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energy center

Review

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A Discussion and Critique of Market transformation

Challenges and Perspectives

June 1999

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Challenges and Perspectives

June 1999

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Prepared for



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Abstract

This review addresses the issue of “market transformation” by exploring the various theories and practices associated with this new model for energy efficiency programs. Despite its rapid acceptance, market transformation is vaguely defined. The intent of this report is to increase the understanding of market transformation in its various forms so that program developers and policymakers can design effective programs and have realistic expectations. Included are a number of different viewpoints from experts in the field and recommendations for further work needed to create a consistent and useful basis of understanding.

Report Summary

Market Transformation has rapidly become the objective of many privately and publicly supported energy efficiency programs in the United States and other countries. The overall goal of market transformation is to increase the share of energy-efficient products and services within targeted markets. Market transformation programs seek to achieve this goal through fundamental, enduring changes in the targeted markets.

Market transformation is an attractive model for achieving greater adoption of energy-efficient technologies. It recognizes the power of market forces; and the concept fits well within the current trend in energy markets towards deregulation, restructuring and increased competition. Market transformation also recognizes the importance of working with key market players—manufacturers, distributors, retailers, and consumers—for any type of intervention.

This report critically examines the development and application of market transformation. The intent is to raise and address key issues with the theory and practice of market transformation in order to develop a more realistic, robust understanding of market transformation. Such understanding should, in turn, lead to more realistic expectations for what market transformation programs can achieve and how to design programs to be the most successful.

The definition of market transformation is generally vague. Some view it as an overall policy objective, while others view it as a program strategy. Some view market transformation as a transition strategy of limited duration, while others see a long term need for interventions designed to transform markets. Market transformation is not an economic concept. It is essentially *marketing strategy* as used in the private business world. The difference in these terms and concepts may be the degree of change sought and the motivations for the change.

Market transformation has many strengths as a program model. It is a holistic, market-based approach and recognizes that the target markets are inherently regional and even national. It seeks enduring, self-sustaining changes in markets. It looks for key *leverage* points within market relationships to achieve the greatest impacts. It builds on experience with utility demand-side management and related initiatives. It provides a strategic model and framework for justifying intervention. Market transformation builds on *diffusion of innovation* theory, which has a rich, well-documented history.

Despite some of market transformation's strengths as a program model, its conceptual and theoretical underpinnings are weak. Market transformation lacks a unified theory; many of the underlying premises of market transformation are themselves poorly defined and understood. Better understanding is needed of the complex social systems—*markets*—that are the targets of market transformation. To date market transformation initiatives reflect relatively simplistic assumptions about a fairly predictable world. The reality of markets is far more complex and less predictable, as evidenced by the relatively high failure rate of new businesses.

Advocates and practitioners of market transformation need to be careful not to over-promise what is possible. It may be best to expect modest results as the knowledge base and experiences with market transformation are still limited. Market transformation itself may be an illusion, as markets are dynamic. Limited interventions are likely to lead to limited results. Achieving market transformation requires a sustained effort—affecting many buying cycles of consumers. Achieving apparent success at any time is no guarantee that the results and changes will be sustained. Generally it is impossible to determine if true market transformation has been achieved until long after the intervention has ended. Market transformation should not be viewed as a one-time event, but must be approached as a long-term, dynamic activity. Despite these reservations, experience with utility demand-side management programs suggests that market transformation holds promise for achieving its objectives.

Market transformation is ultimately tied to understanding and perhaps changing customer value—what it is that matters most to consumers. Energy efficiency is generally a low priority for consumers today because of low energy prices and apparently ample supplies. To transform markets for energy-efficient products and services requires identification of attributes that customers value highly, then bundling such attributes with high energy efficiency. Touting the benefits of energy efficiency alone is unlikely to affect consumer behavior.

Market transformation has evolved from more than two decades of public intervention in private energy markets to achieve social objectives, including improved environmental quality, greater productivity, and enhanced energy security. As a program and policy model, it holds great potential for more effectively achieving greater energy efficiency within the economy than have previous initiatives. However, *transforming markets* to achieve this objective is a daunting challenge, and it is still too early in the process to know if we can meet this challenge. Those involved with market transformation need to solidify its foundations and raise realistic expectations for what it can achieve. We suggest the following next steps:

- Market transformation theory needs to be developed and refined. Consensus should be reached on a definition and objectives of market transformation.
- Existing research in marketing, consumer behavior, diffusion of innovation, and related fields needs to be reviewed and applied to market transformation.
- New research should be conducted to fill in knowledge gaps.
- Actual program experience needs to be evaluated carefully both to advance market transformation theory and practice, and to develop realistic expectations for what market transformation can achieve in both the short- and long-term.

Background and Objectives

The objective of this report is to discuss and critique the theory and application of market transformation in order to gain a more thorough understanding of market transformation's merits and limitations. The objective is not necessarily to answer the questions and resolve the issues raised in the discussion. We invited a set of experts from both inside and outside the energy efficiency *community* to express their views on *market transformation*. Despite the diverse range of backgrounds and experiences of the invited respondents, a surprising number of common themes and observations emerge from the responses. Opinions also differ on key issues. We summarize and highlight both common and dissenting views of the respondents below. The in-depth responses contain a wealth of material—too much to capture fully in a few summary pages. In this section we simply try to capture major points arranged by topic.

This report grew out of discussions among Energy Center of Wisconsin staff and our constituents on the topic of market transformation. ECW is actively engaged in numerous activities that support and seek to transform energy efficiency and renewable energy markets—including efforts such as tracking sales in various appliance markets, market research on residential and commercial construction markets, implementation and evaluation of motor efficiency programs, administration of the *Compressed Air Challenge* and the Wisconsin *Daylighting Collaborative*—two programs with clear market transformation objectives, and creation of a Midwest market transformation organization. While ECW staff and its constituents generally support the concept and model of market transformation, certain aspects of this model need clarification and better connection to our understanding of marketing, market transactions, and past experience with demand-side management (DSM) programs and other public energy initiatives. We seek a more robust, realistic understanding of this relatively new model for energy efficiency programs to better guide the development and implementation of such programs. Below are the major findings.

Findings

Definition of *Market Transformation*

- *Market transformation* is poorly defined. The definitions are vague.
- It still is not clear if market transformation is a strategy or policy objective.
- It has not been important to-date to define market transformation more precisely. The focus has been on using MT to carry on the momentum and experience of DSM.
- Market transformation is not an economic concept.
- Market transformation is essentially *marketing strategy* as used in the private business world. Both seek to change markets. The difference may be the degree of change sought and the motivations for the change.
- *Market barriers* and imperfections are routine features of any market, which marketing attempts to overcome.
- Defining a *transformed market* is much easier than defining *market transformation*.

Examples of Transformed Markets and Market Transformation

- Market transformation is achieved when we have higher levels of *naturally occurring conservation* or when new purchase decisions result in improved energy efficiency.
- There are numerous examples of *transformed markets* in private business—express pizza lunches, for example.
- There also are examples of public efforts to transform other types of markets to achieve social or economic objectives, including soil conservation, nuclear power, affordable housing, higher education, the interstate highway system, family planning, and disease prevention.

Strengths of Market Transformation Theory

- Market transformation is a holistic, market approach to achieve energy efficiency objectives. Market transformation requires programs to look for key “leverage” points, which are often upstream of retail sales, in order to have the biggest market impact.
- Market transformation seeks to achieve lasting change directly.
- Market transformation attempts to make energy efficiency an *automatic* outcome of market transactions—something eventually self-sustaining.
- Market transformation builds on *diffusion of innovation* theory, which has a rich, well-documented history.

Weaknesses of Market Transformation Theory

- Market transformation lacks a unified theory. It has weak conceptual and theoretical underpinnings. For market transformation to succeed there is a need to develop a coherent theory and conduct empirical tests of the theory.
- Market transformation *theory* is poorly understood and is based on underlying premises that are themselves “further abstractions in need of unpacking.”
- Market transformation is still largely premised on assumptions about a fairly predictable world. It avoids the realities of a “messy social world.” Markets are complex social systems. To truly transform markets, we need to understand these complex systems.
- Market transformation could actually create problems for sustained efforts to improve energy efficiency. Market transformation tends to obscure the workings of complex social systems because of relatively simplistic visions of how these work. The danger is that these simplistic assumptions don’t provide a basis for asking a systematic set of questions that would help to identify the key actors, structure and information flows within markets. In turn, the underlying premises upon which market transformation programs are built could prove to be erroneous.
- The market transformation concept needs to be enhanced. We should look for underlying communications theory within markets.
- Market transformation theory is inherent in the social sciences, but has largely been developed by non-social scientists.

Expectations for Market Transformation

- Market transformation builds on the experience and expectations of DSM.
- Market transformation holds promise for achieving its objectives based on experiences to date, although actual program experience is still limited. Much of the experience is a retrospective analysis of past DSM programs that seem to have achieved *market transformation*.

- Market transformation may be an illusion because markets are dynamic—they are always changing and unpredictable.
- We can't assume changes will persist.
- Market transformation can be achieved, but not just on the basis of energy efficiency. Targeted goods and services of programs need other attributes that consumers value enough to buy
- For market transformation to succeed, we need to overcome perceptions about low costs of energy. Either we need to convince consumers that even with existing prices, energy efficiency investments make sense in light of the *true* costs (including externalities and other costs not reflected in the purchase price) or that future prices are likely to increase (as prices better reflect the true costs).
- Market transformation is not likely to be achieved without significant, permanent increases in energy prices. From an economic perspective, there are 3 ways to achieve market transformation: (1) fundamental changes in behavior, (2) provide proper price signals and (3) permanent subsidy.
- We need to recognize the down-side risks of market intervention. We can't always expect success.
- We need to be careful not to over-promise what is possible with market transformation. It is best to expect modest results as the knowledge base and experiences are too limited.
- It is too early to tell if initial market transformation efforts have been successful. Determining whether *lasting* changes have occurred means allowing sufficient time to pass after the intervention has occurred. We won't really know if we have achieved market transformation until much later—potentially years after programs were implemented.

Duration of Market Transformation Programs

- Market transformation requires a sustained effort.
- Market transformation needs to affect many buying cycles of consumers. New consumers are constantly entering the market for many types of goods and services, which may only be purchased once every ten or more years by any single consumer.
- Limited intervention is likely to lead to limited results.
- Market transformation is not a one-time event, but must be approached as a continuous, dynamic activity because markets are dynamic
- We need long lead-times to implement effective programs.

Market Transformation and Consumer Behavior

- Energy efficiency is a low priority for consumers. Low energy prices remain the biggest barrier toward higher energy efficiency resulting from market outcomes.
- Because energy efficiency is such a low priority, the success of market transformation depends on selling consumers on the things they value in a product or service, such as superior performance, quality, and convenience.
- Theories of *market barriers* and neoclassic economics are deficient to explain consumer behavior, and in turn, intervention based on these weak underpinnings.
- Broad-based education about energy efficiency should be an element of market transformation, including K-12 education. We need to change the values of next generation to achieve market transformation.

Market Transformation as a Policy and Program Model

- Market transformation is a ground-breaking policy innovation.
- Market transformation should be seen as an evolution—not revolution—from DSM.
- Market transformation offers an attractive, catalyzing vision for public intervention in private markets.
- Market transformation provides a strategic model and framework for justifying intervention. It asks the right questions and provides a framework for effective program design. The answers are difficult and we're still searching for the answers.
- Market transformation provides discipline to program managers to develop a *business plan* approach—or *marketing strategy*.
- Market transformation is not the only way to achieve public benefits related to energy efficiency.
- *Green pricing programs* can also include energy efficiency (in addition to renewable energy), which is another policy model for encouraging market transformation. This may occur independently of deregulation or *public benefits programs* funded through *wires charges (access fees)*.
- Market transformation fits well within the current political, regulatory environment—the trend towards deregulated, competitive markets.
- Market transformation is not a cheap and quick alternative to DSM and other approaches to energy efficiency.
- The concept of *exit strategies* as part of market transformation programs may be used to eliminate long-term support for energy efficiency.
- Environmental externalities of energy production and use are unlikely to be internalized. This itself may be a reason to justify continued intervention to support energy efficiency—whether in the form of market transformation or not.
- The rise of market transformation as a model comes at an opportune time given the changes underway in markets and energy industries. It is a good time to re-think approaches to public efforts to improve energy efficiency

Market Transformation Program Design and Approaches

- There are a relatively few number of options for consumer incentives as part of market transformation.
- Programs need to identify and stress attributes that matter most to customers—“give the customers what they want.”
- Market transformation needs to be comprehensive, integrated, and well coordinated to be effective.
- A national effort is needed for market transformation.
- Market transformation needs to be strategic for the long-term and tactical in short-term—just as businesses do if they are to succeed.
- Market transformation approaches will vary because of differences in markets.
- Market transformation needs to recognize normal product life-cycles. The approaches will change depending on where you are in life-cycle.
- The key for MT success is for interventions to reach *critical mass* or *contagion*— the take-off point to *sustainable change*. The objective is to affect enough of the market so that you develop positive feed-back.
- Programs need simple and consistent messages to be effective.

- Programs need clearly defined goals for participants and the programs overall.
- Market transformation needs broad-based input, but programs that involve multiple parties can become cumbersome to manage.
- Codes and standards are a means to ensure market transformation gains persist by establishing a floor for performance.

Research Needs for Market Transformation

- There is a lot of existing market research that may provide insights, but the research has to be specific to target markets.
- Much research is needed to understand the “messy social world”—the behavior of markets, which are complex social systems.
- Better understanding of consumer behavior and markets will not necessarily guarantee success of market transformation.
- Price still dictates much of consumer behavior—how can market transformation change this? Key research questions include, “How many consumers are motivated by energy efficiency? What led to this behavior? How much impact can we expect from MT programs?”
- There is an extensive body of literature on consumer behavior and related social science that has largely been ignored relative to the development and application of market transformation. There is a strong need to collect, review and synthesize this work and assess its relevance to market transformation.
- Despite wealth of existing research relevant to market transformation, there is still a need for targeted market research to fill in numerous gaps in our knowledge and understanding of consumer behavior
- The research needs for market transformation are inherently interdisciplinary. The research must bridge the worlds of engineering/technology and social science. Social science research should focus on values, beliefs and behaviors of individuals in target markets.

Challenges for Market Transformation

- Consumers lack understanding of the value of energy-efficiency. Changing fundamental values is difficult and requires a long-term, comprehensive effort.
- We need to use a rational process to develop and assess market transformation from interdisciplinary perspectives.
- We need to avoid the creation of unrealistic expectations, especially given the relatively short time horizons envisioned for many market transformation initiatives.
- Cheap energy prices remain a formidable obstacle for market transformation to succeed.
- Market transformation needs to be defined more clearly and carefully to distinguish it from basic marketing strategy. Compared to *marketing strategy*, market transformation’s goals are more encompassing and have longer time horizons. Consequently, these long time horizons need to be recognized and built into market transformation.
- We need to augment the market transformation model so that we can develop testable hypotheses about programs. Testing these hypotheses is critical to develop better programs and better evaluations.
- Market transformation must recognize fluid nature of markets.
- Market transformation is not the only way to approach energy efficiency.

- We have limited knowledge of market dynamics. We need to improve our knowledge and understanding of markets and consumer behavior to develop effective programs.
- Market transformation needs to be distinguished from DSM—while related they are fundamentally different. Market transformation will require developing new perspectives on markets and consumer behavior.
- Using evaluation feed-back to improve program design and implementation is critical to the success of market transformation because of our limited knowledge of markets.

Conclusions and Next Steps

This report covers much ground. Much hope and promise rides on market transformation. It quickly has become the model for publicly supported energy efficiency programs in the transition to a restructured, competitive world. It also may remain as the model once we get to this world. Or it may vanish. Some will argue that successful market transformation—by definition—will indeed vanish since the objective is to create self-sustaining markets that yield high levels of energy efficiency. Others will argue that this is unrealistic—that the dynamic nature of markets requires a sustained, long-term approach. From this perspective, market transformation must be an on-going process, not a one-time attempt to reach a certain goal, declare success, and move on.

Market transformation emerged as a leading policy and program model with very little dissent. The ability of market transformation to be readily accepted by a broad range of stakeholders stands in stark contrast to the controversies that surrounded the development and application of integrated resource planning and demand-side management. The ambiguity surrounding definitions of *market transformation* makes it easy to define it however one wants. The rapid political acceptance of market transformation as the model for publicly supported energy programs might well reflect this ambiguity.

The danger in this rapid acceptance of market transformation is that some parties may have unrealistic expectations for what it can achieve and how fast desired results can be achieved. As made clear in this report, the theory of market transformation is not well established and we have limited experience upon which to base expected results from implementing market transformation programs. In some cases, market transformation programs have been created for a rather short period—too short to expect, let alone measure—significant program results. The political process may not be well suited to provide long-term support for market transformation. Political horizons are generally much shorter than the time horizons needed to develop, implement, measure, and evaluate market transformation programs.

Transforming markets to achieve greater levels of energy efficiency is a daunting challenge. It is still too early in this process to know if we can meet this challenge. Past experience with DSM and early experience with market transformation programs suggest that this challenge can be met to some degree. This report challenges those involved with market transformation to solidify its foundations and raise realistic expectations for what it can achieve. We suggest the following next steps:

- Market transformation theory needs to be developed and refined. Consensus should be reached on a definition and objectives of market transformation.
- Existing research in marketing, consumer behavior, diffusion of innovation, and related fields needs to be reviewed and applied to market transformation.
- New research should to be conducted to fill in knowledge gaps.
- Actual program experience needs to be evaluated carefully both to advance market transformation theory and practice, and to develop realistic expectations for what market transformation can achieve.

The stakes for market transformation are too great to do anything less than address these many needs.

Development and Application of Market Transformation

Introduction: Emergence of Market Transformation

Market transformation has rapidly become the objective of many privately and publicly supported energy efficiency programs in the United States. Market transformation has evolved from a long history of public intervention in energy markets to promote energy conservation and efficiency as a way to reduce negative social and environmental effects and to improve our economy (Kunkle and Lutzenhiser 1998). The overall goal of market transformation is to increase the share of energy-efficient products and services within targeted markets. Market transformation programs seek to achieve this goal through fundamental, enduring changes in the targeted markets.

Market transformation as a guiding principle for intervention in markets to achieve social objectives fits well with the current trend in energy markets toward deregulation and restructuring. Increased competition in traditionally regulated energy markets is the objective of efforts underway and already taken in states across the US. However, the roots of market transformation lie within the regulated energy industries. Keating et al. (1998) note that market transformation "...[C]ould continue to grow and thrive in a regulated environment."

Market transformation has evolved from the utility demand-side management (DSM) programs of the past decade. The goals of most past DSM programs have been relatively narrow, to reduce energy and power demand to avoid investments in new power plants or transmission and distribution systems. DSM was used within the context of *integrated resource planning* to yield the lowest system cost by avoiding more costly construction and operation of *supply-side* power plants. DSM was considered a resource comparable and substitutable for supply-side resources. DSM typically has been implemented by individual utilities for their own customers, as ordered by utility commissions. Utilities recover the cost of the programs in their rates, so all utility customers share the costs.

Integrated resource planning and demand-side management have suffered a rapid demise in the wake of the movement to restructure and deregulate energy markets (Narum and York 1996). DSM had evolved to be more *market-based*, as utilities reduced program costs and shifted much of the remaining costs to the direct beneficiaries of DSM programs (ECW 1997). DSM had already been changing, but the onset of competition in regulated energy markets spelled the death knell for IRP and DSM as they had come to be practiced.

As DSM evolved, energy efficiency advocates realized that their efforts could have much greater impact if they went beyond the service territories of single utilities to encompass regional and national markets. While not termed *market transformation*, there were several initiatives that took this approach, including manufactured homes in the Pacific Northwest (Baylon, Davis and Hewes 1998) and the *Power Smart Program*, which originated in British Columbia before being adopted elsewhere (Nelson, Tiedemann, and Henriques 1998). These and other state, regional, national and even international collaborations, with multiple parties contributing funds and expertise, have tried to change building practices, introduce new products and change market shares. By collaborations and partnerships, groups have attempted to create the leverage to make larger changes in the markets for target technologies. Examples include *super-efficient* refrigerators, horizontal axis clothes washers, and energy-efficient motors.

Definitions of Market Transformation

There is no single, widely accepted definition of *market transformation*. Below are definitions that have been developed by leading advocates, researchers and practitioners of market transformation.

Transforming a market means changing the types of products or services that are offered in the market, the basis on which purchase and behavioral decisions are made, the type or number of actors in a market, or in some other way altering this set of interactions in a self-sustaining way. ... Any program that has a lasting effect on the structure or operation of a market could be called a market transformation program. (Synergic Resources, 1996)

Market transformation means a reduction in market barriers due to a market intervention, as evidenced by a set of market effects, that lasts after the intervention has been withdrawn, reduced or changed. (Eto, Prahl and Schlegel, 1996)

Market transformation means reducing market barriers to the adoption of cost-effective energy efficiency products and services in a sustained manner. If the most important and relevant market barriers have been addressed to the point where efficient good and services are normal practice in appropriate applications, and these changes are sustained over time, then a market has been transformed. (Nadel and Latham, 1998)

Market transformation is a process whereby energy-efficiency innovations are introduced into the market-place and over time penetrate a large portion of the eligible market.... Market transformation involves ongoing and lasting change, such that the market does not regress to lower levels of efficiency at some later time. (Geller and Nadel, 1994a)

While no single definition exists, market transformation generally refers to the process by which collective action, policies and programs effect a positive, lasting change in the market for energy-efficient technologies and services, such that these technologies and services are produced, recommended, and purchased in increasing quantity. (Suozzo and Nadel, 1996)

Keating et al. (1998) reviewed and analyzed alternative definitions of market transformation. While some view market transformation as a broad policy goal, Keating et al. define market transformation as a strategic approach to intervening in the market. They suggest the following operational definition of market transformation:

An initiative can be recognized as more or less likely to be a strategy-level MT [market transformation] program to the extent that it focuses on energy efficiency, involves a logical strategy for working in the market, including available market leverage, so that it produces potentially lasting effects.

Common elements of the above definitions include:

- Targeted, strategic market intervention.
- Development, introduction and increased availability of energy-efficient products and services.
- Fundamental changes in consumer behavior (increased consideration of energy-efficiency as a purchase criterion).
- Increased market share of energy-efficient products and services through reduction of *market barriers*.
- Regional or national scope for the targeted market.
- Lasting impact.

The above characteristics define market transformation. Later in this paper we discuss problems that arise from different interpretations and definitions of market transformation.

Market Transformation Experience, Strategies, and Measures

While the term *market transformation* only appeared in the literature in the early 1990s, there are examples of earlier energy-efficiency programs that fit the defining characteristics of market transformation. These include (1) Power Smart and (2) Super Good Cents/Manufactured Housing Acquisition Program.

Power Smart was a program created by BC Hydro in 1989, which grew out of its energy conservation programs initiated in the 1970s. Power Smart focused on reducing market barriers for a wide variety of end-use technologies, including commercial/industrial electric motors and consumer appliances. Power Smart took a comprehensive approach to overcoming these barriers. The program targeted consumers, manufacturers, vendors and trades through labeling, marketing, training and consumer education. The program expanded rapidly. At its peak, it was a national entity, with ownership by seven major Canadian utilities, and with 20 Canadian members and 10 international members. According to Nelson et al. (1998), "This provided a coordinated approach to national standards, international energy efficiency labeling, promotions and incentives." Examples of its success include making high-efficiency motors virtually the industry standard in BC. Despite its success, Power Smart was dissolved by its shareholders in 1997.

The Northwest Energy Efficient Manufactured Homes Program arose from the Manufactured Housing Acquisition Program (MAP), a cash incentive program for builders of manufactured homes. The MAP program was an effort funded by the Bonneville Power Administration to transform the market for manufactured homes in Washington, Idaho, Oregon and Montana. It provided a direct cash payment to builders who followed the energy-efficiency specifications of the program (*Super Good Cents, SGC*, standards), which were more demanding than codes required by the Department of Housing and Urban Development (IRT 1992). An evaluation of the program (Peach et al. 1996) found that this \$100 million program was very successful, garnering virtually 100 percent participation while active. At the time of the evaluation, there was no indication of instability in the market and the evaluators estimated that the market share would be sustained at 75% or higher.

The Manufactured Housing Acquisition Program was officially ended in August 1995. Despite the apparent success of the program while it was operating, a more recent examination of program impacts shows that market shares of homes meeting the energy-efficiency specifications have declined significantly in some markets. Baylon et al. (1998) report that the saturation of SGC homes went from 94% of total production in the region to approximately 52% in a period of about 3 years. They conclude, "[T]he market transformation [of SGC homes] was not sustainable."

As illustrated by these examples, market transformation programs require collaboration among a diverse set of market actors, including utilities, manufacturers, retailers, and efficiency advocates. In recent years the need for coordination and collaboration among such a diverse set of actors has led to the development of specific market transformation organizations, including the Northwest Energy Efficiency Alliance (NEEA) and the Northeast Energy Efficiency Partnerships, Inc. (NEEP). In other cases, such as California, electric industry restructuring legislation has led to the creation of state bodies charged with implementing market transformation programs. The Consortium for Energy Efficiency (CEE) is a national organization that also has a mission to transform energy efficiency markets.

These organizations vary significantly in their structure, funding and operation. However, their overall approach to market transformation programs is similar. Market transformation programs typically include the following steps (not necessarily in sequence):

1. Establish infrastructure to lead and manage the market transformation initiative. This could take the form of an organization such as NEEA or NEEP, or it could be an existing organization that takes on this responsibility (a state or national energy department or other public organization).
2. Establish funding to cover costs of the intervention(s) (program costs).
3. Identify market participants (manufacturers, retailers, consumers) and stakeholders (such as public energy offices, advocacy groups, trade organizations).
4. Form collaboratives among key market participants and stakeholders.
5. Define roles of participants in the collaborative.
6. Define markets in which to intervene.
7. Choose target products or services within the chosen market.
8. Measure market baselines against which intervention(s) will be evaluated.
9. Define program (intervention) goals.
10. Design strategies and measures for the intervention.
11. Implement measures.
12. Evaluate results of the program.
13. Develop and implement a transition (exit) strategy.
14. Continue to monitor and evaluate market developments.
15. Continue intervention as indicated by monitoring and evaluation results.

The steps given above show that market transformation is a complex undertaking. Market transformation programs involve multiple parties—each with different motivations and objectives. Market transformation also is broad in its geographic scope (regional and national markets). These two factors alone pose major challenges for market transformation programs. The complexity and dynamic nature of markets pose a different set of challenges. While the challenges of market transformation are many and complex, the potential benefits of market transformation are great. For this reason, market transformation has grown rapidly as a dominant model for publicly supported energy-efficiency programs that are emerging from previous utility DSM programs.

Programs to increase the market share of horizontal axis clothes washers illustrate how organizations such as CEE, NEEP, and NEEA have developed and implemented market transformation programs. Gordon, Banks and Brenneke (1998) discuss lessons learned from the Northwest High-Efficiency Clothes Washer Initiative, dubbed *WashWise*. This program is a regional market transformation program, which seeks to increase the market share of *resource-efficient* clothes washers in the Northwest. The primary program tools include financial incentives (rebates), education (both consumer and sales staff), and marketing. NEEA is the program sponsor and administrator. The program involves manufacturers, energy utilities, retailers and allied partners, such as the US Environmental Protection Agency, non-electric utilities, and local governments. The program has exceeded goals and expectations; it has resulted in nearly a 13 percent market share in less than a year.

Implementation of market transformation programs requires adoption of numerous, coordinated measures targeted to various market participants. These typically may include:

- marketing
- rebates or other consumer incentives to increase consumer acceptance
- labeling
- manufacturer and retailer incentives
- consumer education
- professional training (e.g., sales associates, skilled tradespeople, contractors, manufacturers)
- support for research and development
- codes and standards
- *technology procurement* (specifying required performance of technologies and aggregating customers to create sufficient demand for suppliers to respond to performance requirements)
- other types of bulk purchasing or buyer aggregation to create market *pull*
- design competitions based on desired performance

For more information on implementing market transformation programs, the Energy Center of Wisconsin is developing a guide for program developers.

Emerging Issues and Challenges

Despite the rapid emergence and acceptance of market transformation as a strategy for energy-efficiency programs, this development is not problem-free. While the theory and practice of market transformation has matured to a degree, experience with specific market transformation programs is limited. There are both theoretical and practical problems yet to be resolved. In this section we discuss emerging issues and challenges for market transformation based on our perspectives and experience. After that we present a discussion of the issues raised. ECW members, constituents, and other energy efficiency advocates and professionals may not share these views. We raise them to generate discussion in an effort to create a more robust and realistic understanding of *market transformation*.

Confusing and Conflicting Definitions of Market Transformation

The lack of a uniformly accepted and understood definition of market transformation is more than a semantic problem. Market transformation emerged as a program concept coincident with the onset of energy utility restructuring and re-regulation. Energy efficiency advocates have seized upon market transformation as a vehicle to maintain continued public support for energy efficiency in restructured, competitive energy markets. The impact is clear. In numerous states, restructuring legislation or regulatory orders and proposals have contained explicit language directing energy efficiency programs to focus on *market transformation*. In doing so, market transformation has moved from a strategic framework for the design of efficiency programs to explicit public policy.

Recent activities in Wisconsin provide a clear example of the prominence of market transformation as a new model for publicly supported energy efficiency programs. A diverse set of stakeholders in Wisconsin developed a proposal for *public benefits* energy programs. The Public Service Commission of Wisconsin led this process, and the proposal was offered by the PSCW to the Wisconsin Legislature (WPSC 1997). DSM has been one of the major categories of activities currently provided under the existing regulated market structure in Wisconsin. The PSCW's recommended scope of DSM (principally energy efficiency programs) is (*emphasis added*):

1. Where appropriate, *facilitate the transformation* of markets so that they effectively respond to customers' needs and public interests in increased energy efficiency.
2. Administer, or otherwise insure, *delivery of conservation services* where *market failures and/or barriers* have been identified.
3. Provide consumer education that supports the efforts to deliver services and to *transform energy efficiency and small renewable resource markets*.
4. Administer applied research in support of programming and *market transformation*.

Restructuring and public benefits initiatives in California, New York, Massachusetts, and the Pacific Northwest offer other clear examples in which market transformation has been adopted as a clear policy goal for energy efficiency programs.

Keating et. al (1998) note that the term *market transformation* has been used in at least two ways: "(1) to identify a policy goal, and (2) to describe a strategic approach to intervening in the market, which is only one among many ways of getting to the policy goal." They argue that the latter definition—the strategic approach—should be the basis for developing, implementing and evaluating market transformation programs because "...[I]t is the

only one [definition] for which there is empirical evidence as well as theory.” Blumstein et al. (1998) observe that efforts to define *market transformation* “...[A]re now colored by their financial implications.” They argue that such definitions are being used as the criteria for determining funding of publicly supported programs.

In the political arena the ambiguity over the definition of market transformation may have significant repercussions. Some see market transformation as a transition strategy to end public intervention in private markets. For example, Grundon (1998) states that market transformation is “An intervention designed to transform the energy efficiency market from subsidized to competitive and self-sustaining.” This interpretation of market transformation sees it as a one-time program designed to change the structure of the selected markets permanently so market barriers are either eliminated or significantly reduced.

As others have noted (Keating et al. 1998), market transformation can work after utility markets are opened to retail competition, but it will also work in a regulated utility world and during a transition between the two. Barriers and failures that exist now may continue to exist when customers can choose their supplier.

Numerous *public benefits* proposals, such as in Wisconsin, or approved and implemented policies, such as in California, allow for the interpretation of market transformation as a transition strategy. Under such proposals or policies, public support for market transformation and other public benefits programs would or will exist for a finite period (lasting typically from five to seven years). After the initial period, program results would or will be evaluated and determination of continued need assessed. While such *sunset* provisions may hold open the possibility of continued support, some parties see any continued support for energy efficiency at odds with the trend toward competitive markets. These parties may only support market transformation and other public benefits as a transition strategy. Ultimately, they see market outcomes solely dictating the level of energy-efficiency within the economy (with a few notable exceptions such as low-income energy services and programs).

Inadequate Knowledge and Understanding of Consumer and Organizational Behavior

Market transformation seeks to change markets. Markets are composed of people and organizations (vendors, manufacturers, distributors, trade groups, regulators, etc.). To transform markets, therefore, requires transformation of the behaviors and preferences of people and organizations. Blumstein, Goldstone and Lutzenhiser (1998) observe in their discussion of market transformation:

[B]ecause our focus has broadened to the entire market, we need a much better understanding of a wide variety of other market participants (from producers and distributors, to vendors, regulators and providers of secondary market services). The limited work to date on program evaluation [of market transformation programs] and consumer behavior is simply not sufficient to inform the development of MT [market transformation] programs with a clear focus on *markets*. [emphasis in original]

Market transformation interventions—like many DSM and other energy programs that preceded them—often seem to be based on relatively simple assumptions about the behavior of individuals and organizations. Most interventions are premised on the ability to predict consumer responses; for a given input we can expect a certain output. However, consumer and organizational behavior is more complex and less predictable than commonly assumed.

As discussed in the previous section, a major objective of market transformation is to lower or eliminate *market barriers*. The attendant expectation is that once market barriers are lowered or removed, customers will increase demand for targeted products and services according to market transformation objectives. This is the *rational*

consumer model of economic behavior. However, this premise ignores a lot of other aspects of consumer behavior.

Simply removing or lowering market barriers may be insufficient to achieve the desired consumer response. Consumers must value the products and services promoted through market transformation or other interventions. Energy-efficiency generally does not hold high value for consumers relative to other product attributes. Consequently, it also is important to address these other attributes of technologies and services that customers value highly. For example, market transformation programs for horizontal axis clothes washers stress important non-energy benefits of the product, such as being gentler on clothes and more effective at cleaning.

Promoting non-energy attributes is generally well understood and practiced within current market transformation programs. However, energy industry regulators and legislative bodies may question the use of public funds to promote such non-energy benefits of targeted technologies. Others may question use of public funds to subsidize purchase of what some view as premium consumer products (some models of h-axis clothes washers are priced over \$1000 before rebates).

Shove et al. (1998) provide an in-depth analysis of human behavior relative to climate change and energy efficiency. They conclude that, “[D]iscussion of the human dimensions of energy and global environmental change is currently embedded in a particular policy paradigm that contains within it a singularly limited theory of social change.” Market transformation efforts may suffer from this lack of better understanding of consumer and organizational behavior in response to environmental and social objectives. Payne (1998) argues that research on organizational behavior is needed to go beyond the simple, rational models and create energy policy and programs that can be more effective. For example, Janda (1998) documents significant behavioral differences among building design firms, which may often be seen to be a homogenous group when developing energy efficiency programs.

Market transformations occur absent public intervention. The rapid rise of sport-utility vehicles and halogen torchères are examples of *spontaneous* market transformations related to energy *inefficiency*. These events illustrate the dynamic and unpredictable nature of markets. They also offer important lessons on consumer preferences and behavior. Again, consumers will purchase goods and services that meet their needs and provide value. Energy-efficiency generally is not a priority for consumers—other product characteristics are more important.

The message is clear. If we seek to transform markets, we need to understand consumer and organizational behavior to be able to appeal to attributes that customers value. Without sufficient and accurate understanding of such behavior and of what customers value, interventions to *transform markets* risk high failure rates.

Expectations for Market Transformation

Transformation of markets is a lofty goal. In the private sector, firms compete fiercely to dominate a market through innovation, pricing, and marketing. Blumstein et al. (1998) draw an analogy between efforts by private profit-oriented firms to gain market share by introducing new products and public efforts to transform markets that yield improved energy efficiency. They note, “Private new product market transformation initiatives are subjected to a direct and immediate market test. Indeed, 80 percent of all new products fail this test.” They add, “There is, unfortunately, no reason to believe that would-be public market transformers should do any better at making such predictions.” Despite this private market experience, there is little—if any—acknowledgment of the difficulty involved in transforming markets—whether public or private. Past success with utility DSM programs may have created unrealistic expectations for current or planned market transformation programs (York 1997). If market transformation programs fail to achieve their objectives, the entire model of market transforma-

tion as the basis for publicly supported energy efficiency programs could be jeopardized. But if the world of private markets is any guide, it may be unrealistic to expect high success rates for public efforts to *transform* markets.

A fundamental tenet of market transformation is that limited interventions can lead to lasting market changes. This tenet probably attributes greatly to the widespread appeal of market transformation. Another related tenet is that market interventions can lead to predictable—and desirable outcomes. Such expectations may be unrealistic in many cases. Markets are dynamic and unpredictable. If an intervention improves the market now, other forces may undo the work later. Market transformation provides a framework for improving the operations of a market. But markets are imperfect now for a reason; there are strong forces in effect that result in less efficient products and practices dominating, such as low first, low energy costs, the exclusion of pollution and other external costs, and imperfect information. A market transformation program should include continued monitoring of a market even after the initial goals have been met. If the market *un-transforms*, or if negative changes result, further interventions may be necessary.

The concept of *exit strategies* for market transformation programs embodies the tenet that limited interventions can lead to lasting changes. It is an elegant construct—intervene strategically in a market over a finite period to make long-lasting structural changes in the market. The appeal of creating programs with a finite life is great in an era when government is being *downsized* and energy markets are becoming more competitive. The reality of *exit strategies* may differ widely from theory, however. Recent experience with two markets that have often been cited as *success stories* for market transformation reveal that the idea of maintaining the desired market effects and structural changes in markets after *exiting* the market may be unrealistic.

The market for high efficiency, natural gas furnaces (90% AFUE or better) for residential space heating is a market that has been cited as a clear case of market transformation (Schlegel et al. 1992; Kushler et al. 1996). Through a variety of utility and other efficiency programs, the market share of the high efficiency furnaces reached over 90% in many regions of the state. The programs in Wisconsin were largely phased out beginning in the late 1980s. By the early 1990s the programs had ended. Comparisons of program results were made to Michigan, a Midwestern state with a similar climate and demographics, where there were no comprehensive state-wide programs. High-efficiency furnaces in Michigan only achieved a relatively low market share (about 37%). However, recent research conducted for the Energy Center of Wisconsin shows significant declines in the market share for high-efficiency furnaces in certain regions in Wisconsin—most notably the southeastern region where the market share has dropped as much as 20% from its historic peak (Prahl and Pigg 1997). Other regions of the state have experienced more modest declines—roughly 5%. While the share of high-efficiency furnaces is still relatively high, this experience does raise questions about the sustainability of program impacts after programs are ended.

Baylon et al. (1998) offer a similar story for manufactured homes in the Northwest. After reaching a 94% market share for the super-good cents homes (high energy efficiency), the market share plummeted to 54% in a period of about three years after the program was ended. This suggests that simply achieving a high market share does not assure that the share will be sustained absent the program.

Another widely held expectation of market transformation is that even if such efforts fail, the worst outcome would be that markets would not be changed. There seems to be an implicit assumption among many advocates that market transformation *can do no harm*. We caution that intervention in markets can do more than simply leave markets unchanged. In some cases, changes could result that are counter to intended market transformation goals. Intervention in markets can result in harm; customers may have a bad experience with technologies or services that are promoted or programs may delay development of superior technologies. For example, some of the early compact fluorescent lightbulbs (CFLs) promoted through DSM programs were inferior products. While new CFLs are much improved, some customers who had bad experiences with the inferior CFLs may not

trust the technology again. And perhaps by focusing on CFL technologies, development of superior, more efficient lighting technologies may have been delayed (LED versus CFL exit signs, for example).

Beyond the relative success and performance of technologies, we caution that market transformation initiatives also may have negative repercussions among certain market participants—retailers, distributors, and manufacturers. These groups may be harmed if market transformation initiatives aren't well designed to rely on existing market relationships. And in some cases, hurting certain market players is a specific objective—for example, manufacturers, distributors and retailers of non-energy-efficient technologies.

In the previous section we presented typical market transformation program strategies and elements. The use of rebates and other financial incentives is one of these elements. Rebates were widely used under traditional DSM programs. An apparent appeal of market transformation for many involved in energy efficiency markets is that they view market transformation as a way to achieve DSM objectives *without (or at least very limited)* use of rebates and direct financial incentives. The problem with this expectation is that retailers and manufacturers maintain that rebates and direct financial incentives still work best to *transform* markets. This is well understood by most developers and implementers of current market transformation programs. For example, programs to promote horizontal-axis, resource-efficient clothes washers have used rebates widely to increase market share of this technology within American households.

While the mainstream practice of market transformation may not expect that market transformation signals the end of rebates, the fact that certain key market participants and policymakers may hold this view again creates the potential for unrealistic expectations for market transformation. Such unrealistic expectations could lead to a sense of failure for market transformation programs if rebates are used in programs. Another negative repercussion would be the preclusion of the use of rebates as a tool within market transformation programs.

Evaluation Issues

Program evaluation has been a critical element of DSM. Evaluation results often were used to determine cost recovery and incentives for the utilities offering the programs. Evaluation also provided vital information on how to improve program design and delivery. Evaluation can be expected to be a critical feature of market transformation programs and will create a new set of challenges for program evaluators and managers.

Different definitions and expectations for market transformation create problems in the context of program evaluation. Program evaluation requires addressing a series of fundamental questions, including: (1) What is to be evaluated? (2) How will performance be measured? and (3) What standards will be used against which to evaluate performance? Addressing these fundamental questions for evaluating market transformation programs is difficult given their broad scope and relatively imprecise definition. Clearly the umbrella term *market transformation* will need to be broken down into narrower, more readily quantifiable elements in order for programs to be evaluated. However, even breaking down *market transformation* into a more discrete set of program elements or objectives does not eliminate some fundamental problems for evaluation. The program elements or objectives themselves may be broadly defined.

Developing evaluation standards or objectives for market transformation may be difficult. For example, Eto, Prael, and Schlegel (1996) define market transformation as:

A reduction in market barriers from a market intervention, as evidenced by a set of market effects, that lasts after the intervention has been withdrawn, reduced or changed.

The key phrases and terms in this definition from an evaluator's perspective are (1) *reduction in market barriers*, (2) *set of market effects*, and (3) *that lasts*. Each of these terms and phrases are imprecisely defined from an evaluation perspective. What are *market barriers* and how do you measure changes in them? What are *market effects* and how do you measure them? What length of time is denoted by *that lasts*? In short, what exactly determines when a market has been transformed? These questions must be answered to evaluate market transformation programs.

Evaluation of market transformation and related social and behavioral changes raises numerous challenges compared to evaluation of *traditional* DSM programs. A key challenge stems from the differences in objectives of traditional DSM programs versus market transformation programs. The objectives of market transformation programs are not likely to be expressed in physical terms—kW or kWh savings—as were traditional DSM programs. Instead, the objectives focus on changing markets and ultimately individual behavior within these markets. Evaluating program performance relative to these goals is inherently more difficult than evaluating program performance for achieving specific energy (kWh) and power (kW) goals.

Differences in spatial and temporal dimensions greatly complicate evaluation of market transformation programs. Time horizons are much longer and relevant populations of customers may be much broader geographically. Market transformation programs may be created with the expectation that results can be evaluated after a relatively short time (generally as short as two years with five years as the probable maximum limit). However, market transformation experience suggests that programs may require much longer periods to be developed, implemented and achieve results. It may easily take 2-5 years to develop, implement and operate programs. Evaluation of program impacts may, therefore, not be completed in the relative short span of typical policy decision-making. Absent evaluation results, policy makers may be reluctant to commit to the level and duration of support necessary for market transformation programs. If market transformation programs do not have long-term support, they may be doomed to failure.

The scope of market transformation creates additional evaluation difficulties. Market structures and relationships are complex, which requires a greater number of program mechanisms than typical under past DSM programs. The greater number of program mechanisms and target market actors, along with the larger target populations of programs create difficulties for evaluation in terms of being able to isolate program effects from other effects. Causal relationships and impact attribution will be difficult to establish for many market transformation programs.

Another set of significant problems stems from the need for accurate baseline data against which to evaluate program efforts. Such baselines are lacking for many products and services for the appropriate geographic target of transformation programs. Establishing baseline data in areas and markets where they are lacking is time-consuming and may be difficult and expensive. However, without such data, evaluating program results will be difficult. And without accurate, reliable evaluations of programs, policy makers may be reluctant to continue program funding.

Recent experience in Massachusetts with evaluation of market transformation programs illustrates the difficulties in tying evaluation results to public funding for energy-efficiency programs (FK Gordon et al. 1998). Despite the need for long-term metrics against which to evaluate market transformation results, “[P]ractical considerations drove the metric-setting process to one-year metrics for purposes of paying performance incentives.” Other evaluation difficulties cited by Gordon et al. included disagreements over appropriate metrics, limited experience with market transformation programs, reliance on partnerships for program success (in turn attributing causality of program results), and inadequate baseline data.

The nature of market transformation programs creates a quandary for evaluators. Evaluation has evolved to be an integral component of DSM program implementation, creating expectations from policy makers and program

administrators that evaluators can provide accurate measurement of program impacts and effectiveness. Such expectations are likely to be transferred to evaluation of market transformation programs. Meeting such expectations will be problematic at best, and may be impossible in some cases. The objectives of market transformation programs are broad social and market change, not simply measurements of discrete energy and power resource acquisitions as under traditional DSM programs (which are not that simple!). Market transformation programs are likely to be implemented with the expectation that evaluators can provide accurate analysis and measurement of program results relative to the policy objectives in a relatively short time. Continuation of market transformation programs likely will depend on evaluation results, which may not be able to produce definitive results and attribution of program impacts for relatively short periods.

Policy Implications for Public Support of Energy Efficiency

Beyond policy questions raised by differing definitions, unrealistic expectations and evaluation difficulties, market transformation raises broader policy issues for public efforts to promote energy efficiency.

An underlying premise held by some proponents of market transformation is that competitive markets alone will eventually deliver all the energy-efficient products and services that are socially optimal. The view of market transformation as a transition strategy is based on this belief, which perceives market transformation as merely a temporary catalyst to reach an end-state of optimal energy-efficiency of the economy. Ultimately, market outcomes would dictate what is socially optimal, according to this perspective. Intervention, in this case, is only warranted to make markets operate efficiently (in an economic sense).

A corollary to this perspective is that market intervention to increase energy efficiency is not justified on either a case-specific or on-going basis in markets that aren't being transformed. With market transformation as a model, this corollary leads to the conclusion that there is no room for energy efficiency efforts that provide high societal benefits compared to societal costs that don't have market transformation as an objective. From a broader economic perspective, we argue that if societal benefits are greater than societal costs, energy-efficiency initiatives are cost-justified—regardless of any attempts to transform markets.

Market transformation may have been widely embraced and adopted in the current context of energy industry restructuring as a means to preserve public support for energy efficiency. As we have discussed earlier, the concept of market transformation fits well within the dominant political trend to reduce the “size of government” and rely on the “wisdom of markets” to allocate resources. Now that many states have adopted market transformation as a model and rationale for public support for energy efficiency, we propose that there are reasons to provide public support for energy efficiency separate from objectives to transform markets for energy-efficient products and services. Market transformation should not be the only criterion for determining public support of energy efficiency programs and initiatives. There are other public policy objectives that may be served by other types of programs (Hanson and York 1998). Aspects of energy efficiency are public goods, and therefore, warrant support to serve the public regardless of efforts to transform markets. This may be especially important in relation to efforts to meet global climate change objectives, such as reducing greenhouse gas emissions. Other public goods aspects of energy-efficiency that might be warranted in the long-run include objective information, professional training and education, focused customer assistance, research, demonstration, and development.

Other Perspectives

We have provided basic background and definitions of market transformation. We have also raised emerging issues and challenges as viewed by ECW staff on the theory and application of market transformation. In this section, we present invited responses to a series of questions developed to probe these issues.

The invited respondents represent a wide variety of disciplines, perspectives and experiences. ECW selected the respondents based on recommendations from its own staff and from its Evaluation and Market Research Committee. The respondents are experts on various aspects of markets, marketing, consumer and organizational behavior, energy efficiency programs, utility regulation and evaluation. Some of the respondents have no professional experience in the field of energy policy and energy efficiency programs. Others are highly experienced veterans within the energy efficiency community. Both perspectives are valuable. Inviting responses from “outside” the energy efficiency community can lend fresh perspectives. Such “outsiders” can help test fundamental assumptions and offer new insights. The Appendix gives biographies of the respondents.

The objective of this section—and this report as a whole—is to generate discussion on fundamental tenets on the theory and practice of market transformation. The hope from this discussion is a more robust, realistic understanding of market transformation. In turn ECW hopes that this improved understanding will lead to better program and policy choices on market transformation. The questions and responses in this section address market transformation’s merits and limitations as a policy and program model.

The respondents were sent a draft copy of the previous two sections of this report along with the questions that are given below. ECW asked respondents to use the questions as a guide to discuss the issues. Respondents were not required to answer every question. Some respondents followed the “question-answer” format, while others composed essays that interwove their responses. In the latter case, ECW staff decomposed the essays to fit the “question-answer” format.¹ Other than this type of change, the responses appear largely as the respondents submitted them to ECW. The intent is to provide a free-flowing discussion of the issues as if listening to an assembled panel of experts at a public forum. ECW staff also generally left lengthy responses and passages intact—both to preserve the full response and to add depth to the discussion.

The respondents are:

Larry Alexander	Environmental Futures, Inc.
Dan Barzel	Circuit City
Doug Baston	Northeast by Northwest
Dick Best	Whirlpool
George Edgar	Wisconsin Energy Conservation Corporation
Ed Jesse	Dept of Agricultural and Applied Economics, University of Wisconsin-Madison
Marty Kushler	American Council for an Energy-Efficient Economy
Loren Lutzenhiser	Department of Sociology and Rural Sociology, Washington State University
David Mick	School of Business, University of Wisconsin-Madison
John H. Reed	TecMRKT Works
Doug Ringger	Maytag Appliances
Ken Rolnicki	Channel Marketing Institute and Northwestern University
Mark Siegal	NEES Companies

¹ Doug Baston's and Mark Siegal's responses are extracted from their paper, “Tales from the Trenches: Early Experiences in Market Transformation in the Northeast,” presented at the 1998 Association for Energy Services Professionals Annual Members Meeting. The excerpts in this report are printed with permission from AESP.

Jesse, Mick and Rolnicki are “outsiders” to the energy efficiency community, but offer expertise in economics, marketing, channels of distribution and business strategy. The other respondents are “insiders” and have experience with energy efficiency programs—both DSM and market transformation—to varying degrees.

Below are the questions and responses. The opinions and views expressed are those of the respondents and do not necessarily represent those of their organizations.

Is the concept of *market transformation* realistic? Are there flaws in its underlying theory and premises?

Dan Barzel

“Transforming” the market is a difficult cultural challenge for many reasons. First, appliances last 8-15 years. If every home has a washer and dryer, refrigerator, range and dishwasher, and if each of these were to be replaced on a normal cycle, the average consumer may only be in the market once every 4-6 years. With such a large interval between purchases, people don’t remember the criteria they used when they bought their last appliance. Since most people aren’t aware of what features are available, they look for the features they want – they find these features in a product with the lowest cost and a brand they feel comfortable with. The primary drivers in consumers’ purchase decisions today are price (by a long shot), product selection, and knowledgeable sales help.

What this means to those of us concerned with selling new, innovative technology and helping the marketplace is that we have to intervene in the purchase process with information about new technology and energy efficiency over SEVERAL buying cycles. Our goal should be to educate the consumer through the sales counselor as well as through the educational system and the media. We also have to educate young people about the finite availability of energy and natural resources so that these young consumers will grow up with the understanding of these issues. This is a large and ambitious undertaking.

Dick Best

I believe it is. And also that the concepts of market transformation as viewed by the energy industry can be extended quite easily to the manufacturing environment, although there are some subtle differences.

George Edgar

The concept of market transformation is a common sense response to the objective of increasing the societal benefits from increased levels of energy efficiency. If there are barriers to a market providing and/or customers’ willingness to buy energy-efficient products and services, then removing or mitigating those barriers on a sustainable basis, if possible, is in the public interest. Market transformation seeks to increase the level of “naturally occurring” conservation as a cheaper (over time) and more effective means to attain societal benefits from increased energy efficiency.

The theoretical or conceptual problems with market transformation arise from the fact that different analysts tend to define market transformation as either an objective unto itself or a strategy or means to an objective. If defined as an objective to achieve a higher rate of naturally occurring conservation in various markets for energy-efficient products and services, there is not much to disagree about other than whether that objective is desirable or not. However, if market transformation is defined as a strategy to achieve a higher level of naturally occurring conservation, then the theory and premises on how markets can be transformed requires explication.

This latter theory must explain the nature of the barriers that must be confronted and what actions are reasonably expected to overcome such barriers on a sustainable basis.

There is no one accepted unified theory that explains the nature of the barriers that a market transformation effort seeks to overcome. Rather, there are competing theories ranging from a heavy emphasis on behavioral factors to ones relying on some form of explanation based on neoclassical economics (e.g. market failure theory or transaction cost economics theory). The lack of a unified theory of the nature of the barriers discouraging higher naturally occurring levels of conservation has been a constant feature of energy efficiency policy, efforts, and “politics” over the last 10 to 20 years.

The meaningful part of market transformation is the theory’s diagnosis of the problems and the identification of theoretically viable ways to overcome barriers. The problem with market transformation discussions is that there still is no unified or agreed on theory. Indeed, discussions of market transformation can often jump from the goal to program design in which the design at least appears responsive to a barrier (e.g. lack of information means having an information program element), but has little theoretical or empirical justification to indicate why the program design really will be effective.

Thus, the concept of market transformation is realistic. The continuing problem is that there is an inadequate theory based on empirical results that explains the nature of the barriers and how (and if) they can be overcome. In essence, market transformation redirected the objective of energy efficiency efforts without a corresponding improvement in the theory and application of programs to achieve the objective.

Ed Jesse

The concept of market transformation is not an economic concept. Rather, the concept appears to involve a behavioral hypothesis (hope?): If you provide a subsidy to offset the added cost of manufacturing or purchasing/using an energy-efficient product (versus a conventional one), then the use of that product will continue at a high rate after the subsidy is removed. The definitions of market transformation offered make frequent reference to “market barriers.” These market barriers are low (probably artificially so) energy prices. So the notion of transforming markets toward energy conservation when the market is sending signals contrary to reducing energy use is contradictory itself.

The examples of market transformation provided uniformly demonstrate that unless it is possible to permanently offset any higher acquisition (manufacturing) cost of energy-efficient consumer products, then consumers (manufacturers) will opt for lower efficiency products as soon as temporary offsetting subsidies are removed. While a small percentage of the population will embrace energy conserving products for noneconomic reasons (e.g., a green ethic), the great unwashed are motivated largely by price. This does not bode well for market transformation.

The market (mal-)transformation examples of energy *inefficient* products (SUV’s and halogen torchères) are telling: consumers will make socially undesirable purchase decisions if market signals are contrary to the social objectives that market transformation attempts to achieve. A specific example: Let’s say I blow \$40,000 for a Ford Expedition that gets 10 mpg. I drive 20,000 miles per year. Compared to a \$10,000 Plymouth Neon that gets 40 mpg, I’m consuming 1500 more gallons of gasoline annually – clearly a high social cost. At \$1.10 per gallon (much too high in the eyes of many consumers), I’m spending a marginal \$1650 on fuel to drive my Expedition. But the marginal depreciation per year (assuming a five-year life) associated with driving the Expedition versus the Neon is \$6000. So why do I care about a piddling \$1650 when I’m already spending \$6000 to maintain my macho image?

I think the oil crisis of the mid-1970's is also significant in understanding market transformation. The incentives to utilize energy conserving products and processes were enormous for a few years (I traded my full-sized Pontiac for a new Pinto in 1976). And some effects extended beyond the crisis – you can probably still find a few bricks in toilet tanks placed there in 1976 and a few (higher-quality) low-pressure showerheads. On the other hand, look at the trend in vehicle purchases (I traded my Chevy S-10 for a new Ford F150 Big Bore in 1996).

Marty Kushler

For proponents of energy efficiency, the concept of Market Transformation (MT) is very attractive. Furthermore, on the whole, the concept has a good theoretical and practical foundation when properly designed. Indeed, MT is not so much a radical departure from prior utility DSM programs as it is a natural evolution. Well designed DSM programs always had an interest in broader market effects (e.g., customer and supplier education, equipment availability and price, stocking practices, etc.), it's just that they were secondary to the prime objective of the programs: direct energy saving effects on participants. In its simplest essence, market transformation merely elevates broader market effects to the status of being the primary program objective. In the process, it draws on many lessons learned from the experience with DSM.

Loren Lutzenhiser

Despite a number of problems, it is fair to say that the idea of market transformation is likely to prove as important as any energy policy innovation of the past 50 years. It represents a significant shift in policy emphasis—one with a kinship to other recent turns toward markets in environmental policy-making (e.g., SO₂ emissions trading, electric utility deregulation, global CO₂ market proposals, Federal partnerships with large firms for technology development). It will be important, however, for environmental policy analysts to think very carefully about MT—what it really means, what it can and can't do, what it shouldn't try to do, and what share of energy and environmental policy attention (and resources) it deserves.

At this early stage, it's hard to label MT even as a “concept” or to suggest that it has any underlying relationship to theory. Its practitioners and advocates are drawn largely from the regulated energy world and are generally not trained in the sciences concerned with the organization and dynamics of market systems. They rely solely on experience gained under DSM conditions, along with anecdote and the advice of consultants whose own understandings come largely from the same sources. Few theoretical claims have been made by DSM/MT practitioners and, in fact, the need for theory is questioned by some.

It makes little sense, then, to wonder about MT's underlying theory or premises. At this point, it has none. Its status is that of a very general idea—a highly abstract visionary statement. We can certainly try to unpack the cultural meanings that the term “market transformation” holds for those who use it in policy circles. Like other broad sensitizing concepts, it evokes imagery that aids the imagination. It allows us to visualize the possibility of broad, positive technological change sweeping across the society. In a bird's-eye view from energy policy heights, we are able to imaginatively survey the arrays of technologies in use and envision them changing—hardware changing, purchasing patterns changing, “markets” undergoing change so that energy efficiency becomes a taken-for-granted feature of products. Of course, being able to visualize such a thing doesn't mean that it can be realized. It is important to note that MT is also importantly a call to arms—a way to challenge and reorient the DSM community in precarious times. “Let's transform the world using our best technologies, our best arguments—and just a little bit of money.”

When I first encountered the term “market transformation” several years ago in an early draft paper by ACEEE/LBNL authors, I wondered if revolutionaries had somehow slipped into the energy efficiency fold. A call for “transformation” was surprising in the staid, technical, marginal-cost-competitive world of DSM and laboratory science. What has been more interesting (and puzzling), however, is the unlikely widespread adoption of

MT as a policy orientation, almost uncritically it seems, by state utility regulators. One can only assume that this has been due, at least in part, to regulators' interests in finding a tactful way out of the rate-funded energy efficiency business—a problematic enterprise in a fully marketized energy system.

So, at its core, MT seems to represent an abstraction that is both a visualizing and energizing term. Of course, there have been numerous attempts to “define” MT for policy purposes (see Geller and Nadel 1994b; Keating et al. 1988, for a review). But these definitions fall back on talk of “barriers” and “interventions,” “market effects” and “penetration rates,” “exit strategies” and “persistence effects”—further abstractions in need of unpacking. On close inspection, we find that these second-order concepts are similarly disconnected from theory concerned with either “markets” or their “transformations.” Such connections could be made, of course (see Lutzenhiser et al. 1998; Blumstein et al. 1998 for suggestions), but to date, little systematic effort has been expended to do so. As a result, we really have no basis on which to judge how realistic either the general notion of MT is or the instrumental/strategic sort offered by various MT advocates.

David Mick

The concept of *market transformation* is very vague. Without a clearer understanding and consensus among important parties, it is likely that the use of the concept for planning, implementing, and evaluating publicly supported energy efficiency programs is ill-fated.

In the first place, it is not clear how market transformation is fundamentally different from marketing strategy generally. *Marketing strategy* involves tactics of product development, pricing, promotions, and/or distribution to increase or maintain market share within specific target markets. Also, for most companies, the target markets are broadly dispersed (regional and national) and the effects of their marketing tactics are hoped to be relatively enduring (though more often they are not). These characteristics of marketing strategy appear to be common parts of definitions of market transformation (e.g., Keating et al. 1998). Thus, to the degree that policy makers, regulators, advocacy groups, and program managers have thought previously about these issues, they may just as well have called them marketing strategy issues in a deregulating or re-regulating utilities environment. There may be nothing new here to calling this market transformation—perhaps it is just the same rose by another name.

Nonetheless, except in conditions when marketing strategy aims to stabilize market share, it can be said that the concepts of marketing strategy and market transformation completely overlap on one important quality: they are both concerned with *change* in markets, especially the behaviors among market constituents (e.g., manufacturers, distributors, retailers, consumers, etc.). Perhaps the most fruitful way to differentiate these two concepts is in terms of the *degree of change* that each seeks to bring about (realizing that a precise dividing line between them, on a continuum of change, does not exist). Market transformation should be seen as major, large-scale changes in market behaviors, i.e., people valuing, believing, and doing things that are considerably different (in quality or quantity) from what was before. For example, fifteen years ago Pizza Hut changed the fast-food lunch market dramatically. Previously, pizza restaurants were mostly empty at lunch time because pizzas took too long to prepare and were always too large for a lunch time appetite, especially if the person was eating alone or wanting to order something specific to his or her tastes. After two years of market research and millions of dollars spent in designing and procuring equipment that could deliver a reasonably-priced, very-small pizza in a few minutes—an idea that was thoroughly radical at that time—Pizza Hut changed the eating behaviors of thousands of people and greatly increased its market share for lunch-time fast-food sales. Soon, millions of consumers were taking notice and nearly all of the competitors were following suit. This was truly a market transformation, far beyond ordinary marketing strategy.

John Reed

Although the term “market transformation” is relatively new, the idea that the spread and adoption of new concepts, services and products can be accelerated is not new. Attempts to scientifically study how products and ideas can be introduced into and transform markets have been around since the early part of the 20th century. There is a substantial and well-documented literature describing these efforts. More than 8,000 articles and books based in a wide range of disciplines have been published since the 1930s (for a substantial list of these publications see Rogers 1995). The diffusion of innovation tradition, as it is called, is widely used and referenced in business and industry. The early origins of the diffusion of innovations model resulted from attempts to introduce hybrid seed corn to farmers.

The market transformation concept had its origins in the energy field in the early 1990s (See Keating et. al. 1998). The concept emerged from an interest in re-introducing a more strategic approach to energy efficiency and the need to justify public intervention to support energy efficiency. The broad gauged energy efficiency efforts in the late 1970s had given way in the 1980s to a fairly narrow focus on end-users and the use of rebates in the 1980s. Market transformation was seen as a way of focusing attention on the broader array of actors in the market place, not just end-users, and of using a much broader and more strategic set of strategies to encourage the adoption of energy efficiency.

Much of the thinking about market transformation evolved as a way to justify energy efficiency efforts to economists who play a central role in the policy apparatus in California and elsewhere in the country. The framework has its intellectual roots in macro-economic information theory. The clearest and most comprehensive statement describing the market transformation framework is Eto, Pahl, and Schlegel's scoping study (1996). The basic thread of the market transformation argument is that there are imperfections in the market. These imperfections retard the spread of energy-efficient products and ideas which would provide significant public benefits by reducing energy costs, increasing productivity, and reducing the environmental consequences of energy use. Many of the imperfections in the market result from lack of information and take the form of market barriers that must be overcome. Because these barriers are not likely to be addressed or addressed quickly by the private sector, public sector intervention to overcome these market imperfections is justified. However, intervention is justified only until the intervention succeeds in reducing or eliminating the barriers. Thus, it is appropriate to withdraw support for the intervention and to let the market take its course. The market transformation framework is a response to a free market ideology that recognizes market failures and the need to compensate for those failures.

The market transformation framework has served two important purposes. First, it has provided a much needed reminder of the need to be strategic in dealing with energy efficiency. It provides a much needed correction to the end-use oriented pricing focus of the 1980s that had supplanted the somewhat more strategic but eclectic approaches that followed in the wake of the oil crises in the 1970s.

Market transformation also has provided an important framework for justifying policy development. In this application it has been quite successful. It has been adopted in California, the Northwest, the Northeast, and in numerous other states.

As a framework for program development, program monitoring and program evaluation, its utility is much more limited. At a recent meeting where the results of fifteen studies that retroactively studied the market transformational effects of DSM programs were reviewed, there was nearly unanimous agreement among the researchers that there were significant difficulties in applying the framework to programs. Most indicated that they had designed the studies and had then backfitted the framework to the research. Thus, rather than providing a theoretical framework which linked concepts in a causal nexus that provided testable hypotheses that helped to identify what to measure, the framework mostly provided a common language that was used to describe the results.

Ken Rolnicki

I definitely feel that the overall concept of market transformation is very realistic and necessary. Case-in-point, is that the world is slowly, and sometimes painfully, realizing that energy conservation will play a much more significant role in the way we lead our business and personal lives. (Its flaws?) Nothing is perfect. A clear communication of realistically what is a “market transformation” will be critical in avoiding any serious mistakes. Please see my discussion of the market life cycle model on page 69.

Doug Ringger

The concept of market transformation to high efficiency appliances can be achieved at least to a certain extent given the right product characteristics. First, if we look at how appliance energy efficiency ranks with consumers, it is well below other performance characteristics in purchasing an appliance. For example, when consumers were given a list of eleven characteristics and asked to rank them by importance of how that affected their purchase on dishwashers, energy efficiency placed ninth of eleven factors. When consumers were asked to list on their own important factors in choosing a clothes washer, five other factors placed in importance ahead of energy efficiency. As you can see from this information, energy efficiency is not what drives the decision to purchase a high efficiency appliance.

What are its strengths as a program model? Its weaknesses? Is it a useful model for publicly supported energy efficiency programs?

Dick Best

The energy industry appears to view market transformation as a one-time event, with a defined entry point, pre-determined investment (i.e. funding) and an exit strategy. The appliance industry views market transformation as a continuous and changing activity and a core element of competitive markets. The primary difference is that market transformation for the energy industry is focused on achieving benefits of a societal nature or benefits related specifically to that industry (i.e. energy consumption and emissions), while the appliance industry is focused on market share and profitability. (You could also say consumer needs and preferences, which are the primary drivers of our financial performance.) It seems to be a fine line between marketing for competitive advantage and market transformation activity for resource efficiency.

For market transformation to be effective for either industry, the key drivers for consumer choice must be known and employed effectively. It should be recognized that different groups of consumers respond differently to identical incentives. Also, a group of consumers will respond differently to the same incentive at different points in time. A good example of the timing impact is the current trend in automotive sales of small trucks and SUVs. With a strong economy, gas prices less than \$1.00 and no threatened supply, fuel efficiency is not currently a consumer concern. But remember the 70s.

George Edgar

The strength of the model is that it asks the appropriate question: can the barriers to a higher level of naturally occurring conservation be overcome on a sustainable basis that will provide the lowest cost and most societal benefits. The weakness of the model is that asking the right question does not mean that there are obvious or easy answers, especially when there is fundamental disagreement about the theoretical premises underlying the nature of barriers or how to overcome them.

Market transformation is a useful model because it should require a unified theory be developed behind it. Such a theory together with empirical information should indicate whether or to what extent market transformation is likely to be feasible or under what conditions, or whether energy efficiency has a significant “public goods” aspect which requires a conscious, continued public intervention to increase the level of societal benefits obtained from energy efficiency.

As noted above, the problem with market transformation is that it is an objective or strategy in search of a unified and effective theory that would provide a meaningful model of how market transformation can be achieved as program designs for interventions in markets. Simply defining a barrier and designing a program element that appears to be responsive to the barrier is not a theory nor is it justified by empirical evidence.

Ed Jesse

The strength of the market transformation model would appear to be in its recognition that energy conservation must be induced because it is contrary to marketplace signals. The weakness of the model, or at least the presentation of the model, is in its failure to identify how behavioral changes can be motivated absent a price incentive. To be a credible model for publicly supported energy efficiency programs; the model must be expanded or elaborated.

Two possible expansions/elaborations:

- (1) Identify products and processes for which there is demonstrable evidence that lower operating costs (*with current energy rates*) will more than offset higher investment costs, resulting in an economically rational purchase decision. In that case, a purchase subsidy (market transformation strategy) would make the investment even more attractive. If the product were something purchased regularly (e.g., fluorescent versus incandescent light bulbs), then personal experience would reinforce the wisdom of the initial purchase decision and induce subsequent unsubsidized purchases. If the purchase were infrequent (e.g., low versus high efficiency furnaces), then the subsidy would take consumers “over the edge,” inducing a long term investment that would not otherwise be made (I’m still using a 30-year old furnace in my house because [my local utility] has not attempted to convince me that the amortized cost of a high efficiency unit would be less than the marginal energy cost of continuing to operate my 75-percent efficiency behemoth).
- (2) Promote market transformation products by demonstrating that, *with realistic and likely future energy costs*, the unsubsidized investment cost for the energy-conserving product represents a bargain. In that case, a subsidy that equalizes costs between conventional and high-energy efficiency products would be persuasive to those susceptible to accepting realism with respect to future energy costs.

Marty Kushler

Conceptually, market transformation has many strengths. These include:

- A focus on the whole “market” for an energy-efficient product, and a recognition of the complexity of interactions that produce observed consumer behavior.
- An emphasis on looking “upstream” in the market process, in an attempt to leverage broader impacts that flow through to the end user level.
- A recognition of the importance of attempting to create lasting change in the market, rather than just affecting a one time customer decision, so that energy efficiency benefits continue to be captured over time.
- A practical advantage in that it reflects the “language” of the current political times, with an emphasis on such things as “using market forces” and “correcting market failures.”

Unfortunately, market transformation, at least as it is being approached thus far, has some serious weaknesses and risks for proponents of energy efficiency. The good news may be that these are mostly the result of political decisions and trade-offs made, rather than flaws in the underlying conceptual model, and thus could be corrected. These weaknesses include:

- Too often market transformation is being sold as being cheap, easy and fast, when in reality it is none of those things.
- Market transformation has tended to be portrayed as the new solution, and as a replacement for those “bad old DSM programs,” when in reality it is just one tool that needs to be used in conjunction with those other types of efforts.
- At least in some jurisdictions, market transformation is being perceived as the end itself, rather than one means to what should be the real end objective: capturing the societal benefits of energy efficiency.
- All too often the expectation is being created that market transformation is some kind of a “magic wand” which can be implemented for a few years to “fix” the market, and then such regulatory intervention can be withdrawn. This view is naive at best. At worst, it sets up MT (and by implication, all energy efficiency intervention) for failure and subsequent rejection.

In hindsight it is relatively easy to understand how energy efficiency advocates made some of the trade-offs that have helped create the above-mentioned weaknesses and risks. When faced with policymakers favoring deregulation and less (or no) spending on “social programs” such as energy efficiency, a new language was adopted and “market transformation” became the compromise instrument. For the long term survival of energy efficiency, however, several areas of re-education are going to be essential.

1) Market Transformation is not “Too Cheap To Meter”

Market transformation is difficult, requires significant investment of effort and resources, and necessitates an ongoing commitment of intervention over time. Markets are complex, and there will be many MT efforts that fail to produce noticeable impacts. Advocates should not over-promise, nor allow policymakers to over-promise, what market transformation will be able to deliver, particularly in a short time frame. Most importantly, market transformation should not be portrayed as a way to allow historical DSM budgets to be slashed while still capturing all energy efficiency benefits. That is not a realistic expectation for MT and is an unacceptable rationale for cutting expenditures on energy efficiency.

2) Don’t Allow a “Market Transformation vs. DSM” Mentality to Evolve

In selling the new product (MT) there has been a tendency to trash the old (DSM). This has been partially a tactic reflecting the attitude of certain policymakers who never liked DSM, and partially an overstatement of the hoped for advantages of MT; but it is factually wrong and tactically foolish. DSM, despite being “politically incorrect” at the current time, actually had many very noteworthy successes and achieved a lot of cost-effective savings. Many of the best programs of that era are still legitimate and important tools to use in the pursuit of the societal benefits of energy efficiency.

In terms of political tactics, the energy efficiency community needs to follow the “big tent” strategy. The MT advocates and the Energy Service Company (ESCO)/Energy Efficiency Service Provider (EESP) network have too often been put at odds with each other, squabbling over diminishing energy efficiency funding. That kind of zero-sum game is a prescription for disaster over time. Each of those elements of the energy efficiency community has an important role to play in promoting energy efficiency (including their own political strengths), and they should be working together to expand the pie and secure a maximum commitment to the societal objectives of capturing energy efficiency benefits.

In summary, market transformation is a concept with a very appealing theoretical foundation and some encouraging examples of successful implementation. However, in order to optimally contribute to the objective of capturing the societal benefits of energy efficiency, market transformation must be placed within a proper overall strategic context. Specifically, it should be viewed as one important tool among an array of intervention strategies that make up a comprehensive long-term commitment to securing the benefits of energy efficiency.

Loren Lutzenhiser

In the very general and abstract use of the term to date, there has been little necessity to understand what a “market” might actually consist of or what a “transformation” might look like. It is true that MT practitioners and evaluators are devoting considerable attention to how one might specify, measure and assess the nature of a claimed “transformation.” A good deal of work remains to be done there—although those discussions will inevitably lead back to the question/problem of just what a “market” is. This can, of course, be defined on a case-by-case basis, tailoring the scope of the definition to suit any particular intervention (“the market of appliance retailers in the state” or “the market of medium-sized home builders in the metro area” or “the market of all local government procurement officers”). While to some degree this is necessary, it also offers ample opportunity to undertake MT investments on the basis of sketchy, impressionistic and/or overly hopeful representations of the “market” for any given intervention (whether this might be a bulk refrigerator purchase, an appliance rebate, a manufacturer inducement, or award). One danger of this approach is that, rather than “markets” being “transformed,” the result can be largely symbolic DSM-style technology tinkering efforts that may accomplish as much as DSM did (effectively nibbling away at the margins), but little more.

The “program model” of MT presented in various working definitions stresses strategic intervention, measurable effects, lasting change, and withdrawal from the transformed market. It also relies heavily on the notion of “barriers” to energy efficiency that must be taken into account in program design. The “barriers” formulation has some serious problems. The barriers story goes something like this: “For years now, we have suffered an efficiency gap as individual consumers and firms have failed to appreciate the cost savings to be realized from adopting high-efficiency technologies. Although economically irrational, this failure is due to a variety of barriers to adoption (which include information deficits, short time horizons, split incentives, etc.). A important challenge for market transformation will be to design interventions that can overcome these barriers.” This account offers a vision of the world from the point of view of a particular action agenda—in this case, a technology efficiency agenda. To the energy efficiency planner, a “barrier” is anything that might prevent a would-be buyer from buying the most energy-efficient freezer, motor, or lighting system available. But the action view also offers a distorted perspective on reality—one in which the complexities of market systems are reduced to those few features that seem salient to energy efficiency action planners. In the process, much of importance is overlooked.

Instead of serving as convenient useful shorthand expressions helps to simplify communication, references to “barriers” tend to be used as glosses that facilitate non-discussion of what most technically-trained analysts, policy-makers and practitioners likely fear is a messy social world. This allows policy-making and planning to take place as if the world in which “strategic intervention” is contemplated and “barriers” are anticipated actually existed. This language has been used in the DSM world for years with little harm. Once programs are authorized, program managers, contractors and marketing consultants swing into action without much reference to “barriers” and “interventions” (they have their own glosses, but that’s another story). And sometimes good things happen (“barriers” of ignorance are mounted, buyers are “educated,” light bulbs are subsidized, savings are accomplished). And sometimes—many times—they don’t (e.g., when the large efficiency potentials estimated by national laboratory scientists for the buildings sector remains woefully unrealized). Under MT, however, where detailed knowledge of systems is desirable, this policy-defensive language obscures more than it reveals.

An additional problem lies in the adoption of this action-oriented policy-defensive language in efforts to seriously theorize about markets, technology adoption, and the analysis of policy options. In the worlds of higher-level EE advocates, energy analysts and policy-makers (e.g., in Federal agencies, international advocacy groups such as the American Council for an Energy Efficient Economy, the Alliance to Save Energy, the Natural Resources Defense Council, etc., and the energy sciences community based in the National Laboratory System), these forms of talk can too easily be deployed as if they were theory. When this happens, parties to policy discourse can fall into the trap of believing that more than sketchy forms of pop-economics and organizational jargon is involved—when, of course, they are not.

Real theories of markets and technological change are much more detailed and nuanced because they have been developed on a more disinterested (less action-focused) basis. It is this sort of knowledge, rather than DSM shorthand, that is necessary to support MT. “Markets” in any sophisticated and theoretically defensible use of that term rarely “fail,” and the “barriers” that are found in them tend to be carefully erected and maintained by market actors to protect their own positions—both from competitors and from state intervention (see Smelser and Swedberg 1994 for a survey of sociological and economic understandings of market systems). When viewed through the lens of scientific theory and empirical research, we find that markets are complex human systems of exchange, deeply embedded in a variety of socio-political and cultural systems, all supported by a long-lived technical infrastructure (which has been shaped historically by a variety of interests—some no longer present, some alive and quite well). What appear to DSM practitioners as puzzling “barriers,” are in reality routine and productive ways of doing business, making decisions, organizing stable relationships between firms and actors, and so on. This is a rule-governed world, with norms and conventions working along side of government regulations, work rules and systems of laws and codes. Organizational actors in this world build stable business relations, form supply chains and distribution channels, indemnify one another’s actions, offer guarantees, hedging services and other forms of risk control, and do what they can to create legal and normative constraints upon their competitors, their collaborators and their regulators. They erect a thicket of competing “barriers” that in so doing create a world at once welcoming and hostile to the notion of energy efficiency. Where someone can make a buck (and do good) by selling more efficient products and services, many others can make lots of bucks (and also do some good) selling various grades of less efficient, more consumptive, and more environmentally destructive technologies. By obscuring the workings of these systems through technology-centered paradigms and the DSM “quasi-theory” (actually non-theory), emerging MT “program models” actually handicap serious efforts to move technological systems in the direction of environmental sustainability.

David Mick

In light of these points, the current concept of market transformation as it is being defined by many observers in the energy field may not be sufficiently distinguished from marketing strategy per se. This is not a mere word game, since it directly impinges on the expectations, goals, and criteria for evaluation with respect to program interventions aimed at increasing energy efficiency. If the term “market transformation” continues to be used as a policy and program objective, then the terms of the discussion, including programs therein, must encompass the realization that true market transformation means substantially significant changes in the quality and/or quantity of energy-efficiency behaviors among various market participants.

John Reed

The market transformation framework describes the world at a fairly macro level. It does not present a theory of how products and ideas move into the market place. Rather, it identifies a series of “barriers” that may prevent the adoption of new products and concepts. The framework allows one to classify barriers but it does not relate the barriers to each other in any causal sequence. In this sense it is more of a typology than a theory. The current version of the market transformation framework does not provide a basis for asking a systematic set of questions that would help to identify the key actors, structures, and information flows within markets. Nor does

it describe an ordered set of activities that could provide the basis for the development of a viable program theory that would result in a successful implementation activity.

The market transformation framework does not have a viable underlying communications theory. In order to provide a useful program model, the market transformation framework must be enhanced so that it helps to identify key actors, to quickly identify the nature of relations among actors, to identify what effective interventions might be, and to help to time interventions to effectively reach target audiences. There is a considerable amount of knowledge in this area but the market transformation framework has yet to make good use of it. For example, we know that innovators and early adopters get their information and make decisions based on information from more general media channels while later adopters are largely influenced by information received through personal, professional social networks. If the goal is to influence later adopters, the most salient strategy is one that targets key actors in key networks.

The operation of the market barriers described by the framework need to be examined much more completely than they have been. For instance, when the barrier “asymmetric information” is described it is referred to as a “problem of consumers evaluating the veracity, reliability, and applicability of claims by sales people” and reflects the fact “that sellers of energy-efficient products or services typically have more and better information about their offerings than do consumers (Eto, Prahl, and Schlegel 1996).” Notice that the authors of the passage claim a *typical* asymmetry and do not claim that the asymmetry is uniformly in one direction.

Information is asymmetric in nearly every transaction. Traditionally this has been referred to as the information or knowledge problem. The asymmetries do not necessarily favor one party or other within the transaction. Within the course of a transaction, the advantage of the asymmetries of information may flow back and forth between the parties to the transaction. Each party has information that the other does not. The buyer may know the desired functions and specifications; the seller may have no clue. The seller may know that he cannot obtain the item in the time frame the buyer would like; the buyer may not. The buyer may have a price in mind; the seller may have no idea what that is. Innovators and early adopters are often much more knowledgeable than the potential suppliers of product. Product purchasers often find that they are more knowledgeable than the provider is. Even though the PC revolution is nearly 20 years old, it is not at all unusual to observe sales personnel in computer stores who are less knowledgeable than the customers.

The current market transformation model needs to be augmented to give product characteristics a more central place in the framework. The market transformation framework does identify barriers that deal with the problems of products entering the market. For example, the framework presents the barriers of performance uncertainty, product or service unavailability, and the inseparability of product features. However, it fails to take advantage of what is known about the characteristics of products that make their adoption more likely. For instance, products that are widely adopted usually have relative advantage. Relative advantage has numerous dimensions. Products with certain types of relative advantage are more likely to be adopted than other types.

Energy efficiency products often fail to be adopted because their champions promote forms of relative advantage and other features that do not meet the customer’s needs. In this regard, consider the case of two lighting products. Torchère lamps have sold extremely well. They provide high quality indirect lighting. For the most part they are aesthetically pleasing and quite functional. Most have controls so that lighting levels can be adjusted. And, they are inexpensive. They are also a safety hazard and energy inefficient, two characteristics upon which customers have not focused or acted.

Compact fluorescent bulbs have low operating costs and have long lives in comparison to incandescent bulbs. But, they are bulky and often difficult to install in existing fixtures requiring extenders or modifications to the fixture into which they will be placed. They do not always provide the desired quantity or quality of light. Their first cost is expensive relative to incandescent bulbs. Until recently, they could not be controlled to provide

different levels of lighting. While rebate programs have encouraged their purchase, they have not been embraced with the same enthusiasm that torchère lamps have been.

The torchère lamp sells because it has characteristics customers want. If the new generation fluorescent torchère lamps prove reliable, we may see the fluorescent lamp quickly displace the halogen lamp. Some models of the fluorescent torchère just arriving in the market have all of the desired characteristics of halogen torchères but price, and the price differential may drop rapidly. In addition, they are safer and less costly to operate.

Compact fluorescents may have to be physically modified to increase their acceptance in the market. Alternatively, fixtures may need to be redesigned to accommodate them. Their adoption in the commercial market has been aided by a wide variety of innovative fixtures and lighting system designs that make them a desirable option. New fixture designs may be required to encourage their adoption in the residential sector.

The main point of these examples is to illustrate how product characteristics influence adoption. A market transformation model must account for product characteristics. It should also help us predict when products will succeed or fail in the market.

Ken Rolnicki

One of the positive aspects of this model is that it will discipline the responsible individuals to think and act on a common track thereby, hopefully, producing cohesive agreed upon objectives, strategies and action plans—the heart of any business plan. A primary danger would clearly be the possible misunderstanding or misinterpretation of how markets change and customers purchase services/products by the managerial individuals responsible for the creation and execution of a business/marketing plan dealing with energy conservation market transformation. Incorrect and inconsistent decisions could be reached and implemented that would not consider the overall good of the majority. Additionally, there might be a tendency to react in a tactical, short-range manner as compared to being strategic in the overall business thought process. This is a natural and easy trap for nonmanagers to fall into; it is therefore imperative that program managers devote their full time and efforts into the implementation of both short and long-range plans.

[Is it a useful model for publicly supported energy efficiency programs?] Of course it would be as long as a unified acceptance and program management would be adhered to.

Mark Siegal and Doug Baston

Public utility commissions and state legislatures have recognized that utilities tasked with market transformation objectives will require different kinds of rules and incentives in a post-restructuring environment. For example, the Massachusetts restructuring law requires the state's energy office to promulgate rules that "give due emphasis to statewide market transformation programs in order to systematically eliminate market barriers..." and facilitate "statewide coordination of energy efficiency programs." (Commonwealth of Massachusetts 1997). The Vermont Public Service Board has advocated establishment of a statewide "efficiency utility" which would have amongst its several goals "transforming statewide benefits programs to market-driven programs." (Vermont Public Service Board 1996). Disappointingly, and yet telling, are the recent events in Vermont which have tabled the statewide efficiency utility because of industry restructuring troubles. (Energy Services and Telecom Report 1998)

At the same time, new organizations have emerged to focus on developing market transformation initiatives at the national, regional or state levels. Some, like the Consortium for Energy Efficiency (CEE) and EPA's ENERGY STAR[®], concentrate on developing program or equipment standards which others can adopt as benchmarks or focal points for their own localized program delivery mechanism. (CEE's "Premium Efficiency Motors" standard

and EPA's ENERGY STAR Clothes Washer are good examples.) Others, like the Northeast Energy Efficiency Partnerships (NEEP) and its Northwest cousin, the Northwest Energy Efficiency Alliance (NEEA) incorporate these national standards, or ones they develop locally to meet regional needs and conditions. At the state level organization is more informal. At least that is the case in Massachusetts, where the DSM managers of the Commonwealth's major utilities meet on an as-needed basis to discuss common market transformation program design and implementation issues.

Larry Alexander

We need to remember that market transformation was never meant to be the only technique used to achieve energy efficiency; programs to encourage low-income weatherization, efforts to prompt smart building designs, or other site-specific energy efficiency measures that don't involve uniform products or services will hopefully continue to produce energy savings regardless of how market transformation fares. But with market transformation of products so important to achieving energy efficiency, strategies need to be developed to encourage more energy-efficient products in a deregulated electric marketplace.

One appeal of accomplishing energy efficiency through the market transformation of products is that energy efficiency can be accomplished with little effort on the consumer's part. Everyone is so busy these days, and there are so many stimuli asking people to do so many things, that having to take personal, laborious, and time-intensive steps to achieve energy efficiency would mean that many people wouldn't do it at all. The beauty of market transformation is that people don't have to do much to save energy; they just buy an energy-efficient product and it does it for them. Having one label (as opposed to many conflicting labels) that identifies a product as being energy-efficient, as the ENERGY STAR[®] label does, ensures that consumers won't have to do much even when it comes to shopping. As long as the label is substantive and is not so consensus-based that it stands for nothing, the label is an excellent means of encouraging market transformation.

Traditional market transformation models can continue to be used in jurisdictions with wires charges or other government-mandated energy efficiency programs, but other strategies need to be devised to respond to electricity markets in which no such government supports exist.

States that have not yet deregulated can encourage market transformation through their regulation of utilities' energy efficiency programs or green pricing programs. Green pricing programs offer regulated utilities a way to prepare their systems, marketing departments, etc. for competition by offering their customers one additional product beyond standard service—a product with less impact on the environment. Green pricing programs don't just have to be about renewable sources of energy. They can also include energy efficiency as a means of reducing energy's impact on the environment.

In Massachusetts Electric's Choice: New England Pilot, which Environmental Futures administered, the most widely-selected green option for small businesses was an option that combined hydro power with energy efficiency rebates; it offered one of the lowest prices overall once estimated energy savings were factored in. In this and other green programs, energy efficiency can help offset the added costs of renewable energy by reducing the amount of electricity used overall, thus making renewable energy cost-competitive

All states are likely to deregulate the electricity marketplace, but only some will adopt wires charges to encourage energy efficiency. In the majority of states, there most likely will not be wires charges. How can market transformation thrive even in states without wires charges? How can manufacturers, aggregators, suppliers, and consumers see that there may be some benefit to them by participating in market transformation programs? There are a number of possible scenarios.

Some states may start putting their standard offer service out for bid, rather than having it automatically go to the local distribution company. Maine, for example, will be putting standard offer out for bid prior to its March, 2000 start of deregulation. In evaluating bids, a state could evaluate total energy savings as opposed to just the proposed cost of electricity. In such a situation, a supplier that includes an energy efficiency component in its bid (which could involve a market transformation program) might be viewed more favorably than the supplier offering simply the lowest-priced electricity.

Likewise, a supplier responding to an aggregator's request for bids might do better by including an energy efficiency component. This was exactly the case with an aggregation project spearheaded by National Energy Choice, an aggregator with whom our firm is involved, on behalf of the Massachusetts Municipal Association, the New England Newspaper Association, the Massachusetts Extended Care Foundation, and the Rhode Island Association of School Committees. An aggregator generally makes its money based on the extent to which it offers savings to its customers. The winning supplier, Select Energy, offered not only energy savings beyond the standard offer discount, but also additional savings through an energy efficiency program.

Even in the open marketplace, a number of suppliers may offer energy efficiency measures in their electricity offerings, whether they are offering a green product or a more traditional electricity product. Other than by price, there are few ways in which a supplier can differentiate itself in marketing electricity. Offering an energy efficiency component in addition to electricity, however, is one such way a supplier can market itself as being different from the supplier that merely offers the electricity commodity and nothing else. A market transformation project could constitute all or part of the energy efficiency or green component offered by the supplier. In Pennsylvania, for the purposes of certifying green products, the Green-e certification defines Renewable Resources as not only solar, wind, etc. but also "energy efficiency and conservation."

A supplier may even be able to achieve larger profits by bundling services, including energy efficiency services, together with electricity. In a report which Environmental Futures, together with the Tellus Institute and EUA Citizens Conservation, performed earlier this year for the U.S. Department of Energy's Chicago Office, we noted how an aggregator could potentially increase its profits as well as provide broader energy savings for customers through bundling a number of services, including energy efficiency, into its product offering.²

A supplier or aggregator might offer customers rebates for energy-efficient appliances, or might sell its customers energy-efficient appliances at lower cost by purchasing them in bulk, or might help finance their purchase, or under certain circumstances involving long-term customer contracts, might even provide these appliances for free to its customers. For significant market transformation to take place, such efforts need to take place throughout a region or throughout the country by a number of suppliers or aggregators. Tying such an effort to a common label or program, such as ENERGY STAR, might be a way to encourage widespread participation.

Even if a product that includes an energy-efficient component costs a bit more money up front, it may still attract a niche group of customers motivated less by savings and more by the desire to do something positive for the environment. This has certainly been the case with green pricing programs and for green product offerings. Therefore, even in a state that does not have a wires charge, a number of customers might be willing voluntarily to help support a product offering that includes a fund for advancing market transformation projects. Instead of supporting green megawatts, customers would be supporting negawatts.

To gain customer support, it is important to help people understand that just as purchasing electricity from renewable resources can benefit the environment, using less energy can benefit the environment even more, and therefore market transformation energy efficiency programs can be a key means by which society can reduce

² This report may be found at www.envfutures.com.

greenhouse gas emissions that threaten to bring about global climate change. With this kind of marketing effort, the deregulated marketplace may offer consumers the opportunity to make an important statement when they purchase electricity, just as they make such a statement in purchasing other green products.

Dan Barzel

With successful programs to market energy-efficient appliances, we will see significantly reduced energy consumption and improved product usefulness. Consumers might pay higher purchase prices, but they will receive benefits in the form of decreased operating costs and utility bills for years to come. Also, when manufacturers compete to bring out new energy-saving technologies, consumers will be motivated to buy these new, more efficient and useful products.

On the other hand, intervention that is not long-term and doesn't serve to change our collective memory and values about buying and owning energy-efficient product with the best technology and will simply be a waste of resources — of time, money and human energy.

Are the objectives of market transformation realistic? What results are realistic to expect from market interventions? Can limited intervention lead to lasting changes in markets? Can you *exit* a market and expect changes to persist?

George Edgar

The bottom line answer is that no one knows. However, empirical results over the past 25 years should make one quite sanguine about the ability to transform markets in which energy-efficient goods and services are offered. Indeed, in many areas, energy efficiency is noted by the absence of viable markets that would support private providers (e.g. technical energy assessments). There are obvious reasons to not simply take as gospel prior unsuccessful DSM efforts which often were disjointed, ended prematurely, poorly conceived and/or delivered, or directed at a somewhat different objective such as resource acquisition to avoid utility facilities. But, despite this, many program efforts in the past were intended to create sustainable changes (e.g. even customer incentives were viewed as a short-term means to allow customers to use products and to jumpstart markets). Thus, there is much to learn from past efforts, successful or otherwise, even if they were supposedly justified by a goal of resource acquisition. It is imperative that past market transformation program designs be used as a benchmark for the new generation of programs. It is important to understand why the new efforts will work better than previous ones, especially from the perspective of developing sustainable and vibrant energy efficiency markets.

In my opinion, part of the problem in being able to realistically assess the ability to affect existing market dynamics has been a heavy emphasis on the use of economic theory to justify market interventions. The “political” debate about energy efficiency and the imperialism of neoclassical economics in the 1970s, 1980s and 1990s into other areas has led to a stilted discussion about markets, market barriers, and market transformation. The old saw that if economics explained how to do business there would be no need for business schools appears directly applicable to energy efficiency. If market transformation is the objective, it would appear far more relevant and appropriate to focus on theories and empirical studies of markets, products, and services. Markets require understanding from a wide variety of academic or empirical analysis that encompasses marketing, customer decision making and behavior, and product development and testing.

Energy efficiency can be either distinct products or services (e.g. insulation or assessments) or attributes of a product purchased for other reasons (e.g. a refrigerator). To the extent that energy efficiency is treated as other goods, products, and attributes, the focus should be on theories and empirical studies from competitive markets and how energy efficiency does or does not comport with that theory and empirical information and models.

Markets dynamics do change and can be changed by market actors including the introduction of new, more valuable products (something the residential energy efficiency market could benefit from). It seems incongruous however to attempt to speculate on which limited interventions will in fact lead to lasting changes before an effective unified theory and empirical assessment has been made.

Ed Jesse

The primary objective of market transformation – creating a permanent change in consumer behavior without a permanent change in energy prices – does not seem realistic. Consumers have a well-documented pattern of revisionism in response to cheaper energy costs.

The results of market intervention are fairly predictable. If a purchase decision is made frequently (e.g., gasoline), then market intervention will be very short-lived. If a purchase decision is long-term (e.g., furnaces), then the effect of market intervention will be measurably more pronounced, but not permanent unless accompanied by an actual or anticipated permanent increase in energy costs.

Can limited intervention lead to lasting changes in markets? I doubt it. At least, not unless the markets change to reflect to true cost of energy.

Can you exit a market and expect changes to persist? Ditto.

Marty Kushler

Theoretical talk of “exit strategies” under market transformation has in many cases been corrupted into political decisions to fund MT efforts for a few years and then remove all public intervention. Whether this has been a cynical way to eliminate funding or a naive belief that such market magic was possible is open to debate. What is important, however, is that this misrepresentation be corrected. There are many persistent market barriers that are deeply rooted in human behavior (e.g., a preference for low first cost) or are otherwise insurmountable without some intervention (e.g., lack of capital, split incentives of owners and renters). Furthermore, there is the 500 pound gorilla of market failures: the failure to incorporate environmental externalities into the price of energy. It is completely unrealistic to believe that a few years of MT programs are going to overcome those significant barriers, and efficiency advocates must stop acquiescing to those who suggest it can be done.

Loren Lutzenhiser

Again, I don't think we have the data necessary to judge how realistic the vision or approach might be. The literature suggests that, while change in large-scale technical systems can sometimes be fairly rapid, it is rarely dramatic and is generally slow. There are good explanations for this having to do with the nature of long-term investment, social institutions, complex contractual/legal arrangements, cultural forces, and a number of other factors. Without going into these here, I think that it's fair to say that we shouldn't expect many quick large successes for MT. Modest results should be expected, with a hope for greater impacts. It is undoubtedly important for the credibility of the MT idea that proponents not over-promise (to regulators or the public) what MT is likely to be able to deliver in the near term. To do so is to help start in motion the regulators' exit strategy from their energy efficiency commitments. While in the long run this might be a good thing, in the near term it could be quite disruptive to efficiency efforts.

In principle, limited intervention could lead to lasting changes in market systems. Unique events sometimes make a difference in markets, in organizations and in systems of collective behavior. So do changes attributable to charismatic leadership (a “champion” of change), “being in the right place at the right time,” and even as a result of compelling ideas. However, these sorts of change are infrequent, making dramatic change from minimal intervention unlikely. If one wanted to amplify the effects of limited intervention, it would seem to make sense to target MT action (as the U.S. Environmental Protection Agency is now doing) at major firms and national/ international industry networks. In principle, a simple agreement between major equipment manufacturers and the Federal government could produce dramatic improvements in the efficiency of certain technologies in a fairly short period of time. Federal legislative effort might be required, however, and that is something that can probably only be effectively promoted by national/regional NGOs [non-governmental organizations] and Federal agencies (and something that has, to date at least, been largely defined out of the MT approach). Can a limited intervention at the local level lead to lasting changes (that are large enough to care about)? While not impossible, this is much less likely, since localities usually have little control over technologies developed and manufactured in other contexts.

Can such changes persist? Again, certainly in principle. But the real question is, for how long and to what degree? A wide range of market actors, cultural developments, disconnected policy effects. will certainly conspire to weaken the impacts of MT interventions. Recall the unintended effects of automobile efficiency exemptions for “light trucks” (which enabled the fairly rapid evolution of the inefficient and now ubiquitous minivan and sport utility vehicle), or declining use of compact fluorescent lighting in a non-subsidized environment, or the rapid erosion of energy efficiency in manufactured housing in the Northwest (a frequently cited example of dramatic market transformation achieved under DSM [see Kunkle and Lutzenhiser 1998]).

Fortunately for efficiency advocates, many of today’s energy-using technologies don’t have terribly long remaining useful lives. This will at least offer opportunities for replacement with more efficient equipment—if it’s available, desirable and affordable (or at least perceived to be affordable). However, some energy-using technologies have come to be sized for and built into the physical fabric of everyday life—e.g., large refrigerators built into kitchens that now cannot be easily replaced by smaller more efficient models (see Lutzenhiser and Hackett 1993; Shove et al. 1998; Wilhite and Lutzenhiser 1998 for discussions of various aspects of physical and social embedding of hardware systems). This represents a nearly insurmountable problem for MT. With luck, however, some products of MT interventions might, themselves, become embedded features of the landscape . . . with luck. In any event, various forces will certainly continue to work to both erode and enhance the “transformations” accomplished by various MT interventions, with some having better staying power than others.

David Mick

Goals and objectives tied to market transformation cannot be formulated flippantly, or expected to be achieved without a tremendously well-organized and well-supported program. In the context of thinking about market transformation, limited interventions (e.g., short-term promotions that reduce the costs of energy-efficiency practices) do not seem germane to the concept of true market transformation. But even if they did, they cannot have lasting effects. This would be the equivalent of asking whether a 3-month program of buy-one-liter/get-one-free in the soda pop category by Pepsi is going to change brand preferences in a substantial and lasting manner, beyond the existence of the program. Quite often these short-term interventions are intended to strengthen loyalty among existing customers, i.e., to reinforce prior behavior. They can also pull more purchases from consumers who are price sensitive or who are not strongly brand loyal. But the positive effect on Pepsi’s market share, to the extent it appears, is likely to diminish after the program is removed, with the market soon resettling into pre-program market share levels. Pepsi engages in these promotions, in large part, because other major suppliers do so (Coke, Dr. Pepper), and these short-term interventions are more of a defensive, me-too strategy than anything expected to affect enduring changes in consumer behavior.

Thus, exiting from a market strategy (i.e., stopping the program), when it has been implemented for only a short while, is probably destined to result in market behaviors that return to pre-strategy levels. This seems to explain the lack of long-term, persistent effects in the Power Smart program and the Northwest Energy Efficient Manufactured Homes Program.

John Reed

If by asking if the objectives of market transformation are realistic we are asking whether markets can be transformed or whether the transformation of markets can be accelerated, the answer is yes. However, there are several caveats.

We must be clear about what we mean by transforming markets. Keating, et. al. (1998) list a number of definitions of market transformation. Are we trying to accelerate the adoption of a specific technology, for example, T6 lamps and electronic ballasts? Or, are we trying to promote a product category, for example, efficient lighting? Or, are we trying to alter practices, for example, the design and placement of lighting systems and the use of daylighting.

Technologies and practices have life cycles that involve growth and decline. A technology may reach 30% of the market and then be displaced by another technology. The life cycle of a specific model of a technology is typically much shorter than for product categories or practices. The growth and decline of a specific technology can be measured by penetration of a product category. The transformation of a market by a product category can be measured by penetration into the appropriate market, for example, all relevant commercial establishments. Changes in practice may or may not translate directly into sales of a technology or sales within a product category and may be much more difficult to measure than technology penetration [See Reed and Hall (1998) for an illustration].

It may take as many as thirty or more years for a market place to be fully transformed, that is, for a product category to reach its highest level of penetration. Examples of this are the household penetration curves for refrigerators, black and white televisions, color televisions, microcomputers, microwaves, and other products. For example, the microcomputer revolution began in 1976 and 1977. Most businesses now use microcomputers but after twenty years roughly half of all US households have yet to purchase their first microcomputer. While the complete transformation of the market has not yet occurred, there have been many generations of technology that have come and gone (several transformations of the product category). For example, there were the early 4k machines with paper tape, the 8k machines with magnetic tape, the 16K machines with floppy disks, the 64k machines with 5 megabyte hard disks, etc. The technological transformations within the market have helped to drive the transformation of the product category. Without the technological transformations it is unlikely that the penetration within the product category would be what it is.

The nature and type of intervention in markets may change dramatically over a 30-year period. The initial purpose of marketing is to make people aware of an innovation and to get a small percentage of significant people in the market to adopt the innovation. Innovators and early adopters are important because their experiences and feedback help to shape the technology in a product category so that the technology has product characteristics that meet the needs of customers. Technologies that fail to adapt usually are not adopted. Once the product category is established, the issue usually becomes one of differentiating products in the market and gaining acceptance of features and/or brands. This is generally not considered to be a role for publicly funded interventions.

Diffusion theorists talk about innovations reaching critical mass in the market. This is the point at which the acceptance of an innovation in the market is driven by information traveling through social networks and by the cultural acceptance within social networks of the innovation. Critical mass is the point at which it usually

becomes clear that an innovation will potentially penetrate a large share of the market. For example, it is the point where the electrician hears from his buddies or says to his buddies, "I have used this product. It works. It is reliable. My customers like it. It is the product I will sell." This usually happens somewhere between 15 and 20% penetration of the market. This is the point at which people influence each other and adoption in the market begins to accelerate. Products and ideas that don't make it past this point usually leave the market.

Moore (1995) calls this the point of critical mass the "chasm," and it is really the line between the early adopters and the early majority. Early adopters get information and make decisions on the basis of information received through general information sources. The early majority reference each other. The trick to gaining widespread adoption of a product or idea is to create a beachhead among the early majority so that they will see their peers adopting a product. This is an entirely different task than getting innovators and early adopters to accept a new idea or product.

These observations have several implications for programming and for market transformation efforts supported by public goods charges. The first is that in the early stages of the diffusion of a product or an idea, you can rely on well-targeted use of the media to reach innovators and early adopters. Their participation is important for vetting a product or idea. When you get to the early majority, it is vitally important to target key individuals and groups who have the respect of peers and to get them to adopt.

It is at this point that contagion becomes one's ally and leads to an acceleration in the rate of adoption and to the transformation of the market. You do not get contagion until people see their peers using a product or communicate to their peers that they are using a product. This is the point at which the product really starts becoming a part of the culture. Contagion is necessary for further penetration of the market. This does not mean that advertising or all intervention in the market place can stop but it does mean that company X's decision to adopt is predicated on whether company Y has adopted company X's innovation. Further, without company X's decision, company Y is likely not to adopt. The important point for market transformation efforts supported through public goods charges is that intervention is essential at least to the point where contagion becomes a well established part of the process or it is obvious that contagion is starting to operate. It is at this point that the "market takes over."

It is important to remember that markets are dynamic places. The concept of change and the concept of "lasting" is really an oxymoron. Products change, the actors in the market change, and the needs of actors in the market change. Products and ideas stay in the market only until they are found wanting and until they are exchanged for other products and ideas.

People constantly revisit the decisions they make. People often buy products and then don't use them. This is an indication that they may have revisited their decision and have determined for whatever reason the decision was not a good one. This revisiting of decisions past is why energy audit programs often find people who have made their homes efficient signing up for audits. These people want confirmation that their decision was a good one or that there may be something else that they can do. Revisiting decisions is a frequent if not normative behavior.

The concept of "lastingness" then is really about getting people to reaffirm their decision or to make new decisions but not to revert to a less desired practice or technology. "Lastingness" is a function of the degree to which products and ideas meet needs and the degree to which they remain relevant to the context to which they are adopted. From an energy efficiency standpoint, it may not be desirable for people to become too wedded to a specific technology or set of ideas. The ultimate goal is to increase efficiency, not to maintain the acceptance of a particular method or product for doing so. In effect, what we are striving for is to encourage people to successfully adopt new concepts, technologies and practices that continually lead to improvements in efficiency in

terms of how people use energy to meet their needs. The amount of change is limited by the physical and economic limits to improving energy efficiency and by changing patterns of needs.

In the 1980s, the utilities in Wisconsin provided rebates that caused a shift to more efficient furnaces. After the rebates were withdrawn, the market remained because efficient furnaces were the normative offering among installers. This lasted until market actors entered the housing market in and near the southeast corner of the state and began specifying less efficient furnaces in order to provide more competitively priced offerings in the housing market. The market changed because of a change in the competitive forces in the market.

The “new” innovation in this market is a home that costs less to build as a result of installing a lower efficiency furnace. Notice this does not necessarily translate to a lower cost home for the end user. The contractors may be taking the margin, they may be passing it through to the customer, or they may be doing some of each. The question from a market transformation perspective is whether this “new” innovation will spread from the Southeast across the rest of the state as contractors in the adjacent areas seek to compete with contractors in the affected area. It may remain confined to the Southeastern counties if those market sheds do not overlap with others.

The withdrawal of public goods funding from the furnace market in the late 1980s was appropriate. At that point in time it was unnecessary to use public goods to sustain the market. Now, new intervention in the furnace market may be warranted. However, the intervention need not be the same as the original intervention. There are a variety of options including building codes, energy efficiency designations, or reduced interest loans for more efficient homes that could achieve the same thing as the rebates.

There are five key points to be made concerning interventions in the market

1. Market transformation takes time. It will rarely be the case that a one- or two-year intervention will be sufficient to set a market on an inexorable course to transformation. Indeed, the effects of a one- or two-year intervention may be difficult to detect. It may take several years to develop a product, or program and/or to establish a market.
2. The product must meet a need or it is unlikely to be widely adopted. Innovators and early adopters are important to developing products that will be accepted in the market. It is important for product developers to know whether they are dealing with a product that will have widespread acceptance.
3. The approach to influencing market transformation varies with the stage of adoption. Innovators and early adopters make decisions based on information from general sources. Innovators will tinker with products that aren't quite ready for prime time. The early majority references key peers. They are only interested in products that will deliver as promised. This will likely require a much more targeted and much more personal approach than is used in the early stages of market development.
4. From a public goods perspective, an intervention may need to continue at least until the early majority has clearly begun to adopt a product or an idea and it has become accepted by at least a few key actors. Once critical mass has been reached or it is clear that it will be reached, support may be reduced or withdrawn.
5. Market conditions are constantly changing. Once public intervention is withdrawn, there is need to maintain surveillance of markets to see if forces within the market may change the conditions that lead to acceptance in the market. Additional intervention may be required.

Ken Rolnicki

Yes, I do believe that the objectives of market transformation are not only realistic, but also compulsory if energy conservation attitudes will affect buying behavior.

Do not expect the world to change overnight. That is not realistic. Too many deep rooted, luxurious, energy-wasting practices need to be recognized and addressed. A nationally coordinated three- to five-year energy end user conservation awareness program must be adequately funded, staffed and implemented if the consumer attitudes are to be changed. As a typical energy end user, all I've noticed are sporadic temporary media communications attempting to convince me to participate in power and energy conservation. If we are to succeed in changing the base root environmental attitudes, then a more serious communications campaign must be conceived and implemented.

Limited intervention, in any business format, will produce similarly limited, inadequate results. It's really the difference in thinking tactical versus strategic...short range versus long range. In my marketing managerial opinion, I feel that much of the past and present market transformation program has been regionally piecemeal and certainly not nationally coordinated.

In my opinion, there must always be some type of continual contact with a market in order to assure that the longer-range strategic objectives are attained. Complete disengagement would disrupt or even, halt changes in a marketplace. Segmentation! Segmentation! Segmentation! One must keep in mind that power and energy companies have a very unique marketing advantage...they know precisely who the end user customers are and precisely how much energy they are purchasing.

Larry Alexander

Much has been written about exit strategies and how advances can be maintained even after programs to support market transformation have ended. Ironically, one of the best protections against backsliding, once most products have reached certain energy efficiency levels, involves codifying these new efficiency levels into law—either in building codes or national efficiency standards. However, some manufacturers may balk at such standards, arguing that they run counter to the generally voluntary private sector involvement in market transformation programs.

Dick Best

The focus should be on a singular objective, that of creating a permanent change in a market by some form(s) of intervention. How much change during the program and how much permanent change is maintained after exit should be understood on the front end. Observing some of the current programs on clothes washers, one could conclude they are quite successful based on market share of high efficiency models prior to the programs and market share during the programs. But the ultimate test is what happens after the incentives end, and few of the recent programs have defined that measure.

One of the difficulties the energy industry faces when trying to transform appliance markets is the limited number of consumer drivers available to them to employ as incentives. Of course, there is always money in the form of rebates, tax credits, etc. Certainly this is a time proven method of influencing consumer choice at the point of purchase. But it is probably not the most effective market transformation tool. An example close to home is the SERP (Super-Efficient Refrigerator Program) refrigerator. A large quantity was sold with significant energy savings to the consumer. But when the models were no longer subsidized, the consumers turned to less efficient models at lower prices immediately.

Manufacturers study key consumer drivers frequently. And it is clear that a vast majority of consumers place the performance, price and capacity type of attributes ahead of energy efficiency. Influencing the price obviously will help change consumer choice at the point of purchase. But to effect a significant permanent change, something more substantial than financial incentives must be brought into play. It is interesting to observe that the Maytag Neptune advertising focuses on stain removal (performance)—not energy or water efficiency.

What rates of success should be expected for market transformation (in qualitative terms)? What time horizons are realistic for market transformation programs to achieve intended results?

Ed Jesse

In classic economic terminology, that depends. At least as presented, market transformation can only be successful if the transformation is accompanied by: (a) a fundamental change in the energy conservation “ethic” of consumers; (b) a clear signal that energy costs will increase to recognize scarcity and externalities; or (c) a permanent subsidy that more than offsets any higher costs (investment and operating) of employing energy reducing technologies. I don’t think that time horizons are particularly important in judging the likely success of market transformation strategies unless one of these three elements of success is present.

Marty Kushler

When successful, MT will produce incremental improvements in targeted market events, segments or measures. Rather than declaring victory and going home, the proper use of MT will be to move on to the next most important market events, segments and measures, while continuing to monitor the persistence of past efforts. That is a strategy requiring ongoing commitment and flexibility, not a one-time panacea.

Energy efficiency produces significant societal benefits and enjoys very broad public support. There is no compelling reason why public funding should be only short term. We don’t fund the defense budget for a few years and then expect the private sector to take over. We don’t fund food safety inspections by placing voluntary contribution cans on the counters at restaurants. We don’t propose an “exit strategy” to get the government out of funding child care services or education.³ Like so many other public goods, energy efficiency is worthy of a long term commitment of funding in order to pursue the significant societal benefits (economic, environmental, and even national security) which it can provide. Pretending otherwise in exchange for short term funding is a strategy with no future.

Loren Lutzenhiser

We simply don’t know enough about the undertaking—and we tend to be undertaking it in such an unimaginative way—that speculation is not warranted about which interventions might produce more lasting effects, when exit might and might not be possible, or what time horizons are appropriate. We know a good deal about how very large social systems (countries, tribes, societies, multi-national markets) react when we “intervene” in them with bombs, diplomats, foreign aid, blockades, peace-keepers, and advisors. We know much more about responsiveness in these macro-social systems than we do about how MT might work in the case of a particular technology or regional market. Yet even in the global diplomatic realm, where we’ve expended enormous sums and

³For those who prefer a “private sector” analogy: even MicroSoft, an acknowledged juggernaut with monopoly market control, doesn’t stop aggressively intervening in the market.

conducted a good deal of research and experimentation, we haven't been able to predict very well (despite protracted debate and analysis) what would happen in a Kuwait, Haiti, Russia, Somalia, or Bosnia. We have only been able to discover how our interventions "worked" after they were attempted.

Not that a detailed understanding of a smaller system such as a regional market would guarantee large scale MT success, even using well-designed interventions with solid exit strategies. The markets described by economic historians and other students of innovation and technological change seem to be messy, sometimes chaotic, always evolving places where cause and effect are extremely difficult to assign even with the best data. This is because large, complex interconnected sociotechnical systems are involved, with different sectors changing at different rates and under different influences (e.g., see Hughes 1989, Cowan 1989 for historical perspectives on innovation and large scale transformative technological change). Innovation can and does spill across sectors, the transmission of ideas often being more important than the transmission of tools and artifacts. Ideas and devices are adapted, reinterpreted and changed as they move across contexts (competitor sets, industries, societies). Sometimes the uptake is slow and sometimes it is rapid. Sometimes the result is improvement (in productivity, quality, efficiency, social benefits), and sometimes poorer performance is the result. Both competition and cooperation are involved in market/technology systems, and both can serve to enhance and channel innovation, as well as to discourage it. Sometimes the effects of innovation (on firms, industries, communities, individuals) are significant. At other times they're trivial. The overall pacing of innovation and resulting sociotechnical change is uneven and punctuated, both through time and across communities, societies and social networks. But this is not an open-ended process. As technologies (whether these are production machines, buildings, systems, appliances, cars, etc.) are shaped by socio-political-technical dynamics, their developmental trajectories foreclose the development of alternative (and sometimes arguably better) technologies (see Dosi 1982; Cowan 1996 for discussions of path dependency and technological lock-in).

While we are far from applying any of these sorts of insights from the historical literature in systematic ways to the MT problem, some practitioners are sensitive to the need to ground interventions in the best possible understandings of the systems involved [e.g., Eckman's insistence that interventions be supported by "good stories" about markets and their change potentials (T. Eckman, Northwest Energy Efficiency Alliance, personal communication, 1998)]. Others, however, are content to rely upon the modest arsenal of understandings and limited conceptual vocabularies inherited from DSM.

David Mick

If a program is undertaken to increase energy-efficiency behaviors (e.g., cost reductions to install/use certain industry or household technologies), then it seems that the only possible way that this program could be eventually removed and still have continuing effects (i.e., new individuals performing the same activities, without the cost-reduction offer) is if the strategy has altered the values/beliefs of the *next generation* of industry managers or household consumers. For example, if I get a cost reduction of some kind for installing a piece of equipment on my furnace or air conditioner that increases energy efficiency, AND (this is a big "AND") my son observes and learns from this (perhaps he even helps me install it or he watches as it is done), then he may internalize the value of reducing energy use, independent of whether he realized that there was an economic incentive to my original behavior. Perhaps in his adult life he will act similarly, but even more so out of his own desires to be energy efficient, absent of economic incentives. The point of this hypothetical illustration is to emphasize that most marketing programs cannot have true market transformation effects unless they are kept in place for long periods of time, until they influence the values/beliefs of next-generation consumers. It also suggests that a critical target market for energy-efficiency behaviors is school children.

Overall, increasing energy-efficiency behaviors among targeted adult consumers is likely to remain very difficult in times when the American economy is performing relatively well and energy is readily available (and inexpensive). Also, there seems no reason to believe that energy-efficient behaviors will be higher in a de-regulated

energy environment unless those behaviors arise from changing values/beliefs among market participants. Hence, increasing and perpetuating energy-efficiency behaviors will only occur when (1) values and beliefs are strengthened as to the advantages of such behaviors and/or (2) regulation or legislation mandates such behaviors. Since current socioeconomic developments indicate a more open-market environment for energy providers, it seems inarguable that the scope and tactics of energy-efficiency programs must be long-term and aimed at changing values and beliefs. Without changing values and beliefs, any modifications to behaviors will be temporary, as people will return to old tendencies and habits that fit more readily with prior values and beliefs. If the economy worsens and/or energy becomes less available, then the logic of the preceding ideas would naturally change.

Ken Rolnicki

I firmly believe an adequate time period should be given for a market transformation program to produce the desired results...normally two to five years. Borrowing a quote from a colleague of mine at Kellogg, "Success must be earned and not merely declared," and "Success is a journey, not a destination."

Mark Siegal and Doug Baston

This stuff [market transformation] is hard. And while it is simple to point to barriers such as balkanized utility programs, it is unrealistic to assume that "market transformation" programs can lead to a quick exit from publicly funded energy efficiency. If transforming markets were simple then it would have been done a long time ago. Markets are complex and accomplishing desired outcomes (i.e. transforming them) requires coupling existing expertise found within the energy efficiency community with greater participation by the new network of players in an environment where all implementers — utilities and other entities — are operating under a consistent set of definitions and, to the extent possible, regulation from the public bodies that oversee these programs.

Larry Alexander

It should be noted that many consumers may not want to be educated about energy efficiency. Instead, other attributes of a product may have to be stressed. The possibility of having cleaner, gentler washes is what likely is selling high-efficiency TumbleWash clothes washers; the opportunity to have faster, smarter machines is what encourages people to buy new computers, even if they also sport the ENERGY STAR[®] label. In evaluating a market transformation program, one shouldn't be overly concerned about consumers' motives as long as the products that consumers buy are energy-efficient.

Evaluators also need to realize that by their nature, market transformation projects take time. As has been observed elsewhere, market transformation efforts really are product introductions, and product introductions generally take time. Initially, very few people bought VCRs, but gradually they caught on and now they are in almost every home.

Market transformation efforts also tend to be national or at least regional phenomena rather than statewide efforts, thus making these efforts difficult for state evaluators to analyze. In addition, outcomes are often beyond a program sponsor's control. Manufacturers may have delayed their product release dates (as was the case with many high efficiency clothes washers), other states in a region may not have had a comparable program, the economy may have taken a nosedive——there are many reasons why in any one year in any one state it may be difficult to find evidence of market transformation.

In addition, it may be difficult to prove causation even where there has been market transformation (was it the ratepayer's subsidy or was it a good economy that caused the change?). Therefore, consistent with the "good faith implementation" approach suggested by FK Gordon et al. (1998), we might evaluate the reasonableness of

the steps taken by a program's sponsor to accomplish market transformation, as opposed to looking solely at outcomes such as number of units sold, etc. This might be especially useful in states that look at one-year metrics as the basis for their evaluations.

It should also be noted that market transformation projects by their nature can keep being extended and never end. Thanks to regular technological advances, most products can keep getting more and more energy-efficient. Whatever short-term goals we may have set, we find as we approach them that we can keep going further. However, to avoid feeling like Lucille Ball in the famous bakery assembly line scene where no matter how fast she worked, the conveyor belt kept going faster and she could never catch up, we must proclaim victory when we reach these short-term goals, even as we keep an eye on our longer term goals. That's why it often makes sense to have two tiers for market transformation goals —one that is reachable in the short term and can be linked to consensus-based labels (ENERGY STAR, etc.), and another that lets manufacturers know where we would like them to be in the future.

Dan Barzel

True “transformation” will involve a shift in societal values and probably take 15-25 years. We need to address long-term change with long term-incentives and education. We need to sow the seeds of new, more technology and energy conscious values. Intervention to stimulate this type of overhaul has to be in the form of long stimulation of the market or through the current appliance standard setting process.

George Edgar

Again, being sanguine in the face of limited successful experience and results from previous market transformation activities would suggest a longer time horizon and, at least initially, limited rates of success. The greatest danger in this area is creating expectations that are unlikely to be met. For example, in California, the “public benefits” legislation initially presumed a potential 4-year transition to transformed markets. Some practitioners suggest that 5 to 7 years of market transformation efforts are likely to be necessary in specific market niches (e.g. efficient lighting or appliances in the residential market). Rates of success and time horizons are best treated as specific elements in a program design that should be justified by theory and empirical evidence. They would provide at least a reasoned gauge for a program that could indicate its possible success as well as real-world test about the validity of the theory underlying the design.

What are key research and data needs to develop, implement and evaluate market transformation programs? Do we know enough about consumer and organizational behavior within markets to yield the desired program responses from market transformation interventions?

Loren Lutzenhiser

While there are a number of scientific literatures relevant to markets and technological change exist, they have not been brought to bear on the MT problem. A good deal of MT-relevant work has been undertaken, for example, by social scientists interested in energy and behavior. Much of this has had an emphasis on the consumer side of markets (e.g., see Lutzenhiser 1993), although recently greater attention has been given to the interactions between producers and consumers of energy-using goods (e.g., Shove et al. 1998, Wilhite and Lutzenhiser 1998). The most recent work in this tradition is stimulated by an interest in the human dimensions of global environmental change, and particularly in understanding the dynamics of environmentally-damaging

consumption in advanced industrial societies. While this sort of energy social science theory and research has yet to be widely understood and adopted by the energy efficiency community, there exists an even wider array of MT-relevant literature in the social sciences that remains unknown even to those energy efficiency advocates who are most interested the “human dimensions” of energy systems. This work considers both consumer and producer sides of markets, processes of technical innovation and large-scale technological change, and the behavior of markets as systems. It includes research and theory in organizational analysis, institutional economics, environmental sociology, science/technology studies, economic sociology, cultural anthropology, and consumer psychology.

A first task, then, is the collection, review, and synthesis of knowledge from all relevant literatures that bear on the MT problem. This will allow for a theory-informed assessment of which market systems are likely candidates for MT treatment and how interventions in them might be structured. Without a working knowledge of this literature, MT interventions can be based only on DSM experience, anecdote, and knowledge grounded in the technical professions—hardly a recipe for success or a solid foundation for major social investment.

At present, however, even well-researched interventions are necessarily ventures into uncharted waters. The bulk of the existing social science literature refers to general patterns of market behavior, with relatively little attention paid to the particular markets that are of most interest to EE/MT advocates (e.g., markets for housing, commercial buildings, appliances, lighting, etc.). This means that specifically-targeted research is needed in order to better understand the dynamics (and vagaries) of these markets. This work involves identifying the particular market networks, institutional systems, cultures, regulatory regimes, historical patterns of action, firm interdependencies, and other influences upon innovation in each system (see Blumstein et al. 1998 for a discussion of the role of research in theory-based MT, particularly the relationship between theory, mid-range research, program planning, and evaluation). In a recent scoping study of residential construction markets, for example, Lutzenhiser et al. (1999) argue that successful MT intervention requires an adequate understanding of that industry’s organization of work, recurrent labor supply problems, industry norms regarding “quality” and “defect,” trends in supply chain disintermediation, the effects of product liability and regulation, business cycle impacts, and a variety of related factors.

The research needed to support interventions in such markets—and, in fact, the very thinking needed for effective MT—is inherently interdisciplinary. The market systems in which we would intervene are configured by a combination of environmental, technical, cultural, organizational, economic, and social-regulatory factors. A working conversation is needed that draws from all of the knowledge bases and analytic perspectives that can shed light on these factors—knowledge that is found on both sides of the traditional divide between the “technical” (physics and engineering) and “social” (sociology, economics, anthropology, psychology) sciences.

The technical sciences have developed an impressive array of more efficient ways to heat, light and cool space, and to power industrial, commercial and residential equipment. As noted, the problem has been slow adoption of these innovations, even by forward-looking firms and astute consumers. The task of MT is to stimulate the uptake of these and other efficiency innovations, and hopefully to stimulate the growth of an “efficiency industry.” The social sciences, for their part, have developed a rich knowledge base related to technological change, consumption and the environment. However, social scientists tend not to write for technical audiences (see Ritzer 1998)—although they are quite involved in social policy realms and are generally open to collaborative research (this is particularly true of social scientists who have previously done work on energy, markets and technology). A problem lies in the inflexibility and paradigmatic limits found largely on the technical side. Not only is the growing body of EE/MT-relevant social science work virtually unknown within the techno-centered efficiency community, with only a few notable exceptions, it is not seen as particularly necessary for EE or MT. When social scientists study the evolution of technical systems (e.g., the shaping of military or medical technologies), they find it necessary to understand the physics, chemistry, biology, and engineering involved, as well as the social and institutional elements of those systems. However, when technically-trained efficiency advocates

approach markets and market actors, they often seem to do so with the belief that they are either innately equipped (by virtue of being humans) to understand and act effectively in those contexts without reference to social science knowledge, or that the social world is organized according to simple mechanical principles (e.g., self-interest) and can therefore be readily changed through mechanically-conceived bureaucratic interventions. Unfortunately, both beliefs are demonstrably false.

If the disconnect between social and technical perspectives on a shared problem is potentially problematic for the success of MT (as well as for other global environmental policy regimes), it is logical to ask: “Why such narrow and parochial views?” “Why not an avid interest in acquiring the perspectives, concepts and tools necessary to really understand and evaluate ‘barriers’ to EE innovation?” One possible answer is that EE policy development takes place in an institutional context dominated by an engineering culture and technical vocabulary that simply can’t comprehend or express the complex, fluid and somewhat unpredictable nature of human affairs in markets or other social systems. To really understand the character and dynamics of “barriers to efficiency” (a wonderfully reassuring word that conveys a sense of something solid to be measured and moulded) would require a new grasp of theory and potentially a new conceptual vocabulary. Thinking outside of the EE techno “box” requires a questioning of taken-for-granted assumptions—a deviant and risky business, particularly at a time when the fate of the energy efficiency movement is somewhat in doubt. I would argue, however, that this is precisely the time for an infusion of new ideas into the EE/MT world and for a new collaboration between the technical and social sciences. It is continued failure to expand the EE/MT paradigm to fully include the social dimensions of energy and technology use that is likely to jeopardize the future of the efficiency movement in a changing ecological, political and intellectual environment—not the exploration of new ideas and approaches.

Regardless of what happens to MT or how rigid EE thinking remains, there will continue to be some energy efficiency gains made by firms and consumers as a result of market action and local intervention. Some level of research and development will also continue, as will some level of EE activity by state and local governments, NGOs and universities. The influences of global CO₂ reduction imperatives will continue to be felt and acted upon at various points in markets and government systems. But with a move toward deregulated energy markets (and the belief that optimal efficiency can automatically be “found” by market mechanisms), the future of techno-centered (as opposed to market-centered) EE does not seem bright in any imaginable scenario. The question is: “Can a techno-centered EE paradigm on its own grasp the dynamics of markets well enough to successfully induce the significant growth of market-based efficiency innovation?” I think that with the assistance of some clever (and very lucky) advertising and marketing people, some success may be had by techno-centered EE, particularly at the national level (e.g., via some of EPA’s, DOE’s and CEE’s promising MT initiatives and industry collaboratives). But the answer in general, for most states and localities, has to be “it is very unlikely.”

David Mick

Data are needed to know comprehensively the prior values, beliefs, and behaviors of those intended to be effected by any marketing strategy or market transformation program. Without this baseline for the purposes of conducting pre-program and post-program comparisons, analysis of the success of such programs is moot. Nonetheless, this will be difficult for many reasons. In the first place, the concept of energy-efficient consumer behaviors harbors considerable social desirability biases. Data gathered from surveying people about their current values, beliefs, and behaviors with respect to energy efficiency is likely to be confounded with their tendencies to present a favorable image of themselves as concerned citizens on this matter. This problem is complex, but can be mitigated by certain measurement and statistical procedures (see, e.g., Mick 1996). In the second place, establishing the precise causal effects of such programs will be nearly impossible. There will always be uncertainty about the degree to which the programs themselves have impacted changes versus the effects of other factors (e.g., media news about energy, economic conditions), not all of which can be controlled

or measured for the purpose of refined data analysis. In general, isolating and understanding causal factors through research approaches of a non-experimental, non-laboratory nature is difficult at best, if not impossible.

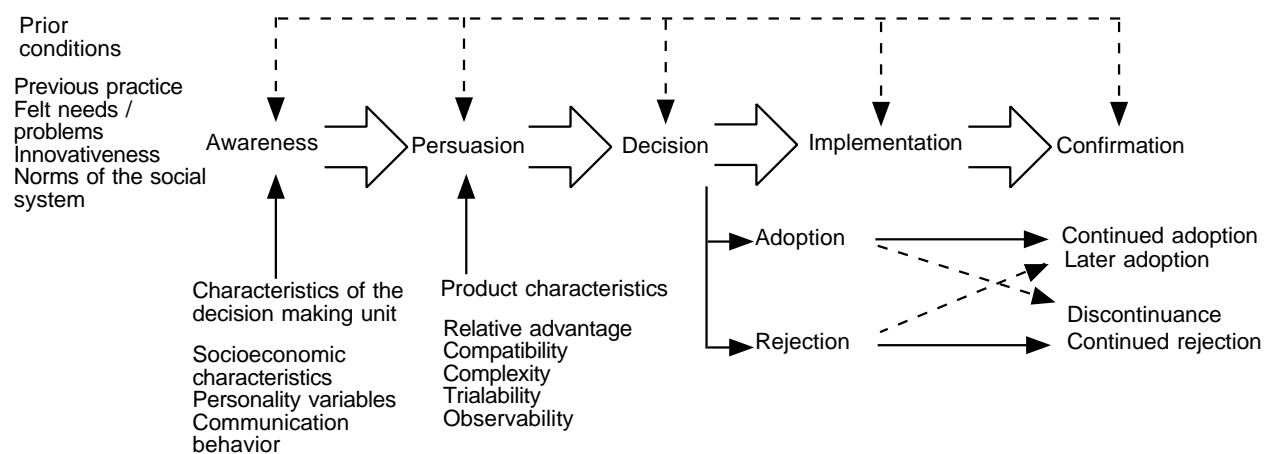
John Reed

These questions assume that the data needs are uniform across market transformation programs. Usually this is not the case. In order to make them more appropriate, these questions might be rephrased as follows. In general terms, how can the process by which markets are transformed be described? In other words, what is the theory of how markets are transformed? Based on this theory, who are the key actors and what are the relations among them in a specific market? Based on the application of the theory to a specific market, what strategies and approaches are to be used to intervene in that market? In other words, what is the program theory? Given the program theory, what should be measured in order to determine whether a market intervention is successful? Finally, what is a good methodological design for evaluating market transformation programs?

A theory of market transformation is vitally important to developing effective market transformation programs. Without a theory, we are likely to develop programs and search answers about program effectiveness in a hit or miss fashion. Further, we are likely to develop program theories that lead to less effective programs. Finally, without a theory we may not measure the things that need to be measured and therefore may not understand how effective an intervention is in transforming a market.⁴

The diffusion of innovation tradition provides one causative model for describing the causes of change in the market (See Figure 1). The model says that actors (at all levels in a market) must become aware of a product, concept or practice before they can adopt. They then seek information and evaluate the innovation. At some point actors make a decision as to whether to adopt a technology or practice. They then implement their decision. If the decision is to adopt, the implementation may be at a point in time well separated from the decision to adopt. Finally, decisions are always subject to confirmation and change.

Figure 1: Diffusion of innovations model



Source: Rogers, 1995

⁴ The term “program theory” as it is used here is a technical term. It refers to an intellectual tradition that is widely referenced by evaluation specialists outside the energy arena. Blumstein et al. (1998), use this same term in a recent paper but it is not clear whether they are aware of the technical use of this term.

This is a very simplistic statement of what is in fact a very powerful model. For instance, within the corpus of this tradition there is a very substantial literature describing the effectiveness of different modes of communication used to create awareness and to communicate information. The primary modes are broadcast modes (basically mass media) and interpersonal modes (i.e., social and professional networks). Which mode to use depends on where one is in the process of transforming the market, a point that was made previously.

There is a very substantial part of this tradition devoted to mathematical modeling of penetration curves (s-curves). A number of these efforts have attempted to model such things as the effects of rebates, information only campaigns, etc. These models could easily be fit to the penetration curves found in the energy literature such as Prah's work on the adoption of advanced lighting technologies and the recent work produced by Rosenberg et al. (1998).

It is not possible in the space allowed for this response to fully articulate this model or to document what is known about the relationships suggested by it. We can illustrate the depth of the model by pointing out that implicitly or explicitly the model implies the need to:

1. Carefully delimit the market(s) that are to be influenced
2. Identify the key actors (decision-makers) in the markets
3. Segment the actors, organizations and/or institutions into groupings that operate in similar ways
4. Identify culture, social structure and patterns of influence that constrain how the various actors in the various market segments make decisions
5. Examine the social characteristics of decision-makers
6. Identify the preferred paths and modes of communication among actors in the market
7. Create targeted activities that generate awareness
8. Analyze the product or idea to understand its characteristics with respect to actors needs, cultural and social settings
9. Shape the product and messages about the product

This is partial list, but it serves to illustrate steps that need to be taken in order to develop a program and to know what to measure.

A practical illustration of some of these points is found in work recently completed by Reed and Hall (1998) during an evaluation of a program designed to transform the buildings market. Generally, people tend to describe the buildings market as if it were monolithic. However, it is extraordinarily complex. Figure 2 and Figure 3 (Reed and Hall, 1998) illustrate patterns of decision making for buildings constructed in a traditional way using an architect and buildings constructed using the design/build approach. In the traditional method, the owner, architect, and designers are the key decision-makers. In the design/build scenario, the end-user, usually represented by a facilities managers, and the contractor are the key decision-makers. The "designers" in a design/build project are likely to be experienced draft persons or engineers. The point is that the decision-makers are different, the channels for reaching the decision-makers are different, the goals of the decision-makers differ, and the messages that are sent to them need to be different. Without understanding who the different decision-makers are, program activities may miss their target and assessments of the market transforming effects of an intervention may not adequately measure the results.

Figure 2: Key players and their relationships for an architect designed building

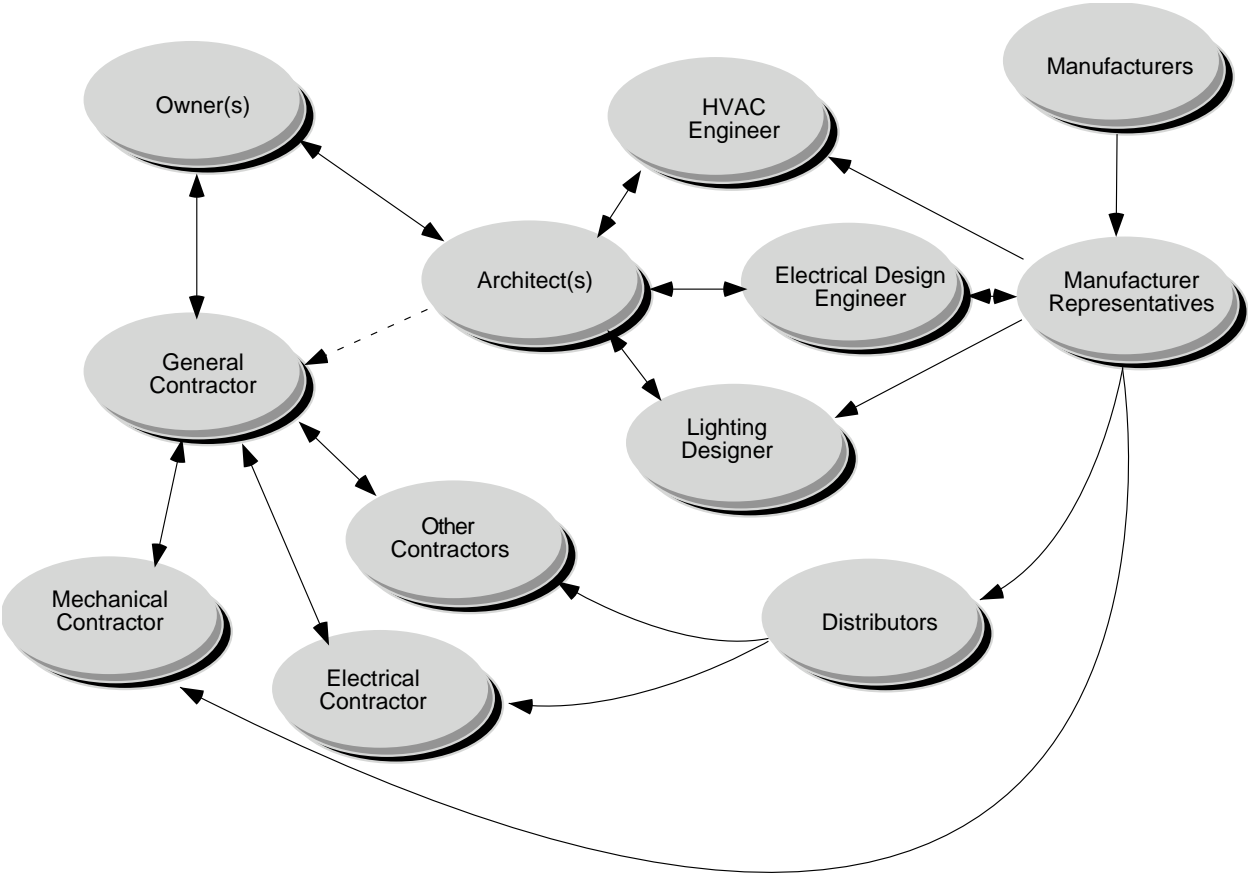
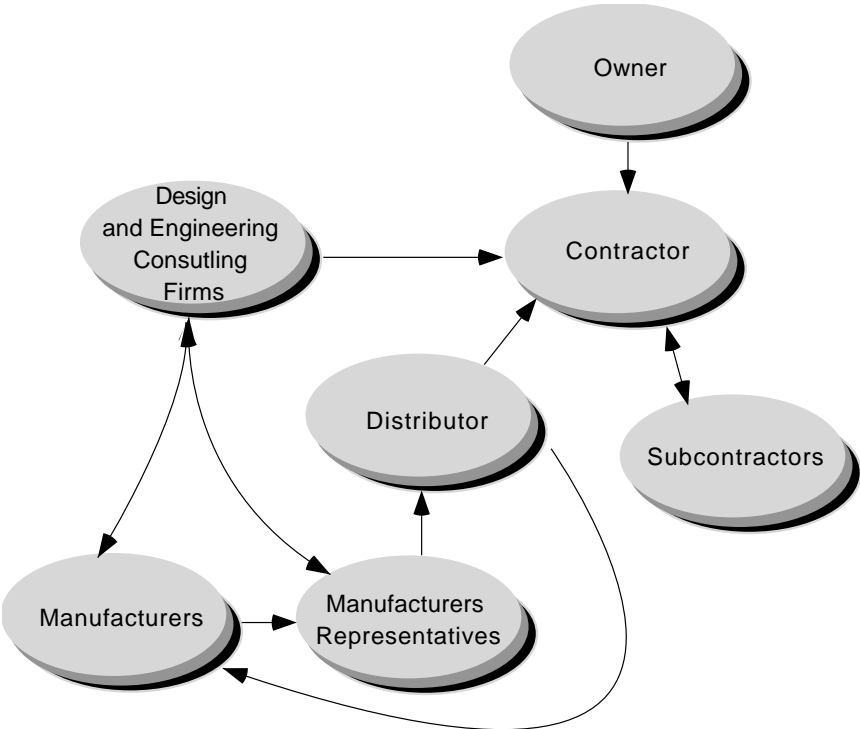


Figure 3: Key market actors and their relationships for new construction using the design/build approach

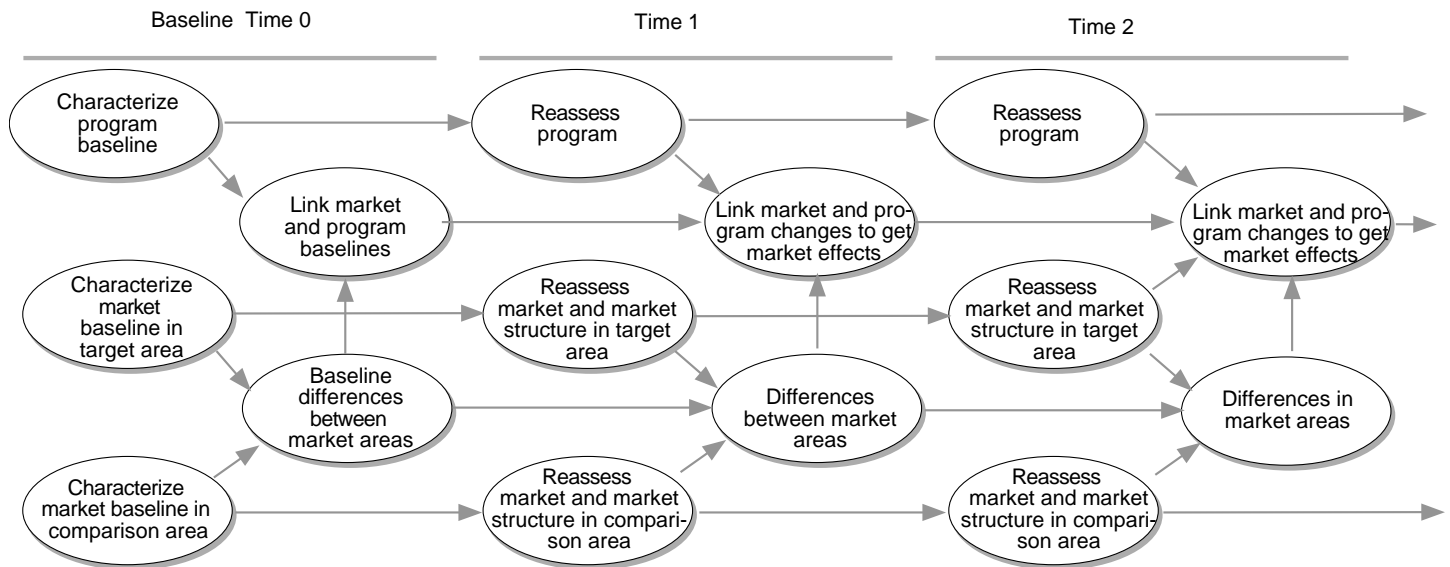


Finally, the evaluation of market transformation programs requires time-series designs. To date, the bulk of market transformation evaluations have been based on single-shot cross-sectional designs largely because evaluations have taken place well after the programs were in place. Single shot designs are substantially less effective than time-series designs because they rely heavily on recall and because it is usually not possible to reconstruct the data for key indicators.

Time-series panel designs are preferred to cross-sectional time series designs. In panel designs, one is able to measure changes and relate the changes directly to each other. Cross-sectional designs allow one to infer changes and to relate the inferred changes to each other.

Figure 4 (Reed and Hall, 1998) presents a model for a time-series design. In order to obtain a rigorous understanding of the effects of a market transformation program, one needs to establish a baseline for the program, a baseline for the market, and a baseline for a similar market outside the target area. In this design one then iteratively measures and calculates changes to key indicators for the program, the market in the target area, and the market in the comparison area. If the evaluation is in place early in the life of the program, evaluators and implementers can share market research and the data collection activities can be designed to support the needs of both evaluators and implementers (Reed et al. 1994).

Figure 4: An illustration of a time-series evaluation design for measuring market transformation



Ken Rolnicki

First and foremost, a high level national organization (call it the Central Energy Authority—CEA) must be formed, funded and given the authority and power to guarantee the coordinated implementation of all regional and national energy conservation programs. Acting as the central source for research, data and management guidance, this agency must have “staying power” via a protected charter for continued existence decades into the future and not be subjected to the possibility of disbanding the organization. A separate permanently funded research committee would be a key part of the CEA.

I do believe that there is certainly enough market and end user information available to create and continue a thorough segmentation analysis program...a crucial ingredient in successful market transformation.

Dan Barzel

All kinds of data are critical to establish the success of any program - in order to measure the impact. Exhaustive data requirements are cumbersome and cause confidentiality and possible anti-trust issues. So I suggest that marketers collect information such as name, address and product purchased, but forget phone number, sales price and purchase reason. Several utilities collect this data; to what end? Will they really call the purchaser? Why is the price important to collect? Price IS a motivator, but if a sponsoring group collects the data, they may have to defend the reason they collected the data. After all, the sponsoring utility should want to know who bought the product, not what they paid.

George Edgar

The market transformation concept has become a “political” and ideological football used to justify widely disparate positions: continued public intervention with targeted incentives is appropriate and necessary to no continued use of customer/vendor incentives if one really wants to create more vibrant and sustainable markets. This battle has affected the presentation of prior DSM experience as either solely resource acquisition oriented or only really achievable through changes in customer perceptions of value (without inducements by an external entity).

As the responses above suggest, the primary research need is a coherent theory for market transformation that is formulated based on a very critical analysis of prior DSM efforts, many of which were thought to be responsive to overcoming customer barriers on a sustained basis. This will require a wide variety of disciplines, many of which underlie business organization and marketing. While there is a good deal of empirical information and experience about “market-based” programs or market transformation efforts, there is no compelling evidence, other than good faith hope, that we truly understand enough about consumer and institutional behavior to “know” how to effectively transform markets (or whether they can be transformed over what period of time or effort).

Developing a unified theory about how to achieve market transformation; conducting empirical tests of that theory; and establishing a reasonable time frame for assessment are the paramount research needs. There also needs to be far fewer autonomous players in this effort. Someone must have the authority to require adequately funded and sufficiently broad efforts (e.g. statewide or regional efforts) that allow a fair test of market transformation efforts. There must also be the ability to ensure the consistency and persistence of efforts (e.g. changing program designs every year is not conducive to market transformation efforts).

Ed Jesse

This is a key question. I think that a key element is the proportion of consumers that are motivated by energy conservation as a societal goal independent of their personal socioeconomic goals. I am pessimistic in presuming that the proportion is quite small. That presumption is based on observations from food markets. Organic foods are viewed (correctly) by consumers in numerous surveys as “healthier” (socially more desirable) than conventional foods. But few consumers routinely purchase organic foods because of a substantial price premium.

Speaking as an economist, I think that what we know about consumer behavior is detrimental to the success of market transformation interventions. Consumers are motivated by price: Social objectives are fine as long as I don't have to pay for achieving them. With respect to private institutions (businesses and industries), the issue is one of externalities. As long as I am not required to internalize external costs, I will continue to produce low energy efficient consumer goods that consumers buy and that maximize my profits. Public agency behavior is a product of the political process and, therefore, unpredictable.

What strategies would be most effective for achieving market transformation? What parties need to be involved? What specific types of intervention are most effective? Can interventions have negative consequences?

David Mick

Strategies for affecting true market transformation are typically broad-scaled, highly risky, and expensive. In addition, assuming a strong economy and good availability of energy, it is likely that most current market participants are not strongly interested in energy-efficiency issues. They are, in the parlance of marketing, low involvement consumers when it comes to energy issues. Theory in consumer behavior strongly suggests that low involvement consumers (in any particular market) cannot be substantially influenced to change their behaviors through information-oriented strategies (e.g., advertising, packaging labels, etc.) because these consumers are not paying attention or processing the information very deeply. Instead, low involvement consumers must be drawn into actual changed behavior, after which they may realize that it was beneficial and worth doing again. Hence, marketers use free samples and other related promotional incentives to induce low involvement consumers to try and experience the product/service. If most consumers are low involvement with respect to energy issues, then strategies for affecting market transformation in the energy field must focus on directly provoking behaviors that can back up, so to speak, and alter related beliefs and values, as opposed to adopting a reverse logic that says information is adequate to change values/beliefs, from which the appropriate behavior will ensue.

John Reed

We do know a great deal about what strategies and interventions will work. However, as the previous section suggests, the strategies must be keyed to the markets, the actors in the markets, and the degree to which the technologies or products have entered the markets. Without knowing the details of the market there is no specific answer to this question.

We do know that some interventions have negative consequences. For example, many residential customers are now skeptical of compact fluorescents and are reluctant to try them because of their early experiences with these bulbs. There are a multitude of similar examples, for instance, the Tennessee Valley Authority's early efforts to promote heat pumps. Both of these are cases of attempts at rapid and widespread diffusion of immature products that did not meet customer and vendor needs. The result was a "poisoning of the well" for subsequent generations of products.

Timing is also important in market transformation efforts. Many DSM programs operated for relatively short periods of time, often, six months to a year. Actors in the market were frequently unable to adjust rapidly enough to take advantage of the programs in their market, or if they did adjust, often found their investments in making adjustments could not be recouped. Many of these programs met their energy goals but left a legacy of skepticism and distrust that made it more difficult to mount the new program.

There are many examples of DSM programs that failed because they did not account for customs, law, and culture. Programs have failed to account for the habits of local work forces. Programs have failed to take into account laws for providing credit to customers or the manner in which inspectors enforce local codes. Not infrequently, advertising materials have failed as a result of translating something that is perfectly harmless in one culture to something with negative connotations in another. Colors and symbols used in advertising may be inappropriate. Such incidents have often undermined the credibility of the programs and the sponsors.

Doug Ringger

The best way to develop a high level of confidence that a high efficiency appliance will be successful in the market place is to first give the customer what they want in performance features. For example, on a washer this might be capacity, excellent cleaning, quiet performance, convenience and then as an added benefit it would use substantially less energy and water. This is certainly not to say that consumers are not interested in saving energy because they are; in some cases there are consumers who feel it is the most important characteristic. To strengthen awareness of the advantage of high efficiency appliances as they are rolled out into the market place, a real live test site can be extremely beneficial. Such a test bed for the Maytag Neptune high efficiency washer was a project done in cooperation with the Federal Department of Energy. For the project, an often drought-stricken small town—Bern, Kansas—was selected to measure the water and energy efficiency of the Maytag Neptune washer. The results showed substantial water and energy savings, and the unique project received substantial media attention reaching many potential washer buyers.

Another tool for market transformation is utility rebates. While rebates may not be looked on as long term support for high efficiency appliances, it is a good way to “jump start” sales of a high efficiency appliance. Data we have indicates rebates appear to have a significant impact on sales of high efficiency washers, for example.

The rate of success for the level of market transformation will depend on several factors. First, if the product has great consumer acceptance because it shows high value even at a high price, it can dominate the high end market, and capture significant market share—this can happen over a relatively short time. To completely transform a product category, however, the pricing may well need to appeal to a much broader range of buyers.

Another type of consumer offer to drive sales of high efficiency appliances would be some form of tax credit. This could encourage replacement of old less efficient appliances with new, more efficient ones before they are worn out, thus accelerating the market transformation.

The greatest assurance a manufacturer can have that their capital investment will result in a success in the market place and a profitable return is to have good up front planning, basing the appliance design on consumer insights. In other words, give the consumer what they want!

Ken Rolnicki

I do believe that the following business strategies need to be employed to ensure a successful market transformational program.

- Create and execute a traditional marketing plan using the following components as the format and build in a check and balance review system to keep the program on track:

- Executive Summary
- Current Situation
- Key Issues
- Objectives
- Strategies
- Tactics
- Controls

- A continual market and customer segmentation program must be instituted under the auspices of the CEA [Central Energy Authority—a body proposed to manage market transformation at the national level].
- Regional geographic differences must be closely considered in the formulation of any national strategic direction.

- Evaluate the individual importance of the marketing mix (product, price, promotion and placement) as they relate to every strategic decision reached.
- Expand the creation and usage of promotional push and pull programs to influence manufacturers, channels of distribution and final end users to attain the objectives of the CEA marketing plan.
- Encourage the bundling of complementary services and hard products so that end users benefits are increased.
- The “same” for co-marketing amongst manufacturers and service companies.
- Last, but certainly not least, utilize vertical marketing approaches to sell services and hard products. Horizontal marketing should take second priority.

The CEA, manufacturers, service providers, channels of distribution, final end-users (in an advisory role) and consultants in certain areas of expertise have to all play their respective communications role in the program.

Mark Siegal and Doug Baston

[T]hose of us who marched merrily off to the glorious Market Transformation Wars a couple of years ago found ourselves quickly mired in the trenches. As scarred veterans, we can now offer the following observations:

1. “Being right, but early, is the same as being wrong.” Market transformation programs - by definition - require the cooperation of and coordination with, a number of autonomous program implementers and regulators, often across multiple political jurisdictions. In our region, these entities are primarily utilities; elsewhere it could be public agencies. But the principle remains the same: program design can’t move any faster, or to any greater detail, than the slowest and most recalcitrant entity is prepared to go. In an environment where there is no consistent understanding of the implications and details of such concepts as “utility restructuring” and “market transformation,” it is very difficult to come to closure on any single, consistent program model.
2. “Don’t throw out the baby with the bath water.” Existing programs that are successful and complement new market transformation initiatives should be maintained and only slowly phased out over time. These programs support new emerging technologies, build on the energy efficiency infrastructure, and have contributed to transforming markets by continually “ratcheting” or moving the market to continually higher levels of efficiency. Additionally, new market transformation programs (and entities such as NEEP) are early in their development cycle and market transformation was an untested and new strategy for utilities in the region...a large proportion of efficiency funds dedicated to program activity could not be allocated to these efforts.”
3. “Take your time and be inclusive.” New market transformation initiatives involve a new network of players. Developing working relationships with upstream market players such as manufacturers and distributors requires time and commitment to consistency. Suggesting that our involvement in these programs is short lived is not necessarily the most productive means of encouraging long term players to commit time and resources. Similarly, market transformation entities such as NEEP require time to build an internal infrastructure capable of delivering a portfolio of market transformation programs and services to the diverse group in the Northeast. While some initiatives such as the previously mentioned NEEP residential HVAC initiative have included manufacturers and other market players, other initiatives have not been as inclusive, especially during the program design and implementation phase.

Larry Alexander

Market transformation seems particularly conducive to a deregulated marketplace because it is meant to be a product of the free marketplace—performed voluntarily in response to the market instead of a government mandate, but ideally producing the same desired result. An important component of market transformation—marketing—is done best in a competitive environment rather than in a regulated environment.

To the extent government is still willing to be involved by administering funds from a wires charge, the market transformation impact in a state can be even broader. Wires charges can be used for general consumer education efforts to encourage purchase of energy-efficient products and to reinforce consumers' awareness of the ENERGY STAR® or other labels when they shop. Wires charges may also be used to help subsidize rebates that either utilities as distribution companies or suppliers as power marketers may offer their customers; they may also be distributed directly to manufacturers as incentives to produce high-efficiency products. Wires charges may also be used to help low-income residents achieve energy efficiency, including through aggregation or "technology procurement" efforts that foster the production of high-efficiency appliances such as apartment-sized refrigerators.

It should not matter if wires charges are used to provide rebates for products that consumers choose because of attributes other than energy efficiency (e.g. clothes washers that are gentler on clothes), as long as energy will be saved as a result. The energy saved will still be the same, regardless of the consumer's motivation in buying the product.

Nor should it be a bar to wires charge funding of rebates if new energy-efficient products initially, at least, cost more and therefore may be bought by more affluent customers. New product innovations, including energy efficiency features, often are placed initially on upscale products. As they become popular and volume is increased, the per-unit cost is reduced and they become more affordable. Calculators, VCRs, and camcorders are all examples of products that when first introduced were bought by affluent markets but ultimately became affordable for much broader markets. At the same time that some wires charge funding might be supporting these products, other portions of such funding might also be supporting programs focused specifically on low-income consumers as discussed above.

Dan Barzel

How do we change the buying dynamic? Consider the interventions we rely on today: advertising, rebates, special promotions and point-of-purchase displays and tagging. But to change consumers' values both in the short run and the long run requires more. It will take a large effort by the public policy makers, educators, businesses, utilities and others to initiate and complete this process of change.

Already we have seen huge success stories with energy-efficient appliances. Two examples are the Maytag Neptune washer and the Whirlpool SERP (Super Energy Efficient) refrigerator. These products brought new technology into the market and actually IMPROVED usefulness while reducing energy usage by 50 percent over "regular" products. The breakthrough products are brought to market once every 4 or 5 years and the technology migrates to other products over long periods of time. These are examples of true market change. Market change is possible; however, doing it on a large scale is a daunting undertaking.

To implement effective marketing programs for energy-efficient appliances there should be focus on a simple advertising message, on point-of-purchase material and a smooth communication with the implementers. Many groups are developing programs to educate consumers about the underlying issues of energy efficiency. For example, utilities already are augmenting the DOE ENERGY STAR® labeling program with rebates and advertising efforts.

The most effective strategies, in my view, are ones which do the following:

- First, they begin with adequate lead time to properly develop a program which incorporates the goals of the participants (utilities, retailers, federal, state and local government, contractors, etc.); this allows dialogue with (and incorporates ideas from) the participants over the tools used in the program. Start work with partners' 12 weeks or more before any program is launched.
- Second, the message should be EFFECTIVE. To that end, I suggest marketers use all possible sources of advertising (or pay the professional retailer or marketer to deliver the message). Use strong consumer incentives (i.e. rebates). However, I recommend that manufacturers rely on cash mail-in rebates, NOT instant rebates, which put retailers in the accounting practice, (not the sales business).
- Third, the programs should be as long-term as possible. Don't forget: We are trying to change people's values, and this won't occur in one three month program!
- Fourth, use ENERGY STAR as the only logo/brand/icon. Leave out sub brands, utility names, telephone numbers or other extraneous data. Any other information in the ad will cloud the message to consumers.
- Finally, make the program easy for the "implementers" (be it retailer, utility or marketing company) to communicate, put in place and explain.

Dick Best

What all of this suggests are some considerations for successful market transformation programs:

1. Identify the key consumer choice attributes for the product to be promoted.
2. Determine if a positive differential exists (or can be developed) in a key attribute that favors the target product. There is significant effort of this type being applied in clothes washers. Advocates of horizontal axis technology claim improved cleanability and fabric care, but this concept has not been convincingly sold to consumers. Maybe because for the consumer, it is not readily apparent that any such differential exists.
3. Devote substantial time and investment in consumer education. Build the consumer knowledge and desire to purchase the product without point of purchase financial incentives. This is needed for a successful exit strategy.
4. Understand what is required of each participant (consumer, retailer, manufacturer, and program administrators) to execute a successful market transformation program. Sufficient product offerings must be available, manufacturers and retailers must be able to participate without undue burden, and consumers need to be able easily see the benefits.
5. Determine program goals for critical milestones. For example, how much market change during first intervention period. How much incremental change during second period, etc. (If you are having an effect, the same incentives should drive increasing change over time).

There may also be the opportunity to capitalize on societal benefits when product attribute benefits are not present. Again, considerable effort must be employed on education to convey the proper message and change buying decision priorities. But as with automobiles and SUVs, focus on issues such as resource efficiency may be difficult to maintain as societal values change. My suggestion in this case is to work with standards programs to effect changes.

George Edgar

The answers to all of the questions above but the last one depends on the specific product, service, and market niche involved. Practitioners know that interventions can have negative as well as positive consequences, including disturbing existing markets. Changing annual program designs over the years have caused trade allies to forego programs because of the problems caused for them (e.g. inventory, uncertainty from changing direction, unmet customer demand, etc.). A “failed” intervention may also confirm to a trade ally or vendor that there is no viable market for a specific product or service. Thus, program design and implementation as well as expectations created should recognize both the short and potentially long-term impacts of poorly designed or delivered programs.

Many programs designs are geared toward covering a broad range of customers and market niches in one program (e.g. energy assessment that seek to install low-cost measures and to identify and capture major measure savings opportunities). Customers and providers will have a variety of different motivations to do anything as well as different capabilities to do proposed options. Thus, programs designs have typically become a “menu” of potential responses to customer or institutional barriers to participate in a program. For example, ENERGY STAR[®] program efforts involve manufacturers, distributors, retailers, and customers with an aim to make the featured products valuable, desirable, affordable, and easy to obtain.

It can be expected that integrated and comprehensive program designs that address the variety of barriers present to all of the market actors and consumers in a market will be necessary for an effective intervention. Specifically, the components and characteristics of program design should be the product of a theory informed by empirical analysis.

Ed Jesse

Possibly effective strategies/interventions are noted under my response to the second set of questions regarding MTs strengths and weaknesses as a program model (page 28). I think that trying to convince consumers that they should be good citizens and conserve energy if that is incompatible with their objectives of saving money or achieving more nebulous personal goals is swimming upstream. The appeal must be directed at the pocketbook.

Loren Lutzenhiser

It's much too early to tell what the most effective MT strategies might be. Except for sweeping changes in national standards, regulations, tax codes, or other institutional structures that cut across industries, these will almost certainly vary from technology to technology and from market to market. It's also not clear who should be involved in interventions under what circumstances. In some cases, MT support for small innovators may be crucial. Large firms are often slow to innovate, although they are also quick to purchase innovative firms and the rights to technological innovations (often diluting the value and potential of both in the process). Some collaborations or public-private partnerships probably require the participation of market leaders (e.g., in the highly concentrated home appliance industry). The partnership strategy may have to be different yet in fragmented industries with many suppliers and competing/cooperating local producers (e.g., residential construction). In those cases, trade associations might be key allies.

Certainly MT interventions can (and will) have unintended consequences. This has been true of every technological innovation in human history, from fire and settled agriculture, to steam power, nuclear fission, the computer, and the credit card. And some impacts of EE innovation can certainly be considered “negative” from environmental, energy efficiency and/or equity points of view. Think about negative consequences involved in wind power, prescriptive building codes and home mortgage subsidies. These adverse consequences may be outweighed by their benefits, of course, and they may even be considered by some to be positive developments.

What are the defining characteristics of a *transformed market*? Can these be measured? How?

John Reed

There is no such thing as a transformed market. Markets are in a constant state of flux. There are markets where a technology, a product category, or a set of practices may come to almost totally dominate the market. Even in such markets there is seldom a situation in which there is 100% penetration. The life of a product may be cut short by a new product. Products and ideas that penetrate 20 to 30% of the “sales” in a market typically represent a market where the product and ideas will continue to proliferate. Some characteristics of markets where penetration can be sustained or increased with minimal intervention are as follows:

- There are either mature products that meet customer needs that are largely differentiated by brand and minor features or there is a technology development trajectory, that is likely to be sustained that will result in the definition and refinement of the product or ideas in ways that will increase its match with customer needs
- The products or ideas have been adopted by manufacturers, vendors, and end-users have been adopted by people other than innovators and early adopters. The innovations are commonly referenced in the professional and organization networks

Key influentials in professional and organizational networks have adopted the innovation or believe that the innovation represents the preferred product or practice

Ken Rolnicki

In my opinion, dynamic and emotional marketplaces like energy conservation are always in some form of transformation. I really don't expect that such an environment can ever cease being what I term a “change agent” affecting the lives of humankind.

Measurements will only become evident as the marketplace transforms itself and the unknown factors become known data and information.

George Edgar

The defining characteristic of a transformed market is a higher level of naturally occurring conservation for an end-use or service. There are viable “measurement” methods to assess changes from baseline levels or practices including customer awareness, decision making criteria, customer purchasing habits, manufacturer and retailer promotions, retailer inventory practices, and sales results. The methods to assess market dynamic changes have been discussed and debated in many industry journals and reports over the last few years. These market dynamics would entail new, more valuable products and services for consumers as well as greater vendor and customer interest in existing energy-efficient products and services.

The challenge for M&V [measurement and verification] for market transformation programs is that a better job is needed to understand the benefits and limits of M&V as well as how M&V must be integrated with program design and implementation needs. The emphasis of many regulatory programs for various reasons in the past was on “precise” M&V requirements that tended to drive program design away from less quantifiable benefits either because the utility would be rewarded or potentially punished for measured results. Those in charge of market transformation efforts must have a realistic and working knowledge of what M&V can and can't do as well as what is the appropriate balance to assess “success” and over what time frame can success begin to be

assessed. The issue in M&V is what are the best methods to assess success dependent on the program objectives and design, not how comparable are M&V methods for different types of programs.

Ed Jesse

I would define a transformed market, very simply, as one in which new purchase decisions, in the aggregate, result in lower energy consumption than previous purchase decisions. This is quantifiable, at least in part. For example, the average mpg ratings over time for new consumer vehicle purchases is a measure of the success of market transformation as applied to the car and light truck market (admittedly, this measure may be biased by EPA regulations). Similar measures for other consumer goods are not currently calculated, but could be (e.g., average kWh or therm use for home appliances, heating and air conditioning units, and light bulbs).

Loren Lutzenhiser

This is probably a little like asking what counts as “art” or “pornography”—the answer being “you’ll know it when you see it.” “Transformations” are only noted after they have been found to have taken place, e.g., in urbanization, industrialization, suburban sprawl. We will be able to decide, say in 20 years, whether particular energy-technology markets have been transformed (or at least changed significantly), and perhaps whether formal MT interventions had anything to do with those changes. In the interim, we can certainly decide as a matter of policy and for evaluative purposes, what will count as “transformed enough” to have warranted intervention—a 10% market share for high-efficiency washing machines (or 5% or 50%). The decision might be informed by some sort of “cost of reduced demand” test (we have many ways of estimating this from DSM experience). The measurement game of “how much change is going to be enough for us to say that a ‘transformation’ has taken place” will, undoubtedly, consume a good deal of time, attention and money as MT advocates and program sponsors wrestle with new realities in the MT context, using as best they can the tools inherited from DSM.

David Mick

The defining characteristics of a transformed market are:

- changes to the mental alternatives of behavioral choices, also known as “consideration sets” (i.e., the different things a person can do in a given situation, e.g., how to heat a house at lower cost)
- changes in values (i.e., the degree to which consumers deeply care about energy-related issues, such as availability of natural resources, energy costs, pollution, etc.)
- changes in behaviors, qualitatively or quantitatively (e.g., whether people are performing acts of energy efficiency more often or better than before)

These can be measured through cross-sectional surveys and longitudinal behavior diaries, but they are always subject to several measurement dilemmas (errors). These dilemmas are complicated and cannot be enumerated here in a concise manner.

Are there parallels in other industries or markets for market intervention to achieve social objectives? What approaches have been taken? What results have been achieved?

Ken Rolnicki

Yes, there are comparisons in other industries. The most obvious would be in the petro-chemical products arena where citizens have readily become environmentally cautious about the consumption of fossil fuels. The situation is not unique.

George Edgar

This is a key research issue. Obviously there have been public interventions into markets to achieve societal objectives (e.g. programs to promote home ownership). The relevant question however about these prior interventions is whether they are analogous to energy efficiency market transformation efforts.

Ed Jesse

Parallels have generally attempted to operate within the capitalistic market system, either by (a) providing more or less permanent subsidies that attempt to offset the marginal costs of achieving social objectives *vis a vis* conventional practices; or (b) promoting an educational campaign that demonstrates cost savings associated with products or practices consistent with the social objective.

An example of the first approach is soil conservation. The dust bowl period of the mid to late 1930's vividly emphasized the need to alter agricultural crop production practices to prevent extensive loss of topsoil and diminished productive capacity. But farmers were pretty much universally broke because of depression-related farm prices. The Roosevelt administration created the Soil Conservation Service (SCS; now NRCS for Natural Resources Conservation Service) within the U.S. Department of Agriculture. SCS provided technical assistance to farmers, but more importantly, it also provided funds to offset the cost of farmers' adopting conservation practices such as construction of grass waterways and planting of windbreaks. Cost sharing still exists; farmers have not yet been weaned from conservation subsidies after more than 50 years despite the fact that adopting conservation practices can be demonstrated to be cost-effective without subsidies.

An agricultural example illustrating the second approach is conservation tillage, or minimum tillage, of cropland. Deep plowing (followed by disking followed by dragging) of land designated for corn planting buries old crop residue and leaves an attractive, black or brown, smooth, well-mulched surface for the corn planter to pass over. It also creates a beautiful setting for major soil erosion. Research trials in the 1960's demonstrated that planting corn directly into old crop residue minimized erosion – with no loss in yield. Plus eliminating two or more passes over the land saved lots of labor, fuel, and machinery depreciation.

Problem: Farmers liked to plow (Regional and National plowing contests were popular events for many years following World War II), and smooth, bare planting surfaces were indicative of a good farmer. No self-respecting farmer would be caught dead with corn stalks and weeds sticking out from his newly planted cornfield.

Solution: A major effort by Agricultural Colleges and the Cooperative Extension Service to demonstrate the economic benefits of minimum tillage. The conservation benefits were mentioned almost in passing. The pitch was in the cost savings associated with minimum tillage. The effort achieved substantial and lasting success. Plows are hard to find these days. And soil losses in the Corn Belt have been cut significantly.

The moral of these successful market transformation strategies is that economics do matter, emphasizing the need to demonstrate financial benefits – either market-related or subsidized – in any strategy to achieve collateral social objectives.

Loren Lutzenhiser

There are probably many cases from which we can gain insights about markets and interventions that would be helpful in our thinking about MT. However, there are few (if any) where small, tactful government-sponsored interventions have been undertaken that encourage, inform and grease the market skids in the public interest. This seems to be the sort of action that most MT advocates have in mind. Examples of direct government action in markets and technology development processes are historically quite numerous, however. The first American corporations were created by colonial governments (to build canals, roads, harbors and other public works). The first engineering school (West Point) was a Federal creation. The fundamental development work in mass production and interchangeable parts was done by the Federal government at the Springfield Armory. The growth of steel, railroad and communications industries were all stimulated by government investment and grants. Petrochemical, munitions and electrical power industries were, in most parts of the U.S., encouraged and financed by government spending and investment. Nuclear power, the contemporary scientific research system, most key modern patents, and nearly all important modern technological innovations (from high speed aircraft to microelectronics, digital communications, the internet, and biotechnology) are products of government intervention and public subsidy.

Recent historical examples of strategic interventions that have transformed particular markets include: the GI Bill and housing markets, the national defense highway system and real estate markets, guaranteed student loans and labor markets, installment credit and home appliance markets, mail order and sundries markets, credit cards and finance markets, and IRAs and capital markets. All of these cases involved relatively “small” changes (changes in law, changes in funding flows, changes in basic ideas about what was possible). All had dramatic results. None of these interventions were of the tentative sort envisioned by MT advocates. As it is presently evolving in the U.S., MT seems to be an arena in which direct government action has largely been ruled inappropriate, ineffective and inadmissible—in a truly bizarre collective lapse of memory about where corporations and markets came from in the first place, how technological innovation has historically taken place in and around markets, and why governments continue to exercise considerable control over the behavior of market actors.

From these cases, we can draw some parallels that may be instructive for would-be MT practitioners. These include the observations that small changes can indeed have large effects, although the forces working against them are often formidable. Also, we can see that all sociotechnical change is unpredictable and tends to result in unanticipated and unintended outcomes. Some of these will arguably be “good,” while others will not. MT will be lucky if it can associate itself with some of the former and prevent itself from being blamed for the latter.

As large scale sociotechnical systems change, they also evolve. By this I mean that in the course of change (whether gradual and rapid) fundamentally new phenomena are brought into existence. Our ability to understand these (whether they might be nuclear weapons production wastes, transgenic engineering possibilities or the virtual world of the internet) requires the development of new theories, perspectives, analytic techniques, and ethical discourses. And, with every problem solved (fewer local emissions from an electric car fleet), new problems are created (distant pollution from coal-fired power plants needed to fuel the cars). The point here is that MT cannot, and should not, be considered solely in public utility commission hearing rooms or utility and NGO board rooms. The problems that the approach is intended to address, and the complexity of the systems in which it is intended to intervene, are such that a larger public policy dialogue is required to insure that MT performs well, does little harm, and is evaluated in terms of its real contributions to environmentally-oriented EE. It is quite likely that the sorts of limited MT interventions imagined at this time will be completely inade-

quate to accomplish any “transformations” on the scale of the GI bill or the IRA. Yet these are precisely what will be needed to innovatively modify human production and consumption patterns so that a reasonable standard of living is possible for future generations on the planet. Potentially entangled with very strong (intended and unintended) counter-tendencies resulting from utility deregulation, MT as current conceived is quite likely to be much too weak a policy response to do what needs to be done.

John Reed

Historically, there have been many efforts that parallel the current market transformation efforts. A most notable one is agricultural extension service. In effect there has been public goods funding of the development and diffusion of innovations in the agriculture sector. The mission of the land grant system has been to improve agriculture through the application of science and the transfer of technologies to the private sector. There is a very clear pattern of using public funds to develop and improve the agricultural sector. While some may take issue with the ultimate value of many of the innovations that have been transferred, the land grant system has had a long string of successes developing and transferring such things as hybrid seed corn, high yield rice, advanced farming practices, pesticides and herbicides, biotechnology, advanced farm equipment, etc. The land grant system has become very adept at discovering and developing new technologies, organizing the knowledge, transferring the knowledge to the private sector, and getting new technologies accepted.

Family planning is another arena in which there is substantial success (and failure) that is well documented. Much of this effort has occurred in the developing nations. Here again, we see the use of public funds to develop, organize, and transfer information and technology to the public.

A third arena is disease prevention. This is a clear case where there are insufficient incentives in the market place to encourage disease prevention activities, at least until epidemics reach advanced stages. The justification for public funding is that early intervention is the most desirable way to deal with threats to public health. The Public Health Service has a long history of attempting to inform and mobilize the public. A particularly good recent example is the Centers for Disease Control Division of HIV/AIDS. In addition to monitoring the HIV/AIDS epidemic, they are attempting to use insights from marketing and social science to design strategic interventions targeted to specific audiences. They are also implementing programs to test the effectiveness of interventions and to identify improved intervention strategies.

What are the greatest challenges for market transformation programs to achieve their goals?

Dan Barzel

American consumers today don't understand why the issue of energy-efficiency in appliances has any bearing on their lives. As long as we can remember, the lights have always turned on when we flipped the switch and water has always comes out of the tap. True, in certain areas of the country water is a scarce resource and certain geographic areas have experienced brown outs or black outs for short periods of time. Otherwise, there has been a consistent supply of energy. Many of us have little memory of the Arab oil embargo and the fear of gas shortages in the 1970s and 1980s.

By contrast, most Europeans have developed what we can call an “institutional memory” of energy shortages and a consciousness of the fragility of the environment. By necessity over the years and by choice today they use power and resources sparingly. These consumers consider energy-efficient products necessary in their society today.

Yet, in this country, we are still only beginning to talk about how to change the values American consumers' place on energy efficiency and purchasing energy-efficient products. Our goal is for them to ask about new technology, operating costs and energy usage when they shop for a new product. At this point, it is a tall order. As a society, we need to focus on educating young people about the benefits of energy efficiency and the role of technology in helping us to have effective products which use less power.

George Edgar

There are two major challenges: (1) using a rational process to develop and assess market transformation efforts grounded in multiple disciplines and (2) avoiding the creation of expectations that may not be able to be met, at least within the time frame envisioned. Social engineering is not an easy effort even when a solution seems obvious. The policy objective should be to attain the societal benefits from increased energy efficiency. That public objective is likely to have a greater constituency if the cost of intervention appears smaller in relation to the benefits or limited in time and effort. But, it is dangerous to promise what may be very difficult to deliver over a limited period of time.

Market transformation efforts should be presented as a common sense response to capture societal benefits at a long term lower cost to society. But, the value of the societal benefits from increased efficiency should not be made dependent on the success of market transformation efforts. Societal benefits from energy efficiency may have a meaningful "public goods" aspect that requires continued intervention if market transformation programs are successful or less successful than is hoped.

Thus, a primary challenge for market transformation is to present itself in context. The context is that it could be a desirable means to an important public interest end. However, presently the level of success that can be attained with market transformation efforts is not presently known. We are still learning what may or may not work. In that process, it will still be desirable to capture societal benefits from other program means to both enjoy the benefits and to demonstrate that benefits are available to be captured. While there are likely to be budget conflicts between different program types or uses in an era of reduced energy efficiency funding, one means to attain an objective should not obscure the benefits of real energy efficiency benefits from other means.

Ed Jesse

[The greatest challenges for market transformation are:]

- Cheap energy achieved via a shortsighted/pandering political system.
- Voters who think that cheap energy is a birthright.
- Elected officials who promote that attitude through election campaigns that mindlessly promise more tax cuts and implicitly condemn any attempt at a rational energy policy.
- A nation that seems oblivious to an impending energy disaster.

Loren Lutzenhiser

While there are undoubtedly others, six challenges for MT are readily apparent from the analysis above. These are

- fluid markets
- EE's [energy efficiency's] loss of moorings
- limited knowledge of market dynamics

- differentiating DSM and MT
- developing new perspectives, and
- limited research/analytic infrastructure.

The world in which MT is required to act is one that is rapidly changing in unpredictable ways. It will be no small challenge to act effectively in dynamic contexts that include new internet-based forms of commerce, communication and information management. Electricity markets will operate through these systems, with flows of billing information, system control signals and behavior/performance information paralleling and interacting with electrical current flows. These systems will overlay a changing environmental system and will interact with changing industrial conditions, globalized political and economic systems, and continuously evolving urban/suburban development patterns. A variety of technological trends (from distributed power generation to agricultural intensification and large-scale reconfiguration of transportation systems) are likely to complicate the picture, as are social movements (from community sustainability to decentralized education) along with larger social/cultural developments related to generational change, mass migration, local and regional economic and environmental crises, and related developments. Regardless of what MT practitioners are or aren't able to accomplish through their interventions, the macro system will continue to change and evolve in complex, interesting and unpredictable ways.

It will be important for MT to move into this flux with eyes wide open. This has been done many times in the past, both by private intervenors (e.g., Carnegie, Ford, Edison, Rockefeller, and others) and via national public debates (e.g., regarding social security, GI bill, preference hiring, defense investment, etc.). It should happen in the case of MT. In the coming decades, EE should play an important role (along with other approaches) in the development and implementation of policies to combat global environmental change (GEC) and particularly greenhouse warming. The principle of market-based intervention is turning out to be a key U.S. Federal policy approach to GEC (e.g., via agency-centered pro-environmental interventions along the lines of EPA's various ENERGY STAR[®] programs, through CO₂ emissions trading schemes, and the hoped-for development of new environmental mitigation/improvement industries). While all of these and other pro-environmental policy initiatives can and should positively interact with nationwide MT, at present those macro-level approaches are being planned and managed at some distance from discussions (which are almost entirely technical) about the details of energy system restructuring and its consequences.

A second challenge follows from the fact that the design of MT interventions is lodged in a technical dialogue about restructuring that has already largely succeeded in redefining EE as MT. EE as historically buried in the energy system was already cut off from its origins in national-level concerns about economic well-being, energy security, social equity, and energy system impacts on the natural environment. While the local expression of some of these larger concerns (prompted, e.g., by costly fuel in the Northeast, acid rain in the Midwest, and salmon extinction in the Northwest) has to some degree continued to provide some justification other than avoided cost for some EE activities, in most instances the case for energy efficiency has been made solely on the basis of its cost being lower than that of other sources of supply. The principle of energy conservation was translated into supply substitution, and then monetized and rationalized in hardware-oriented DSM schemes. Given that the source of funds was largely from utility rates (which were overseen by public regulators, accountants and attorneys), it could hardly have been otherwise. But the net result has been the severing of EE philosophy and rationale from its historic roots, and the resulting separation of EE from its future role as a key response to energy system-induced GEC.

With the move toward MT, the problem is compounded, since marginal cost arguments are weak in a cheap energy environment and the techno-incentive solutions appropriate to DSM are unintelligible to many (probably most) actors on both the consumer and producer sides of markets. Fortunately for EE, the idea of improved technical efficiency and energy resource conservation has many allies—specifically environmental NGOs, neo-

traditional urban planning and green buildings movements, community sustainability movements, and others who are actively trying to reshape large parts of the socio-material system along more environmentally friendly lines. To many of these interest groups, the expanded use of more energy-efficient products and practices, new technology development, sustainable resource use, and reduced levels of consumption are important goals. Some of the larger national and regional MT-oriented organizations are showing the way (and perhaps where some of the dead-ends are to be found), by moving into markets with allies to encourage pro-EE evolutionary tendencies through aggregated green purchasing, building commissioning, tightened equipment performance standards, improved uptake of more efficient lighting, window, motor, and appliance technologies, etc. Their experience will provide valuable insights to the main body of the MT movement as it develops—if it develops.

A third challenge lies in the fact that the level of knowledge of market systems is quite low, even in the most sophisticated MT efforts. This is not surprising, since market knowledge seems to be quite low in the business community in general, as evidenced by high failure rates, particularly of small and medium-sized firms and the amount of attention paid to uncertainty and risk in business reporting and financial modeling. While predictions about markets and the behavior of market actors are probably most accurate closest to the point of everyday transactions, it becomes increasingly sketchy as greater distance and more actors are involved. The level of market knowledge may be particularly low among technically-trained and DSM-conditioned energy system actors, for reasons discussed above.

MT programs are also faced with another series of challenges related to differentiating among at least four types of proposed intervention. Some past DSM programs seem to have had market effects that might be called “transformative” (see Kunkle and Lutzenhiser 1998), and certainly some well-grounded, effective past DSM efforts can succeed, with modification, in the MT context. It is also hoped that some new, innovative MT initiatives based on a better knowledge of market possibilities might succeed where hardware/incentive-based efforts have fared less well. But two other types of intervention are also possible, and unfortunately these are often not readily distinguishable from the first two. Some are DSM programs that have been rhetorically dressed up to masquerade as MT, while others involve proposed partnerships with market actors that will turn out to have largely been about the conversion of MT resources into private profits. The sorting out of these possibilities will (and should) consume a good share of MT funders’ attention. When EE advocates and government agencies play in the market, they will need to do so with a nearly impossible combination of calculation, boldness and caution.

A fifth challenge involves breaking free of DSM-oriented program paradigms and understandings of markets and even of technologies themselves. This is a daunting task for technically-trained practitioners, but one that is necessary in order for effective MT planning and evaluation to take place. Only with a much-broadened range of perspectives on the social behavior of consumers and institutional actors in markets, can MT designers hope to accurately gauge (even approximate) the prospects of successful intervention in the case of any particular technology or market setting. It will require a high level of organizational commitment, rethinking EE and close coordination among MT efforts in order to enhance institutional learning (see Blumstein et al. 1998). Some government agencies (e.g., state energy and environmental policy agencies) and interest groups (e.g., environmental NGOs and industry associations) have a broad enough range of responsibilities—and therefore a broad enough view of EE (including its social and statutory history and continuing policy relevance)—to allow them to take the lead in these efforts. That view does not exist in the regulated utility context, where creative MT leadership is unlikely. In order to successfully pursue MT, a rare combination of vision, paradigm-shift, research deployment, program design, innovative evaluation, enhanced dissemination of results, and infrastructure development will be needed.

A final challenge follows from that ambitious list. This involves developing the capacity of the EE system to refashion itself along needed lines. I think that the preceding discussion has made a strong argument that successful MT will be very difficult to accomplish, and that the present EE system is not very well equipped to act

effectively in a new market context. I think that an improved knowledge base is required for any minimal chance of success at MT—one that draws extensively on (1) EE program experience under DSM and in other (e.g., international) contexts, (2) social science findings and understandings of market systems and market actors, (3) experimental MT interventions that are extensively evaluated in real-time, (4) MT research designed to explore features of particular markets in support of MT intervention, and (5) careful reflection on the lessons learned by the macro-MT initiatives undertaken by EPA, DOE, CEE, etc. None of these knowledge sources can, on its own, adequately support MT. All need to be knit together in a policy and science infrastructure—one that does not yet exist. That enterprise will require the involvement of social scientists, MT managers, policy-makers, EE program practitioners, technical specialists, market actors, and NGOs [non-governmental organizations]. This is a major undertaking that will likely require the creation of a new interdisciplinary focus and speciality area of practice and research. It will be time-consuming and relatively costly, although it can be built upon a network of existing key centers and ideas. Unfortunately, in the present energy environment, time and money seem to be two items in very short supply.

David Mick

The greatest challenges for affecting market transformation programs are

- to define the concept carefully, in a distinguishing manner from basic marketing strategy, and to have this definition widely adopted
- to recognize that the goals of true market transformation are more encompassing, with longer time horizons, than those of most marketing strategies; therefore, these goals should only be articulated in the context of full realization that the programs needed to achieve these goals must be shared and supported by all participants in the process (e.g., policy makers, program managers, retailers) and cannot be short-lived

In the end, it may be better for those who champion market transformation in the energy field to think of parallels to broad, multi-dimensional, long-term societal programs such as affirmative action, rather than to specific business exemplars (which translate into brief public service announcements or short-term financial promotions to encourage energy-efficiency behaviors). In this manner, the dialogue about market transformation will not lose sight of the fact that the ultimate issue here is changing deeply-held values and beliefs that subtly pattern the energy-related consumption behaviors of everyday life.

John Reed

A first challenge is to clearly define and understand the market in a systematic way. Most programs need to do more market research to identify the actors, the most influential actors, the professional and organizational networks within which actors are embedded, and the concerns and motivations of the influential actors. Often program managers have good knowledge of the market but they do not systematically organize that information and use it as a basis for program design.

A second challenge is to augment the existing transformation model so that it can be used as a basis for developing hypotheses about programs. This should lead to both better programs and better evaluations.

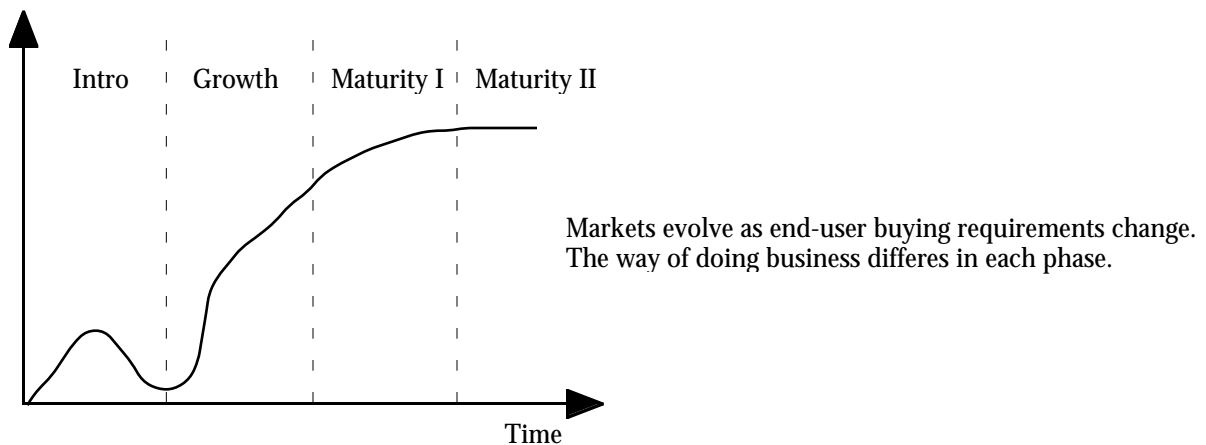
A third challenge is really a corollary of the first two. Program managers need to use well-grounded market transformation theory to develop program models to guide their efforts. Because program managers do not have a clear picture of the market, program theories are often weaker than they need to be and programs are not as effective as they could be. For example, if target audiences are not effectively segmented and profiled and messages and channels are not well matched to the segments, the likely result is that less effective communications channels will be used to deliver less salient messages.

A final challenge is to get program managers to use feedback from program evaluations based on time-series designs and to modify their program models in order to improve the effectiveness of their implementation strategies.

Ken Rolnicki

Here are sources of the most significant challenges the market transformation program will face:

- Operating under a temporary rather than permanent managerial charter and thereby risking the possibility of program cancellation.
- Composition and implementation of improved end user energy conservation education programs.
- Lack of long-range public and governmental support for energy conservation programs.
- A clear assessment of where the regional and national monetary resources should be placed and who is in control of the administration of the expense budget.
- Conception and then continual observation of a thorough market and end user segmentation analysis program to identify past, present and most importantly, future energy consumption and conservation attitudes.
- The full understanding by all involved parties in the market transformation program of what I call “The Total Channel Equation” and how all 3 of the channel parts function separately and as a whole:
 1. *Manufacturer provider of service* → 2. *Channel of distribution* → 3. *Final end user.*
- Constant and complete observation of the Market Life Cycle:



- Conception and implementation of a professionally coordinated regional and national media communications program to reach and influence all three parts of the channel of distribution.
- Monitoring new emerging marketing concepts (e.g., Integrated Supply, Diminishing Supplies and Channel Task Transfer).

In the final assessment, all individuals who consume power and energy must be made seriously aware of the real dangers of energy shortage, depletion and related pollution tragedy to our individual lifestyles, our country, our security and the planet on which we enjoy life. The time has passed for all of us to stop paying lip service to this critical environmental subject and to take firm, coordinated and strategic action.

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Appendix: Respondent Biographies

Larry Alexander

Larry Alexander is the Director of the Energy Division of Environmental Futures, Inc., a private consulting firm that works with both business and non-profit clients to provide expertise in a variety of energy and environmental areas, including utility restructuring, green power programs and energy aggregation. Alexander has been Director since 1997. From 1993-1996 Alexander was the Executive Director of the Consortium for Energy Efficiency, Inc., a national organization working to transform energy-efficiency markets. Alexander served as a Commissioner of the Massachusetts Department of Public Utilities from 1990-91, and was a State Representative in the Massachusetts House of Representatives from 1979-90. During this period, Alexander served as the House Chairman of the Joint Committee on Energy. He also served as Chairman of the Energy and Public Utilities Committee and Co-Chairman of the Global Climate Change Task Force of the Council of State Governments, Eastern Regional Conference. He was author of the Appliance Efficiency Law adopted in Massachusetts in 1991. Alexander also has been an attorney in private practice, and holds an AB from Yale University and a JD from the Boston University School of Law.

Dan Barzel

Dan Barzel is the Assistant Vice President, Merchandising for Circuit City. Barzel and his team buy appliances valued at approximately \$1.5 billion (at retail) each year, making Circuit City the second largest retailer of appliances in the US. Barzel joined Circuit City in 1989, managing returns and service vendor issues. He later served as Assistant Buyer, National Buyer, Senior National Buyer, and Assistant Vice President for Major Appliances before assuming his current position. Barzel serves as a member of an advisory committee for the US Department of Energy on energy efficiency programs and has spoken on market transformation at several national forums, including ACEEE's national workshop on market transformation and the ACEEE Summer Study. Barzel holds a BS in Building Construction and an MBA from the University of Florida. Prior to his work for Circuit City, Barzel has held positions in construction, real estate and merchandising. He also owned and ran his own retail company for two years selling casual clothing.

Doug Baston

Doug Baston is the Principal of Northeast By Northwest, a small consulting firm specializing in and energy efficiency program design, energy policy analysis and regulatory assistance. Baston has more than 20 years of experience designing and managing utility and community-based energy efficiency programs and performing energy policy analysis. He has held management positions at the Bonneville Power Administration and Central Maine Power Company, as well as founded and directed a community-based non-profit corporation dealing in energy issues. At BPA he was instrumental in designing a number of the nation's first utility-based energy efficiency programs. At CMP he designed that company's portfolio of efficiency programs, established its field program delivery structure, and grew his efficiency staff from four to eighteen over a period of fourteen months. Since establishing NBN, he has consulted to a variety of utility, government and public interest clients, including the U.S. Department of Energy, Pacific Northwest National Laboratory, the Conservation Law Foundation, Northeast Energy Efficiency Partnerships, the States of Maine, New Hampshire and Vermont, the Boston Edison Company, New England Electric, Narragansett Electric and, most recently, the Long Island Power Authority. Baston is a graduate of the University of Maine and the University of Maine School of Law. He also studied energy economics at Lewis and Clark College and Portland (Oregon) State University.

Dick Best

Dick Best is the Director of Environmental and Regulatory Programs for the Whirlpool Corporation—a position he has held for four years. Best has 21 years of experience in the appliance industry, including 12 years in design, test and manufacturing, 3 years in international marketing and 4 years as Technology Director in Asia, where he was based in Singapore. Best has a BS in electrical engineering from Michigan Technological University and an MA in Management from Nazareth College.

George Edgar

George R. Edgar has been the Executive Director of Wisconsin Energy Conservation Corporation (WECC), a non-profit energy consulting firm, located in Madison, Wisconsin since 1991. He has been involved in energy policy and energy efficiency program development and implementation for over 20 years. Prior to joining WECC, Edgar was a Commissioner on the Public Service Commission of Wisconsin (PSCW); a lawyer representing municipal utilities; an attorney for various consumer and low-income groups; chief staff member at the PSCW; and a Legal Services attorney. He has consulted on energy and energy efficiency policies and programs for utilities, governmental entities, and consumer, environmental and low-income groups throughout North America.

Ed Jesse

Ed Jesse is Associate Dean for Agriculture and Natural Resources Extension, a joint position between the College of Agricultural and Life Sciences, University of Wisconsin-Madison, and Cooperative Extension, University of Wisconsin-Extension. Prior to assuming this administrative post in 1992, he was a Professor and Extension agricultural marketing and policy specialist in the Department of Agricultural Economics at the University of Wisconsin-Madison, where he served as department chair from 1986 to 1991. He joined the faculty in 1984 following 16 years with the U.S. Department of Agriculture's Economic Research Service, stationed in Washington, DC, and Davis, California. Jesse holds BS, MS, and PhD degrees in Agricultural Economics from the University of Wisconsin.

Marty Kushler

Marty Kushler has been involved in energy research and evaluation for over two decades. He currently is Co-Director of the Utilities Program at the American Council for an Energy-Efficient Economy. Prior to this position, he served as Supervisor of Evaluation with the Michigan Public Service Commission. Kushler was with the MPSC for over ten years. Prior to his work at MPSC, he worked for Michigan's State Energy Office. Kushler has a Ph.D. in Psychology, with a specialty in applied community research, from Michigan State University.

Loren Lutzenhiser

Loren Lutzenhiser is a member of the Departments of Sociology and Rural Sociology at Washington State University, where he teaches graduate courses in technology studies, complex organizations and community processes as part of WSU's Environmental Sociology Ph.D. program. Lutzenhiser is an internationally recognized scholar in the fields of environmental sociology and the sociology of science and technology, and has published his research widely in academic journals, including *Social Problems*, *Sociological Forum*, *Energy Policy*, *Energy—The International Journal*, and the *Annual Review of Energy and the Environment*. Lutzenhiser also has consulted with a variety of government and non-profit groups, including the International Academy of the Environment in Geneva, the OECD in Paris, the Norwegian Research Council, the Oxford University Environmental Change Programme, and the U.S. National Research Council. Lutzenhiser is completing a scoping study of social research needed to support market transformation interventions in California for the

California Institute for Energy Efficiency, and is participating in a study of the prospects of getting energy efficiency better incorporated into state and local government procurement practice in the Northwest (this work is supported by NEEA and CEE).

David Mick

David Glen Mick is an Adjunct Professor of Administrative Medicine and Associate Professor of Marketing at the University of Wisconsin-Madison. He holds a PhD in Marketing (1987), a Master's degree in Health Care Administration (1980), and a Bachelor's degree in Philosophy (1974) from Indiana University, and a Master's degree in English Literature (1976) from the University of Texas at Austin. His research has centered on the nature and role of meaning in consumer behavior, particularly in the domains of advertising processing, self-gifts, and the consumption of technological products. Among other outlets, his research has appeared in the *Journal of Consumer Research*, the *Harvard Business Review*, the *International Journal of Research in Marketing*, the *Journal of Retailing*, and *Semiotica*. His 1986 article "Consumer Research and Semiotics: Exploring the Morphology of Signs, Symbols, and Significance" was given the Best Article award in the *Journal of Consumer Research* for 1986-1988. Three of his other publications have also received awards from the Association for Consumer Research and the American Marketing Association. He has previously served on the faculties of Indiana University, the University of Florida, the Copenhagen Business School (as Guest Professor 1989-90), and Dublin City University (as Endowed Chair of Marketing, 1997-98). As of July 1999 he will begin serving a three-year term as the Editor of the *Journal of Consumer Research*.

John H. Reed

John H. Reed is a Principal and co-founder/co-owner in the firm, TecMRKT Works, a technologically oriented market and evaluation research firm located in Arlington, Virginia, and in Madison, Wisconsin. Reed is a leader in studies of the transformation of energy and energy equipment markets with more than a half dozen recent publications in the area. He is currently studying the professional building market in California to determine the market potential for a series of daylighting design software tools and Internet web sites. Recently completed projects include market effects studies of the Seattle Lighting Design Lab, the Silicon Growers project, and three web-sites. Reed also recently completed a study of market penetration and market potential of a wind turbine green power program and a study of Pacific Gas and Electric Company's Energy Center that targets architects, engineers, builders, and manufacturers who serve the commercial buildings markets in Northern California. From 1992-1995 he served as Evaluation Director for Wisconsin Demand-Side Demonstrations, Inc. and as a Senior Consultant for HBRS, Inc., Madison, Wisconsin. Previously, he spent nearly 12 years as a researcher and group leader at Oak Ridge National Laboratory in Oak Ridge, Tennessee, and seven years as a faculty member at Bates College in Lewiston, Maine. Reed holds an MA and PhD, both in Sociology, from Cornell University and an undergraduate degree in Sociology from Iowa State University.

Doug Ringger

Douglas M Ringger is the director of product planning for Maytag Company, a position he has held since 1989. Ringger has been with the Maytag Company since 1965. From 1977 to 1989 he was manager of Maytag's product testing laboratory. He also has served as a senior design engineer in Maytag's research department, and began his career with Maytag as a design engineer in research. Ringger has a degree in mechanical engineering from the University of Minnesota.

Ken Rolnicki

Kenneth J. Rolnicki was the President of the Channel Marketing Institute and a Professor at Northwestern University's J.L. Kellogg Graduate School of Management, where he taught courses in channels of distribution and sales/marketing management. Rolnicki died in January 1999. Rolnicki was a frequent seminar leader for the American Management Association and recently authored a business text, *Managing Marketing Channels of Distribution*. Rolnicki had a long career in private business before his teaching career. He served as director of market development for Sola, a business unit of General Signal; and was director of North American Sales and Marketing for B&K Precision. Most of Rolnicki's private business career was spent at Bell & Howell, where he served in a number of positions ranging from regional sales manager to vice president of sales and marketing in its communication and business equipment systems divisions. Rolnicki had a bachelor's degree from De Paul University and an MBA from Roosevelt University.

Ken brought great enthusiasm and business experience to this project and related work. We are saddened by his sudden loss, and his voice of practical wisdom will be greatly missed.

Mark Siegal

Mark Siegal is a senior analyst at the NEES companies and has been involved in the implementation of its large C&I energy efficiency programs. In this role he has developed new products and services for customers including a buying club for energy-efficient lighting equipment and a turnkey installation service for energy-efficient equipment. Currently Siegal is working with 20 Northeast utilities on a regional Market Transformation HVAC program and participating in a national roundtable tasked with identifying energy-efficient HVAC installation practices. Most recently Siegal led an effort to license NEES's large commercial and industrial energy efficiency programs to other MA utilities. Prior to joining NEES, Siegal worked as a consultant for utility clients. He earned a Bachelor of Arts in Economics from Temple University, a Masters in Energy Management and Policy from the University of Pennsylvania and is a Certified Energy Manager.



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