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ELECTRICITY REGULATION AND MARKET TRANSFORMATION: A BRAZILIAN REGULATOR POINT OF VIEW

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“I am not an advocate for frequent changes in laws and constitutions but laws and institutions must go hand in hand with the progress of the human mind. As that becomes more developed, more enlightened, as new discoveries are made, new truths discovered and manners and opinions change, with the change of circumstances, institutions must advance also to keep pace with the times.

We hold these truths to be self-evident: that all men are created equal, that they are endowed by their creator with certain inalienable rights, among these are life, liberty and the pursuit of happiness, that to secure these rights government are instituted among men.”

Thomas Jefferson

CONTENTS

Section 1: INTRODUCTION

This section presents a brief summary paper's content.

The second section of this paper will show what is market transformation and how does it work, how to implement a market transformation strategy, which are the players and policies to implement and how to plan and develop a market transformation strategy.

The third section shows the results of the use of resources corresponding to 1% of the annual net income of power distribution utilities in Brazil for energy efficiency programs in the first year of application, examining the conditions for introduction of market transformation programs.

The fourth section will evaluate market transformation programs by introducing methodological questions regarding the own nature of the markets and considering the elements of an evaluation strategy designed to quantify the impact of the programs as to both uses of energy and market indicators.

The fifth section of this paper will demonstrate that the sustainability depends on the effects of the market transformation program and the continuity of market effects when the program is completed. We try to present a few indications to assure the sustainability of the choices made in program design and during its implementation, as well as the possible sequence of the process in new activities.

Finally we present the conclusion and recommendations and the references.

Section 2: MARKET TRANSFORMATION GOVERNMENT AND SOCIETY

2.1 WHAT IS MARKET TRANSFORMATION?

2.1.1 DEFINING THE TERM

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

Due to the substantial effort required, generally, a market transformation strategy is designed to promote comprehensive changes across many parts of a market for a particular measure, not just at the margins. Measures are generally chosen that lend themselves to a comprehensive changes (e.g., ultimately achieving market shares that approach 100 percent of appropriate applications). By choosing measures in this way, savings can be maximized while making efficient use of limited resources.

This concept of market transformation can be applied to any type of product or service, though, to date, it has been applied most extensively to the challenge of the increasing the use of energy-saving technologies and practices.

A number of different terms are commonly used to describe different aspects of market transformation efforts. In order to clearly define what is meant, we describe bellow the following definitions:

- *Measure* – Collectively used to denote both energy-saving technologies and practices.

- *Activity* – Applying a particular "tool" to accomplish specific objectives. This could include developing a training class that teaches air conditioner installers about proper installation techniques, or offering rebates for the purchase of products that meet a desired efficiency level.

- *Initiative* – Multiple activities designed to increase the market penetration of a particular measure such as an energy-saving product (e.g., 90% efficient furnaces) or an energy-saving practice. Often, more than one organization will be involved in implementing an initiative, and activities will evolve as the market development of a measure progresses.

- *Strategy* – A broader more strategic effort intended to affect dramatic changes across a market segment (e.g., commercial buildings or restaurants) and/or within a particular end use (e.g., residential cooling). A market strategy will generally include a variety of organization engaged in the delivery of a set of coordinated initiatives and their corresponding activities. Furthermore, a market transformation strategy can include initiatives that promote both energy-saving technologies and related installation and maintenance practices. The choice of whether to pursue an initiative or a strategy will depend on many factors including the synergies between related measures and

whether chances of long-term success are best maximized with a broad or more narrowly focused approach.

The real benefits of market transformation are achieved when multiple activities are combined into coordinated initiatives and then into strategies. In general terms, a market transformation initiative or strategy for a specific market segment or end use should generally involve:

1. A careful analysis of the overall market, including an identification of the particular barriers that are hindering the development, introduction, purchase and use of targeted measure;

2. A clear statement of the overall goal of the initiative or strategy as well as the specific objectives that will be accomplished along the way by the different initiatives or activities;

3. The development of a set of coordinated activities that will achieve the desired objectives and systematically address each of the identified barriers;

4. Successful implementation of the individual activities, including periodic evaluation and adjustments designed to respond to actual experience; and

5. Development and execution of a plan for transitioning from extensive market intervention activities toward a largely self-sustaining market, i.e., an “exit strategy”.

Market transformation efforts are different from most traditional utility demand-side management (DSM) programs in several respects. The

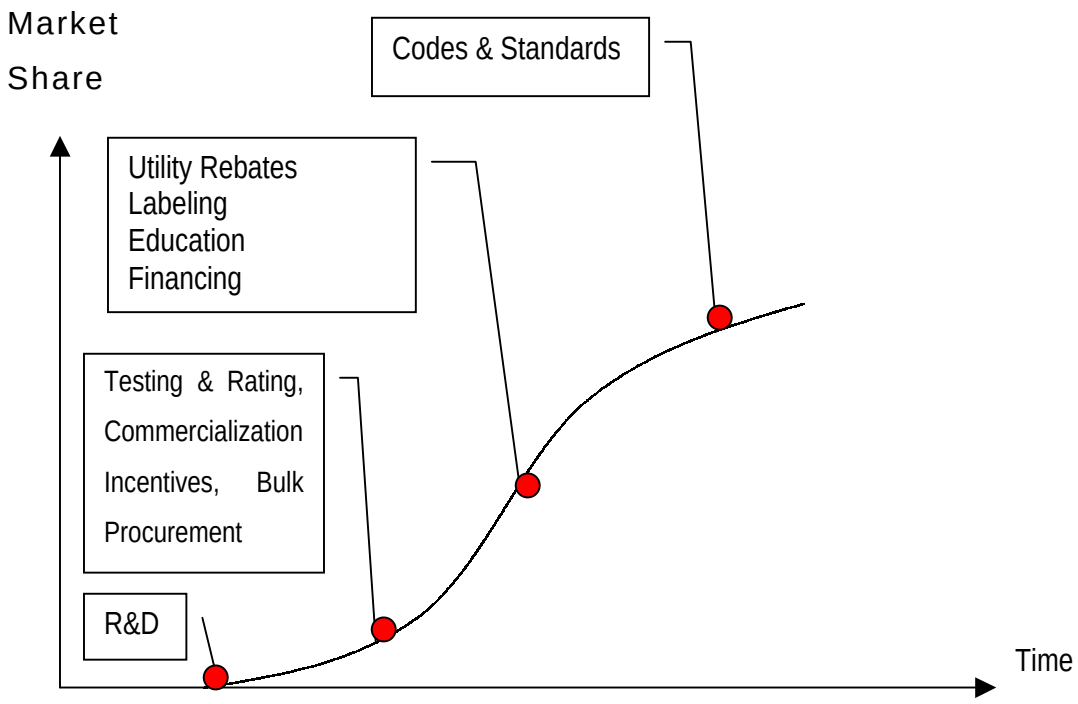
primary difference is that the fundamental goal of market transformation is to change markets, not to save energy in the short term. By changing markets, market transformation initiatives are designed to save substantial amounts of energy in the long term. As a result, market transformation activities are devised in direct response to identified market barriers. In fact, understanding the particular market barriers for a measure is very helpful for developing and implementing successful market transformation activities. In addition, market transformation initiatives generally are broader and long-term than DSM programs. A market transformation initiative may have several phases, many players and a variety of activities. Coordination among the relevant players is thus necessary to ensuring that a market transformation strategy or initiative is effective and the broad goals are accomplished. Since the primary goal of market transformation is to change markets, evaluation of market transformation programs emphasizes progress made in addressing market barriers and not precise measurements of program energy savings. While many traditional DSM programs include some of these attributes, few include all of these attributes that typify market transformation programs. However, market transformation is not a label that uniquely identifies certain energy efficiency program designs to the exclusion of others. It is instead an objective that all energy efficiency programs have at least a theoretical potential to achieve, although some programs are clearly more effective at achieving this objective than others.

2.1.2 HOW DOES IT WORK

Frequently, a market diffusion or “S” curve is used to illustrate the market transformation process (see Figure 1). The market diffusion

curve shows an idealized version of the process by which a new technology or practice evolves from market introduction to mass-market or wide-scale adoption. The market history of many technologies can be represented using this type of curve, e.g., microwave ovens, VCR's, etc. Market transformation initiatives typically include activities designed to accelerate the market adoption of a particular energy-saving measure so that it becomes (and hopefully remains) common practice much sooner than it would otherwise.

Figure 1: Accelerating the Market Adoption Process



Accordingly, market transformation initiatives often include activities designed to:

1) Stimulate the development and market introduction of new energy-efficient models,

2) Strategically build the market share of these new products until they attain a niche position in the market, and then
3) Change the consumer purchasing practices in order to further expand the market adoption of these measures so they reach mass-market status and eventually become common practice.

Different activities or “tools” are appropriate at different points along this market diffusion curve, since barriers are often a function of product/market maturity (see Figure 1). For example, R&D and technology procurement efforts may be employed in the early stages of an initiative in order to stimulate the introduction of new high-efficiency measures. Rebates and targeted outreach to large purchasers (e.g., bulk purchases) may be used to strategically increase market penetration until the measure achieves “niche” status. Consumer education, loans/rebates, and other promotional activities such as *ENERGY STAR*® labeling may be used to expand a measure’s market share to its full mass-market potential. And codes and minimum efficiency standards can be used to complete the transformation process by removing clearly inefficient products and practices from the market.

As the market share for a targeted efficiency level or practice increases, activities will need to evolve. Players may need to fine-tune their current activities (e.g., reduce the dollar value of a utility rebate), or actually “shift” their activities to address the next generation of product efficiency. Market transformation is a process, and it rarely ends after sales for one particular product are expanded. Accordingly, it is often appropriate to develop a broad market transformation that will help orchestrate a number of related initiatives and activities over time. For example, if we consider residential air conditioners, there may be a variety of activities

underway at any given point that target equipment with progressively higher seasonal energy efficiency ratio. This could include promotional and educational activities focused on air conditioning units, utility rebates targeted at higher-efficiency units, and a bulk procurement effort targeted at new units.

When such supporting activities are executed in a coordinated and well-timed fashion, the combined or “synergistic” results in the marketplace can be significant. Isolationist efforts that concentrate on only one activity, such as market introduction, without the support of complimentary activities that build the market for the new product, are unlikely to succeed in transforming the market in a sustained way. The market penetration of a desired measure may increase to a niche level, but additional activities will be required to pull the technology further into the market so that it actually becomes common practice. The specific activities and timing of market transformation initiatives and strategies will vary from measure to measure and should be specified in a long-term market transformation plan that is periodically refined. The process of planning a market transformation initiative or strategy is discussed in more detail in Section 2.3

2.2 IMPLEMENTING A MARKET TRANSFORMATION STRATEGY

A broad market transformation strategy is designed to alter the market for a particular end use or market segment, and requires the input and participation of a variety of organizations and players. They also require a great deal of planning and market analysis. The sections that follow focus on the process for developing and implementing a market transformation initiatives and strategies.

2.2.1 SELECTING & SCREENING MEASURES FOR MARKET TRANSFORMATION INITIATIVES AND STRATEGIES

In 1998, Pacific Gas & Electric, Boston Edison, Northeast Energy Efficiency Partnerships, Northeast Energy Efficiency Alliance, and the Consortium for Energy Efficiency have conducted screening exercises to select targets for new market transformation initiatives. This type of screening process is useful in order to determine whether a potential measure is actually a good target for a market transformation initiative and to prioritize measures so that the most attractive measures can be targeted first. In general each of these exercises involved comparing energy-saving measures across several different parameters such as potential energy savings, measure cost-effectiveness, and likelihood of success.

Estimates of potential energy savings are important because in order to justify the substantial work and effort required to develop and implement market transformation initiative, substantial savings must be achieved. All other things being equal, new market transformation initiatives with high savings will be more advantageous than initiatives with smaller savings. For measures with only small potential energy savings, it may be not worthwhile to devote the time and resources needed to develop and implement an initiative.

Information on measure cost-effectiveness is important for several reasons. First, measure cost-effectiveness is very important for convincing consumers to implement a measure. If measures are very expensive relative to benefits, achieving substantial market share will be near impossible. Second, prioritizing utility and public benefit DSM programs has typically relied on the Total Resources Cost (TRC) test;

measure cost is a primary element in assessing TRC costs. However, in assessing cost-effectiveness, the critical factor is not cost-effectiveness at current measure prices, but these prices may be high due to specific market barriers, but instead, the critical factor is likely future measure cost-effectiveness once market barriers have been addressed.

The likelihood that a market transformation initiative can be successful is perhaps the most critical factor in selecting market transformation targets. If an initiative is unlikely to be successful, it is generally not worth pursuing. As noted above, success is typically defined to mean substantial and lasting changes in the market. Likelihood of success in turn depends on an analysis of the major market barriers that are impeding each measure, the magnitude of theses barriers, and the likelihood that program interventions can overcome them. Likelihood of success also depends on whether a viable exit strategy is available. For example, for high efficiency residential clothes washers, the major market barriers are limited product availability, high first cost, and questions about consumer acceptance. However, there are recent signs these barriers are being addressed – new products have been announced, some manufacturers are reducing prices, consumer surveys show purchaser satisfaction to be very high, and growing numbers of rebate and promotion programs make it likely these trends will continue.

Potential energy savings and measure cost-effectiveness are generally analyzed on a quantitative basis based on costs and energy savings in average applications. Likelihood of success is usually examined on a qualitative basis based on a careful assessment of market barriers and how easily these can be overcome, and consultations with industry experts. Of course, professional judgment

must also be applied, as it is not possible to objectively quantify all factors that are important in selecting measures to target. For example, virtually all organizations use substantial amounts of staff and Board member judgment as they sift through options and select which programs to implement. One critical area requiring professional judgment is to identify which measures are sufficiently related and likely to succeed to lend themselves to a broad market transformation strategy rather than a more narrowly focused initiative.

2.2.2: UNDERSTANDING THE MARKET FOR A MEASURE

Whether developing a broad market transformation strategy, or an individual initiative, it is essential to begin with a clear understanding of the market, both in general terms, and with regards to the specifics of the measure being targeted. Some observations about basic market mechanics, the process for analyzing a market, and the identification of market barriers are presented below.

2.2.2.1: BASIC MARKET MECHANICS

The operation of the competitive market is based on two driving forces:

1. Manufactures and other actors in the supply chain (i.e., distributors, retailers, and contractors) make business decisions that they believe will maximize their profits.
2. Consumers make purchasing decisions that they believe will maximize their happiness or satisfaction, or serve their perceived needs at least cost.

The market penetration of energy efficiency measures is determined through business transactions that occur between suppliers and consumers. To generate profits, suppliers compete for sales based on the products attributes they think are most important to consumers; usually characteristics such as price, features, and quality. While energy efficiency will contribute to lower operating costs over the life of the product, most consumers do not factor this economic value into their assessment of cost, and more importantly, they do not demand this feature from manufactures. As a result, most manufacturers concentrate on designing products that include the most desirable features at the lowest possible cost. This type of design paradigm often leads manufacturers to avoid product changes that improve efficiency but also increase cost. Likewise, in an effort to limit costs and increase profits, many manufacturers produce “premium” products that contain many extra features, and improved efficiency, but at a significantly higher price. Basic units with better efficiency are not always available; instead efficiency and various “bells and whistles” are often packaged together, substantially raising the cost of improved efficiency products.

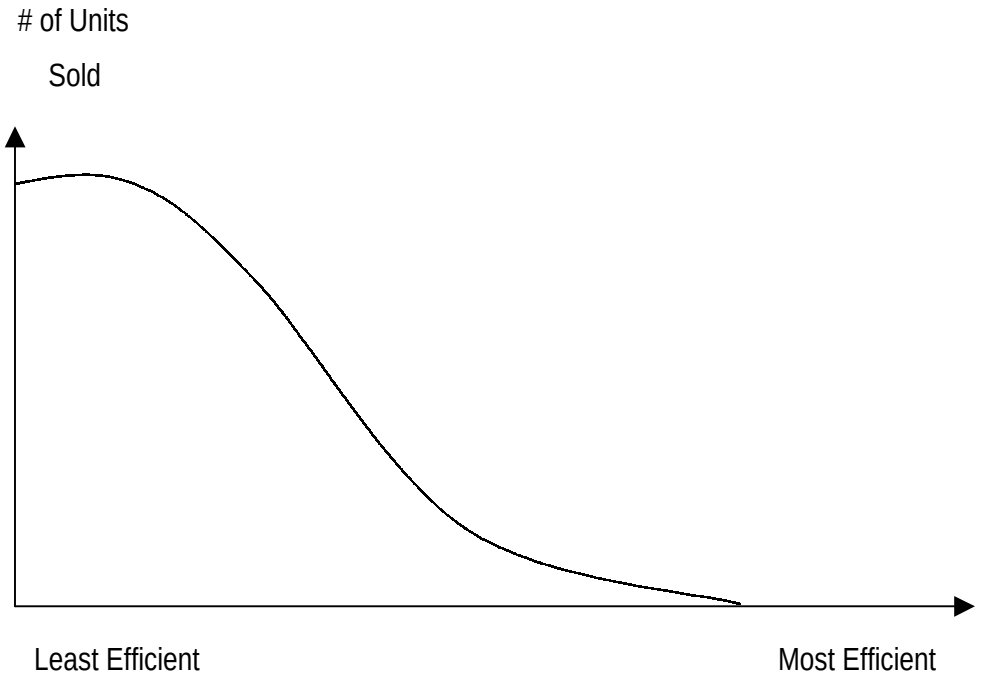
Consumers demand is a powerful and often underestimated tool with which to affect changes in the market place. If market transformation activities can produce substantial increases in consumer demand for a targeted measure, then the suppliers of energy-efficient measure will earn more profit. Once it is clear that there is profit to be made (e.g., manufacturers and trade allies perceive that strong demand will continue), other suppliers will be induced to enter to the new market and offer similar energy-saving measures. Thus, by working to change consumer-purchasing practices, market transformation practitioners can put market forces to work for them and use them to help transform markets.

2.2.2.2: ANALYZING THE MARKET

When embarking on a process to develop a new market transformation initiative or strategy, it is useful to define the "market" that is being targeted for transformation. Is the goal to reduce the energy intensity of a particular end use, such as residential refrigerators, or to improve the overall energy efficiency of a particular market segment, such as multifamily housing? Once the particular end use or market segment is clarified, it is important to assess the current market penetration of the higher-efficiency models or energy-saving practices. For equipment, it is often useful to begin by looking at a distribution curve that plots current annual sales or market penetration against efficiency levels.

An example of such a curve is shown in Figure 2:

Figure 2: Initial Frequency Distribution Curve



This image is a snapshot in time that provides insight into the overall market for the technology, in particular the current distribution of equipment sales. For a technology that is covered under existing federal minimum efficiency standards, it is typical to see the highest volume of sales concentrated around the lowest available efficiency level, with sales level dropping significantly as you move towards the higher-efficiency models.

The next step includes defining the distribution channel or “value chain” through which a measure is delivered to end-user. This entails outlining the number and types of companies involved at each stage in the distribution process, and nothing where national interests (like manufacturers), regional interests (like distributors), and local interests (like retailers or contractors) are involved. It is also important to understand the financial signals or incentives each player in the distribution channel is responding to when they make their individual decisions. For example, does a retailer earn more or less profit margin on an energy-efficient refrigerator relative to a standard-efficiency model? What are the financial tradeoffs associated with displaying a more efficient model on the showroom floor instead of a less efficient one? Accordingly, the market assessment process must be detailed, and usually involves significant data collection, analysis, and interviews with players throughout the distribution process, e.g., manufacturers, distributors, retailers, contractor, etc. In summary, this entails determining the following:

- Who is involved at each step in the distribution process?
- What role does each entity play?
- How do they operate?
- Why do they do it that way?

- What prevents them from promoting the more efficient alternatives?

2.2.2.3: DEFINING THE BARRIERS

In addition to understanding the basic market structure for a particular measure, it is useful to discover and define all of the relevant barriers that are hindering the introduction and/or adoption of energy-saving alternatives. Two barriers appear to have a fundamental impact on the market penetration of most energy-efficient measures:

1- Consumers are often unable to determine if a specific energy-efficient measure is a good investment for them since they lack information that is credible, easily-understood, relevant to their situation, and available at the exact time they are making a purchasing decision; and
2- Consumers do not understand that their energy use has a direct effect on the environment, and so lack an important motivation to choose the environmentally preferable alternative.

Layered on top of these barriers, are a variety of additional institutional or transactional barriers. Some of the more difficult barriers include:

- Split incentives between landlords and tenants, between homebuilders and homebuyers (where landlords and builders purchase low-cost, low-efficiency equipment while tenants and homebuyers pay the higher operating costs);
- The panic nature of many purchasing decisions (which means that only readily available models can be chosen);
- Institutional purchasing practices that do not factor in lifecycle costs;

- The treatment of energy consumption as a cost center rather than a potential profit center;
- And the common use of differential investment hurdle rates (higher for efficiency investments than many alternative uses of capital)

Other common barriers associated with new technologies include a dearth of available products, an absence of skilled installers familiar with the new technology, high price premiums for efficient products, and high transaction costs for investigating non-conventional products.

Additional barriers are often very specific to the particular measure under consideration, and can be found at all levels of the distribution chain through which that measure is delivered to consumers. That is why it is important to begin a market transformation initiative or strategy by completely analyzing the market for the measure in question – from the factory point of sale – and identifying the particular barriers that hinder the energy-efficient measures at each phase of the process.

2.3: PLANNING AND DEVELOPING THE MARKET TRANSFORMATION STRATEGY

Once a measure has been identified, the market analyzed, and barriers identified, the players can proceed to develop the overall market transformation strategy, and define its individual component activities.

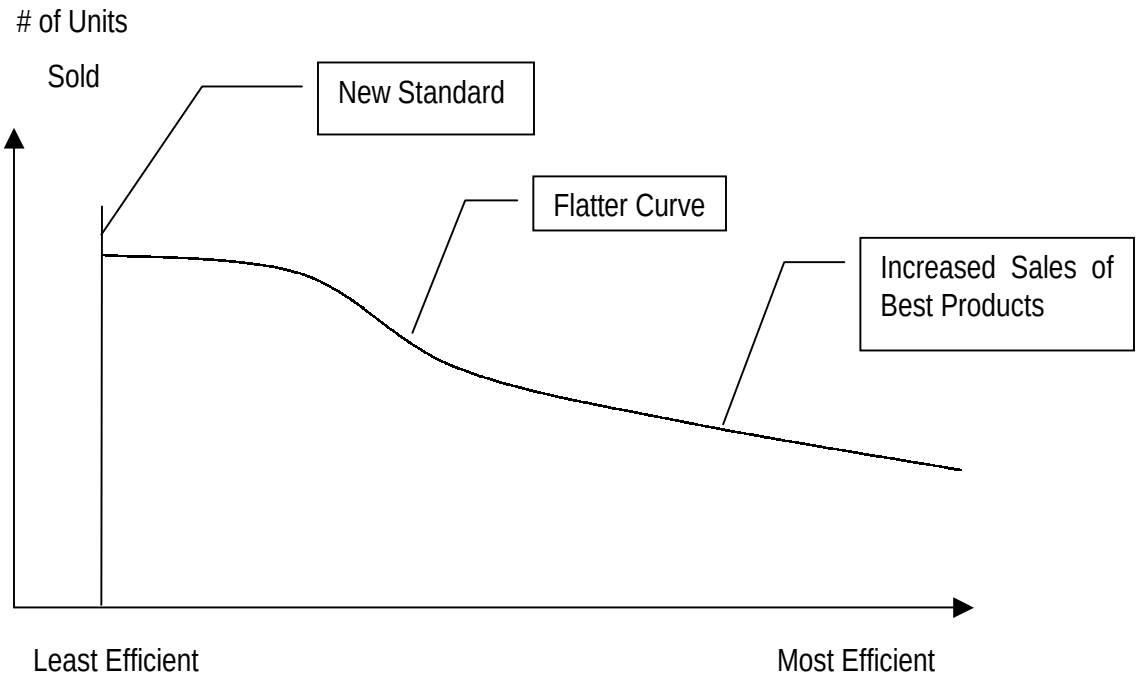
Step 1: Define the Broad Goals and Objectives

All market transformation initiatives and strategies should have a clearly articulated goal, as this will guide the development of the individual activities. Each supporting activity within an initiative or

strategy should also have its own clear objective. For example, a market transformation strategy may be developed to reduce residential sector cooling energy by significantly changing the distribution of residential air conditioning equipment sales. This general goal may be represented as shown in Figure 2 (above) and Figure 3.

In order to flatten and extend the initial frequency distribution curve, a variety of activities, each with their own objective, should be devised. For example, specific objectives for a residential air conditioner strategy might include raising the market penetration, to increase sales an to develop and begin implementing a technician certification program on proper installation and maintenance procedures.

Figure 3: The Transformed Market



Once defined, these specific objectives become the criteria upon which the overall strategy will be evaluated. It is thus important to define the goals and objectives in such a way to ensure that future progress can be measured.

In order to ensure that the goals of each activity support the broader goal of the initiative or strategy, it is important for the appropriate players to work together in defining the common vision for the endeavor. This coordination can occur in a variety of ways. Sometimes a market transformation initiative or strategy can be crafted and implemented at a regional level by regional players; this will be most effective when targeted market segment or end use is highly regional, e.g., new construction practices, evaporative cooling equipment, etc. Frequently national coordination will be necessary when targeting a widely used technology or an industry standard practice. Sometimes, this national coordination will be facilitated by one or more national organizations as they work to integrate their efforts with those being developed or implemented by others. It is also possible that regional organizations may conduct the initial work that lays the groundwork for a broader national initiative or strategy.

Step 2: Develop Program Activities that Address Key Barriers

After the goals are defined, a set of activities can be designed. Program design should be directly linked to barriers defined during the market assessment phase. Large and expensive programs that do not get to the root of the basic barriers are not likely successful, or to yield sustained results. Since barriers often exist at many points along the product distribution chain, a variety of carefully crafted activities may need to be employed as part of a program. For example, in order to increase the market penetration of existing high-

efficiency furnaces, a variety of efforts may be required, ranging from the training on how to sell high-efficiency models, to development of attractive loan products that lower the monthly costs to homeowners. Sometimes these different efforts are best implemented sequentially, while other times they should be implemented simultaneously for greatest effect.

When developing potential activities, it is important to match the “tool” to task or objective. A program planner has access to a variety of tools that can be applied to facilitate changes in the market. Different tools are appropriate for different tasks and at different stages in the market diffusion process, since the barriers are a function of product/market maturity. Market transformation practitioners can directly stimulate the early movement up the S-curve by effectively utilizing a combination of proven intervention techniques. Research, development and demonstration efforts can be used to stimulate the development and sometimes the initial commercialization of new technologies. Organized bulk procurement efforts or commercialization incentives can also be used to stimulate the market introduction of the newly developed products. Following up with aggressive outreach to other large purchasers and utility rebate or financing efforts can help the targeted product achieve “niche” status in the market.

Shepherding a targeted technology from niche status to a mass-market presence can be more difficult because it requires the involvement of more players in the value chain (some of whom may have been by-passed in the early phases of the initiative), and a significantly greater number of transactions that cannot easily be combined into bulk procurements. Once a desires product has achieved some important market traction, program managers should

generally begin to rely more on a broad consumer demand to drive the remaining phases of the market adoption process. While this continued acceleration up the S-curve may happen naturally in some cases, educational or other promotional activities may be needed to facilitate changes in consumer purchasing practices and the preferences upon which these decisions are based. Outreach and promotional efforts targeted at the appropriate trade allies (e.g., retailers, distributors) are also often useful at this point in order to ensure the targeted products are available and the sales people are aware of their benefits. Financial incentives (rebates and financing) may have a role at this stage, but as market share increases, incentives can be first reduced, and then ultimately phased out. Codes and minimum efficiency standards can be used later in the market adoption process to capture the gains that have been achieved and to prevent any substantial backsliding.

Once tools are selected, it is also useful to ensure that they will be utilized by organizations whose institutional capabilities and mission are well suited to the task. Due to their scale, some tools are best suited for national use by a national organization, e.g., working with product manufacturers to label high-efficiency equipment. However, even for national products, there will generally be an important role for regional and local organizations to play in working with the local distribution channel and local consumers. Also for some climate-dependent products, regional organizations may need to take lead as specific measures are not cost-effective nationwide but only in cold or hot climates. Likewise, for regional practices, there may be some common elements between regions that can be developed nationally and adapted to each region. At times, such as with personal computers, the market even be international in scope, and call for international cooperation. In addition, some tasks, such as R&D,

require significant technical expertise and access to necessary resources. It would be inappropriate for an organization without this type of experience to take on this type of activity. Likewise, some tasks require significant interaction with trade allies, retailers, and/or consumers and will be better suited to organizations with experience in marketing.

Another important part of program planning is coalition building. Since most market transformation initiatives involve many different players, ranging from governments and utilities to equipment manufactures, vendors, specifiers and installers, coalitions will often need to be developed. All times, formal coalitions can be formed; other times information sharing and tacit cooperation may suffice.

Step 3: Develop An Implementation Plan

Once the activities and tools have been chosen, and the responsibilities of each player clarified, each organization should develop its own implementation plan outlining how it will actually carry out its activities. This planning process includes preparing materials, talking to appropriate trade allies, investigating potential delivery mechanisms, pinpointing specific areas for early targeted action, developing a strategy for communicating to costumers and the press about the new activities, developing administrative and tracking mechanisms, and developing market plan. While it is useful to develop a plan that will guide implementation and budgeting, it is important to remember that the plan will need to evolve over time in response to new information, new opportunities, or as a result of significant market shifts. At this stage, an evaluation plan also needs to be developed and baseline information defined so as to provide a

pre-program benchmark upon which future evaluations can be pegged.

Section 3: END-USE MARKET TRANSFORMATION – THE BRAZILIAN EXPERIENCE

Restructure and reform of the electric sector in Brazil introduced new performance conditions for the activity of the regulating agent. The Brazilian Electricity Regulatory Agency (ANEEL) was instituted in 1997 with the purpose of regulating and monitoring the production, transmission, distribution, and market of electric energy, in conformity with the policies and guidelines set by the Federal Government. In 1999, ANEEL determined that power distribution utilities should invest, every year, at least 1% of its operating income from the previous year in actions to extend the efficiency in the use and offer of electric energy. Of this total, a minimum of 25% (or 0.25% of the annual operating income) must be invested in actions to extend the end-use efficiency of electric energy.

Conventional energy efficiency programs have been designed and applied according to resource acquisition approach. With this focus, more efficient equipment and technologies are introduced in production processes and in existing buildings and facilities. This does not assure, however, that the replacement of equipment, in the future, will occur according to the same efficiency pattern.

In the period prior to the reform of the electric sector, vertically oriented companies gathering generation, transmission, distribution, and marketing functions, under a same control and ownership, could be interested in the programs in view of avoided costs resulting from delay in investment in new installed capacity. However, restructuring separated different functions into independent business units, making unfeasible the transfer of benefits from energy efficiency gains in

distribution (end uses) to generation. Indeed, in the new structure—and regarding the end use of electricity—, the introduction energy efficiency measures creates benefits to the electricity consumer (with the reduction of energy consumption) and to society (expenditure postponed for new generation).

For distribution companies, energy efficiency measures may create advantages when they result in demand reduction in critical areas, in which immediate investment would be required to assure the supply of electricity. A number of barriers (such as the high initial cost of efficient equipment) make unfeasible the investment by consumers themselves. Similarly, revenue reduction works as a disincentive for distribution companies to promote the introduction of energy efficiency measures among their consumers.

Therefore, in order to reach the benefits to society resulting from the more efficient use of energy, compulsorily funded programs have been implemented by the universe of electricity consumers. This orientation should, however, privilege initiatives resulting in sustainability of energy efficiency measures and market-oriented actions, which could endure in the long run. The selection of such initiatives should be made in the scope of a new design for the energy efficiency programs.

In the new structure of the electric sector, the implementation of energy efficiency programs should set choices that enable, at the same time, make possible the benefits to society resulting from the efficient use of energy and promote energy efficiency market transformation. These programs should be drawn in function of criteria capable of making the energy efficiency market gradually practicable.

The decision to establish market transformation programs is related to the verification that market barriers existing in the energy efficiency market may be overcome with the measures contained in the programs. Among the existing barriers are the lack of information on energy efficiency, transaction costs and the fact that energy costs do not internalize environmental costs. Associated with a set of specific aspects regarding conditions of the end-use energy market agents, these barriers jeopardize the operation of the energy efficiency market.

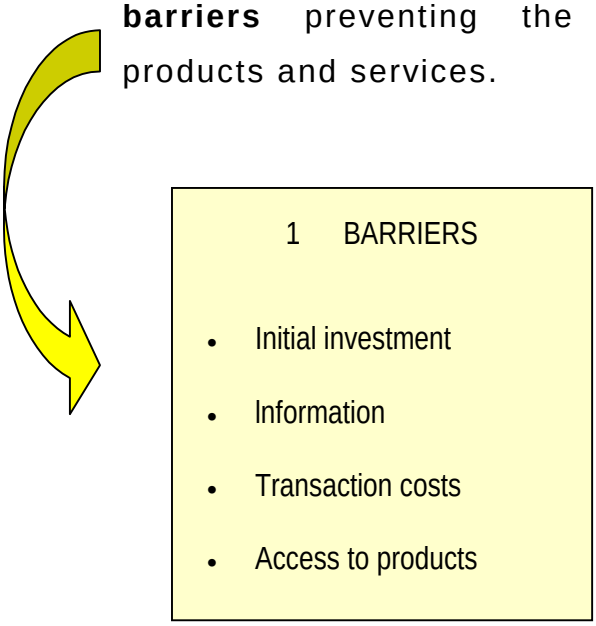
The last few years saw the beginning of the implementation of market transformation programs (California and Massachusetts), whose results will be better assessed in the long run. In addition, the preparation of market transformation programs has been object of publications and conferences (American Council for an Energy-Efficient Economy –ACEEE and National Association of Regulatory Utility Commissioners –NARUC in the United States, among others). The action of regulatory agencies in the drawing of market transformation programs has also been extended in recent years, meeting the needs to advertise promotional mechanisms of efficiency compatible with restructuring of electrical systems and the introduction of competitive mechanisms in the electricity industry.

Generally, the gains obtained in energy efficiency is of direct interest of Regulators for the consequences observed in relation to the following:

(1)Conservation and availability of resources;
(2)Reduction of energy costs and economic competitiveness;
(3)Environmental quality;

(4)Sustainable development.

Market Transformation is a process that allows overcoming **barriers** preventing the development of energy-efficient products and services.



3.1: CONCEPT OF ENERGY EFFICIENCY MARKET TRANSFORMATION

A market transformation program is distinguished from a conventional energy efficiency program because, in fact, it stimulates the offer and demand of energy efficiency and guides the energy efficiency policy, previously oriented to consumers, toward the set of energy efficiency market. It should be noted that a market transformation program is planned for several years (multiannual programs), along which the conditions for offer and demand of efficient products and services become sustainable and gradually release the program.

In short, market transformation means a sustainable change in:

- The offer of products or services in the market
- Conditions in which purchasing decisions are made
- The type and number of players in the market
- The set of market interactions

For this to occur, market transformation programs, generally, have involved issues as technical efficiency, costs, product marketing, and consumer behavior.

There are several definitions for market transformation. There's a consensus, however, that market transformation involves a continuous and enduring change, in such way that market will not return later to lower levels of efficiency. For some, more than a type of program, market transformation is, indeed, a result or a product. For others, market transformation is a process through which innovations in energy efficiency are introduced in the market and begin to occupy, with time, a large share of the referred market. Yet, other authors consider that market transformation implies in a sustainable reduction of market barriers up to the point in which efficient goods and services become a normal practice in proper applications.

Although not related to the restructuring process of the electric sector, the concept of market transformation has been considered as a reference approach to obtaining energy efficiency in a market-oriented competitive environment.

This way, one of the benefits of an approach in terms of market transformation is in the use of market forces to overcome energy efficiency barriers. In addition, there's the expectation of extra energy saving at reduced costs.

In market transformation programs we have the introduction of new elements in the structure of the energy efficiency market (e.g., new offer conditions, different access conditions to products and services) and in the sharing of market players in such way that energy efficiency is improved and the changes remain beyond the end of the program. Since most market transformation programs involve the introduction/promotion of new equipment in the market, or a reduction in the use of an inefficient technology, it is expected that market transformation programs result in an accelerated rate of technological improvement and in cost reduction.

A market transformation program requires the participation of distribution utilities (for its implementation), as well as that of manufacturers, distributors, and resellers (for product distribution), in addition to construction companies and designers (for specification of products and its application). The program design must mobilize the interest of these market agents in order to assure the results associated with energy efficiency.

3.2: PROCESS OF INVESTING THE 1% REVENUE OF UTILITIES IN ENERGY EFFICIENCY PROGRAMS. SUMMARY OF RECENT RESULTS (SECTORS AND REGIONS). RELEVANT ASPECTS OF EXPERIENCE GAINED FOR PREPARATION OF MARKET TRANSFORMATION PROGRAMS.

The resources for development of energy efficiency programs in Brazil come from 1% of the annual net income of power utilities. The Manual for Preparation of the Annual Program for Combating the Waste of Electricity, published by ANEEL in 1999, describes the conditions to

be followed by power distribution utilities for submittal of programs involving the application of such resources in end uses of electricity.

Table 1 shows applications made with this resource by power distribution companies. This data is still preliminary, but it is showed, in order to highlight the main uses and sectors which have been object of investment by distribution companies. Thus, we will have a reference for each concession area, of uses and sectors in which the introduction of energy efficiency measures has been more profitable.

These results may serve as a first approach to conditions of application of market transformation programs in the several concession areas in which resources from the 1% annual net income of the companies are employed.

	INVESTMENTS PER SECTOR (R$ Thousand)											
	IP	**RES**	**IND**	**PP**	**COM**	**EDU**	**TREIN.**	**MKT**	**INST**	**RURAL**	**FC**	**LOSSES**
AES-SUL	332.07	146	146	160	0	96	0	400	0	182	1315	3038.18
RGE	659.74	150	290	220	70	0	0	0	0	0	1187	4001.3
TOTAL SOUTH	**991.81**	**296**	**436**	**380**	**70**	**96**	**0**	**400**	**0**	**182**	**2502**	**7039.48**
BANDEIRANTE	1727.93	444.35	783.9	444.35	457.74	115	0	635.92	60	0	4000	9334.85
CEMIG	2800	1273.98	1523.71	662	780	75.9	0	581.78	56.46	135	276.5	12341
CERJ	1267	224	277	214.5	0	40	30	0	205	0	666.19	16223.15
CPFL	1940	640	1020	450	222	100	50	300	0	0	3510	7970
ELEKTRO	1104.3	227	710.3	227	0	0	0	0	0	0	1787.8	4416.36
ELETROPAULO	1500	925	925	925	1814	105	36	0	0	0	7215	17050
ESCELSA	695.17	199.43	141.35	176.42	35.78	41.6	33.55	3020	0	0	1124.6	2684.14
LIGHT	8983.54	560.23	819.79	560.5	460	160	0	431.8	0	0	3233.6	7373
TOTAL SE	**20017.94**	**4493.99**	**6201.05**	**3659.77**	**3769.52**	**637.5**	**149.55**	**4969.5**	**321.46**	**135**	**21813.69**	**77392.5**
CELPA	416.71	92.17	92.17	140.52	61.07	40	45.99	40	54.13	0	276.5	2058.76
CEMAT	391.2	173.41	127.82	75.4	0	0	0	91.8	0	0	636.19	3081.06
TOTAL NORTH	**807.91**	**265.58**	**219.99**	**215.92**	**61.07**	**40**	**45.99**	**131.8**	**54.13**	**0**	**912.69**	**5139.82**
COELBA	4832.1	603.79	229.34	698.46	1256.42	311	30	263.9	250	256.35	611.36	0

COELCE	574.5	334.6	136.11	136.01	0	102.43	0	198.97	40.4	0	370	4923.6
COSERN	427.36	148.72	52	50	0	53.7	0	0	0	0	231	1539.06
ENERGIPE	597.18	55.44	78	67.73	0	95.24	0	131.5	0	0	164	500.4
TOTAL NE	**6431.14**	**1142.55**	**495.45**	**952.2**	**1256.42**	**562.57**	**30**	**594.37**	**290.4**	**256.35**	**1376.36**	**6963.06**
ENERSUL	2884.23	67.04	67.31	69.35	31.06	116.4	40.06	130.99	10.96	0	604.62	1621.33
TOTAL MIDW	**2884.23**	**67.04**	**67.31**	**69.35**	**31.06**	**116.4**	**40.06**	**130.99**	**10.96**	**0**	**604.62**	**1621.33**
TOTAL BRAZIL	**31133.03**	**6265.16**	**7419.8**	**5277.24**	**5188.07**	**1452.47**	**265.6**	**6226.66**	**676.95**	**573.35**	**27209.36**	**98156.19**

TABEL 1

IP = Public Lighting
RES = Residential
IND = Industrial
COM = Commercial
EDU = Education
TREIN = Training
MKT = Marketing
INST = Internal Electricity Network
RURAL = Rural
FC = Demand Side Management
LOSSES = Losses

The analysis of the information contained in this Table indicates a set of issues related to the end use of electricity for preparation of market transformation programs in Brazil.

3.3: POSSIBILITIES AND OPTIONS FOR ACTIONS BY THE REGULATOR IN THE PROCESS OF MARKET TRANSFORMATION

Introducing market transformation programs requires definition of new guidelines by Regulators. Thus, we understand that energy efficiency programs should become multiannual (so market transformation can produce results) and its assessment (more complex and with a greater degree of uncertainty) is associated with the evolution of the selected indicating markets. The fact of being multiannual implies in few impacts in the first years, but, in the sequence, there will be

larger impacts that those of conventional programs. With time, the market's own dynamic will make possible sustainable energy efficiency objects.

Moreover, programs must be consistent with other objectives of the public policy, both in the regulated market and in the competitive market. This way, the action of the Regulator will allow overcoming market barriers and preserve the interest of the regulated consumer. Market transformation programs are aimed at the removal or reduction of market barriers. Market barriers are obstacles to efficiency increase in a given market. Normally they are considered in the literature as an explanation for the lack of success or unfeasibility of programs. However, they should be understood as an indication for measures that must be taken to assure the result predicted in a market transformation program.

Therefore, market barriers indicate that the program has not been designed to be developed under the existing conditions of the market, or that market faults indicate the need for other measures. This way, main barriers to technology, service, or targeted behavior must be identified. In addition, market will not be transformed should the market transformation program remove only existing barriers on the offer side of the product, or only on the demand side of the consumer.

In a study on market transformation strategies to promote energy efficiency in end uses, Steve Nadel and Howard Geller consider that several program policies and initiatives may contribute to market transformation, as follows:

- Research and Development
- Demonstration and tests
- Sales incentive

- Marketing and consumer education
- Financial incentives
- Voluntary commitment (assumed by market agents)
- Wholesale purchasing
- Building Codes (Buildings)
- Efficiency codes and standards for equipment

These guidelines should be selected in function of the objectives and areas of application of a market transformation program, but as a whole, they indicate a myriad of alternatives contained in the design of these programs.

Regulators have three implementation alternatives to stimulate market transformation as an approach to reach energy efficiency objectives:

- Implementation of programs per concession area;
- Implementation of programs by an independent entity;
- Implementation whether by an independent entity or by a regional consortium of power distribution companies.

The choice should comply with the planned evolution of the electric sector structure. Although a few components of market transformation programs (e.g., offer of efficient equipment) may involve several distribution companies and be effected in the regional sphere, program design and application should be associated with each concession area. The success of the program is related to the effective interest and involvement of power utilities.

In a competitive environment, market information is strategic for preservation of free customers, which makes it difficult for a joint action among distribution companies. However, they can stimulate each distribution company operating independently to strengthen its

presence at electricity consumer sub sectors, improving service condition to those customers, and attracting free customers from the same sub sectors belonging to other concession areas. This way, each program would be setting market transformation objectives per concession area in harmony with competitive conditions implemented by the restructuring and reform of the electric sector.

In addition, Regulators could explore existing synergies between program funding with resources from electricity consumers and other initiatives capable of associating and helping market transformation (e.g., modernization of the productive system, increase competitiveness, reduction of public expenditure, employment policy, state fiscal incentives). We should emphasize the leveraging of additional resources based on resources financed by consumers, which may substantially extend the success of energy efficiency measures introduced by the market transformation program.

The evaluation process is a fundamental dimension for the accomplishment of the program; the selection of proper market indicators should be defined in the program design. These indicators are estimated prior, during and after development of the market transformation program. Indicators are selected in function of their capacity to modify themselves when the program changes the way the market operates.

The program should include conditions for its conclusion, by establishing an exit strategy and setting a time frame for the program to accomplish the estimated efficiency improvement and for a permanent change in the market to occur. After a preset period of time, in function of performance of market indicators selected, the market transformation program will be finished. The following may be

indicated as parameters of efficiency improvement realized by the market transformation program:

- Progress of the technology dissemination curve during a certain period of time;
- A specific efficiency target;
- A percentage change in the market.

In the definition of these parameters, careful attention should be paid to the fact that those receiving any incentive may delay achieving the goals to maintain their incentives.

Market Transformation

Conventional Energy Efficiency

- Sustainable
- Time limited
- Market-oriented
- Long-term results
  - Temporary
  - Indefinite horizon
  - Consumer funded
  - Short-term results

Section 4: EVALUATION OF MARKET TRANSFORMATION PROGRAMS

The development of a market transformation program should be monitored along its evolution to provide conditions for observing its results and, if necessary, taking all appropriate correction measures. In addition, an assessment strategy should be established to allow quantifying the impacts of the program both regarding the use of energy and market indicators. In case of energy use, we should stress that immediate impacts (as a result of the program) and enduring impacts (that transformed markets will maintain without interference) will be noticed.

Before program implementation, a negotiation should be conducted among participants to determine standards and criteria to be employed in evaluation. Schematically, we may consider that the main phases of the evaluation process are the following:

(1) Determining the level of efficiency of the initial base and definition of market indicators;
(2) Monitoring energy saving and market indicators during the program;
(3) Evaluation (at the end of the program) of energy saving and impacts of market transformation.

The degree of accuracy of the evaluation process of market transformation programs will be lower than that of a conventional program, involving, principally, the measure of a set of market indicators. In this case, data regarding the change of indicators considered relevant before program implementation is collected. For

effectively measuring market evolution and demonstrating market transformation, the collection of these indicators should begin when the initial base is first established.

The assessment of market transformation programs has methodological issues relative to the own nature of the markets. Since there is a market interactivity, it is difficult to isolate the participation of each component in the program success (e.g., changes in the selection of consumers may result in changes in behavior of equipment manufacturers/sellers). Markets change frequently, which calls for a follow-up on its evolution during program development.

Even considering the economic and financial force exerted by distribution companies on the electric energy market and its effects on manufacturers, resellers, and consumers of energy-efficient services and products, the markets are not organized per concession area, being influenced by macroeconomic conditions, laws, and publicity beyond these limits. In addition, major changes in the markets are slow and situations foreign to the program may also affect market transformation process. On the other hand, the shorter the time period observed, the greater the uncertainty that changes observed may be attributable to market transformation, since this implies in long-lasting changes.

4.1 – CRITERIA AND MECHANISMS FOR TECHNICAL AND ECONOMIC EVALUATION

The most important to evaluate and measure in a market transformation program are market effects, reduction of market

barriers, and the probability that the changes introduced by the program are sustainable.

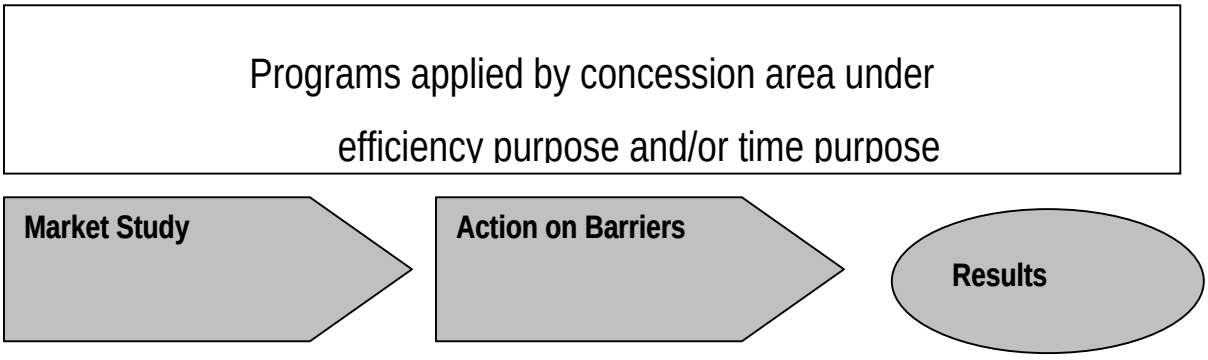
In order to consider that a market has actually been transformed, it should be demonstrated that:

(1) There were a change in the market that resulted in an increased use of energy efficiency technologies

(2) The change occurred as a result of a market transformation program

(3) The change is long lasting and will be maintained on its own beyond the end of the program.

Even though (1) and (2) demonstrate market effects, it is necessary to add condition (3) to demonstrate that the market has actually been transformed. It is recommended, however, a greater effort in the evaluation of market effects and in the reduction of barriers, than in the demonstration that the effects are long lasting.



4.2 – MEASURING AND CHECKING PERFORMANCE

The results and performance of a market transformation program may be established as of market effect indicators. Market effect indicators are expected to be durable and result in the substantial reduction or removal of market barriers. Market effects correspond to changes in the market that may be attributed to the market transformation program and market effect indicators are the indicators of these changes. These indicators are appropriate because they are accessible and periodical, and allow corrections and the introduction of enhancements in the program, and may be used to develop or anticipate estimates of market penetration and impacts on the load.

The relevant aspects of the evaluation refer to the control over the performance of the power distribution company in developing the market transformation program. The implementation of an evaluation system based on market effects requires that the power distribution company and the Regulator agree, initially, in relation to a set of aspects, such as, for instance, market effect rates and market barrier reduction, and on the methods used to evaluate market effects and market barrier reduction.

Market effect estimates may be more defendable with information and evidence of support in relation to market barrier reduction (e.g., a market evaluation, a description of market barriers, an evaluation of market effects that may result in reduction of these barriers, other relations among observed market effects, and market barrier reduction). The demonstration of market effects by a distribution company will be more acceptable if supported by information and evidences in relation to market barrier reductions.

The process of market effect estimate takes the following steps:

1 – begin with a hypothesis or logical base for the market effect: determine what market, what players, and what impacts on the market

2 - evaluate if the hypothesis is reasonable by means of a collection of information of preliminary support

3 – design/establish the evaluation in which the preliminary information will be used and the supporting evidences— this may help identifying where (and how) to look for effects

4 – conduct the evaluation focusing on the strongest hypothesis of market effects and reductions of market barriers

5 – use supporting evidences to corroborate evaluation results.

One of the mechanisms to evaluate market transformation effects is the development of forecasts on which market indicators will change should the program be well succeeded and to follow these indicators, in time, using an almost experimental design. This requires collecting data from sellers, distributors, and manufacturers.

The initial market will have to be researched to provide information on how current markets are operating, including an initial understanding on which market barriers are preventing consumers from adopting profitable energy efficiency measures. In addition, in order to document the results of actions from the power distribution company, it is necessary to first establish baseline conditions for market indicators which are expected to be affected by the program.

When it comes to how a market transformation program should be evaluated in function of definite changes introduced in the energy efficiency market, it is difficult to determine the causality of the

program (how it would be in a conventional program). This makes it necessary to increase investment dedicated to establish the causal effects (e.g., what is the result related to) of the program. In addition, in the scope of market transformation programs, we have to distinguish two approaches for evaluation of the program's gross impacts: a micro research oriented to precisely locate economies associated to individual measures and a macro research to establish the general level gross change of the market, without specifying the role of the power distribution company as the agent causing this change.

In terms of investment, evaluation of market transformation requires significant investment to perform four different activities:

(1) Develop information necessary to understand the way market agents interact;
(2) Measure the conditions of market baseline;
(3) Establish follow-up systems to make the continuous monitoring of these conditions practicable;
(4) Develop new methods to integrate and analyze all data.

Since a large part of potential market transformation effects may occur beyond the limits of concession areas of distribution companies, demonstrating the effectiveness of the programs will require a coordinated research among different electricity distribution companies.

Section 5: MARKET TRANSFORMATION AND SUSTAINABILITY

The issue of sustainability is related to obtaining market effects by the market transformation program and to the continuity of market effects after the end of the program. The introduction of these programs is recent and requires a long term for checking how the measures introduced are enduring. However, we can establish indications that assure sustainability of the choices made in the design of programs and during their implementation:

- The choices must be established in such way to find support in the own operation of the market;
- The regulatory action must be limited in time and associated to market operation;
- Surpassing a few market barriers gradually and implementing the best opportunities for market transformation should increase the potential for overcoming other barriers and reducing the cost to achieve less attractive market transformation opportunities.

5.1: PROCESS SEQUENCE IN NEW ACTIVITIES

- Process organization starting from sectors, uses, and regions of higher potential results.

The use of resources for market transformation programs should select, as a priority, sectors and end uses in concession areas of higher potential for obtaining market effects, and in which there's a greater probability of preserving the energy efficiency standard introduced by the program.

- Success in these areas allowing a gradual transfer to sectors, uses, and regions of less potential, and so on.

Achieving the objectives of market transformation programs in situations of best possible effect should benefit new sectors and end uses in concession areas of less potential for market effects from benefits from the reduction of barriers under the most favorable conditions.

- Experience and lessons learned in the initial period (greater potential result) serving as reference to areas of less potential, and so on.

Learning from situations (consumer sectors, end uses, and concession areas) of higher potential for obtaining market effects and reduction of market barriers may improve performance and reduce implementation cost of market transformation programs in areas of less potential, being the process applied in a successive way.

5.2 - PARTICIPATION OF THE MAIN AGENTS INVOLVED IN THE PROGRAMS

One other factor relative to sustainability of market transformation programs refer to the cooperation among the agents involved in energy efficiency market. The measures implemented by the programs will be preserved by the changes made from interactions among these agents:

- Consumers
- Energy Service Companies (ESCOs)
- Equipment manufacturers
- Equipment Resellers/Importers
- Power distribution companies

From this group, we must stress the importance of the power distribution companies:

- For being directly associated with the expenditure on energy consumption habits of the consumer;
- For having a controlled market that can be oriented toward the efficient use of energy;
- Because the size/volume of this controlled market is what can, in fact, mobilize the other participants (manufacturers, resellers, importers, ESCOs).

Section 6: CONCLUSION AND RECOMMENDATIONS

The market transformation approach is gathering speed and many of the leading organizations active in the energy efficiency arena have adopted the new principles as part of their philosophy and activities. In this paper, we have tried to describe the key components of successful market transformation initiatives and strategies, as well as some of the underlying principles that should guide design and implementation. In summary, successful market transformation initiatives and strategies should generally include the following:

- A careful analysis of the market and identification of barriers;
- The development of a long-term strategy that includes a progressive series of activities designed to surmount the identified barriers;
- The implementation of a variety of coordinated activities involving a number of different actors;
- Periodic evaluation of progress toward the long-terms goals by observing various market indicators;
- Making necessary updates and revision to the different activities as a result of evaluation results or new market information; and
- The development and execution of an exit or transition plan that will ensure market changes are sustained after activities are concluded or the level of effort is reduced.

In order to follow this process, and achieve a greater number of successes, practitioners need to coordinate more and focus on initiatives and strategies, rather than isolated activities. Increased coordination will require the development of a common vision or consensus on the key market transformation concepts, tools, and activities, many of which we have tried to describe in this paper. A key area around which to begin coordination efforts is the diverse portfolio of existing activities – they should be better grouped into comprehensive strategies with common goals, clear objectives, and sound evaluation protocols.

Increasingly the regulatory agency, or related state organizations, will be responsible for making significant funding decisions regarding state or regional program activities. They can play a useful role in promoting broader coordination among players and in requiring the development of truly integrated market transformation strategies.

State and federal policy makers, as well as non-profit groups and utilities, need to consider the steps necessary to carryout a key underlying activity that supports all market transformation strategies – **public education**. Outreach efforts to stimulate increased public understanding of energy use, its impact on society, and the benefits of using energy more efficiently are essential to ensuring the long-run success of all market transformation strategies. In Brazil, Brazilian Electricity Regulatory Agency – ANEEL and the Mines and Energy Ministry – MME, are actively conducting outreach efforts to increase awareness and understanding of energy efficiency and market transformation. Regional and local organizations should consider be tied with the federal organizations, repeating common themes, and utilizing common material in order to help build broader consumer understanding. If we can succeed in creating a new conventional wisdom regarding energy use, it will contribute to changing fundamental consumer purchasing preferences. This type of shift will make it easier for program planners to address many of the remaining market barriers.

Since market transformation initiatives and strategies foster broad changes across the market for a measure, they have to be evaluated differently than traditional utility demand-side management programs. Setting clear discrete objectives and tracking simple market indicators are key elements of any evaluation effort for market transformation.

The market transformation approach is a sound policy framework for facilitating public energy efficiency and environmental goals. As a highly-strategy method, market transformation strategies are a wise use of public or private funds.

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