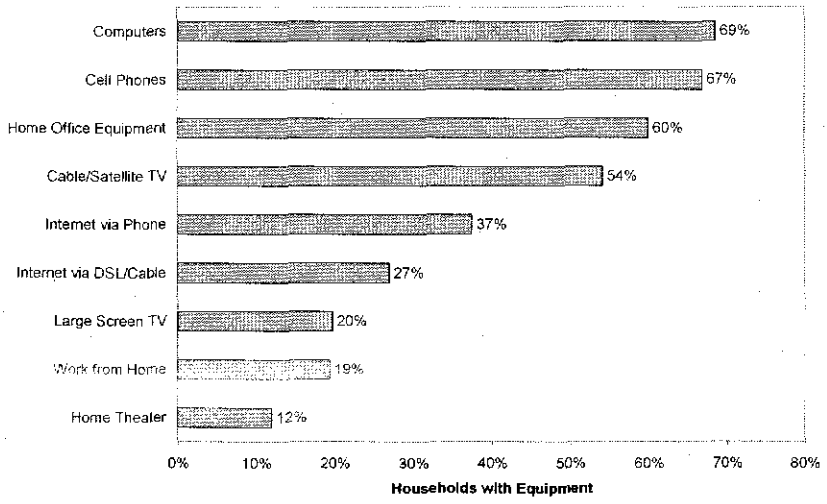
1.9 Technology

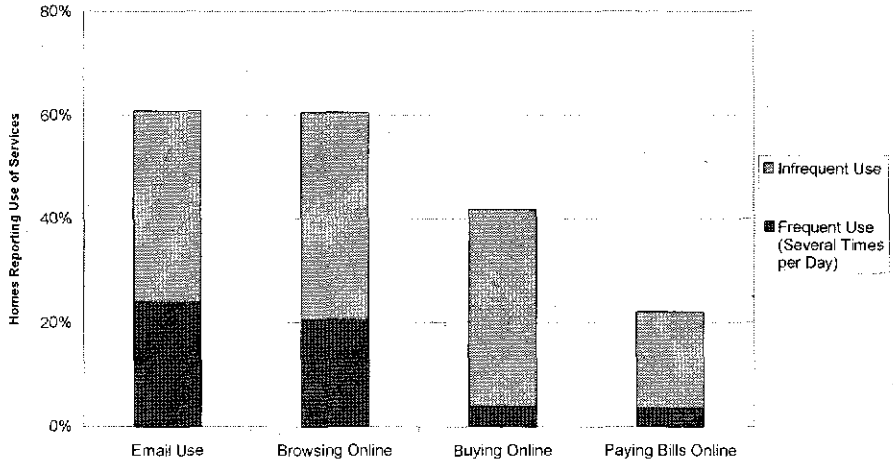
While the number of dwellings with more than three computers is just under 6%, there is a computer in 69% of all dwellings (Figure 39). Other entertainment, general technology, and communication services are also appearing in numerous dwellings.

Figure 39
Penetration of Technology Equipment



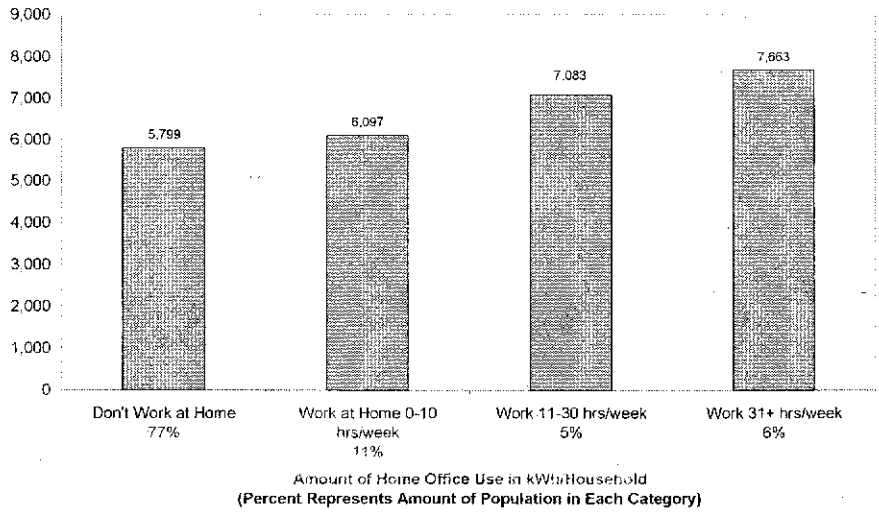
As people have more PCs, they are spending much more time on the PC and using it for a range of other services (Figure 40).

Figure 40
Use of Online Computer Services



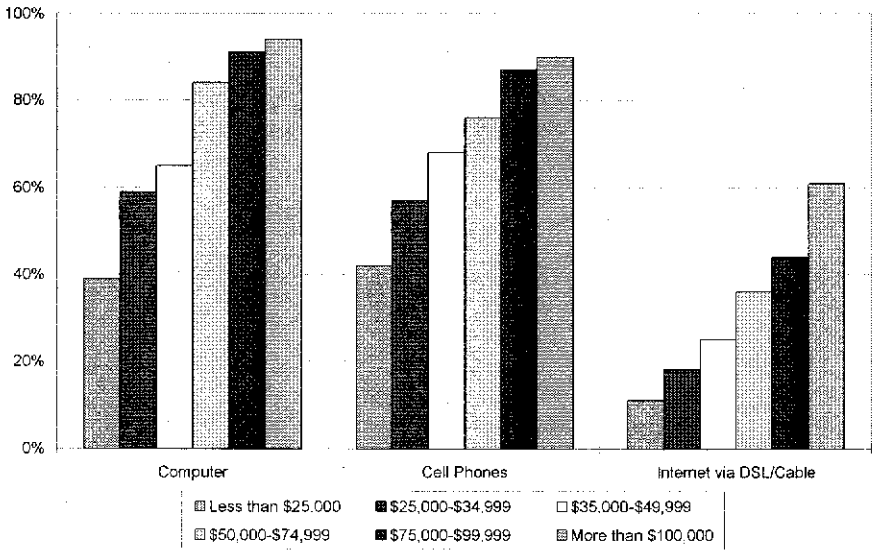
Home offices are currently found in 23% of all dwellings. While home offices add to energy use, they occur in all energy use categories. As home offices are used more regularly, average consumption per household increases (Figure 41).

Figure 41
Electricity Use by Amount of Home Office Use



Many discretionary end uses have a strong income correlation. Figure 42 provides three examples of that trend.

Figure 42
Technology Services by Income



1.10 Data Comparisons

Effect of Combining the Main Sample and Non-response Follow-Up Sample

To combine the results from the main sample and the follow-up efforts, the study combined the weights from both components to create a set of individual weights that represents the number of households that each participant represents. Instead of fully weighting the non-respondent results to represent all non-respondents, the follow-up sample weights were reduced in a systematic approach. This assumed that the follow-up sample represents only those customers who would respond to the follow-up survey but not to the main survey, rather than assuming the follow-up respondents represent all non-respondents to the main survey. This approach improved overall precision and reduced the likelihood of individual outlier cases in the non-respondent sample from skewing overall results. The non-response follow-up proved to be a successful way to capture a segment of the population underserved by the direct-mail campaign. Table 8 shows several key results for customers by dwelling type and survey method.

In general, non-respondents had similar energy usage and major equipment holdings as direct-mail participants but differed significantly in that they were less likely to be property owners, less likely to be using energy-efficient lighting, more likely to be non-English speaking, more likely to be ethnically diverse, and less educated overall. It follows from this that the direct-mail campaign was most successful with individuals who were more aware of energy efficiency, were more motivated because of their ownership, more educated, and more capable of handling an English survey. The non-response follow-up was able to get to more Spanish-speaking customers. While the non-response follow-up adds significant cost to a project of this magnitude, the fact that customers differ in these ways indicates that it is a wise step to take to minimize non-response bias found in a single-method survey approach.

Table 8

Comparison of Results by Surveying Method and Dwelling Type

	Single Family		Multi-Family (2-4 Units)		Multi-Family (5+ Units)		Mobile Homes	
	Initial Mail	Non-Response	Initial Mail	Non-Response	Initial Mail	Non-Response	Initial Mail	Non-Response
Completed Surveys	12,599	1,225	2,979	409	2,866	512	526	37
Weighted to Population	2,363,823	3,693,704	524,317	1,155,001	513,069	1,463,655	95,691	103,602
Average Electric Consumption	7,248	7,160	4,429	4,201	3,689	3,969	6,271	6,531
Average Gas Consumption	547	538	341	338	215	216	491	478
Average Dwelling Size	1,837	1,755	1,156	1,061	925	914	1,258	1,083
Average Dwelling Age	14.5	18.9	24.0	24.8	28.4	34.6	19.4	27.9
Average Number of People	2.88	3.42	2.53	2.74	2.10	2.68	2.30	2.22
Average Number of Seniors	0.53	0.30	0.38	0.13	0.37	0.15	0.74	0.42
Average Income	73,389	68,714	54,246	47,346	45,388	41,702	30,971	28,807
Owners	91%	81%	50%	26%	26%	13%	87%	89%
Central Cooling	50%	47%	40%	33%	41%	31%	60%	38%
Gas Space Heating	85%	89%	77%	75%	46%	54%	57%	56%
All Exterior Walls Insulated	56%	61%	45%	48%	43%	44%	65%	59%
CFL Penetration	63%	50%	55%	42%	51%	37%	57%	51%
Primary Language English	92%	80%	85%	67%	87%	69%	95%	81%
Head of Household Hispanic	12%	26%	17%	36%	13%	33%	9%	20%
College Grad or Higher	53%	44%	47%	39%	50%	36%	23%	18%

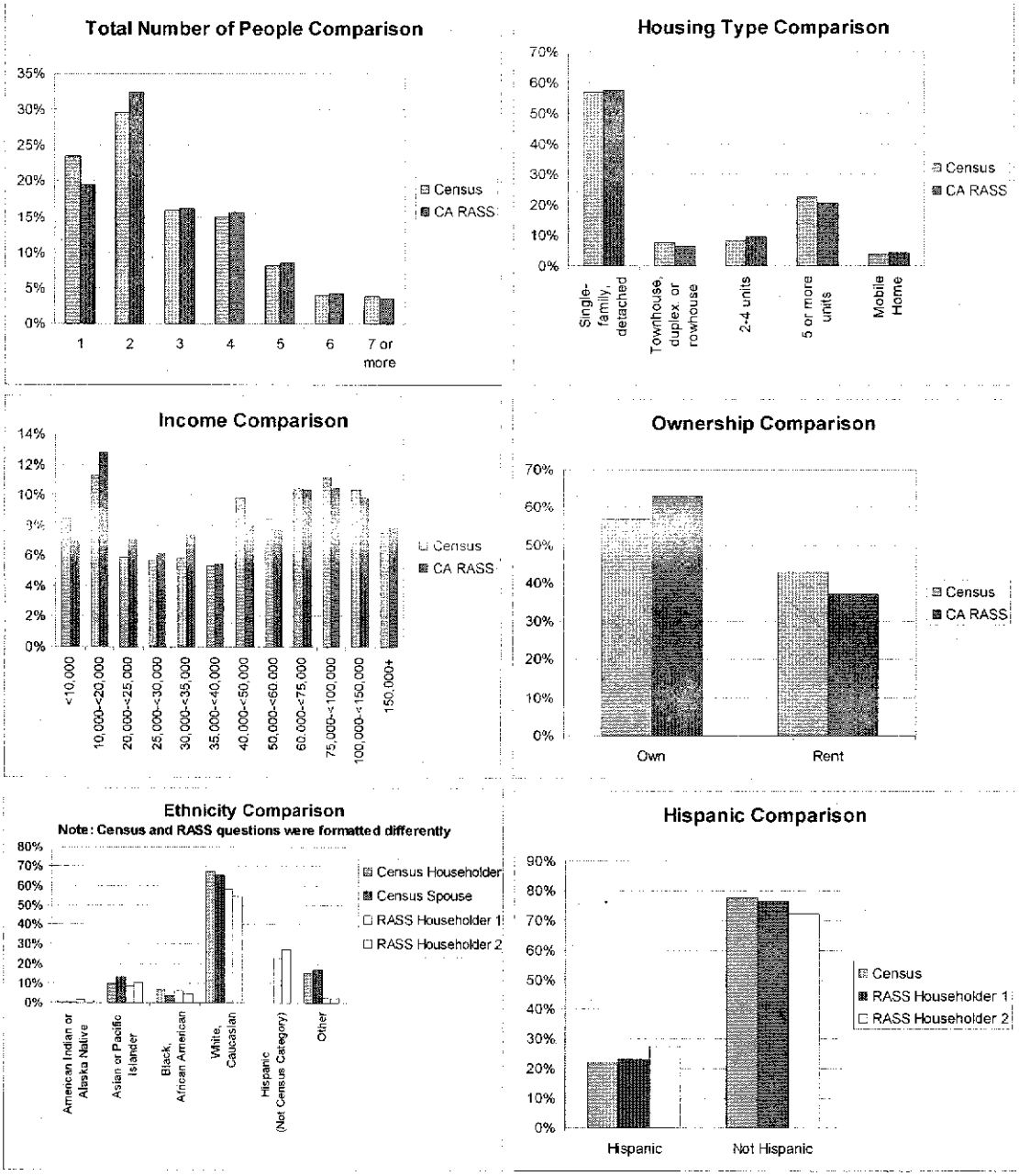
Comparison to Census Data

To understand how the results correspond to the population of California, we compared 2000 census data to the RASS results.[9] Overall, the comparison of the RASS demographic information to the 2000 Census data is reasonable, and the sampling plan yielded a set of customer respondents that closely mirrors the population at large. The most notable area where the study appears to fall short is in the single-occupant rental market. The shortfalls occur predominantly in the young-adult age groups. Because the results aligned with census data, the study group decided to keep the initial sample weights and not post-stratify the results.

A few of the Census-to-RASS comparison values (most notably ethnicity and language) were asked in a different format from the Census so comparisons are not directly relevant. Despite language results that differ in form enough that a comparison is not meaningful, the fact that our Hispanic ethnicity numbers come out very close to the Census helps to confirm that we were able to capture results from that population segment. As noted above, this is in large part because of the non-response follow-up efforts. A series of Census comparison tables is included below as Figure 43.

Figure 43

Comparison of RASS Results to 2000 Census Results



Appendix: Black and White Copy of Figure 2 from Page 8

ENDNOTES

[1] Lighting numbers triangulated from Baseline Energy Use Characteristics, Technology Energy Savings, Volume I, California Energy Commission, May 1994, publication p300-94-006 as well as various KEMA-XENERGY RECAP Program results.

[2] Previous RASS studies were performed by SCE in 1995, PG&E in 1995, and SDG&E in 1993.

[3] Details on the 20/20 program can be found at the Energy Commission web site: http://www.energy.ca.gov.

[4] PG&E press release dated 8/31/2002 which discusses 20/20 program savings in the residential market (http://www.pge.com/news/archived_news_releases/006a_news_rel/020831.shtml).

[5] Energy Commission Forecast Demand Office, April 2003, settlement-quality metered load data from the California Independent System Operator (CAISO) and revised employment data from the California Employment Development Department. Further detail is also available in the Public Interest Energy Strategy Report (Energy Commission Publication #100-03-012F).

[6] This is attributed to the fact that during the course of the study, the statewide 20/20 program was in effect. This program offered customers an opportunity to reduce their total bill by 20% if they reduced their usage 20% from the previous year's usage. As an example of the impact of this program, roughly 30% of PG&E customers qualified for this program in 2001 and 2002.

[7] The SDG&E increase for single family homes is attributable to the fact that new buildings are much larger than older buildings in that service territory and increasing at a much higher rate than in other service territories.

[8] SoCalGas performed an internal re-weighting of their data to account for the customers who were not served by the electrically based population. While the housing type trends are similar to those displayed in Figure 29, the re-weighted values show an overall usage for older homes at 453 therms and new homes at 430 therms. By re-weighting, SoCalGas was able to adjust the balance of single family and multi-family dwellings to better match their population. This resulted in declining energy use overall as well as by housing type for the SoCalGas new home population.

[9] Census Data Source: Census 2000 5% PUMS for California

STATE OF ILLINOIS
ILLINOIS COMMERCE COMMISSION

COMMONWEALTH EDISON COMPANY **Approval of the Energy Efficiency and Demand Response Plan**	)	**Docket No. 07-0540**

Exhibit 1.1 of
Geoffrey C. Crandall

On Behalf of

The Environmental Law & Policy Center

December 14, 2007

Geoffrey C. Crandall

Vice President and Principal

EDUCATION

B.S. in Business and Pre-Law, Western Michigan University, 1974.

Mr. Crandall has also completed courses at Michigan State University Graduate School, the University of Wisconsin-Madison and Wayne State University, in areas of federal taxation, accounting, management and the economics of utility regulation. Mr. Crandall also completed the examination for the National Conference of States on Building Codes and Standards Energy Auditor.

EXPERIENCE

Mr. Crandall joined MSB in January 1990. He specializes in residential and low-income issues, the impact of energy efficiency and utility restructuring on customers. Mr. Crandall has addressed issues related to energy efficiency and residential customers and utility restructuring in California, New York, Colorado, Iowa, and Michigan. He has analyzed and/or designed energy efficiency programs for residential customers in Michigan, Georgia, Wisconsin, Arizona, and New Orleans, and has conducted workshops on low-income restructuring and energy efficiency issues in over 20 states, including Washington, Hawaii, Nevada, Kansas, Michigan, Rhode Island, California, Virginia, and New Orleans. In the energy efficiency area, Mr. Crandall has analyzed and proposed modifications to utility demand-side programs in the states of Arizona, Georgia, Hawaii, Illinois, Maine, Michigan, Minnesota, North Carolina, Ohio, Pennsylvania, Utah, Washington State, California, Iowa, Montana, Colorado, Missouri, Virginia, Wisconsin, and Washington D.C.

Prior to joining MSB, Mr. Crandall was employed by the Michigan Public Service Commission from 1974 through 1989, where he served as the Director of the Demand-Side Management Division. He was responsible for the development, implementation and monitoring of government- and utility-sponsored demand-side management, energy-efficiency and conservation policies and programs. These activities involved customers in the residential, commercial, industrial and institutional sectors. He was responsible for both pilot and full-scale programs, and conducted demand-side program design and implementation. Mr. Crandall is familiar with marketing strategies, segmentation and market-penetration analyses, as well as the implementation of successful demand-side programs.

Mr. Crandall has dealt with a wide variety of regulatory issues beyond energy conservation, including utility diversification, non-traditional regulatory concepts, incentive regulation, utility billing practices, utility power plant maintenance and management of plant outages.

Mr. Crandall served as Chair of the NARUC Energy Conservation Staff Subcommittee from 1986-1989. He has lectured and made presentations to many groups on demand-side programs and least-cost planning, including two NARUC-sponsored least-cost planning conferences; the 1990 NARUC Regional Workshops on Least-Cost Utility Planning in Newport, Rhode Island and Little Rock, Arkansas; the Wisconsin Public Service Commission's Integrated Resource Planning Workshop; the 1988, 1989, and 1990 Michigan State University Graduate School of Public Utilities and the U.S. Department of Energy.

Mr. Crandall has testified before the: United States Congress, Michigan Legislature, Michigan Public Service Commission, North Carolina Utilities Commission, Public Service Commission of the District of Columbia, Illinois Commerce Commission, Maine Public Utilities Commission, Massachusetts Department of Public Utilities, Public Service Commission of Hawaii, Minnesota Public Service Commission, Iowa Public Service Commission, Georgia Public Service Commission, Public Utility Commission of Ohio, Virginia Public Service Commission, Wisconsin Public Service Commission, and the City Council of the City of New Orleans, Louisiana.

Mr. Crandall has written several articles published in the Public Utilities Fortnightly and Electricity Journal, Natural Gas Magazine, and a number of proceedings for the Biennial Regulatory Information Conference and the American Council for an Energy-Efficient Economy.

TESTIMONY

Case No. U-5531, (8/77), Consumers' Power Company electric rate increase application. Mr. Crandall served as the Staff Witness and recommended that the Applicant initiate the Residential Electric Customers' Information program.

Case No. U-6743, (3/81), Michigan Consolidated Gas Company. Mr. Crandall served as the Staff policy witness and recommended that the Commission approve a surcharge to cover all reasonable and prudent costs associated with Applicant's implementation of the Michigan Residential Conservation Services Program.

Case No. U-6819, (6/81), Michigan Power Company-Gas. Mr. Crandall served as the Staff policy witness and described the basis for the program and the expected level of activity, recommending that the Commission approve a surcharge to cover all reasonable and prudent costs associated with Applicant's implementation of the Michigan Residential Conservation Service Program.

Case No. U-6787, (6/81), Michigan Gas Utilities Company. Served as the Staff policy witness and described the basis for the program and the expected level of activity, recommending that the Commission approve a surcharge to cover all reasonable and prudent costs associated with the implementation of the Michigan Residential Conservation Service Program.

Case No. U-6820, (6/81), Michigan Power Company-Electric. Served as the Staff policy witness and reviewed the Applicant's request to operate the Michigan Residential Conservation Service Program. Although not mandated by federal law, Applicant chose to operate the program in conjunction with its other services offered to residential gas customers. Recommended the establishment of a surcharge to cover all reasonable and prudent costs associated with the operation of that program.

Case No. U-5451-R (10/82), Michigan Consolidated Gas Company. Served as the Staff policy witness and described the Staff's position regarding Applicant's proposed adjustment of surcharge level. Recommended that the eligibility criteria for customers be adjusted to more accurately reflect proper fuel consumption and to include customers who would be likely to realize a seven-year return on their investment by installing flue-modification devices in conjunction with Applicant's financing program.

Case No. U-6743-R, (10/82), Michigan Consolidated Gas Company. Served as the Staff policy witness regarding the Applicant's proposed expenses and revenues, as well as the reasonableness of activity and expense levels in the company's projected period.

Case No. U-7341 (12/84), Detroit Edison Company, Request for Authority for Certain Non-Utility Business Activities. Represented the Staff's position during settlement discussions and sponsored the settlement agreement.

Case No. U-6787-R, (3/84), Michigan Gas Utilities Company. Served as the Staff witness regarding the Applicant's proposed expenses and revenues. This also included a review of the company's future expenses associated with the Energy Assurance Program, the Specialized Unemployed Energy Analyses, and the Michigan Business Energy Efficiency Program expenses.

Case No. U-8528, (3/87), Commission's Own Motion on the Costs, Benefits, Goals and Objectives of Michigan's Utility Conservation Programs. Represented the Staff on the costs and savings of conservation programs and the other benefits of existing programs, and described alternative actions available to the Commission relative to future energy-conservation programs and services and other conservation policy matters.

Case No. U-8871, et al., (4/88), Midland Cogeneration Venture Limited Partnership. For approval of capacity charges contained in a power-purchase agreement with Consumers' Power Company. Served as the Staff witness on Michigan conservation potential and reasonably achievable programs that could be operated by Consumers' Power Company, and testified to the potential impact of these conservation programs on the Company's request for use of its converted nuclear plant cogeneration project. Also recommended levels of demand-side management potential for the commercial, industrial and institutional sectors in Consumers' Power service territory.

Case No. U-9172, (1/89), Consumers' Power Company, Power-Supply Cost-Recovery Plan and Authorization of Monthly Power-Supply Cost-Recovery Factors for 1989. Served as Staff witness on the conservation potential and reasonably achievable programs that could be operated by Consumers' Power Company. Testified to the potential impact of these conservation programs on the Company's fuel and purchase practices, its five-year forecast and the fuel factor. Recommended levels of demand-side management potential for the commercial, industrial and institutional sectors in Consumers' Power service territory as an offset to its more-expensive outside and internally generated power. Suggested that CPCO vigorously pursue conservation, demand-side management research, and planning and program implementation.

Case No. U-9263, (4/89), Consumers' Power Company Request to Amend its Gas Rate Schedule to Modify its Rule on Central Metering. Served as a Staff witness on the conservation effect of converting from individual metered apartments to a master meter. Suggested that the Commission continue its moratorium on the master meters, due to the adverse energy-conservation and efficiency impact.

Case No. E-100 (1/90) North Carolina Public Service Commission proceeding on review of the Duke Power Company's least-cost utility plan. Testified on behalf of the North Carolina Consumers' Council regarding utility energy-efficiency and demand-side management programs and the concept of profitability and implementation of demand-side management programs.

Case No. 889 (1/90) Public Service Commission of the District of Columbia. Testified on behalf of the Government of the District of Columbia in the Potomac Electric Power Company's application for an increase in its retail rates (general rate case). Sponsored testimony regarding the design and implementation and overall appropriateness of PEPCO's existing and proposed energy-efficiency and conservation programs.

Case No. 889 (4/90) Public Service Commission of the District of Columbia. Provided supplemental direct testimony and testified on behalf of the Government of the District of Columbia in the Potomac Electric Power Company's application for an increase in its retail rates (general rate case). Offered supplemental testimony regarding a more detailed review of PEPCO's existing pilot and full-scale energy-efficiency and conservation programs. Offered suggestions and recommendations for a future direction for PEPCO to pursue in order to implement more cost-effective and higher-impact energy-efficiency and conservation programs.

Case No. ICC Docket 90-004 and 90-0041 (6/90) Illinois Commerce Commission proceeding to adopt an electric-energy plan for Central Illinois Light Company (CILCO). Testified on behalf of the State of Illinois, Office of Public Counsel and the Small-Business Utility Advocate. Reviewed the CILCO electric least-cost plan filing and the conservation and load-management programs proposed in its filing. Sponsored testimony regarding my analysis of the proposed programs, and offered alternative programs for the Company's and the Commission's consideration.

Case No. D.P.U. 90-55 (6/90) Commonwealth of Massachusetts Department of Public Utilities. Testified on behalf of the Commonwealth of Massachusetts, Division of Energy Resources. Reviewed and analyzed Boston Gas' proposed energy-conservation programs that were submitted for pre-approval in its main rate case. In addition, suggested that it might consider implementation of other natural-gas energy- efficiency programs, and not award an economic incentive for energy-efficiency and conservation programs until minimum program-implementation standards are satisfied.

Case No. U-9346 (6/90) Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency Association. Reviewed and analyzed the Consumers' Power Company rate-case filing related to energy-efficiency and demand-side management programs. Proposed alternative energy-efficiency programs and recommended program budgets and a cost-recovery mechanism.

Case No. 89-193; 89-194; 89-195; and 90-001 (6/90) Maine Public Utilities Commission. Testified on behalf of the Maine Public Advocate's Office. Reviewed the appropriateness of Bangor Hydro-Electric Company's existing energy-efficiency and demand-side management programs in the context of BHE's main rate case and request for approval to construct the Basin Mills Hydro-Electric dam. Reviewed the overall resource plan and suggested alternative programs to strengthen the energy-efficiency and demand-side management resource efforts.

Case No. 6617 (4/91) Hawaii Public Utility Commission. Testified on behalf of the Hawaii Division of Consumer Advocacy. Described what demand-side management resources are, why they should be included in the integrated resource planning process, and proposed the implementation of several pilot projects in Hawaii along with guidelines for the pilot programs.

Case No. E002/GR-91-001 (5/91) Minnesota Public Utilities Commission. Testified on behalf of Minnesotans for an Energy Efficient Economy. Assessed the DSM programs being operated or proposed by Northern States Power Company and made recommendations as to ways in which NSP could improve its DSM efforts.

Case No. 905 (6/91) Public Service Commission of the District of Columbia. Testified on behalf of the District of Columbia Energy Office. Responded to the energy-efficiency and load management aspects of Potomac Electric Company's filing and made several recommendations for DC-PSC action.

Case No. 6690-UR-106 (9/91) Public Service Commission of Wisconsin. Testified on behalf of The Citizens' Utility Board of Wisconsin. Assessed the DSM programs being operated or proposed by the Wisconsin Public Service Corporation, made recommendations as to the WPSCO energy efficiency programs, and suggested ways the company could improve its DSM efforts.

Case No. E002/CN-91-19 (12/91) Minnesota Public Utilities Commission. Testified on behalf of Minnesota Department of Public Service. Assessed the DSM potential and programs being operated or proposed by Northern States Power Company and made recommendations as to the potential for energy efficiency in the NSP service territory and ways in which NSP could improve its DSM efforts.

Case No. 912 (4/92) Public Service Commission of the District of Columbia. Testified on behalf of the Government of the District of Columbia in the Potomac Electric Power Company's application for an increase in its retail rates for the sale of electric energy. Testified regarding the reasonableness of DSM and EUM policy changes, the cost allocation of the DSM and EUM expenses, an examination of the prudence of management regarding the energy-efficiency programs, and an examination of the appropriateness of the costs associated with energy-efficiency programs.

Case No. PUE 910050 (5/92) Virginia State Corporation Commission. Testified on behalf of the Citizens for the Preservation of Craig County regarding the need for the Wyoming-Cloverdale 765 kV transmission line. Specifically, addressed the adequacy of the DSM planning of Appalachian Power Company and Virginia Power/North Carolina Power. Made recommendations as to APCO and VEPCO's energy efficiency programs, and suggested ways the company could improve its DSM efforts.

Case EEP-91-8 (5/92). Iowa Utilities Board. Testified on behalf of the Izaak Walton League concerning the adequacy of Iowa Public Service Company's Energy Efficiency Plan. Reviewed the plan and suggested modifications to it.

Case No. 4131-U and 4134-U (5/92). Georgia Public Service Commission. Testified on behalf of the Georgia Public Service Commission staff regarding the demand-side management portions of Georgia Power Company's and Savannah Electric and Power Company's Integrated Resource Plans. Testimony demonstrated that it is reasonable for the Commission to expect that the utilities can successfully secure substantial amounts of demand-side management resources by working effectively with customers.

Case 917 (8/92). Public Service Commission of the District of Columbia. Testified on behalf of the District of Columbia Energy Office in hearings on Potomac Electric Power Company's Integrated Resource Planning process. Addressed a number of program-specific issues related to PEPCO's demand-side management efforts.

Case No. 4132-U, 4133-U, 4135-U, 4136-U (10/92). Georgia Public Service Commission. Testified on behalf of the Staff Adversary IRP Team of the Georgia PSC. Provided a critique of Georgia Power Company's and Savannah Electric and Power Company's proposed residential and small commercial DSM programs.

Case No. 4135-U (3/93). Georgia Public Service Commission. Testified on behalf of the Staff Adversary IRP Team of the Georgia PSC. Provided a critique of Savannah Electric and Power Company's proposed Commercial and Industrial DSM programs.

Case No. R-0000-93-052 (12/93). Arizona Corporation Commission. Testified on behalf of the Arizona Community Action Association. Critiqued and made recommendations regarding the integrated resource plans and demand-side management programs of Arizona Public Service Company and Tucson Electric Power Company.

Case No. 934 (4/94). Public Service Commission of the District of Columbia. Filed testimony on behalf of the District of Columbia Energy Office in hearings concerning the Washington Gas Light Company (WGL) general rate case application to increase existing rates and charges for gas service. Testimony involved critiquing and reviewing WGL's least cost planning efforts and integration of DSM, marketing and gas supply efforts.

Case No. U-10640 (10/94). Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency Association concerning the need to integrate DSM and load promotion analysis into MichCon's GCR planning process.

Case No. 05-EP-7 (3/95). Wisconsin Public Service Commission. Testified on behalf of the Citizens' Utility Board on level of utility DSM and program designs and strategies.

Case No. 05-EP-7 (3/95). Wisconsin Public Service Commission. Testified on behalf of the Wisconsin Community Action Program Association on low-income customers and utility DSM programs.

Case No. TVA 2020-IRP (9/95). Tennessee Valley Authority. Testified on behalf of the Tennessee Valley Energy Reform Coalition. Assessed, critiqued and made recommendations regarding the integrated resource plans and demand-side management programs proposed by the Tennessee Valley Authority.

Case No. R-96-1 (10/95). Alaska Public Utilities Commission. Testified on behalf of the Alaska Weatherization Directors Association regarding the proposed standards and guidelines for integrated resource planning and energy efficiency initiatives under consideration in Alaska.

Case No. D95.9.128 (2/96). Montana Public Service Commission. Testified on behalf of the District XI Human Resources Council concerning the low-income energy efficiency programs offered by the Montana Power Company.

Case No. DPSC Docket No. 95-172 (5/96). Delaware Public Service Commission. Prepared draft testimony on behalf of the Low-Income Energy Consumer Interest Group regarding Delmarva Power & Light Company's application to revise its demand-side programs. The case was settled, with LIECIG obtaining funding for low-income energy efficiency programs, prior to testimony.

Case No. U-11076 (8/96). Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Michigan Jobs Commission's recommendations regarding electric and gas reform. Discussed the implications of utility restructuring and the needs of residential and low-income households, and proposed regulatory and industry solutions.

Case No. 96-E-0897 (3/97). New York Public Service Commission. Prepared draft testimony for New York's Association for Energy Affordability regarding the impact of proposed utility restructuring plans on low-income customers. The case was settled in Spring 1997.

Case No. R-00973954 (7/97). Pennsylvania Public Utilities Commission. Testified on behalf of the Commission on Economic Opportunity regarding the economics of demand-side measures and programs proposed for implementation by Pennsylvania Power & Light Company.

Case No. 98-07-037 (7/98) California Public Utilities Commission. Testified on the California Alternative Rates for Energy and the Low Income Energy Efficiency programs

regarding the implementation and adoption of revisions to these programs necessitated by the AB 1890 and the Low Income Governing Board.

Case No. U-12613 (3/01). Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Wisconsin Public Service Corporation application to implement PA 141 the electricity deregulation law. I reviewed the portions of the filing related to their provision of electric energy efficiency and load management.

Case No. U-12649 (3/01). Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Wisconsin Electric Power Company and the Edison Sault Electric Company application to implement PA 141 Michigan's electricity deregulation law. I reviewed the portions of the filing related to their provision of electric energy efficiency and load management.

Case No. U-12651 (3/01). Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Northern States Power Company – Wisconsin application to implement PA 141 the electricity deregulation law. I reviewed the portions of the filing related to their provision of electric energy efficiency and load management.

Case No. U-12652 (3/01). Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Indiana Michigan Power Company d/b/a American Electric Power application to implement PA 141 the electricity deregulation law. I reviewed the portions of the filing related to their provision of electric energy efficiency and load management.

Case No. U-12725 (4/01). Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Wisconsin Electric Power Company and the Edison Sault Electric Company application to increase its residential rates. I reviewed the portions of the filing related to their provision of electric energy efficiency and load management and recommended a significant increase in these activities.

Case No. U-13060 (12/01). Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Michigan Consolidated Gas Company application for Approval of their Gas Cost Recovery Plan and Five-Year gas Forecast. I reviewed the filing and recommended the Commission reject the proposed GCR factor and suggested continuation of the existing GCR factor or adopt an adjusted MCAAA sponsored GCR factor. I also suggested a set-aside allocation be designated for low-income customers to ensure access to alternative gas providers under the applicant's customer choice program.

Case No. 6690-UR-114 (9/02). Wisconsin Public Service Commission. Testified on behalf of the Citizens Utility Board regarding the Wisconsin Public Service Corporation application to increase its electric and natural gas rates. I reviewed the portions of the filing related to their low-income assistance/weatherization and the proposed executive compensation incentive plan.

Case No. U-14401 (04/05). Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Michigan Consolidated Gas Company application for Approval of their Gas Cost Recovery Plan and Five-Year gas Forecast. I reviewed the filing and recommended the Commission reject the proposed plan and suggested initiation of strategies that would lower the need to acquire expensive and unnecessary gas supplies.

Case No. U-14401-R (10/05). Michigan Public Service Commission. Testified on behalf of the Michigan Community Action Agency regarding the Michigan Consolidated Gas Company application re-opener Approval of their Gas Cost Recovery Plan and Five-Year gas Forecast. I reviewed the filing and recommended the Commission reject the proposed plan and suggested initiation of strategies that would lower the need to acquire expensive and unnecessary gas supplies.

Case No. U-14701 (02/06) Michigan Public Service Commission. Testified on behalf of the Michigan Environmental Council and The Public Interest Group In Michigan regarding the Consumers Energy Company application for Approval of a Power Supply Cost Recovery Plan and for Authorization of Monthly Power Supply Cost Recovery Factors for Calendar Year 2006. I reviewed the filing including the application, testimony, exhibits, discovery responses and submitted testimony recommending that the Commission not approve the five-year PSCR plan as filed due to the impacts related to the Palisades sale and the absence of alternative resources in the projected five-year resource portfolio.

Case No. U-14702 (02/06) Michigan Public Service Commission. Testified on behalf of the Michigan Environmental Council and The Public Interest Group In Michigan regarding The Detroit Edison Company application for authority to implement a Power Supply Cost Recovery Plan in its rate schedules for 2006 metered jurisdictional sales of electricity. I reviewed the application, testimony, exhibits and submitted testimony that recommended that the Commission not approve the proposed five-year PSCR plan as filed due because it was deficient in its selection of alternative resources in the projected five-year resource portfolio.

Case No. U-14992 (12/06) Michigan Public Service Commission. Testified on behalf of the Michigan Environmental Council and The Public Interest Group In Michigan regarding The Consumers Energy Company application for approval of the proposed Power Purchase Agreement in connection with the sale of the Palisades Nuclear Power Plant and other assets. The purpose of my testimony was to address the overall soundness of this application and proposal. I reviewed the application, testimony, exhibits and submitted testimony that recommended that the Commission not approve the proposed purchase power agreement and transfer the ownership of the nuclear plant and other assets.

Case No. 06-0800 Illinois Commerce Commission (3/07). Provided testimony on behalf of the Illinois Citizens Utility Board regarding the Illinois electricity resource auction process. I assessed the existing resource/power supply auction based bidding process and recommended modifications and improvements to the Illinois resource acquisition mechanism.

Case No. 24505-U (5/07). Georgia Public Service Commission. Testified on behalf of the Georgia Public Service Commission Advocacy staff regarding the demand-side management portions of Georgia Power Company's Integrated Resource Plans. Testimony demonstrated that it is reasonable for the Commission to approve the five proposed DSM programs and expect that Georgia Power can successfully secure considerably more demand-side management resources by working effectively with its customers.

Case No. U-14992 (11/07) Michigan Public Service Commission. Testified on behalf of the Michigan Environmental Council and The Public Interest Group In Michigan regarding The Consumers Energy Company rate application for approval a rate increase and the recovery of energy efficiency programs and certain costs in connection with the sale of the Palisades Nuclear Power Plant and other assets. I reviewed the application, testimony, exhibits and submitted testimony that recommended that the Commission not approve the recovery of transaction costs involving the transfer the ownership of the nuclear plant and other assets and on various aspects of its proposed energy efficiency programs and proposed incentives.

In addition, I have served the following public sector clients since 1990.

Client	Nature of Service
Alaska Housing Finance Corporation	Analysis of energy efficiency, system planning and applicability of EPAct standards to Alaska resource selection process.
California Low Income Governing Board	In conjunction with AB 1890 the state's restructuring statute provided analyses of options to deliver energy efficiency and assistance programs to low-income households in a restructured utility environment. Assisted the CPUC and Low Income Governing Board in developing low-income energy assistance and energy efficiency programs, implementation methods and procedures under interim utility administration.
Conservation Law Foundation of New England	Provided technical support to the collaborative working groups with Boston Edison, United Illuminating, Eastern Utilities Association, and Nantucket Electric regarding system planning approaches, energy efficiency programs and resource screening.
District of Columbia Energy Office	Analysis of DC Natural Gas' and PEPCo's integrated resource planning and demand side management programs.
District of Columbia Public Service Commission	Testimony regarding demand-side management, least cost planning principles.
Germantown Settlement, Philadelphia	Analysis and technical support regarding business structure and market to aggregate load and/or provide energy efficiency and energy assistance services to low-income households.
Hawaii Division of Consumer Advocacy	Developed demand-side management programs and integrated resource planning rules.
Iowa Department of Natural Resources	Developed and implemented workshops to train building operators and architects in energy efficiency and renewable energy resource opportunities.

Public Interest Research Group In Michigan	Principal investigator and project manager for the "Lessons Learned: Michigan Electricity Restructuring Report"
Maryland Public Service Commission	Reviewed demand-side management programs and impact and process evaluation methods and suggested improvements.
Massachusetts Division of Energy Resources	Analysis of Boston Gas Co. integrated resource plans and residential energy efficiency programs. Analysis of Boston Gas's commercial and industrial energy efficiency programs
City of New Orleans	Developed least cost planning rules, guided a public working group to develop demand-side programs, and developed a low income, senior citizens energy efficiency program.
Oak Ridge National Laboratory	Prepared an economic analysis of the customer impact from various electricity restructuring configurations for the State of Ohio
Ohio Office of Consumer Council	Analyzed two utilities' long-range plans and energy efficiency resource options. Analyzed the Dominion East Gas Company application to be relieved of the merchant function.
Ontario Energy Board	Developed demand-side management programs and evaluated need for natural gas integrated resource planning rules.
Pennsylvania Office of Consumer Advocate	Evaluated demand-side management programs for several electric utilities.
Upper Peninsula Power Company	Provided technical training, technical and achievable energy efficiency potential analysis and developed a specific and geographically tailored low income, senior citizens energy efficiency program.

U.S. Environmental Protection Agency	Developed handbook, "Energy Efficiency and Renewable Energy: Opportunities from Title IV of the Clean Air Act", which focuses on how energy efficiency and renewables relate to acid rain compliance strategies.
U.S. Environmental Protection Agency and U.S. Department of Energy	Analyzed and compared utility supply- and demand-side resource selection for Clean Air Act compliance on the Pennsylvania-New Jersey-Maryland (PJM) interconnection.
Utah Department of Commerce	Analysis of the PacifiCorp proposed Demand-Side Management Tariff Schedule.
Vermont Public Service Board	Analysis of the prudence of Green Mountain Power's planning and management of the Hydro-Quebec power purchase.
Washington State Weatherization Directors	Natural Gas energy conservation program design involving Cascade Natural Gas Company

STATE OF ILLINOIS
ILLINOIS COMMERCE COMMISSION

COMMONWEALTH EDISON COMPANY **Approval of the Energy Efficiency and Demand Response Plan**	)	**Docket No. 07-0540**

Exhibit 1.2 of
Geoffrey C. Crandall

On Behalf of

The Environmental Law & Policy Center

December 14, 2007

Nexant
The Power of Experience

PUBLIC DISCLOSURE

Achievable Energy Efficiency Potential Assessment

Final Study for Georgia Power

March, 2007

Table of Contents

1 EXECUTIVE SUMMARY

1.1 Background

- The Georgia Public Service Commission, in Docket No. 22449-U issued a June 22, 2006 accounting order that requires Georgia Power Company's 2007 IRP filing to include an assessment of the maximum achievable cost effective potential for energy efficiency programs in its service area.

- The assessment study is to follow the scope and detail used in the May 5, 2005 Assessment of Energy Efficiency Potential in Georgia prepared for the Georgia Environmental Facilities Authority (GEFA).

- Georgia Power retained Nexant, Inc. to conduct the assessment of energy efficiency potential in the Georgia Power Company service area, building upon results of the Company's demand-side management (DSM) measure screening and technical analyses which Nexant had supported over the preceding months. Southern Company Services provided additional support on the study's modeling analyses.

1.2 Assessment Approach

- The assessment of achievable potential was conducted in three sequential steps.
  - Organize input data. Compile final DSM measure screening results and collect service area sales forecast data. Inputs include confidential data such as forecast customer counts and floor space, end-use saturations, end-use unit energy consumption and energy intensity, etc.
  - Estimate energy efficiency potential impacts at end use level. Using economic screening results of 215 discrete measures, Nexant analyzed groups of measures by facility type and end use to estimate technically feasible and economically feasible potential impacts. The groups of measures were modeled in EnerSim to simulate interactive effects of multiple measures affecting space conditioning end uses.

- Estimate theoretically achievable impacts. Following a review of DSM market potential studies and observed program results, Nexant applied plausible market penetration curves to each end use to estimate technically feasible, economically feasible, and potentially achievable energy efficiency impacts

1.3 Definitions of Energy Efficiency Potential

- For symmetry with the GEFA report on Energy Efficiency Potential, this study defines energy efficiency potential as follows:
  - Technical Potential—the quantification of savings that could be realized if energy efficiency measures were applied in all feasible instances, regardless of cost.
  - Economic Potential—the subset of technical potential that is cost-effective from the Total Resource Cost Perspective, without regard to cross subsidies
  - Achievable potential—energy savings that can feasibly be achieved through program and policy interventions. This study estimates theoretically achievable potential for three policy intervention scenarios that correspond to varying levels of incentives provided to end-use consumers:[1]
    - Low incentives—monetary incentives to customers equivalent to 25% of incremental costs of energy efficiency improvements
    - Moderate incentives—monetary incentives to customers equivalent to 50% of incremental costs of energy efficiency improvements
    - Aggressive incentives—monetary incentives to customers equivalent to 100% of incremental costs of energy efficiency improvements

[1] The scenario definitions adopt the nomenclature of the GEFA study to describe varying levels of incentives without consideration of possible connotations of "low," "moderate," and "aggressive" levels of incentives.

- Each scenario includes significant expenditures on incentives to subsidize the purchase of energy-efficiency measures. It should be further noted that this study is based on a number of estimates, including projections of penetration rates which attempt to describe human behavior associated with program structures. It is not possible to know with certainty whether the results can be obtained under the scenarios studied.

1.4 Summary Results

- This assessment presents projections of estimated technical, economic, and achievable potential for the 2007 to 2018 time period. Section 3 presents detailed results.
- Projections of achievable potential by the year 2010 range between 1.7% and 6.2% of electricity sales, and 2.0% and 7.3% of peak demand.[2] Table 1 below presents results for the three policy intervention scenarios.[3]
- Figure 1 and Figure 2 below show projections of theoretically achievable energy sales and peak demand relative to Georgia Power's baseline forecasts.[4] The figures illustrate alternative forecasts that reflect the effects of estimated Low Incentive, Moderate Incentive, and High Incentive impacts on electricity sales and peak demand.

Table 1: Theoretically Achievable Potential—Total Potential and Percent of 2010 Forecast

Load Type	Low Incentive		Moderate Incentive		Aggressive Incentive	
Reduction in Electricity Sales (MWh)	Redacted	1.7%	Redacted	3.3%	Redacted	6.2%
Reduction in Peak Demand (MW)	Redacted	2.0%	Redacted	3.8%	Redacted	7.3%

[2] Throughout this study, "peak demand" signifies the demand for power at the generator level at the time of system peak, except as otherwise noted.
[3] Each scenario estimate of theoretically achievable potential assumes a 2007 start date of full-scale program implementation. Delayed start-up or a measured ramping up to full-scale implementation would lessen the magnitude of theoretically achievable potential in any given future year.
[4] This study analyzed the residential, commercial, and industrial sector forecasts, and not Georgia Power's total forecast, which also includes MARTA and territorial wholesale customers.

Figure 1: Theoretically Achievable Potential (Electricity Sales)

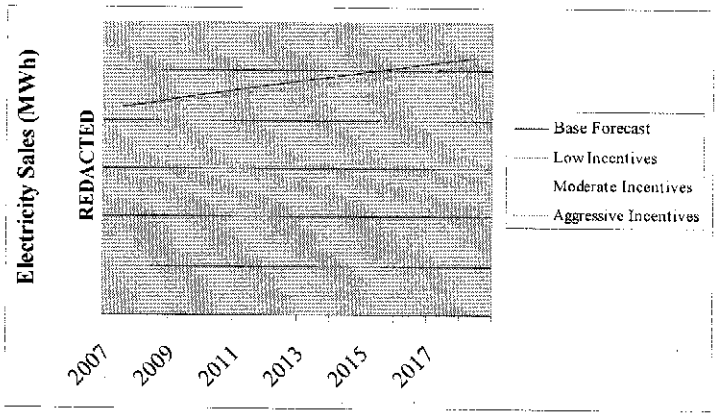
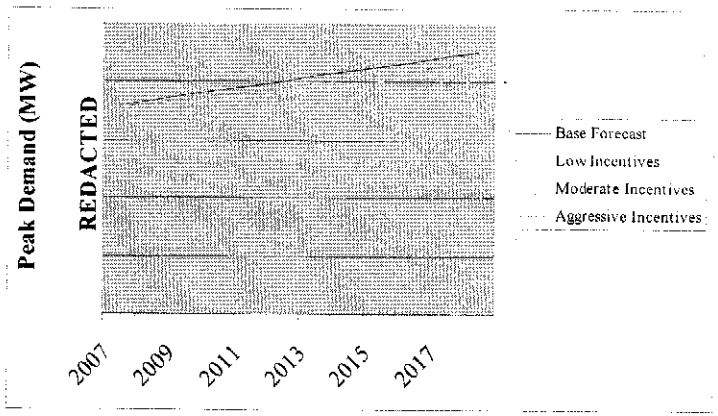


Figure 2: Theoretically Achievable Potential (Peak Demand)



1.4.1 Achievable Potential by Sector

- For the Aggressive Incentive scenario, Figure 3 and Figure 4 illustrate the achievable potential for electricity sales and peak demand impacts by sector.

Figure 3: 2010 Achievable Potential by Sector (Electricity Sales)

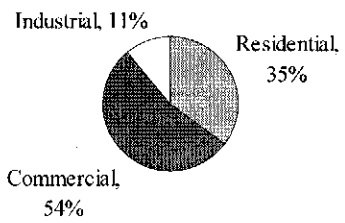
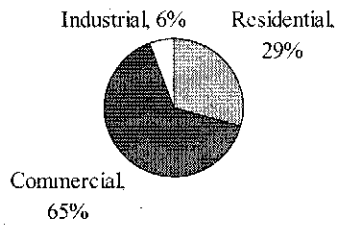


Figure 4: 2010 Achievable Potential by Sector (Peak Demand)



1.4.2 Achievable Potential by End Use

- Figure 5 and Figure 6 illustrate the end uses that comprise the achievable potential (Aggressive Incentive scenario) for electricity sales and peak demand impacts.

Figure 5: 2010 Achievable Potential by End Use (Electricity Sales)

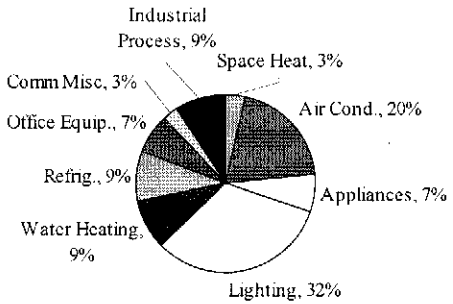
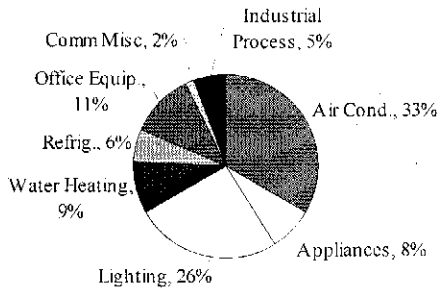


Figure 6: 2010 Achievable Potential by End Use (Peak Demand)



Note: The end-use shares of theoretically achievable potential are based on non-coincident peak demand reductions and do not necessarily match shares sector shares presented in Figure 4.

1.4.3 Achievable Potential Cost-Effectiveness

- Table 2, Table 3, and Table 4 present cost-effectiveness indicators from Total Resource Cost (TRC), Ratepayer Impact Measure (RIM), and Participant Cost Test (PCT) perspectives respectively, of the effects of achievable energy efficiency impacts from 2007 through 2018. The tables present economic indicators for each scenario of theoretically achievable potential.
- Benefits and costs are measured in the following way from TRC, RIM, and PCT perspectives:

- The TRC and RIM perspectives measure benefits as the reductions in costs utilities experience as a result of reduced demand for energy. The PCT measures benefits as the reductions in participants' energy costs plus all incentives received to offset energy-efficiency measure costs.
- TRC perspective costs include all costs incurred to purchase, install, and maintain efficiency technologies, plus administrative costs required to implement energy efficiency programs
- RIM perspective costs include all incentives to encourage purchase, installation, and maintenance of efficiency technologies, plus administrative costs required to implement energy efficiency programs, plus the lost electric utility revenues as a result of reduced energy sales.[5]
- PCT perspective costs include all costs incurred to purchase, install, and maintain efficiency technologies.

- TRC net benefits of between $0.8 and $3.1 billion are theoretically achievable, at a RIM net cost of between $1.3 and $4.9 billion to electricity ratepayers. The RIM net cost indicates the amount that electricity rates would have to increase due to DSM—over and above rate increases that would ordinarily be expected.[6]

- PCT net benefits of between $1.6 and $6.7 billion are theoretically available to participants.

Table 2: TRC Net Benefits and Benefit-Cost Ratios

Scenario	Net Benefits (Billions)	Benefit-Cost Ratio
Low Incentive	$0.8	1.5
Moderate Incentive	$1.8	1.7
Aggressive Incentive	$3.1	1.8

Table 3: RIM Net Benefits and Benefit Cost-Ratios

Scenario	Net Benefits (Billions)	Benefit-Cost Ratio
Low Incentive	-$1.3	0.6
Moderate Incentive	-$2.4	0.6
Aggressive Incentive	-$4.9	0.5

[5] Electric utility revenues are lost when authorized fixed costs are under-recovered due to the effects of DSM on reducing energy sales. Recovery of these authorized fixed costs from remaining energy sales causes rates to increase.

[6] This study does not estimate RIM benefits and costs from a gas utility perspective. To the extent that gas utility lost revenues exceed avoided gas supply costs, as would normally be expected, gas rates would also be adversely affected and would rise above otherwise anticipated increases. Estimated net present value data presented in this assessment are for the period from 2007 through 2018.

Table 4: PCT Net Benefits and Benefit-Cost Ratios

Scenario	Net Benefits (Billions)	Benefit-Cost Ratio
Low Incentive	$1.6	3.1
Moderate Incentive	$3.4	3.4
Aggressive Incentive	$6.7	4.0

- Figure 7, Figure 8, and Figure 9 below illustrate breakdowns of benefits and costs for TRC, RIM, and PCT perspectives for each of the three scenarios.
  - The TRC benefits in each scenario accrue from approximately equal shares of avoided electricity costs and avoided gas costs.
  - The RIM perspective includes benefits and costs only to the electric utility.
  - The PCT net benefits would be substantial even without financial incentives to encourage participation by subsidizing portions of participants' efficiency measure costs.

Figure 7: TRC Benefits and Costs by Scenario

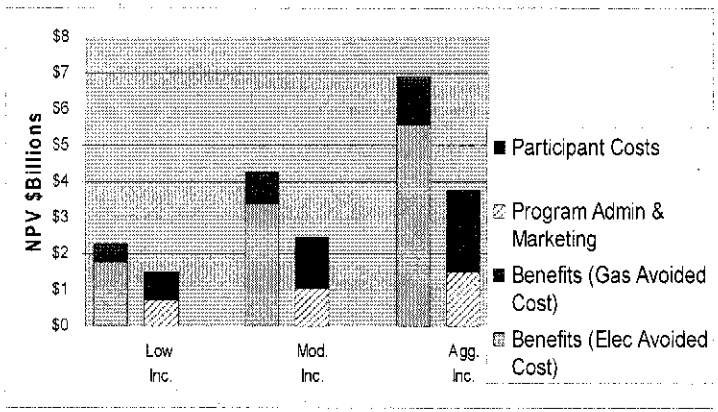
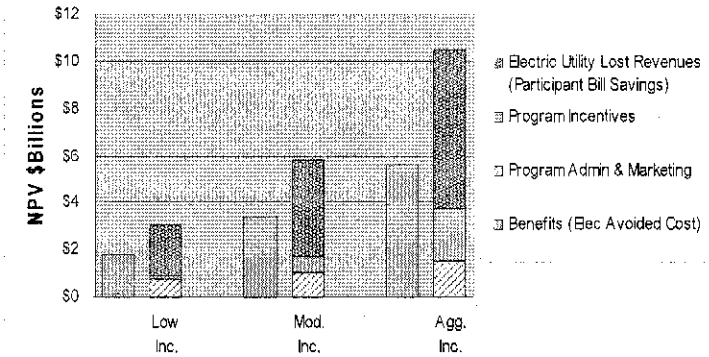
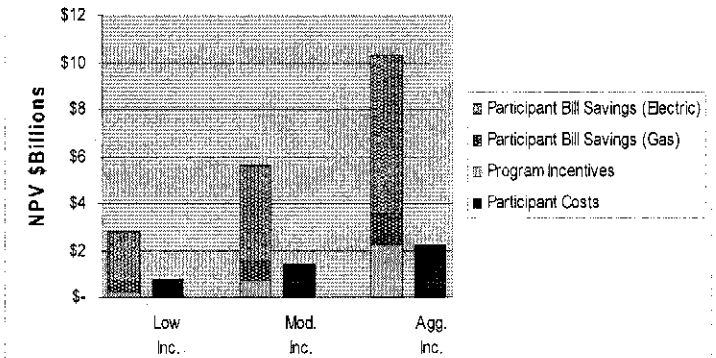


Figure 8: RIM Benefits and Costs by Scenario



Note: The above RIM analysis is only for the electric utility and does not include gas utility RIM results.

Figure 9: PCT Benefits and Costs by Scenario



- Annual DSM program expenditures in each theoretically achievable scenario would be substantial. Table 5 lists the annual expenditures in 2010 associated with each of the scenarios.

Table 5: 2010 Annual Program Expenditures by Scenario ($Millions)

Scenario	Annual Incentives ($MM)	Administrative Costs ($MM)	Total Costs ($MM)
Low Incentive	$29.0	$116.0	$145.0
Moderate Incentive	$125.8	$188.8	$314.6
Aggressive Incentive	$513.9	$342.6	$856.6

- Table 6 indicates the cumulative capacity reductions that are theoretically achievable for each of the scenarios analyzed.[7]

Table 6: Theoretically Achievable Georgia Power Capacity Reductions

Scenario	2018 Capacity Change (MW)
Low Incentive	Redacted
Moderate Incentive	Redacted
Aggressive Incentive	Redacted

1.5 Conclusions

- An apparently significant potential for increased energy efficiency exists in Georgia, where the economy could benefit from effects associated with reduced energy consumption and peak power requirements.

[7] In this table, capacity reductions signify the amount of generation capacity, as opposed to peak demand, that could theoretically be avoided.

- Reductions in energy consumption and peak power requirements occur when energy-efficiency measures or actions are implemented by energy customers, who receive economic benefits directly from reductions in their energy bills. Customers could also benefit from any financial incentives that might be offered by programs intended to accelerate markets for the purchase and installation of high-efficiency measures.

- Per directive of the Georgia Public Service Commission, this study adopts the structure of the Georgia Environmental Facilities Authority's similar study, which examined scenarios of theoretically achievable energy efficiency potential associated with "low" incentives, "moderate" incentives, and "aggressive" incentives. Each scenario involves substantial expenditures on incentives, ranging from $29 million per year to more than $510 million per year by 2010, the fourth year of program implementation. This study also demonstrates, however, that customers are able to realize substantial benefits from increased energy efficiency even without any financial subsidies.

- Economic benefits to the State's retail energy market resulting from energy efficiency improvements made by customers in Georgia Power's service territory could range to as high as $0.8 billion to $3.1 billion.

- If implemented through electric utility programs, the potential benefits of energy efficiency associated with energy reductions ranging from 1.7 percent to 6.2 percent of forecast sales come at a substantial cost to ratepayers. Net costs to electric utility ratepayers could range to as high as $1.3 billion to $4.9 billion. These costs are over and above the cost associated with meeting these demand needs using supply side options. Program costs alone could increase rates as much as $0.9 billion to $3.8 billion. This study does not estimate costs to gas utility ratepayers, who could also experience adverse rate impacts.

1.6 Caveats

- The interpretation of results presented in this study (and in general, all studies of this nature) should include consideration of several important caveats.

- Uncertainties. A key determinant of the potential for achievable energy efficiency savings is the market penetration rate and yet these estimates of customer response represent a substantial source of uncertainty in the projections of achievable potential. The GEFA study, in a similar caveat, noted that "the greatest source of uncertainty in our projections of achievable potential are the estimates of market share growth under each policy scenario."

  The estimated impact of efficient technologies on energy consumption is another key determinant of savings potential, and yet these inputs also have substantial uncertainty. In the near term, while efficient technology options can be reasonably well defined, customer behavior and electricity usage patterns vary widely and can differ significantly from assumptions necessarily made to model "typical" usage profiles. In future years, uncertainties are exacerbated by lack of information about future technology choices. Georgia Power's forecasting models already incorporate the effects of trend increases in end use energy efficiency that reflect historical trends. There is no sound basis, however, for estimating potential impacts of unknown future technologies that are incrementally *even more* efficient than the higher efficiency end uses implicitly incorporated in the forecast. As a result, the availability and magnitude of future impacts are inherently speculative.

- Potential reliability impacts. The uncertainties noted above could result in deterioration of system reliability if estimates of theoretically achievable energy savings were used to justify reductions in the load forecasts used for planning Power Purchase Agreements (PPAs) and capacity construction programs. If estimated energy savings do not materialize, then the planned PPAs and generation resource options—many of which require long lead times to place into operation—might be insufficient to sustain system reliability until recourse to additional (and likely more costly) resource options can be secured.

- Rate impacts. The effect of energy efficiency programs on rates, unlike other effects of energy savings programs, has little uncertainty: energy efficiency programs cause electricity rates to rise faster than they would ordinarily. In addition, the uncertainties noted above that could result in reduced energy savings are not necessarily associated with comparable reductions in program costs and adverse rate impacts. Market

acceptance rates that fail to materialize, for example, reduce incentives and rebate processing costs but do not reduce marketing costs or other fixed costs of program management and reporting. More worrisome, if realized technology impacts are less than estimated impacts, then the impact of *all* of the estimated costs of rebates, processing, marketing, and administration remains but with diminished savings of supply costs. That is, the rate impacts effects could be more adverse than estimated in this study.

2 STUDY APPROACH

2.1 Introduction

- It should be noted that this study is based on a number of estimates, including projections of penetration rates which attempt to describe human behavior associated with program structures. It is not possible to know with certainty that the results can be obtained under the scenarios studied.

2.1.1 Background

- The Georgia Environmental Facilities Authority (GEFA), to better understand the estimated magnitude of achievable energy savings potential in Georgia, commissioned ICF Consulting to conduct a study of technical and economic potential for energy efficiency in the State

- Referencing the GEFA study, the Georgia PSC issued a June 22, 2006 accounting order in Docket No. 22449-U requiring Georgia Power Company's 2007 IRP filing to include an assessment of the maximum achievable cost effective potential for energy efficiency programs in its service area.

2.1.2 Objectives

- In response to the accounting order, Georgia Power subsequently retained Nexant to investigate energy efficiency potential in its service area, defining the following objectives:
  - Expand the scope of DSM measure screening and economic analyses to quantify technical and economic potential for energy efficiency
  - Assess theoretically achievable potential for energy efficiency in scenario analyses corresponding to policy settings in which customers are offered low incentives, moderate incentives, and aggressive incentives

2.2 Approach

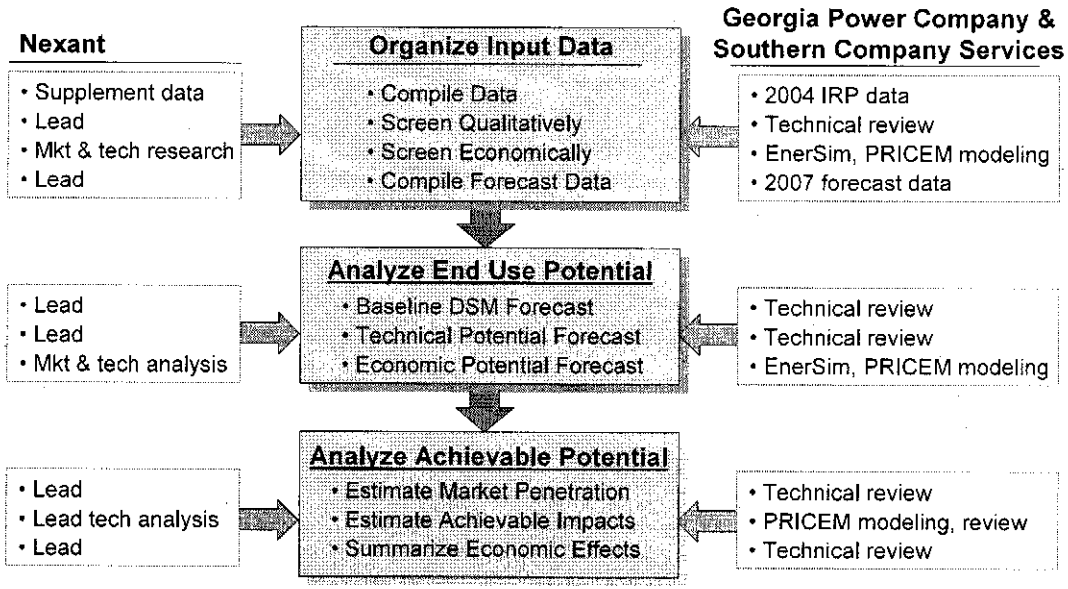
- The central technique in Nexant's approach to projecting estimates of energy efficiency potential is to modify end-use forecast data to reflect substitution of existing and expected energy consumption patterns with higher-efficiency end-use patterns.
- The study followed three sequential steps, which are each described in more detail in the text that follows below. Nexant, Georgia Power, and Southern Company Services staff worked in close collaboration throughout the analysis, to maximize effective use of their combined expertise and analytical tools. Figure 10 illustrates the roles and inputs each party contributed to the analysis.
  - Organize input data. Compile final DSM measure screening results and collect service area sales forecast data. Inputs include confidential data such as forecast customer counts and floor space, end-use saturations, end-use unit energy consumption and energy intensity, etc.
  - Estimate energy efficiency potential impacts at end use level. Using economic screening results of 215 discrete measures, Nexant analyzed groups of measures by facility type and end use to estimate technically feasible and economically feasible potential impacts. The groups of measures were modeled in EnerSim to simulate interactive effects of multiple measures affecting space conditioning end uses.
  - Estimate theoretically achievable impacts. Following a review of DSM market potential studies and observed program results, Nexant applied plausible market penetration curves to each end use to estimate technically feasible, economically feasible, and potentially achievable energy efficiency impacts.

2.2.1 Organize Data Inputs

- To ensure a comprehensive analysis of energy end uses and potentially achievable savings, Nexant's analysis began with a "bottom up" approach that examined measure-specific impacts and cost data. Measure data resulted from several comprehensive screening analyses that Nexant and Georgia Power had jointly conducted

and shared with the DSM Working Group (established by a 2004 ruling of the Georgia Public Service Commission) over the preceding months. The screening analyses included the following key components:

Figure 10: Analysis Inputs and Roles



– Compile and augment comprehensive lists of measures, building upon prior analyses conducted in Georgia and in other states. The measures analyzed in Georgia Power's 2004 IRP provided an initial list, which was supplemented through consideration of other sources, such as the 2005 GEFA report, California's Deemed Energy Efficiency Resource database and the Northwest Power and Conservation Council's Regional Technical Forum database. The final list included almost 550 measures.

- Conduct a qualitative screening to ensure that candidate measures are suitable for the Company's customers, that costs and impacts can be determined with reasonable accuracy, that better measures are not readily available in the marketplace, etc. The qualitative screening analysis, which resulted in a list of about 500 measures, was also discussed in progress with the DSM Working Group.
- For all candidate measures that passed the qualitative screening, the approach updated both cost and impact data for each measure.
    - Nexant conducted market research to update measure costs. The cost data differentiate between type of cost (capital, installation labor, maintenance, etc.) so that cost components can be updated more readily. In this way, retrofit (capital plus installation labor plus incremental maintenance), new construction (incremental capital and maintenance), and burnout costs (incremental capital and maintenance) can be separately evaluated for measures that can be adopted in different implementation modes.
    - Weather-sensitive end uses were analyzed in the EnerSim model, which simulates energy usage in homes and buildings using weather data specific to Georgia Power's service area. Home and building prototypes were modeled for both existing and new dwellings and facilities.
- Conduct economic screening. Southern Company Services conducted the economic analysis of individual measures, utilizing its PRICEM model to identify the avoided energy supply costs associated with measure savings. This analysis resulted in a final list of 95 residential measures and 120 nonresidential measures that were incorporated into the analysis of achievable potential.

- Collect and analyze forecast data. Georgia Power supplied baseline forecast data for residential, commercial, and industrial sectors.

    - The residential forecast data were organized by housing type (single family, multi-family, and manufactured housing) and end use (electric furnace, electric room heating, heat pump heating, gas furnace, gas room,

heating, central air conditioning, heat pump cooling, room air conditioning, dish washers, washers, water heating (electric and gas), cooking (electric and gas), refrigerators (first and second), freezers, dryers (electric and gas), color TVs, lighting, and other).

- The commercial sector forecast was similarly organized by facility type (amusement, education, government, grocery, health, lodging, miscellaneous, office, religious, restaurant, retail, and warehouse) and end use (heating, cooling, water heating, cooking, refrigeration, exterior lighting, interior lighting, office equipment, and miscellaneous).

- The industrial sector forecast was organized by major end use (motors, thermal processes, lighting, other processes, and miscellaneous).

2.2.2 Estimate Energy Efficiency Potential at End Use Level

- The first major task in estimating energy efficiency potential is to construct a baseline DSM forecast that is consistent with the Company's forecast.[8] For example, in the residential sector, the general equation for the DSM baseline forecast is:

Eq. 1: $$Forecast_{BL} = \sum_{i,j,t} HH_{i,t} \times EUS_{i,j,t} \times UEC_{i,j,t}$$

Where:
$HH_{i,t}$ = the number of households of type i in year t
$EUS_{i,j,t}$ = the saturation of end use type j in household type i in year t
$UEC_{i,j,t}$ = the unit energy consumption of end use j in household type i in year t

- Nonresidential sectors followed an analogous methodology tied directly to Georgia Power's forecast.

[8] This study analyzed the residential, commercial, and industrial sector forecasts, and not Georgia Power's total forecast, which also includes MARTA and territorial wholesale customers.

- The next major task is to create an alternative forecast that characterizes the DSM technical potential, which is accomplished by substituting the most efficient technologies at the end use level. Following the residential example above, the general equation is:

Eq. 2: $Forecast_{TP} = \sum_{i,j,t} HH_{i,t} \times EUS_{i,j,t} \times UEC_{i,j',t}$

Where:
$HH_{i,t}$ = the number of households of type i in year t
$EUS_{i,j,t}$ = the saturation of end use type j in household type i in year t
$UEC_{i,j',t}$ = the unit energy consumption of end use j' (the most efficient end use technology configuration) in household type i in year t

  - The technical potential for DSM is the difference between Equation 1 and Equation 2. Special consideration is required in determining UECi,j',t to incorporate the interactive effects of appliance and envelope measures. All of the measures (with the exception of mutually exclusive measures) affecting a particular energy end use were bundled together as a package of measures and analyzed in the EnerSim simulation model to determine the aggregate effects of all measures acting simultaneously.

- The next task, creating an alternative forecast of "economic" DSM potential (i.e., considering the most efficient measures that pass the TRC test), is conducted similarly. Again following the residential example, the general equation is:

Eq. 3: $Forecast_{EP} = \sum_{i,j,t} HH_{i,t} \times EUS_{i,j,t} \times UEC_{i,j'',t}$

Where:
$HH_{i,t}$ = the number of households of type i in year t
$EUS_{i,j,t}$ = the saturation of end use type j in household type i in year t
$UEC_{i,j'',t}$ = the unit energy consumption of end use j'' (the most efficient end use technology configuration *that is also economic*) in household type i in year t

- Similar to the calculation of technical potential, the economic potential for DSM is the difference between Equation 1 and Equation 3. And again, special consideration is required in determining UECi,j'',t to incorporate the interactive effects of appliance and envelope measures. In considering interactive effects of measures contributing to economic DSM potential, only the TRC-passing measures were bundled together for simulation modeling. In this case, however, measures were sequentially added to the EnerSim analyses up until the point at which the *next* measure's net benefits were no longer cost-effective.

2.2.3 Estimate Theoretically Achievable Impacts

- The estimation of theoretically achievable energy efficiency potential requires estimating, among other parameters, the rate at which cost-effective measures might be adopted over time. Because program implementation scenarios have a direct influence over such market penetration rates, Nexant's approach incorporated sets of market penetration curves corresponding to the following implementation scenarios:[9]

  - "Low" incentives: This scenario assumes market penetration rates projected for financial incentives that subsidize 25% of an energy end-user's incremental measure costs, and a program implementation strategy centered on marketing/outreach tactics.
  - "Moderate" incentives: Market penetration rates are projected for financial incentives that subsidize 50% of an energy end-user's incremental measure costs, and a program implementation strategy that features increased marketing/outreach activities.
  - "Aggressive" incentives: Market penetration rates are projected for financial incentives that subsidize the entire incremental cost of energy efficiency measures, coupled with a program implementation strategy that features much more aggressive marketing, direct outreach, and technical service offerings.

[9] The scenario definitions adopt the nomenclature of the GEFA study to describe varying levels of incentives without consideration of possible connotations of "low," "moderate," and "aggressive" levels of incentives. Each scenario includes significant expenditures on incentives to subsidize the purchase of energy-efficiency measures.