



***NRNC MARKET CHARACTERIZATION AND  
PROGRAM ACTIVITIES TRACKING STUDY  
TRENDS REPORT  
1999-2003***

***FINAL***

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## **1. INTRODUCTION**

The main objective of the statewide Market Characterization and Program Activity Tracking (MCPAT) Study is to collect, summarize and report nonresidential new construction (NRNC) market characteristics, as well as program information, in support of the statewide Savings By Design (SBD) energy efficiency program offered by Southern California Edison, Pacific Gas and Electric Company, San Diego Gas and Electric Company, and Southern California Gas Company. The publication of results on an ongoing basis allows program designers, implementers, evaluators, and market participants to determine the extent to which the NRNC market changes over a given period of time, understand how energy efficiency practices are implemented in the NRNC market, and if necessary, modify the SBD Program to most effectively enhance energy efficiency practices in the new construction market.

This Report examines the NRNC market trends and Savings By Design program trends from SBD program inception (July 1999) until the end of PY2003. Its main goal is to provide a summary of market and program activities in support of Savings By Design program planning and implementation activities in the second half of 2004 and beyond.

### **REPORT LAYOUT**

The main body of the report starts in Chapter 2 with a discussion of trends in the NRNC market. Drawing on the Savings By Design program participation databases maintained by the four California electric investor-owned utilities (IOUs) PG&E, SCE, SDG&E and SoCalGas, the chapter then discusses trends in participation to the SBD program, as well as trends in the program penetration into the market.

Chapter 3 presents trends in the number of measures installed by SBD program participants in 1999-2003, by measure class. It then discusses trends in the energy savings achieved by measures installed by SBD program participants, by measure class.

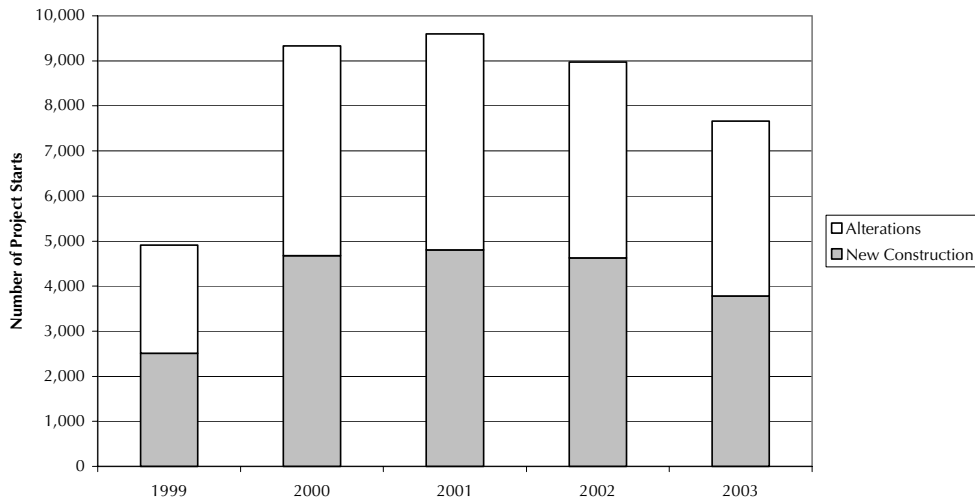
## 2. NUMBER OF NRNC PROJECTS, 1999-2003

This chapter presents information on the nonresidential construction activity that has occurred between the second half of 1999 and the end of 2003, in the State of California. The first section summarizes total NRNC market and Savings By Design program activity. The second section covers the number of project starts in the market, by building type, as reported by F.W. Dodge. The third section analyzes the Savings By Design (SBD) program activity for projects signed up between the second half of 1999 and the end of 2003. The last section presents SBD program penetration into the market.

### 2.1 MARKET AND PROGRAM SUMMARY

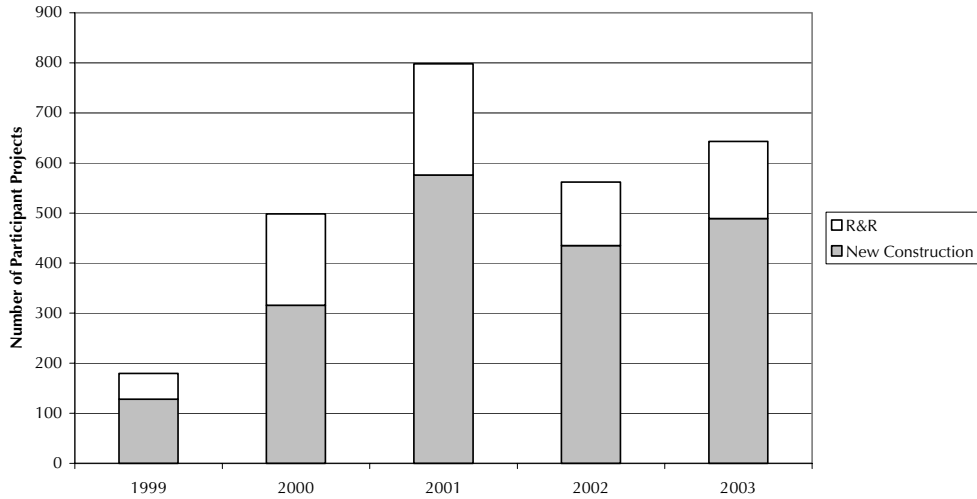
F.W. Dodge data indicate that, between mid-1999 and the end of 2001 market activity was relatively stable to the number of projects starting construction per year. Similar to the general trends in the California economy, NRNC activity started to decrease in 2002, and continued in 2003 (Exhibit 2.1).

**Exhibit 2.1**  
**F.W. Dodge Number of Nonresidential New Project Starts**  
**By Year**



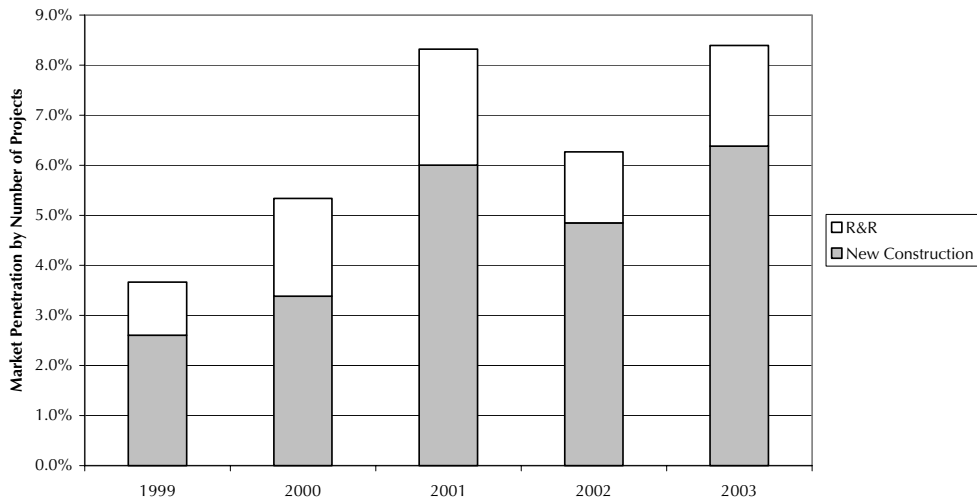
Savings By Design (SBD) program activity follows similar trends as the NRNC market, with a relatively busy year in 2001 and a less active year in 2002. Program activity recovered in 2003 relative to 2002, but was still significantly lower than in 2001 (Exhibit 2.2).

**Exhibit 2.2**  
**Number of SBD Program Participants**  
**By Year**



SBD program penetration into the market follows the market and program trends, increasing between 1999 and dropping in 2002. It is interesting to note, however, that because program activity recovered in 2003 while market trends continued downwards, the 2003 program year achieved the highest historic penetration rates in terms of number of participant projects (Exhibit 2.3).

**Exhibit 2.3**  
**SBD Penetration into the Market**  
**By Year**



## **2.2 MARKET TRENDS BY BUILDING TYPE**

Exhibits 2.4–2.6 present the activity in the nonresidential new construction market (as described by F.W. Dodge) by building segment, in terms of number of projects that have started construction in a given period of time. Appendix A contains a glossary of building types tracked by F.W. Dodge. Please refer to Appendix B for data supporting the charts presented in this chapter.

Exhibit 2.4 shows the total number of projects that have started construction between July 1999 and December 2003.

Exhibit 2.5 presents the number of nonresidential new construction and addition projects that have started construction from the inception of the SBD program (July 1999) until the end of 2003, as reported by F.W. Dodge.

Exhibit 2.6 summarizes the number of nonresidential alteration projects that have started construction between July 1999 and December 2003.

## **2.3 SAVINGS BY DESIGN PROGRAM TRENDS BY BUILDING TYPE**

Exhibits 2.7-2.9 present Savings By Design program activity for nonresidential new construction participants for whom the IOUs have committed funds between July 1999 and December 2003.

Exhibit 2.7 presents the total number of participant SBD projects between July 1999 and December 2003.

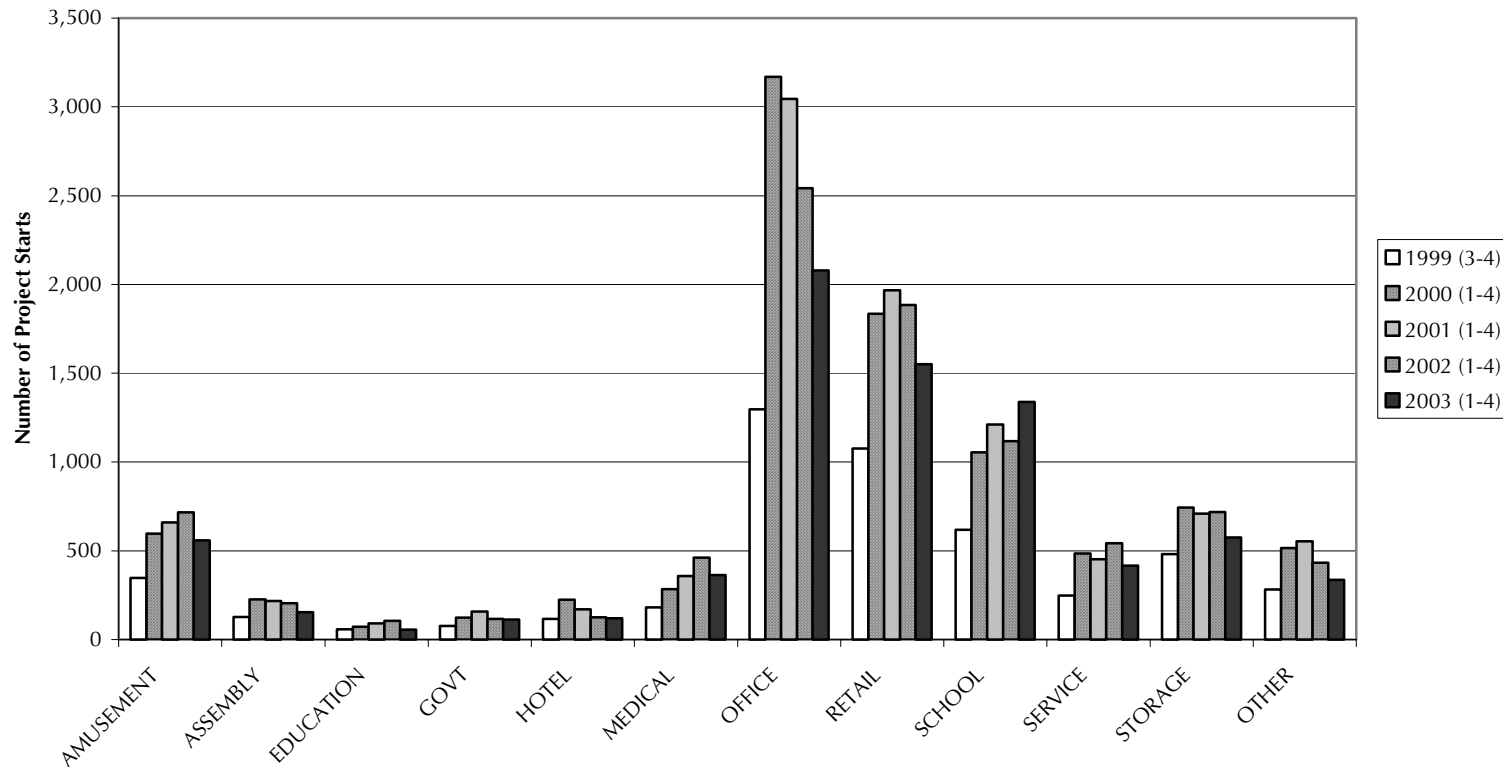
Exhibit 2.8 shows the number of participant SBD new construction projects between July 1999 and December 2003.

Exhibit 2.9 summarizes the number of participant SBD renovation/remodel/first tenant improvement projects (R&R) between July 1999 and December 2003.

## **2.4 PROGRAM PENETRATION INTO THE NRNC MARKET**

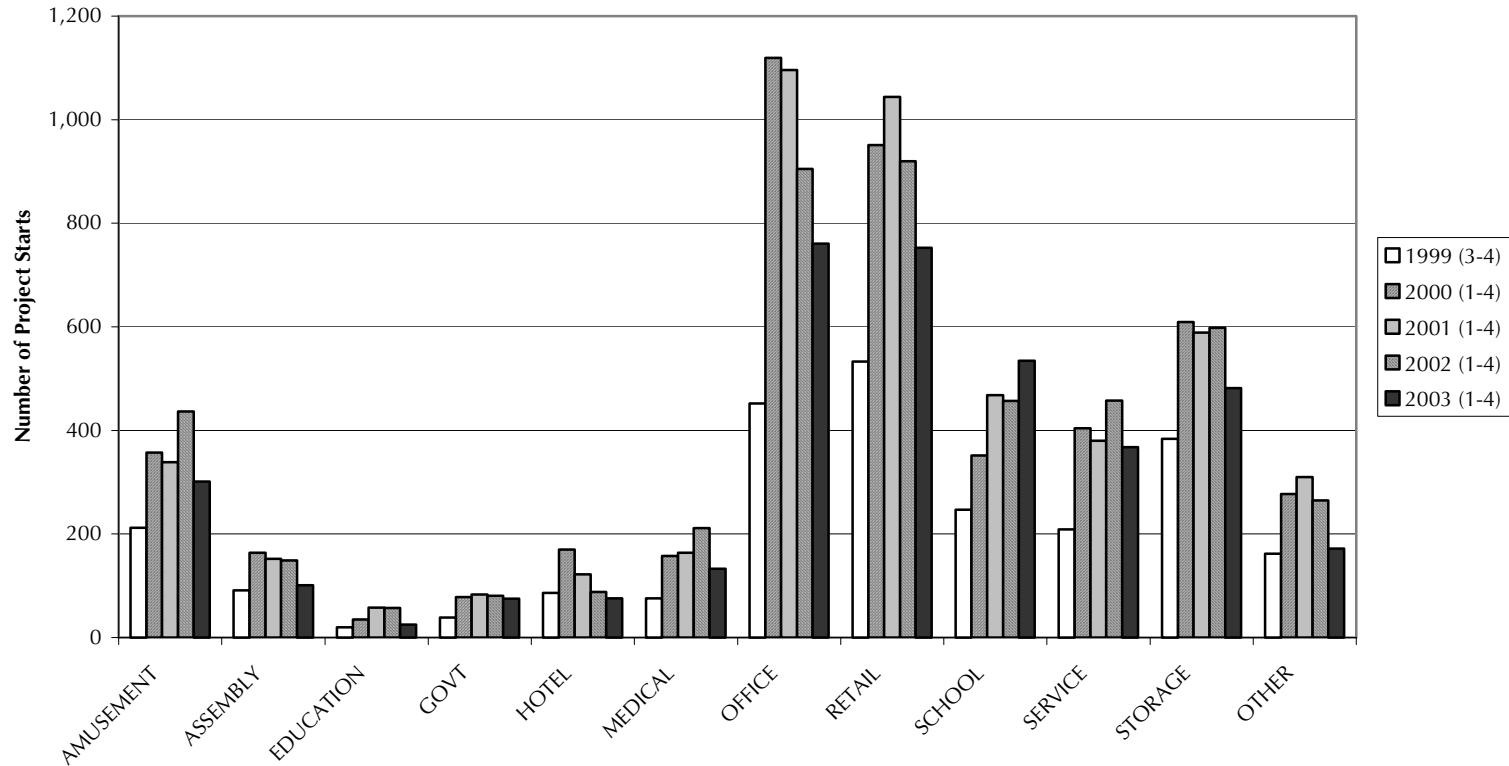
Exhibit 2.10 presents the fraction of NRNC project starts between July 1999 and December 2003 that have been captured by the Savings By Design program.

**Exhibit 2.4**  
**F.W. Dodge Total Number of Nonresidential Project Starts**  
**By Building Type and Year**



Over time, the NRNC market exhibits consistent activity by building type: some building types are very active from year to year (office, retail, school and storage) while others see relatively little activity (education, government). There are some fluctuations in the number of project starts by building type over time, with the most active building types experiencing the highest fluctuations. The overall decline in market activity in 2002 and 2003 relative to 2001 can be correlated to the trends in the California economy.

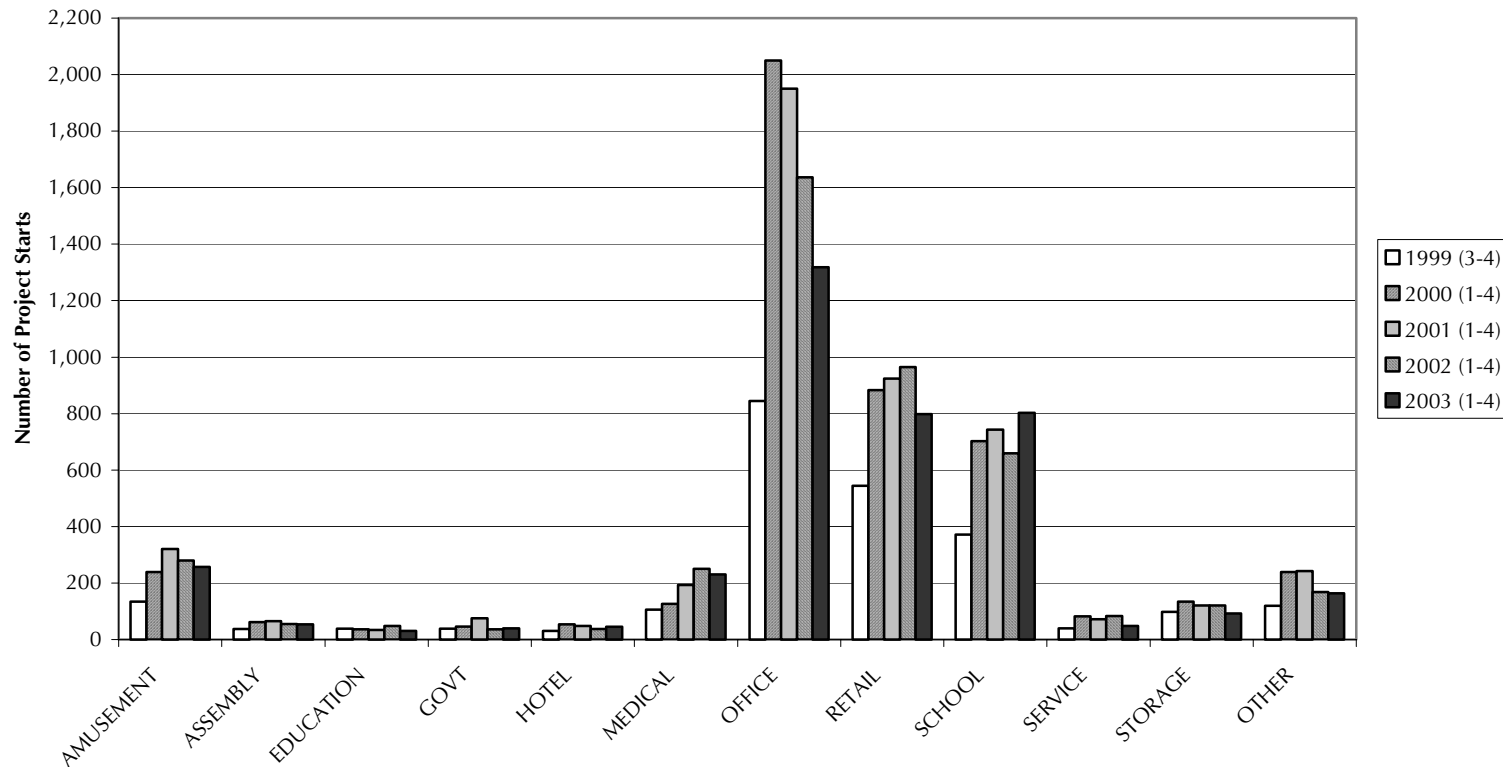
**Exhibit 2.5**  
**F.W. Dodge Number of Nonresidential New Construction Project Starts**  
**By Building Type and Year**



The office, retail, storage, school and service building segments represent a large share of the new construction activity. These building types also experience the highest fluctuations over time. In 2002 new construction market activity experienced a decline that continued into 2003. Of all building types, only schools experienced an increase in market activity in 2003 relative to 2001 and 2002.

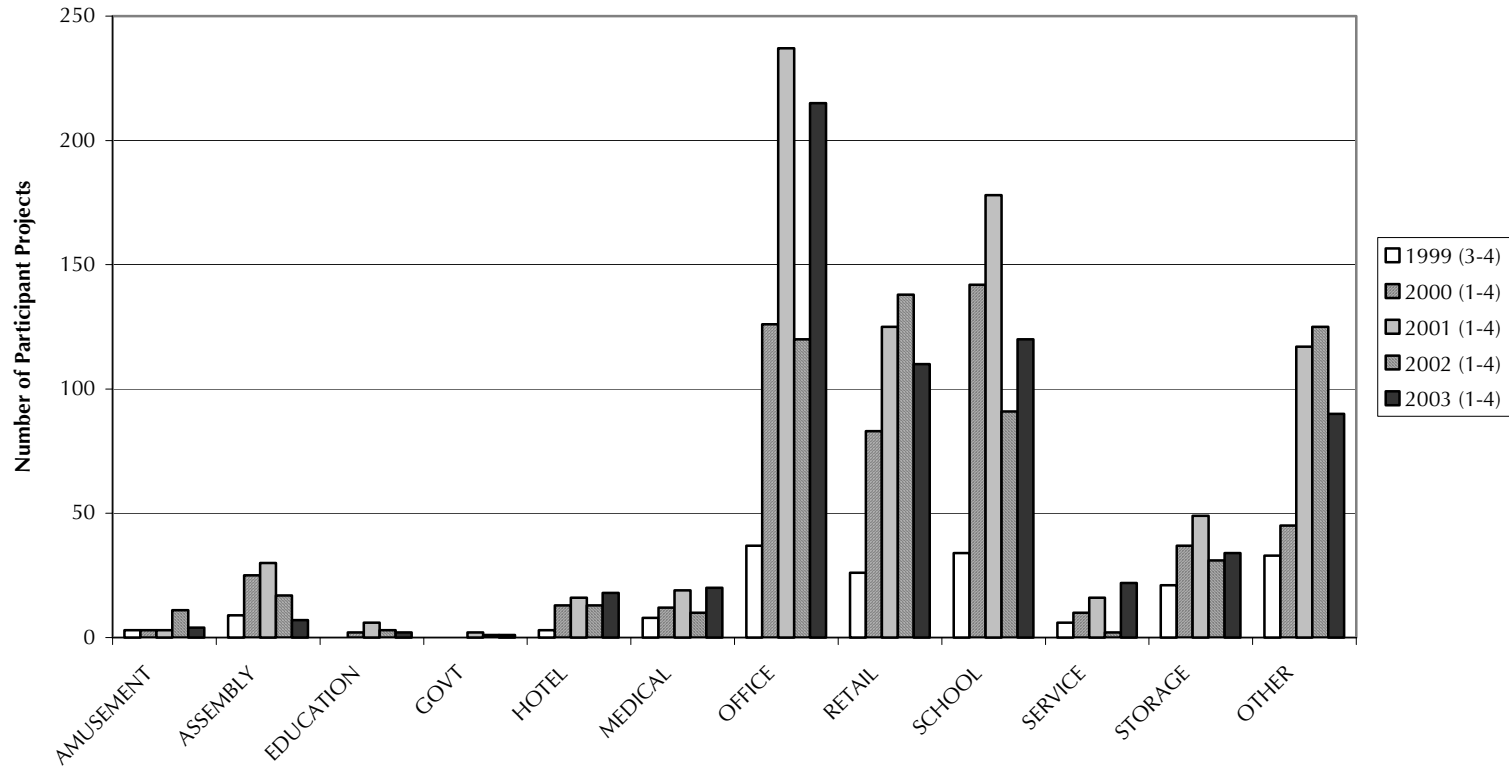


**Exhibit 2.6**  
**F.W. Dodge Number of Nonresidential Alteration Project Starts**  
**By Building Type and Year**



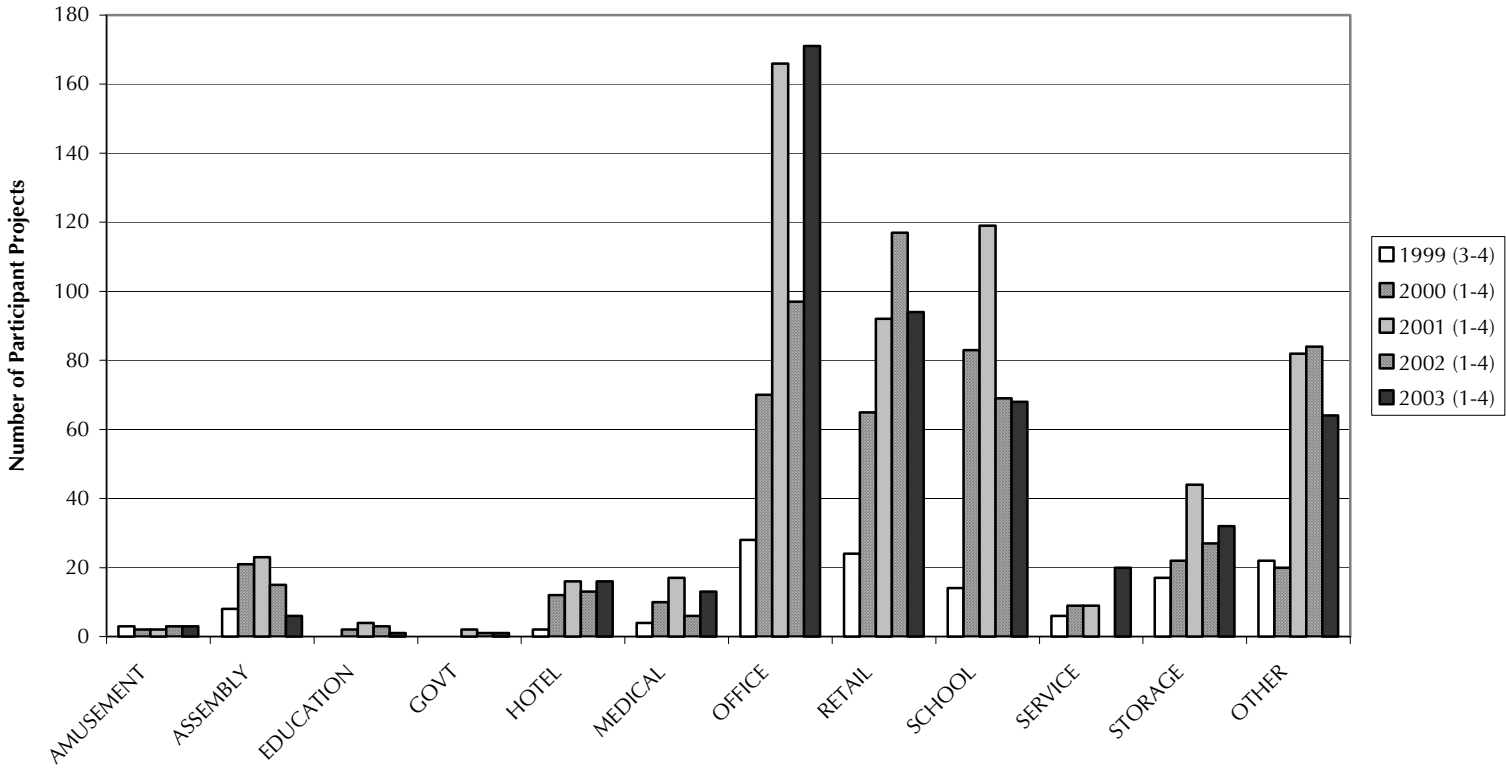
Most of the alteration activity is concentrated in the office, retail and school building segments, with office by far the most active segment. Note that in the office segment, the number of alteration projects is roughly double as compared to the number of new construction projects. Again, the most active segments also present the highest fluctuations over time. The alteration market also experiences a decline in activity after 2001, with the notable exception of the school segment in 2003.

**Exhibit 2.7**  
**Total Number of SBD Program Participants**  
**By Building Type and Year**



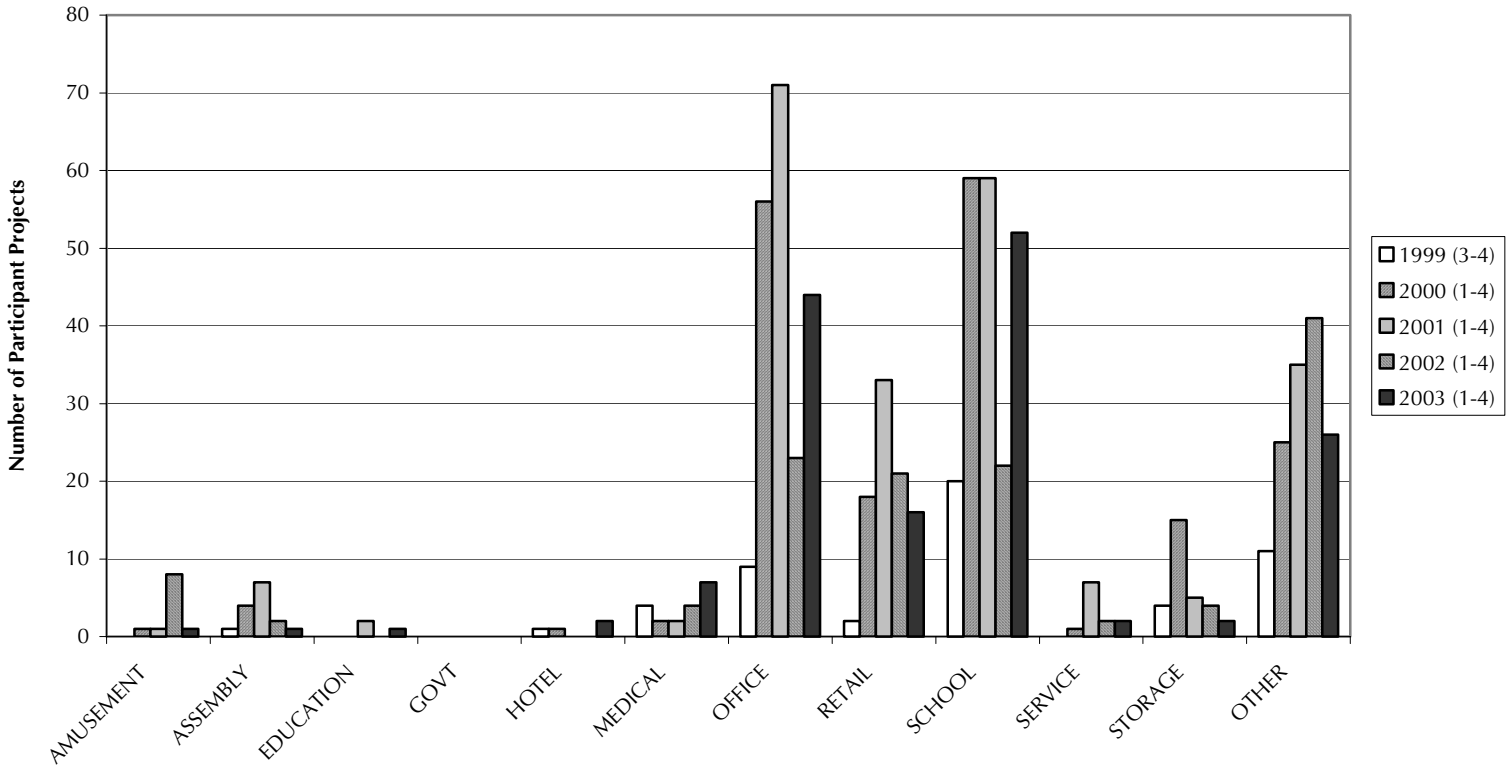
The majority of SBD program participants belong to the office, school and retail building types. Similar to the NRNC market, program participation increased between 1999 and 2001, and then decreased in 2002, with the exception of the retail segment. Unlike the NRNC market, where the downward trend continued in 2003, program participation increased in most building segments in 2003 relative to 2002.

**Exhibit 2.8**  
**Number of Nonresidential New Construction SBD Participants**  
**By Building Type and Year**



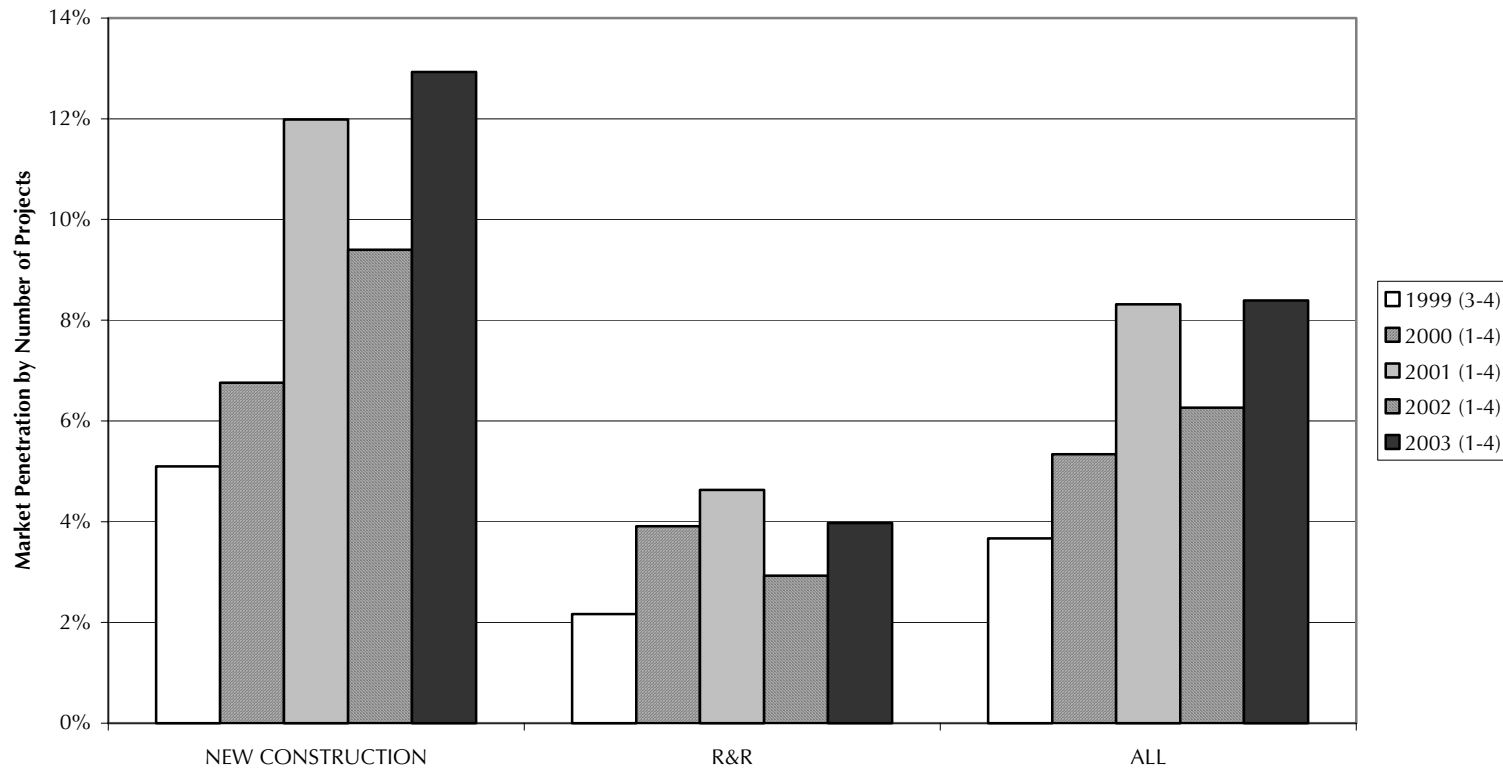
The majority of new construction SBD program participants belong to the office, retail and school building types. New construction participation increased between 1999 and 2001, and then decreased in 2002, with the exception of the retail segment. In 2003 total participation has increased in 2003 relative to 2002, with participation in the office segment in 2003 surpassing even the high levels of participation from 2001.

**Exhibit 2.9**  
**Number of Nonresidential R&R SBD Participants**  
**By Building Type and Year**



The majority of SBD R&R participants are also concentrated in the office, retail and school building segments. R&R participation also experienced an increase between 1999 and 2001, a drop in 2002, and a recovery in 2003. There is one interesting exception in the retail segment, where participation continued to increase in 2002, but then declined in 2003. Similar to new construction, total participation rates in 2003 have been higher than in 2002, but not quite as high as in 2001.

**Exhibit 2.10**  
**Savings By Design Program Penetration into the Market**



Program penetration into the market increased from 1999 to 2001. The high penetration rates in 2001 are due both to building code changes that went into effect on July 1, 2001, and to the conservation efforts undertaken in California during the Summer of 2001. Market penetration slightly decreased in 2002, only to reach the highest historic penetration rates (for the program overall) in 2003. Please note that, because F.W. Dodge alteration projects include retrofits, but retrofit projects do not qualify for the SBD program, program penetration into the market for the R&R segment, as well as for the entire program, are underestimated.

### **3. SAVINGS BY DESIGN MEASURES INSTALLED, 1999-2003**

This chapter presents the measures installed by Savings By Design program participants from program inception in July 1999 until the end of 2003. The measures installed by each participant were established using the following fields from the tracking system maintained by the IOUs: the “meas\_desc” field for SCE participants, the “description” field for PG&E participants, and the “msr\_desc” field for SDG&E and SoCalGas participants. Each entry into the tracking system was then assigned to one of the measure segments presented below, and counted as one instance in which that particular class of measures was installed through the SBD program. A glossary of the measures installed by SBD participants is presented in Appendix C.

#### **3.1 NUMBER OF MEASURES INSTALLED**

Exhibits 3.1-3.4 summarize the number of measure classes installed by SBD program participants between July 1999 and December 2003. Since projects that opted for the Whole Building approach achieve significantly higher energy savings than any single measure under the Systems Approach, the number of measures and energy savings are reported separately for Whole Building participants and Systems Approach participants.

Exhibit 3.1 presents the number of Whole Building SBD participant projects from July 1999 until December 2003.

Exhibit 3.2 presents the number of measure classes installed by all participants in the Systems Approach component of the program.

Exhibit 3.3 summarizes the number of measure classes installed by new construction participants in the Systems Approach component of the program.

Exhibit 3.4 shows the number of measure classes installed by remodel/renovation/first tenant improvement participants in the Systems Approach component of the program.

#### **3.2 ENERGY SAVINGS BY MEASURE CLASS**

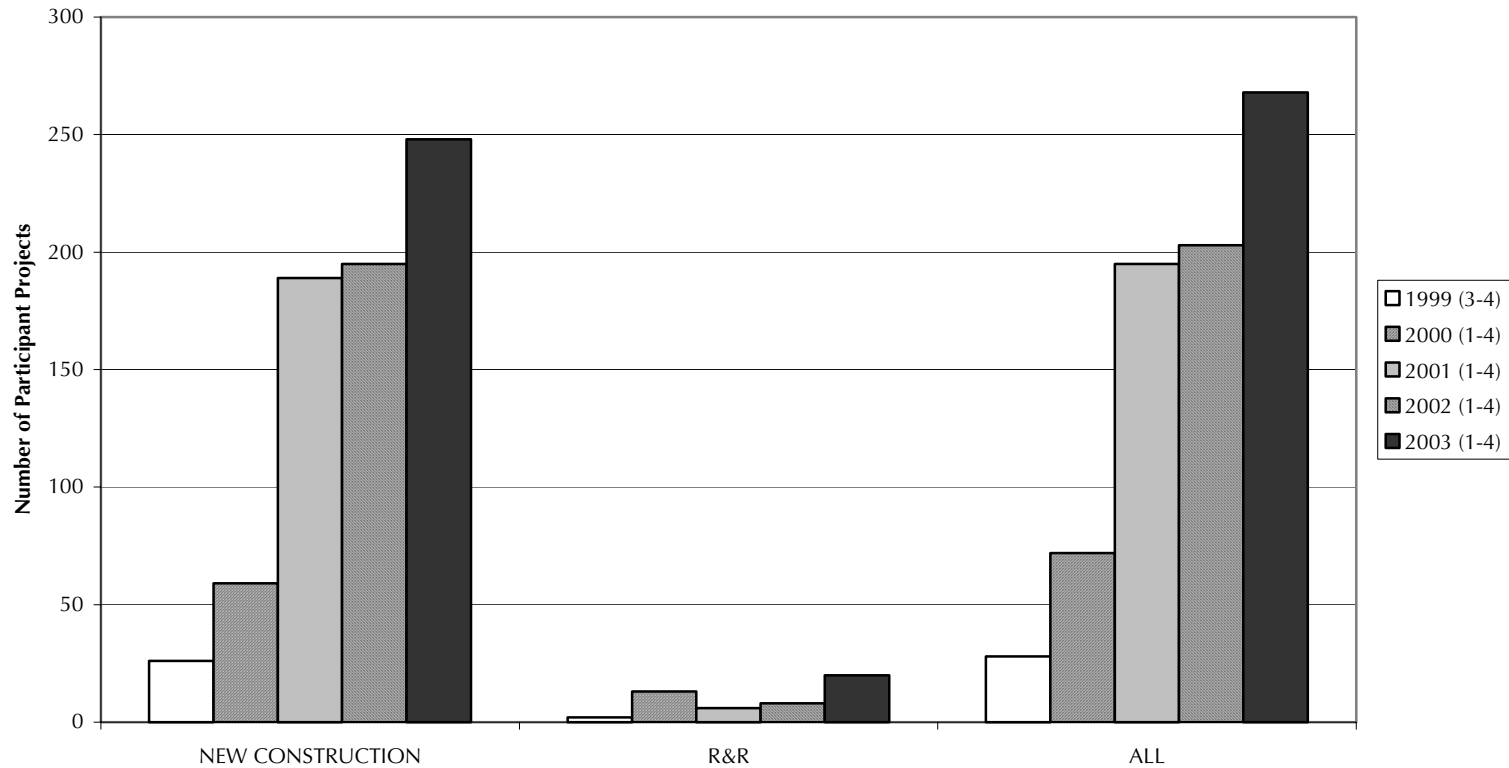
Exhibit 3.5 presents estimated energy savings achieved by Whole Building SBD participant projects from July 1999 until December 2003.

Exhibit 3.6 presents energy savings from all participants in the Systems Approach component of the program.

Exhibit 3.7 summarizes energy savings by measure class from new construction participants in the Systems Approach component of the program.

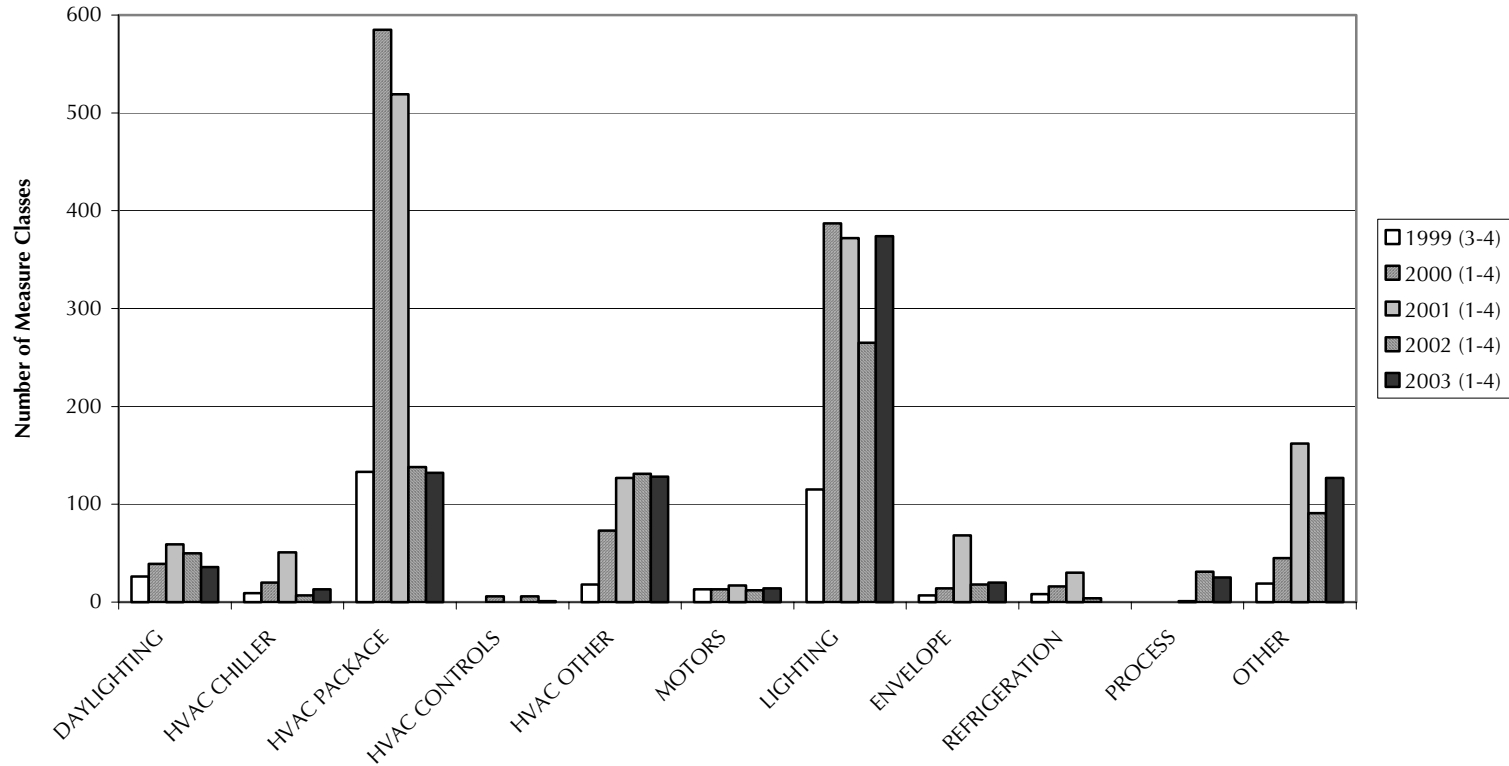
Exhibit 3.8 shows energy savings by measure class, from remodel/renovation/first tenant improvement participants in the Systems Approach component of the program.

**Exhibit 3.1**  
**Number of Whole Building Approach SBD Participants**



Most of the SBD participants who choose the Whole Building approach are new construction participants. Even though the market and the SBD program have registered a decrease in participation after 2001, the number of new construction Whole Building participants has increased from 1999 to 2003. Participation in the R&R segment has registered a dip following year 2000, but has increased steadily since then.

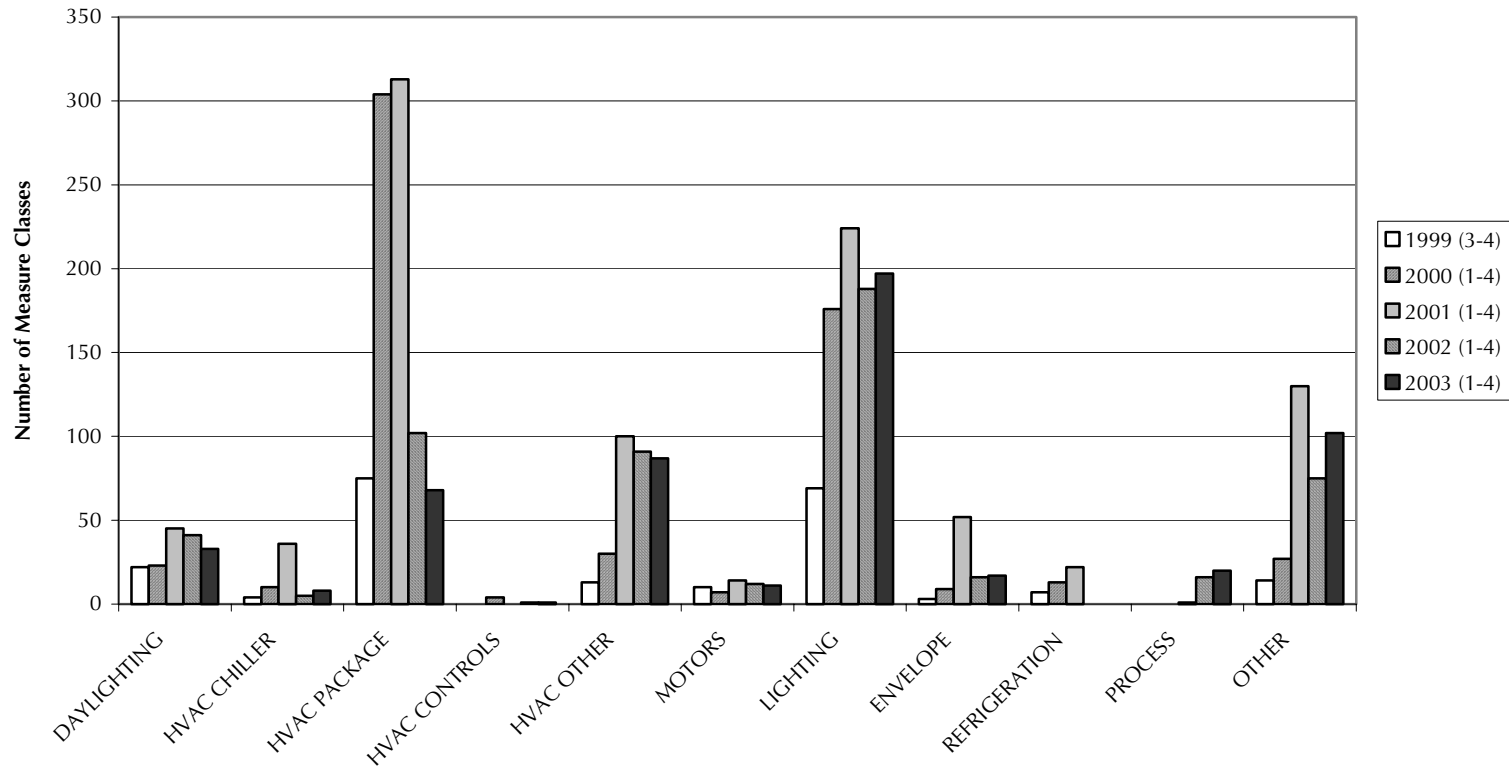
**Exhibit 3.2**  
**Classes of Measures Installed by All Systems Approach SBD Participants**



Among SBD participants that choose the Systems Approach, unitary HVAC systems were the most popular measures installed in 2000 and 2001, followed by lighting. In 2002 and 2003, as NRNC market activity slowed down substantially, unitary HVAC system installation through the SBD program dropped to second place after lighting.

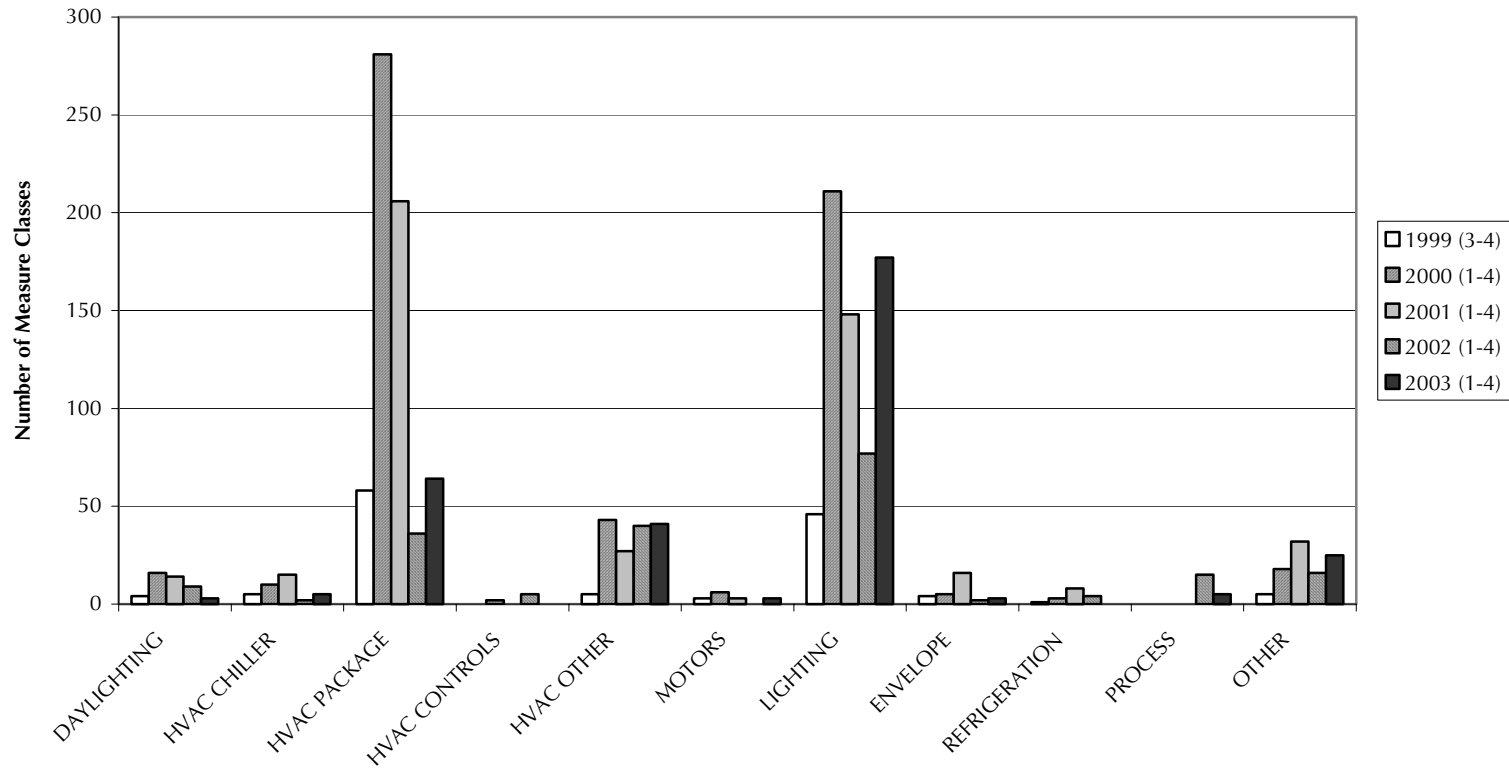


**Exhibit 3.3**  
**Classes of Measures Installed by Systems Approach New Construction SBD Participants**



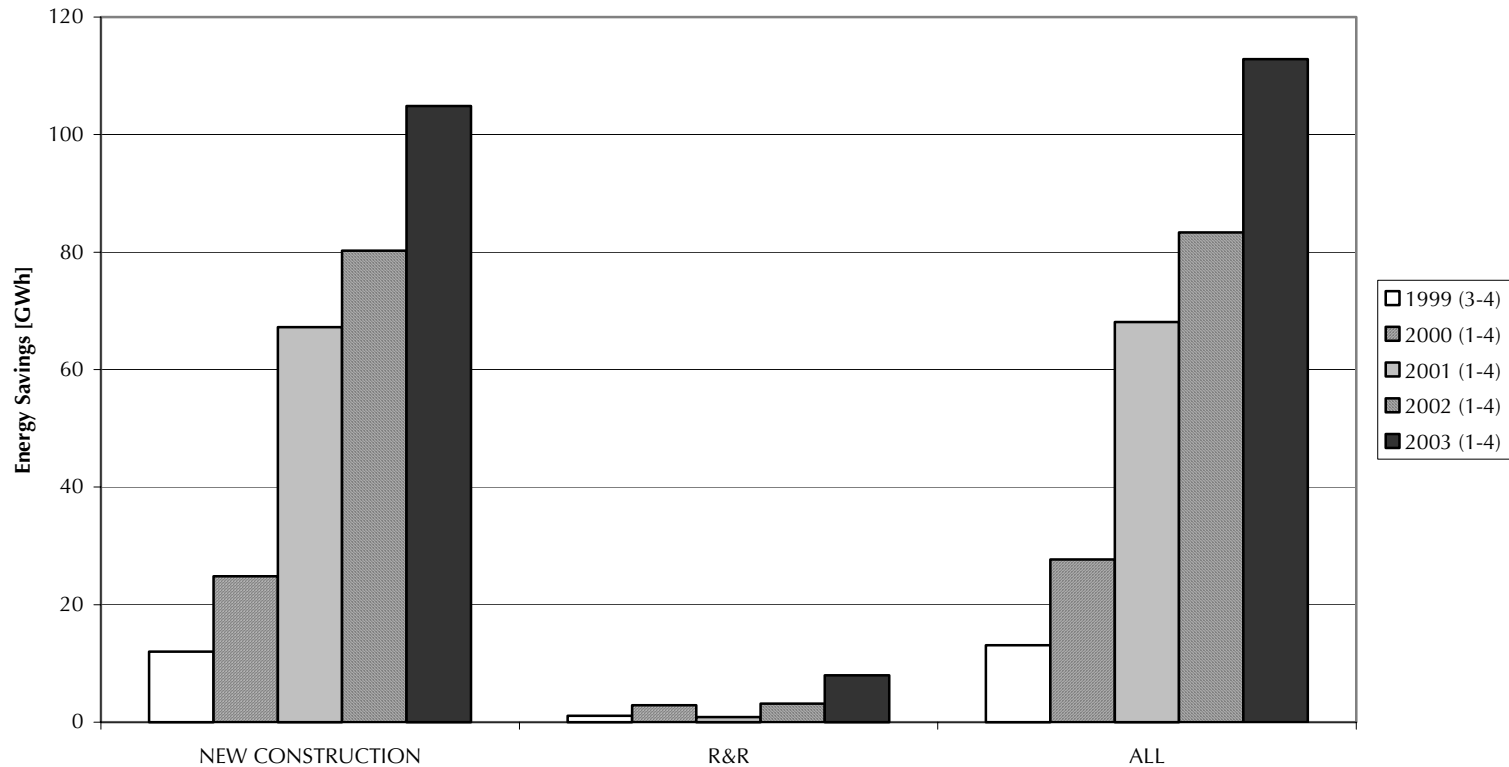
The measures installed most often by the Systems Approach new construction participants were unitary HVAC systems, lighting and “other HVAC” measures (fan or pump motors, air handler VSDs, furnaces, boilers, and other measures labeled as “HVAC energy reduction”). It is interesting to note that, after a peak in 2001, the number of package HVAC units decreased sharply in 2002 and continued to decrease in 2003. The installation of refrigeration measures has also dropped after 2001. This is mainly because three of the four IOUs have channeled major refrigeration projects through the Whole Building component of the SBD program.

**Exhibit 3.4**  
**Classes of Measures Installed by Systems Approach R&R SBD Participants**



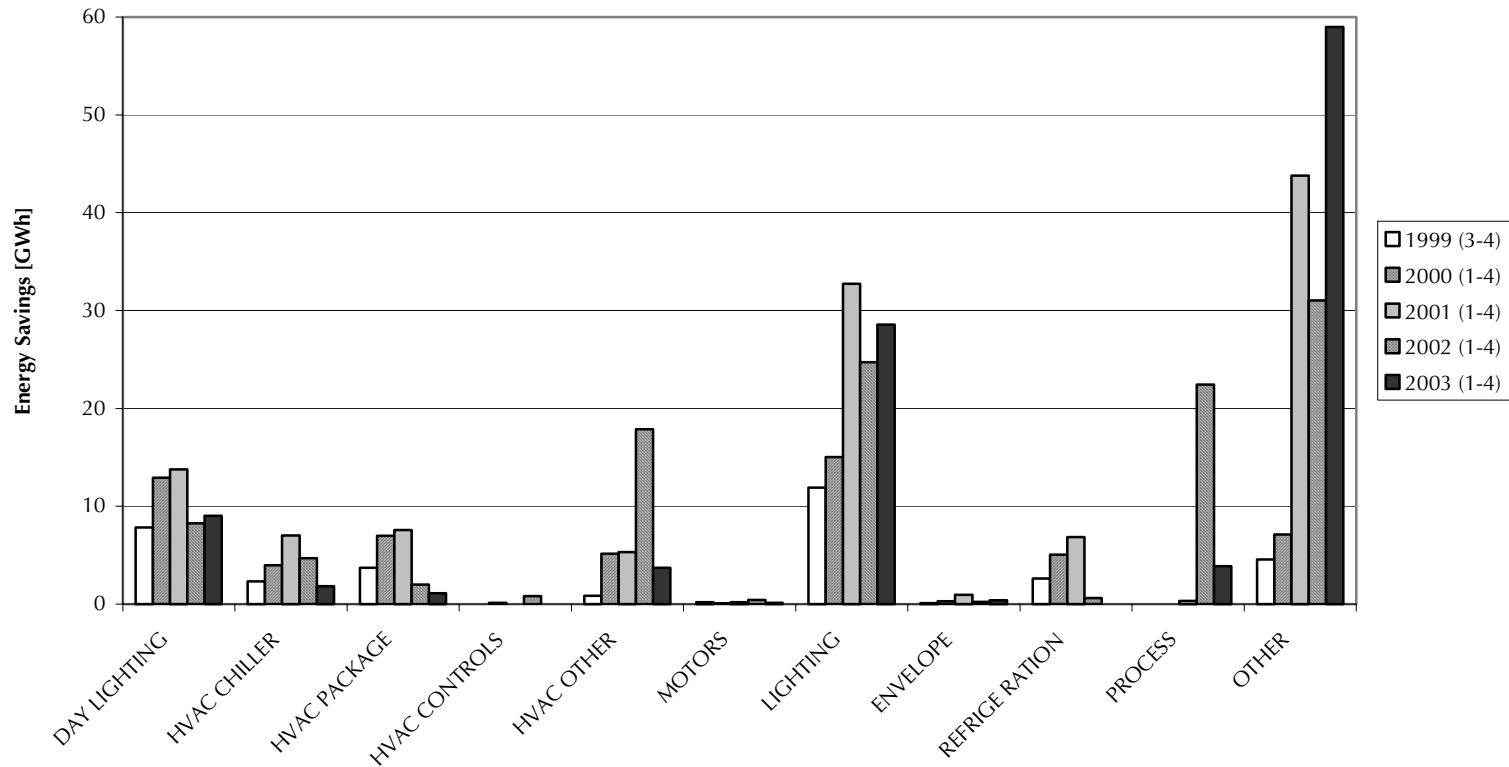
The measures installed most often by R&R participants in the Systems Approach component of the SBD program were also unitary HVAC systems, lighting and “other HVAC” measures. Similar to new construction participants, the number of unitary HVAC systems installed by R&R participants started to drop after 2000, and registered a historic low in 2002. There was a slight increase in installation rates in 2003.

**Exhibit 3.5**  
**Energy Savings from Whole Building Approach SBD Participants**



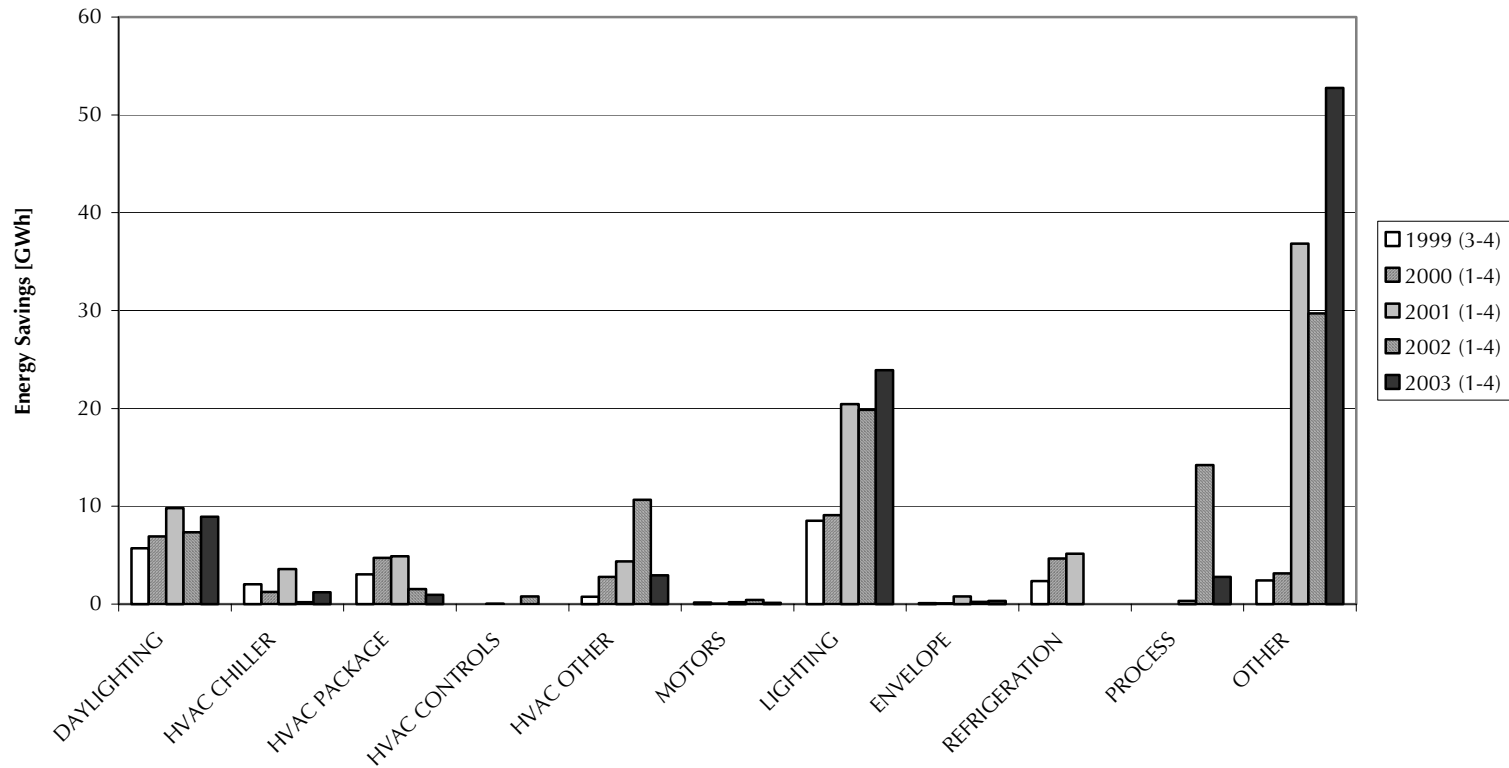
There is an upward trend over time in the energy savings achieved by the Whole Building component of the SBD program. New construction participants account for the highest savings, with over 100 GWh of estimated savings in 2003 alone. The entire Whole Building component of the program accounts for an estimated 112 GWh in 2003, higher than the estimated savings of the entire SBD program (including the Systems Approach component) in 2000.

**Exhibit 3.6**  
**Energy Savings from All Systems Approach SBD Participants**



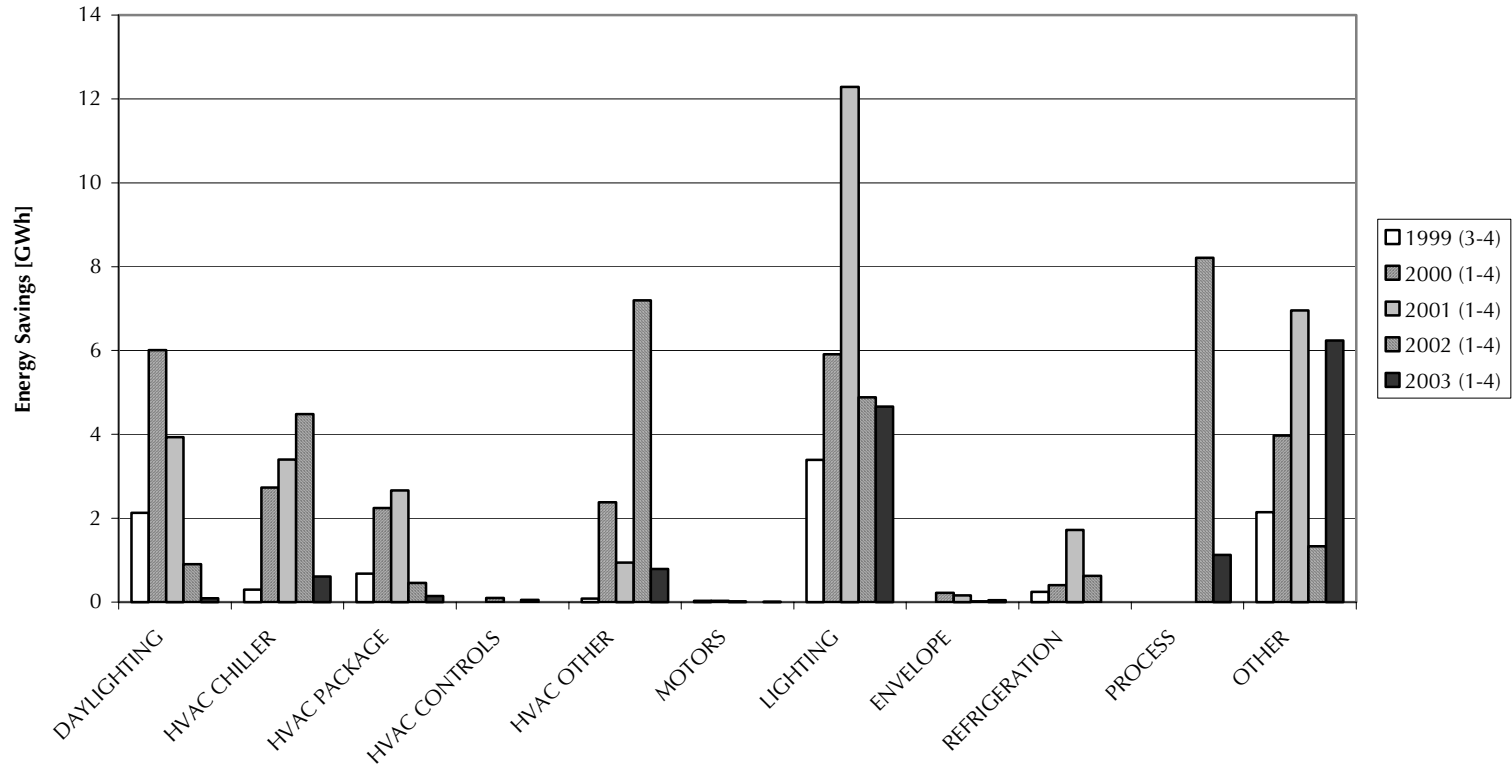
The “other” measure category (air compressors, variable speed drives, service hot water systems, and other measures labeled “miscellaneous” or “other”) dominates the Systems Approach component of the SBD program in terms of estimated energy savings. Other measures that generate relatively high savings are lighting and daylighting.

**Exhibit 3.7**  
**Energy Savings from Systems Approach New Construction SBD Participants**



Among measures installed by the new construction participants in the Systems Approach component, the highest energy savings are attributed to the "other" measure category (air compressors, variable speed drives, service hot water systems, and other measures labeled "miscellaneous" or "other"). Other measures that generate high energy savings are lighting, daylighting and "other HVAC" measures. Again, note that savings from refrigeration measures after 2002 are reported within the Whole Building component of the program.

**Exhibit 3.7**  
**Energy Savings from Systems Approach R&R SBD Participants**



Lighting and daylighting account for the highest estimated energy savings achieved by R&R participants in the Systems Approach component. “Other HVAC” measures and process measures account for relatively high energy savings in 2002, but have historically had low savings.

**APPENDIX A**

**GLOSSARY OF BUILDING TYPES RECORDED BY F.W. DODGE**

Amusement	amusement and recreational buildings
Assembly	religious and worship buildings
Education	libraries, museums
Government	government services
Hotel	hotels and motels
Medical	hospitals and other health-related buildings
Office	office and laboratory buildings
Retail	retail stores and shopping centers
School	schools, colleges and universities, including dorms
Service	service stations
Storage	warehouses and storage facilities
Other	other nonresidential buildings

**APPENDIX B**  
**SUPPORTING DATA**

Detailed data supporting the charts in Chapters 2 and 3 are presented in this Appendix.

Table B-1 contains detailed information about project starts by building type and year, for both NRNC market (based on F.W. Dodge data) and SBD program activity.

Table B-2 summarizes the number of measure classes installed by the Savings By Design program participants. For consistency with the MCPAT Annual Reports, each entry into the tracking system was assigned to one of the measure segments presented in Table B-2, and counted as one instance in which that particular class of measures was installed through the SBD program.

Table B-3 shows estimated energy savings achieved by SBD participants, by measure class.



**Exhibit B-1**  
**Number of Project Starts by Building Type and Year**  
**Market (F.W. Dodge)**

YEAR (QTR)	AMUSEMENT	ASSEMBLY	EDUCATION	GOVT	HOTEL	MEDICAL	OFFICE	RETAIL	SCHOOL	SERVICE	STORAGE	OTHER	TOTAL
<b>New Construction</b>													
1999 (3-4)	212	91	20	39	86	76	452	533	247	209	384	162	2,511
2000 (1-4)	357	164	35	78	170	158	1,119	951	352	404	609	277	4,674
2001 (1-4)	339	152	58	83	122	164	1,096	1,044	468	380	589	310	4,805
2002 (1-4)	437	149	57	81	88	211	905	920	457	458	598	265	4,626
2003 (1-4)	301	101	25	75	76	133	761	753	535	368	482	172	3,782
<b>Alterations</b>													
1999 (3-4)	134	37	38	38	30	106	845	544	371	39	98	120	2,400
2000 (1-4)	239	62	36	46	54	126	2,050	883	703	82	134	239	4,654
2001 (1-4)	321	66	34	76	48	193	1,950	924	743	72	121	243	4,791
2002 (1-4)	280	55	49	36	37	251	1,637	965	660	84	121	168	4,343
2003 (1-4)	257	54	30	39	45	230	1,318	798	803	49	93	164	3,880
<b>All</b>													
1999 (3-4)	346	128	58	77	116	182	1,297	1,077	618	248	482	282	4,911
2000 (1-4)	596	226	71	124	224	284	3,169	1,834	1,055	486	743	516	9,328
2001 (1-4)	660	218	92	159	170	357	3,046	1,968	1,211	452	710	553	9,596
2002 (1-4)	717	204	106	117	125	462	2,542	1,885	1,117	542	719	433	8,969
2003 (1-4)	558	155	55	114	121	363	2,079	1,551	1,338	417	575	336	7,662

**Savings By Design Program**

YEAR (QTR)	AMUSEMENT	ASSEMBLY	EDUCATION	GOVT	HOTEL	MEDICAL	OFFICE	RETAIL	SCHOOL	SERVICE	STORAGE	OTHER	TOTAL
<b>New Construction</b>													
1999 (3-4)	3	8	0	0	2	4	28	24	14	6	17	22	128
2000 (1-4)	2	21	2	0	12	10	70	65	83	9	22	20	316
2001 (1-4)	2	23	4	2	16	17	166	92	119	9	44	82	576
2002 (1-4)	3	15	3	1	13	6	97	117	69	0	27	84	435
2003 (1-4)	3	6	1	1	16	13	171	94	68	20	32	64	489
<b>Renovation/Remodel/First Tenant Improvement</b>													
1999 (3-4)	0	1	0	0	1	4	9	2	20	0	4	11	52
2000 (1-4)	1	4	0	0	1	2	56	18	59	1	15	25	182
2001 (1-4)	1	7	2	0	0	2	71	33	59	7	5	35	222
2002 (1-4)	8	2	0	0	0	4	23	21	22	2	4	41	127
2003 (1-4)	1	1	1	0	2	7	44	16	52	2	2	26	154
<b>All</b>													
1999 (3-4)	3	9	0	0	3	8	37	26	34	6	21	33	180
2000 (1-4)	3	25	2	0	13	12	126	83	142	10	37	45	498
2001 (1-4)	3	30	6	2	16	19	237	125	178	16	49	117	798
2002 (1-4)	11	17	3	1	13	10	120	138	91	2	31	125	562
2003 (1-4)	4	7	2	1	18	20	215	110	120	22	34	90	643

**Exhibit B-2**  
**Classes of Measures Installed by SBD Participants**  
**By Measure Class Type and Year**

YEAR (QTR)	WHOLE BUILDING	DAY LIGHTING	HVAC CHILLER	HVAC PACKAGE	HVAC CONTROLS	HVAC OTHER	MOTORS	LIGHTING	ENVELOPE	REFRIGE RATION	PROCESS	OTHER	TOTAL
<b>New Construction</b>													
1999 (3-4)	26	22	4	75	0	13	10	69	3	7	0	14	243
2000 (1-4)	59	23	10	304	4	30	7	176	9	13	0	27	662
2001 (1-4)	189	45	36	313	0	100	14	224	52	22	1	130	1,126
2002 (1-4)	195	41	5	102	1	91	12	188	16	0	16	75	742
2003 (1-4)	248	33	8	68	1	87	11	197	17	0	20	102	792
<b>Alterations</b>													
1999 (3-4)	2	4	5	58	0	5	3	46	4	1	0	5	133
2000 (1-4)	13	16	10	281	2	43	6	211	5	3	0	18	608
2001 (1-4)	6	14	15	206	0	27	3	148	16	8	0	32	475
2002 (1-4)	8	9	2	36	5	40	0	77	2	4	15	16	214
2003 (1-4)	20	3	5	64	0	41	3	177	3	0	5	25	346
<b>All</b>													
1999 (3-4)	28	26	9	133	0	18	13	115	7	8	0	19	376
2000 (1-4)	72	39	20	585	6	73	13	387	14	16	0	45	1,270
2001 (1-4)	195	59	51	519	0	127	17	372	68	30	1	162	1,601
2002 (1-4)	203	50	7	138	6	131	12	265	18	4	31	91	956
2003 (1-4)	268	36	13	132	1	128	14	374	20	0	25	127	1,138

**Exhibit B-3**  
**Estimated Annual Energy Savings (GWh) for SBD Participants**  
**By Measure Class and Year**

YEAR (QTR)	WHOLE BUILDING	DAY LIGHTING	HVAC CHILLER	HVAC PACKAGE	HVAC CONTROLS	HVAC OTHER	MOTORS	LIGHTING	ENVELOPE	REFRIGERATION	PROCESS	OTHER	TOTAL
<b>New Construction</b>													
1999 (3-4)	11.98	5.69	2.02	3.03	0.00	0.75	0.17	8.52	0.11	2.35	0.00	2.42	37.05
2000 (1-4)	24.81	6.90	1.25	4.73	0.03	2.78	0.05	9.10	0.08	4.65	0.00	3.13	57.51
2001 (1-4)	67.24	9.82	3.60	4.90	0.00	4.36	0.18	20.45	0.78	5.14	0.34	36.84	153.65
2002 (1-4)	80.24	7.34	0.20	1.53	0.77	10.66	0.42	19.84	0.23	0.00	14.23	29.70	165.17
2003 (1-4)	104.85	8.94	1.22	0.95	0.00	2.94	0.13	23.91	0.33	0.00	2.77	52.75	198.79
<b>Alterations</b>													
1999 (3-4)	1.10	2.13	0.30	0.68	0.00	0.08	0.03	3.39	0.00	0.24	0.00	2.14	10.11
2000 (1-4)	2.86	6.01	2.73	2.25	0.10	2.38	0.03	5.91	0.22	0.40	0.00	3.97	26.87
2001 (1-4)	0.85	3.93	3.40	2.66	0.00	0.95	0.02	12.29	0.16	1.72	0.00	6.96	32.92
2002 (1-4)	3.12	0.91	4.48	0.45	0.05	7.20	0.00	4.89	0.01	0.62	8.21	1.33	31.28
2003 (1-4)	8.00	0.09	0.61	0.14	0.00	0.79	0.01	4.67	0.05	0.00	1.13	6.24	21.73
<b>All</b>													
1999 (3-4)	13.08	7.82	2.32	3.71	0.00	0.83	0.20	11.91	0.11	2.59	0.00	4.56	47.15
2000 (1-4)	27.67	12.91	3.98	6.98	0.13	5.16	0.08	15.02	0.30	5.05	0.00	7.10	84.38
2001 (1-4)	68.08	13.75	7.00	7.57	0.00	5.31	0.20	32.74	0.94	6.86	0.34	43.79	186.57
2002 (1-4)	83.37	8.25	4.69	1.99	0.82	17.86	0.42	24.73	0.24	0.62	22.44	31.03	196.45
2003 (1-4)	112.85	9.03	1.83	1.10	0.00	3.73	0.14	28.58	0.38	0.00	3.90	58.99	220.52

## APPENDIX C

### GLOSSARY OF MEASURES IMPLEMENTED BY SBD PARTICIPANTS

Whole Building	Measures installed as part of the Whole Building approach
Daylighting	Daylighting measures
Skylight	Skylights
HVAC chiller	High-efficiency chillers
HVAC package	High-efficiency unitary systems
HVAC controls	Controls for HVAC systems
HVAC other	Other measures labeled as "HVAC", including air handling units, pumps, variable speed drives, motors and other measures specifically labeled "HVAC".
Motors	High-efficiency motors and other measures labeled as "motors"
Lighting	Lighting measures, including lighting power density reduction
Envelope	Envelope measures, including insulation and windows
Other	Refrigeration, process cooling and pumps, variable frequency drives and adjustable speed drives that are not specifically labeled "HVAC" or "motors", controls that are not specifically labeled "HVAC" or "motors", and measures labeled "other" or "miscellaneous".