Panel 4 Introduction

Global and Environmental Issues

This is the third full panel on energy efficiency and the environment held at an ACEEE Summer Study.

In the 1992 proceedings, panel leaders Cathy Zoi and Paul Centolella noted that the 1992 panel reflected a transition period "from assessment of the environmental potential of conservation to the implementation of new environmental policies designed to incorporate the impacts of efficiency improvements."

We note that the policy framework within which our practice is conducted is increasingly complex and global in scope.

On the domestic front, we are in the fourth year of the Clean Air Act Amendments of 1990, and the second year of the Energy Policy Act of 1992. Internationally, we are several years along in the implementation of the UN Framework Convention on Climate Change and on negotiations of treaties on regional transport of the combustion and other byproducts which are precursors to acid rain and ozone (smog) formation, respectively.

The globalization of environmental issues provided the justification for establishing a panel that includes both environmental topics and energy activities in foreign countries. This year's panel follows two broad themes. The first poses the question, what are we learning from the first generation of programs designed to intentionally capture the environmental and other non-energy benefits of efficiency? The second asks, across the broad range of early experiments in energy efficiency programs in other countries, what are we learning and how comparable are these results to those gathered at home?

We also note here the emergence in the last year of significant new policy themes that should benefit from this panel's findings. The passage of the controversial North American Free Trade Agreement, the current discussions around the General Agreement on Trade and Tariffs, and the newer so-called environmental technologies initiatives, many of which are intended to help the United States balance of trade, raise challenging and often conflicting questions for sound policy aimed at sustainable development outcomes.

This panel's papers have been divided into the following sessions.

Project/Program Lessons from Other Countries, Sessions I and II

The experiences of implementing programs and analyzing opportunities in other countries is not only valuable for those of us working in foreign countries, learning about these experiences provides us with new insights and ideas for implementing domestic programs. The papers presented in these two sessions provide some useful lessons.

Didusková and Slavotínek describe some of the early experiences in the Czech Republic's first encounter with performance contracting. While performance contracting has not developed as quickly or as broadly as many speculated a decade ago, the conditions in the Czech Republic may be more ripe for performance contracting than those in the United States. Friedmann reports the results of a study that shows Mexico's rapid electricity demand growth in the residential sector could be almost completely offset with the introduction of more efficient appliances, primarily models meeting U.S. minimum efficiency standards. Gula et al. present the results of the first extensively monitored conservation retrofit of a multi-family residential complex by one of the famously inefficient district heating systems in Eastern Europe. While the demonstration produced substantial energy savings in the buildings, the surprise result was the lack of savings resulting from better control of building heat uptake from the district heating system. In other words, the unsophisticated system controls for determining the amount of heat to deliver to the buildings couldn't be improved upon with more sophisticated controls.

Larsen describes the results of four empirical studies of energy conservation programs in Denmark, and on the basis of these studies, proposes a national program to reduce Danish electricity consumption. If the program were implemented only by Denmark and not its trading partners, Larsen projects that more than half of the savings would come from educational efforts, including energy audits.

With all the discussion of retail wheeling in the U.S. electric industry, readers should take interest in Hewitt and Cohen's report on the development of DSM programs in the United Kingdom, where retail wheeling is already a reality. The DSM programs are an attempt to make DSM work in an industry structure and regulatory system that has thus far discouraged DSM. Turning back to Eastern Europe, where so much new activity on energy efficiency is being led by the recently created energy efficiency centers there, Bull et al. report on a unique and promising application of integrated resource planning to two district heating systems in the Czech Republic and Slovakia. As expected, significant cost-effective conservation potential was identified, but more importantly, the application has demonstrated the suitability of IRP planning methodology for district heating systems and has attracted the serious interest of Czech and Slovak energy system managers.

Policy Options for Energy-Intensive Economies

Properly implemented, energy efficiency strategies can help developing economies simultaneously address economic efficiency and environmental performance: this session provides helpful information for international policy consideration of the cultural barriers and opportunities for achieving this promise.

The paper by Marouiek of SEVEn presents a sobering view of what it takes to comprehensively address the challenge posed by hundreds of years of environmental neglect: his organization's 14-point agenda is ambitious and its real-world focus on the goal of ensuring economic stability and adequate financial resources is instructive for fostering opportunities which have yet to be fully explored even in Western economies.

A case study of how these principles actually work is provided by Secrest et al. for a city of 250,000 persons largely dependent upon the regular use of soft coal-significant potential exists for energy efficiency to substitute for coal, particularly in that city's large, cooperatively owned buildings, which are heated by district systems.

On a larger and equally challenging scale, Byrne, Shen, and Li document the interplay between rapid industrialization, energy use, and the environment; they posit a form of integrated resource planning as a framework for using energy efficiency and renewable resources to offset problems and capture net benefits for the economy.

Appliance Efficiency, Recycling and Materials Recovery, Sessions I and II

Achieving technical potential for energy efficiency in residential appliance programs is difficult and is constrained partly by the large inventory of older appliances that remain in use.

Programs that provide incentives for accelerated scrappage of older appliances have proven popular where tried and have the virtue not only of energy efficiency but of environmental protection as well. Scrappage programs which recover raw materials and safely process chemicals that are toxic (e.g., PCBs) or ozone depleting (e.g., CFCs) vividly demonstrate a creative approach to meeting environmental and economic imperatives simultaneously.

Wall's paper on this subject sets a policy context for consideration of the value of appliance recycling in the fight against ozone depletion. There is five times as much CFC in refrigerator insulation as there is in refrigerant. Materials recovery is shown to be a viable alternative to more environmentally questionable practices like incineration.

Steckel and Hildebrandt's paper is one of the first to fully identify the range of benefits from the point of view of both the participating utility and the municipality whose landfill costs are being avoided. The authors also suggest a basis for inclusion of some of these benefits when evaluating appliance recycling using total resource cost tests.

The Sacramento Municipal Utility District has described its refrigerator recycling program as a cornerstone of its "conservation power plant." Erikson's case study of SMUD's three existing programs illustrates the complexity of the regulatory, economic, and environmental issues utilities face when implementing DSM programs.

Turning to toxic waste disposal, Milakofsky addresses the issue of electric utility involvement in the disposal of fluorescent lamps and fluorescent lamp ballasts containing polychlorinated biphenyl (PCB). He summarizes pertinent federal and state regulations, reviews utility experience with a number of lamp and ballast disposal programs, and concludes that utility efforts to assist customers with lamp and ballast disposal are beneficial to the utility. MacLeod and Haites take a broader look at waste disposal (including non-toxic waste) in an evaluation of Ontario Hydro's Espanola Power Savers Project and recommend several approaches for reducing waste generation from utility DSM programs.

Non-Energy Impacts of DSM and Efficiency Improvements

Energy efficiency programs can potentially achieve many types of benefits through single investments; however, most program evaluations fail to capture these broader societal benefits and, therefore, significantly undervalue the results of the efficiency investments.

Kuennen submit that broader efficiencies and their correspondingly broader benefits are both real and necessary to achieving the goals of sustainable development. An analytical framework that clarifies the role of basic values in setting the parameters of such benefits analysis is presented along with a set of research and policy initiatives that should result from this kind of analysis.

In a series of examples, Mills and Rosenfeld describe the multiple benefits of energy-efficient new technologies, illustrating that the package of positive attributes of new energy-efficient technologies is often far more impressive than the energy savings alone. And finally, Hashem, Haites, and Vanderhoff report an important finding: all the attention given to including environmental externalities in utility planning in the United States has thus far produced very little in the form of increased DSM activity.

Clean Air Act, Environmental Policy, and Utility Investment

In many ways, the Clean Air Act Amendments of 1990 (CAAA) set the stage for a major shift in the practice of minimizing the environmental effects of energy usage; perhaps the most basic way is in the provisions that encourage market-based incentives for emissions reduction, including emissions trading and offsetting generally, and the Title IV $S0_2$ allowance system specifically.

Hobbs and Centolella provide a framework within which to evaluate all such policies affecting the environmental impact of utility operations. Their analysis suggests that ultimately, the systems that evolve from the CAAA allowance system will be only half as expensive (in terms of direct utility costs) as what might have resulted had Congress chosen a taxed-based system for Title IV $S0_2$ controls. A comparison and case study approach suggests that market-based environmental regulation that effectively internalizes environmental costs offers the greatest potential for minimizing the costs of achieving emission reductions contrasts with other approaches including absolute emissions caps and externality adders.

Holmes, Neal, and Nadel extend this type of analysis to include the real-world planning experience of a "coal-belt" utility with a significant current portfolio of DSM programs (expected to produce 266 megawatts of summer peak demand reduction and 1,070 gigawatt-hours of energy reduction in 1999). An expanded portfolio of both efficiency and load management programs is presented, along with a methodology for estimating the emissions impacts of the resultant scenarios and implications for other utilities.

Koebel further extends the analysis to include the experience of a utility operating in an airshed labelled "extreme" for ozone non-attainment under the CAAA. In particular, the CAAA set up a system for extending bonus allowances which provides reward incentives for utilities that most actively pursue DSM as part of their resource portfolio after 1992. The paper discusses the range of options available to this utility to utilize the bonus system (which they expect to be engaged in by 1995) and presents a method for judging the value to the utility of the bonus versus the cost of utilization.

Community Issues and Opportunities

While the energy and environmental benefits of DSM and other efficiency programs are often analyzed on a regional basis, the tangible and indirect benefits may actually be quite geographically targeted. Full costing methodologies, coupled with a benefits analysis, can build an understanding of the focus of such benefits, which in turn can aid in building long-term societal support.

In this context, Knoepfel, Bernow, and Lazarus consider the environmental impacts of long-distance energy transport and transmission including emissions, land use, electro-magnetic frequency, and visual and habitat impingement; they postulate considerable potential site-specific benefit from DSM. This research will clarify and extend the kind of benefits analysis already conducted for more localized DSM programs aimed at minimizing T&D investments while enabling a broader aggregation of regional benefits than has been heretofore possible.

Previous Summer Study sessions have highlighted the potential to mitigate urban heat island effects that occur due to such factors as low albedos and low rates of vegetative cover. Kurn, Bretz, Akbari, and Huang utilized a network of twenty-three weather stations to detect existing effects in Southern California communities. Measurements of surface-air temperatures over vegetated areas were one to two degrees lower than background temperatures. The daytime heat island effect is estimated to account for 5 to 10 percent of urban peak electric demand, and a methodology for estimating the benefit of increases in vegetative cover is presented against this backdrop.

Public buildings may account for as much as 10 percent of the consumption of natural gas and electricity in urban utility territories. Strategies that can help school districts conserve bring substantial benefits to revenue-strapped local and state governments at the very time that education reform requires such support. Watson, Coleman, and Bingold's analysis of the aggressive Energy Smart program in Oregon public schools illustrates the complexity of performance standards, investment considerations, and organizational/institutional incentives and barriers that need to be weaved together to achieve the program goals of increased environmental stewardship, improved energy management, resource conservation, and targeting of new financial resources directly back to the participating school district.

Spotlight Sessions

The Summer Study's interest in international energy efficiency issues is broad, encompassing activities in both developed and developing countries and spanning every region of the globe. One group of countries, however, continues to attract a disproportionate share of attention: the countries of Eastern Europe, the former Soviet Union, and China, or the so-called post-planned economies. Chandler, who has gained extensive experience in these countries through his efforts to establish non-governmental energy efficiency centers, offers a thought-provoking paper that argues for major changes in the way bilateral and multilateral institutions deliver energy assistance to these countries. For example, he suggests that if reforms fail to redirect World Bank energy project loans from their near exclusive supply-side focus, the Bank should cease lending for projects and restrict itself to "structural adjustment" loans. He also urges much greater use of local non-governmental experts in U.S. AID-sponsored projects, arguing that they are highly qualified and more flexible than their governmental counterparts.

Turning to another topic, Bernstein argues that the excitement in the energy efficiency and environmental communities over market-based approaches to performance is somewhat tempered by the emerging critiques offered by the environmental justice and community economic development movements, among others: much of the benefit claimed appears to accrue to large institutions and perhaps even at the cost (in terms of both economics and of health) of smaller users and emitters. He asks, are these economic barriers to the cost-effective implementation of DSM and environmental programs, or are these barriers cultural and political?

This paper suggests that economic and cultural/political problems are both real and proposes solutions for each type. When account is taken of the capacity of existing institutions organized for achieving social equity goals, such as community development corporations, development finance institutions, and job development initiatives, a matrix of co-investment opportunities (between such programs and efficiency initiatives) can be developed and used on a region-by-region, neighborhood-by-neighborhood basis.

The paper also considers the economic policy dimension of the distribution of efficiency-derived benefits, whether the program incentive is market-based or regulatory. In an increasingly urban, sprawled out, and diversifying population with an inadequate distribution of income and an over-adequate poverty rate, the political attractiveness of approaches to "marrying" efficiency programs to development initiatives becomes salient. Examples of such approaches are presented from the fields of energy, materials reuse, manufacturing, and particularly transportation efficiency; in the latter case, the Intermodal Surface Transportation Efficiency Act and its associated regulations are presenting a series of direct financial and legal incentives for simultaneously achieving social equity, access, mobility, and environmental goals.

Discussion Session

This session captures abroad range of interesting papers that couldn't easily be grouped. They do, however, share the attribute of being good discussion topics.

Schipper and Sheinbaum—What really moves society toward achievement of significant efficiencies in the use of energy is of strategic importance. Schipper and Sheinbaum look at several components of changes in energy utilization (level of activity, household size, home size, appliance ownership, and features) in Organization of Economic Cooperation and Development (OECD) countries after the oil price crash period (1973-1990). The paper provides a context for evaluating the relative contributions of key strategies (including price, technological progress, and standards setting) to achieving technical potential.

Schrock, Meier, Solomon, Vine, and Stoops— The last decade of scientific research has brought much understanding of global environmental problems and consensus around the need for initial actions and long-term reductions, codified in policies ranging from the Clean Air Act Amendments to the Energy Policy Act to the Rio Agreement.

The estimation of reductions and verification of the actual reductions presents unusual opportunities and challenges. Schrock et al. review the policy differences and associated reporting and verification protocols among three major U.S. reporting programs and compare the relative importance to uncertainties of reference case selection, energy estimating procedures, and selection of factors for converting energy savings to emissions. This analysis is essential to the overall integration of the many databases necessary to tabulate and consistently compile the sources, levels, and relative reductions of energy and atmospheric emissions. The authors present a timely case study of the tracking opportunity presented by the $S0_2$ allowance system.

Shankle— Policy makers are increasingly questioning the full impacts of their decisions that favor particular technologies or approaches, including the full range of environmental, energy, and economic impacts. Shankle describes an approach to resolving these questions, calling it life-cycle assessment. The paper demonstrates the breadth and complexity of the issues that must be confronted and offers a framework for resolving them.

Chisti— Chisti discusses what appears to be a growing approach by electric utilities to meeting their industrial customers' needs: offering assistance to customers that simultaneously addresses their need to comply with environmental regulations, improve productivity, and increase the value they derive from their electricity use, perhaps by improving their energy efficiency. He includes a description of his company's database and model that assists in the implementation of the program.

Wisnewski, Reeves, and Markiewicz— In another report on program experience from Poland, Wisnewski et al. describe a demonstration project that tested consumer response to changes in the way they pay for heat in buildings served by district heating systems. Study participants had previously paid for their heat (which was subsidized by the government) on the basis of the floor area of their apartments; thus, no incentive existed for conserving heat. To test their response to usage-based energy bills, radiator heat meters were installed to estimate the amount of heat used by each apartment and heating bills were allocated accordingly. Participants responded to the cost incentives weakly, but the authors site several experimental problems and reasons why larger energy savings were not achieved.

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