building envelope and system engineering issues. The papers presented reviewed the latest information on utility restructuring and impacts on utility-sponsored programs, as well as global market issues, information technologies, and non-energy benefits. Sustainable development strategies; community-scale initiatives; factors influencing energy consumption and purchase of energy-efficient technologies; and how to design, implement, and evaluate energy programs were just a few of the cutting edge discussions that warm the mind and stir our quest for enlightment.

The subjects of the ten volumes in this proceedings are:

1. Residential Buildings: Technologies, Design, and Performance Analysis
2. Residential Buildings: Program Design, Implementation, and Evaluation
3. Commercial Buildings: Technologies, Design, and Performance Analysis
4. Commercial Buildings: Program Design, Implementation, and Evaluation
5. Deregulation of the Utility Industry and Role of Energy Service Companies (ESCOs)
6. Market Transformation
7. Information and Electronic Technologies
8. Consumer Behavior and Non-Energy Effects
9. Energy and Environmental Policy
10. Building Industry Trends

We, the co-chairs, would like to thank the 23 panel leaders who sorted more than 658 abstracts, selecting and nurturing 309 papers through the rigid review and publishing process, and selecting more than 60 talks for the poster sessions. We would also like to thank the many peer reviewers who worked with the panel leaders. Finally, a well-deserved thank you to the staff of ACEEE, in particular Glee Murray and Rebecca Lunetta (who received key assistance from Renee Nida and Julia Harvell) for their support and guidance throughout this process and for making the week a very successful "energy camp."

James McMahon, Lawrence Berkeley National Laboratory
Pat Love, Oak Ridge National Laboratory

Acknowledgments

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PANEL 9: INTRODUCTION

Energy and Environmental Policy

Today's methods of producing and using energy cause more environmental damage than any other peaceful human activity, a fact that is becoming increasingly clear to scientists and the general public alike. The human health and ecosystem consequences of acid rain and smog are well documented, and the potential damage from global climate change looms large. The contribution of today's energy system to these environmental and human health impacts—because of the reliance on inefficient coal plants and the internal combustion engine—is providing a strong impetus for changing the ways we produce and use energy.

Energy efficiency, clean and renewable energy resources, and distributed generation are solutions for addressing these environmental concerns that are available today and will be even stronger in the future as technologies advance. Energy-efficient buildings and building-integrated energy resources, the subject of this Summer Study, are especially effective means of reducing the need for fossil-fueled, central station power generation. This panel highlights initiatives that are being launched at every scale (local, state, regional, national, and global) to promote building sector technologies as a route to a cleaner energy future.

The papers in this panel reflect how energy policies and practices in different countries and regions of the United States are influenced by a wide array of policy drivers, from climate change to urban air quality, economic competitiveness, and electric industry restructuring. They also document the availability of a wide range of program delivery mechanisms including voluntary approaches, appliance efficiency standards, building codes, and financial incentives. The papers show that great progress has been made since the energy crises of the 1970s in the design, implementation, and evaluation of energy and environmental policies.

The Kyoto Protocol Goals: Policies and Trends. The Kyoto Protocol proposes challenging goals for U.S. greenhouse gas emission reductions. The papers in this session describe technology and policy options for reducing the carbon dioxide emissions associated with buildings. Battles and Burns examine trends in energy use in buildings, factors underlying these trends such as changes in energy efficiency and fuel mix, and the effect of energy use in buildings on carbon emissions. Geller, Bernow, and Dougherty examine ten major policies that would increase energy efficiency, accelerate the adoption of renewable energy technologies, and drive the nation's energy consumption toward less carbon-intensive fossil fuels. Murtishaw, Schipper, and Unander describe a method for comparing energy use and carbon emissions across countries. Such international comparisons can spotlight opportunities for efficiency improvements.

Green Communities. Many opportunities for improving the efficiency of buildings are most effectively addressed at the community scale. Deal and Fournier illustrate this by developing

scenarios that help soften the ecological strain of human development patterns and increase resource efficiency by using an integrated, ecological, and engineering approach to modeling urban dynamics. Hill et al. review some of the critical issues that threaten the success of emission reduction action plans implemented by communities. They also identify specific opportunities for strategic collaborative undertakings. Megdal et al. provide information on the role of energy efficiency in local governments based on a survey of local governments in Idaho, Montana, Oregon, and Washington. They also point to the role local government associations could have as vehicles for market transformation. Elliot, Busch, and Davey present an overview of opportunities and barriers associated with improving the energy efficiency of buildings in American Indian communities.

Codes and Standards: Views from Abroad. Building appliance and equipment codes and standards have become cornerstones of the energy policies of many countries in recent years. Della Cava et al. summarize the history of standards and labeling programs for appliances, equipment, and lighting products internationally; explain the benefits and rationale for promoting such programs; and describe financial, technical, and information resources that are available globally for policymakers who are considering implementing or upgrading such programs. Matrosov, Chao, and Goldstein describe processes and stakeholder roles in the development and implementation of building energy codes in Russia, and discuss similarities and differences between Russian and American experiences in code development. Holt, Marker, and Harrington examine an Australian program of energy performance standards for appliances and building equipment. Hui investigates building energy efficiency standards in Hong Kong and mainland China, offering an overview of the requirements of specific energy efficiency laws and discussing how these requirements affect building design.

Using Energy Efficiency Indicators to Develop Energy Policies. There is a strong desire to develop robust, yet easily understandable, ways to influence energy and environmental decisions. Rose reviews an energy accounting methodology that can be used by decision-makers to assist in developing codes, standards, or incentive programs. Larkin describes how developing effective community indicators for energy allows complex data to be condensed into a manageable source of meaningful information to promote long-term community sustainability. Chaitkin et al. describe how using marginal prices to calculate the life-cycle costs and energy savings of appliance standards will provide better estimates of actual consumer economics.

Calculating the Energy and Air Quality Benefits of Mitigating Heat Islands. There is a growing recognition that urban heat islands can be mitigated to reduce cooling usage in buildings, lower ambient air temperature, and improve urban air quality. Konopacki and Akbari calculate and analyze the potential annual energy, peak power, and carbon dioxide reductions by mitigating urban heat islands in three cities. Douglas, Hudischewskyj, and Gorservski describe the application of an urban air shed model to examine and quantify the effect of heat island reduction measures on ozone concentrations for five urban areas in the northeastern United States. Gorsevski, Taha, and Sailor outline which heat island mitigation measures are most effective for a range of U.S. cities.

Green Buildings. Each of the papers in this session describes green building programs that have been initiated in the Pacific Northwest, a region that is providing national leadership in this policy arena. Higgins, Good, and Bennett provide an overview of the development of three green building programs, including their design features and lessons learned. Dasher, Potter, and Stum explain the process of building commissioning and how it can be used to mitigate problems with building systems and materials when green products are installed. Based on a retrospective analysis

of three recently built buildings in Portland, Bennett et al. present the results of applying a green rating system to select green building options.

Capturing Lost Opportunities: Promoting Effective Building Codes and Appliance Standards. It is well recognized that there are opportunities to achieve energy savings above and beyond minimum appliance efficiency standards and building codes. Mast et al. examines opportunities to leverage private sector forces, local government initiatives, and publicly funded energy efficiency programs to promote more energy-efficient construction practices. Thorne and Kubo estimate the energy and carbon emission reductions that states and the nation could achieve by adopting more stringent appliance and equipment standards. Van Buskirk provides an explicit quantitative approach to modeling the regulatory impacts of energy efficiency on appliance shipments. Lutz describes the results of modeling techniques used to help the U.S. Department of Energy (DOE) estimate the energy savings, emission reductions, and jobs created that could be achieved as a result of updating water heater efficiency standards.

Voluntary Programs. The 1990s saw the strong growth of voluntary approaches to promoting energy efficiency investments in the United States. Hughes and Muessel describe DOE's Federal Energy Management Program's effort to promote alternative financing of energy conservation investments at federal facilities. They provide an overview of the Super Energy Savings Performance Contract (Super ESPC) Program, explain the differences between regional and technology-specific contracts, and describe how agencies use ESPCs. Judkoff and Farhar present results of a five-year process evaluation of two tools that can help improve the efficiency of the nation's housing stock: the home energy rating system and energy-efficient mortgages. The paper identifies the program characteristics that are common to high rates of use of these two tools. Laitner and Hogan explore how technology options might differ under a variety of environmental and economic objectives compared to a single objective solution. Among the objectives evaluated are level of investment, annualized costs, level of both carbon emissions and air pollutants, and net employment benefits.

Promoting the Use of Energy Efficiency and Distributed Generation in the New Competitive Environment. Pursuing energy efficiency and distributed energy technologies has the potential to revolutionize the electricity industry. Raynolds and Cowart describe how energy efficiency can improve the reliability of the electricity system as it restructures. Vine describes how one state is attempting to promote the use of emerging and distributed technologies through research, development, and demonstration and market transformation programs. Cymbalsky, Boedecker, and Wade analyze the potential impact of distributed generation on energy consumption, and air emissions from a national modeling perspective.

Electric Industry Restructuring: New Opportunities/New Challenges. As the electricity industry restructures, there are new opportunities yet there are also new challenges for consumers. Plunkett, Coakley, and Bryk describe how one state's restructuring of its electricity industry provides greater opportunities for energy efficiency. Pirkey et al. detail the need to educate rural consumers about utility deregulation, as well as the challenges associated with reaching this customer group. Fitch describes how the interaction among key policy questions drive the implementation of energy efficiency programs and initiatives.

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