Measuring Spillover and Market Transformation Effects of Residential Lighting Programs

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This paper summarizes the methods and key results of a study of the market transformation and spillover effects of residential lighting programs operated by five New England utilities over the period 1991 to 1994. Using data from interviews with manufacturers, retailers, and customers, as well as a variety of other sources, the study found that utility DSM programs had contributed to transformation of the residential market for compact fluorescent lamps (CFLs) by raising customer awareness and trust of the product and by supporting manufacturers' investments in improved technology, marketing, and distribution channels. The study used a telephone survey of customers in the sponsors' service territories and in areas not served by utility DSM programs to estimate the net effects of the sponsors' programs, including spillover. Three different methods, including discrete choice modeling, were used to estimate net program effects. All found significant levels spillover effects among participants and nonparticipants in the sponsors' service territories.

OVERVIEW OF STUDY OBJECTIVES AND METHODS

This paper summarizes the methods and key results of the Residential Lighting Spillover Study. The study was conducted in early 1995 and was sponsored by a consortium of five New England electric utilities: Boston Edison Company, COM/Electric, Eastern Utility Associates, New England Electric System, and Northeast Utilities. The major research objectives were to:

- Assess the effect of the sponsors' residential lighting programs on the market for compact fluorescent lamps and fixtures; and,
- Quantify the spillover effects of the sponsors' programs on energy consumption among their residential customers or, alternatively, the net energy savings attributable to the programs, including spillover effects.

Each of the sponsors had operated demand-side management (DSM) programs to promote compact fluorescent lamps (CFLs) and associated products. Between 1991 and 1994, over 18 percent of all the sponsors' residential customers had taken part in at least one of these programs. Through these efforts, the sponsors had sold, installed, or provided rebates for the purchase of more than 3.4 million compact fluorescent lamps and fixtures.

Definitions of market transformation and spillover effects of DSM programs

For this project the sponsors adopted the following definitions of market transformation and spillover.[1]

- ***Definition of Spillover.*** spillover is any reduction in energy consumption or demand that is due to a DSM program, other than reductions due to measures or actions taken by participants as part of the program.
- ***Definition of Market Transformation.*** Market transformation occurs when a DSM program induces a lasting change in the structure of an energy product or service market or the behavior of market actors that results in greater adoption and penetration of energy-efficient technologies.

These basic definitions furnished the starting point for establishing indicators of spillover and market transformation that were appropriate to compact fluorescent products.

Research activities

The following research activities were undertaken to assess the market transformation and spillover effects of the sponsors programs.

- Interviews with representatives of all major manufacturers of compact fluorescent lamps.
- Interviews with representatives of thirty-eight retailers, including six located outside the sponsors' service territories.
- Review of statistical and secondary sources on shipments, sales, and residential saturation of compact fluorescent lamps.
- Telephone surveys of random samples of residential electric customers both within the territories served by the five sponsors and in three selected utility service

territories where no DSM programs had been offered. The survey questionnaires contained a detailed inventory of all lighting fixtures that could accommodate compact fluorescent lamps. It also contained extensive questions on CFL purchases, installation, and removal, as well as familiarity with the key features of compact fluorescent technology. Altogether, 1,785 interviews were completed: 613 DSM participants in the sponsors' lighting programs, 632 nonparticipants from the sponsors' service territories, and 540 customers from the non-program areas.

RESULTS OF THE MARKET TRANSFORMATION ANALYSIS

Approach to assessing program impacts on market transformation

Implicit in the definition of market transformation used for this study are three key research questions.

- Have changes occurred in the structure of the market or the behavior of market actors that will increase or accelerate adoption of the technology in question?
- Are these changes likely to be long-lasting?
- To what extent can changes in the market be attributed to the effects of utility DSM programs?

The study found evidence that market transformation, as defined above, had likely occurred in regard to compact fluorescent lamps among manufacturers. That is, we identified:

- changes in the behavior of manufacturers which have accelerated the market penetration of compact fluorescents;
- less definite indicators that these changes are likely to persist in the face of the current decline in utility DSM activity; and;
- evidence that the above changes are attributable to utility DSM efforts, and, in some cases, to the efforts of the sponsors in particular.

On this last point, the manufacturers who were interviewed for this study reported that they based product and promotion decisions in part on the status of utility programs nationwide. They were reluctant to attribute influence to one utility or group of utilities. The structure of the customer survey, however, allowed us to analyze the association between the sponsors' programs and levels of customer awareness and knowledge of compact fluorescent technology.

There were signs of market transformation among customers, however the evidence here was less strong. Adoption of compact fluorescent lamps has accelerated since 1991 and levels of recognition for compact fluorescents are generally high across the nation. However, we found no evidence that these patterns will persist in the face of decreased DSM activity.

Interviews with retailers suggested that they have not played an active role in promoting CFLs. While all retailers interviewed stock CFLs, few have undertaken initiatives to promote them. Rather, they are responding to the marketing initiatives of manufacturers and utilities.

Generally speaking, it may be too soon to assess how long the effects of utility programs will be on the behavior of manufacturers and consumers. However, some of the short-term indicators discussed below suggest that utility intervention did accelerate the development of the market for compact fluorescents.

The key findings of this study in terms of the elements of market transformation were as follows.

Changes in the market to accelerate adoption of CFLs

Changes among manufacturers. Over the period 1992-1995, manufacturers made the following changes in national product strategy, with an eye to accelerating the penetration of CFLs in the residential market.

- ***Product improvements.*** Since the inception of utility support for compact fluorescents, manufacturers have invested in new designs to overcome customer resistance to the product. These enhancements increased light output, decreased size and weight, eliminated flicker and delay in starting, and improved light dispersion and color. Manufacturers also made changes to meet power quality standards of utility program sponsors.
- ***Price reductions.*** Manufacturers reduced prices of older, less desirable models to the point at which retailers could sell them for $5—$10. Market studies have indicated that this price is a threshold barrier to customer acceptance.
- ***Development of effective retail channels.*** Manufacturers have developed mass market retail channels appropriate to the price and performance characteristics of

the product. These include dedicated display areas in national discount and home center chains.

Changes among retailers. After some resistance in the early nineties, CFLs are stocked by virtually all retailers in the following categories: local hardware stores, home centers, discount department stores, electrical supply dealers.[2] Over 60 percent of the retailers interviewed for this study carried full lines of compact fluorescents.

Changes among customers. All indicators of product adoption—manufacturers' shipments, market penetration surveys, manufacturer and retailer reports of sales trends—indicate that sales and market penetration of compact fluorescent lamps have increased steadily over the past four years. Manufacturer shipment data compiled by the US Census indicate that domestic shipments (including imports) grew 6.5 percent between 1992 and 1993, and 3.1 percent between 1993 and 1994. Manufacturers' representatives reported that domestic shipments and sales grew from 10 percent to 25 percent during this same period. Moreover, the results of saturation surveys conducted during this period with both national and regional samples suggest a higher level of sales and sales growth than is consistent with Census figures. See Table 1. Voluntary reporting and lack of specific data on imports (which account for a large part of the market) may lead to under-reporting in the Census. The findings from these various sources are consistent in the sense that they show increases in sales and market penetration of CFLs. However, due to differences in the types of data used and methodological differences among studies that sought similar kinds of data, there is no formal way to reconcile differences in estimated growth or penetration rates.

Indicators of lasting changes

Findings from manufacturers. All manufacturers interviewed believed that utility subsidies for compact fluorescent technology will be eliminated entirely within two to three years. All reported that their companies expected that compact fluorescents would remain a profitable product category in the face of reduced utility support, and that they were in the process of implementing strategies to sustain sales and profitability in the new environment. Elements of these strategies which are currently in place include the following.

- ***Increased advertising to boost product awareness.*** All manufacturers reported increasing national marketing and advertising budgets in 1994 and 1995. The increases ranged from 100 to 800 percent.

- ***Continued product improvements.*** Manufacturers are about to introduce models that incorporate further refinements, such as the ability to work with dimmer and three-way switches.

- ***Two-track pricing strategy.*** Most manufacturers are adopting a two-track pricing strategy at the national level. Older models are being priced below the $10 retail threshold to attract price-sensitive ''late adopters''. Newer models incorporating the latest technologies are being introduced at prices from $16 to $26 attract

Table 1. *Results of Customer Surveys: Percentage of Customers with CFLs*

Sponsor/Area	Date	Survey Technique	Sample	% of Respondents with CFLs
Pacific Gas & Electric	1991	On-site	Random all customers	2.7%
US DOE Residential Energy Consumption Survey	1993	On-site	National probability sample. n = 7,000	8.9%
Iowa-Illinois	1994	Telephone	Random, nonparticipant	12.1%
Iowa Electric	1994	Telephone	Random, nonparticipant	25.9%
Iowa Southern	1994	Telephone	Random, nonparticipant	30.7%
Manufacturer	1994	Telephone	N/A	20.0%
New England Utilities: Nonprogram areas	1995	Telephone	Random, all customers	21.6%

customers who already value the technology. This pricing policy opens up the product category to a broader range of customers than it previously attracted.

- ***Incorporation of compact fluorescent technology into a greater range of products.*** Most manufacturers are incorporating compact fluorescent technology into reflector lamps, shop lights, and overhead fixtures to mitigate the impact of the elimination of utility rebates for screw-in lamps.

- ***Standardization of components to reduce costs.*** Several manufacturers reported that longer-term efforts to standardize components and reduce manufacturing costs were nearing completion.

In addition to these product strategies, all manufacturers reported making major investments in new production capacity in 1993 and/or 1994. These included the completion of new factories in China and Mexico, as well as expansions and improvements to existing facilities in the United States and Europe.

Findings from Retailers. Retailers have increased stocking patterns of CFLs largely in response to utility and manufacturer initiatives. We discovered little evidence of independent commitment to promote CFLs in the long term should utility or manufacturer promotional efforts decline.

Findings from Customers. The results of recent process evaluations for one of the project sponsors indicate that customer satisfaction with the performance of compact fluorescents has increased. This should help foster long-term stability or growth in sales.

Evidence of the effect of utility programs

Findings from manufacturers. All manufacturers interviewed for this study believed that utility DSM programs had played an essential role in developing the markets for compact fluorescents, and that the pace of product development and sales growth would have been significantly slower in the absence of utility involvement. The manufacturers identified the following three key contributions of utilities to the development of the market.

- Customer education concerning the energy savings, environmental benefits, and long useful life associated with compact fluorescents.

- Enhancement of the credibility of manufacturers' claims for superior product performance.

- Enhanced cash flow from subsidized markets to support further investments in product development and efficient production facilities.

Findings from customers. Over 67 percent of customers in the program areas were aware of compact fluorescents at the time of the customer survey, versus 47.3 percent of customers in the nonprogram areas. This finding suggests that utility programs may have been important in broadening the residential market for compact fluorescent lamps.

ANALYSIS OF PROGRAM SPILLOVER EFFECTS

Approach to quantifying spillover

The study estimated spillover energy savings associated with the sponsors' CFL programs or, alternatively, net program savings including spillover using three different methods. Data for implementing all three methods were developed through a single data collection effort. This effort consisted primarily of a telephone survey of 1,785 residential customers. The sample for this survey was divided into three roughly equal-sized groups:

- ***Program area participants:*** customers in the sponsors territories who had participated in at least one program to promote compact fluorescents.

- ***Program area nonparticipants:*** customers in the sponsors territories who had not participated in any of the sponsors' programs to promote compact fluorescents.

- ***Nonprogram area customers:*** customers of three utilities in the Midwest and South which had never operated programs to promote compact fluorescents.

The analysis data set was supplemented by information gathered from a number of sources on the following:

- Average costs per kWh in the respective service territories;

- Average energy savings associated with the installation of compact fluorescents in the respective service territories;

- Market prices for CFLs, as well as rebates and discounts which program participants received.

The three methods used to estimate spillover and/or net program savings were as follows.

Method 1: Comparison of Saturation of Compact Fluorescent Lamps. The first method used the difference in saturation of compact fluorescent lamps between the program area and the nonprogram area as a measure of the net program effects on customers' purchase and installation decisions.[3] The saturation of compact fluorescents in the nonprogram areas serves as a proxy for ''naturally occurring'' installations within the sponsors' territory. The difference in saturation between the sponsors' and nonprogram areas provides the basis for estimating the net energy savings of the program, including spillover, as well as the ''Net-to-Gross'' ratio. This is the ratio of net energy savings to gross energy savings as calculated from program records of the number of compact fluorescents installed.

Method 2: Spillover Estimates based on Analysis of Customer Self-Reports. The second approach to estimating spillover analyzed the survey responses of customers within the program area to estimate the following adjustments to gross savings.

- Free Ridership: the number of CFLs per participant that participants would have purchased in the absence of the programs;

- Participant Spillover: the number of CFLs per participant that participants purchased on their own as a result of their experience with utility programs.

- Nonparticipant Spillover: the number of CFLs per nonparticipant that nonparticipants purchased as a result of the program.

- Out-of-service Rate: Previous evaluations of residential lighting programs had found that a significant portion of CFLs sold through the programs had either been removed or never installed. Measurement of this factor was required to reconcile findings from the customer survey on current saturation to records of program sales or direct installations.

Each of these quantities can be expressed as a percentage of the total number of CFLs installed through the sponsors' programs. One minus the sum of the four quantities can be interpreted as an estimate of the programs' net-to-gross ratio. See Table 4 for the application of this approach.

Method 3: Discrete Choice Modeling. The third approach to estimating net program savings and spillover used discrete choice modeling to estimate the impact of the DSM programs on the probability that residential customers will purchase compact fluorescents. This modeling approach yielded estimates of net program savings including spillover and of spillover savings alone. In estimating these impacts, the model takes into account variations between areas and between individual customers in the following sets of characteristics that can influence the purchase decision:

- number and nature of opportunities in the household to use compact fluorescents;

- the energy savings associated with using compact fluorescents;

- perception of other benefits associated with using compact fluorescents and other attitudinal factors;

- demographic variables such as level of education, which other studies have found to be associated with purchase of compact fluorescents and implementation of other energy efficiency measures; and,

- the customers' exposure to utility compact fluorescent lamp promotions.

In short, this approach controls for the effects of systematic differences between service territories in housing, demographics, and energy price characteristics which may affect customers' probability of purchase.

The three methods used to estimate net program savings and spillover produced very consistent results. These results indicate that the sponsors' efforts to promote CFLs did induce a significant volume of spillover, i.e. purchases of CFLs outside the programs which can be attributed to the effects of the programs.

The following paragraphs present the key results of the three methods. All results are expressed as net-to-gross ratios. These are percentages of gross program savings: the total number of CFLs sold or installed through the sponsors' programs (3,415,422 units) multiplied by a standard unit energy savings of 56.1 kWh per year. This last figure was derived from the results of numerous evaluations that the sponsors had undertaken of individual residential lighting programs.

A note on CFL saturation findings

The lighting inventories taken as part of the telephone interviews constituted the core data for all three program impact analysis methods. From the inception of the study, there was concern that customers who were not familiar with CFLs would tend to over report their presence, due either to lack of clarity about the product or desire to burnish their image with the interviewer. To address this issue, extensive descriptions of CFLs were provided in the interview script.

The results of the inventories reinforced concern with the accuracy of customer reports. The results for participants and nonparticipants in the program areas seemed to be in line with expectations. Moreover, the market penetration of CFLs in the nonprogram areas seemed in line with historical trends. About 22 percent of households (weighted) in the nonparticipant sample reported having CFLs installed. However, these households reported having more than 4.6 CFLs installed, on average. This figure seemed intuitively high to the project team as well as to project reviewers.

If inventories of CFLs in the nonprogram areas were biased upward in some way that the program area inventories were not, then the analytical approaches which relied on ''net'' methods would likely underrepresent program effects. To investigate this possibility close comparisons were made of saturation, purchasing behavior, and non-response patterns between nonparticipants in the program areas and respondents in the nonprogram areas. We expected that potential biases or differences in reporting would show up as discrepancies between the two groups. However, these groups were very similar along these dimensions. We concluded that whatever potential biases that affected respondents in nonprogram areas also affected nonrespondents in the program areas, who received 81.7 percent of the weight in program area saturation calculations and modeling computations. Therefore, we believe that the results of the analyses provide a reasonable estimate of net program effects and spillover.

One final hypothesis concerning the unexpectedly high saturation of CFLs in the nonprogram areas was that it reflected spillover effects of DSM programs. The market transformation analysis conducted for this study provided some evidence that manufacturers responded on a national scale to the regional stimulus of DSM programs by improving products and distribution systems. Thus, customer response to CFLs would be higher in nonprogram areas than it would have been in the absence of DSM programs. The essentially cross-sectional approach of the spillover analysis precluded formal testing of such an hypothesis, although this potentially important effect of DSM programs bears further exploration in the future.

RESULTS OF METHOD 1: CROSS-SECTIONAL COMPARISON

The following paragraphs detail the calculation of Net CFLs, the net-to-gross ratio, and net program savings using the cross-sectional comparison of CFL saturations.

Step 1: Difference in CFL Saturation. Table 2 shows the number of CFLs installed at the time of the survey for the key sample segments. The figure in the columns headed ''All'' in the program areas represents the mean number of CFLs installed in the respective service territories, weighted to reflect the relative representation of participants and nonparticipants in the sample. On average, customers in the Full Program Area (Boston Edison, EUA, NEES, and NU) had 1.87 CFLs installed and in use at the time of the survey. The corresponding figure for customers in the Direct Install Program Only area (COM/Electric) was 1.54 CFLs. On average, respondents in the nonprogram areas had 1.00 CFLs installed. The Net CFLs per customer was therefore 0.87 in the Full Program Area and 0.54 among COM/Electric customers.

Step 2: Calculation of Net CFLs. To calculate the Net CFLs in service attributable to the sponsors' programs, we multiply the Net CFLs per customer by the total number of residential customers in the two program areas. These calculations are shown in Table 3. We estimate the Net CFLs attributable to the sponsors' programs at 2,906,601.

Results of method 2: analysis of self-reported data

Table 4 summarizes the results of the survey data analysis conducted to implement Method 2. Adjustments for CFLs out of service and free ridership accounted for a reduction of gross program savings of 35.4 percent. Participant and nonparticipant spillover contributed a positive adjustment of 17.9 percent. Thus, the total adjustment was -17.5 percent, for a net-to-gross ratio of 82.5 percent. Energy savings associated with this net-to-gross ratio are 158,074 MWH per year.

Results of method 3: discrete choice modeling

The estimation of net program savings and the portion of net savings that represents program spillover is accomplished by establishing relationships between the dependent variable—in this case the probability of choosing to install a compact fluorescent bulb in any particular socket—and independent variables including customer characteristics, relative energy costs among regions covered by the study, and customers' lighting usage patterns. The first model estimates for each customer, the probability of installing CFLs with and without the influence of the program. This model therefore produces a measure of net program effects, including spillover. The second model estimates the effect of the program on participants' probability of installing a CFL, netting only the effects of free ridership. Together, these two models allow calculation of the remainder of the ''net'' program influence, i.e. spillover.

The discrete choice models are structured such that the spillover effect can be separated from other net program net effects. This is accomplished by specifying two separate models, each designed to capture one specific effect. The

Table 2. *CFLs Installed and In-use per Customer*

	Full Program Area			Direct Install Program Only			Non-program
	Participant	Nonparticipant	All	Participant	Nonparticipant	All	Area
Total CFLs Installed per Customer	5.12	1.10	1.87	4.45	1.27	1.54	1.00
Net CFLs per Customer			0.87			0.54	

Table 3. *Calculation of Net CFLs*

Net CFLs per Customer: Full Program Area	0.87
Total residential customers in Full Program Area	× 3,150,811
Net CFLs in Full Program Area	2,741,206 2.74 million
Net CFLs per Customer: Direct Install Programs Only	0.54
Total residential customers: Direct Install Programs Only	× 306,288
Net CFLs: Direct Install Programs Only	165,395
Net CFLs in Sponsors' Territories	2.91 million
Total CFLs sold or distributed by Sponsors' Programs	3.42 million
Net-to-Gross Ratio	0.851

Table 4. *Adjustments to Gross Program Savings Using Analysis of Self-Reported Data*

Adjustments to Gross Savings	
CFLs Out of Service (From Individual Program Evaluations)	−25.8%
Free Ridership	− 9.6%
Participant Spillover	+ 2.9%
Nonparticipant Spillover	+15.0%
Total Adjustment	**−17.5%**
Net-to-Gross Ratio	**82.5%**

model used to capture net program savings, referred to below as the net-to-gross model is a relatively simple model for the probability of installing a CFL. The dependent variable in the model is an indicator variable for whether the observation is a CFL or not. The model is specified for all observations in both the program (treatment) and nonprogram (control) areas. Among the independent variables in the model is a dummy variable for whether the observation is in the program or nonprogram area. This dummy variable captures the overall influence of the program, i.e. program net savings.

The model used for calculating the program spillover effect, by isolating other program net effects, is referred to below as the free ridership model. This model estimates the probability of participating in the program, given that the customer installed a compact fluorescent lamp. Observations used in this model are those for which a CFL is installed, including program participants or nonparticipants in the program area. The model predicts the probability of installing the CFL with a rebate, i.e. through the program. This model is used to calculate an auxiliary variable, called the inclusive value, for all observations in the program area, that captures the program effect net of free ridership. When included in the net-to-gross model the inclusive value captures the incremental net effect of the program, i.e. without spillover. When the inclusive value variable is added to the net-to-gross model, the dummy variable indicating location in the program area captures the remaining net effect, i.e. the program spillover. Table 5 shows the variables that entered into the net-effects and free ridership models. All variables entered with the expected signs; all coefficients were statistically significant at the 95 percent confidence level.

The program net savings and program spillover are readily calculated by estimating the probabilities of installing CFLs for bulbs in the program area with and without the influence

Table 5. *Description of Variables in Discrete Choice Models*

Net-Effects Model

TREATMENT	=	Whether customer is in the program area (0/1)*
IV	=	The inclusive value of participating in the program
PRICEHRS	=	Price per kWh * Hours of operation of the lamp
CMPR_EFF	=	Customer compares efficiency levels when making purchases (1–5)**
NEAT_NIK	=	Customer is very concerned with appearance of living space (1–5)**
PEOPLE	=	Number of people living in the home
SENIOR	=	Customer is in the elderly category (over 65 yrs of age) (0/1)*
NON_RMS	=	The socket is located in a hallway, basement, attic, closet, or outside light (0/1) *

Free Ridership Model:

REBATE	=	The rebate available to the customer through utility program
COUPONS	=	Customer uses coupons for purchases (1-5)**
LOW_INC	=	Customer is in the lowest income level (under $20,000 per yr)
SENIOR	=	Customer is in the elderly category (over 65 yrs of age)
NO_HS	=	Customer education level less than high school completion (0/1)*
KNOW_CFL	=	Customer is aware of the savings and useful life of CFLs (0/1)*
ROOMS	=	Number of rooms in the house
PEOPLE	=	Number of people in the house

*A coding of (0/1) is an indicator variable with a value of 1 representing an affirmative response.
**A coding of (1–5) is a rating provided on a 1 to 5 scale.

of these two critical variables. To state the net program savings and spillover in terms of energy, the estimated probabilities are multiplied by the estimated savings for bulbs and the sample weights to arrive at an estimated kWh associated with each of these effects. The results of that operation were then used in conjunction with estimates of gross savings derived from program records to estimate net-to-gross and spillover-to-gross ratios. The model estimated the net-to-gross ratio at 89.1 percent of Gross Program Savings. Spillover savings were estimated at 27.1 percent of Gross Program Savings.

Comparison of results of the three spillover estimation methods

Table 6 displays the key results of the three spillover estimation methods. Despite the very different analytical approaches these methods represent, the analyses arrived at similar results. This, of course, does not necessarily mean that the results of the analysis are accurate. For theoretical reasons, the modeling approach is preferable to the cross-sectional comparison of CFL saturations because it explicitly controls for differences between service territories and

Table 6. Comparison of Spillover Analysis Results

Method	Net-to-Gross Ratio (as % of Gross Program Savings)	Spillover Savings (as % of Gross Program Savings)
Method 1: Cross-sectional Comparison of Saturations	85.1%	N/A
Method 2: Analysis of Self-Reported Data	82.5%	17.9%
Method 3: Discrete Choice Modeling	89.1%	27.1%

between individual customers in factors that can affect the likelihood of installing compact fluorescent lamps. It is also preferable to the analysis of self-reported data in that it does not rely on customers' recollections of the circumstances under which they bought compact fluorescents and the relative weight of various potential influences on that purchase.

ENDNOTES

1. This project was one element of a research agenda on market transformation and spillover effects which the sponsors developed through a methodological scoping study concluded in January 1995. The working definitions of market transformation and spillover used in the residential lighting study were developed through the scoping study. (XENERGY, 1995)

2. Visits to a number of general discount merchandise discount chains in early 1996 suggest that these establishments have significantly reduced shelf space given to CFLs.

3. Unless otherwise defined for a specific analysis, ''saturation'' refers to the number of compact fluorescents installed and in use per customer in a given area. ''Market penetration'' refers to the percentage of customers who have compact fluorescents in their homes.

REFERENCES

XENERGY Inc. and Easton Consultants. 1995. *Spillover Scoping Study*, Burlington, MA.