

***EVALUATING THE MARKET EFFECTS OF SOUTHERN CALIFORNIA EDISON'S
COMMERCIAL AND INDUSTRIAL ENERGY EFFICIENCY PROGRAMS***

***STUDY ID NUMBERS 3505 AND 3506
FINAL REPORT***

Submitted to

***Andrea Horwatt
Southern California Edison Company
300 N. Lone Hill Ave.
San Dimas, CA 91773***

Submitted by

***QUANTUM CONSULTING INC.
147 Old Solomons Island Road, Suite 303
Annapolis, MD 21401***

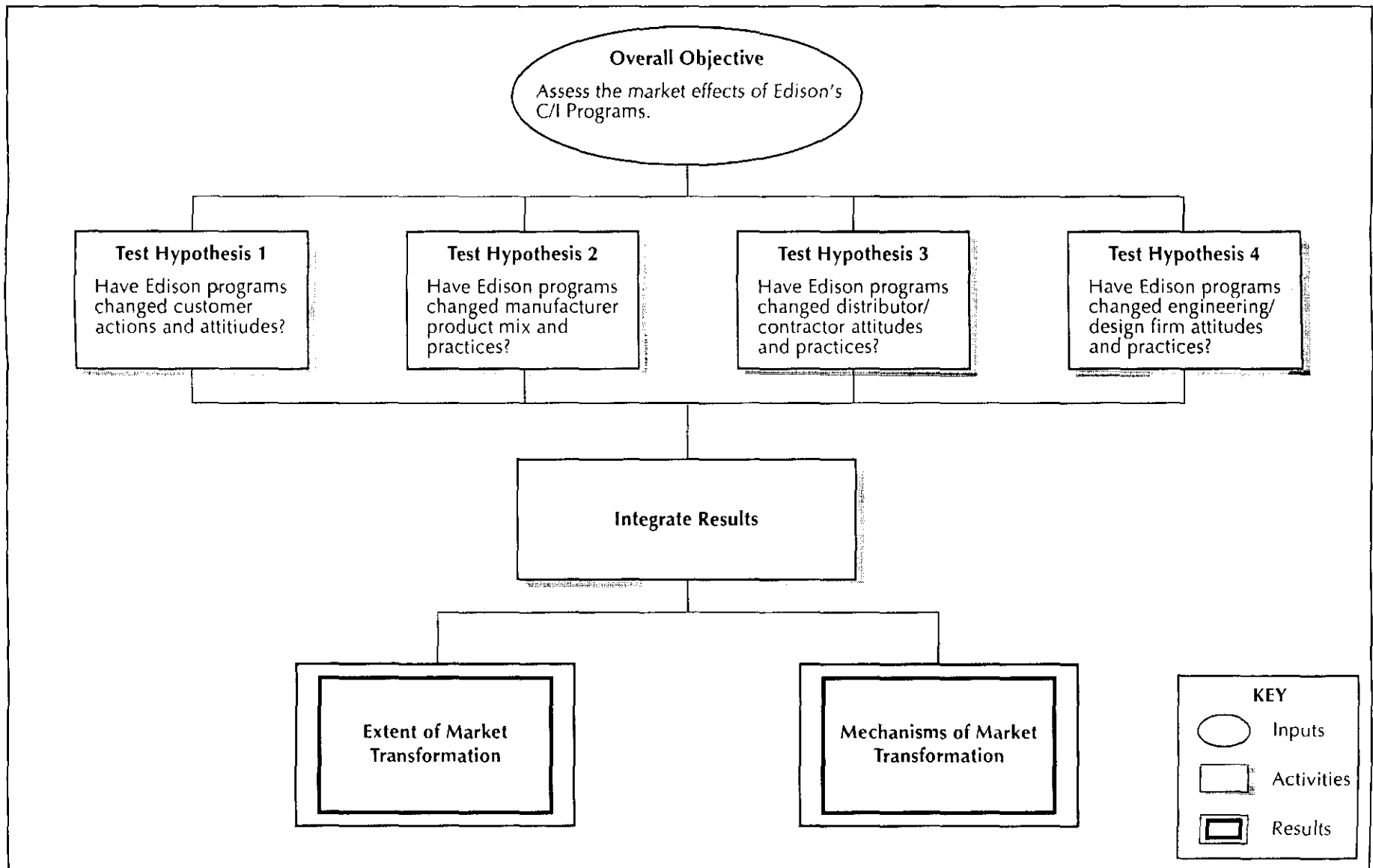
P784-320

30 March 1998

CONTENTS

Section	
ES	Executive Summary
1	Introduction and Approach
2	Overall Results
3	Measure-Specific Results
3.1	Lighting
3.2	HVAC
3.3	Motors
3.4	Adjustable-Speed Drives
3.5	Energy Management Systems
4	Summary and Conclusions

Project Objectives



THIS REPORT PRESENTS THE APPROACH TO AND RESULTS OF THE INVESTIGATION OF THE MARKET EFFECTS OF SOUTHERN CALIFORNIA EDISON'S (EDISON'S) COMMERCIAL AND INDUSTRIAL ENERGY-MANAGEMENT HARDWARE REBATE PROGRAM AND ENERGY MANAGEMENT SERVICES PROGRAM (HEREAFTER REFERRED TO AS C/I ENERGY EFFICIENCY PROGRAMS.)

- The study focused on five technologies -- fluorescent lighting, packaged air conditioning, motors, adjustable speed drives (ASDs), and energy management systems (EMSs) – and examined both the overall effects of the Edison C/I programs on customer attitudes and their individual effects on customer actions and market barriers for each of the above technologies.
- To support the overall research objective, the four hypotheses shown in the facing exhibit were tested to determine whether market effects could be observed and, if possible, quantified. Several aspects of this approach are worth noting:
 - The market transformation framework used in this study is based on “A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs” by Joseph Eto, Ralph Pahl, and Jeff Schlegel (1996). As a result, this study emphasized the role of market barriers in determining the extent to which any of the markets studied have been transformed.
 - The Edison programs whose market effects were investigated were neither designed nor undertaken with market transformation in mind.
 - Because each hypothesis was tested using data from a variety of sources, a “preponderance of evidence” approach was used to determine whether market effects were or were not supported for each measure studied.
 - A related objective was to distinguish between the market effects of the audit and incentive programs.

THE APPROACH USED TO MEET THE RESEARCH OBJECTIVES WAS TO DEVELOP A QUANTITATIVE ASSESSMENT OF MARKET EFFECTS THROUGH A COMPARISON OF ACTIONS TAKEN BY CUSTOMERS OUTSIDE THE EDISON PROGRAMS, BOTH WITHIN AND OUTSIDE EDISON'S SERVICE TERRITORY.

- This analysis of customer actions is the foundation for the overall approach and reflects the belief that customer actions are the ultimate measure of market transformation. Another important component of the approach, however, was to determine whether market effects can be ascertained through changes in attitudes and reductions in perceived market barriers that are associated with (and may precede) the changes in customer actions.
- Primary data were collected from customers, distributors/contractors, and engineering/design firms to determine whether market actions and attitudes in Edison's service territory were influenced by the C/I programs.
 - Collection of customer data focused on actions taken by commercial and industrial customers outside of Edison's programs (i.e., nonparticipants), both within and outside Edison's service territory. A short canvass survey was conducted with a total of 2,000 customers in Edison's territory and 2,000 customers in other territories to identify customers who have undertaken an equipment replacement action since January 1, 1995 and to find out whether standard efficiency or high efficiency equipment was selected.
 - Surveys of contractors and distributors addressed issues of product mix and availability, pricing, and performance, as well as vendor attitudes toward energy efficient equipment.
 - Interviews with engineering and design firms were used to determine the extent to which energy-efficient technologies are specified as "standard practice."
 - All the above surveys also included questions to capture respondent perceptions regarding market barriers to the adoption of energy efficient technologies.
- For all market actors, surveys were conducted with a comparison group in one or more areas that are similar to Edison's service territory in many respects, but that do not have audit and rebate programs.

Summary of Customer Actions

Technology	Replacement Rate (%)			Percent Efficient (%)			Total Market Effect	Attributable to Audits	Attributable to Incentives
	E	N	A	E	N	A	(E-N)	(A-N)	(E-A)
Lighting	11.3	22.4	18.6	38	34	35	4	1	3
HVAC	8.4	14.2	16.4	43	55	67	<0	12	<0
Motors	8.7	14.9	13.2	48	25	36	23	11	12
ASD	2.8	6.5	3.4	NA	NA	NA	<0	<0	<0
EMS	3.2	5.1	5.1	NA	NA	NA	<0	0	<0

E = Edison Territory

N = No-program Territory

A = Audit-only Territory

The quantity (E-N) minus the quantity (E-A) = A-N

THE DATA WERE ANALYZED TO PROVIDE AN ESTIMATE OF THE BREAKDOWN OF THE MARKET BY TECHNOLOGY AND EFFICIENCY LEVEL FOR EACH GEOGRAPHIC AREA. THE ASSUMPTION INHERENT IN THIS METHOD IS THAT -- OTHER THINGS BEING HELD EQUAL -- OBSERVED MARKET EFFECTS CAN BE ATTRIBUTED TO THE EDISON PROGRAM.

- An attempt was made to disaggregate the overall observed market effects into those effects attributable to audit programs and those attributable to incentive programs.
 - The facing exhibit presents the results of this effort, taking the difference between Edison and the no-program territory as the effect of all programs and the difference between Edison and the audit territory as the effect of rebates alone.
 - Note that these results are drawn from self-reported data, and are therefore subject to caveats regarding the accuracy and reliability of such data, especially when used to make cross-technology and cross-territory comparisons. In addition, the broad confidence bounds around all these estimates make it impossible to say that any of the calculated market effects are statistically significantly different from zero at the 90 percent confidence level.
- With these caveats in mind and based on the results shown in the facing exhibit, the largest quantitative market effect can be observed for motors, with the total observed market effect evenly divided between effects attributable to audits and to rebates.
- A smaller overall effect was observed for lighting installations, most of which was attributable to incentives.
- For other measures, installations were lower in Edison territory than in one or both of the comparison areas.

THESE CUSTOMER ACTIONS, AS WELL AS DATA ON THE ACTIONS AND PERCEPTIONS OF BARRIERS OF OTHER MARKET ACTORS, WERE USED TO TEST THE HYPOTHESES OF MARKET EFFECTS THAT WERE THE FOCUS OF THIS STUDY, AS PRESENTED ON THE FOLLOWING PAGE.

Summary of Hypothesis Testing Results

Technology	Customer Effects			Mnfr. Effects	Vendor Effects			Designer Effects			Overall Market Effects		
	Actions	Barriers	Overall		Actions	Barriers	Overall	Actions	Barriers	Overall	Actions	Barriers	Overall
Lighting	●●●	●●●	●●●	●●	●●●	●●	●●	●●●●	●●	●●●	●●●	●●	●●●
HVAC	●	●	●	●	●	●	●	●●●	●●	●●	●●	●	●
Motors	●●●	●●	●●●	●●	●	●	●	●●	●●	●●	●●	●●	●●
ASD	●	●	●	NA	●	NA	●	●	NA	●	●	●	●
EMS	●	●	●	NA	●	NA	●	●●	NA	●●	●	●	●

Overall market effects determined as follows:

- For overall actions and barriers, the mean of the individual items
- For overall effects, take the mean all the actions/barriers items plus two times the mfr.effect if appropriate

●●●●●	Conclusive support for market effects
●●●●	Strong support for market effects
●●●	Moderate support for market effects
●●	Weak support for market effects
●	No support for market effects

MEASURE-SPECIFIC RESULTS WERE USED TO EVALUATE THE HYPOTHESES OF MARKET EFFECTS FOR EACH MEASURE AND EACH GROUP OF MARKET ACTORS. AS SHOWN IN THE FACING EXHIBIT, THE STRONGEST INDICATION OF MARKET EFFECTS WAS FOUND FOR LIGHTING.

- Both actions and perceptions of market barriers were analyzed in drawing a conclusion regarding the hypotheses that Edison's programs had market effects that could be observed for each group of market actors.
- The strongest case for market effects can be made for lighting, where at least some evidence of market effects could be observed for each chain in the market.
- For other technologies studied, indicators of market effects were strongest in the actions of the design community.
 - This finding is consistent with the fact that some of the technologies targeted by Edison programs have been incorporated into codes and standard practices.
 - It also suggests that any observed market effects are more likely to be sustained into the future through continued interaction between proponents of energy efficiency and the design community.

WHILE THE RESULTS OF THIS STUDY DO NOT CONCLUSIVELY DEMONSTRATE MARKET EFFECTS FOR THE TECHNOLOGIES INVESTIGATED, THE FINDINGS HAVE IMPLICATIONS BOTH FOR POLICY MAKERS AND FOR FUTURE EVALUATIONS.

- A compelling implication for policy and program design is the apparent success of the total package of market interventions in changing the mix of technologies specified by the design community, suggesting that market effects of past and current program may persist well into the future.
- A second policy implication can be drawn from the finding that less complex technologies (such as lighting and HVAC) may be subject to greater information-related barriers than measures like EMSs and ASDs, perhaps because the latter are purchased by more technologically sophisticated buyers. This would mean that even relatively simple energy efficient technologies should be supported by ongoing and pervasive flows of information and technical assistance if barriers to their adoption are to be overcome.
- In addition, a number of important lessons were learned regarding the methods needed to identify, quantify, and explain market effects.
 - To assess market effects properly requires a time frame long enough for true market transformation to have occurred. But this means either relying on respondent recollection of long past actions (as in the current study) or pulling together data from different points in time to draw comparisons. The market baseline studies currently being conducted in California should provide such a basis for comparison over time.
 - The quantities and types of equipment installed continue to be a key to the analysis of market effects. If customer data are used, the efficiency of installed equipment must be verified either through on-site visits or through the use of written documents such as invoices or equipment specifications, collected from customers via phone or fax. Both options add to the cost of data collection.
 - More generally, sample sizes for market transformation studies need to be much larger – especially when a range of measures is being investigated – so that statistically significant results can be obtained both for individual technologies and at the segment level.

- The use of data on perceptions of barriers to help determine the permanence of market effects raises its own challenges and requirements.
 - Clearly, the reliability of any barrier scale is enhanced if it is based on a thorough understanding of a particular market. A market characterization, including focus groups and in-depth interviews to develop an understanding of how various market actors conceptualize market barriers, would facilitate the development of a reliable scale.
 - In addition, we believe that the results demonstrate that multiple indicators of market barriers are desirable to account for (and minimize) measurement error.
 - Finally, data on perceptions of barriers ought to be of sufficient depth and quality to support more detailed analysis of the relationship between market interventions and perceptions and between perceptions and actions, so that the effects and mechanisms of various interventions can be predicted.
- As more studies of market effects are performed, data are collected, and results are analyzed, it becomes increasingly important to integrate all the sources of available data before primary data collection activities are initiated. Development of sets of standard questions to address issues of market barriers, information sources, customer and vendor attitudes, and other variables that either measure or explain the mechanisms of market effects would enhance the value of each study in contributing to the growing body of knowledge on assessing market transformation.

1.0 INTRODUCTION AND APPROACH

THIS REPORT PRESENTS THE APPROACH TO AND RESULTS OF THE INVESTIGATION OF THE MARKET EFFECTS OF SOUTHERN CALIFORNIA EDISON'S (EDISON'S) COMMERCIAL AND INDUSTRIAL ENERGY-MANAGEMENT HARDWARE REBATE PROGRAM AND ENERGY MANAGEMENT SERVICES PROGRAM (HEREAFTER REFERRED TO AS C/I ENERGY EFFICIENCY PROGRAMS).

- The study focused on five technologies: fluorescent lighting; packaged air conditioning, motors, adjustable speed drives (ASDs), and energy management systems (EMSs).
- The study examines both the overall effects of the Edison C/I programs on customer attitudes and effects on each of the above technologies on customer actions and market barriers.
- The report is organized as follows:
 - First the study objectives and approach are discussed, including data sources, sample design, and analysis methods.
 - Next, overall results are examined at an aggregate level, using both existing Edison sources and primary data collected from customers within and outside Edison's service territory.
 - Each of the technologies of interest is then analyzed individually to test the four hypotheses set forth to determine the extent to which the Edison programs have produced any market effects.
 - Finally, results are integrated and summarized. In addition to weighing the findings for each of the technologies surveyed to determine overall market effects, this section summarizes methodological lessons learned in the course of the study and presents areas that offer opportunities for future research.

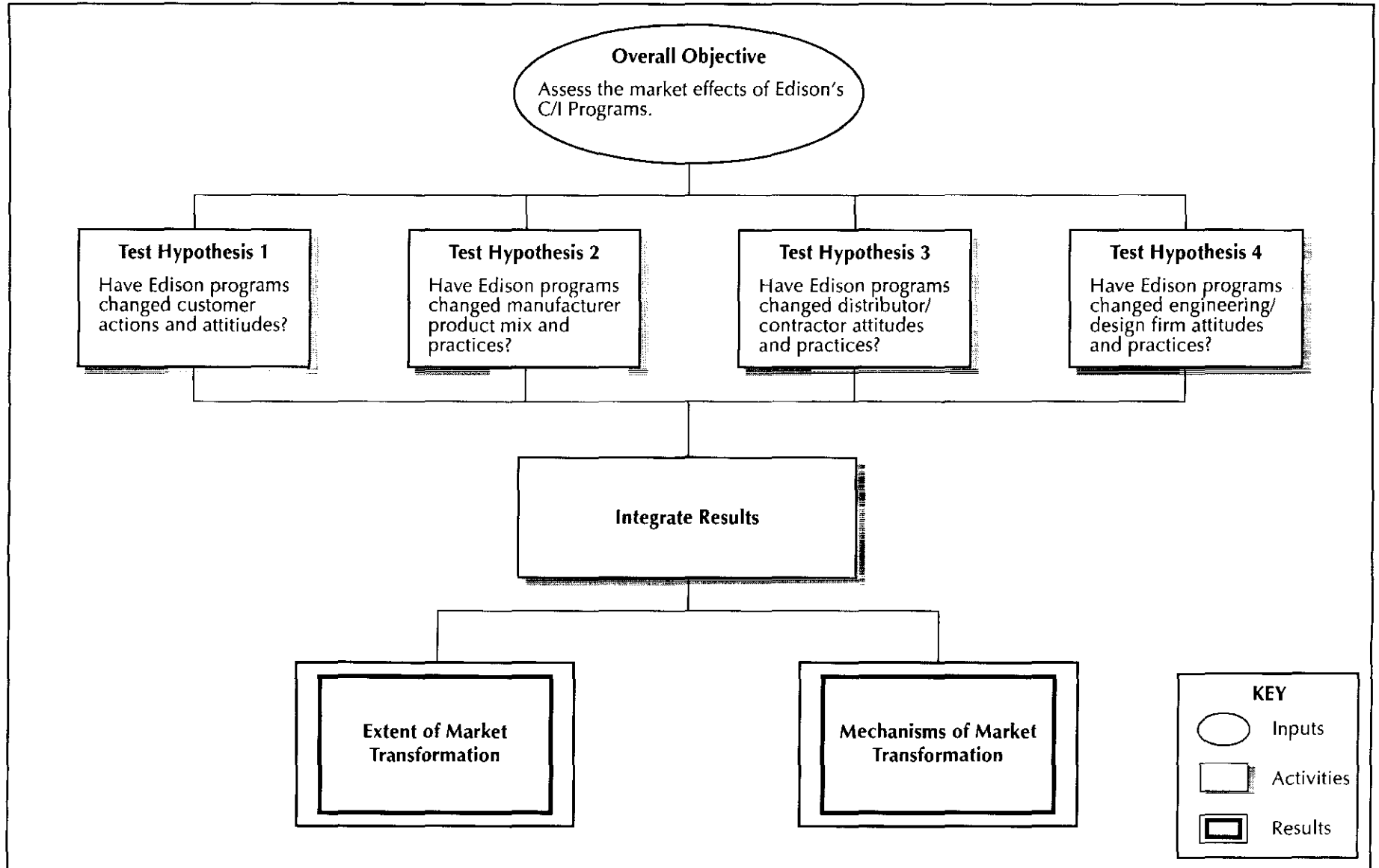
IN THE REMAINDER OF THIS INTRODUCTORY CHAPTER, THE RESEARCH APPROACH AND METHODOLOGY ARE DISCUSSED.

INTRODUCTION

THIS SECTION OF THE REPORT PRESENTS A DISCUSSION AND REVIEW OF THE PROJECT'S RESEARCH OBJECTIVES, THE RESEARCH DESIGN, DATA SOURCES, AND ANALYTICAL METHODS.

- First the study objectives and the overall research approach are discussed.
- Next, an overview is presented of the data required to meet the objectives
 - Issues surrounding the availability and use of existing Edison data are discussed
 - Secondary data sources and their applicability to the current study are analyzed
 - Primary data collection activities within and outside Edison's service territory are discussed, including the selection of comparison regions to serve as indicators of what would have occurred in Edison's territory in the absence of the C/I programs.
- The approach to testing the four hypotheses that make up the core of the research effort is discussed, with particular emphasis on the integration of results.
- Finally, caveats that should be considered when analyzing the results are discussed.

Project Objectives



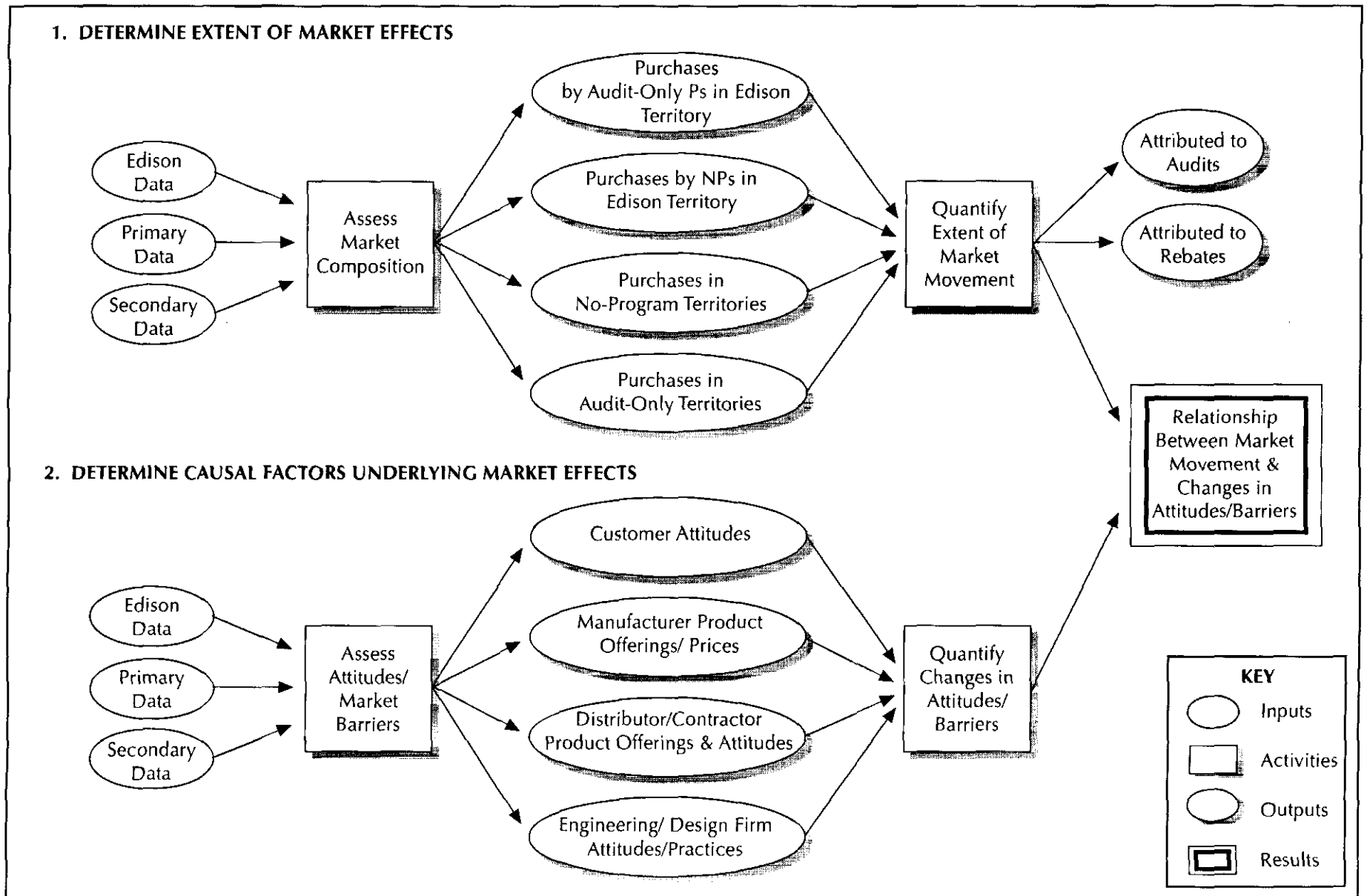
INTRODUCTION

THE RESEARCH OBJECTIVES OF THE STUDY, AS SUMMARIZED IN THE FACING EXHIBIT, ARE TO DETERMINE THE EXTENT TO WHICH EDISON'S COMMERCIAL AND INDUSTRIAL PROGRAMS HAVE TRANSFORMED THE MARKET.

- The principal research objective was to assess the market effects of Edison's Commercial and Industrial Energy Management Hardware Rebate and Energy Management Services Programs.
 - To support this overall objective, we tested the four hypotheses, emphasizing market actions of customers, manufacturers, distributors/contractors, and engineering/design firms.
 - In addition to testing the four hypotheses, a goal of the study was to integrate the various measures of market transformation, if possible quantitatively.
 - Because Edison has offered both incentive programs and programs that focus on facility audits, a related objective was to distinguish between the market effects of the audit and incentive programs.
- The market transformation framework used in this study is based on "A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs" by Joseph Eto, Ralph Prahl, and Jeff Schlegel (1996).
- An additional goal of the study was to assess specific market barriers and how (and if) they have been overcome. Data on specific market barriers, as well as attitudes for the above groups, were analyzed in an effort to explain how the Edison programs have affected the market.

IT SHOULD BE NOTED THAT THE EDISON PROGRAMS WHOSE MARKET TRANSFORMATION EFFECTS ARE BEING INVESTIGATED IN THIS STUDY WERE NEITHER DESIGNED NOR UNDERTAKEN WITH MARKET TRANSFORMATION IN MIND.

Overall Approach



APPROACH

THE APPROACH USED TO MEET THE RESEARCH OBJECTIVES DESCRIBED ON THE PREVIOUS PAGE WAS TO DEVELOP A QUANTITATIVE ASSESSMENT OF MARKET EFFECTS THROUGH A COMPARISON OF ACTIONS TAKEN BY CUSTOMERS OUTSIDE THE EDISON PROGRAMS, BOTH WITHIN AND OUTSIDE EDISON'S SERVICE TERRITORY.

- The principal facets of the research design can be summarized as follows.
 - The analysis focuses on the programs' effects on the markets for lighting, HVAC, motors, adjustable speed drive (ASD) technologies, and energy management systems (EMS).
 - Primary data on customer actions were collected from a sample of nonparticipating customers both within and outside of Edison's service territory to determine whether these actions indicate market effects and whether any observed market effects could be quantified.
- This analysis of customer actions is the foundation for the overall approach and reflects the belief that customer actions are the most objective (and ultimate) measure of market transformation.
- Another important component of the approach is to determine whether market effects can be ascertained through changes in attitudes and reductions in perceived market barriers that are associated with (and may precede) the changes in customer actions.
 - Customer attitudes toward energy efficient technologies were analyzed using both existing Edison data and primary data.
 - Customer perceptions of specific market barriers associated with the measures/technologies being investigated were analyzed using primary data.
 - Data on market barriers and attitudes were also collected from other market actors within and outside of Edison's service territory to determine whether these supported the market effects observed in end user actions and attitudes.

THE STUDY USED A MIX OF INTERNAL EDISON DATA, SECONDARY INFORMATION SOURCES, AND PRIMARY DATA TO ADDRESS THE RESEARCH OBJECTIVES.

- Required data for the study included detailed information on customer attitudes and supplier practices as well as the size and composition (by efficiency) of relevant markets.
- Internal Edison data sources provided some of this information
 - Since several surveys of customer attitudes toward and adoption of energy efficiency have been conducted over the years, available data were analyzed to address several key questions regarding the extent of market effects.
 - In addition, program data provided an indication of the market penetration of the Edison programs, the characteristics of the participant and nonparticipant populations, and the sample of nonparticipants for the primary data collection effort.
- Secondary data sources were used primarily as indicators of economic and socioeconomic characteristics in other service territories relative to Edison's service territory.
 - Information such as environmental voting records collected by the League of Conservation Voters provided an indication of non-economic variables.
 - Data on various aspects of the cost of doing business in comparison territories were obtained from Regional Financial Associates (RFA).
- Primary data were collected from customers, distributors/contractors, and design/engineering firms, as described in greater detail on the following pages.

PAST EDISON SURVEYS PROVIDED DATA ON MARKET PENETRATION OF ENERGY EFFICIENT TECHNOLOGIES, CUSTOMER ATTITUDES, AND PARTICIPATION IN EDISON PROGRAMS.

- As shown in the facing exhibit, previous Energy Use Surveys (EUS) contain a substantial amount of data that could be used to assess market penetration for various EE measures in Edison's service territory over time, as well as data on attitudes that may be linked to the extent of observed market effects. (What is lacking, however, is a control group to provide an indication of what market penetration over time would have been in the absence of market intervention.)
- Technologies for which market penetration data were available include adjustable speed drives (ASDs), high efficiency motors, energy-efficient lighting, and controls (including both lighting controls and control systems for energy management).
- Several of the more recent (1991 and 1995) commercial and industrial energy use surveys also captured data on program participation, thereby allowing us to analyze results for the participant and nonparticipant groups separately to determine whether nonparticipant actions might reflect market effects.
- While several surveys were conducted specifically to gather data on customer attitudes, the Energy Use Surveys were the most useful, since the 1991 Commercial and Industrial Energy Use Surveys both asked the same two questions regarding the importance of energy efficiency.

***Evaluation of Comparison Territories
Costs by State***

	Cost of Doing Business		Unit Labor Cost		Energy Cost		State & Local Taxes	
	Index	Rank	Index	Rank	Index	Rank	Index	Rank
California	110.37	5	105.99	8	138.16	6	101.48	20
Georgia	100.15	21	101.38	20	99.80	17	91.42	38
Illinois	107.65	7	109.16	4	109.09	16	94.14	31
Kentucky	88.18	49	89.30	49	75.39	45	98.95	23
Louisiana	90.86	48	90.18	48	92.15	29	94.01	32
Michigan	103.20	15	101.10	21	113.90	14	102.93	16
Minnesota	101.39	17	103.17	15	85.03	38	112.59	5
New York	110.08	6	102.27	17	133.41	9	133.71	1
Virginia	98.00	26	102.21	18	84.63	39	86.45	45

SECONDARY DATA FROM A RANGE OF SOURCES CONTRIBUTED TO OUR ABILITY TO SELECT COMPARISON TERRITORIES AND IDENTIFY REMAINING DIFFERENCES AMONG SERVICE TERRITORIES THAT COULD HELP EXPLAIN OBSERVED RESULTS.

- As shown by the data on costs of doing business in the facing exhibit, secondary data sources play a key role in characterizing the comparison service territories.
- While the above data call attention to the differences between Edison's territory and other areas, note that the importance of energy costs relative to the overall cost of doing business shows substantially less variation among territories than does the cost of energy alone.

Primary Data Collection by Type and Area

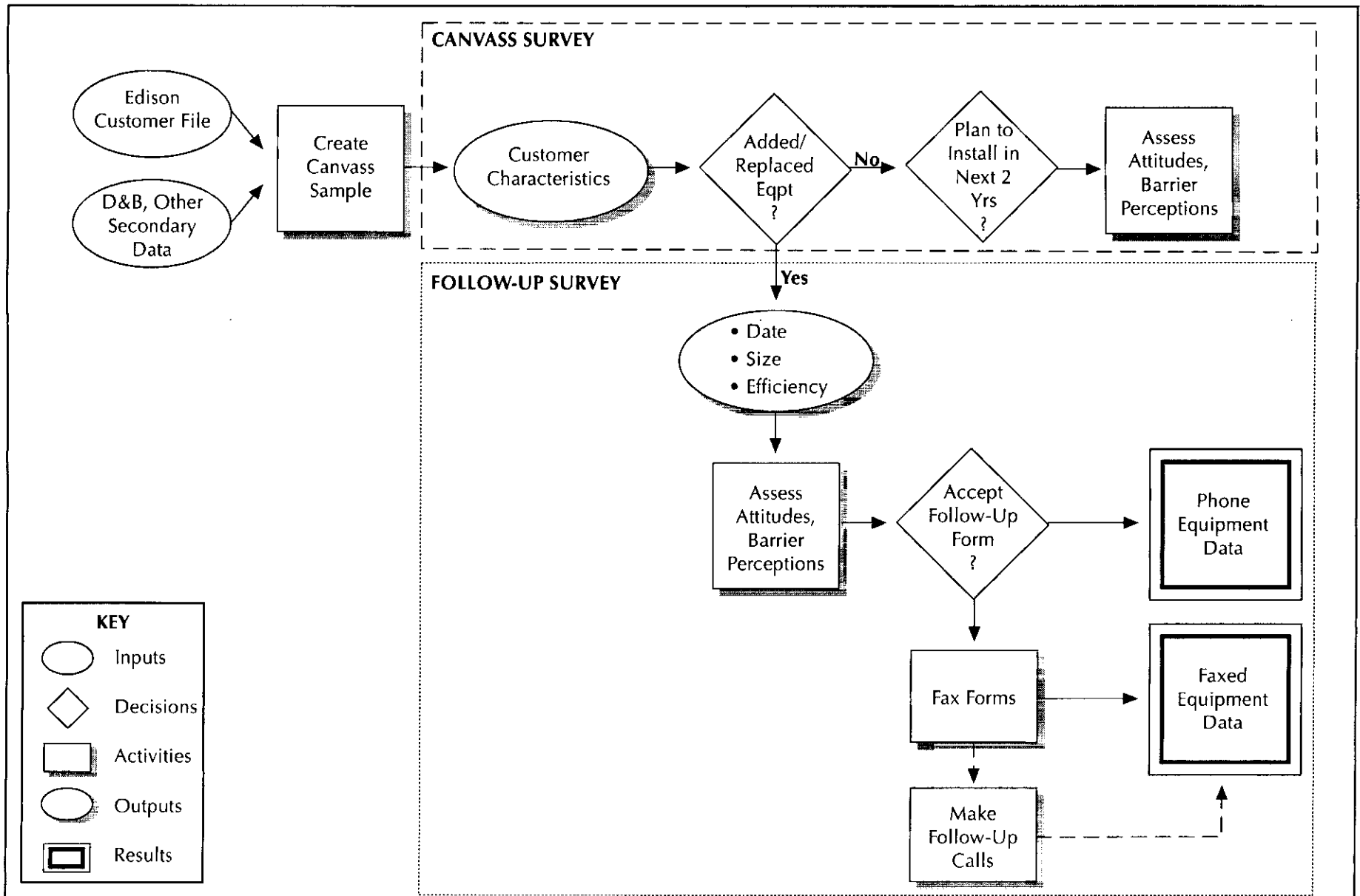
		Edison Service Territory		Other Service Territories			Totals
		Nonparts	Total	Audit-only	No Program	Total	
Customers	Canvass Surveys	2000	2000	1000	1000	2000	4000
	Replacement/Attitude Data	300	300	150	150	300	600
Contractors/Distributors	HVAC		50			50	100
	Lighting		50			50	100
	Motors/ASDs		50			50	100
Design/Engineering Firms			50			50	100

APPROACH . . . PRIMARY DATA

PRIMARY DATA WERE COLLECTED FROM CUSTOMERS, DISTRIBUTORS/CONTRACTORS, AND ENGINEERING/DESIGN FIRMS TO DETERMINE WHETHER MARKET ACTIONS AND ATTITUDES IN EDISON'S SERVICE TERRITORY WERE INFLUENCED BY THE C/I PROGRAMS.

- The facing exhibit illustrates the survey samples for each of the above groups.
- Collection of customer data focused on actions taken by commercial and industrial customers outside of Edison's programs (i.e., nonparticipants), both within and outside Edison's service territory.
- Surveys of contractors and distributors addressed issues of product mix and availability, pricing, and performance, as well as vendor attitudes toward energy efficient equipment.
- Interviews with engineering and design firms were used to determine the extent to which energy-efficient technologies are specified as "standard practice."
- All the above surveys also included questions to capture respondent perceptions regarding market barriers to the adoption of energy efficient technologies.

Canvass and Follow-up Surveys



PRIMARY DATA WERE COLLECTED ON CUSTOMER REPLACEMENT ACTIONS, ATTITUDES, AND PERCEPTIONS OF MARKET BARRIERS, BOTH WITHIN AND OUTSIDE EDISON'S SERVICE TERRITORY.

- A short canvass survey was conducted with a total of 2,000 customers in Edison's territory and 2,000 customers in other territories.
 - The primary purpose of these surveys was to identify customers who have undertaken an equipment replacement action since January 1, 1995 years and to find out whether standard efficiency or high efficiency equipment was selected.
 - To provide a consistent measure of overall attitudes toward energy efficiency both inside and outside Edison's service territory, the two attitude questions that appeared on previous Edison surveys were also asked of canvass survey respondents. Four additional questions that assessed customer attitudes toward the environment were also asked of all survey respondents.
- Customers who took a replacement action were asked about the type, size, and efficiency of equipment installed.
 - These replacing customers were also asked to respond to a series of questions relating to market barriers believed to be pertinent for the technology they replaced (e.g., lighting, HVAC).
 - In addition, canvass survey respondents were asked about their plans to purchase new equipment over the next two years. If they were planning a purchase, they were asked the same series of questions about their perceptions regarding market barriers.
- Replacing customers were also asked to complete a faxed (or mailed) form asking for nameplate, invoice, or other data needed to verify the energy efficiency of the installed equipment. While not enough forms were completed to accurately characterize the markets (despite several follow-up calls and an offer of a \$25 incentive), the returned forms did provide a basis for validating the self-reported efficiency data.

PRIMARY DATA WERE ALSO COLLECTED FROM OTHER MARKET ACTORS, INCLUDING DISTRIBUTORS/CONTRACTORS AND ENGINEERING/DESIGN FIRMS.

- To obtain information on the effect of the Edison programs on market barriers, including the costs and availability of energy-efficient equipment, data were collected from distributors/contractors, and engineering/design firms.
- Surveys were conducted with distributors and contractors, both within Edison's service territory and in territories selected to provide comparison markets.
 - Questions asked of distributors and contractors focused on the breakdown of sales by efficiency level. Also covered were the cost and availability of energy-efficient equipment from manufacturers, the perceived profitability of energy-efficient equipment, and other issues of attitude and awareness.
 - The distributor/contractor surveys were also used as the best source of information on manufacturers' ability and willingness to supply energy-efficient technologies at reasonable cost in a given area. No surveys were attempted with manufacturers directly.
 - Lists of contractors and equipment distributors were obtained from Edison, from commercially available directories or business databases, and from trade association membership directories.
- Surveys of architectural and engineering firms emphasized the extent to which standard design practices now incorporate energy-efficient technologies.
- For both groups, data were also collected regarding these market actors' perceptions of market barriers and customer attitudes toward energy efficiency.

Candidate Comparison Utilities

Utility	SMSA	Total Customers	Peak (MW)	C/I Customers	C/I Rev. (% of Total)	Average Coml Rate*	CDD/yr	Audits	Rebates	Greenness Voting Index
Southern California Edison		4,125,224	18,044	473,297	61	8.67	1,537	●	●	70
Georgia Power	Atlanta	1,659,279	11,758	202,754	67	4.29	1,667			38
Virginia Power	Richmond	1,854,549	14,239	181,622	41	4.03	1,348			46
Commonwealth Edison	Chicago	3,316,022	17,928	286,781	55	6.46	752	●		67
Louisiana Power & Light	New Orleans	599,457	5,042	67,752	63	4.45	2,655	●		32
Northern States Power	Minn./St. Paul	1,188,483	5,930	136,979	64	4.63	682	●		61
Detroit Edison	Detroit	1,969,148	9,684	172,367	65	5.16	626	●		61
Louisville Gas & Electric	Louisville	333,985	2,219	34,514	51	3.82	1,288			29
NYSEG	Plattsburgh	785,736	2,611	76,804	42	8.70*	438	●		57
Savannah Electric Power	Savannah	115,306	729	12,980	51	4.74	2,365	●		38

Source: Pocket Guide to U.S. Electric Utilities, 4th Ed. (1996).

* Energy User News - cents/kwh - Sept. 1996

SELECTION OF COMPARISON REGIONS TO BE USED AS BENCHMARKS FOR ACTIONS TAKEN BY EDISON NONPARTICIPANTS WAS A CRITICAL STEP IN THE RESEARCH EFFORT. IT IS IMPORTANT TO NOTE THAT NO REGION CAN SERVE AS A PERFECT BASELINE THAT MATCHES EDISON'S TERRITORY IN ALL RESPECTS. A CONCERTED EFFORT WAS MADE, HOWEVER, TO MATCH THE EDISON TERRITORY IN AS MANY WAYS AS REASONABLY POSSIBLE.

- The facing exhibit summarizes key characteristics of several potential comparison service territories, including both territories with audit programs and no programs at all. In addition to the absence of rebate programs, other potential criteria for selecting comparison service territories include size, climate (heating degree days), economic conditions, electricity prices, and overall social/political attitudes.
- Since no other area of the country matches Edison's service territory perfectly on all these criteria, each criterion was applied independently to determine which territory or territories offer the best basis for comparison. Ultimately, the various service territory characteristics were balanced with professional judgment to select comparison territories.
 - For the no-program territory, the region served by Georgia Power Company was chosen because of its size, customer mix, comparable cooling requirements, and consistent absence of DSM programs.
 - For the audit-only comparison, two areas were chosen: that served by Louisiana Power and Light was selected because of the relative similarity in cooling requirements, while NYSEG's service territory was chosen because it is one of the few candidates with rates comparable to Edison's. Because of the dramatic differences in cooling requirements between New York and Southern California, however, HVAC replacements were excluded from the survey fielded in New York.

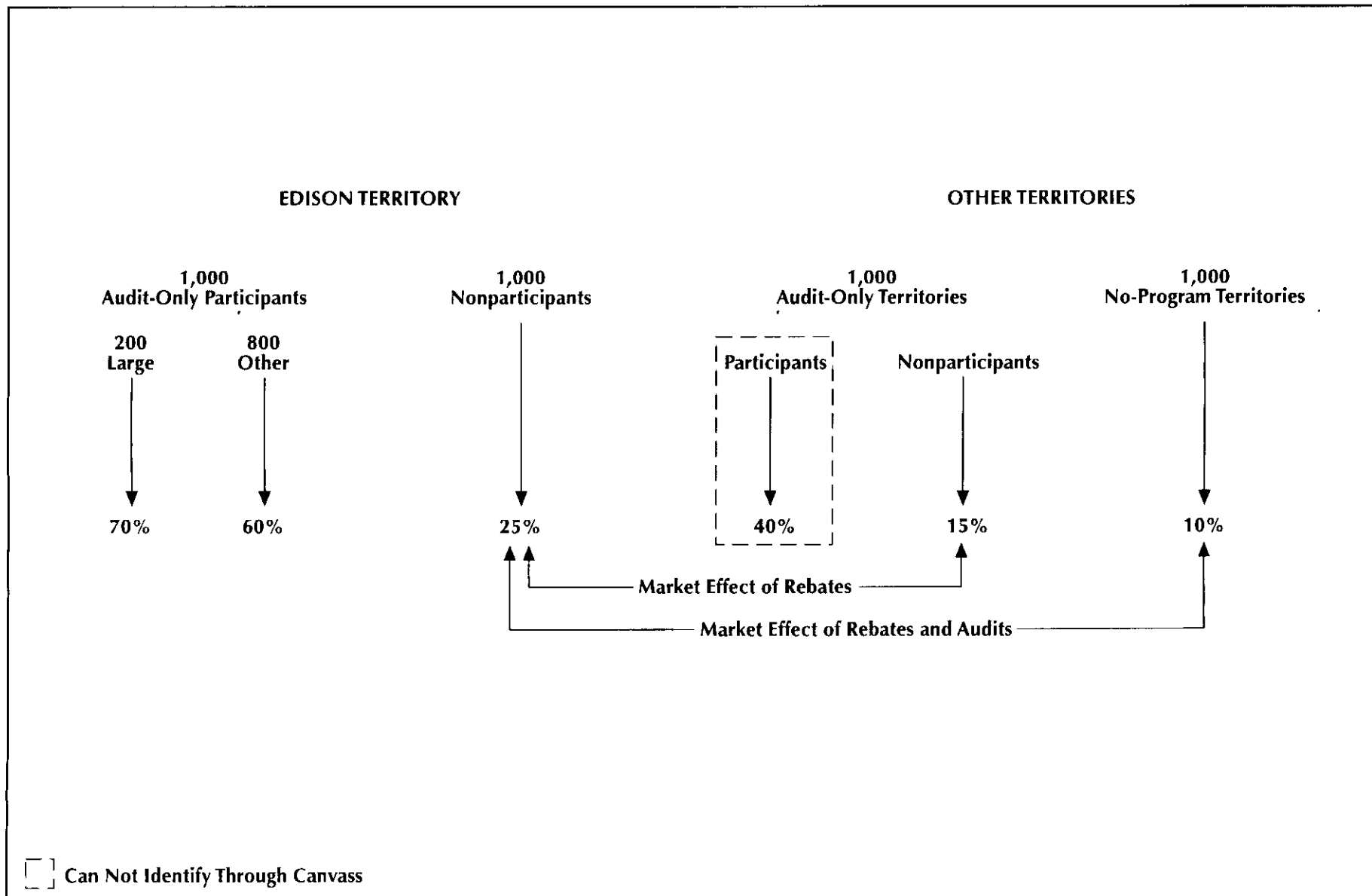
SAMPLES WERE DESIGNED TO REPRESENT EDISON'S NONPARTICIPANT POPULATION BY BUSINESS/BUILDING TYPE AND SIZE (RATE CLASS), WEIGHTED BY ANNUAL ELECTRICITY USAGE.

- The sample of nonparticipants within Edison's service territory was drawn from the Edison customer database (CDB) and program tracking system. The sample was stratified by building type/rate class/kWh consumption. Customers with high kWh consumption were oversampled.
 - Customers were considered nonparticipants if they had not participated in any of Edison's programs from 1993 forward.
 - As discussed in more detail on the following page, a number of customers were specifically excluded from the nonparticipant sample because of concerns regarding over-surveying -- particularly large customers. This primarily affected the time-of-use (TOU) class of customers.
- Samples for the comparison service territories were drawn from commercial data sources.
 - Using primary SIC code data available from Dun & Bradstreet, businesses in these territories were mapped to the building type classifications used for California evaluations, i.e., CEC building type definitions.
 - Information on tariffs comparable to that available for Edison customers was unavailable for the comparison territories. Instead, size, as measured by the number of employees, was used as a proxy, with sample points allocated among businesses with 5 or fewer employees (comparable to GS-1), 5 to 99 employees (comparable to GS-2), and 100 or more employees (comparable to TOU) in the same proportion as in the in-territory sample.
- All results (both in-territory and out-of-territory) were weighted according to the kWh distribution across business/building type and rate class of the entire Edison population.

IT SHOULD BE NOTED THAT SEVERAL FACTORS CONSTRAIN THE REPRESENTATIVENESS OF THE EDISON NONPARTICIPANT SAMPLE AND THE STUDY'S ABILITY TO MIRROR THAT SAMPLE IN THE NO-PROGRAM AND AUDIT-ONLY TERRITORIES.

- The reason for surveying Edison nonparticipants is to simulate the overall state of the Southern California market in the absence of Edison's programs. To the extent that specific customer classes have consistently been the target of more aggressive marketing of Edison DSM programs, the nonparticipant population is significantly different from the overall population in these customer classes. This is evident particularly in the high rate of program penetration among TOU customers relative to the GS-1 and GS-2 rate classes.
- Historically Edison's large customers were heavily surveyed for market research and evaluation studies because of their high electricity consumption and their frequent participation in energy efficiency programs. This frequent contact gave rise to numerous customer complaints and adversely affected customer relations. As a result, Edison now attempts to limit survey contact to one per year for all customers. This substantially limited the number of TOU customers available for the nonparticipant sample.
- Even though the sample plan specified 246 completed surveys with TOU customers (based on their contribution to kWh in the nonparticipant population), only 475 TOU customers were available for inclusion in the sample frame. We were able to complete canvass surveys with 78 of these 475 customers, a response rate of 17 percent. Whether those respondents are representative of Edison's TOU population in the absence of the program is uncertain.

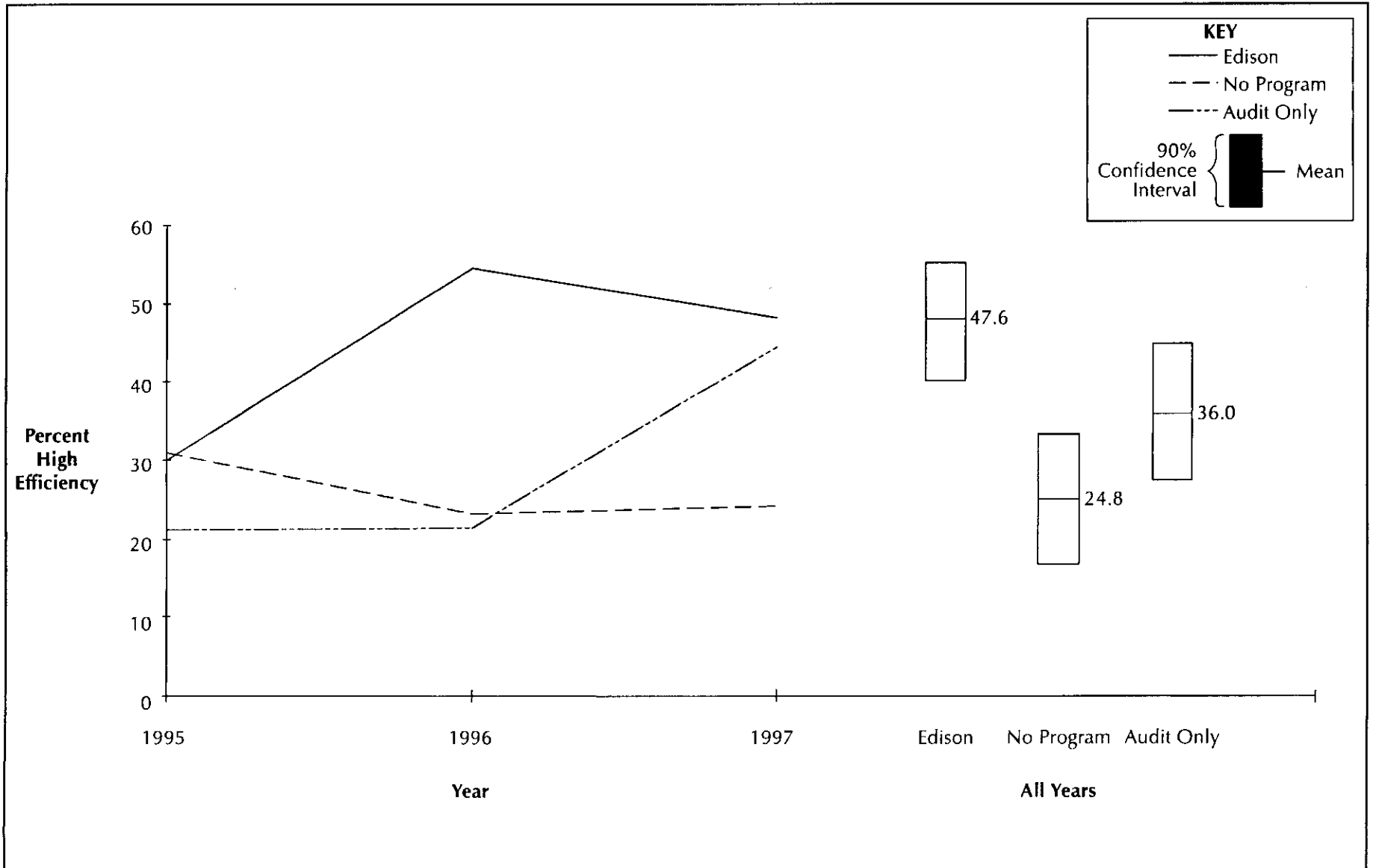
**Comparison of Customer Actions
Percentage of Various Groups Installing Energy-Efficient Technologies**



THE PRIMARY DATA COLLECTED VIA TELEPHONE WERE ANALYZED TO PROVIDE AN ESTIMATE OF THE BREAKDOWN OF THE MARKET BY TECHNOLOGY AND EFFICIENCY LEVEL FOR EACH GEOGRAPHIC AREA. THE ASSUMPTION INHERENT IN THIS METHOD IS THAT — OTHER THINGS BEING HELD EQUAL — OBSERVED MARKET EFFECTS CAN BE ATTRIBUTED TO THE EDISON PROGRAM.

- The facing exhibit presents an illustrative example of results for the percentage of high efficiency lighting retrofits for customers in each of the territories analyzed.
- In the exhibit, the percentage of high efficiency installations is shown for each of the groups surveyed. (For measures that are, by definition, efficient, such as control systems and ASDs, the percentages would be the percent of customers who reported installing the measure.)
- The extent of market effects may be estimated by comparing the percentage of energy efficient installations by program nonparticipants in Edison's service territory (25 percent in the exhibit) to the percentage of energy efficient installations in a comparison territory where there have been no programs (10 percent in the exhibit) and audit programs only (15 percent in the exhibit).
 - By comparing the actions of nonparticipants in Edison's territory when both rebate and audit programs are in place to the actions of nonparticipants in a territory with only an audit program in place, we can estimate the extent of market movement attributable to Edison's rebate programs.
 - In the facing exhibit, this would amount to 25-15 percent, or a 10 percent increase in the share of efficient equipment attributable to the rebate programs. With the overall market effect of the programs calculated at 15 percent above, we would conclude that the audit program accounted for the remaining 5 percent.
- It was the original intent of this study to quantify the market effects of the Edison programs in terms of kWh savings attributable to customer actions outside the programs relative to the actions of a comparison territory. It proved to be impossible to collect enough of the detailed equipment data needed to calculate such kWh savings for the technologies covered. Instead, the effects of customer actions were quantified using the percentage of high efficiency (HE) equipment installed in each territory for each technology, as shown above.

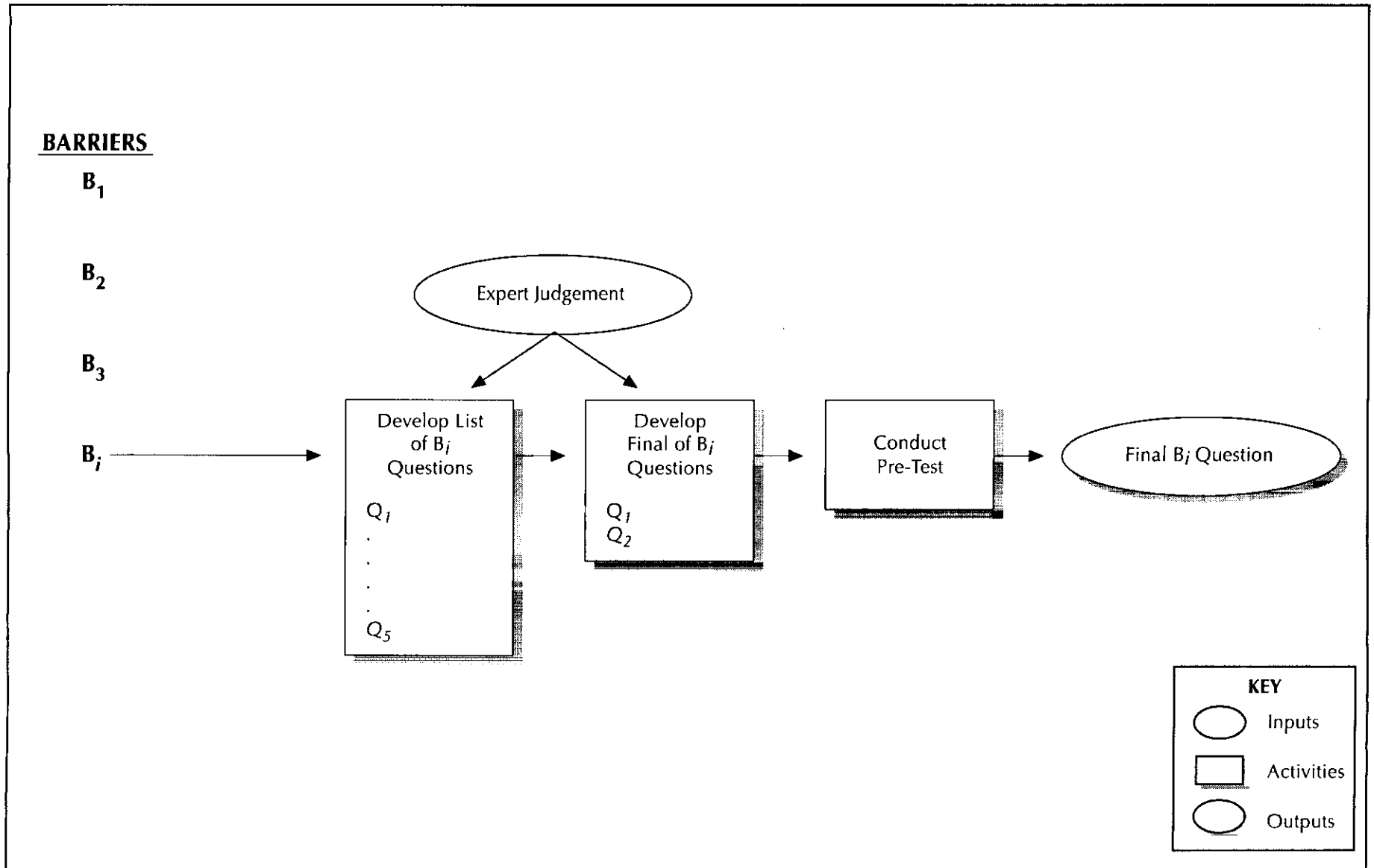
Percent High Efficiency Installation by Year and Overall -- Motors



CUSTOMER ACTIONS WERE ANALYZED BOTH OVER THE ENTIRE ANALYSIS PERIOD AND BY YEAR, ALTHOUGH THE RELATIVELY FEW OBSERVATIONS FOR INDIVIDUAL YEARS LIMITS THE VALIDITY OF ANNUAL COMPARISONS.

- Results are presented both for each year (1995, 1996, and 1997) and for the entire period, as shown in the example for HE motors installations in the facing exhibit. Note that the confidence bounds surrounding the estimates are relatively wide even for the aggregate results, leading to the conclusion that it would not be meaningful to draw any firm conclusions based on the year-by-year analysis.
- In addition to the percent of HE units installed, the replacement rates (number of customers replacing/number of customers responding to the canvass survey) were analyzed, both overall and by year.
 - One consistent result across technologies and service territories was that reported replacement rates were higher for the more recent years.
 - Replacement rates were generally higher in the no-program and audit-only territories than among Edison nonparticipants. This may be due in part to the fact that Edison program participants account for a significant portion of the market for these technologies in Edison's territory, particularly among the heavily weighted large (TOU) customers.

Developing Barrier Questions



IN ADDITION TO CUSTOMER ACTIONS, THE EXTENT OF MARKET TRANSFORMATION WAS MEASURED BY CUSTOMER RESPONSES TO SURVEY QUESTIONS REGARDING MARKET BARRIERS.

- As described earlier, canvass survey replacers were asked about their experience with barriers relative to the measure they installed. In addition, customers who are planning to replace over the next two years were asked what barriers they expect to encounter.
- Given that there are more than a dozen market barriers identified in the Eto, Prah, and Schlegel scoping study, it was necessary to ask only a single question for most barriers to minimize adverse effects on response rates. For three barriers, multiple phrasings of barrier questions were used because the survey pre-test indicated that these three barriers were less clearly understood by respondents. To develop these questions, the following process was used¹:
 - apply expert judgment about what barriers apply to what technologies
 - conduct a literature review of other available studies
 - pretest the survey instrument with all the barriers that have not been screened out, looking for responses that indicate that several barriers are measuring the same thing.

¹ Ideally, questions regarding customer barriers would be developed based on focus groups or one-on-one discussions with customers regarding their thought/decision process when purchasing this equipment. Such an effort was beyond the scope of the current study. Instead, an effort was made to develop a single set of "generic" barrier questions that could be applied across all technologies.

THE RESULTS OF THE CUSTOMER SURVEYS ALLOW US TO COMPARE VARIOUS MEASURES OF MARKET EFFECTS (I.E., THE PERCENT OF EFFICIENT TECHNOLOGIES INSTALLED) WITH RESPONSES TO THE QUESTIONS DESIGNED TO MEASURE THE PRESENCE OF MARKET BARRIERS.

- As shown in the facing exhibit, the percentage of high-efficiency units can be compared with mean responses to individual barrier questions to determine whether there is a relationship between the level of perceived barriers and the market share of high-efficiency equipment.
- In addition, individual barriers were analyzed to see how they vary across territories and how closely they are aligned with other barriers. A factor analysis of responses to barrier questions was also conducted.

WHILE THE STUDY APPROACH IS FOUNDED ON THE ANALYSIS OF ACTIONS AND PERCEPTIONS OF CUSTOMERS, SIMILAR ANALYSES WERE ALSO CONDUCTED FOR OTHER MARKET ACTORS, INCLUDING BOTH CONTRACTORS/DISTRIBUTORS AND DESIGN/ENGINEERING FIRMS.

- Wherever possible, trade ally responses to questions regarding market barriers were quantified to allow comparisons across regions and help explain differences in the degree of market transformation observed in customer actions within and outside Edison’s service territory.
- Contractors and distributors were also asked to provide a percentage breakdown of their sales by type and efficiency.
 - These data provide an independent corroboration of the customer actions used to estimate the extent of market effects.
 - Distributor/contractor estimates of the current mix of efficiencies were particularly valuable for those technologies that are more difficult for customers to report, such as motors and rooftop air conditioners.
- Design/engineering firms were asked to identify the percentage of installations for which they specify high efficiency lighting, HVAC, and motors technologies to determine if such technologies have become “standard” practice.

RESULTS OF THE ANALYSES DESCRIBED ABOVE WERE SUMMARIZED AND INTEGRATED TO DETERMINE THE EXTENT TO WHICH THEY SUPPORT THE HYPOTHESES TO BE TESTED FOR EACH OF THE FIVE TECHNOLOGIES.

- In the facing exhibit, the results of testing each hypothesis for the five technologies studies are summarized.
- Note that there is significant variation in the extent to which market effects are observed for each of the hypotheses and each of the five technologies. These differences will be discussed in greater detail in the chapters where measure-specific results are presented.
- The overall methodology used in this study was to review the results of the multiple approaches that were used to determine if a “preponderance of evidence” supported the hypothesis that market effects could be observed for each of the measures investigated.

IN THE FOLLOWING CHAPTER, OVERALL RESULTS OF THE ANALYSIS OF EXISTING EDISON DATA AND PRIMARY DATA ARE PRESENTED.

2.0 OVERALL RESULTS

IN THIS SECTION OF THE REPORT, OVERALL RESULTS ARE PRESENTED IN ORDER TO DETERMINE WHETHER EXISTING EDISON DATA, PRIMARY DATA ON CUSTOMER ACTIONS, AND PRIMARY DATA ON CUSTOMER ATTITUDES AND PERCEPTIONS PROVIDE EVIDENCE OF MARKET EFFECTS.

- In this chapter, aggregate analyses of existing Edison data and primary data are presented. The evidence supporting the hypotheses of market effects for each chain in the market is assessed for each of the five technologies studied is presented in subsequent chapters.
- Results are presented in the following order.
 - First, data on customer actions captured in several past Edison surveys are analyzed to determine whether the observed actions of nonparticipants show any evidence of increasing adoption of energy efficiency measures -- a precondition to the existence of market effects in our analytical framework.
 - The analyses of customer actions are followed by an analysis of customer attitudes toward energy efficiency and energy conservation for various categories of customers (e.g., commercial vs industrial; participants vs. nonparticipants) to determine whether these attitudes are more positive over time or for groups with greater exposure to Edison programs -- both of which would be taken as an indication of market effects. Primary data on customer attitudes are also analyzed to determine whether these are influenced by presence of audit and/or incentive programs.
 - Finally, customer perceptions of market barriers to energy efficiency, as measured by responses to questions for each market barrier, are analyzed to determine whether the differences in levels of barriers across territories provide an indicator of market effects and of the mechanisms of market effects.

**Cumulative Percentage with Installed Measures
by Year (weighted)
Based on 1991 Mail Survey**

EMS

Year	Industrial		Commercial	
	Nonparticipant	Participant	Nonparticipant	Participant
	Cum % (N=313)	Cum % (N=443)	Cum % (N=717)	Cum % (N=1395)
1988	0.2%	4.2%	0.5%	4.1%
1989	0.5%	5.0%	0.7%	4.7%
1990	0.5%	5.2%	0.7%	5.0%
1991	0.5%	5.5%	0.8%	5.7%

VSD

Year	Industrial		Commercial	
	Nonparticipant	Participant	Nonparticipant	Participant
	Cum % (N=313)	Cum % (N=443)	Cum % (N=717)	Cum % (N=1395)
1988	2.2%	12.6%	0.8%	1.4%
1989	2.5%	13.6%	0.8%	1.5%
1990	2.6%	14.9%	1.5%	1.7%
1991	2.7%	18.9%	1.5%	1.9%

DATA FROM MAIL SURVEYS CONDUCTED IN 1991 SHOW ONLY MODEST ADOPTION BY NONPARTICIPANTS FOR MOST MEASURES ANALYZED.

- Using these data, the case for market effects would be supported if there were a significant increase in the adoption of these energy-efficient technologies over time by nonparticipants. One would expect the overall adoption rate among nonparticipants to be lower than for participants, but there should be a noticeable increase in nonparticipant adoptions if market effects were occurring.
 - The cumulative increase in the saturation of energy management systems (EMSs) and variable speed drives (VSDs) for participants and nonparticipants, for both commercial and industrial customers, show a significant increase in installation of these measures by both commercial and industrial participants. (Note that participants include customers who installed any qualifying EE measure through one of Edison's programs, not just EMSs or VSDs).
 - Conversely, nonparticipant percentage saturation was an order of magnitude lower for three of the four technology/customer combinations analyzed. Only nonparticipant commercial customers installations of VSDs were relatively high compared to those of participants, overall levels for both groups were too low to be statistically significantly different from each other or from zero (at the 90 percent confidence level.)
- While the low level of observed installations of EE equipment among nonparticipants appears to preclude the possibility of any market effects, the lack of a comparison group makes it impossible to draw such a conclusion.

**Cumulative Percentage with Installed E-E Measures
By Year (weighted)
Based on 1992 On-sites**

Year	CFB		EMS		VSM		EE Fluorescent Lamps		EE Ballasts	
	Nonpart.	Participant	Nonpart.	Participant	Nonpart.	Participant	Nonpart.	Participant	Nonpart.	Participant
	Cum % (N=197)	Cum % (N=433)	Cum % (N=197)	Cum % (N=433)	Cum % (N=197)	Cum % (N=433)	Cum % (N=197)	Cum % (N=433)	Cum % (N=197)	Cum % (N=433)
1989	0.9%	18.0%	0.6%	4.7%	0.2%	1.0%	12.4%	19.1%	9.2%	17.5%
1990	1.5%	18.6%	0.7%	5.4%	0.2%	1.0%	17.4%	24.1%	11.0%	22.4%
1991	1.5%	19.2%	0.7%	6.0%	0.2%	1.0%	19.5%	30.0%	12.1%	28.0%
1992	1.5%	19.4%	0.7%	8.1%	0.2%	1.1%	21.2%	32.0%	13.8%	30.4%

A SIMILAR ANALYSIS CONDUCTED FOR A DIFFERENT GROUP OF CUSTOMERS AND A BROADER SET OF MEASURES SHOWS AN INCREASE IN NONPARTICIPANT ADOPTION OF ENERGY EFFICIENT FLUORESCENT LAMPS AND BALLASTS.

- For the commercial customer segments analyzed, there was virtually no increase in the saturation of EMSs and variable speed motors (VSMs) for nonparticipants, or, in the case of VSMs, for participants. (Note that this terminology is consistent with the original survey questions, not the present analysis.)
- For lighting technologies, saturation among nonparticipants was substantial.
 - For EE fluorescent lamps, NP saturation increased from 12.4 to 21.2 percent.
 - For EE ballasts, the increase was more modest, but nonetheless substantial, representing about one-seventh of commercial customers in these segments.
- Again, these data must be interpreted with caution because of the lack of a comparison group or other indicator of actions that would have been taken in the absence of the program.
- An analysis of the same technologies conducted based on the results of the 1995 survey of a different sample of commercial customers showed a similar, but less dramatic, increase in nonparticipant installations of both EE lamps and ballasts. The increase was small compared to the increase in participant installations, however.

ON THE FOLLOWING PAGES, OVERALL CUSTOMER ATTITUDES TOWARD ENERGY EFFICIENCY ARE DISCUSSED.

Mean Attitude Scores Across All Respondents

N	Mean	90% Conf.	Item
4348	5.07	+/- .03	Improving energy efficiency to reduce operating costs
4324	4.82	+/- .04	Improving energy efficiency to protect the environment
4166	4.60	+/- .04	Recycling more to protect the environment
4207	4.36	+/- .04	Recycling more to reduce costs
4254	3.85	+/- .04	[The company's] energy concerns compared to other business concerns

Note: Scores ranged from 1 (extremely unimportant) to 6 (extremely important).

ACROSS TERRITORIES, CUSTOMERS INTERVIEWED RATE THE ENERGY CONCERNS OF THEIR COMPANIES CLOSE TO AVERAGE WHEN COMPARED WITH THEIR OTHER BUSINESS CONCERNS (3.85 ON A 1-6 SCALE). THEY ALSO RATE INCREASING ENERGY EFFICIENCY TO REDUCE OPERATING COSTS RELATIVELY HIGH (5.07 ON THAT SCALE).

- To assess the stated motivations of customers for reducing energy use, customers were asked to rate the importance of each of five often-cited reasons. The survey items included:
 - Improving energy efficiency to reduce operating costs
 - Improving energy efficiency to protect the environment
 - [The company's] energy concerns compared to other business concerns
 - Recycling more to reduce costs
 - Recycling more to protect the environment
- Overall, respondents rated "Improving energy efficiency to reduce operating costs" as being of most importance to their companies, as shown in the facing exhibit.
- To assess the relationship between utility program offerings and customer attitudes, a predictive model was developed, as discussed on the following pages.

THE AVAILABILITY OF AUDITS APPEARS TO INCREASE THE IMPORTANCE THAT CUSTOMERS ATTRIBUTE TO EACH OF THE ATTITUDE STATEMENTS. ON AVERAGE, CUSTOMERS IN SERVICE TERRITORIES WHERE AUDIT PROGRAMS ARE AVAILABLE RESPOND SIGNIFICANTLY HIGHER ON EACH OF THE SCALES.

We attempted to ascertain whether customers' responses were correlated with the types of programs available in their service territory or with their own involvement or intentions to purchase particular technologies.

- To do this, predictive models were constructed for each attitude score. The predictors included:
 - Service territory characteristics (i.e., the availability of audit or rebate programs) for the respondent.
 - Past or planned actions (i.e., whether the respondent's company had purchased each of the technologies studied, whether the efficiency was known, and whether the efficiency was high or standard).
- The results indicate that statistically reliable predictive models can be constructed. Nonetheless, many other factors determining the attitudinal responses were not captured in these models. (In other words, the explained variance was quite small, with a maximum adjusted R-square of .026).
- In every instance, the most reliable single predictor of a score higher than average is the availability of an audit program in the respondent's service territory.

RESULTS OF THE INDIVIDUAL REGRESSION RESULTS ARE PRESENTED IN THE TECHNICAL APPENDIX. AN EXAMPLE IS DISCUSSED ON THE FOLLOWING PAGE.

Attitude Prediction Model

$$\begin{aligned} \text{ATT} = & 4.52 + 0.58*\text{RF_AC} + 0.63*\text{RF_LT} + 0.57*\text{RF_EM} + 0.61*\text{EF_MO} + \\ & (0.07) \quad (0.30) \quad (0.31) \quad (0.25) \quad (0.29) \\ & 0.51*\text{HI_AC} + 0.53*\text{AUDIT} - 0.96*\text{REBATE}*\text{EF_AC} + 1.47*\text{AUDIT}*\text{EF_AC} \\ & (0.30) \quad (0.09) \quad (0.54) \quad (0.59) \end{aligned}$$

() Standard error

Where:

- ATT = Customer's Attitude Score (1-6)
- RF_AC = 1 if Customer Replaced/Will Replace HVAC System; 0 Otherwise
- RF_LT = 1 if Customer Replaced/Will Replace Lighting System; 0 Otherwise
- RF_EM = 1 if Customer Replaced/Will Replace EMS System; 0 Otherwise
- EF_MO = 1 if Customer Knew Efficiency of Installed Motor; 0 Otherwise
- HI_AC = 1 if Customer Installed High Efficient HVAC System; 0 Otherwise
- AUDIT = 1 if Customer's Service Territory Offered Audit Program (Edison, New York, Louisiana)
- REBATE = 1 if Customer's Service Territory Offered Rebate Program (Edison)
- EF_AC = 1 if Customer Knew Efficiency of Installed HVAC System; 0 Otherwise

A DESCRIPTION OF THE MODEL FOR THE RATED IMPORTANCE OF THE ITEM “IMPROVING ENERGY EFFICIENCY TO REDUCE OPERATING COSTS” ILLUSTRATES THE TYPE OF MODEL THAT WAS CONSTRUCTED.

- Model results, a portion of which is shown in the facing exhibit for the item mentioned above (see technical appendix for details), indicate that customers will rate the importance of this item more highly if they:
 - Are in a service territory with audit programs
 - Are in a service territory with audit programs and have replaced or are contemplating replacement of their air conditioning
 - Have replaced or are contemplating replacement of their lighting or EMS
 - Know the efficiency of the motors they have replaced
- The availability of rebate programs does not have such a general effect, but appears to affect the ratings given by customers who have replaced specific technologies with high efficiency units, particularly air conditioning.
 - Customers being in a service territory with rebate programs is not predictive of higher importance ratings overall.
 - The models for responses to the other attitude statements suggest that this factor matters only when taken in conjunction with the purchase or expected purchase of specific technologies—particularly air conditioning.
- The apparent influence of the presence of utility audit programs on customer attitudes toward various indicators of the importance of energy efficiency supports lends some support to the hypothesis that Edison programs have had a market effect.

CUSTOMER PERCEPTIONS OF MARKET BARRIERS ARE EXAMINED NEXT.

TO STUDY CUSTOMERS' PERCEPTIONS OF WHAT MAY BE MARKET BARRIERS TO THE RELEVANT TECHNOLOGIES, WE MEASURED THEIR AGREEMENT WITH EACH OF 14 STATEMENTS DESIGNED TO PROVIDE A CONCRETE DESCRIPTION OF A MARKET BARRIER.

- The questions were asked of all survey respondents who had recently replaced or were planning to replace one of the technologies (for that technology). Interviewees were asked to provide responses to each barrier question on a 1-10 scale, running from strongly disagree to strongly agree. Each statement described some aspect of the selection, acquisition, or operation of a new, energy-efficient option. Furthermore, each was designed to embody one of the barriers described in the Eto, Prahl, and Schlegel Scoping Study.
- While it would have been preferable to base them, as well, on a systematic and complete market characterization for each technology, this was impossible due to budget constraints. Instead, the questions were crafted based on the barriers described in the Scoping Study and on the basis of considerable expert judgement relative to these technologies and their markets.
- One approach to the systematic measurement of barriers identified in the Scoping Study – that is, measuring those barriers that were felt actually to be operating in the market – was rejected both because of the lack of a complete market characterization and because it was felt that the lack of a barrier in a particular market (technology-based as well as geographically-based markets), should not be assumed but tested. Thus, we expected to see some barriers receive high scores, and others low ones.
- Efforts were made to word the items generally enough to apply to each of the technologies of interest. Examples of these statements (and the theoretical barriers intended) include the following:
 - It is very difficult to find high-efficiency insert relevant technology in this area. (Product or service unavailability)
 - Our organization does not have the time or personnel to monitor the installation or operation of high efficiency insert relevant technology. (Hidden costs)

A FACTOR ANALYSIS WAS UNDERTAKEN TO DETERMINE WHETHER A NUMBER OF BARRIERS WERE SO INTERCORRELATED THAT THEY WOULD BE MOST EFFICIENTLY TREATED AS A FEW FACTORS RATHER THAN AS THE FULL RANGE OF LISTED ITEMS.

- Based on a practical understanding of the barriers, and on the expectation stated in the Scoping Study itself, it was anticipated that the barriers, as measured, would be intercorrelated to some degree at least. The factor analysis was undertaken to determine whether the barriers were so intercorrelated that they would be most efficiently treated as a few factors rather than as a lot of individual items. Our own theoretical thinking led us to expect three or four factors.
- As explained in greater detail in the Technical Appendix, the factor analysis was conducted using both orthogonal and oblique rotations.
 - The initial analysis yielded only a single factor. Separate analyses for customers who had actually purchased (instead of planned to purchase) the technology or who met specific criteria for self-reported knowledge of the technology in question yielded similar results.
 - Further exploration of the data showed that 157 of 4400 respondents (3.6%, distributed across all technologies) gave exactly the same answer on all 14 barrier questions. Since this subset of “zero-variance” respondents would be contributing to the unitary nature of the factor findings, these observations were excluded from the analysis.
- A factor analysis conducted on the above questions indicated that two independent factors accounted for almost one-half of the variation in survey responses.
 - Two factors met the standard criterion of eigenvalues of 1.0 or more.
 - A varimax rotation of the resulting 2-factor structure was performed.
 - (An oblimax rotation provided highly similar results.)
 - The two factors accounted for approximately 26% and 22% of the variance, respectively.

RESULTS OF THE FACTOR ANALYSIS ARE DISCUSSED ON THE FOLLOWING PAGES.

RESULTS OF THE FACTOR ANALYSIS INDICATE THAT RESPONDENTS RECOGNIZE TWO SETS OF BARRIERS TO ENERGY-EFFICIENT TECHNOLOGIES. THESE MAY BE INTERPRETED AS CONCERNS REGARDING: 1) THE COSTS (AS BROADLY INTERPRETED) OF ACQUIRING AND OPERATING THE TECHNOLOGY, AND 2) THE TRUSTWORTHINESS AND ASSISTANCE OF DISTRIBUTORS AND MANUFACTURERS OF THE TECHNOLOGY.

- The first factor, the costs (as broadly interpreted) of acquiring and operating the technology, includes the items shown in the following table.

Factor loading	Item	Theoretical barrier (from Scoping Study)
.831	The proper operation of high-efficiency (technology) requires more time and training than our company can afford.	Hidden costs
.825	Our organization does not have the time or personnel available to monitor the installation and operation of high-efficiency (technology).	Hidden costs
.733	High-efficiency (technology) are too innovative a technology for our organization.	Organization practices or custom
.678	The initial investment required by high-efficiency (technology) is too great for our company.	Access to financing
.655	The standard operating procedures of our purchasing department do not accommodate the purchase of more costly high-efficiency (technology).	Organization practices or custom
.537	High efficiency (technology) often include extra features that are expensive and unnecessary.	Inseparability of product features

- Note that the most prominent barriers appear to be concerns about hidden costs and the difficulty of securing internal acceptance. Although the immediate direct costs of the technology (access to financing, inseparability of product features) appear to play a role, they seem to be somewhat less influential than hidden cost and organizational concerns in determining perceptions regarding the presence of this barrier.

WHILE IT APPEARS AT FIRST GLANCE TO COMPRISE SEVERAL DIVERSE ASPECTS OF MARKET BARRIERS, THE SECOND FACTOR CAN BE CONSIDERED TO REPRESENT THE TRUSTWORTHINESS AND ASSISTANCE OF DISTRIBUTORS AND MANUFACTURERS OF THE TECHNOLOGY.

- The second factor, the trustworthiness and assistance of distributors and manufacturers of the technology, includes the items shown in the following table.

Factor loading	Item	Theoretical barrier (from Scoping Study)
.714	Sales people are touting high-efficiency (technology) strictly for their own benefit.	Asymmetric information and opportunism
.631	Someone else would gather the benefits of our company investing in high-efficiency (technology).	Misplaced or split incentives
.619	It is very difficult to find high-efficiency (technology) in this area.	Product or service unavailability
.597	Acquiring high efficiency (technology) is more of a hassle than for standard efficiency units.	Hassle or transaction costs
.562	High-efficiency (technology) have performance problems.	Performance uncertainties

- The two most prominent items suggest distrust and suspicion regarding the motivations of sales persons and distributors.
- The next two items suggest additional reservations regarding the transparency of the distribution system.
- The last item suggests some suspicion of the technology itself—or of those producing it.

OVERALL, SURVEY RESPONDENTS TEND TO REJECT THE NOTION THAT EITHER OF THESE FACTORS REPRESENTS A SIGNIFICANT BARRIER TO ENERGY EFFICIENCY.

- The generally low level of perceived barriers is reflected in the following factor scores:
 - The average score for Factor 1, over all respondents, is 3.2 on the 1-10 scale of disagreement to agreement.
 - The average score for Factor 2 is 2.6.
 - In other words, those interviewed reject concerns about the (broadly-interpreted) costs of high-efficiency technologies.
 - They also reject suspicion and criticism of the motives and actions of distributors and manufacturers of those technologies.
- Despite the generally low level of agreement that these factors describe the current state of the market for the technologies studied, some intriguing differences emerge from more fine-grained analyses. In the following pages, we discuss briefly several statistically significant differences between and among:
 - Respondents who have recently purchased one of the technologies studied and those who are considering future purchases
 - Service territories differing in the availability of audits and rebates
 - Technologies.

AMONG RESPONDENTS BASED IN EDISON'S SERVICE TERRITORY, CUSTOMERS WHO HAVE ACTUALLY PURCHASED A PARTICULAR TECHNOLOGY RECENTLY ARE SIGNIFICANTLY LESS LIKELY TO PERCEIVE THE PRESENCE OF EACH SET OF BARRIERS THAN ARE THOSE WHO ARE CONTEMPLATING SUCH PURCHASES IN THE FUTURE.

- For Factor 2, the scores are 2.5 and 2.9 ($t = 3.83, p < .05$).
- The causal direction of the relationship cannot be determined from this analysis.
 - It is possible that respondents who actively seek out and purchase a technology learn directly that perceived barriers are, in fact, absent.
 - However, it is also possible that it is those customers who are least likely to perceive the presence of market barriers who are most likely to seek and consummate purchases.
- Further analysis (see the discussion of differences between customers who replaced with high-efficiency and those who replaced with standard efficiency in the measure-specific results) seems more consistent with the former explanation.

IT IS TEMPTING TO COMPARE SCORES ON THE TWO FACTORS ACROSS SERVICE TERRITORIES THAT DIFFER WITH RESPECT TO OFFERING AUDITS AND REBATES. HOWEVER, SEVERAL ANOMALOUS RESULTS SUGGEST THAT SUCH COMPARISONS WOULD REQUIRE CONSIDERABLY MORE INFORMATION FOR VALID INTERPRETATION.

- For example, the results from two audit-only service territories differ markedly from one another.
 - The New York service territory shows differences between replacers and future replacers that are similar to those in Edison's service territory.
 - The Louisiana service territory shows results in the opposite direction.
- The Georgia service territory respondents, with no program, show less concern with Factor 1 than do the Edison respondents.
- Among the additional information required for interpretation and attribution of causality is the kind of market characterization described earlier, which would include developing an understanding, for each service territory, of:
 - Macroeconomic factors
 - Specific programs, targets, and technology emphases of the programs available
 - Results, including spillover, of programs conducted in earlier years
- These results reinforce the difficulty of determining causal direction in the absence of a tracking study or a research design with pre- and post- measurements.

RESPONDENTS ARE LEAST LIKELY TO REJECT FACTOR 1 WITH RESPECT TO LIGHTING AND MOST LIKELY TO DO SO WITH RESPECT TO EMS.

- Pairwise comparisons of technologies indicate that interviewees are more likely to perceive (broadly-interpreted) cost as a barrier with respect to lighting than with respect to EMS, ASDs, *or* motors.
- At first blush, it may seem surprising for respondents to report the greatest level of Factor 1 with respect to lighting. (The reader should keep in mind that these data are relative. The absolute score indicates that respondents do report the issues as unlikely, overall.)
- One possible interpretation is that, compared to respondents who purchase the other technologies considered, those who purchase lighting technologies are:
 - Less likely to understand the technology involved
 - Less likely to be able to disaggregate the affected portion of their demand and consumption and, hence, may be more concerned with hidden costs and justifying their purchases.
- Conversely, those who purchase or consider EMS may more often be those with engineering backgrounds and the confidence that they can cope with the technology involved. No questions regarding specific levels of technical training were included in the survey, however.

Factor Analysis
Customers Reporting Standard vs High Efficiency Installations

	Statistic	Replacer Group		t-value of Difference
		Standard-Efficiency	High-Efficiency	
Factor 1				
Air conditioning	Mean	3.47	2.63	3.68
	N of cases	118	112	
	Standard dev.	1.82	1.62	
Motors	Mean	3.50	2.57	3.64
	N of cases	137	66	
	Standard dev.	1.69	1.71	
Lighting	Mean	3.64	3.04	3.02
	N of cases	236	120	
	Standard dev.	1.87	1.73	
Factor 2				
Air conditioning	Mean	2.76	2.23	3.10
	N of cases	118	109	
	Standard dev.	1.38	1.21	
Motors	Mean	2.83	2.39	2.05
	N of cases	133	66	
	Standard dev.	1.20	1.51	
Lighting	Mean	2.78	2.39	2.84
	N of cases	234	120	
	Standard dev.	1.33	1.14	

SIMILARLY, RESPONDENTS ARE LEAST LIKELY TO REJECT FACTOR 2 WITH RESPECT TO LIGHTING AND MOST LIKELY TO DO SO WITH RESPECT TO ASDS.

- Again, it seems possible that purchasers and potential purchasers of lighting are lowest in confidence about the level of their knowledge and their ability to reap the benefits of their investments by selecting and obtaining the appropriate technology.
- In contrast, decision-makers who have purchased or are considering ASDs seem likely to be those with at least some engineering knowledge and the confidence that they can obtain a good reward for their investment.
- These results regarding differences among technologies in perceived concerns suggest directions for program design, despite the fact that they may reflect some sampling factors.
 - The reported results are based on data from a sample that includes:
 - . Customers who have not been participants in recent utility programs
 - . Largely small and medium-sized customers, who are generally unsophisticated about energy issues
 - Nonetheless, it is just these C/I customers who are most numerous and most in need of future program assistance if the market for energy-efficiency is to become broadly sustainable.

ACCORDINGLY, IF THE INTERPRETATIONS SUGGESTED ABOVE ARE CONFIRMED, FUTURE PROGRAMS SHOULD BE DESIGNED TO ASSUAGE THE CONCERNS IDENTIFIED HERE WITH RESPECT TO EVEN THE MOST MUNDANE TECHNOLOGICAL ADVANCES.

SOME EVIDENCE SUPPORTS THE HYPOTHESIS THAT EXPERIENCE WITH OBTAINING HIGH-EFFICIENCY UNITS MAY INCREASE THE TENDENCY TO DISAGREE WITH THE CONCERNS STUDIED. MOREOVER, THAT TENDENCY MAY HAVE BEEN INTENSIFIED BY PROGRAMS SUCH AS THOSE CONDUCTED BY EDISON.

- As shown in the facing exhibit, replacers who report selecting high efficiency units are significantly more likely to disagree with either set of concerns than are those who report purchasing standard-efficiency units.
 - The results hold, for both factors, with respect to every relevant technology: air conditioning, motors, and lighting. (The issue of efficiency level is moot with respect to EMS or ASDs.)
 - The analysis is based on only those respondents (across all service territories) who professed to know the efficiency level of the units they bought. It should be noted, however, that fax forms returned by respondents who had installed lighting tended to support the self-reported data.
- Programs such as those conducted by Edison appear to help to further reduce concerns among those replacers who select high-efficiency units.
 - When the results shown in the previous table are broken down by service territory, statistically significant differences (at the 90% level of confidence) are found in all but one comparison made among Edison customers installing standard and high efficiency versions of each of the technologies.
 - No such consistency is found in either of the service territories offering only audits or in the service territory offering neither rebates nor audits.

WHILE THE FACTOR ANALYSIS OF BARRIER RESULTS APPEARS TO SUPPORT A CORRELATION BETWEEN THE PERCEIVED LEVEL OF BARRIERS, THE PRESENCE OF UTILITY PROGRAMS, AND THE PURCHASE OF HIGH EFFICIENCY EQUIPMENT, THE APPLICABILITY OF THESE RESULTS IS LIMITED BY THE LACK OF A PRIOR MARKET CHARACTERIZATION THAT WOULD SUPPORT ASSIGNING CAUSAL DIRECTION TO THE FINDINGS.

3.0 MEASURE-SPECIFIC RESULTS

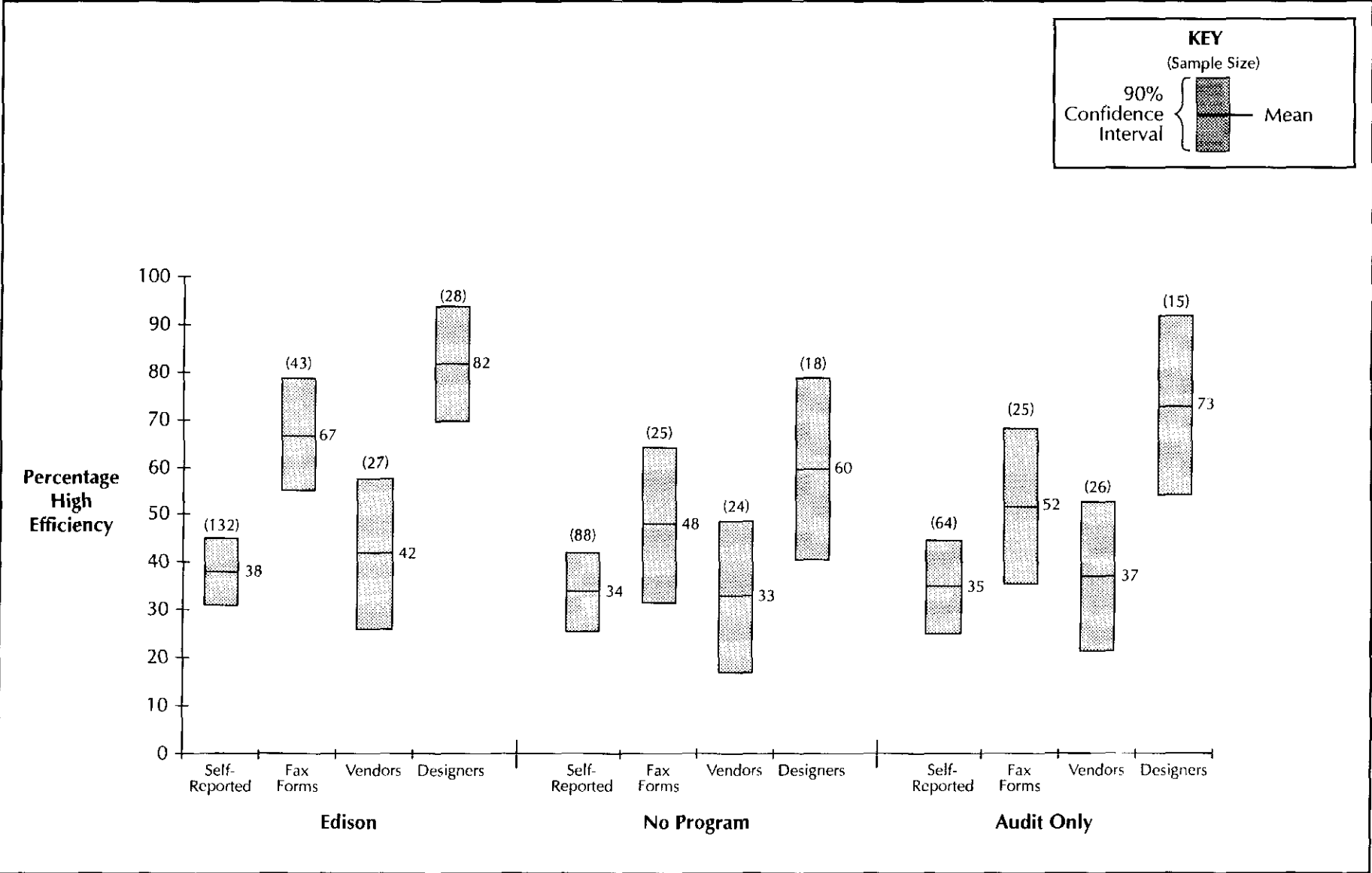
IN THIS CHAPTER OF THE REPORT, RESULTS ARE PRESENTED IN ORDER TO SUPPORT THE TESTING OF EACH HYPOTHESES FOR EACH OF THE TECHNOLOGIES INVESTIGATED.

- The extent of market effects observed in customer actions is analyzed by comparing efficient technology installations as a percentage of total installations.
 - Customer responses to the canvass survey are first used to determine the replacement rate and whether installations were standard or high efficiency.
 - .. Self-reported data were used for the replacement actions.
 - .. The self-reported data were validated using the results of follow-up fax forms sent to customers who agreed to provide detailed data on equipment type.
 - Data on percent of efficient sales/installations were also collected from vendors. It must be kept in mind that, for vendors within Edison's service territory, those data reflect both the direct effects of Edison rebate programs as well as market effects resulting from Edison's programs.
- Comparisons are made between Edison and the no-program territory (Georgia Power) and the two audit-only territories (NYSEG, and Louisiana Power & Light). Results for the latter two regions were averaged to minimize the effects of territory-specific variations in economic conditions.
- Data on attitudes and perceptions regarding market barriers were also analyzed for customers and other market actors within and outside Edison's service territory. To the extent that perceived barriers reported by groups within Edison's territory are lower than those reported in the other territories, these data will be considered to support the hypothesis that there are market effects that can be attributed, at least in part, to the Edison programs.

RESULTS OF THE ABOVE ANALYSES ARE PRESENTED ON THE FOLLOWING PAGES.

3.1 MEASURE-SPECIFIC RESULTS – LIGHTING

**Edison Market Effects
Lighting -- Percentage High Efficiency
Summary of Results**

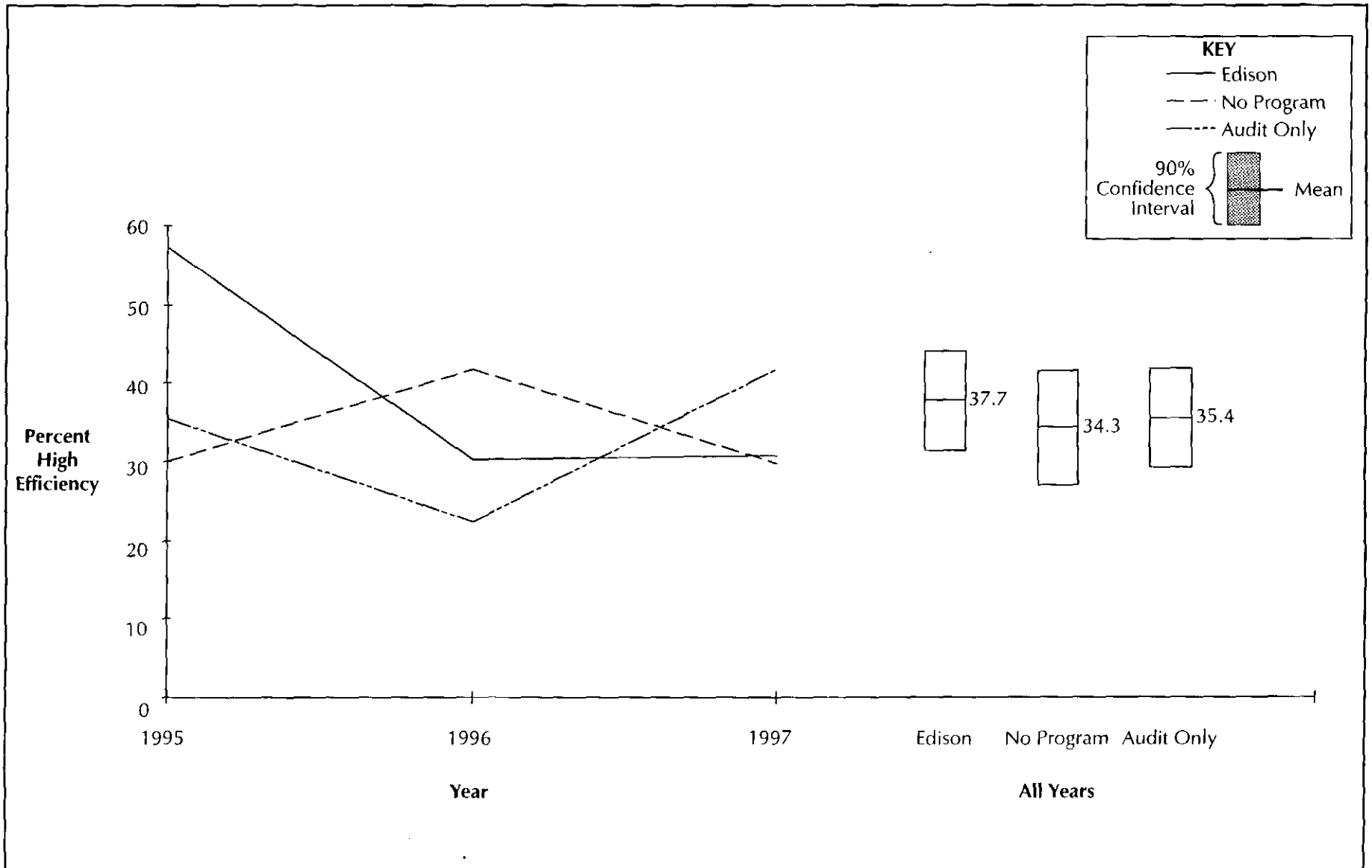


ESTIMATES OF THE PERCENTAGE OF HIGH EFFICIENCY LIGHTING INSTALLATIONS FROM VARIOUS INFORMATION SOURCES, PRESENTED IN THE FACING EXHIBIT, INDICATE THAT NONPARTICIPANTS IN EDISON'S TERRITORY WERE MORE LIKELY TO INSTALL THIS TECHNOLOGY THAN CUSTOMERS IN OTHER TERRITORIES.

- As shown in the facing exhibit, the overall percentage of efficient units (self-reported) installed by non-participants in Edison's territory was slightly higher than for the other territories (38 percent versus 34 percent and 35 percent), although the difference was not significant (defined throughout this chapter to mean statistically significant at the 90 percent confidence level.)
- Completed equipment data forms (i.e., fax forms) returned by replacing customers confirm a higher proportion of efficient installations (based, in the facing exhibit, on the percentage of replacing premises installing electronic ballasts.)
- Lighting vendors in Edison territory reported a higher proportion of T-8 bulbs and electronic ballasts sold than did vendors in other territories.
- Designers (Architectural and Engineering, or A&E) firms in Edison territory were more likely to specify high efficiency lighting than designers in either the no-program or audit-only territories.

CUSTOMER ACTIONS AND PERCEIVED BARRIERS ARE EXAMINED IN GREATER DETAIL BELOW.

Percent High Efficiency Installation by Year and Overall -- Lighting



THE SHARE OF EFFICIENT LIGHTING WAS HIGHEST AMONG EDISON NONPARTICIPANTS WHO INSTALLED LIGHTING IN 1995, WHEN REBATES WERE NOT OFFERED.

- In 1995, when rebates were suspended in Edison's service territory, the percentage of qualifying equipment was higher than in other years, suggesting that some customers in these segments who would otherwise have installed EE lighting through the program chose to install such equipment anyway.
- Note that differences in the share of efficient lighting across all three years are not statistically significant. With even smaller sample sizes for replacements in individual years, it is very difficult to draw firm conclusions for those be drawn for those years.

AS AN ADDITIONAL INDICATOR OF THE EXTENT OF MARKET EFFECTS, CUSTOMER ATTITUDES AND PERCEPTIONS OF BARRIERS TO THE INSTALLATION OF ENERGY EFFICIENT LIGHTING ARE EXAMINED NEXT.

ATTITUDES TOWARD ENERGY EFFICIENCY AMONG CUSTOMERS WHO INSTALLED LIGHTING WERE MORE FAVORABLE IN EDISON'S SERVICE TERRITORY THAN IN OTHER AREAS.

- Edison customers responding to the current survey who installed lighting had a higher mean rating than the overall population, but the difference was not statistically significant. Edison customers who installed lighting assigned a higher level of importance than the general population for each of the five questions asked regarding attitudes toward energy efficiency.
- Compared to other territories, Edison customers who replaced their lighting assigned a higher priority to improving energy efficiency to reduce operating costs than their counterparts in either the no-program or audit-only territories, although the difference was significant only for the no-program territory.
- Edison lighting replacers also had significantly higher responses than either the no-program or audit-only territories for the importance of energy concerns compared to other business concerns.
- For other attitude questions, Edison responses were generally higher, but not significantly so.

Lighting Barriers
-- Familiar w/High Efficiency --

Service Territory	Result	Total
Edison	Future	5.48
	Replaced	4.93
	High Efficient	4.56
	Standard Efficient	5.47
No Program	Future	4.37
	Replaced	4.86
	High Efficient	5.05
	Standard Efficient	5.36
Audit Only	Future	4.47
	Replaced	5.03
	High Efficient	6.00
	Standard Efficient	4.85

ONE OF THE QUESTIONS ASKED ON THE SURVEY TO QUALIFY RESPONDENTS – “HOW FAMILIAR ARE YOU WITH ENERGY EFFICIENT LIGHTING” – PROVIDES AN ADDED INDICATION OF THE MARKET EFFECTS THAT EDISON PROGRAMS MAY HAVE HAD.

- Among customers who are planning to replace lighting in the future, Edison non-participants had a significantly higher level of familiarity than either the no-program or audit-only territories.
- Among customers who installed lighting, Edison customers have approximately the same level of familiarity with high efficiency technology as those in other service territories.
- In contrast, Edison customers who reported installing high efficiency lighting had a lower level of familiarity than those who reported installing standard efficiency lighting – the opposite of the pattern in other territories. This may be because customers who were less familiar with the technology were more likely to rely on outside designers – who more often specify high efficiency equipment, as discussed below.

ONLY A WEAK INDICATION OF MARKET EFFECTS IS PROVIDED BY THE SELF-REPORTED LEVEL OF FAMILIARITY WITH EFFICIENT LIGHTING.

Lighting Barriers
-- Mean Barrier Levels --

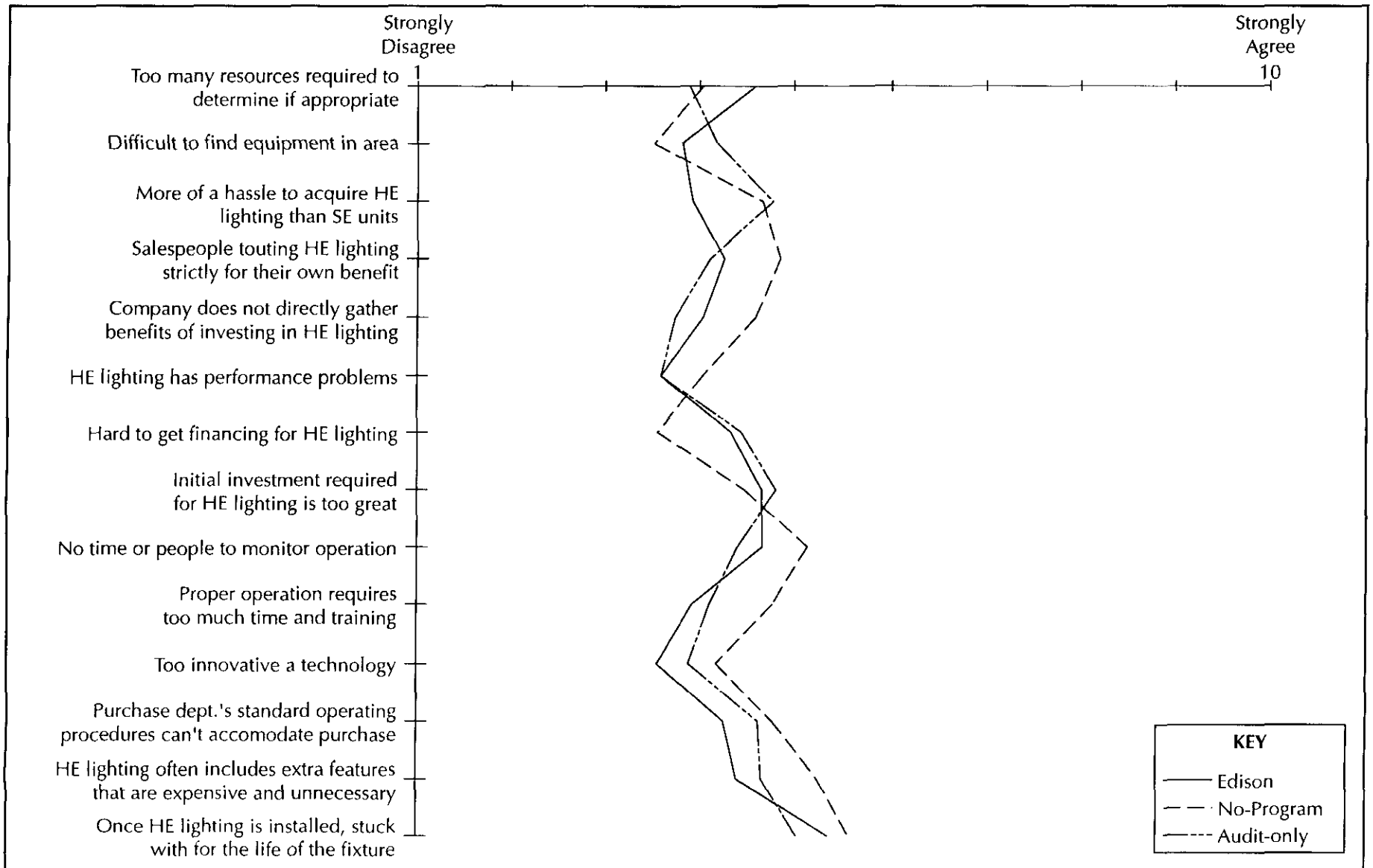
Service Territory	Result	Total
Edison	Future	5.03
	Replaced	4.23
	High Efficient	3.87
	Standard Efficient	4.61
No Program	Future	4.12
	Replaced	4.52
	High Efficient	4.18
	Standard Efficient	4.99
Audit Only	Future	5.17
	Replaced	4.29
	High Efficient	3.83
	Standard Efficient	4.61

FOR CUSTOMERS WHO INSTALLED LIGHTING, PERCEIVED MARKET BARRIERS TO THE ADOPTION OF ENERGY EFFICIENCY WERE FOUND TO BE GENERALLY LOWER IN EDISON'S SERVICE TERRITORY THAN IN EITHER AUDIT-ONLY OR NO-PROGRAM TERRITORIES, ALTHOUGH THE DIFFERENCES WERE NOT STATISTICALLY SIGNIFICANT.

- The facing exhibit shows the mean level of self-reported barriers for all customers who installed or are planning to install lighting systems in various service territories.
 - Among customers who replaced, the average of all barriers was significantly lower in Edison's territory than in either the no-program or audit only territories, though the differences were not statistically significant.
 - Customers with plans to replace lighting in the future, however, reported lower overall barriers in the no-program territory. (This appears to be due to the high level of barriers reported by a small number of TOU customers in Edison territory.)
 - Not surprisingly, mean barrier levels were lower in all territories for customers who reported installing high efficiency units than for those who installed standard lighting.
- It should be noted that one of the audit-only territories – NYSEG, in upstate New York – would be expected to have been influenced by the lighting programs conducted throughout the Northeast in the past.

OVERALL PERCEPTIONS OF BARRIER LEVELS APPEAR TO SUPPORT THE HYPOTHESIS THAT EDISON LIGHTING PROGRAMS HAVE AFFECTED PROGRAM NONPARTICIPANTS. INDIVIDUAL BARRIERS ARE DISCUSSED ON THE FOLLOWING PAGES.

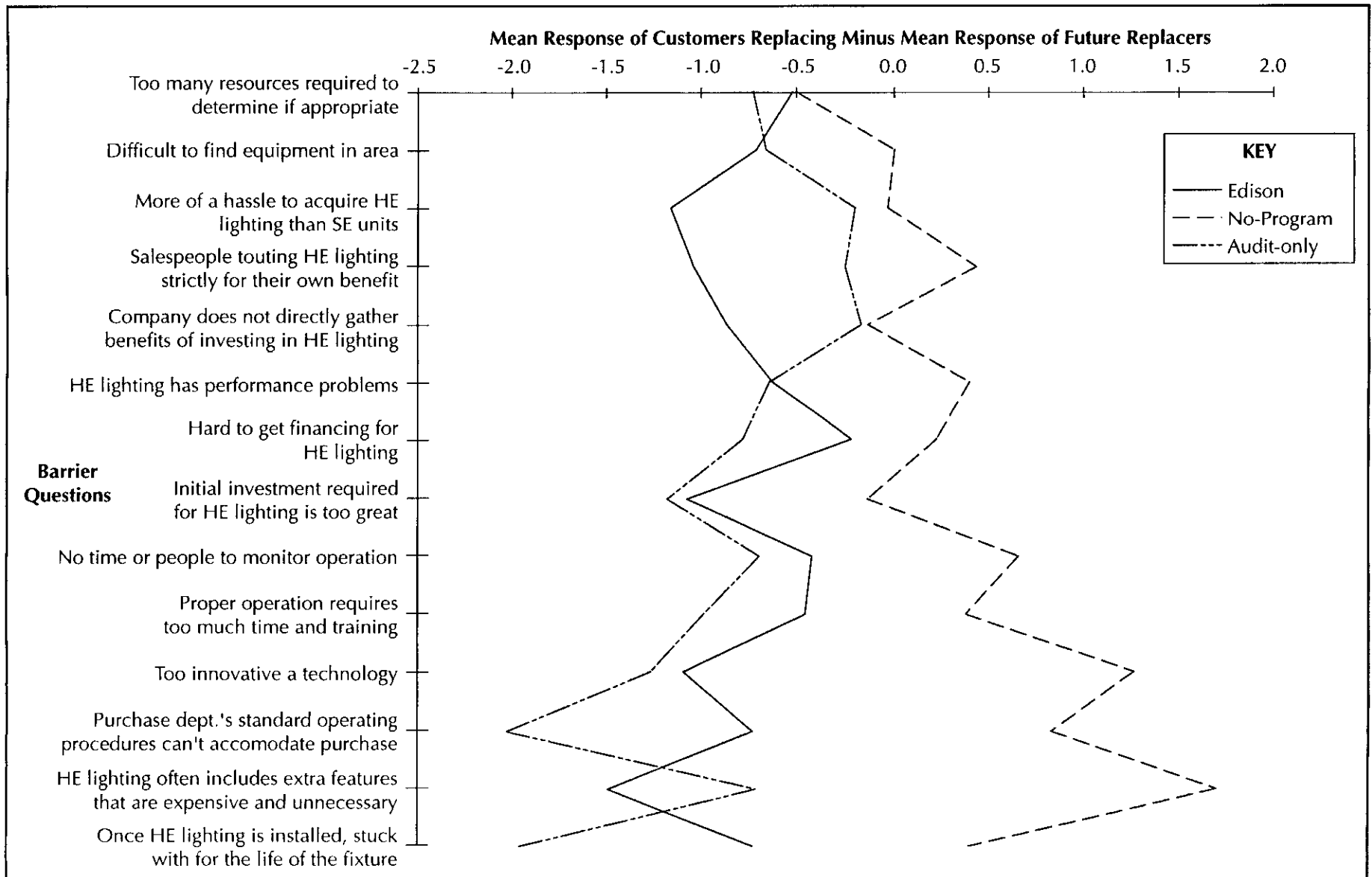
Lighting Barriers
Mean Responses to Barrier Questions by Territory



EDISON NONPARTICIPANTS WHO INSTALLED LIGHTING REPORTED THE LOWEST LEVEL OF PERCEIVED BARRIERS FOR FIVE OF THE 14 BARRIER QUESTIONS ASKED AND THE HIGHEST FOR ONE.

- Among customers who replaced lighting, Edison customers had a statistically significantly lower response to the barrier question relating to the hassle of acquiring efficient lighting. Barriers for which Edison mean responses were lower, but not significantly so, included:
 - No resources to monitor operation of HE lighting
 - Purchasing department can't accommodate HE equipment
 - HE lighting often includes unnecessary extras
 - HE lighting is too innovative for our organization
- Edison customers expressed a significantly higher level of agreement with the statement "too many resources are required to determine if HE lighting is appropriate" than did respondents in other territories. There were no other barriers, however, for which Edison customers had the highest response.

Lighting Barriers -- Future vs. Replaced
Differences in Mean Responses to Barrier Questions by Territory



AMONG CUSTOMERS WHO HAD NOT YET REPLACED LIGHTING BUT WHO WERE PLANNING TO DO SO, PERCEIVED BARRIERS WERE RELATIVELY HIGHER IN EDISON TERRITORY.

Note that a negative mean response in the facing exhibit means that future replacers perceive a higher barrier level than customers who actually replaced.

- As can be clearly seen in the facing exhibit, future replacers in Edison territory had consistently higher barriers than did those who had already replaced.
- The higher level of perceived barriers among future replacers than for past replacers may reflect a lack of awareness and understanding of the processes involved in lighting equipment selection.
 - The fact that customers who have actually been through the lighting purchase process report lower barriers suggests that some barriers may have been reduced in Edison's service territory.
 - The generally similar pattern for respondents in the audit-only territory (when compared to those of no-program respondents) seems to support this hypothesis.

BASED ON CUSTOMER-LEVEL RESULTS, WE CONCLUDE THAT THE OBSERVED CHANGES IN CUSTOMER PURCHASE PATTERNS, ATTITUDES, AND PERCEIVED BARRIERS DO IN FACT PROVIDE SOME SUPPORT FOR THE HYPOTHESIS OF MARKET EFFECTS.

Lighting Vendor Technologies (Weighted by Fixtures)

Result	Edison	No-Program	Audit-Only
N	27	24	26
1996 - % T8 Lamps and Electronic Ballasts	42.0%	32.8%	37.0%
1996 - % Energy Saver Lamps and Electronic Ballasts	10.8%	4.8%	12.3%
1996 - % Energy Saver Lamps and Magnetic Ballasts	25.8%	1.1%	5.6%
1996 - % T12 Lamps and Magnetic Ballasts	21.4%	61.3%	45.1%
1995 - % T8 Lamps and Electronic Ballasts	27.7%	20.5%	21.4%
1995 - % Energy Saver Lamps and Electronic Ballasts	4.6%	4.5%	3.7%
1995 - % Energy Saver Lamps and Magnetic Ballasts	16.7%	1.2%	7.1%
1995 - % T12 Lamps and Magnetic Ballasts	51.1%	73.8%	67.8%
1996 - T8 Lamp Availability (1 to 6 scale)	5.84	5.98	5.07
1995 - T8 Lamp Availability (1 to 6 scale)	5.10	4.60	3.54
% Difference in Cost - T8 Lamps v. T12 Lamps	35.2%	39.5%	33.1%
1996 - Electronic Ballast Availability (1 to 6 scale)	4.57	5.37	4.76
1995 - Electronic Ballast Availability (1 to 6 scale)	3.38	4.56	2.91
% Difference in Cost - Electronic Ballasts v. Magnetic Ballasts	45.4%	25.9%	30.4%
1996 - % Reflectors	25.1%	28.7%	63.1%
1995 - % Reflectors	24.7%	28.5%	50.3%
1996 - % EMS	3.1%	0.5%	9.3%
1995 - % EMS	1.6%	0.5%	9.1%

THE HYPOTHESIS THAT EDISON PROGRAMS HAVE AFFECTED MANUFACTURER PRODUCT MIX AND PRACTICES WAS ADDRESSED THROUGH THE PERCEPTIONS OF LIGHTING DISTRIBUTORS AND CONTRACTORS WHO DEAL DIRECTLY WITH EQUIPMENT MANUFACTURERS.

- For all territories surveyed, the availability of both T-8 lamps and electronic ballasts (reported on a 1 to 6 scale) increased significantly (a point or more) between 1995 and 1996.
- That this occurred not only in Edison's territory but also in both no-program territories suggests that manufacturers have substantially (and permanently) increased their production of these technologies.
- Whether the market effects of Edison programs contributed to this shift in production patterns cannot be determined conclusively.
 - For T-8 lamps, product availability was higher in 1995 than in either the no-program or audit-only territories, even though there were no Edison program rebates in place at that time.
 - Vendors in Edison's territory had the lowest mean response to a barrier question relating to their overall ability to "easily get delivery of energy-efficient lighting equipment."
- Given the size of the California market, it is plausible that the Edison programs actually affected manufacturing practices on a national scale. This would be consistent with the high levels of T-8 lamp and electronic ballast availability reported by distributors and contractors in areas as far away as Georgia and Louisiana.

WHILE THERE ARE INDICATIONS THAT THE CALIFORNIA MARKET HAS LED THE NATIONAL MARKET IN THE AVAILABILITY OF EFFICIENT LIGHTING, THE HYPOTHESIS THAT EDISON PROGRAMS CONTRIBUTED TO THIS EFFECT CANNOT BE CONCLUSIVELY DEMONSTRATED.

THE HYPOTHESIS THAT EDISON PROGRAMS HAVE CHANGED DISTRIBUTOR AND CONTRACTOR ATTITUDES AND PRACTICES WAS TESTED USING BOTH ATTITUDE DATA AND INFORMATION ON PRODUCT SALES.

- A sample of lighting contractors and distributors was developed using internal Edison data as well as Dun & Bradstreet data from iMarket, Inc. to ensure that both participating and nonparticipating vendors were contacted. Given the pervasive nature of the Edison programs among major players in the local lighting equipment market, it was not anticipated that pure “non-participant” distributors or contractors could be found.
- The 1995 program year when rebates were not offered by Edison was compared to 1996 for distributors and contractors, who were asked to report their breakdown of sales by efficiency and size for both years.
- In addition to these sales data, dealers were asked about their perceptions of customer attitudes and of market barriers -- both within and outside Edison’s territory -- to gauge the impact of the Edison programs.

ON THE FOLLOWING PAGES, SALES OF HIGH-EFFICIENCY LIGHTING REPORTED BY VENDORS ARE DISCUSSED.

Lighting Vendor Technologies (Weighted by Fixtures)

Result	Edison	No-Program	Audit-Only
N	27	24	26
1996 - % T8 Lamps and Electronic Ballasts	42.0%	32.8%	37.0%
1996 - % Energy Saver Lamps and Electronic Ballasts	10.8%	4.8%	12.3%
1996 - % Energy Saver Lamps and Magnetic Ballasts	25.8%	1.1%	5.6%
1996 - % T12 Lamps and Magnetic Ballasts	21.4%	61.3%	45.1%
1995 - % T8 Lamps and Electronic Ballasts	27.7%	20.5%	21.4%
1995 - % Energy Saver Lamps and Electronic Ballasts	4.6%	4.5%	3.7%
1995 - % Energy Saver Lamps and Magnetic Ballasts	16.7%	1.2%	7.1%
1995 - % T12 Lamps and Magnetic Ballasts	51.1%	73.8%	67.8%
1996 - T8 Lamp Availability (1 to 6 scale)	5.84	5.98	5.07
1995 - T8 Lamp Availability (1 to 6 scale)	5.10	4.60	3.54
% Difference in Cost - T8 Lamps v. T12 Lamps	35.2%	39.5%	33.1%
1996 - Electronic Ballast Availability (1 to 6 scale)	4.57	5.37	4.76
1995 - Electronic Ballast Availability (1 to 6 scale)	3.38	4.56	2.91
% Difference in Cost - Electronic Ballasts v. Magnetic Ballasts	45.4%	25.9%	30.4%
1996 - % Reflectors	25.1%	28.7%	63.1%
1995 - % Reflectors	24.7%	28.5%	50.3%
1996 - % EMS	3.1%	0.5%	9.3%
1995 - % EMS	1.6%	0.5%	9.1%

DISTRIBUTORS AND CONTRACTORS IN EDISON'S SERVICE TERRITORY REPORTED A HIGHER PROPORTION OF T-8 LAMPS AND ELECTRONIC BALLASTS SOLD THAN DID DISTRIBUTORS AND CONTRACTORS IN OTHER SERVICE TERRITORIES.

- Even though there were no rebate programs in effect in 1995, the percentage of lighting sales accounted for by T-8 lamps and electronic ballasts was significantly higher in Edison's service territory than in either the audit-only or no-program territories.
 - California vendors in 1995 reported that the combination of T-8 lamps and electronic ballasts accounted for a much larger share of sales than reported by vendors in the no-program and audit-only territories.
 - In contrast to the other territories, where standard efficiency T-12 lamps and magnetic ballasts accounted for approximately two-thirds of sales in 1995, standard efficiency lighting represented less than half of the market in Edison territory. The fact that this occurred in 1995 (a year when rebates were not offered) seems to strongly support market effects.
- For 1996, Edison vendors also reported both the largest share of T-8 lamps and electronic ballasts and the lowest share of T-12s with magnetic ballasts. Vendors in the other territories did, however, report a relatively larger increase in the percentage of efficient lighting, indicating that the national market may have been catching up with (and perhaps being influenced by) the California market.
- The higher level of sales of efficient lighting in Edison territory comes despite the relatively high incremental cost of both T-8 lamps and electronic ballasts reported by California vendors. In addition, Edison territory vendors reported lower levels of both reflector installations in both 1995 and 1996.

Lighting Vendor Barriers and Attitudes

Result	Edison	No-Program	Audit-Only
N	27	24	26
Barriers (agreement on 1 to 10 scale)			
Difficult to Find Good Supplier of EE	2.85	2.13	2.62
Cannot Easily Get Delivery of EE	1.89	2.04	2.38
More of a Hassle to Sell EE	3.89	4.00	4.69
Difficult to Explain Value of EE	4.19	3.79	4.62
No Added Value from Promoting EE	4.93	4.83	7.62
Unwilling to Stake Reputation on Reliability of EE	2.78	2.88	3.62
Additional Cost and Effort to Install and Service EE Not Worthwhile	2.00	2.25	3.12
Selling EE Could Damage Reputation for Quality	1.70	1.67	2.00
Sell More EE If Had Just Particular Features Customers Need	4.19	1.83	5.08
Lose Sales to Competitors Selling Standard	5.67	5.04	5.50
Mean of All Barriers	3.41	3.05	4.12
Attitudes (1 to 6 scale)			
Importance of EE to Customers	4.04	3.00	3.85
How Informed Customers Are of EE Options	2.44	2.54	2.50
How Receptive Customers Are to Installing EE Equipment	4.00	3.00	3.19
Importance of EE to Customers to Reduce Operating Costs	4.19	3.50	4.65
Importance of Customer's Energy Concerns Compared to Other Business Concerns	4.19	3.50	4.65
Mean of All Attitude Questions	3.77	3.11	3.77

DESPITE THEIR RELATIVELY HIGH SALES OF EFFICIENT LIGHTING, VENDORS IN EDISON'S TERRITORY REPORT HIGHER LEVELS OF BARRIERS THAN THEIR COUNTERPARTS IN THE NO-PROGRAM TERRITORY, SUGGESTING THAT ANY OBSERVED MARKET EFFECTS MAY BE DIFFICULT TO SUSTAIN.

- Edison territory vendors reported mean barriers that are higher than those for the no-program territory, but lower than those for vendors in the audit-only territory. Neither difference was, however, statistically significant.
 - The highest barrier reported was the concern that vendors who offer high efficiency lighting would lose sales to competitors selling standard lighting.
 - The lowest barrier levels were reported for availability issues and for concerns that EE lighting could damage a firm's reputation for quality.
- Edison vendors and vendors in audit-only territories ranked their customers' interest in and knowledge of energy efficiency higher than vendors in the no-program territory.

ON BALANCE, WHILE THE ATTITUDES AND PERCEPTIONS OF VENDORS DO NOT PROVIDE A CONVINCING CASE FOR MARKET EFFECTS, THE HIGHER PROPORTION OF EFFICIENT LIGHTING SOLD BY EDISON TERRITORY VENDORS APPEARS TO OFFER SOME SUPPORT FOR MARKET EFFECTS.

DESIGN/ENGINEERING FIRMS IN EDISON'S SERVICE TERRITORY WERE MORE LIKELY TO SPECIFY ENERGY-EFFICIENT LIGHTING THAN WERE SIMILAR FIRMS IN NO-PROGRAM TERRITORIES.

- More than 80 percent of fluorescent lighting specifications by architects and engineering firms in Edison's territory were high efficiency in 1996, a higher proportion than in the comparison territories. This difference was not statistically significant, however.
- Even in 1995, an audit-only year in Edison's territory, the percentage of installations specified as high efficiency was higher than in the comparison territories.
- As noted elsewhere, design/engineering firms in Edison's territory also specified energy management systems for over half their lighting specifications.
- Designers are most likely to be directly influenced by energy efficiency requirements for new construction, which appear to be shaping their practices for all their specifications.
- The move toward high efficiency lighting in the California design community suggests that observed changes in lighting are likely to be sustained; moreover, the lighting design community appears to be an excellent target for continued market intervention efforts.

ON BALANCE, THE DESIGN/ENGINEERING COMMUNITY IN EDISON'S SERVICE TERRITORY APPEARS TO HAVE BEEN MOVED TOWARD SPECIFYING HIGHER EFFICIENCY LIGHTING.

THE POSITIVE AND NEGATIVE INDICATORS OF MARKET EFFECTS PROVIDED BY TESTING EACH OF THE HYPOTHESES FOR LIGHTING ARE SUMMARIZED IN THE EXHIBIT BELOW.

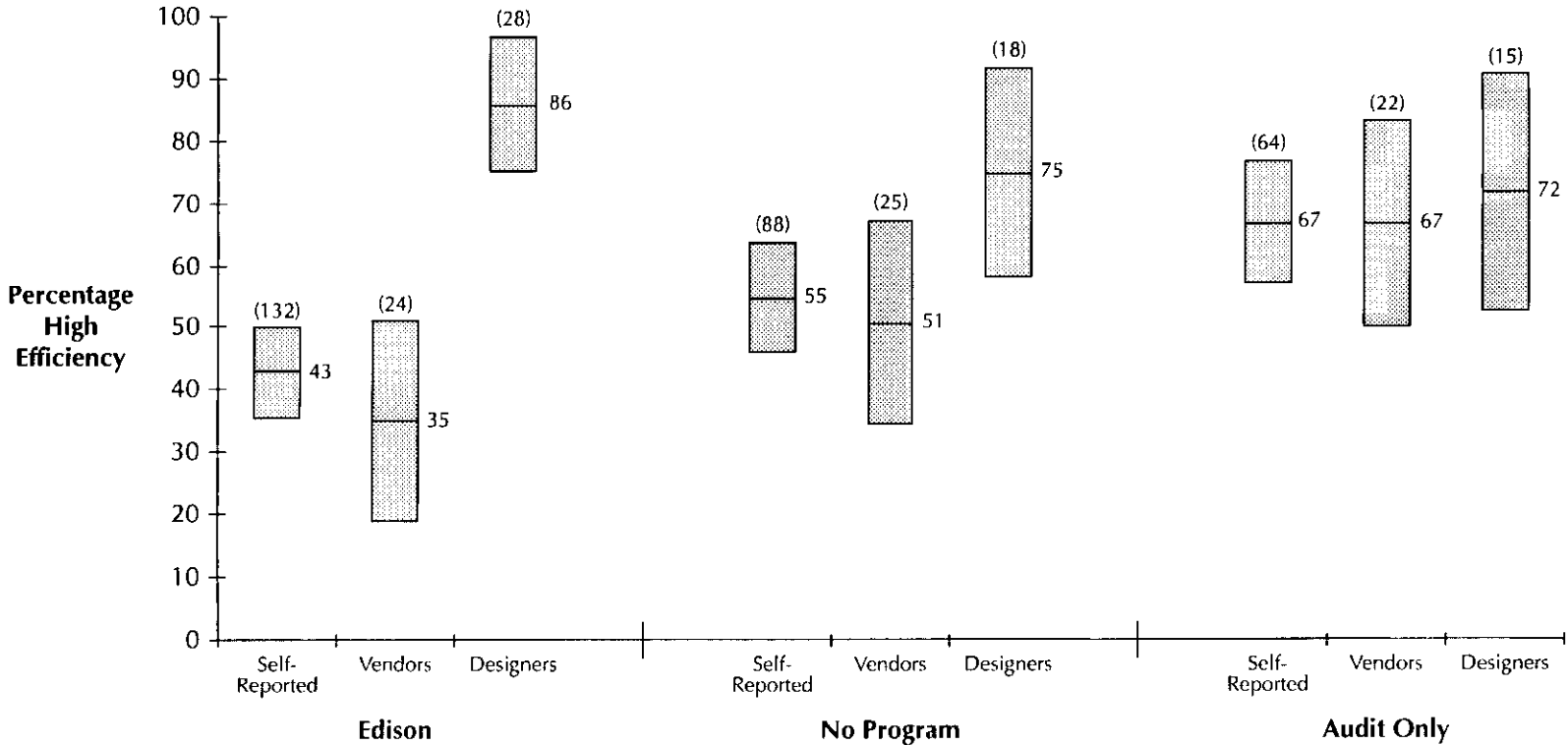
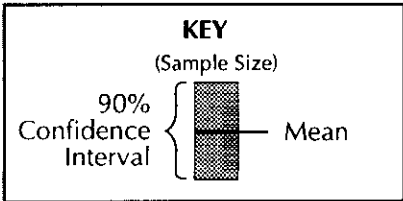
Conclusions - Lighting

	Supporting	Not Supporting	Conclusion
Hypothesis 1 Customer Effects	<p>More (but not significantly) energy efficient installations self reported in Edison territory; tax forms corroborate</p> <p>Significantly higher response for importance of energy efficiency</p> <p>Significantly higher level of familiarity with EE lighting among future replacers in Edison territory than other territories.</p> <p>Somewhat lower overall mean barrier level, but not significant</p>	Higher response for "too many resources required"	● ● ●
Hypothesis 2 Manufacturer Effects	Higher availability of T-8s in 1995 and 1996; appears to have led the market	Lower availability of electronic ballasts	● ●
Hypothesis 3 Vendor Effects	<p>Higher (but not significantly) proportion of EE lighting sold</p> <p>More favorable perception of customer attitudes toward EE</p>	<p>Higher incremental cost of electronic ballasts, T8s</p> <p>Lower proportion of reflectors</p> <p>Higher levels of vendor-perceived barriers</p>	● ●
Hypothesis 4 Designer Effects	Higher proportion of EE lighting specified		● ● ●

● ● ● ● ●	Conclusive support for market effects
● ● ● ●	Strong support for market effects
● ● ●	Moderate support for market effects
● ●	Weak support for market effects
●	No support for market effects

3.2 MEASURE-SPECIFIC RESULTS – HVAC

**Edison Market Effects
HVAC -- Percentage High Efficiency
Summary of Results**

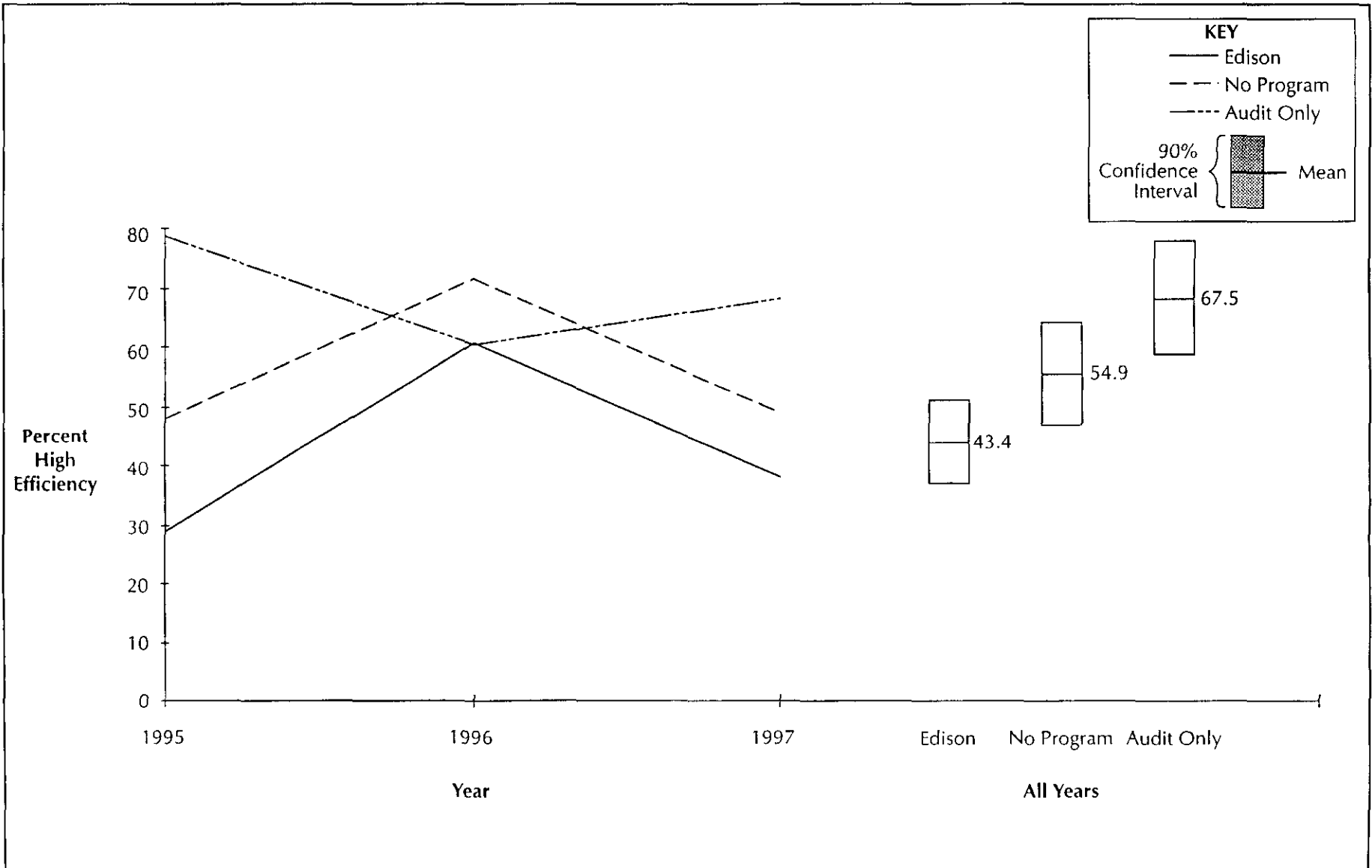


ESTIMATES OF THE PERCENTAGE OF HIGH EFFICIENCY HVAC INSTALLATIONS FROM VARIOUS INFORMATION SOURCES, PRESENTED IN THE FACING EXHIBIT, INDICATE THAT NONPARTICIPANTS IN EDISON'S TERRITORY WERE GENERALLY LESS LIKELY TO INSTALL THIS TECHNOLOGY THAN CUSTOMERS IN OTHER TERRITORIES.

- Self-report data indicate that 43 percent of the Edison customers who purchased packaged air conditioning units installed high efficiency models, statistically significantly less than the 55 percent for the no-program and 67 for the audit-only territories.
- Among HVAC vendors, those in Edison's territory reported a significantly lower proportion of high efficiency HVAC units sold across all size ranges.
- A&E firms in Edison territory were more likely to specify high efficiency HVAC than firms in the no-program or audit-only territories.

CUSTOMER ACTIONS AND PERCEIVED BARRIERS ARE EXAMINED IN GREATER DETAIL BELOW.

**Percent High Efficiency Installation
By Year and Overall -- Packaged Air Conditioning**



BASED UPON SELF-REPORTED CUSTOMER DATA, THE SHARE OF EFFICIENT HVAC WAS SIGNIFICANTLY LOWER FOR EDISON NONPARTICIPANTS THAN FOR THE AUDIT-ONLY TERRITORY.

- Edison nonparticipants had a lower self-reported percentage of efficient HVAC installations than either no-program or audit-only territories. As shown in the facing exhibit, efficient installations in Edison territory were significantly lower than those in the audit-only territory.
- While the relatively small sample sizes for replacements in individual years limit the extent to which conclusion can be drawn for individual years, the 1995 results indicate a particularly low proportion of efficient HVAC installed.

AS AN ADDITIONAL INDICATOR OF MARKET EFFECTS, CUSTOMER ATTITUDES AND PERCEPTIONS OF BARRIERS TO THE INSTALLATION OF ENERGY EFFICIENT HVAC UNITS ARE EXAMINED NEXT.

ATTITUDES TOWARD ENERGY EFFICIENCY AMONG CUSTOMERS WHO INSTALLED HVAC UNITS WERE MORE FAVORABLE THAN FOR THE OVERALL POPULATION, BOTH WITHIN EDISON'S SERVICE TERRITORY AND IN OTHER AREAS.

- Edison customers responding to the current survey who installed HVAC had a higher mean rating (5.35) than the overall population (5.17), although the difference was not statistically significant. Edison customers who installed HVAC assigned a higher level of importance than the general population for each of the five questions asked.
- Compared to other territories, Edison customers assigned a higher priority to improving energy efficiency to reduce operating costs than their counterparts in either the no-program or audit-only territories. This same pattern prevailed for the other attitude questions, with the exception of "recycling more to protect the environment," where Edison nonparticipant mean responses were identical to those of no-program territory customers.

HVAC Barriers
-- Mean Barrier Levels --

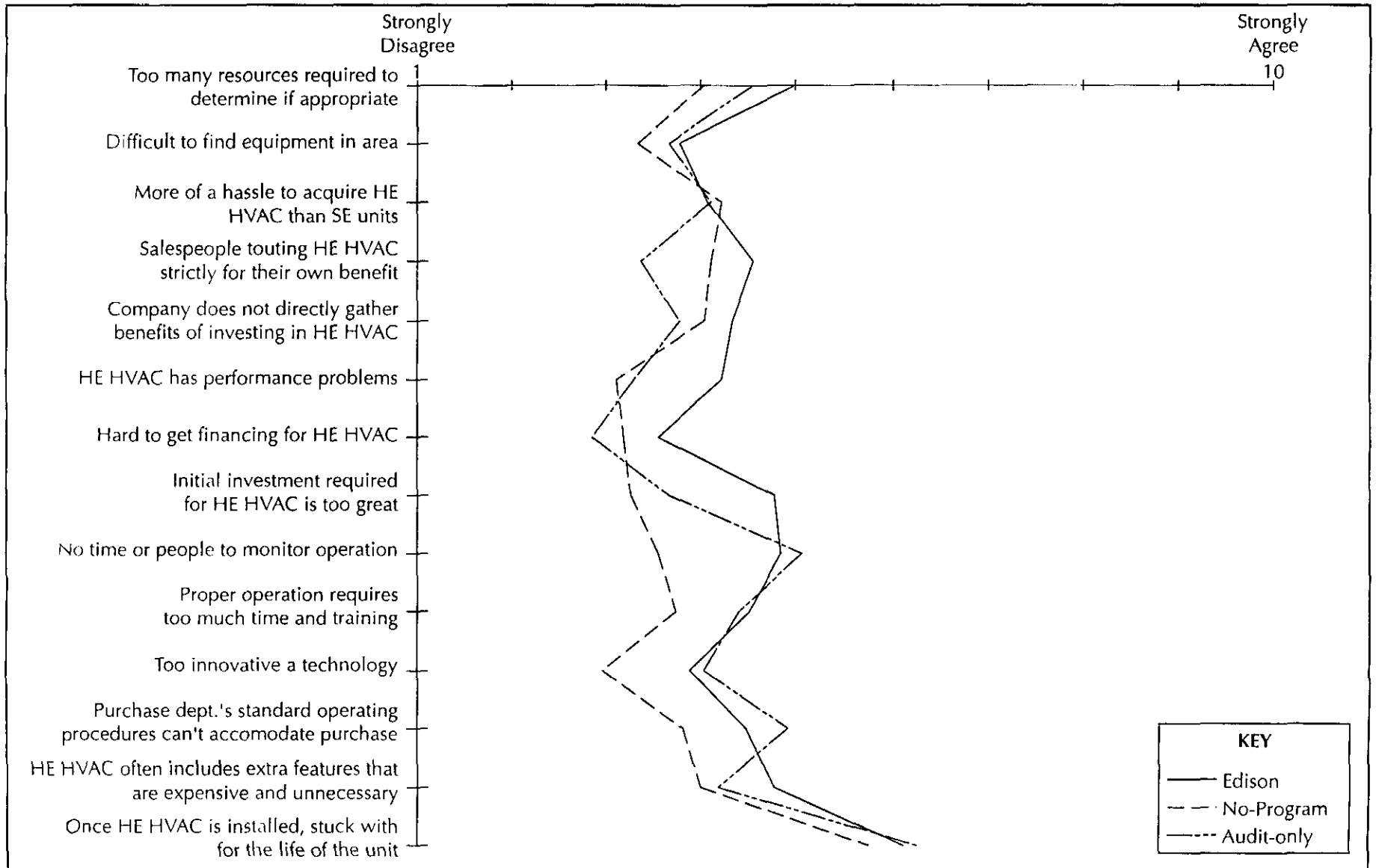
Service Territory	Result	Total
Edison	Future	4.86
	Replaced	4.48
	High Efficient	3.90
	Standard Efficient	5.15
No Program	Future	3.84
	Replaced	3.79
	High Efficient	3.18
	Standard Efficient	4.55
Audit Only	Future	4.26
	Replaced	4.14
	High Efficient	3.98
	Standard Efficient	4.16

FOR CUSTOMERS WHO REPLACED HVAC, PERCEIVED MARKET BARRIERS TO THE ADOPTION OF ENERGY EFFICIENT UNITS WERE FOUND TO BE SIGNIFICANTLY HIGHER IN EDISON'S SERVICE TERRITORY THAN IN EITHER AUDIT-ONLY OR NO-PROGRAM TERRITORIES.

- The facing exhibit shows the mean level of self-reported barriers for all customers installing or planning to install HVAC in various service territories.
 - Among customers who replaced, the average of all barriers was significantly higher in Edison territory than in the audit-only and no-program territories.
 - Edison customers with plans to replace HVAC in the future also reported higher overall barriers than customers in either of the other two territories.
- In all service territories, customers who installed energy efficient HVAC perceived lower barriers than those who installed standard efficiency models, with Edison customers who installed standard efficiency units reporting the highest mean barrier level of any group.

INDIVIDUAL BARRIERS TO THE ADOPTION OF ENERGY EFFICIENT HVAC ARE DISCUSSED ON THE FOLLOWING PAGES. THE INTERACTION OF THESE BARRIERS IS DISCUSSED IN GREATER DETAIL IN THE NEXT SECTION OF THE REPORT.

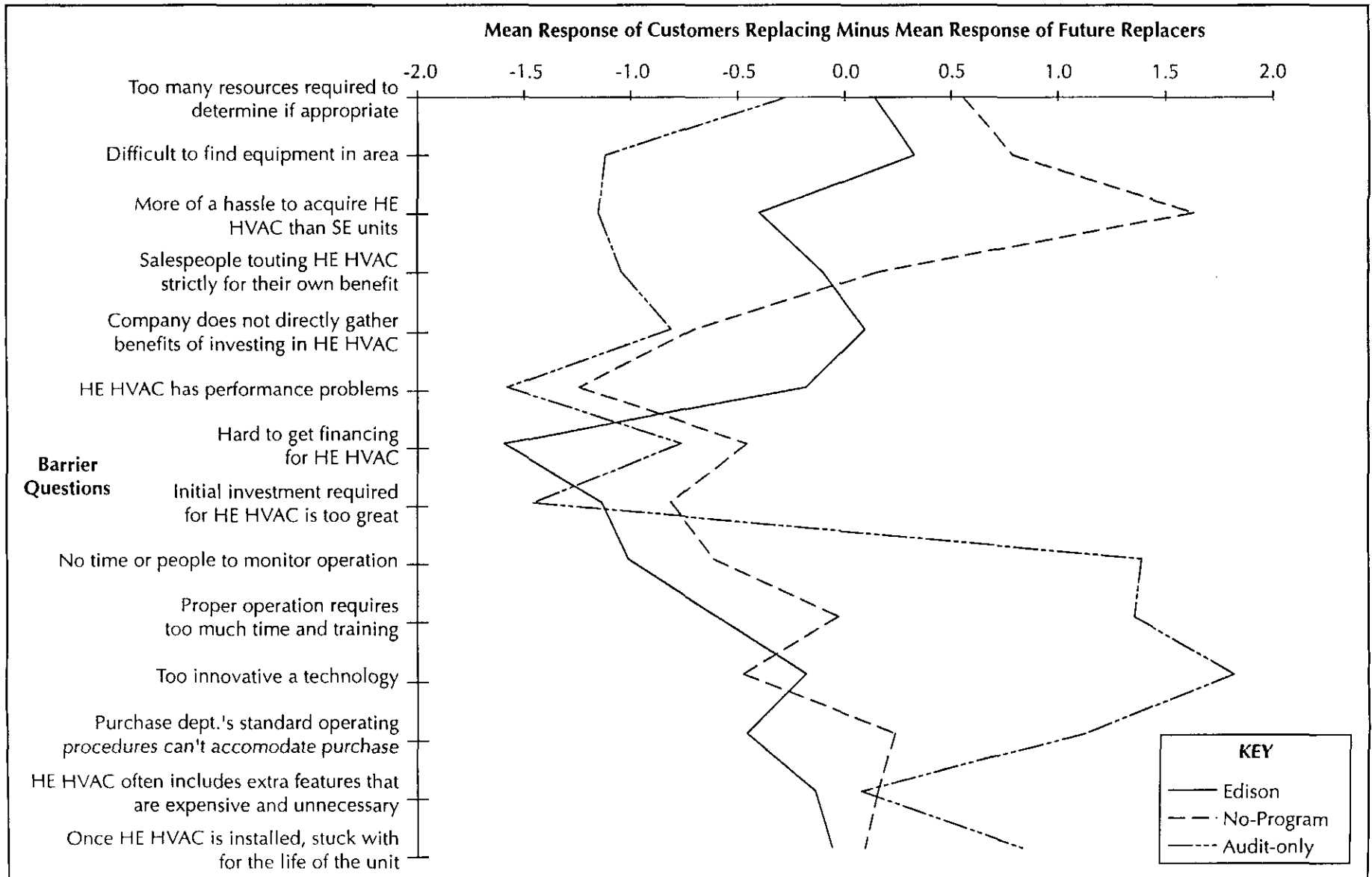
HVAC Barriers Mean Responses to Barrier Questions by Territory



EDISON NONPARTICIPANTS REPORTED THE HIGHEST LEVEL OF PERCEIVED BARRIERS FOR NINE OF THE 14 BARRIER QUESTIONS ASKED AND THE LOWEST FOR ONLY ONE.

- Among customers who replaced HVAC, barriers were highest for Edison customer for 9 of the 14 barrier questions, with two of the differences statistically significant. These included:
 - HE HVAC has performance problems
 - The initial investment required for HE HVAC is too high
- The mean response to barrier questions was lowest in Edison's territory for the statement "acquiring HE HVAC is more of a hassle," but the difference between this and the mean responses for other territories was not statistically significant.
- The fact that barriers relating both to the initial acquisition of HE HVAC units and to their ongoing operation were perceived as substantially greater in Edison territory may help explain the limited acceptance of HE units among replacing customers.

HVAC Barriers -- Future vs. Replaced
Differences in Mean Responses to Barrier Questions by Territory



AMONG CUSTOMERS WHO WERE PLANNING TO REPLACE HVAC UNITS, MEAN RESPONSES TO BARRIER QUESTIONS WERE SIGNIFICANTLY HIGHER IN EDISON TERRITORY FOR THREE OF THE 14 BARRIER QUESTIONS ASKED.

- Future replacers in Edison territory reported the highest mean levels for ten barriers, including three for which the differences were statistically significant. These three were:
 - Hard to get financing for HE HVAC
 - No resources to monitor operation of HE HVAC equipment
 - HE HVAC requires too much time and training
- To the extent that differences between perceived barriers for actual and future replacers represent a degree of “learning” as a result of the purchase process, those differences were substantial for only three of the barrier questions. For other barriers, actual replacers appear to have retained the perceptions of high barriers described above.
- Future replacers in Edison territory reported the lowest mean response to the statement, “Someone else gathers the benefit of HE HVAC,” but the difference was not statistically significant.

HVAC Contractor Technologies (Weighted by Units)

Result	Edison	No-Program	Audit-Only
N	24	25	22
1996 - Overall % High Efficient	34.8%	51.4%	67.3%
1995 - Overall % High Efficient	31.3%	46.3%	63.1%
1996 - Overall High Efficient Availability (1 to 6 scale)	5.37	5.70	5.76
1995 - Overall High Efficient Availability (1 to 6 scale)	5.15	5.61	5.68
% Overall Difference in Cost - High v. Standard	25.2%	35.2%	25.5%
1996 - % EMS	3.1%	0.2%	11.2%
1995 - % EMS	2.5%	0.2%	10.6%
% Units Single-Phase LT 65,000 BTU	54.8%	49.4%	64.7%
1996 - % High Efficient	28.1%	35.1%	66.7%
1995 - % High Efficient	23.3%	28.2%	62.9%
1996 - High Efficient Availability (1 to 6 scale)	5.58	5.91	5.81
1995 - High Efficient Availability (1 to 6 scale)	5.23	5.91	5.81
% Difference in Cost - High v. Standard	24.8%	31.4%	24.9%
% Units Three-Phase LT 65,000 BTU	22.8%	7.7%	8.8%
1996 - % High Efficient	39.1%	50.9%	45.0%
1995 - % High Efficient	36.8%	42.5%	41.4%
1996 - High Efficient Availability (1 to 6 scale)	5.46	5.45	5.43
1995 - High Efficient Availability (1 to 6 scale)	5.33	5.45	5.14
% Difference in Cost - High v. Standard	26.9%	36.8%	29.8%
% Units Three-Phase 65,000-135,000 BTU	16.5%	35.6%	19.6%
1996 - % High Efficient	48.8%	68.5%	74.8%
1995 - % High Efficient	47.3%	65.9%	67.0%
1996 - High Efficient Availability (1 to 6 scale)	5.00	5.65	5.64
1995 - High Efficient Availability (1 to 6 scale)	5.00	5.48	5.36
% Difference in Cost - High v. Standard	24.1%	37.4%	23.0%
% Units Three-Phase GT 135,000 BTU	5.9%	7.3%	6.9%
1996 - % High Efficient	41.9%	78.6%	81.1%
1995 - % High Efficient	39.8%	77.1%	81.1%
1996 - High Efficient Availability (1 to 6 scale)	4.06	4.86	6.00
1995 - High Efficient Availability (1 to 6 scale)	4.06	4.43	6.00
% Difference in Cost - High v. Standard	24.7%	47.9%	32.8%

THE HYPOTHESIS THAT EDISON PROGRAMS HAVE AFFECTED MANUFACTURER PRODUCT MIX AND PRACTICES WAS ADDRESSED THROUGH THE PERCEPTIONS OF VENDORS WHO DEAL DIRECTLY WITH HVAC MANUFACTURERS.

- Contractors in Edison territory reported a lower level of availability of high-efficiency HVAC units than either no-program or audit-only territory contractors.
- For both Edison and the other territories surveyed, the availability of efficient HVAC (reported on a 1 to 6 scale) increased only slightly between 1995 and 1996 – less than for any of the other measures investigated.
- This suggests that efficient HVAC is a more mature technology for which the major increases in product availability have already occurred, but it does not support the hypothesis that Edison programs contributed to this change.

THE HYPOTHESIS THAT EDISON PROGRAMS CONTRIBUTED TO INCREASED AVAILABILITY OF HIGH-EFFICIENCY HVAC UNITS CANNOT BE CONCLUSIVELY DEMONSTRATED.

THE HYPOTHESIS THAT EDISON PROGRAMS HAVE CHANGED VENDOR ATTITUDES AND PRACTICES WAS TESTED USING BOTH ATTITUDE DATA AND INFORMATION ON PRODUCT SALES.

- Given the pervasive nature of the Edison programs among major players in the local HVAC market, it was not possible to find pure “nonparticipant” contractors in Edison’s territory. Data for these vendors therefore reflect the direct influence of Edison’s programs as well as market effects.
- The 1995 program year (when no rebates were offered by Edison) was compared to 1996 for vendors, who were asked to report their breakdown of sales by efficiency and size for both years.
- In addition to these sales data, dealers -- both within and outside Edison’s territory -- were asked about their perceptions of customer attitudes and of market barriers to gauge the impact of the Edison programs.

ON THE FOLLOWING PAGES, SALES OF HIGH-EFFICIENCY HVAC REPORTED BY VENDORS ARE DISCUSSED.

HVAC Contractor Technologies (Weighted by Units)

Result	Edison	No-Program	Audit-Only
N	24	25	22
1996 - Overall % High Efficient	34.8%	51.4%	67.3%
1995 - Overall % High Efficient	31.3%	46.3%	63.1%
1996 - Overall High Efficient Availability (1 to 6 scale)	5.37	5.70	5.76
1995 - Overall High Efficient Availability (1 to 6 scale)	5.15	5.61	5.68
% Overall Difference in Cost - High v. Standard	25.2%	35.2%	25.5%
1996 - % EMS	3.1%	0.2%	11.2%
1995 - % EMS	2.5%	0.2%	10.6%
% Units Single-Phase LT 65,000 BTU	54.8%	49.4%	64.7%
1996 - % High Efficient	28.1%	35.1%	66.7%
1995 - % High Efficient	23.3%	28.2%	62.9%
1996 - High Efficient Availability (1 to 6 scale)	5.58	5.91	5.81
1995 - High Efficient Availability (1 to 6 scale)	5.23	5.91	5.81
% Difference in Cost - High v. Standard	24.8%	31.4%	24.9%
% Units Three-Phase LT 65,000 BTU	22.8%	7.7%	8.8%
1996 - % High Efficient	39.1%	50.9%	45.0%
1995 - % High Efficient	36.8%	42.5%	41.4%
1996 - High Efficient Availability (1 to 6 scale)	5.46	5.45	5.43
1995 - High Efficient Availability (1 to 6 scale)	5.33	5.45	5.14
% Difference in Cost - High v. Standard	26.9%	36.8%	29.8%
% Units Three-Phase 65,000-135,000 BTU	16.5%	35.6%	19.6%
1996 - % High Efficient	48.8%	68.5%	74.8%
1995 - % High Efficient	47.3%	65.9%	67.0%
1996 - High Efficient Availability (1 to 6 scale)	5.00	5.65	5.64
1995 - High Efficient Availability (1 to 6 scale)	5.00	5.48	5.36
% Difference in Cost - High v. Standard	24.1%	37.4%	23.0%
% Units Three-Phase GT 135,000 BTU	5.9%	7.3%	6.9%
1996 - % High Efficient	41.9%	78.6%	81.1%
1995 - % High Efficient	39.8%	77.1%	81.1%
1996 - High Efficient Availability (1 to 6 scale)	4.06	4.86	6.00
1995 - High Efficient Availability (1 to 6 scale)	4.06	4.43	6.00
% Difference in Cost - High v. Standard	24.7%	47.9%	32.8%

IN ALL SIZE RANGES, CONTRACTORS IN EDISON'S SERVICE TERRITORY REPORTED A LOWER PROPORTION OF HIGH EFFICIENCY HVAC SOLD THAN DID VENDORS IN OTHER SERVICE TERRITORIES.

- The lower share of efficient HVAC units was reported by Edison contractors despite reported incremental costs for HE equipment that were, on average, lower than those for either of the comparison territories.
- The percentage of efficient systems sold by Edison contractors was lowest for the larger units.
 - In 1996, fewer than 50 percent of the 65-135,000 BTUh units sold by Edison vendors met high efficiency criteria, compared to 69 percent for the no-program and 75 percent for the audit-only groups.
 - The same pattern prevailed for three phase units greater than 135,000 BTUh, where the percentage of efficient units sold by no-program and audit-only territory vendors was almost twice as high as the percentage sold by Edison area contractors.

Overall HVAC Vendor Barriers and Attitudes

Result	Edison	No-Program	Audit-Only
N	29	25	25
Barriers (agreement on 1 to 10 scale)			
Difficult to Find Good Supplier of EE	2.24	2.00	1.52
Cannot Easily Get Delivery of EE	2.03	2.36	1.48
More of a Hassle to Sell EE	4.93	3.76	3.72
Difficult to Explain Value of EE	5.45	3.20	3.24
No Added Value from Promoting EE	5.59	5.16	4.56
Unwilling to Stake Reputation on Reliability of EE	2.28	2.16	2.84
Additional Cost and Effort to Install and Service EE Not Worthwhile	2.07	1.76	1.84
Selling EE Could Damage Reputation for Quality	1.38	1.20	1.36
Sell More EE If Had Just Particular Features Customers Need	3.59	3.04	3.24
Lose Sales to Competitors Selling Standard	5.66	4.88	4.60
Mean of All Barriers	3.52	2.95	2.84
Attitudes (1 to 6 scale)			
Importance of EE to Customers	3.88	4.48	4.76
How Informed Customers Are of EE Options	3.41	3.28	3.80
How Receptive Customers Are to Installing EE Equipment	3.55	3.92	4.28
Importance of EE to Customers to Reduce Operating Costs	4.31	4.76	4.84
Importance of Customer's Energy Concerns Compared to Other Business Concerns	2.90	3.68	3.80
Mean of All Attitude Questions	3.61	4.02	4.30

VENDORS IN EDISON'S TERRITORY REPORT HIGHER LEVELS OF BARRIERS THAN THEIR COUNTERPARTS IN OTHER SERVICE TERRITORIES.

- On average, Edison territory HVAC vendors had higher mean responses to barrier questions and reported a lower interest in energy efficiency among their customers than did vendors in other service territories.
 - The overall mean barrier level for Edison vendors was .57 to .68 points higher than for either of the comparison territory groups.
 - Vendor perceptions of customer awareness of and interest in energy efficiency, on the other hand, were about 0.4 to 0.7 points lower than for the comparison groups.
- Edison respondents had the highest mean responses to eight of the ten vendor barriers studied.

AVAILABLE DATA DO NOT APPEAR TO SUPPORT THE HYPOTHESIS THAT THE EDISON PROGRAMS HAVE CHANGED HVAC VENDOR ATTITUDES AND PRACTICES.

DESIGN/ENGINEERING FIRMS IN EDISON'S SERVICE TERRITORY SPECIFIED A SIGNIFICANTLY HIGHER PERCENTAGE OF ENERGY-EFFICIENT HVAC SYSTEMS THAN DESIGNERS IN OTHER TERRITORIES.

- In 1996, the percentage of high efficiency HVAC among all such installations specified by firms in Edison's service territory was 86 percent; the comparable figure was 75 percent for no-program territories and 73 percent for audit-only territories.
- In 1995, an audit-only year in Edison's territory, the percentage of installations specified as high efficiency was 82.5 percent -- higher than in either the no-program (64 percent) or audit-only (69 percent) comparison territories.
- For both the availability of high-efficiency HVAC and the incremental cost of high-efficiency units, the responses of Edison designers were between those of the two comparison groups, though none of the differences was statistically significant across territories.

DESIGN/ENGINEERING FIRMS IN EDISON'S TERRITORY WHO SPECIFIED HVAC INSTALLATIONS FOR THEIR CUSTOMERS PERCEIVED LOWER BARRIERS TO ENERGY EFFICIENCY THAN SIMILAR FIRMS IN THE COMPARISON TERRITORIES.

- The mean level for all barriers among designers was 4.6 in Edison's service territory and 4.9 for both the no-program and audit-only territories – not a statistically significant difference. Barrier perceptions were lowest for Edison designers in the following:
 - Difficult to find a good supplier of EE equipment
 - Difficult to explain value of EE equipment
 - Additional cost to install and service EE equipment not worthwhile
 - Specifying EE equipment could damage our reputation for quality
 - It would be easier to sell EE equipment if it had just the features customers need
 - We lose business to competitors who specify standard-efficiency equipment
- Edison design/engineering firms also reported a slightly higher level of interest in EE equipment among their customers, although the differences were not significant.
- As with lighting designers, the HVAC design community appears to be an excellent target for continued market intervention efforts.

ON BALANCE, THERE IS SOME EVIDENCE TO SUPPORT THE HYPOTHESIS THAT THE DESIGN/ENGINEERING COMMUNITY IN EDISON'S SERVICE TERRITORY HAS BEEN MOVED TOWARD SPECIFYING HIGHER EFFICIENCY HVAC UNITS.

THE POSITIVE AND NEGATIVE INDICATORS OF MARKET EFFECTS PROVIDED BY TESTING EACH OF THE HYPOTHESES FOR HVAC ARE SUMMARIZED IN THE EXHIBIT BELOW.

Conclusions - HVAC

	Supporting	Not Supporting	Conclusion
Hypothesis 1 Customer Effects		Significantly fewer energy efficient installations in Edison territory Highest response for 9 barriers, incl. 2 statistically significant	●
Hypothesis 2 Manufacturer Effects		Lower availability of EE HVAC	●
Hypothesis 3 Vendor Effects	Lower (but not significantly) incremental cost for EE HVAC	Lower proportion of EE HVAC sold Higher vendor barriers	●
Hypothesis 4 Designer Effects	Higher proportion of EE HVAC specified		●●

●●●●●	Conclusive support for market effects
●●●●	Strong support for market effects
●●●	Moderate support for market effects
●●	Weak support for market effects
●	No support for market effects

3.3 MEASURE-SPECIFIC RESULTS – MOTORS

Percentage High Efficiency Motors

Data Source	Self-report	Vendors	Designers
W/U	Weighted	Weighted*	Weighted
Territory	% installing HE	% HE Motors	% HE Motors
Edison	48	70	82
(N)	(132)	(37)	(28)
No Program	25		70
(N)	(88)		(18)
Audit-Only	36		83
(N)	(64)		(15)
All Non-Edison**		77	
(N)		(16)	

* By horsepower range as well as total sales

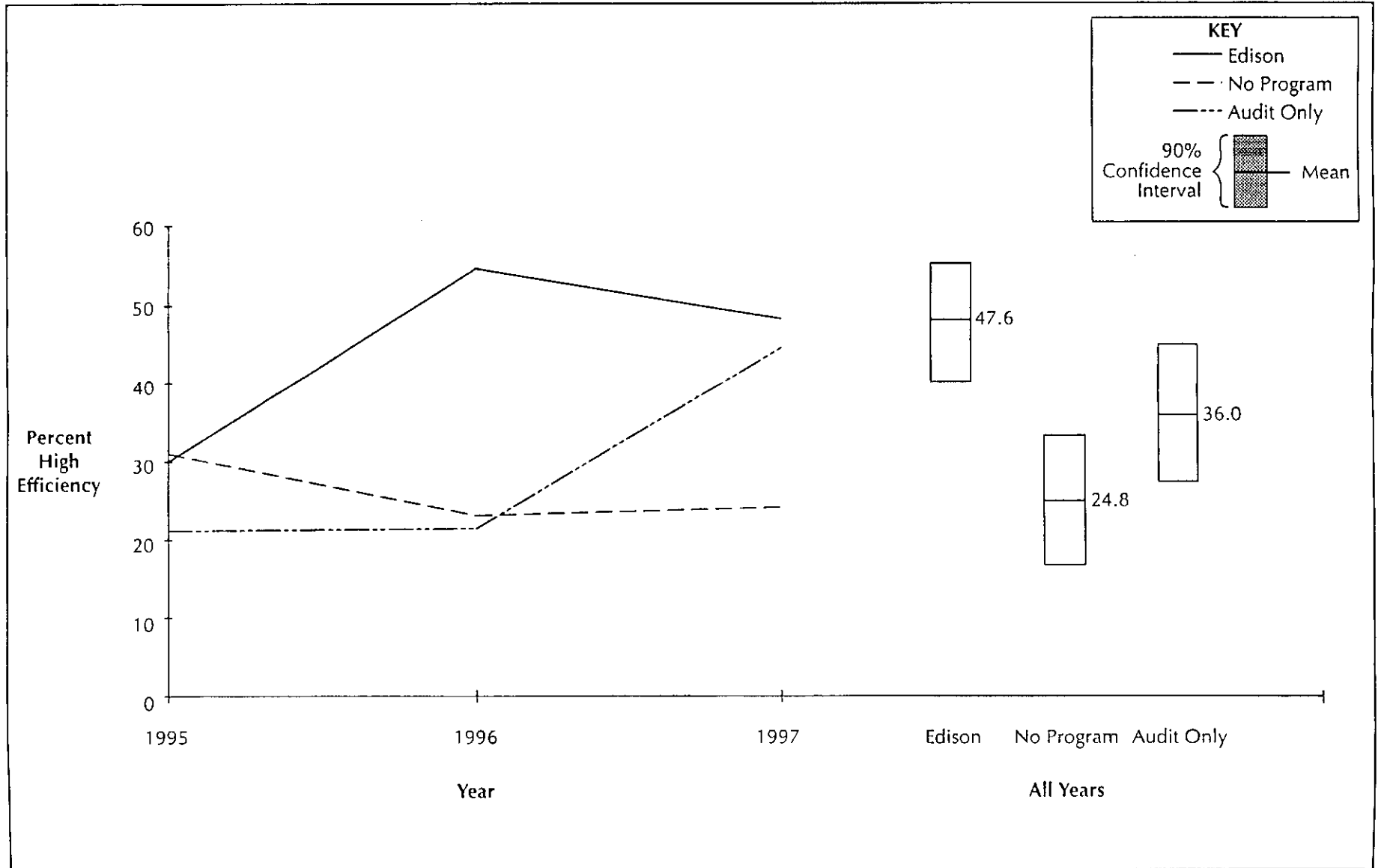
** Results for no-program and audit-only vendors were combined

ESTIMATES OF THE PERCENTAGE OF HIGH EFFICIENCY MOTOR INSTALLATIONS FROM VARIOUS INFORMATION SOURCES, PRESENTED IN THE FACING EXHIBIT, INDICATE THAT NONPARTICIPANTS IN EDISON'S TERRITORY WERE GENERALLY MORE LIKELY TO INSTALL THIS TECHNOLOGY THAN CUSTOMERS IN OTHER TERRITORIES.

- Self-report data indicate that 48 percent of the Edison customers who purchased motors installed high efficiency models, compared to 25 percent for the no-program and 36 percent for the audit-only territories.
- Among motor vendors, those in Edison territory reported a slightly lower proportion of high efficiency motors sold across all size ranges, although the differences were not statistically significant. (Because there were relatively few motor distributors in the no-program territories who would participate in the survey, results from the no-program and audit-only territories were combined.)
- A&E firms in Edison territory were more likely to specify high efficiency motors than firms in the no-program territory, and about as likely as firms in audit-only territories.

CUSTOMER ACTIONS AND PERCEIVED BARRIERS ARE EXAMINED IN GREATER DETAIL BELOW.

Percent High Efficiency Installation by Year and Overall -- Motors



BASED UPON SELF-REPORTED CUSTOMER DATA, THE SHARE OF EFFICIENT MOTORS WAS SIGNIFICANTLY HIGHER AMONG EDISON NONPARTICIPANTS THAN FOR THE NO-PROGRAM TERRITORY.

- Edison nonparticipants had a higher reported percentage of efficient motors installations than either no-program or audit-only territories. As shown in the facing exhibit, efficient installations in Edison territory were higher than those in the no-program territory. This difference was statistically significant at the 90 percent confidence level.
- While the relatively small sample sizes for replacements in individual years limit the extent to which conclusion can be drawn for individual years, the 1996 results indicate a particularly high proportion of efficient motors installed.

AS AN ADDITIONAL INDICATOR OF MARKET EFFECTS, CUSTOMER ATTITUDES AND PERCEPTIONS OF BARRIERS TO THE INSTALLATION OF ENERGY EFFICIENT MOTORS UNITS ARE EXAMINED NEXT.

ATTITUDES TOWARD ENERGY EFFICIENCY AMONG CUSTOMERS WHO INSTALLED MOTORS WERE MORE FAVORABLE THAN FOR THE OVERALL POPULATION, BOTH WITHIN EDISON'S SERVICE TERRITORY AND IN OTHER AREAS.

- Edison customers responding to the current survey who installed motors had a higher mean rating (5.35) than the overall population (5.17), although the difference was not statistically significant. Edison customers who installed motors assigned a higher level of importance than the general population for each of the five questions asked regarding attitudes toward energy efficiency.
- Compared to other territories, Edison customers assigned a higher priority to improving energy efficiency to reduce operating costs than their counterparts in either the no-program or audit-only territories. This same pattern prevailed for the other attitude questions, with the exception of "recycling more to protect the environment," where Edison nonparticipant mean responses were identical to those of no-program territory customers.

Motors Barriers
-- Mean Barrier Levels --

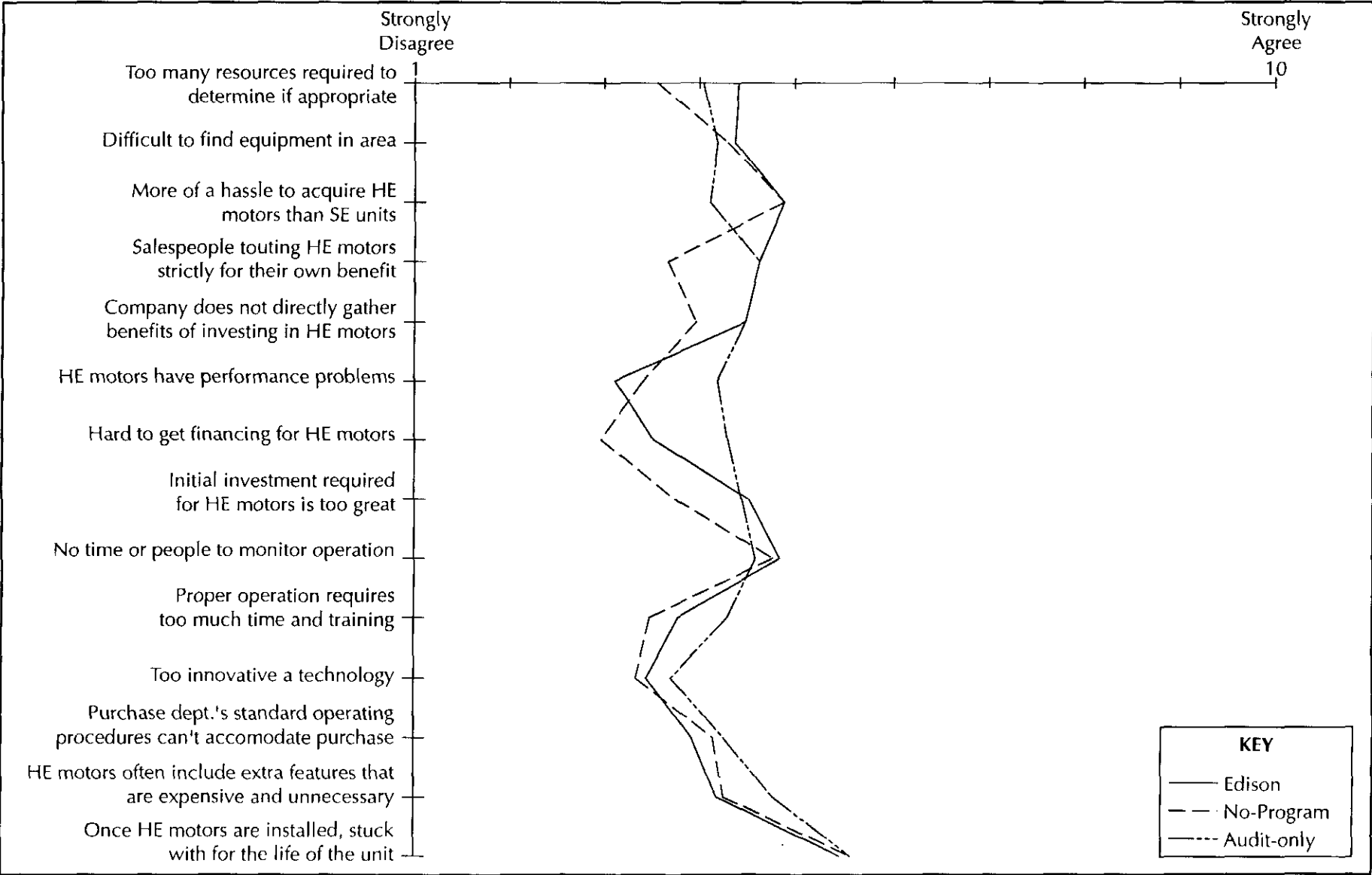
Service Territory	Result	Total
Edison	Future	4.52
	Replaced	4.25
	High Efficient	3.71
	Standard Efficient	4.47
No Program	Future	4.18
	Replaced	4.00
	High Efficient	3.32
	Standard Efficient	4.51
Audit Only	Future	3.92
	Replaced	4.38
	High Efficient	4.18
	Standard Efficient	4.82

FOR CUSTOMERS WHO REPLACED MOTORS, PERCEIVED MARKET BARRIERS TO THE ADOPTION OF ENERGY EFFICIENCY WERE FOUND TO BE NOT SIGNIFICANTLY DIFFERENT IN EDISON'S SERVICE TERRITORY THAN IN EITHER AUDIT-ONLY OR NO-PROGRAM TERRITORIES.

- The facing exhibit shows the mean level of self-reported barriers for all customers installing or planning to install motors in various service territories.
 - Among customers who replaced, the average of all barriers was slightly lower in Edison territory than for the audit-only territory, and slightly higher than in the no-program territory. None of the differences are statistically significant.
 - Edison customers with plans to replace motors in the future, however, reported higher overall barriers than customers in either of the other two territories, although, again, the differences were not statistically significant.
- In all service territories, customers who installed energy efficient motors perceived lower barriers than those who installed standard efficiency models, although the difference was smallest in Edison territory.

INDIVIDUAL BARRIERS TO THE ADOPTION OF ENERGY EFFICIENT MOTORS ARE DISCUSSED ON THE FOLLOWING PAGES. THE INTERACTION OF THESE BARRIERS IS DISCUSSED IN GREATER DETAIL IN THE NEXT SECTION OF THE REPORT.

Motors Barriers
Mean Responses to Barrier Questions by Territory

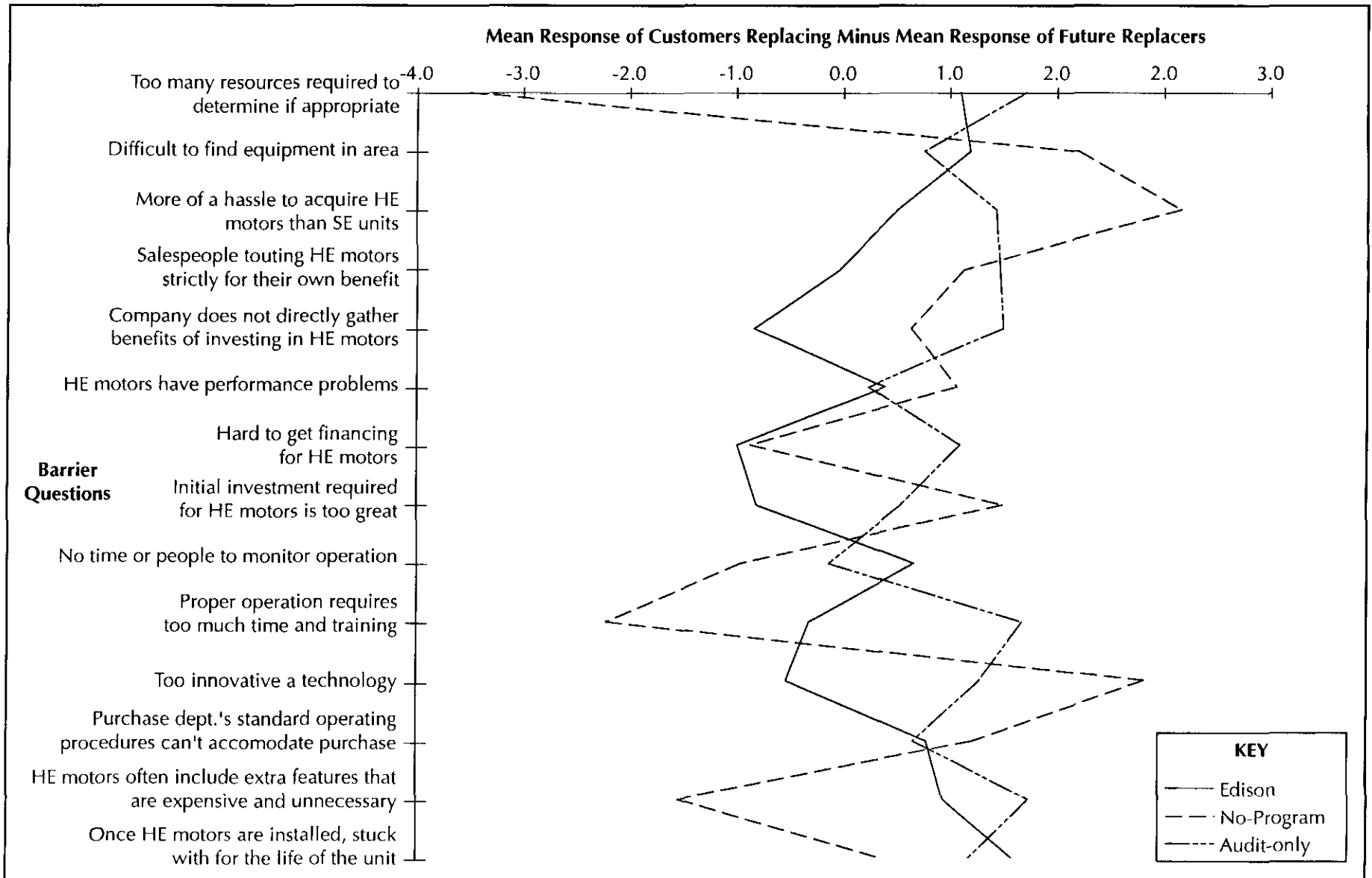


EDISON NONPARTICIPANTS REPORTED THE LOWEST LEVEL OF PERCEIVED BARRIERS FOR FOUR OF THE 14 BARRIER QUESTIONS ASKED AND THE HIGHEST FOR SIX.

- Among customers who replaced motors, barriers were lowest for Edison customers for four of the 14 barrier questions, but none of the differences were statistically significant. These barriers that were lower but not significantly so, included:
 - HE motors have performance problems
 - Purchasing department can't accommodate HE models
 - HE motors often include unnecessary extras
 - Once purchased, stuck with the equipment

- The mean response to barrier questions was highest in Edison's territory for six questions, although the differences were not statistically significant. These barriers that were higher, but not significantly so, included:
 - Too many resources required to determine if appropriate
 - Difficult to find HE motors in this area
 - Salesmen sell for their own benefit
 - Someone else gathers the benefit from our company installing HE motors
 - Initial investment too high
 - No resources to monitor operation of HE equipment

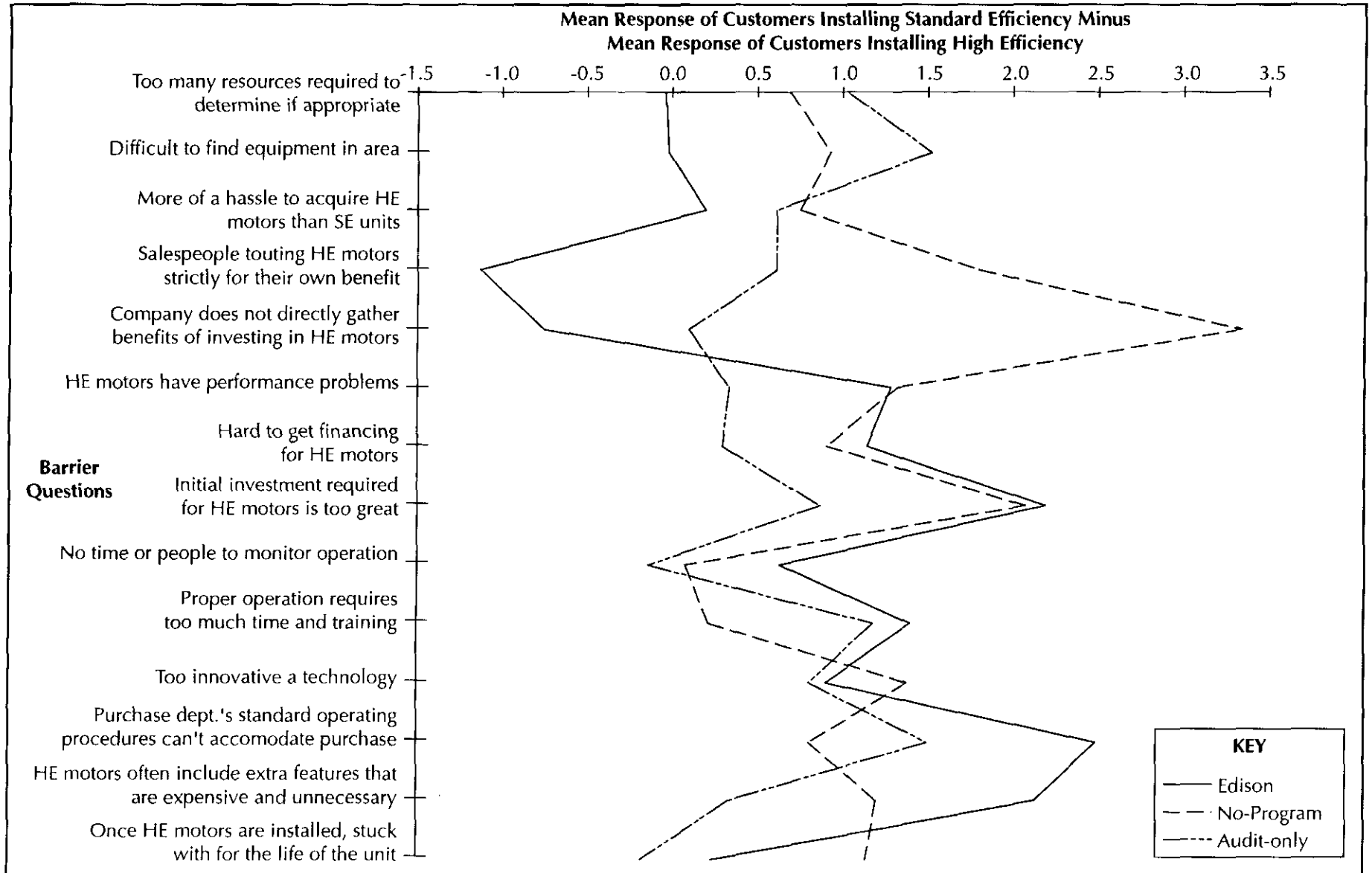
Motors Barriers -- Future vs. Replaced
Differences in Mean Responses to Barrier Questions by Territory



AMONG CUSTOMERS WHO WERE PLANNING TO REPLACE MOTORS, MEAN RESPONSES WERE SIGNIFICANTLY HIGHER IN EDISON TERRITORY FOR FIVE OF THE 14 BARRIER QUESTIONS ASKED.

- Future replacers in Edison territory reported the highest mean levels for eight barriers, including five for which the differences were statistically significant. These five included:
 - Acquiring HE is a hassle
 - Salesmen sell HE for their own benefit
 - Someone else gathers benefits of HE motors
 - HE motors have performance problems
 - Hard to get financing for HE motors
- The higher level of perceived barriers among future replacers may reflect a lack of awareness and understanding of the processes involved in equipment and selection. The fact that customers who have actually been through the equipment purchase process report lower barriers suggests that some barriers may have been reduced in Edison's service territory.

**Motors Barriers -- High vs. Standard Efficiency
Mean Responses to Barrier Questions by Territory**



IN ALL SERVICE TERRITORIES, CUSTOMERS WHO REPORTED INSTALLING EFFICIENT MOTORS PERCEIVED BARRIERS AS BEING LOWER THAN THOSE WHO INSTALLED STANDARD EFFICIENCY MODELS. THIS DIFFERENCE WAS SMALLEST FOR EDISON'S SERVICE TERRITORY.

- Installers of standard efficiency motors in Edison's territory had lower mean barrier responses than those in the comparison territories. A small difference in responses could be taken to mean that a particular barrier did not represent a significant obstacle to the installation of efficient motors.
- The smallest difference between high and standard efficiency installers in Edison's territory was observed for responses regarding:
 - Too many resources required to determine if appropriate
 - High efficiency is more of a hassle
 - Difficult to find HE motors in this area
- The greatest difference between installers of high and standard efficiency motors (and therefore the most significant perceived barriers to efficient installations) were found for responses to the following:
 - Initial investment required is too great
 - Purchasing department can't accommodate HE models
 - HE motors include expensive and unnecessary extras

BASED ON CUSTOMER-LEVEL RESULTS, WE CONCLUDE THAT THE OBSERVED DIFFERENCES IN CUSTOMER PURCHASE PATTERNS, ATTITUDES, AND PERCEIVED BARRIERS PROVIDE ONLY WEAK SUPPORT FOR A HYPOTHESIS OF MARKET EFFECTS IN EDISON'S SERVICE TERRITORY.

Customer-level indicators in support of market effects for Edison programs include the following:

- Edison nonparticipants had a higher reported percentage of efficient motors installations than either no-program or audit-only territories, although the percentage was statistically significantly higher only relative to the no-program territory.
- Edison customers who installed motors assigned a higher level of importance than the general population for each of the five questions asked regarding attitudes toward energy efficiency, but the differences were not statistically significant.
- The fact that customers in Edison's territory who have actually been through the equipment purchase process report lower barriers suggests that some barriers may have been reduced in Edison's service territory.
- Perceptions of barriers for customers who installed standard efficiency motors were not significantly different from the perceptions of customers who installed high efficiency models.

Motors Vendor Technologies (Weighted by Units)

Result	Edison	No-Program and Audit-Only
N	37	16
1996 - Overall % High Efficient	69.9%	76.7%
1995 - Overall % High Efficient	65.1%	66.9%
1996 - Overall High Efficient Availability (1 to 6 scale)	5.23	4.69
1995 - Overall High Efficient Availability (1 to 6 scale)	4.65	4.15
% Overall Difference in Cost - High v. Standard	20.0%	18.7%
1996 - % ASD	5.4%	18.0%
1995 - % ASD	5.5%	21.3%
% Motors LT 10 HP	58.8%	52.0%
1996 - % High Efficient	74.5%	70.7%
1995 - % High Efficient	67.6%	55.4%
1996 - High Efficient Availability (1 to 6 scale)	5.03	4.69
1995 - High Efficient Availability (1 to 6 scale)	4.26	4.13
% Difference in Cost - High v. Standard	20.8%	22.2%
% Motors 10-25 HP	18.5%	21.0%
1996 - % High Efficient	71.4%	81.8%
1995 - % High Efficient	69.2%	77.1%
1996 - High Efficient Availability (1 to 6 scale)	5.53	4.46
1995 - High Efficient Availability (1 to 6 scale)	4.98	3.91
% Difference in Cost - High v. Standard	20.2%	15.8%
% Motors 25-100 HP	17.9%	20.0%
1996 - % High Efficient	57.1%	82.5%
1995 - % High Efficient	55.6%	79.5%
1996 - High Efficient Availability (1 to 6 scale)	5.67	4.94
1995 - High Efficient Availability (1 to 6 scale)	5.56	4.43
% Difference in Cost - High v. Standard	18.8%	14.8%
% Motors GT 100 HP	4.8%	7.0%
1996 - % High Efficient	55.7%	89.3%
1995 - % High Efficient	54.2%	85.9%
1996 - High Efficient Availability (1 to 6 scale)	4.89	4.70
1995 - High Efficient Availability (1 to 6 scale)	4.81	4.19
% Difference in Cost - High v. Standard	13.9%	12.8%

THE HYPOTHESIS THAT EDISON PROGRAMS HAVE AFFECTED MANUFACTURER PRODUCT MIX AND PRACTICES WAS ADDRESSED THROUGH THE PERCEPTIONS OF VENDORS WHO DEAL DIRECTLY WITH MOTOR MANUFACTURERS.

- For both Edison and the other territories surveyed, the availability of efficient motors (reported on a 1 to 6 scale) increased by 0.5 or more between 1995 and 1996. Given the small size of the vendor sample, however, these differences were not statistically significant.
- That this occurred not only in Edison's territory but also in the no-program territories suggests that manufacturers have substantially (and permanently) increased their production of these technologies.
- Whether the market effects of Edison programs contributed to this shift in production patterns cannot be determined conclusively.
 - For most motor size ranges, the availability of efficient motors in 1996 for other areas was approximately equal to the 1995 availability of efficient motors of the same size range in Edison territory.
 - This lagged increase in availability in other areas may reflect the market effects of Edison programs.
- Given the size of the California market, it is plausible that the Edison programs actually affected manufacturing practices on a national scale. This would be consistent with the high levels of equipment availability reported by distributors and contractors in areas as far away as Georgia and Louisiana.

WHILE THERE ARE INDICATIONS THAT THE CALIFORNIA MARKET HAS LED THE NATIONAL MARKET IN THE AVAILABILITY OF EFFICIENT MOTORS, THE HYPOTHESIS THAT EDISON PROGRAMS CONTRIBUTED TO THIS EFFECT CANNOT BE CONCLUSIVELY DEMONSTRATED.

THE HYPOTHESIS THAT EDISON PROGRAMS HAVE CHANGED VENDOR ATTITUDES AND PRACTICES WAS TESTED USING BOTH ATTITUDE DATA AND INFORMATION ON PRODUCT SALES.

- Given the pervasive nature of the Edison programs among major players in the local motors market, it was not possible to find pure “non-participant” distributors in Edison’s territory. Data for these vendors therefore reflect the direct influence of Edison’s programs as well as market effects.
- The 1995 program year (when no rebates were offered by Edison) was compared to 1996 for vendors, who were asked to report their breakdown of sales by efficiency and size for both years.
- In addition to these sales data, dealers were asked about their perceptions of customer attitudes and of market barriers -- both within and outside Edison’s territory -- to gauge the impact of the Edison programs.

ON THE FOLLOWING PAGES, SALES OF HIGH-EFFICIENCY MOTORS REPORTED BY VENDORS ARE DISCUSSED.

VENDORS IN EDISON'S SERVICE TERRITORY REPORTED A LOWER PROPORTION OF HIGH EFFICIENCY MOTORS SOLD THAN DID VENDORS IN OTHER SERVICE TERRITORIES.

- Even though availability of high efficiency motors was higher in Edison territory than in other regions, the overall percentage of high efficiency motors sold by distributors was lower, suggesting that market barriers exist primarily on the customer rather than on the supply side of the market.
- While the (weighted) percentage of sales accounted for by high efficiency motors was almost the same for Edison and other territory vendors in 1995, the difference between the two groups increased substantially the following year. In 1996 the percentage of efficient motor sales increased by 5 percent (from 65 to 70) for Edison vendors, but by 10 percent (from 67 to 77) for out-of-territory vendors.
- The small (less than 10 horsepower) category accounted for 59 percent of sales for Edison vendors, and in this category their sales of high efficiency models topped those of the out-of-territory group. In addition, incremental costs for high efficiency motors were greater for Edison vendors in all categories except the less-than-10 horsepower class.
 - In other categories, Edison vendors not only sold relatively fewer motors, but sold a smaller proportion of motors that met the NEMA standard for energy efficiency. Motors over 100 horsepower, for example, accounted for less than 5 percent of the sales of the Edison area distributors contacted, and only 56 percent of those motors were high efficiency models (compared to 82 percent for other-territory vendors.)
 - The different mix of motors sizes may reflect differences in the characteristics of motor-using industries between California and other regions.

Motors Vendor Barriers and Attitudes

Result	Edison	No-Program and Audit-Only
N	37	16
Barriers (agreement on 1 to 10 scale)		
Difficult to Find Good Supplier of EE	2.59	2.25
Cannot Easily Get Delivery of EE	2.27	1.94
More of a Hassle to Sell EE	5.32	4.13
<i>Difficult to Explain Value of EE</i>	4.78	4.44
No Added Value from Promoting EE	5.24	4.25
Unwilling to Stake Reputation on Reliability of EE	4.00	3.19
Additional Cost and Effort to Install and Service EE Not Worthwhile	3.05	3.69
Selling EE Could Damage Reputation for Quality	2.38	1.75
Sell More EE If Had Just Particular Features Customers Need	4.22	3.38
Lose Sales to Competitors Selling Standard	4.95	4.38
Mean of All Barriers	3.88	3.34
Attitudes (1 to 6 scale)		
Importance of EE to Customers	3.22	3.69
How Informed Customers Are of EE Options	2.78	3.63
How Receptive Customers Are to Installing EE Equipment	3.49	3.56
Importance of EE to Customers to Reduce Operating Costs	3.70	3.69
<i>Importance of Customer's Energy Concerns Compared to Other Business Concerns</i>	3.19	3.25
Mean of All Attitude Questions	3.28	3.56

VENDORS IN EDISON'S TERRITORY REPORT HIGHER LEVELS OF BARRIERS THAN THEIR COUNTERPARTS IN OTHER SERVICE TERRITORIES.

- On average, Edison territory motor vendors had higher mean responses to barrier questions and reported a lower interest in energy efficiency among their customers than did vendors in other service territories.
- It should be noted, however, that the number of vendors available to be contacted and willing to respond to the survey was relatively limited in the other territories, necessitating the combination of no-program and audit-only responses. Moreover, none of the differences in perceived barriers and attitudes reported here are statistically significant, primarily because of the small sample sizes involved.

OVERALL, AVAILABLE DATA DO NOT APPEAR TO SUPPORT THE HYPOTHESIS THAT THE EDISON PROGRAMS HAVE CHANGED VENDOR ATTITUDES AND PRACTICES.

DESIGN/ENGINEERING FIRMS IN EDISON'S SERVICE TERRITORY WERE MORE LIKELY TO SPECIFY ENERGY-EFFICIENT MOTORS THAN THOSE IN NO-PROGRAM TERRITORIES, AND ABOUT AS LIKELY AS FIRMS IN THE AUDIT-ONLY TERRITORY.

- In 1996, the percentage of high efficiency motors among all such installations specified by firms in Edison's service territory was 82 percent; the comparable figure was 70 percent for no-program territories and 83 percent for audit-only territories.
- In 1995, an audit-only year in Edison's territory, the percentage of installations specified as high efficiency was 80 percent -- higher than in either the no-program (64 percent) or audit-only (78 percent) comparison territories.

Architect and Engineer Barriers and Attitudes
-- Firms Selling Motors --

Result	Edison	No-Program	Audit-Only
N	21	9	13
Barriers (agreement on 1 to 10 scale)			
Difficult to Find Good Supplier of EE	6.19	6.89	7.38
Cannot Easily Get Delivery of EE	4.19	5.22	3.92
More of a Hassle to Sell EE	5.00	5.22	3.85
Difficult to Explain Value of EE	5.29	5.44	5.62
No Added Value from Promoting EE	6.29	4.00	5.15
Unwilling to Stake Reputation on Reliability of EE	3.71	4.22	3.15
Additional Cost and Effort to Install and Service EE Not Worthwhile	3.24	2.67	3.38
Selling EE Could Damage Reputation for Quality	3.48	2.89	2.69
Sell More EE If Had Just Particular Features Customers Need	5.81	7.00	6.31
Lose Sales to Competitors Selling Standard	4.14	4.44	3.54
Mean of All Barriers	4.73	4.80	4.50
Attitudes (1 to 6 scale)			
Importance of EE to Customers	4.52	5.11	4.31
How Informed Customers Are of EE Options	3.33	3.78	3.00
How Receptive Customers Are to Installing EE Equipment	4.19	4.00	4.77
Importance of EE to Customers to Reduce Operating Costs	4.38	4.22	4.92
Importance of Customer's Energy Concerns Compared to Other Business Concerns	3.14	3.22	3.23
Mean of All Attitude Questions	3.91	4.07	4.05

DESIGN/ENGINEERING FIRMS IN EDISON'S TERRITORY WHO SPECIFIED MOTOR INSTALLATIONS FOR THEIR CUSTOMERS PERCEIVED LOWER BARRIERS TO ENERGY EFFICIENCY THAN SIMILAR FIRMS IN THE NO-PROGRAM TERRITORIES, BUT HIGHER BARRIERS THAN AUDIT-ONLY TERRITORY FIRMS.

- The mean level for all barriers among designers was 4.7 in Edison's service territory 4.8 for the no-program, and 4.5 for the audit-only territories. Barrier perceptions were lowest for Edison designers in the following:
 - Difficult to find a good supplier of EE equipment
 - Difficult to explain value of EE equipment
- Barriers were highest for Edison design/engineering firms in the following:
 - No added value from promoting EE equipment
 - Specifying EE equipment could damage our reputation for quality
- On balance, there is only weak evidence in support of the hypothesis that the design/engineering community in Edison's service territory has been moved toward specifying higher efficiency motors. This contrasts with the market-leading role that the design community appears to be taking in the lighting and HVAC markets, and may be explained by the role of Title 24 in California, which affects the design of commercial buildings more than of industrial motors applications.

THE POSITIVE AND NEGATIVE INDICATORS OF MARKET EFFECTS PROVIDED BY TESTING EACH OF THE HYPOTHESES FOR MOTORS ARE SUMMARIZED IN THE EXHIBIT BELOW.

Conclusions - Motors

	Supporting	Not Supporting	Conclusion
Hypothesis 1 Customer Effects	Significantly higher percent EE installations in Edison territory Larger difference between future and past replacer barriers	No significant difference in perceived barriers	● ● ●
Hypothesis 2 Manufacturer Effects	Higher availability, availability in Edison territory led other markets		● ●
Hypothesis 3 Vendor Effects		Slightly lower proportion of EE sales; not significant Higher perceived barriers	●
Hypothesis 4 Designer Effects	Higher proportion of EE motors specified than no-program terr. Lower barriers than no-program	Lower proportion of EE motors specified than audit-only terr. Higher barriers than audit-only	● ●

● ● ● ● ●	Conclusive support for market effects
● ● ● ●	Strong support for market effects
● ● ●	Moderate support for market effects
● ●	Weak support for market effects
●	No support for market effects

3.4 MEASURE-SPECIFIC RESULTS – ADJUSTABLE SPEED DRIVES

Percentage Installing ASDs

Data Source	Self-report	Self-report	Vendors	Designers
W/U	Weighted	Weighted	Weighted	Weighted
Territory	% installing ASD	% Motors w/ASD	% Motors w/ASD	% Motors w/ASD
Edison	2.8	32.2	5.4	25.5
(N)	(132)		(37)	(28)
No Program	6.5	43.6		35.0
(N)	(88)			(18)
Audit-Only	3.4	25.8	18.0	28.2
(N)	(64)		(16)	(15)

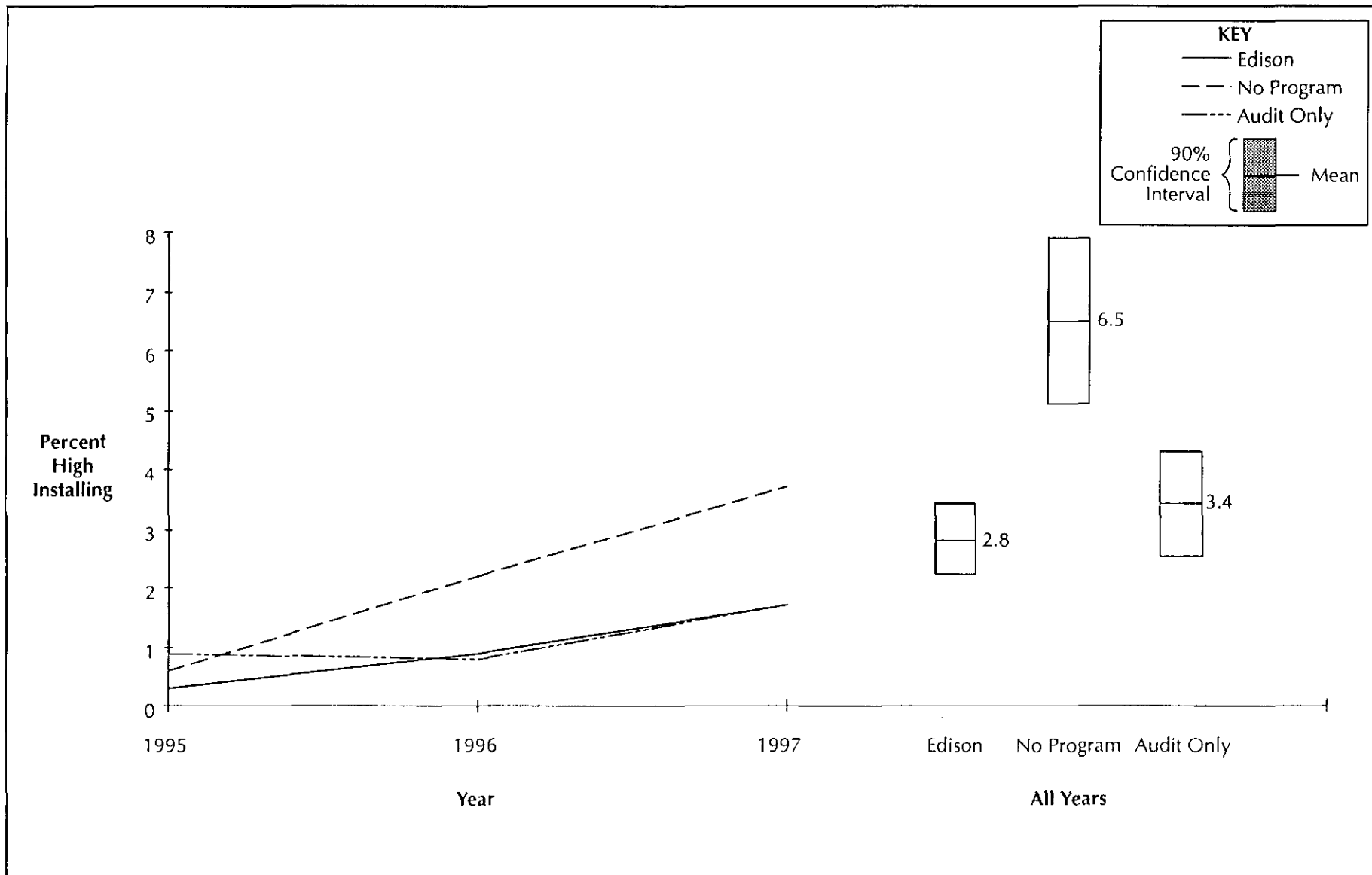
** Results for no-program and audit-only vendors were combined

ESTIMATES OF THE PERCENTAGE OF ASD INSTALLATIONS FROM VARIOUS SOURCES OF INFORMATION, PRESENTED IN THE FACING EXHIBIT, INDICATE THAT NONPARTICIPANTS IN EDISON'S TERRITORY WERE LESS LIKELY TO INSTALL THIS TECHNOLOGY THAN CUSTOMERS IN OTHER TERRITORIES.

- The number of ASD installations was calculated both as a percentage of all customers surveyed and as a percentage of motors installation. As shown in the facing exhibit, the overall percentage of ASDs installed by non-participants in Edison's territory was slightly lower than for the other territories investigated.
- Self-report data indicate that 2.8 percent of the 2,000 customers surveyed installed ASDs, compared to 6.5 percent for the no-program and 3.4 for the audit-only territories. ASD installations as a percentage of motor installations were, of course, higher, and were more consistent with the data from designers who specify motor systems.
- Among motor vendors, those in Edison territory reported a lower proportion of motors sold with ASDs than did those in the no-program and audit territories. (Because there were relatively few motor distributors in the no-program territories who would participate in the survey, results from the no-program and audit-only territories were combined.)
- Results for designers indicate that A&E firms in Edison territory were less likely to specify ASDs than firms in the no-program and audit-only territories.

WHILE THESE OVERALL RESULTS DO NOT SUGGEST THAT MARKET EFFECTS ARE EVIDENT IN CUSTOMER INSTALLATIONS, CUSTOMER ACTIONS AS WELL AS PERCEIVED BARRIERS ARE EXAMINED IN GREATER DETAIL BELOW.

Percent Installing by Year and Overall -- ASD



BASED UPON SELF-REPORTED CUSTOMER DATA, INSTALLATION OF ASD UNITS WAS LOWEST AMONG EDISON NONPARTICIPANTS IN 1995, WHEN REBATES WERE NOT OFFERED.

- Only 0.3 percent of Edison nonparticipants reported installed ASDs in 1995, when rebates were suspended in Edison's service territory.
 - Installations increased in 1996 and 1997, but failed to match the overall levels observed in either the no-program or audit-only territories.
 - Among individual segments, the replacement rate among Edison GS-2 industrial customers was somewhat higher than for other territories, but it was much lower for Edison's TOU industrial customers than for the comparable groups in other regions. Not a single TOU customer reported installing ASDs in 1995.
- As a percentage of customers installing motors, the percentage of ASDs installed in Edison territory was higher than for the audit-only territories but well below the percentage observed in the no-program territory. (Almost all the ASD installations in the no-program territory appear to have been associated with new motor installations, while a significant number of Edison ASD installations appear to have been applied to existing motors.)

AS AN ADDITIONAL INDICATOR OF THE EXTENT OF MARKET EFFECTS, CUSTOMER ATTITUDES AND PERCEPTIONS OF BARRIERS TO THE INSTALLATION OF ASDs ARE EXAMINED NEXT.

ATTITUDES TOWARD ENERGY EFFICIENCY AMONG CUSTOMERS WHO INSTALLED ASDs WERE SOMEWHAT MORE FAVORABLE THAN FOR THE OVERALL POPULATION, BOTH WITHIN EDISON'S SERVICE TERRITORY AND IN OTHER AREAS.

- For all Edison nonparticipants, the mean level of importance assigned to improving energy efficiency to reduce operating costs was 5.2 in the current survey.
 - Customers responding to the current survey who installed ASDs had a slightly higher mean rating (5.35), although the difference was not statistically significant.
 - Edison customers who installed ASDs assigned a higher level of importance than the general population for each of the five questions asked about attitudes toward energy efficiency.
- Compared to other territories, the Edison mean importance of improving energy efficiency to reduce operating costs was higher than the 4.7 mean for ASD installers in the no-program territory, but slightly lower than the 5.4 mean rating for installers in the audit-only territory.
 - This same pattern generally prevailed for the other attitude questions, although Edison nonparticipant attitudes were almost identical to those of no-program territory customers for "importance of energy concerns compared to other business concerns" and "recycling more to protect the environment."
 - These results are significant only in so far as they dispel the notion that California customers are uniformly "greener" and more energy-conscious than customers in such areas as Georgia and Louisiana.

ASD Barriers
-- Familiar w/High Efficiency --

Service Territory	Result	Total
Edison	Future	5.38
	Replaced	5.89
No Program	Future	4.30
	Replaced	6.47
Audit Only	Future	4.36
	Replaced	5.32

ONE OF THE QUESTIONS ASKED ON THE SURVEY TO QUALIFY RESPONDENTS – “HOW FAMILIAR ARE YOU WITH ASDs” – PROVIDES AN ADDED INDICATION OF THE MARKET EFFECTS THAT EDISON PROGRAMS MAY HAVE HAD.

- Among customers who are planning to install ASDs in the future, Edison nonparticipants had a statistically significantly higher level of familiarity than comparable customers in the no-program territory (compared to the audit-only territory the Edison levels were higher, but not significantly so), suggesting that Edison program may have overcome information-related barriers.
- Among customers who actually installed ASDs, Edison customers have approximately the same level of familiarity with high efficiency technology as those in other service territories. Moreover, the difference in familiarity between actual and future installers is smaller for Edison customers than for those in the other territories. That is, more future replacers in Edison territory have already acquired some of the familiarity that is acquired only through the replacement process in other territories.

ASD Barriers
-- Mean Barrier Levels --

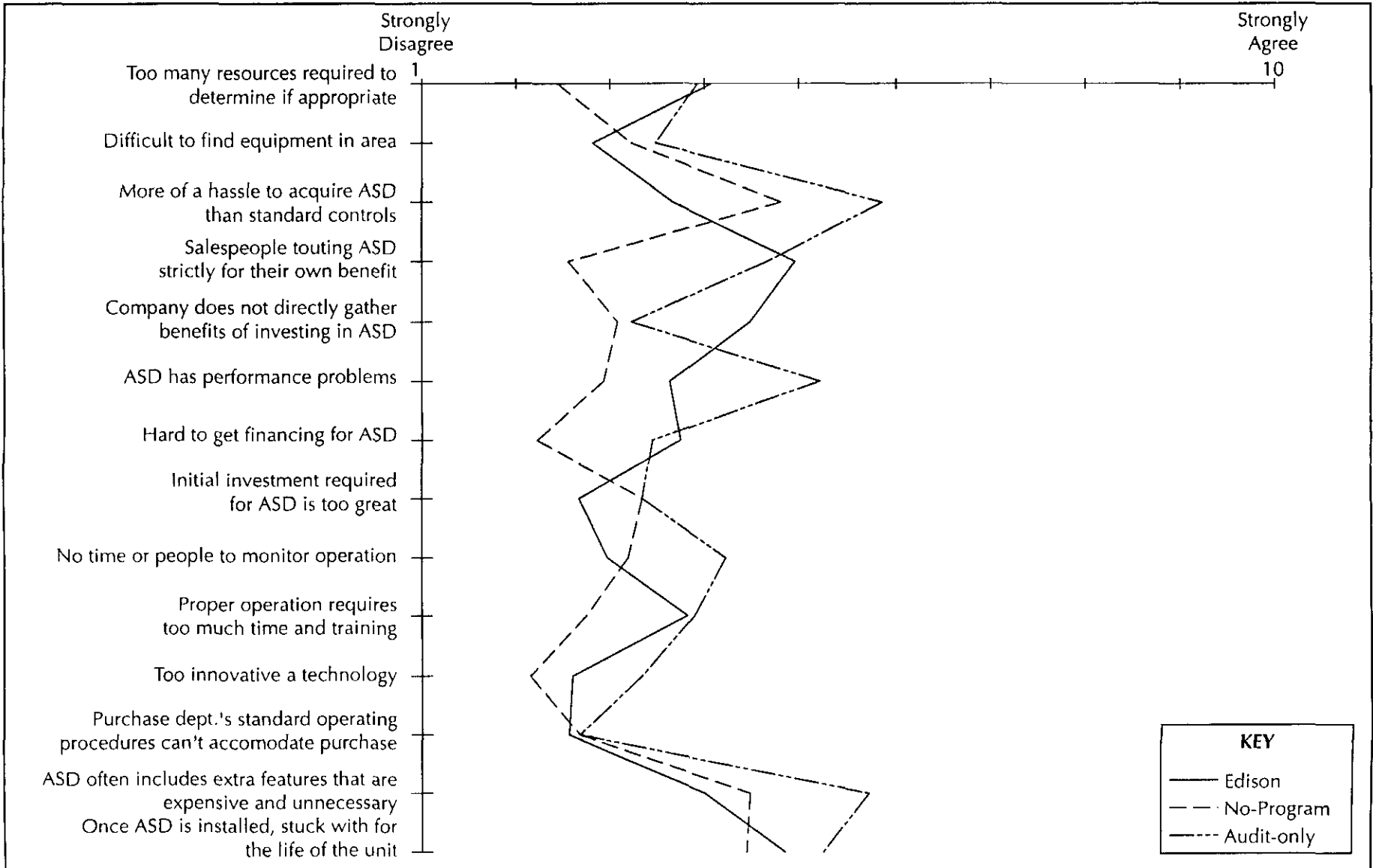
Service Territory	Result	Total
Edison	Future	4.43
	Replaced	3.61
No Program	Future	2.94
	Replaced	3.15
Audit Only	Future	4.01
	Replaced	4.14

A SUBSTANTIAL DIFFERENCE IN THE MEAN LEVEL OF PERCEIVED MARKET BARRIERS TO THE ADOPTION OF ASDs WAS FOUND BETWEEN CUSTOMERS IN EDISON’S SERVICE TERRITORY WHO PLAN TO INSTALL ASDs AND THOSE WHO ACTUALLY INSTALLED THEM

- Among customers who installed, the average of all barriers was slightly higher than for the no-program territory, but lower than for the audit-only territories.
- Edison customers with plans to install ASDs in the future, however, reported higher mean barrier levels than any of the other territories.
- The higher level of perceived barriers among future installers than for past installers may reflect a lack of awareness and understanding of the processes involved in equipment and selection. The fact that customers who have actually been through the equipment purchase process report lower barriers suggests that some barriers may have been reduced in Edison’s service territory.

OVERALL PERCEPTIONS OF BARRIER LEVELS DO NOT APPEAR TO SUPPORT THE HYPOTHESIS THAT EDISON PROGRAMS HAVE REDUCED MARKET BARRIERS FOR PROGRAM NONPARTICIPANTS. INDIVIDUAL BARRIERS ARE DISCUSSED ON THE FOLLOWING PAGES.

ASD Barriers
Mean Responses to Barrier Questions by Territory



EDISON NONPARTICIPANTS REPORTED THE LOWEST LEVEL OF PERCEIVED BARRIERS FOR SIX OF THE 14 BARRIER QUESTIONS ASKED AND THE HIGHEST FOR FOUR.

- Among customers who installed ASDs, barriers were lowest for Edison customer for six of the 14 barrier questions. Responses were statistically significantly lower only for the question designed to measure the hassle of acquiring ASDs. Barriers that were lower but not significantly so, included:
 - Difficulty of finding
 - Hard to get financing
 - Initial investment too high
 - Often includes unnecessary extras
 - Once purchased, stuck with the equipment

- The mean response to barrier questions was highest in Edison's territory for four questions. The difference was significant only for the statement that "our company does not directly gather the benefits from investing in ASDs." Barriers that were higher, but not significantly so, included:
 - Too many resources required to determine if appropriate
 - Salesmen sell for their own benefit
 - ASDs have performance problems.

BASED ON CUSTOMER-LEVEL RESULTS, WE CONCLUDE THAT THE OBSERVED CUSTOMER PURCHASE PATTERNS, ATTITUDES, AND PERCEIVED BARRIERS DO NOT PROVIDE COMPELLING EVIDENCE OF MARKET EFFECTS.

VENDORS IN EDISON'S SERVICE TERRITORY REPORTED A SIGNIFICANTLY LOWER PROPORTION OF ASDs SOLD THAN DID DISTRIBUTORS AND CONTRACTORS IN OTHER SERVICE TERRITORIES.

- For both 1995 and 1996, the percentage of motors sold that included ASDs was less than one-third as high for motor distributors in Edison's territory as in other territories. Note that this percentage was essentially the same for 1995 and 1996 in Edison territory, even though there was no program in place in 1995.
- The lower numbers for Edison territory vendors may in part reflect the fact that a higher proportion of their sales is accounted for by smaller (less than 10 hp) motors (59 percent for Edison; 52 percent for others) that are less likely to include ASDs.

VENDOR SALES DATA DO NOT APPEAR TO SUPPORT THE HYPOTHESIS THAT MARKET EFFECTS CAN BE OBSERVED IN EDISON'S SERVICE TERRITORY AT THE WHOLESALE LEVEL.

Architect and Engineer Technologies (Weighted by Specifications)

Result	Edison	No-Program	Audit-Only
Completes	21	9	13
1996 - % ASD w/Motors	25.5%	35.0%	28.2%
1995 - % ASD w/Motors	24.7%	31.3%	25.3%

DESIGN/ENGINEERING FIRMS IN EDISON'S SERVICE TERRITORY REPORTED SPECIFYING A SOMEWHAT LOWER PERCENTAGE OF MOTORS WITH ASDs THAN SIMILAR FIRMS IN NO-PROGRAM TERRITORIES.

- The Edison territory A&E firms who specified motor installations for their clients reported specifying ASDs for an average of 25.5 percent of motor installations, compared to 35 percent in no-program and 28 percent in audit-only territories.
- Results also indicate that the percentage of motors specified with ASDs showed a smaller increase from 1995 to 1996 in Edison territory than in either of the two comparison areas.
- As with the specification of motor efficiency, the less aggressive role of California designers in specifying ASDs may be related to the lack of state standards comparable to Title 24.

THERE IS NO INDICATION THAT THE PRESENCE OF EDISON'S AUDIT AND INCENTIVE PROGRAMS HAS HELPED MOVE DESIGN PRACTICES TOWARD GREATER SPECIFICATION OF ASDs IN EDISON'S SERVICE TERRITORY.

THE POSITIVE AND NEGATIVE INDICATORS OF MARKET EFFECTS PROVIDED BY TESTING EACH OF THE HYPOTHESES FOR ASDs ARE SUMMARIZED IN THE EXHIBIT BELOW.

Conclusions - ASDs

	Supporting	Not Supporting	Conclusion
Hypothesis 1 Customer Effects	Higher familiarity among future replacers Significantly lower barrier for hassle	Significantly lower rate of installations in Edison territory Significantly higher barrier for split incentives	●
Hypothesis 3 Vendor Effects		Lower proportion of motors sold with ASDs in Edison territory	●
Hypothesis 4 Designer Effects		Lowest proportion of motors specified with ASDs	●

● ● ● ● ●	Conclusive support for market effects
● ● ● ●	Strong support for market effects
● ● ●	Moderate support for market effects
● ●	Weak support for market effects
●	No support for market effects

3.5 MEASURE-SPECIFIC RESULTS – ENERGY MANAGEMENT SYSTEMS

Percent Installing Energy Management Systems

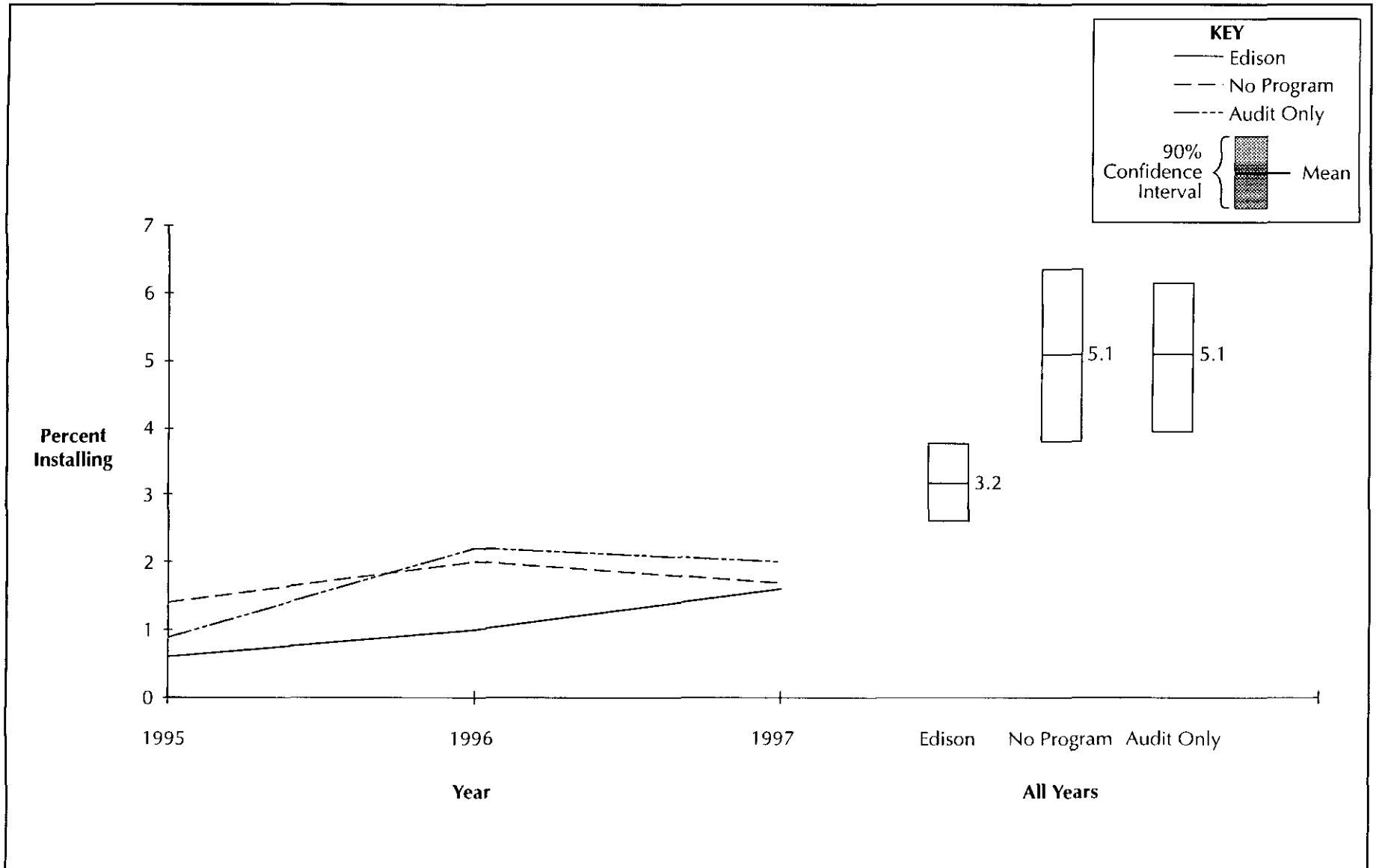
Data Source	Self-reported			Contractors		Designers	
Territory	% Installing EMS	% HVAC w/EMS	% Light w/EMS	% HVAC w/EMS	% Light w/EMS	% HVAC w/EMS	% Light w/ EMS
Edison	3.2	25.5	36.4	3.1	3.1	58.0	51.0
No Program	5.1	69.9	36.4	0.2	0.5	42.0	16.0
Audit-Only	5.1	36.1	21.8	11.2	9.3	41.0	26.0

ESTIMATES OF THE PERCENTAGE OF EMS INSTALLATIONS FROM VARIOUS SOURCES OF INFORMATION, PRESENTED IN THE FACING EXHIBIT, INDICATE THAT NONPARTICIPANTS IN EDISON'S TERRITORY WERE LESS LIKELY TO INSTALL THIS TECHNOLOGY THAN CUSTOMERS IN OTHER TERRITORIES.

- The number of EMS installations was calculated both as a percentage of all customers surveyed and as a percentage of the number of HVAC and lighting installation. As shown in the facing exhibit, the overall percentage of EMSs installed by non-participants in Edison's territory was significantly lower than for the other territories investigated.
- Self-report data indicate that 3.2 percent of the 2,000 customers surveyed in Edison's territory installed EMSs, compared to 5.1 percent for both the no-program and audit-only territories. Not enough fax forms were returned to corroborate or contradict these numbers.
- Among other market actors, both HVAC and lighting vendors in Edison territory reported a higher proportion of systems sold with EMSs than did those in the no-program territory, but a lower percentage than vendors in the audit-only territory. The differences between Edison and the audit-only territory were statistically significant at the 90 percent confidence level.
- Results for designers indicate that A&E firms in Edison territory were more likely to specify EMSs than firms in the no-program territory for both HVAC and lighting installations. The differences were significant for the lighting specifications only.

CUSTOMER ACTIONS AS WELL AS PERCEIVED BARRIERS ARE EXAMINED IN GREATER DETAIL BELOW.

Percent Installing by Year and Overall -- EMS



CUSTOMER ACTIONS DO NOT PROVIDE SUPPORT FOR THE HYPOTHESIS OF MARKET EFFECTS, SINCE INSTALLATION OF EMS UNITS WAS LOWEST AMONG EDISON NONPARTICIPANTS.

- Installation of EMS units was lowest among Edison nonparticipants in 1995, when rebates were not offered.
 - Fewer than 1 percent of Edison nonparticipants reported installing EMSs in 1995, when rebates were suspended in Edison’s service territory.
 - Installations increased in 1996 and 1997, but failed to match the overall levels observed in either the no-program or audit-only territories.
- Because most EMS installations would be expected to take place when HVAC or lighting systems are replaced, the percentage of customers installing HVAC or lighting who also installed EMSs was analyzed, with the following results.
 - Only 26 percent of Edison customers who replaced air conditioners also installed an EMSs, compared to 70 percent in the no-program territory and 36 percent in the audit-only territory.
 - The percentage of customers who installed EMSs as well as lighting was 36 percent in both the Edison and no-program territories – well above the 22 percent in the audit-only territory.

AS AN ADDITIONAL INDICATOR OF THE EXTENT OF MARKET EFFECTS, CUSTOMER ATTITUDES AND PERCEPTIONS OF BARRIERS TO THE INSTALLATION OF EMSs ARE EXAMINED NEXT.

ATTITUDES TOWARD ENERGY EFFICIENCY AMONG EDISON CUSTOMERS WHO INSTALLED EMSs WERE SIMILAR TO THOSE OF THE OVERALL POPULATION.

- For all Edison nonparticipants, the mean level of importance assigned to improving energy efficiency to reduce operating costs was 5.2 in the current survey – the same level reported by customers who installed EMSs.
- The attitudes of Edison customers who installed EMSs were generally similar to those of customers who installed EMSs in other territories.
- Edison customers who reported installing EMSs considered themselves less familiar with EMS technology than did their counterparts in other territories.
 - On a 1-10 scale, Edison customers who installed EMSs averaged 4.8 in disagreeing/agreeing with the statement “I am quite familiar with Energy Management Systems.”
 - EMS installers in the no-program territory averaged a 5.1 response to the same question, while audit-only customers averaged 5.6.

IT DOES NOT APPEAR THAT EDISON PROGRAMS HAVE HAD A SIGNIFICANT IMPACT IN CHANGING THE ATTITUDES OF CUSTOMERS WHO INSTALLED AN EMS.

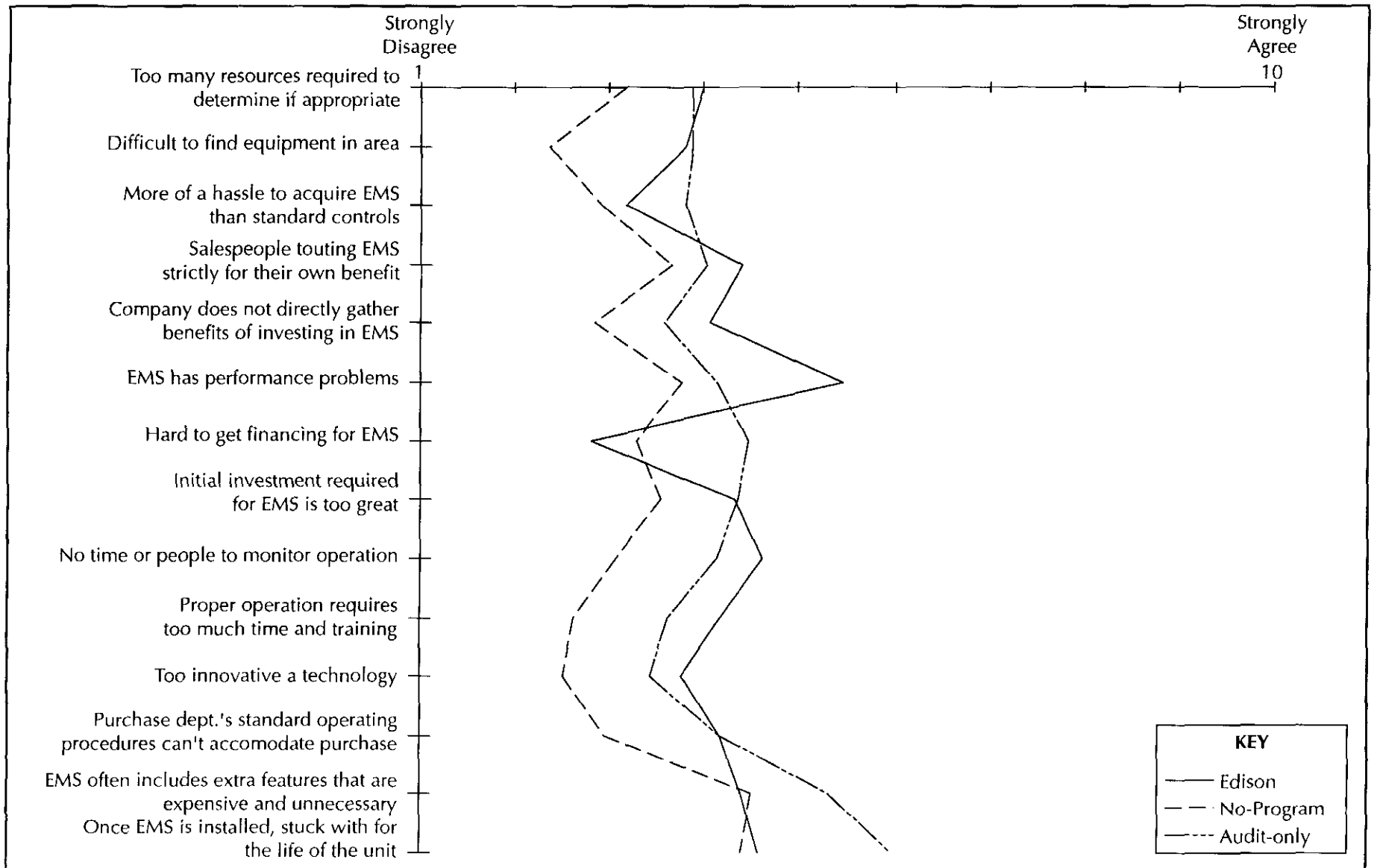
EMS Barriers
-- Mean Barrier Levels --

Service Territory	Result	Total
Edison	Future	5.08
	Replaced	4.12
No Program	Future	4.47
	Replaced	3.25
Audit Only	Future	3.92
	Replaced	4.20

CUSTOMERS IN EDISON'S SERVICE TERRITORY WHO PLAN TO INSTALL EMSs REPORTED SIGNIFICANTLY HIGHER BARRIERS THAN CUSTOMERS WHO ACTUALLY INSTALLED THEM

- Among customers who installed, the average of all barriers was slightly higher than for the no-program territory, but lower than for the audit-only territories.
- Edison customers with plans to install EMSs in the future, however, reported higher mean barrier levels than any of the other territories.
- The higher level of perceived barriers among future installers than for past installers may reflect a lack of awareness and understanding of the processes involved in equipment selection.
 - Customers in Edison territory who had actually replaced had lower mean responses for all but one barrier. The difference was greatest for barriers relating to the hassle of acquiring EMSs or the ability to finance them.
 - The single barrier for which replacers had a higher mean response relates to uncertainty regarding the performance of EMSs.
 - The fact that customers who have actually been through the EMS purchase process report lower barriers suggests that some barriers may have been reduced in Edison's service territory.

EMS Barriers
Mean Responses to Barrier Questions by Territory



EDISON NONPARTICIPANTS REPORTED THE HIGHEST LEVEL OF PERCEIVED BARRIERS FOR SEVEN OF THE 14 BARRIER QUESTIONS ASKED, AND THE LOWEST FOR TWO.

- Among customers who installed EMSs, barriers were lowest for Edison customers for two of the 14 barrier questions, although neither barrier was statistically significantly lower. Barriers that were lower but not significantly so included:
 - Hard to get financing
 - Often includes unnecessary extras
- The mean response to barrier questions was highest in Edison's territory for seven questions. The difference was significant only for the statement that "EMSs have performance problems." Barriers that were higher, but not significantly so, included:
 - Too many resources required to determine if appropriate
 - Salesmen sell for their own benefit
 - Someone else gathers benefits of EMSs
 - Our firms does not have the resources to monitor operation of EMS
 - EMSs require too much time and training
 - EMSs are too innovative a technology for our organization.

BASED ON CUSTOMER-LEVEL RESULTS, WE CONCLUDE THAT THE OBSERVED CUSTOMER PURCHASE PATTERNS, ATTITUDES, AND PERCEIVED BARRIERS DO NOT PROVIDE PERSUASIVE EVIDENCE OF MARKET EFFECTS.

VENDORS IN EDISON'S SERVICE TERRITORY REPORTED A SIGNIFICANTLY LOWER PROPORTION OF EMSs SOLD THAN DID DISTRIBUTORS AND CONTRACTORS IN OTHER SERVICE TERRITORIES.

- For both 1995 and 1996, the percentage of HVAC systems sold that included EMSs was less than one-third as high for contractors in Edison's territory as for audit-only territory vendors, although the Edison percentage was higher than for the no-program territory.
- The percentage of installation with EMSs for Edison vendors was also between the audit-only and no-program territory levels for lighting installations with EMS. The percentage of Edison territory lighting installations reported to include an EMS was 3.1 percent in 1996, well above the no-program territory level but only one-third of the audit-only territory level.
- For both lighting and HVAC applications of EMS, 1996 installations were marginally higher than those for 1995.

VENDOR SALES DATA DO NOT APPEAR TO SUPPORT THE HYPOTHESIS THAT MARKET EFFECTS CAN BE OBSERVED IN EDISON'S SERVICE TERRITORY AT THE WHOLESALE LEVEL.

Architect and Engineer Technologies (Weighted by Specifications)

Result	N	Edison	N	No-Program	N	Audit-Only
Completes		47		29		22
1996 - % EMS w/Lighting	37	50.7%	24	15.7%	15	25.8%
1995 - % EMS w/Lighting	37	48.5%	24	14.5%	15	6.8%
1996 - % EMS w/HVAC	28	57.9%	18	42.0%	15	41.2%
1995 - % EMS w/HVAC	28	54.6%	18	37.3%	15	38.4%

DESIGN/ENGINEERING FIRMS IN EDISON'S SERVICE TERRITORY REPORTED SPECIFYING A HIGHER PERCENTAGE OF BOTH HVAC AND LIGHTING INSTALLATIONS WITH EMSs THAN DID SIMILAR FIRMS IN NO-PROGRAM TERRITORIES.

- Because design/engineering firms typically specify complete HVAC or lighting systems, they are far more likely to include EMSs as a part of their specifications.
 - Of the 37 Edison territory A&E firms who specified HVAC installations for their clients reported specifying EMSs for an average of 51 percent of motor installations in 1996, compared to 16 percent in the no-program and 26 percent in audit-only territories.
 - Similarly, designers in Edison territory who specified lighting included EMSs in 58 percent of their lighting specifications – significantly more than the 42 percent for no-program and 41 percent for audit-only territory designers.
- Results also indicate that the percentage of lighting and HVAC systems specified with EMSs was already high in Edison's territory in 1995, while it was still relatively low in the other territories. To the extent that designers in California led their counterparts in other territories in specifying EMSs, the Edison programs may have had an effect on the market.

THERE IS SOME INDICATION THAT THE PRESENCE OF EDISON'S AUDIT AND INCENTIVE PROGRAMS MAY HAVE HELPED MOVE THE DESIGN COMMUNITY TOWARD GREATER SPECIFICATION OF EMSs.

THE POSITIVE AND NEGATIVE INDICATORS OF MARKET EFFECTS PROVIDED BY TESTING EACH OF THE HYPOTHESES FOR EMS ARE SUMMARIZED IN THE EXHIBIT BELOW.

Conclusions - EMS

	Supporting	Not Supporting	Conclusion
Hypothesis 1 Customer Effects		Significantly fewer EMS installations in Edison territory Significantly higher perception of performance problems	●
Hypothesis 3 Vendor Effects		Significantly lower proportion of both lighting and HVAC sales with EMS in Edison territory	●
Hypothesis 4 Designer Effects	Significantly higher proportion of EMS specified for lighting Higher (but not significantly) proportion of EMS specified for HVAC		● ●

● ● ● ● ●	Conclusive support for market effects
● ● ● ●	Strong support for market effects
● ● ●	Moderate support for market effects
● ●	Weak support for market effects
●	No support for market effects

4.0 SUMMARY AND CONCLUSIONS

Summary of Customer Actions

Technology	Replacement Rate (%)			Percent Efficient (%)			Total Market Effect	Attributable to Audits	Attributable to Incentives
	E	N	A	E	N	A	(E-N)	(A-N)	(E-A)
Lighting	11.3	22.4	18.6	38	34	35	4	1	3
HVAC	8.4	14.2	16.4	43	55	67	<0	12	<0
Motors	8.7	14.9	13.2	48	25	36	23	11	12
ASD	2.8	6.5	3.4	NA	NA	NA	<0	<0	<0
EMS	3.2	5.1	5.1	NA	NA	NA	<0	0	<0

E = Edison Territory

N = No-program Territory

A = Audit-only Territory

The quantity (E-N) minus the quantity (E-A) = A-N

CUSTOMER ACTIONS, BY TECHNOLOGY, WERE USED TO ESTIMATE THE OVERALL EXTENT OF MARKET EFFECTS AND THE PORTION ATTRIBUTABLE TO AUDITS AND REBATES. IT SHOULD BE RECALLED, HOWEVER, THAT ALL OF THE PERCENTAGES SHOWN HAVE BROAD CONFIDENCE BOUNDS.

- As explained in the “Methods” section of this report, an attempt was made to disaggregate the overall observed market effects into those effects attributable to audit programs and those attributable to incentive programs.
 - The facing exhibit presents the results of this effort, taking the difference between Edison and the no-program territory as the effect of all programs and the difference between Edison and the audit territory as the effect of rebates alone.
 - Note that these results are drawn from self-reported data, and are therefor subject to caveats regarding the accuracy and reliability of such data, especially when used to make cross-technology and cross-territory comparisons. In addition, the broad confidence bounds around all these estimates make it impossible to say that any of the calculated market effects are statistically significantly different from zero at the 90 percent confidence level.
- With these caveats in mind and based on the results shown in the facing exhibit, the largest quantitative market effect can be observed for motors, with the total observed market effect evenly divided between effects attributable to audits and to rebates.
- A smaller overall effect was observed for lighting installations, most of which was attributable to incentives.
- For other measures, installations were lower in Edison territory than in one or both of the comparison areas.

THESE CUSTOMER ACTIONS, AS WELL AS DATA ON THE ACTIONS AND PERCEPTIONS OF BARRIERS OF OTHER MARKET ACTORS, WERE USED TO TEST THE HYPOTHESES OF MARKET EFFECTS THAT WERE THE FOCUS OF THIS STUDY, AS PRESENTED ON THE FOLLOWING PAGE.

Summary of Hypothesis Testing Results

Technology	Customer Effects			Mnfr. Effects	Vendor Effects			Designer Effects			Overall Market Effects		
	Actions	Barriers	Overall		Actions	Barriers	Overall	Actions	Barriers	Overall	Actions	Barriers	Overall
Lighting	●●●	●●●	●●●	●●	●●●	●●	●●	●●●●	●●	●●●	●●●	●●	●●●
HVAC	●	●	●	●	●	●	●	●●●	●●	●●	●●	●●	●
Motors	●●●	●●	●●●	●●	●	●	●	●●	●●	●●	●●	●●	●●
ASD	●	●	●	NA	●	NA	●	●	NA	●	●	●	●
EMS	●	●	●	NA	●	NA	●	●●	NA	●●	●	●	●

Overall market effects determined as follows:

- For overall actions and barriers, the mean of the individual items
- For overall effects, take the mean all the actions/barriers items plus two times the mfr.effect if appropriate

●●●●●	Conclusive support for market effects
●●●●	Strong support for market effects
●●●	Moderate support for market effects
●●	Weak support for market effects
●	No support for market effects

MEASURE-SPECIFIC RESULTS DESCRIBED IN THE PREVIOUS CHAPTER WERE USED TO EVALUATE THE HYPOTHESES OF MARKET EFFECTS FOR EACH MEASURE AND EACH GROUP OF MARKET ACTORS. AS SHOWN IN THE FACING EXHIBIT, THE STRONGEST INDICATION OF MARKET EFFECTS WAS FOUND FOR LIGHTING.

- Both actions and perceptions of market barriers were analyzed in drawing a conclusion regarding the hypotheses that Edison's programs had market effects that could be observed for each group of market actors.
- The strongest case for market effects can be made for lighting, where at least some evidence of market effects could be observed for each chain in the market.
- For other technologies studied, indicators of market effects were strongest in the actions of the design community.
 - This finding is consistent with the fact that some of the technologies targeted by Edison programs have been incorporated into codes and standard practices.
 - It also suggests that any observed market effects are more likely to be sustained into the future through continued interaction between proponents of energy efficiency and the design community.

WHILE THE RESULTS OF THIS STUDY DO NOT CONCLUSIVELY DEMONSTRATE MARKET EFFECTS FOR THE TECHNOLOGIES INVESTIGATED, THE FINDINGS HAVE IMPLICATIONS BOTH FOR POLICY MAKERS AND FOR FUTURE EVALUATIONS.

- The most compelling implication for policy and program design is the apparent success of the total package of market interventions in changing the mix of technologies specified by the design community.
 - Changes in this arena have generally been achieved without extensive reliance on incentives; instead market intervention has focused on the provision of information, the establishment of relationships, and the development of standards.
 - The observed changes in equipment specification are more likely to be permanent than those achieved with other market actors. Not only do designers influence construction and equipment selection practices for years ahead, they are also more directly affected by codes and standards that formalize those practices.
- A second policy implication can be drawn from the finding that those technologies (such as lighting and HVAC) that appear to be less complex may be subject to greater information-related barriers than measures like EMSs and ASDs, perhaps because the latter are purchased by more technologically sophisticated buyers. This would mean that even the simplest energy efficient technologies should be supported by ongoing and pervasive flows of information and technical assistance if barriers to their adoption are to be overcome.

IN ATTEMPTING A BROAD INVESTIGATION OF THE MARKET EFFECTS OF EDISON'S C/I ENERGY EFFICIENCY PROGRAMS, A NUMBER OF IMPORTANT LESSONS WERE LEARNED REGARDING THE METHODS NEEDED TO IDENTIFY, QUANTIFY, AND EXPLAIN SUCH MARKET EFFECTS.

- To assess market effects properly requires a time frame long enough for true market transformation to have occurred. But this means either relying on respondent recollection of long past actions (as in the current study) or pulling together data from different points in time to draw comparisons. The market baseline studies currently being conducted in California should provide such a basis for comparison over time.
- The quantities and types of equipment installed continue to be key determinants of whether market effects exist and whether these can be quantified.
 - If customer data are used, one must either perform on-site visits to verify the efficiency of the installed measure or verify the self-reported efficiency through the use of written documents such as invoices or equipment specifications, collected from customers via phone or fax.
 - Both options add to the cost of data collection. Given typical replacement rates and customer reluctance to participate in survey efforts, this means a very large scale canvass survey effort is needed to identify enough in-the-market customers to support a characterization of the market in terms of efficiency.
- More generally, sample sizes for market transformation studies need to be much larger – especially when a range of measures is being investigated – so that statistically significant results can be obtained. Ideally, analysis should be supported at the segment level, since one would expect (and data in this study confirm) that market segments have different perceptions of market barriers as well as different installation rates of energy efficient equipment. Sample sizes should be determined with the following elements in mind:
 - the number of technologies being studied
 - the number of possible dependent variables
 - the number of independent variables
 - the number of comparison groups
 - the number of planned comparisons
 - the power of the various statistical tests and analytical tests being used.

CONCLUSIONS . . . METHODOLOGICAL LESSONS LEARNED

- The use of data on perceptions of barriers to help determine the permanence of market effects raises its own challenges and requirements.
 - Clearly, the reliability of any barrier scale is enhanced if it is based on a thorough understanding of a particular market. A market characterization, including focus groups and in-depth interviews to develop an understanding of how various market actors conceptualize market barriers, would facilitate the development of a reliable scale.
 - In addition, we believe that the results demonstrate that multiple indicators of market barriers are desirable to account for (and minimize) measurement error.
 - Finally, data on perceptions of barriers ought to be of sufficient depth and quality to support more detailed analysis of the relationship between market interventions and perceptions and between perceptions and actions, so that the effects and mechanisms of various interventions can be predicted.
- As more studies of market effects are performed, data are collected, and results are analyzed, it becomes increasingly important to integrate all the sources of available data before primary data collection activities are initiated. Development of sets of standard questions to address issues of market barriers, information sources, customer and vendor attitudes, and other variables that either measure or explain the mechanisms of market effects would enhance the value of each study in contributing to the growing body of knowledge on assessing market transformation.