

# **Electric Energy Efficiency Potential Study for Central Electric Power Cooperative, Inc.**

Prepared by GDS Associates, Inc.

Final Report

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# Presentation Overview

- Executive Summary and Key Findings
- Characteristics of the CEPCI Service Area
- Key Assumptions Used in this Study
- Load Forecasts
- Study Methodology
- Residential Sector – Key Findings
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# Executive Summary pg. 1

- Estimate the technical and achievable potential for electric energy savings from energy efficiency in the CEPCI Service Territory
- Energy efficiency opportunities typically are physical, long-lasting changes to buildings and equipment that result in decreased energy use while maintaining the same or improved levels of energy service.
- In developing the estimates of technical and achievable savings potential, GDS considered savings opportunities for a wide variety of energy efficiency measures across all three sectors.
- This study makes use of a wide range of existing studies conducted in South Carolina and throughout the US on the potential energy savings, cost, and penetration of energy efficient measures. These other existing studies provide an extensive foundation for estimates of electric energy savings potential in existing residential, commercial, and industrial facilities
- Findings suggest that there is significant savings potential in the CEPCI service territory for electric energy efficiency savings
- The magnitude of the maximum potential savings is similar to results reported for recent studies in many other states

# Executive Summary pg. 2

- The technical potential savings for electric energy efficiency measures is 32% of projected 2017 MWh sales
- The achievable potential ranges from 5% to 22% of projected 2017 MWh sales (based on low, medium and high market penetration scenarios).
- The achievable cost effective potential ranges from 4% to 20% of projected 2017 MWh sales (based on low, medium and high market penetration scenarios).
- The maximum achievable cost-effective potential savings is 20%. This high level of savings is the maximum available, is based on 80% market penetration, and could only be attained with very aggressive, well-designed and well-funded programs over a ten-year time period, and only if very high levels of market penetration can be achieved in South Carolina.

# Technical Electric Energy Efficiency Potential Savings by 2017

	Technical MWh Savings by 2017 from Electric Energy Efficiency Measures/Programs for CEPCI	2017 MWh Sales Forecast for this Sector	Percent of Sector 2017 MWh Sales Forecast
<b>RESIDENTIAL</b>	4,550,936	12,762,474	35.7%
<b>COMMERCIAL</b>	1,213,566	4,186,923	29.0%
<b>INDUSTRIAL</b>	763,029	3,468,315	22.0%
<b>TOTAL</b>	6,527,531	20,417,712	32.0%

# Achievable Electric Energy Efficiency Potential Savings by 2017

ACHIEVABLE ELECTRIC ENERGY EFFICIENCY POTENTIAL SAVINGS BY 2017							
		Achievable MWh Savings from Electric Energy Efficiency Programs			Percentage MWh Savings (Savings as a Percent of 2017 MWh Sales)		
	2017 MWh Sales Forecast for This Sector	Achievable MWh Savings by 2017 (20% Market Penetration Scenario)	Achievable MWh Savings by 2017 (50% Market Penetration Scenario)	Achievable MWh Savings by 2017 (80% Market Penetration Scenario)	% Savings by 2017 (for the 20% Market Penetration Scenario)	% Savings by 2017 (for the 50% Market Penetration Scenario)	% Savings by 2017 (for the 80% Market Penetration Scenario)
Residential	12,762,474	607,723	1,651,015	3,070,342	4.8%	12.9%	24.1%
Commercial	4,186,923	242,713	606,783	970,853	5.8%	14.5%	23.2%
Industrial	3,468,315	130,062	325,154	520,247	3.7%	9.4%	15.0%
Total	20,417,712	980,498	2,582,952	4,561,441	4.8%	12.7%	22.3%



# Achievable Cost-Effective Electric Energy Efficiency Potential Savings by 2017

ACHIEVABLE COST EFFECTIVE ELECTRIC ENERGY EFFICIENCY POTENTIAL SAVINGS BY 2017							
		Achievable Cost Effective MWh Savings from Electric Energy Efficiency Programs			Percentage MWh Savings (Savings as a Percent of 2017 MWh Sales)		
	2017 MWh Sales Forecast for This Sector	Achievable Cost Effective MWh Savings by 2017 (20% Market Penetration Scenario)	Achievable Cost Effective MWh Savings by 2017 (50% Market Penetration Scenario)	Achievable Cost Effective MWh Savings by 2017 (80% Market Penetration Scenario)	% Savings by 2017 (for the 20% Market Penetration Scenario)	% Savings by 2017 (for the 50% Market Penetration Scenario)	% Savings by 2017 (for the 80% Market Penetration Scenario)
Residential	12,762,474	461,689	1,432,799	2,655,392	3.6%	11.2%	20.8%
Commercial	4,186,923	242,713	606,783	970,853	5.8%	14.5%	23.2%
Industrial	3,468,315	95,379	238,447	381,515	2.8%	6.9%	11.0%
Total	20,417,712	799,781	2,278,028	4,007,759	3.9%	11.2%	19.6%



# Achievable Cost Effective Potential – Cumulative Annual MWh Savings by Year – 80% Penetration

ACHIEVABLE COST EFFECTIVE POTENTIAL MWH SAVINGS - 80% MARKET PENETRATION SCENARIO

Year	CEPCI mWh Load Forecast Before Energy Efficiency Impacts			Residential Energy Efficiency Savings		Commercial Energy Efficiency Savings		Industrial Energy Efficiency Savings		Total Energy Efficiency Savings (mWh)		CEPCI Total Load Forecast Before EE Impacts	CEPCI Load Forecast After EE Impacts
	Res. Sector mWh Sales	Comm. Sector mWh Sales	Ind. Sector mWh Sales	mWh Savings	% of Projected Res. mWh Sales	mWh Savings	% of Projected Comm. mWh Sales	mWh Savings	% of Projected Ind. mWh Sales	mWh Savings	% of Projected Total MWh Sales	mWh	mWh
2008	10,098,961	3,202,023	2,749,435	267,942	3%	97,085	3%	38,151	1%	403,179	3%	16,050,419	15,647,240
2009	10,374,722	3,310,351	2,829,275	538,413	5%	194,171	6%	76,303	3%	808,887	5%	16,514,348	15,705,461
2010	10,657,930	3,418,012	2,909,115	811,434	8%	291,256	9%	114,454	4%	1,217,144	7%	16,985,056	15,767,912
2011	10,946,642	3,524,974	2,988,955	1,087,118	10%	388,341	11%	152,606	5%	1,628,065	9%	17,460,570	15,832,506
2012	11,239,234	3,632,283	3,068,795	1,365,544	12%	485,426	13%	190,757	6%	2,041,727	11%	17,940,312	15,898,584
2013	11,535,811	3,740,841	3,148,635	1,642,950	14%	582,512	16%	228,909	7%	2,454,370	13%	18,425,287	15,970,917
2014	11,835,373	3,850,612	3,228,475	1,908,174	16%	679,597	18%	267,060	8%	2,854,831	15%	18,914,460	16,059,629
2015	12,140,576	3,961,563	3,308,315	2,154,806	18%	776,682	20%	305,212	9%	3,236,700	17%	19,410,454	16,173,755
2016	12,450,177	4,073,690	3,388,315	2,404,084	19%	873,767	21%	343,363	10%	3,621,214	18%	19,912,182	16,290,967
2017	12,762,474	4,186,923	3,468,315	2,655,392	21%	970,853	23%	381,515	11%	4,007,759	20%	20,417,712	16,409,953



# Achievable Cost Effective Potential – Cumulative Annual MWh Savings by Year – 50% Penetration

ACHIEVABLE COST EFFECTIVE POTENTIAL MWH SAVINGS - 50% MARKET PENETRATION SCENARIO

Year	CEPCI mWh Load Forecast Before Energy Efficiency Impacts			Residential Energy Efficiency Savings	Commercial Energy Efficiency Savings		Industrial Energy Efficiency Savings		Total Energy Efficiency Savings (mWh)		CEPCI Total Load Forecast Before EE Impacts	CEPCI Load Forecast After EE Impacts
	Res. Sector mWh Sales	Comm. Sector mWh Sales	Ind. Sector mWh Sales	mWh Savings	mWh Savings	% of Projected Res. mWh Sales	mWh Savings	% of Projected Ind. mWh Sales	mWh Savings	% of Projected Total MWh Sales	mWh	mWh
2008	10,098,961	3,202,023	2,749,435	144,408	60,678	1%	23,845	1%	228,931	1%	16,050,419	15,821,489
2009	10,374,722	3,310,351	2,829,275	290,393	121,357	3%	47,689	2%	459,439	3%	16,514,348	16,054,909
2010	10,657,930	3,418,012	2,909,115	437,967	182,035	4%	71,534	2%	691,536	4%	16,985,056	16,293,521
2011	10,946,642	3,524,974	2,988,955	587,204	242,713	5%	95,379	3%	925,296	5%	17,460,570	16,535,275
2012	11,239,234	3,632,283	3,068,795	738,154	303,391	7%	119,223	4%	1,160,769	6%	17,940,312	16,779,543
2013	11,535,811	3,740,841	3,148,635	888,496	364,070	8%	143,068	5%	1,395,633	8%	18,425,287	17,029,654
2014	11,835,373	3,850,612	3,228,475	1,031,362	424,748	9%	166,913	5%	1,623,022	9%	18,914,460	17,291,438
2015	12,140,576	3,961,563	3,308,315	1,163,651	485,426	10%	190,757	6%	1,839,835	9%	19,410,454	17,570,619
2016	12,450,177	4,073,690	3,388,315	1,297,592	546,105	10%	214,602	6%	2,058,299	10%	19,912,182	17,853,883
2017	12,762,474	4,186,923	3,468,315	1,432,799	606,783	11%	238,447	7%	2,278,028	11%	20,417,712	18,139,683

# Achievable Cost Effective Potential – Cumulative Annual MWh Savings by Year – 20% Penetration

ACHIEVABLE COST EFFECTIVE POTENTIAL MWH SAVINGS - 20% MARKET PENETRATION SCENARIO

Year	CEPCI mWh Load Forecast Before Energy Efficiency Impacts			Residential Energy Efficiency Savings		Commercial Energy Efficiency Savings		Industrial Energy Efficiency Savings		Total Energy Efficiency Savings (mWh)		CEPCI Total Load Forecast Before EE Impacts	CEPCI Load Forecast After EE Impacts
	Res. Sector mWh Sales	Comm. Sector mWh Sales	Ind. Sector mWh Sales	mWh Savings	% of Projected Res. mWh Sales	mWh Savings	% of Projected Comm. mWh Sales	mWh Savings	% of Projected Ind. mWh Sales	mWh Savings	% of Projected Total MWh Sales	mWh	mWh
2008	10,098,961	3,202,023	2,749,435	46,017	0%	24,271	1%	9,538	0%	79,827	0%	16,050,419	15,970,593
2009	10,374,722	3,310,351	2,829,275	92,663	1%	48,543	1%	19,076	1%	160,282	1%	16,514,348	16,354,066
2010	10,657,930	3,418,012	2,909,115	139,940	1%	72,814	2%	28,614	1%	241,368	1%	16,985,056	16,743,689
2011	10,946,642	3,524,974	2,988,955	187,879	2%	97,085	3%	38,151	1%	323,116	2%	17,460,570	17,137,455
2012	11,239,234	3,632,283	3,068,795	236,496	2%	121,357	3%	47,689	2%	405,542	2%	17,940,312	17,534,770
2013	11,535,811	3,740,841	3,148,635	284,923	2%	145,628	4%	57,227	2%	487,778	3%	18,425,287	17,937,509
2014	11,835,373	3,850,612	3,228,475	330,580	3%	169,899	4%	66,765	2%	567,245	3%	18,914,460	18,347,215
2015	12,140,576	3,961,563	3,308,315	373,678	3%	194,171	5%	76,303	2%	644,152	3%	19,410,454	18,766,303
2016	12,450,177	4,073,690	3,388,315	417,430	3%	218,442	5%	85,841	3%	721,713	4%	19,912,182	19,190,469
2017	12,762,474	4,186,923	3,468,315	461,689	4%	242,713	6%	95,379	3%	799,781	4%	20,417,712	19,617,931

# Achievable Cost Effective Potential – Cumulative Annual Summer and Winter MW Savings – 80% Penetration

**ACHIEVABLE COST EFFECTIVE POTENTIAL - WINTER AND SUMMER PEAK MW SAVINGS FROM ENERGY EFFICIENCY PROGRAMS - 80% MARKET PENETRATION SCENARIO**

Year	Residential		Commercial		Industrial		Total Savings		CEPCI Peak Load		CEPCI Peak Load		Percent Savings	
	Winter Peak MW Savings	Summer Peak MW Savings	Winter Peak MW Savings	Summer Peak MW Savings	Winter Peak MW Savings	Summer Peak MW Savings	Winter Peak MW Savings	Summer Peak MW Savings	Winter Peak Load (MW)	Summer Peak Load (MW)	Winter Peak Load (MW)	Summer Peak Load (MW)	Winter Peak MW Savings	Summer Peak MW Savings
2008	68	47	22	37	7	7	97	92	3,714	3,499	3,616	3,407	2.6%	2.6%
2009	137	95	45	74	14	14	196	184	3,825	3,598	3,630	3,415	5.1%	5.1%
2010	206	143	67	111	22	22	294	276	3,938	3,699	3,644	3,423	7.5%	7.5%
2011	276	192	89	149	29	29	393	370	4,052	3,801	3,659	3,431	9.7%	9.7%
2012	346	242	111	186	36	36	493	464	4,168	3,904	3,674	3,440	11.8%	11.9%
2013	416	292	134	223	43	43	593	558	4,284	4,008	3,691	3,450	13.8%	13.9%
2014	486	339	156	260	50	50	692	650	4,402	4,112	3,710	3,463	15.7%	15.8%
2015	552	383	178	297	58	58	787	738	4,521	4,219	3,734	3,481	17.4%	17.5%
2016	618	427	200	334	65	65	883	826	4,641	4,327	3,758	3,500	19.0%	19.1%
2017	685	472	223	372	72	72	980	916	4,763	4,435	3,783	3,519	20.6%	20.6%

# Achievable Cost Effective Potential – Cumulative Annual Summer and Winter MW Savings – 50% Penetration

**ACHIEVABLE COST EFFECTIVE POTENTIAL - WINTER AND SUMMER PEAK MW SAVINGS FROM ENERGY EFFICIENCY PROGRAMS - 50% MARKET PENETRATION SCENARIO**

Year	Residential		Commercial		Industrial		Total Savings		CEPCI Peak Load		CEPCI Peak Load		Percent Savings	
	Winter Peak MW Savings	Summer Peak MW Savings	Winter Peak MW Savings	Summer Peak MW Savings	Winter Peak MW Savings	Summer Peak MW Savings	Winter Peak MW Savings	Summer Peak MW Savings	Winter Peak Load (MW)	Summer Peak Load (MW)	Winter Peak Load (MW)	Summer Peak Load (MW)	Winter Peak MW Savings	Summer Peak MW Savings
2008	38	24	14	23	5	5	56	52	3,714	3,499	3,658	3,447	1.5%	1.5%
2009	76	49	28	46	9	9	113	105	3,825	3,598	3,713	3,494	2.9%	2.9%
2010	114	74	42	70	14	14	169	157	3,938	3,699	3,769	3,542	4.3%	4.3%
2011	153	100	56	93	18	18	227	211	4,052	3,801	3,826	3,590	5.6%	5.5%
2012	192	126	70	116	23	23	284	264	4,168	3,904	3,884	3,639	6.8%	6.8%
2013	231	151	83	139	27	27	342	318	4,284	4,008	3,942	3,690	8.0%	7.9%
2014	270	176	97	163	32	32	399	370	4,402	4,112	4,003	3,742	9.1%	9.0%
2015	306	199	111	186	36	36	454	420	4,521	4,219	4,067	3,798	10.0%	10.0%
2016	343	221	125	209	41	41	509	471	4,641	4,327	4,132	3,855	11.0%	10.9%
2017	380	245	139	232	45	45	565	522	4,763	4,435	4,198	3,913	11.9%	11.8%

# Achievable Cost Effective Potential – Cumulative Annual Summer and Winter MW Savings – 20% Penetration

**ACHIEVABLE COST EFFECTIVE POTENTIAL - WINTER AND SUMMER PEAK MW SAVINGS FROM ENERGY EFFICIENCY PROGRAMS - 20% MARKET PENETRATION SCENARIO**

Year	Residential		Commercial		Industrial		Total Savings		CEPCI Peak Load		CEPCI Peak Load		Percent Savings	
	Winter Peak MW Savings	Summer Peak MW Savings	Winter Peak MW Savings	Summer Peak MW Savings	Winter Peak MW Savings	Summer Peak MW Savings	Winter Peak MW Savings	Summer Peak MW Savings	Winter Peak Load (MW)	Summer Peak Load (MW)	Winter Peak Load (MW)	Summer Peak Load (MW)	Winter Peak MW Savings	Summer Peak MW Savings
2008	12	7	6	9	2	2	19	18	3,714	3,499	3,694	3,480	0.5%	0.5%
2009	24	15	11	19	4	4	38	37	3,825	3,598	3,787	3,561	1.0%	1.0%
2010	36	22	17	28	5	5	58	56	3,938	3,699	3,880	3,643	1.5%	1.5%
2011	48	30	22	37	7	7	78	74	4,052	3,801	3,975	3,726	1.9%	2.0%
2012	60	38	28	46	9	9	97	93	4,168	3,904	4,070	3,810	2.3%	2.4%
2013	73	46	33	56	11	11	117	112	4,284	4,008	4,167	3,895	2.7%	2.8%
2014	85	53	39	65	13	13	137	131	4,402	4,112	4,265	3,982	3.1%	3.2%
2015	97	60	45	74	14	14	156	149	4,521	4,219	4,365	4,070	3.4%	3.5%
2016	109	67	50	84	16	16	175	167	4,641	4,327	4,466	4,159	3.8%	3.9%
2017	121	75	56	93	18	18	194	186	4,763	4,435	4,568	4,249	4.1%	4.2%

# Total Resource Cost Test for CEPCI Service Area – 80% Penetration Scenario

TOTAL RESOURCE COST TEST - ACHIEVABLE COST EFFECTIVE ELECTRICITY SAVINGS POTENTIAL SCENARIO FOR CEPCI (Based on 80% market penetration by 2017)						
Column #	1	2	3	4	5	6
	Present Value of Total Resource Benefits (\$2008)	Present Value of Total Measure Incremental Costs (\$2008)	Present Value of Implementation Costs (\$2008)	Present Value of Total Costs (Col 2 +Col 3)	Net Present Value Savings (\$2008)	TRC Test Benefit/ Cost Ratio
Residential Sector	\$2,299,895,380	\$859,761,581	\$147,215,924	\$1,006,977,504	\$1,292,917,876	2.28
Commercial Sector	\$718,622,894	\$295,086,533	\$51,200,646	\$346,287,179	\$372,335,715	2.08
Industrial Sector	\$228,234,522	\$44,511,730	\$20,120,246	\$64,631,976	\$163,602,546	3.53
Total	\$3,246,752,796	\$1,199,359,844	\$218,536,816	\$1,417,896,660	\$1,828,856,137	2.29

# Total Resource Cost Test for CEPCI Service Area – 50% Penetration Scenario

TOTAL RESOURCE COST TEST - ACHIEVABLE COST EFFECTIVE ELECTRICITY SAVINGS POTENTIAL SCENARIO FOR CEPCI (Based on 50% market penetration by 2017)						
Column #	1	2	3	4	5	6
	Present Value of Total Resource Benefits (\$2008)	Present Value of Total Measure Incremental Costs (\$2008)	Present Value of Implementation Costs (\$2008)	Present Value of Total Costs (Col 2 +Col 3)	Net Present Value Savings (\$2008)	TRC Test Benefit/ Cost Ratio
Residential Sector	\$1,185,992,772	\$366,303,002	\$79,843,965	\$446,146,967	\$739,845,805	2.66
Commercial Sector	\$449,139,309	\$184,429,083	\$32,000,404	\$216,429,487	\$232,709,822	2.08
Industrial Sector	\$142,646,576	\$27,819,831	\$12,575,154	\$40,394,985	\$102,251,591	3.53
Total	\$1,777,778,657	\$578,551,916	\$124,419,523	\$702,971,439	\$1,074,807,218	2.53

# Total Resource Cost Test for CEPCI Service Area – 20% Penetration Scenario

TOTAL RESOURCE COST TEST - ACHIEVABLE COST EFFECTIVE ELECTRICITY SAVINGS POTENTIAL SCENARIO FOR CEPCI (Based on 20% market penetration by 2017)						
Column #	1	2	3	4	5	6
	Present Value of Total Resource Benefits (\$2008)	Present Value of Total Measure Incremental Costs (\$2008)	Present Value of Implementation Costs (\$2008)	Present Value of Total Costs (Col 2 +Col 3)	Net Present Value Savings (\$2008)	TRC Test Benefit/ Cost Ratio
Residential Sector	\$386,970,117	\$103,351,145	\$25,733,857	\$129,085,002	\$257,885,115	3.00
Commercial Sector	\$179,655,724	\$73,771,633	\$12,800,162	\$86,571,795	\$93,083,929	2.08
Industrial Sector	\$57,058,630	\$11,127,932	\$5,030,062	\$16,157,994	\$40,900,636	3.53
Total	\$623,684,471	\$188,250,711	\$43,564,080	\$231,814,791	\$391,869,680	2.69



# Administrative and Incentive Costs By Sector – 80% Penetration

Administrative and Incentive Costs by Sector - Based on 80% Market Penetration by 2017								
Year	Residential		Commercial		Industrial		Total	
	Administrative Costs	Incentive Costs	Administrative Costs	Incentive Costs	Administrative Costs	Incentive Costs	Administrative Costs	Incentive Costs
2008	\$16,076,527	\$51,284,489	\$ 5,825,116	\$ 7,587,651	\$2,289,088	\$2,861,360	\$24,190,731	\$61,733,500
2009	\$16,715,111	\$52,238,425	\$ 5,999,870	\$ 7,587,651	\$2,357,760	\$2,861,360	\$25,072,741	\$62,687,436
2010	\$17,378,854	\$53,199,863	\$ 6,179,866	\$ 7,587,651	\$2,428,493	\$2,861,360	\$25,987,213	\$63,648,874
2011	\$18,074,839	\$54,204,225	\$ 6,365,262	\$ 7,587,651	\$2,501,348	\$2,861,360	\$26,941,449	\$64,653,236
2012	\$18,802,257	\$55,238,385	\$ 6,556,220	\$ 7,587,651	\$2,576,388	\$2,861,360	\$27,934,865	\$65,687,396
2013	\$19,562,181	\$56,300,467	\$ 6,752,906	\$ 7,587,651	\$2,653,680	\$2,861,360	\$28,968,767	\$66,749,478
2014	\$20,321,969	\$57,210,645	\$ 6,955,493	\$ 7,587,651	\$2,733,290	\$2,861,360	\$30,010,752	\$67,659,656
2015	\$21,157,711	\$58,366,287	\$ 7,164,158	\$ 7,587,651	\$2,815,289	\$2,861,360	\$31,137,158	\$68,815,298
2016	\$21,993,536	\$59,363,981	\$ 7,379,083	\$ 7,587,651	\$2,899,748	\$2,861,360	\$32,272,367	\$69,812,992
2017	\$22,812,255	\$60,129,547	\$ 7,600,455	\$ 7,587,651	\$2,986,740	\$2,861,360	\$33,399,451	\$70,578,558

# Administrative and Incentive Costs By Sector – 20% Penetration

Administrative and Incentive Costs by Sector - Based on 20% Market Penetration by 2017								
Year	Residential		Commercial		Industrial		Total	
	Administrative Costs	Incentive Costs	Administrative Costs	Incentive Costs	Administrative Costs	Incentive Costs	Administrative Costs	Incentive Costs
2008	\$2,761,045	\$2,262,317	\$ 1,456,279	\$ 1,896,913	\$572,272	\$715,340	\$4,789,596	\$4,874,569
2009	\$2,882,724	\$2,357,168	\$ 1,499,967	\$ 1,896,913	\$589,440	\$715,340	\$4,972,131	\$4,969,421
2010	\$3,009,351	\$2,452,354	\$ 1,544,966	\$ 1,896,913	\$607,123	\$715,340	\$5,161,441	\$5,064,606
2011	\$3,143,033	\$2,552,206	\$ 1,591,315	\$ 1,896,913	\$625,337	\$715,340	\$5,359,686	\$5,164,459
2012	\$3,283,125	\$2,654,476	\$ 1,639,055	\$ 1,896,913	\$644,097	\$715,340	\$5,566,277	\$5,266,729
2013	\$3,430,056	\$2,759,580	\$ 1,688,227	\$ 1,896,913	\$663,420	\$715,340	\$5,781,703	\$5,371,833
2014	\$3,575,851	\$2,849,848	\$ 1,738,873	\$ 1,896,913	\$683,323	\$715,340	\$5,998,047	\$5,462,100
2015	\$3,739,362	\$2,964,870	\$ 1,791,040	\$ 1,896,913	\$703,822	\$715,340	\$6,234,224	\$5,577,123
2016	\$3,901,246	\$3,063,473	\$ 1,844,771	\$ 1,896,913	\$724,937	\$715,340	\$6,470,954	\$5,675,725
2017	\$4,057,981	\$3,140,071	\$ 1,900,114	\$ 1,896,913	\$746,685	\$715,340	\$6,704,780	\$5,752,324

# EE Potential Studies from Other States and Regions: % of Total Electricity Sales

**Comparison of Potential Electricity Savings from Other States and Regions  
Percent of Total Electricity (GWh) Sales**

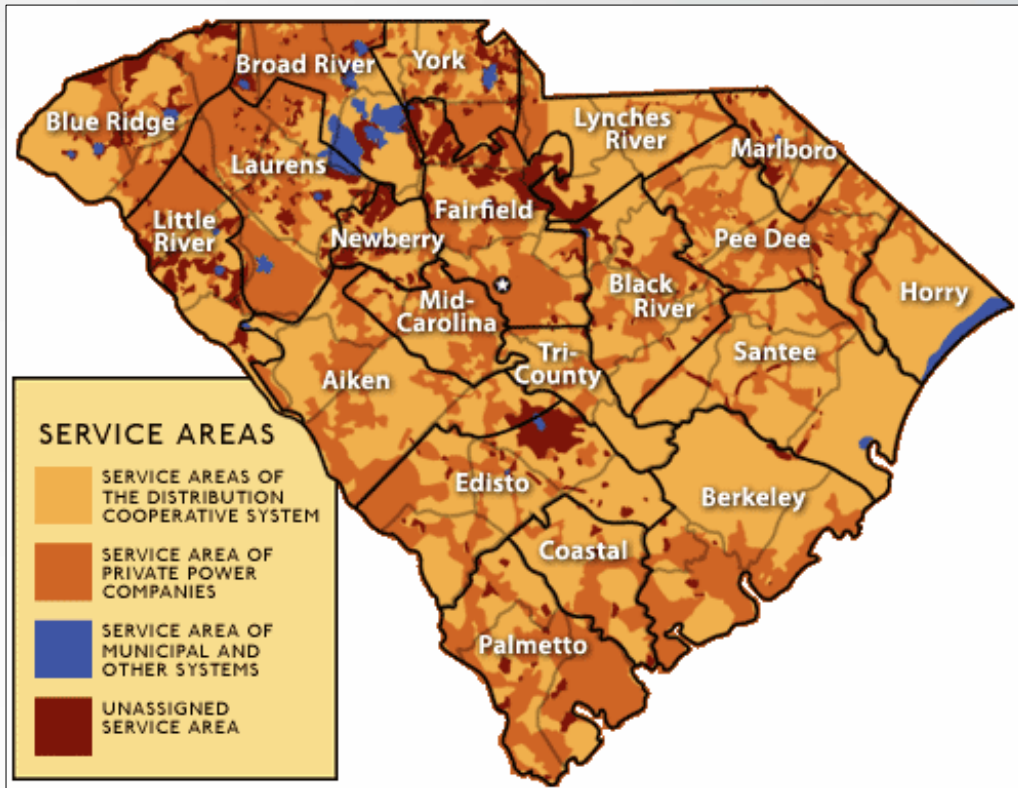
	CEPCI - 80% Penetration	CT	CA	FL	GA	Big Rivers (KY)	Mass.	NC	NY	NY/NJ/ PA	OR	Puget Sound (WA)	Southwest	TX	VT	WI
	2017	2012 <sup>1</sup>	2016 <sup>2</sup>	2017 <sup>3</sup>	2015 <sup>4</sup>	2015 <sup>5</sup>	2007 <sup>6</sup>	2016 <sup>7</sup>	2012 <sup>8</sup>	2011 <sup>9</sup>	2013 <sup>10</sup>	2023 <sup>11</sup>	2020 <sup>12</sup>	2017 <sup>13</sup>	2015 <sup>14</sup>	2015 <sup>15</sup>
<b>Technical Potential</b>																
<b>Total</b>	<b>32%</b>	<b>24%</b>	<b>30%</b>		<b>29%</b>			<b>33%</b>	<b>37%</b>		<b>31%</b>		<b>33%</b>		<b>35%</b>	
<b>Achievable Potential</b>																
<b>Total</b>	<b>22%</b>	<b>17%</b>		<b>26%</b>	<b>20%</b>			<b>20%</b>	<b>30%</b>			<b>12%</b>		<b>33%</b>	<b>22%</b>	
<b>Achievable Cost Effective Potential</b>																
<b>Total</b>	<b>20%</b>	<b>13%</b>	<b>10%</b>		<b>9%</b>	<b>12%</b>	<b>24%</b>	<b>14%</b>				<b>6%</b>			<b>19%</b>	<b>9.2%</b>
<b>Incentive Level as a Percent of Incremental Cost</b>																
Percentage	50%	51-70%	between 2004 incentives and full incremental cost	NA	25, 50, 100%	50%	N/A	50%	20-50%		N/A		15-25%	NA	50%	
Page		p. 30	p. ES-2		p. 2-11			p. 3	p. 3-7				p. 5-10			

# CEPCI Load Management Programs

Program	Total January Peak Load Savings (MW)	Total July Peak Load Savings (MW)	2005 Cumulative Annual MWh Savings
Air Conditioner Program	0.00	0.70	0
Original Water Heater Program	22.50	11.25	0
H2O Advantage Water Heater Program	34.53	17.26	0
H2O Select Water Heater Program	9.66	4.83	0
Voltage Reduction Program (2005)	47.24	20.02	0
Voltage Reduction Program (2006)	35.35	19.50	0

- CEPCI uses large capacity waters heaters that are controllable for specified periods of time (usually 4 hrs)
- Air conditioners can be cycled indefinitely (may not be in service)
- Customers with standby generators can be used for peak shaving

# Key Characteristics of the CEPCI Service Area



CEPCI's service area is diverse, including local electric membership cooperatives across the state of South Carolina.

# CEPCI's Sales to Members

**In 2005, CEPCI was the 8th largest generation and transmission electric co-op in the nation by sales to members.\***

RANK	UTILITY NAME	STATE	SALES FOR RESALE (MWh)
1	Oglethorpe Power Corporation	GA	24,667,274
2	Associated Electric Coop, Inc	MO	22,766,365
3	North Carolina EI Member Corp	NC	17,121,949
4	Seminole Electric Coop, Inc	FL	16,650,785
5	Basin Electric Power Coop	ND	16,210,848
6	Tri-State G & T Assn, Inc	CO	15,295,892
7	Great River Energy	MN	14,403,324
<b>8</b>	<b>Central Electric Power Co-op, Inc</b>	<b>SC</b>	<b>13,494,444</b>
9	Arkansas Electric Coop Corp	AR	12,771,399
10	Old Dominion Electric Coop	VA	12,510,376

\*Source: 2005 EIA Form 861

# CEPCI's Service Area Characteristics

- 21,000 square miles of service area (80% of the land area of South Carolina)
- 1.7 million people
- Approximately 620,000 households
- 51.3% of homes built after 1987 as of 2005

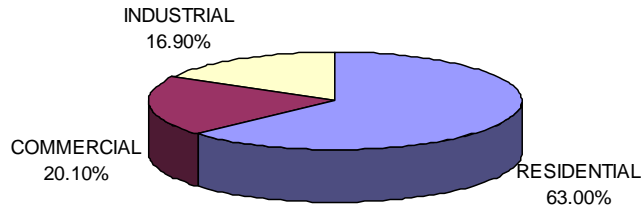
# CEPCI Key Statistics for 2006

Number of Customers (all sectors):	678,197
Total MWh Sales:	14,740,003
Winter Peak Load MW:	3,480
Summer Peak Load MW:	3,290
Total Revenues:	\$1,279,643,918
Average Revenue per kWh:	\$.087

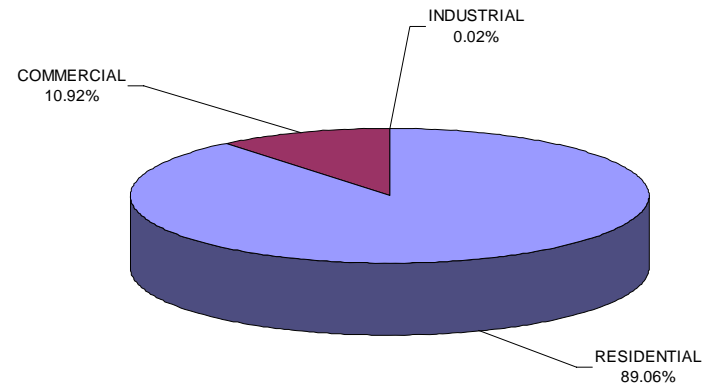


# CEPCI Service Area Energy Usage

**Sales by Customer Class, 2006**



**Customers by Class, 2006**



# Key Assumptions

- GDS screening model used to calculate all benefit/cost ratios
- Study results do not reflect any demand savings from demand response programs.
- Transmission Line Loss Factor: 2.5%
- Distribution Line Loss Factor: 4.4% (3 year average)
- Inflation rate 3% per year
- Nominal discount rate: 6.08% (not inflation adjusted)
- Reserve margin Winter: 10%  
Summer: 13%

# New Benefit-Cost Screening Model

- Built by GDS Associates over the past five years
- Operates in an Excel environment
- Model has been approved by regulators in other States (New Hampshire, Maine, Massachusetts, Vermont, etc.)
- Can handle up to 110 energy efficiency measures
- User-friendly, easy to use

# Sources of End Use Load Shape Factors

- Utility end use load research studies
- Energy efficiency program evaluation reports
- Other energy efficiency potential studies
- Energy efficiency conference proceedings



# CEPCI MWh Sales, 1996-2006

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	TOTAL
1996	6,824,026	1,909,578	1,469,384	10,202,987
1997	6,634,452	1,987,780	1,657,668	10,279,900
1998	7,300,594	2,144,902	1,813,789	11,259,285
1999	7,407,653	2,243,110	1,936,350	11,587,114
2000	7,939,446	2,437,423	2,013,127	12,389,996
2001	8,099,988	2,410,040	2,149,763	12,659,791
2002	8,481,730	2,522,563	2,294,276	13,298,569
2003	8,530,956	2,536,717	2,376,689	13,444,362
2004	9,042,675	2,727,367	2,509,759	14,279,800
2005	9,215,545	2,835,661	2,460,130	14,511,336
2006	9,286,766	2,962,179	2,491,058	14,740,003
Compound Average Annual Rate of Growth	2.8%	4.1%	4.9%	3.4%

# CEPCI Number of Customers, 1996-2006

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	TOTAL
1996	461,541	50,635	24	512,200
1997	478,042	52,876	33	530,952
1998	494,190	54,799	50	549,039
1999	509,010	58,129	67	567,206
2000	524,948	60,587	87	585,622
2001	537,824	61,991	99	599,914
2002	552,205	63,314	102	615,620
2003	564,281	65,452	113	629,847
2004	575,673	67,764	122	643,558
2005	590,005	70,660	127	660,793
2006	603,995	74,070	133	678,198
Compound Average Annual Rate of Growth	2.5%	3.5%	16.8%	2.6%

# 2005 Appliance Saturation Data

**Customer saturation is the percentage of customers who have one or more of the appliance.**

**Appliance saturation is the total number of appliances divided by the total number of customers.**

Equipment	Customer Saturation (%)	Appliance Saturation (%)
<b>Space Heating and Cooling</b>		
Electric Space Heating	71.5	N/A
Room Air Conditioning	24.8	35.3
Central Air Conditioning Electric	86.5	N/A
Central Air Conditioning Gas	8.7	N/A
Space Heating Gas	17.3	N/A
<b>Water Heating</b>		
Water Heating Electric	84.8	91.5
Clothes washer	96.9	97.8
Water Heating Non-Electric	15.2	N/A
<b>Household Appliances</b>		
Clothes dryer	91.9	92.5
Refrigerator	99	123.6*
Freezer	58.2	69.2
Dehumidifier	7.7	8.8
Dishwasher	64.3	65.0
Pool Pump or Heater	37.7	N/A

\*Note: Over 100% saturation indicates some homes with more than one appliance



# Load Forecasts

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# CEPCI Load Forecast by Customer Class, 2008-2017 (MWh)

(Without Energy Efficiency Program Impacts)

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	TOTAL
2008	10,098,961	3,202,023	2,749,435	16,050,419
2009	10,374,722	3,310,351	2,829,275	16,514,348
2010	10,657,930	3,418,012	2,909,115	16,985,056
2011	10,946,642	3,524,974	2,988,955	17,460,570
2012	11,239,234	3,632,283	3,068,795	17,940,312
2013	11,535,811	3,740,841	3,148,635	18,425,287
2014	11,835,373	3,850,612	3,228,475	18,914,460
2015	12,140,576	3,961,563	3,308,315	19,410,454
2016	12,450,177	4,073,690	3,388,315	19,912,182
2017	12,762,474	4,186,923	3,468,315	20,417,712
Compound Average Annual Rate of Growth	2.4%	2.7%	2.3%	2.4%

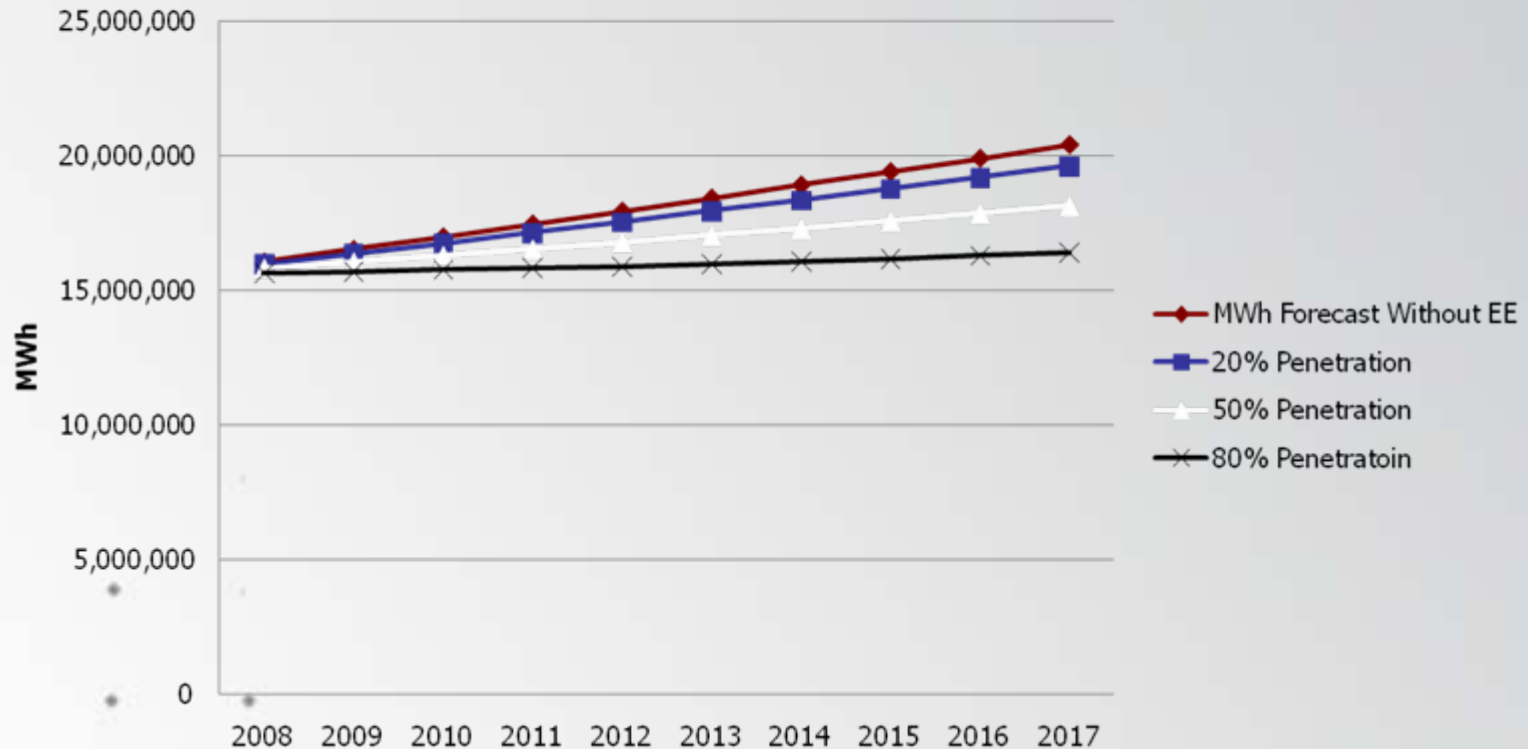
# Customer Forecast, 2008-2017

Year	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	TOTAL
2008	632,598	77,280	128	710,006
2009	646,366	79,321	129	725,816
2010	660,349	81,310	130	741,789
2011	674,480	83,249	131	757,860
2012	688,682	85,164	132	773,978
2013	702,963	87,079	133	790,175
2014	717,199	88,994	134	806,326
2015	731,586	90,908	135	822,629
2016	746,043	92,823	136	839,001
2017	760,427	94,737	137	855,300
<b>Compound Average Annual Rate of Growth</b>	1.9%	2.1%	0.7%	1.9%

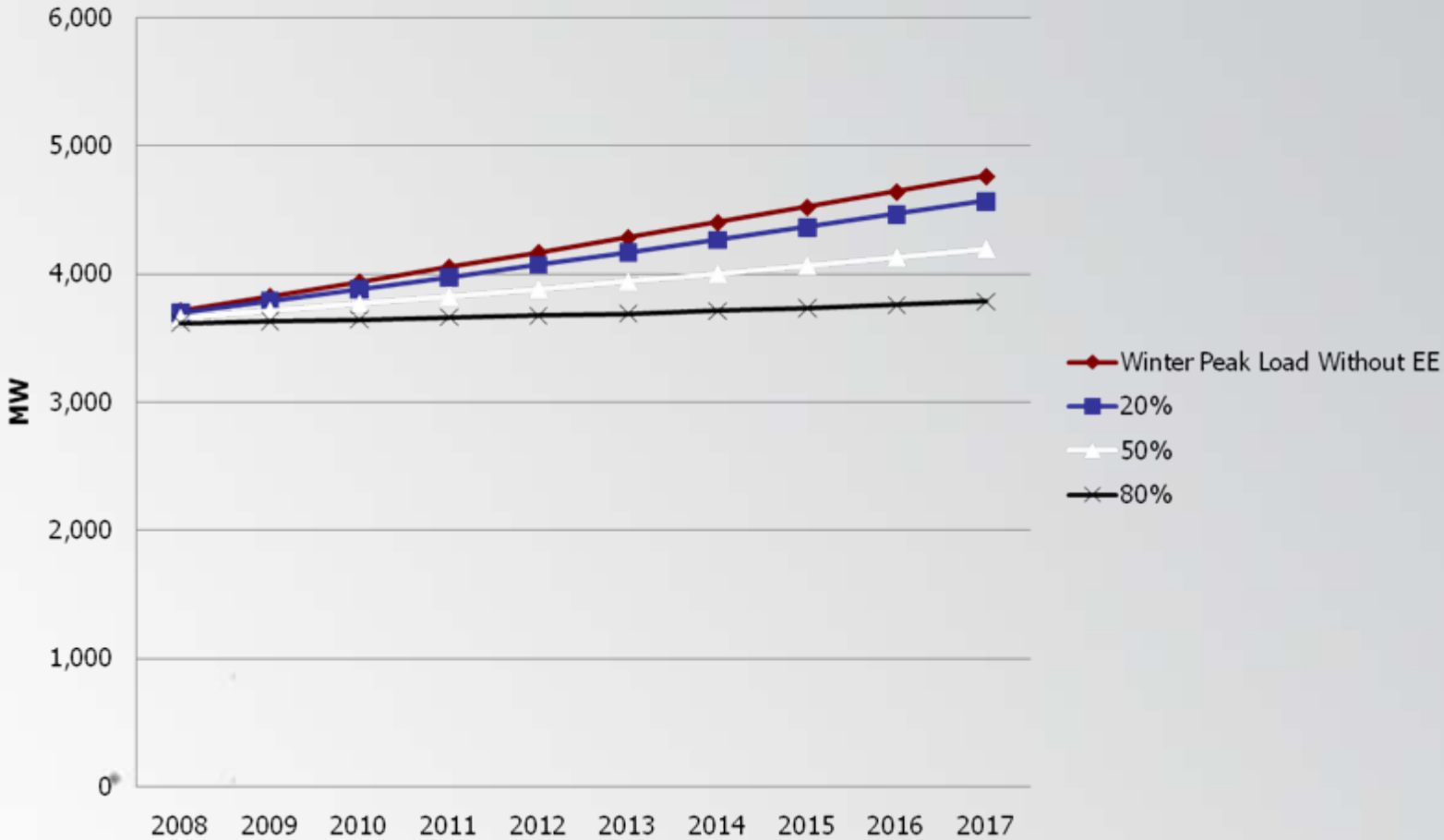
# CEPCI Total Load Forecast

## Before and After Energy Efficiency Program Impacts

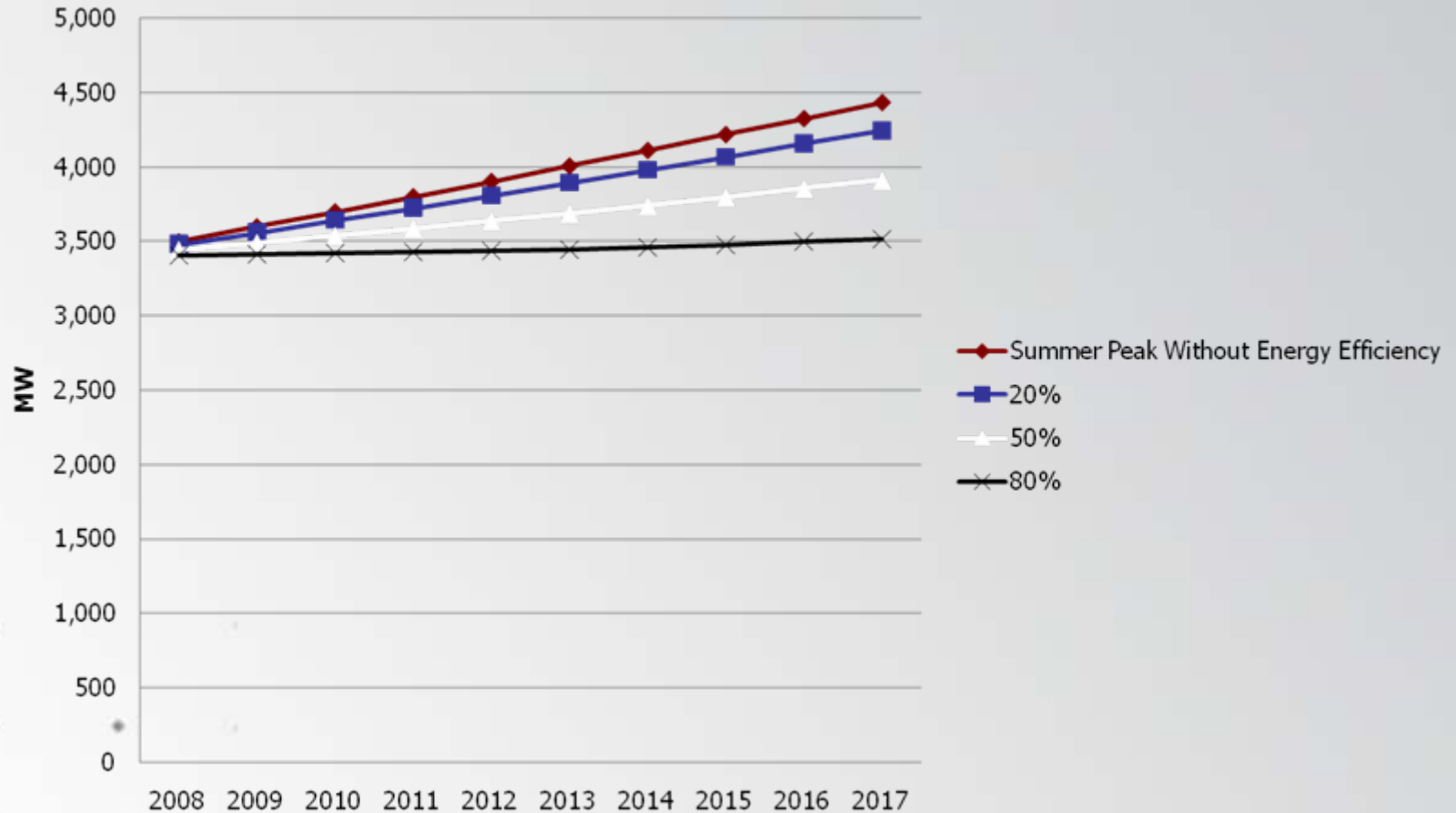
### MWh Sales - Impacts of Energy Efficiency Programs



# Impacts of Energy Efficiency Programs on Winter Peak (MW)



# Impacts of Energy Efficiency Programs on Summer Peak



# 2006 Generation Expansion Plan

Year	Resource Expansion Plan
2007	COAL
2008	
2009	COAL
2010	
2011	125 MW
2012	COAL
2013	
2014	
2015	125MW
2016	NUCLEAR
2017	

The Generation Plan consists of:

1. 600MW Coal Unit in 2007
2. 600MW Coal Unit in 2009
3. 125 MW Purchase in 2011
4. 600 MW Coal unit in 2012
5. 45% Share of 1100 MW Nuclear Unit in 2016

Unit capacity amounts are total system capacities, for Central and Santee Cooper. The purchases are for peaking capacity only, and would not be carried over to other years. CEPCI will pay over time for a portion of their use based on a cost sharing agreement with Santee Cooper

# Avoided Costs

- Provided by Santee Cooper and Central, based on an energy efficiency program scenario developed by GDS that achieves 10% kWh sales and peak load reduction by the year 2017
- Based on avoided capacity and energy costs of new generation and distribution
- Assumes no transmission system avoided costs

# Introduction to the Methodology

- This section of the report presents an overview of the approach and methodology that was used to determine the achievable cost-effective potential for the CEPCI service areas
- The assessment rests on three key calculations:
  - Technical Potential
  - Achievable Potential
  - Achievable Cost-Effective Potential



## Technical Potential

Complete penetration of all measures analyzed where technically feasible

Developed from estimates of individual energy efficiency measures in each sector (high efficiency lighting, space heating and cooling equipment, etc)

Electricity savings that would result if:

100% of inefficient electric appliances and equipment were replaced immediately

As long as they were deemed technically feasible.

## Achievable Potential

Determines the market penetration that can be achieved with a concerted, sustained campaign of aggressive programs market intervention (examined 20%, 50% and 80% market penetration scenarios)

Estimates based on ranges of penetration level that could be achieved by 2017

Most measure costs are calculated on a replace on burnout basis.

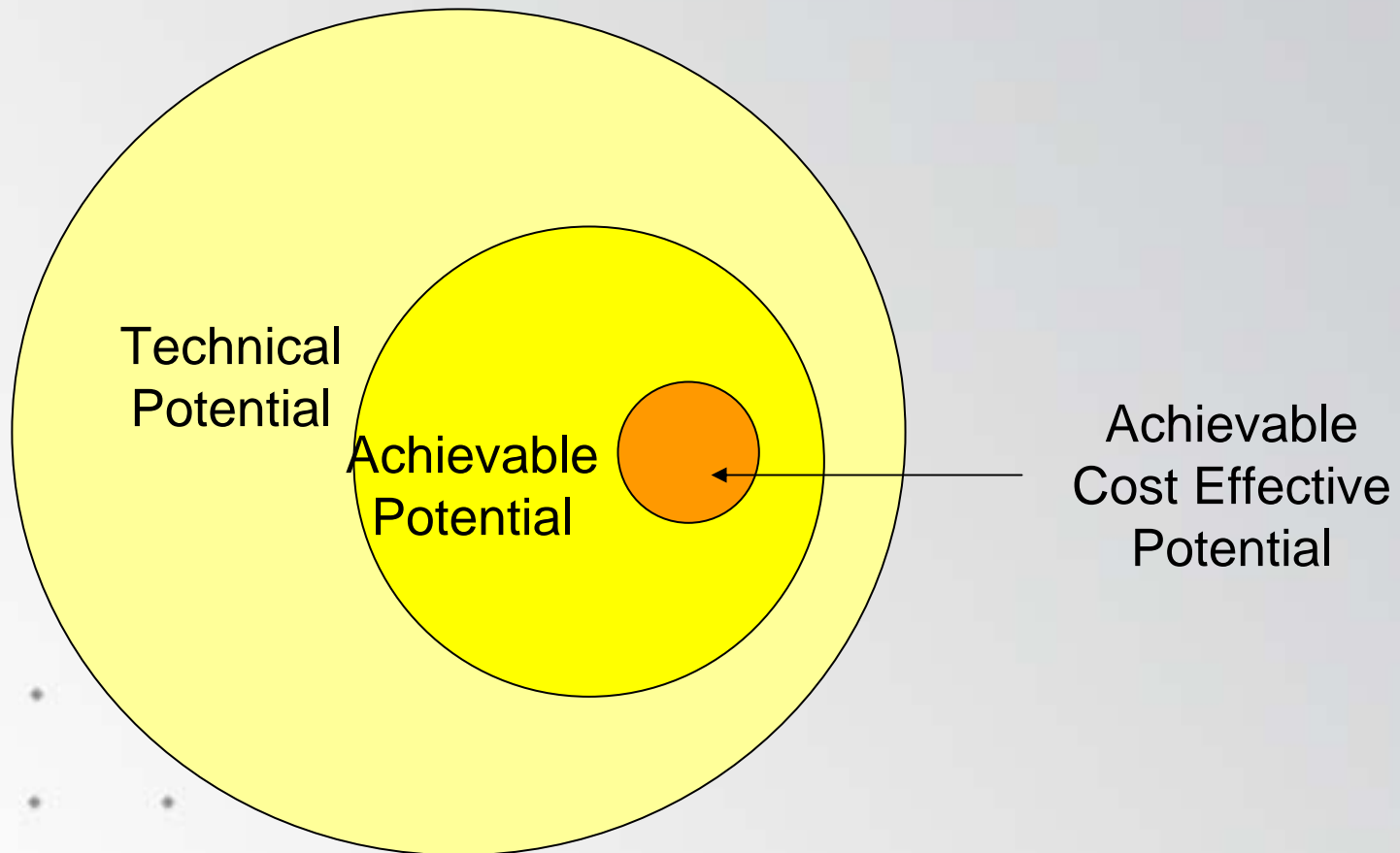
## Achievable Cost Effective Potential

Potential for the realistic penetration of energy efficiency measures that are cost effective according to the Total Resource Cost Test

Energy efficiency measures that are not cost effective were excluded.

Examined scenarios for market penetration that can be achieved with a concerted, sustained campaign involving highly aggressive programs and market interventions.

# The relationship between these three calculations shown in a Venn diagram:



Note: diagram is for illustrative purposes only, and does not reflect precise numerical ratios between categories.

# Steps for Estimating Energy Efficiency Potential

1. Identification of data sources for electric energy efficiency measures.
2. Identification of electric energy efficiency measures to be included in the assessment.
3. Determination of the characteristics of each energy efficiency measure including its incremental cost, electric energy savings, operations and maintenance savings, current saturation, the percent of installations that are already energy efficient, and the useful life of the measure.
4. Calculation of initial cost-effectiveness screening metrics (e.g., the Total Resource Cost Test benefit cost ratio) and sorting of measures from least-cost to highest cost per kWh saved.
5. Collection and analysis (where data was available) of the baseline and forecasted characteristics of the electric end use markets, including electric equipment saturation levels and consumption, by market segment and end use over the forecast period.
6. Integration of measure characteristics and baseline data to produce estimates of cumulative costs and savings across all measures (supply curves).
7. Determination of the cumulative technical and achievable potentials using supply curves.
8. Determination of the annual achievable cost effective potential for electricity savings over the forecast period.

# Key Assumptions for Achievable Penetration of Efficiency Measures

- GDS examined three market penetration scenarios for energy efficiency measures (20%, 50%, 80%)
- Incentives for energy efficiency ranged from 20% of measure incremental cost in the low case, 35% in the medium case, and 50% in the high case
- The high case penetration of 80% is based on actual penetration experience of highly successful programs in other regions of the United States and interviews with energy efficiency program administrators across the US

# Technical Potential Residential Sector Equation

$$\begin{array}{c}
 \text{Technical} \\
 \text{Potential} \\
 \text{of} \\
 \text{Efficient} \\
 \text{Measure}
 \end{array}
 =
 \begin{array}{c}
 \text{Total} \\
 \text{Number of} \\
 \text{Residential} \\
 \text{Households}
 \end{array}
 \times
 \begin{array}{c}
 \text{Base Case} \\
 \text{Equipment} \\
 \text{End Use} \\
 \text{Intensity} \\
 \text{(annual} \\
 \text{kWh use} \\
 \text{per} \\
 \text{home)}
 \end{array}
 \times
 \begin{array}{c}
 \text{Base} \\
 \text{Case} \\
 \text{Factor}
 \end{array}
 \times
 \begin{array}{c}
 \text{Remaining} \\
 \text{Factor}
 \end{array}
 \times
 \begin{array}{c}
 \text{Convertible} \\
 \text{Factor}
 \end{array}
 \times
 \begin{array}{c}
 \text{Savings} \\
 \text{Factor}
 \end{array}$$

- Number of Households is the number of residential electric customers in the market segment.
- Base-case equipment end use intensity is the electricity used per customer per year by each base-case technology in each market segment. This is the consumption of the electric energy using equipment that the efficient technology replaces or affects. For example purposes only, if the efficient measure were a high efficiency light bulb (CFL), the base end use intensity would be the annual kWh use per bulb per household associated with an incandescent light bulb that provides equivalent lumens to the CFL.
- Base Case factor is the fraction of the end use electric energy that is applicable for the efficient technology in a given market segment. For example, for residential lighting, this would be the fraction of all residential electric customers that have electric lighting in their household.
- Remaining factor is the fraction of applicable dwelling units that have not yet been converted to the electric energy efficiency measure; that is, one minus the fraction of households that already have the energy-efficiency measure installed.
- Convertible factor is the fraction of the applicable dwelling units that is technically feasible for conversion to the efficient technology from an engineering perspective (e.g., it may not be possible to install CFLs in all light sockets in a home because the CFLs may not fit in every socket in a home).
- Savings factor is the percentage reduction in electricity consumption resulting from application of the efficient technology.

# Residential Programs and Measures Considered

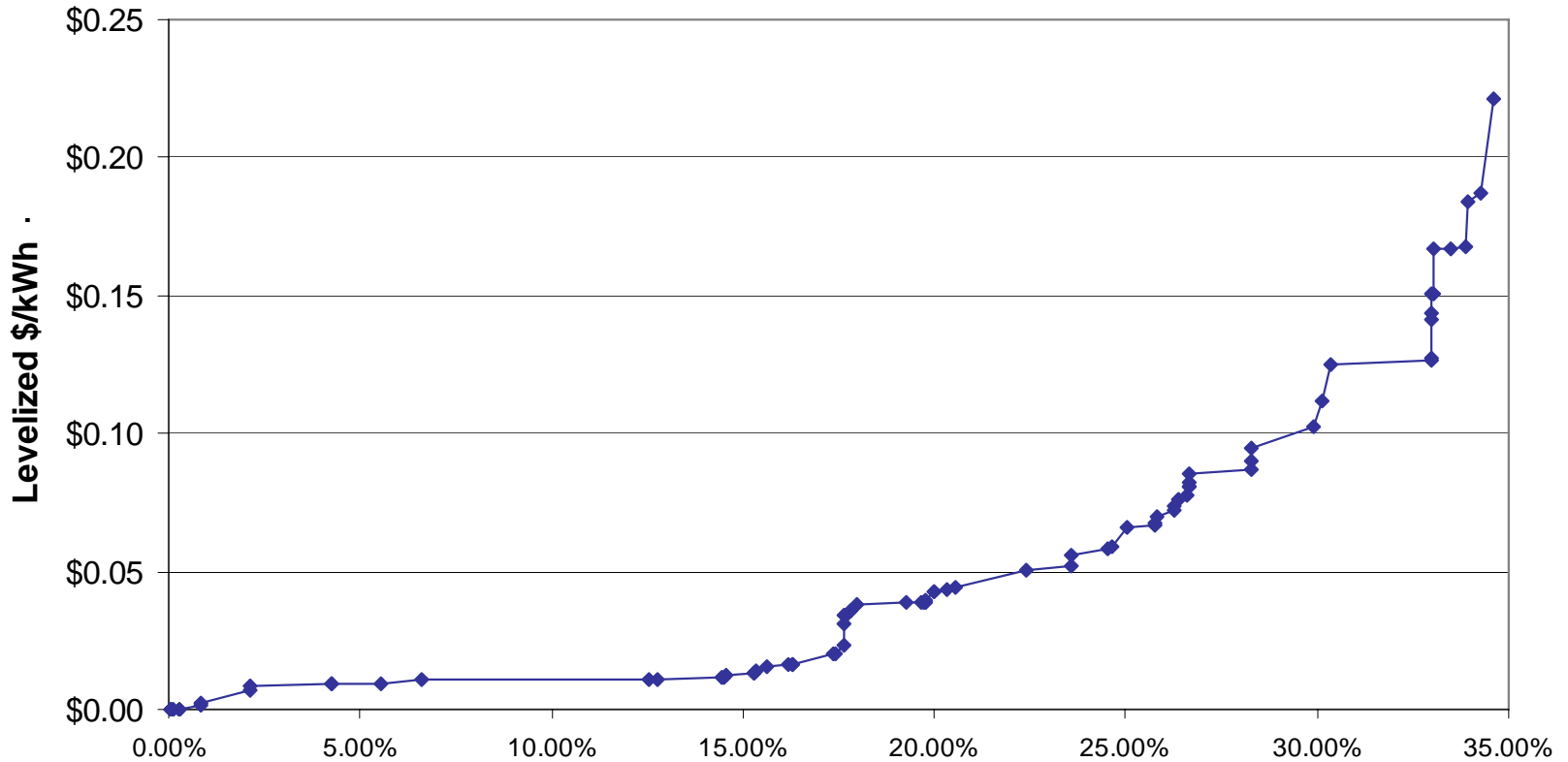
End-Use Type	Measures/Programs Included
Appliances	Energy Star Refrigerators, Freezers, Dishwashers, Dehumidifiers, Refrigerator Turn-in, & Freezer Turn-in
Standby Power	Small Plug-load appliances
Residential Pools	High Efficiency Pool Pumps
Lighting	Compact Fluorescent Bulbs
Heating & Cooling	Insulation & Weatherization Packages, Energy Star Windows, Programmable Thermostats, Room Air Conditioners, Central Air Conditioners, Electric Heat Pumps, High Efficiency Furnace Fans, Duct Sealing, Radiant Barriers, HVAC Tune Up, Ground Source Heat Pumps
Water Heating	Water Heater Blankets, Pipe Wrap, Low Flow Showerheads/Faucets, Energy Efficient Water Heaters, Solar Water Heating Systems w/ Electric Water Heater Back-Up, Heat Pump Water Heater
New Homes Construction	Efficient building practices and Energy Star Appliances for New Homes
Low Income Insulation & Weatherization	Insulation & Weatherization Package for Low Income Homes



# Residential Sector Findings

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## Residential Electric Efficiency Supply Curve for CEPCI Service Territory

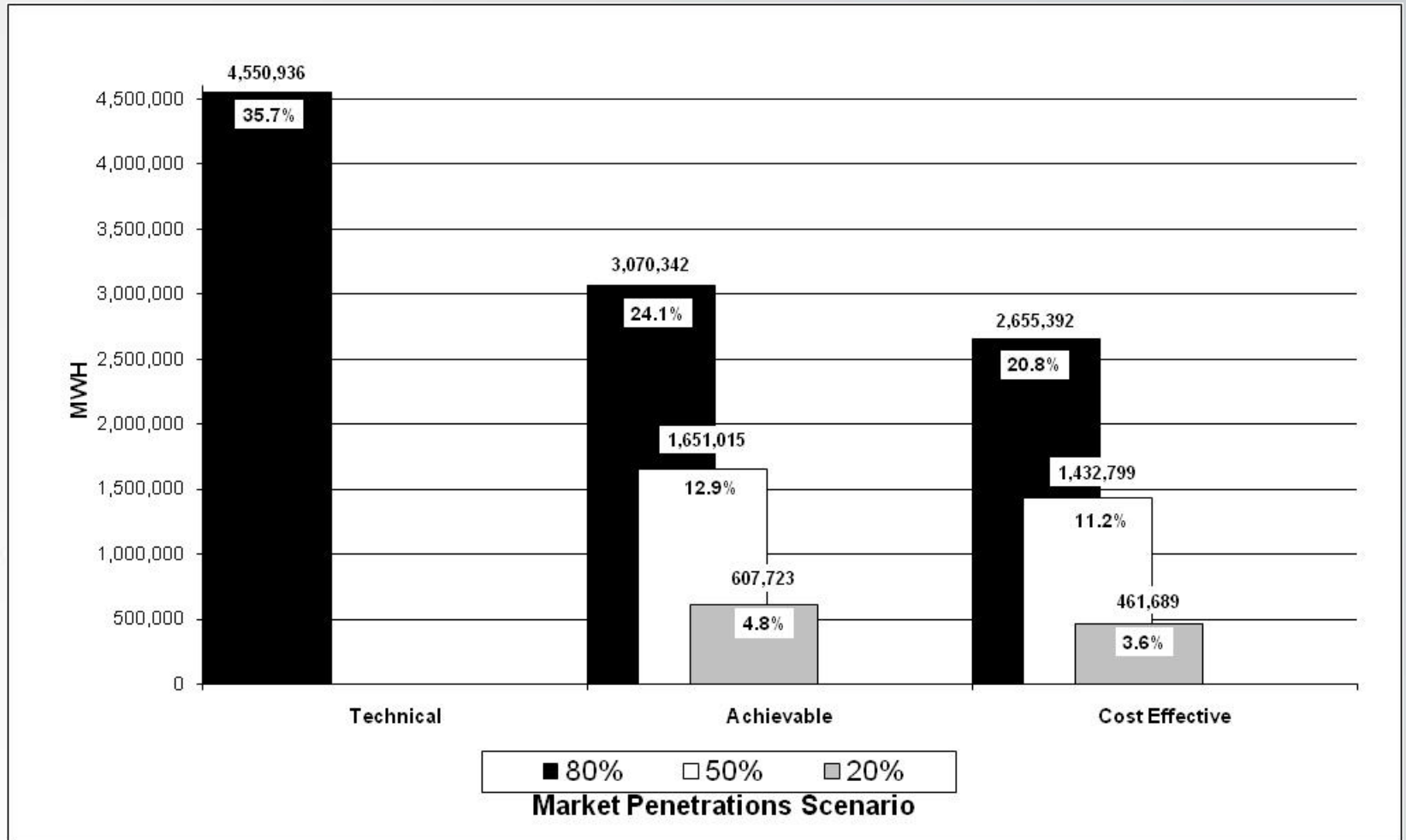


### Savings Technical Potential as a % of 2017 Forecasted Electric Use

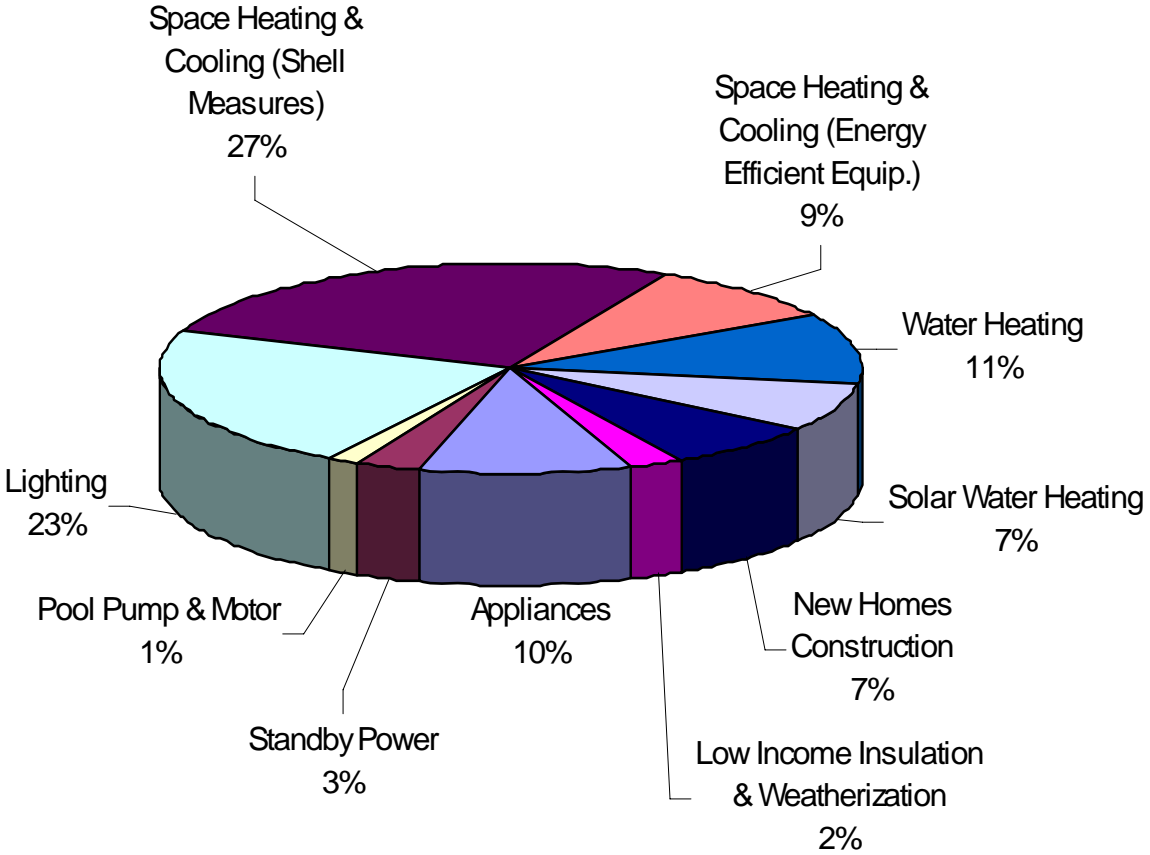
Note: Only includes measures with a levelized \$/kWh < \$0.25. High Efficiency Heat Pumps, Central A/Cs, Ground Source Heat Pumps, & Clothes Washers are not included.



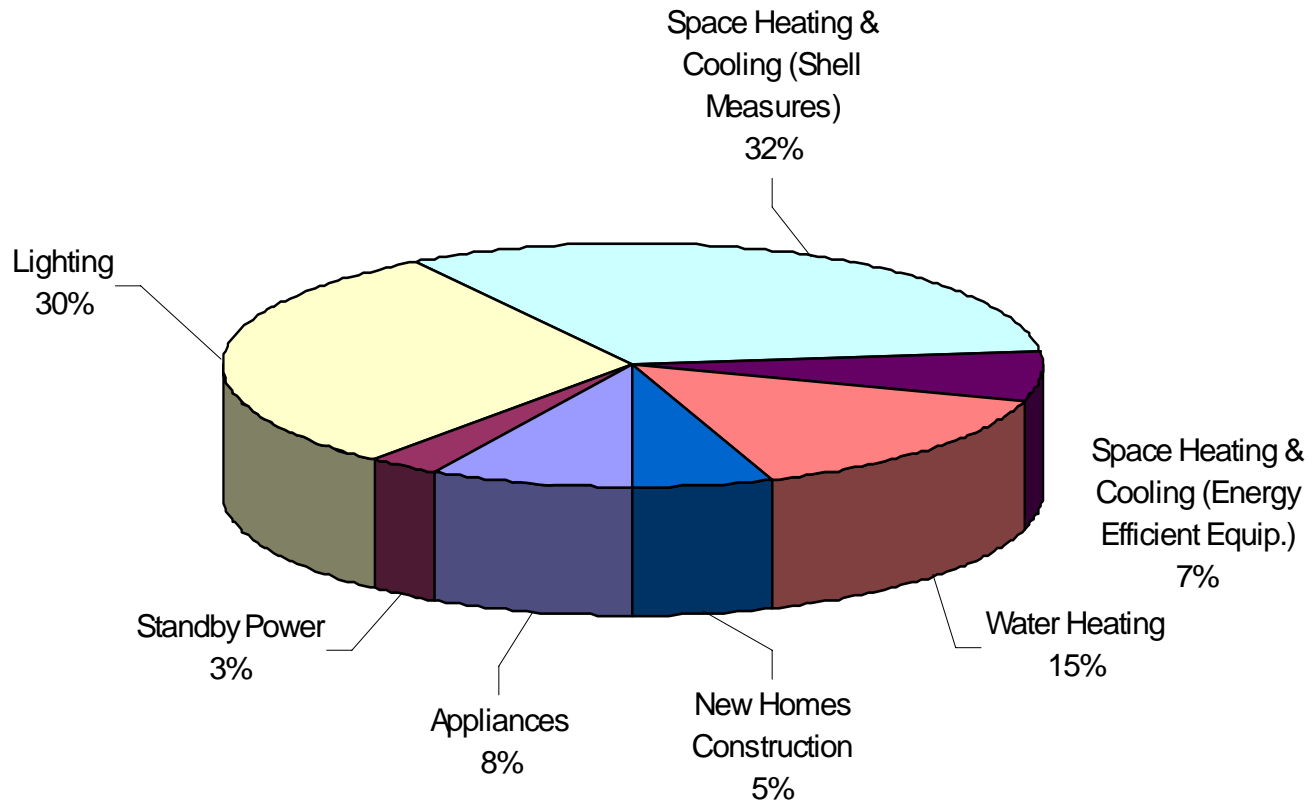
# Residential Sector Summary of Potential Savings



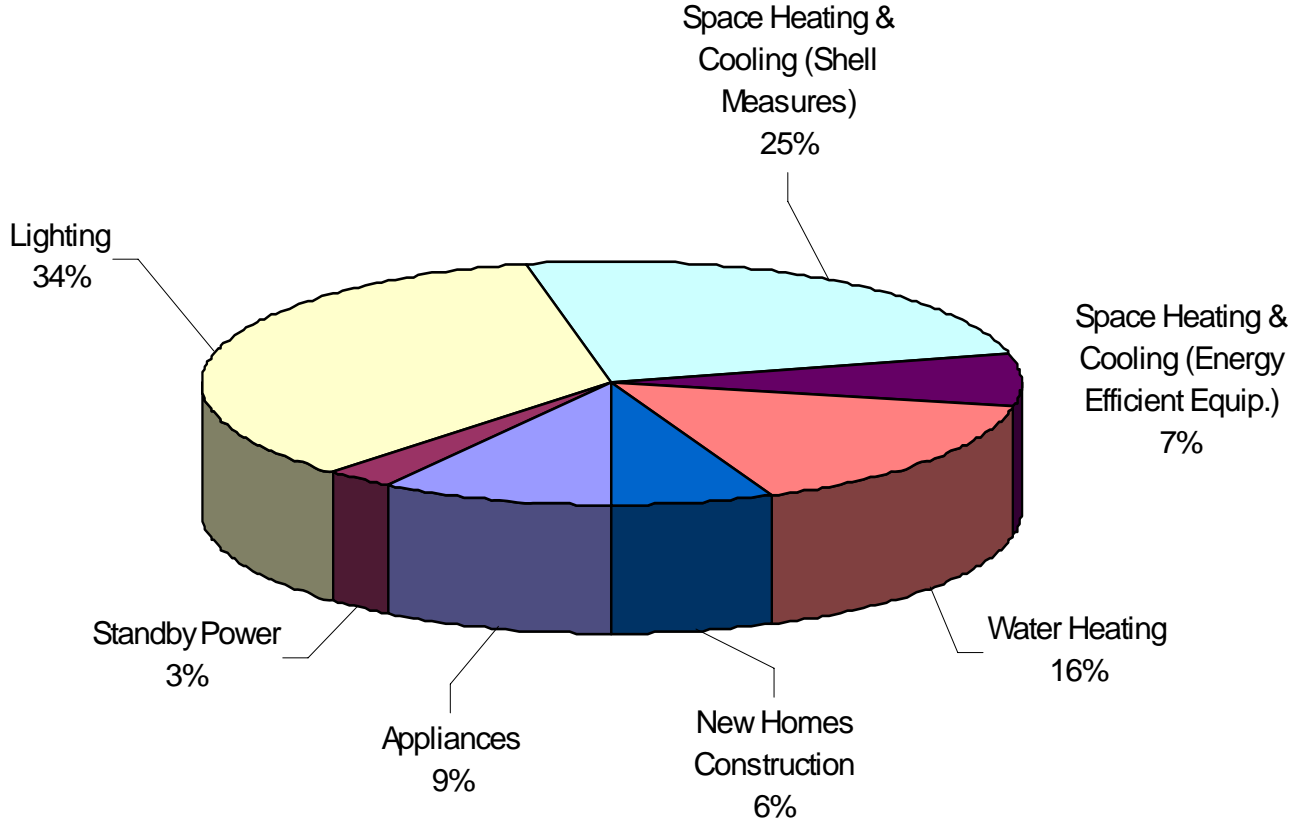
# Residential Sector End Use Savings as a % of Total Technical Potential



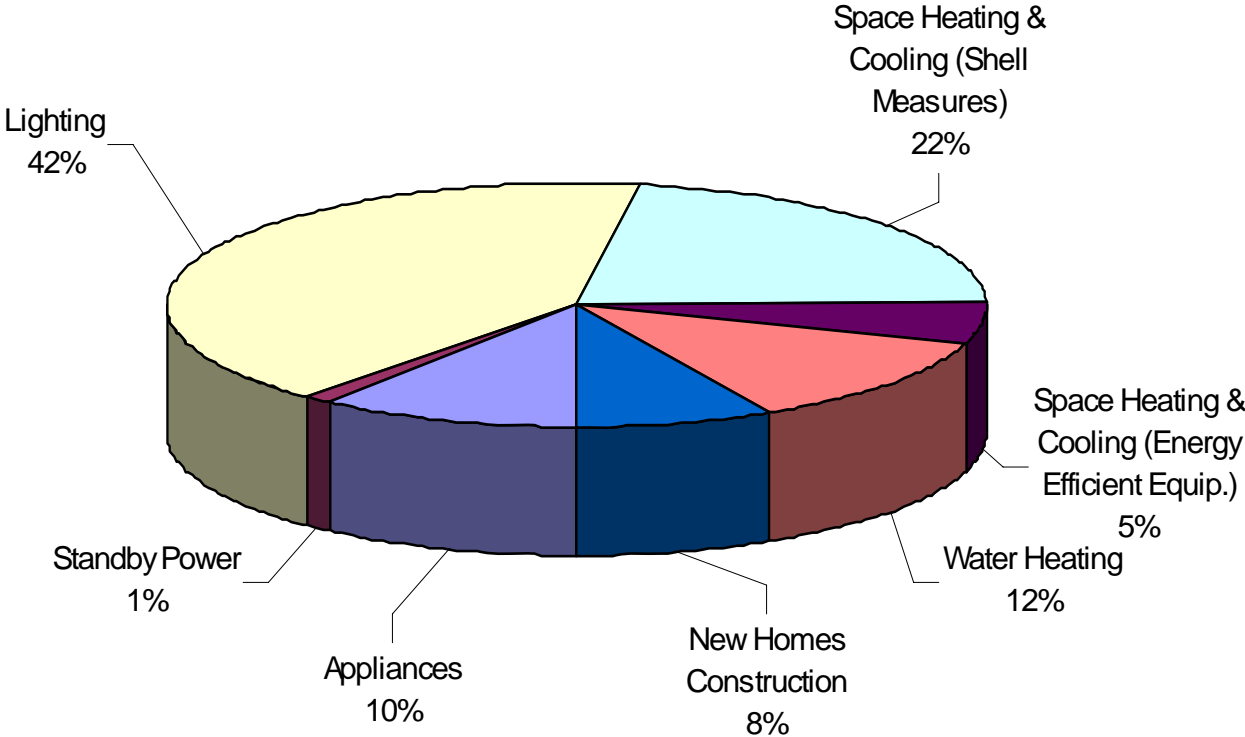
## Residential Sector End Use Savings as a % of Total Achievable Cost Effective Potential (80% Penetration Scenario)



# Residential Sector End Use Savings as a % of Total Achievable Cost Effective Potential (50% Penetration Scenario)



# Residential Sector End Use Savings as a % of Total Achievable Cost Effective Potential (20% Penetration Scenario)



# Cost of Conserved Energy - Residential Electric Efficiency Measures

Measure	Levelized \$/kWh	Measure	Levelized \$/kWh
SF Energy Star Dehumidifer	\$0.0000	MF Efficient Furnace Fan (Non-Electric Furnace)	\$0.0162
MF Energy Star Dehumidifer	\$0.0000	SF Standby Power	\$0.0203
SF Energy Star Room A/C	\$0.0000	MF Standby Power	\$0.0203
MH Energy Star Room A/C	\$0.0000	SF Programmable Thermostats (Electric Cooling Only)	\$0.0231
MF Energy Star Room A/C	\$0.0000	MF Programmable Thermostats (Electric Cooling Only)	\$0.0308
SF Energy Star Dishwasher (Electric)	\$0.0000	MF Insulation & Weatherization Package (Electric Space & Cooling)	\$0.0320
MF Energy Star Dishwasher (Electric)	\$0.0000	MF Duct Sealing (Electric Space & Cooling)	\$0.0321
SF Pipe Wrap	\$0.0019	SF Efficient Water Heater	\$0.0334
MF Pipe Wrap	\$0.0025	MH Programmable Thermostats (Electric Cooling Only)	\$0.0342
SF Water Heater Blanket	\$0.0064	MH Insulation & Weatherization Package (Electric Space & Cooling)	\$0.0356
MF Water Heater Blanket	\$0.0082	MH Duct Sealing (Electric Space & Cooling)	\$0.0357
SF Low Flow Showerhead/Faucets	\$0.0083	SF Energy Star Compliant Side by Side Refrigerator	\$0.0358
SF Second Refrigerator Turn In	\$0.0096	MF Energy Star Compliant Side by Side Refrigerator	\$0.0358
MF Second Refrigerator Turn In	\$0.0096	SF HVAC Tune-Up	\$0.0391
MF Low Flow Showerhead/Faucets	\$0.0106	MH HVAC Tune-Up	\$0.0391
SF Programmable Thermostats (Electric Space & Cooling)	\$0.0107	MF HVAC Tune-Up	\$0.0391
SF CFL Bulbs (Homes w/ no CFL bulbs installed)	\$0.0112	SF Energy Star Compliant Bottom Freezer Refrigerator	\$0.0391
MF CFL Bulbs (Homes w/ no CFL bulbs installed)	\$0.0112	MF Energy Star Compliant Bottom Freezer Refrigerator	\$0.0391
SF CFL Bulbs (Homes w/ partial CFL installation)	\$0.0113	MF Radiant Barriers (Electric Space & Cooling)	\$0.0418
MF CFL Bulbs (Homes w/ partial CFL installation)	\$0.0113	SF Energy Star Compliant Top Freezer Refrigerator	\$0.0426
SF Second Freezer Turn In	\$0.0129	MF Energy Star Compliant Top Freezer Refrigerator	\$0.0426
MF Second Freezer Turn In	\$0.0129	MF Efficient Water Heater	\$0.0427
MF Programmable Thermostats (Electric Space & Cooling)	\$0.0143	MF ES Windows (Electric Space & Cooling)	\$0.0430
MH Programmable Thermostats (Electric Space & Cooling)	\$0.0159	MH Radiant Barriers (Electric Space & Cooling)	\$0.0465
SF Efficient Furnace Fan (Non-Electric Furnace)	\$0.0162	MH ES Windows (Electric Space & Cooling)	\$0.0478
MH Efficient Furnace Fan (Non-Electric Furnace)	\$0.0162	SF Duct Sealing (Electric Space & Cooling)	\$0.0482

**Note:** SF (Single Family) ; MF (Multi Family) ; MH (Mobile Home)  
Single Family homes include mobile homes unless specifically stated

Grey-shaded measures are those with a cost of conserved energy above the current 2006 \$/kwh of electricity (\$0.087)

# Cost of Conserved Energy - Residential Electric Efficiency Measures (continued)

Measure	Levelized \$/kWh	Measure	Levelized \$/kWh
SF ES Windows (Electric Space & Cooling)	\$0.0484	SF Radiant Barriers (Electric Cooling Only)	\$0.1350
SF New Construction (Electric)	\$0.0503	SF Insulation & Weatherization Package (Electric Cooling Only)	\$0.1387
SF Radiant Barriers (Electric Space & Cooling)	\$0.0628	MF LI Insulation & Weatherization	\$0.1401
SF Insulation & Weatherization Package (Electric Space & Cooling)	\$0.0645	MF Heat Pump Water Heater	\$0.1410
SF New Construction (Non-Electric)	\$0.0671	MH LI Insulation & Weatherization	\$0.1558
MF New Construction (Electric)	\$0.0673	SF High Efficiency Heat Pump (Tier 2)	\$0.2062
MF Insulation & Weatherization Package (Electric Cooling Only)	\$0.0689	SF High Efficiency Central AC (Tier 1)	\$0.2275
MF Duct Sealing (Electric Cooling Only)	\$0.0691	MF High Efficiency Heat Pump (Tier 2)	\$0.2776
SF Pool Pump and Motor	\$0.0719	SF Ground Source Heat Pump	\$0.2812
SF Energy Star Compliant Upright Freezer (Manual Def.)	\$0.0764	MF High Efficiency Central AC (Tier 1)	\$0.3036
MF Energy Star Compliant Upright Freezer (Manual Def.)	\$0.0764	MH High Efficiency Heat Pump (Tier 2)	\$0.3119
MH Insulation & Weatherization Package (Electric Cooling Only)	\$0.0766	SF High Efficiency Heat Pump (Tier 1)	\$0.3312
MH Duct Sealing (Electric Cooling Only)	\$0.0768	MH High Efficiency Central AC (Tier 1)	\$0.3441
SF Energy Star Compliant Chest Freezer	\$0.0808	MF Ground Source Heat Pump	\$0.3699
MF Energy Star Compliant Chest Freezer	\$0.0808	MH Ground Source Heat Pump	\$0.4124
MF New Construction (Non-Electric)	\$0.0897	MF High Efficiency Heat Pump (Tier 1)	\$0.4449
MF Radiant Barriers (Electric Cooling Only)	\$0.0900	SF High Efficiency Central AC (Tier 2)	\$0.4721
MF ES Windows (Electric Cooling Only)	\$0.0925	MH High Efficiency Heat Pump (Tier 1)	\$0.5069
SF Solar Water Heating	\$0.0968	SF Energy Star Clothes Washer (w/ Electric DWH)	\$0.5305
MH Radiant Barriers (Electric Cooling Only)	\$0.1000	MF Energy Star Clothes Washer (w/ Electric DWH)	\$0.5305
MH ES Windows (Electric Cooling Only)	\$0.1028	MF High Efficiency Central AC (Tier 2)	\$0.6358
SF Duct Sealing (Electric Cooling Only)	\$0.1037	MH High Efficiency Central AC (Tier 2)	\$0.7154
SF ES Windows (Electric Cooling Only)	\$0.1041	SF Energy Star Clothes Washer (w/ Non-Electric DWH)	\$2.1219
SF LI Insulation & Weatherization	\$0.1049	MF Energy Star Clothes Washer (W/ Non-Electric DWH)	\$2.1219
SF Heat Pump Water Heater	\$0.1103		

**Note:** SF (Single Family) ; MF (Multi Family) ; MH (Mobile Home)  
Single Family homes include mobile homes unless specifically stated

Grey-shaded measures are those with a cost of conserved energy above the current 2006 \$/kwh of electricity (\$0.087)

# Top Ten Single Family Measures

(based on 80% Market Penetration Scenario)

Technical Potential (kWh)		Achievable Potential (kWh)		Achievable Cost Effective Potential (kWh)	
1	CFL Bulbs (Homes w/ no CFL bulbs installed) 759,662,708	1	CFL Bulbs (Homes w/ no CFL bulbs installed) 607,724,604	1	CFL Bulbs (Homes w/ no CFL bulbs installed) 607,724,604
2	Solar Water Heating 335,024,629	2	CFL Bulbs (Homes w/ partial CFL installation) 170,222,569	2	CFL Bulbs (Homes w/ partial CFL installation) 170,222,569
3	Second Refrigerator Turn In 266,102,213	3	Radiant Barriers (Electric Space & Cooling) 164,922,829	3	Radiant Barriers (Electric Space & Cooling) 164,922,829
4	New Construction (Electric) 231,517,205	4	Second Refrigerator Turn In 137,671,716	4	Second Refrigerator Turn In 137,671,716
5	CFL Bulbs (Homes w/ partial CFL installation) 216,461,297	5	Insulation & Weath. Pkg. (Electric Space & Cooling) 131,432,745	5	Insulation & Weath. Pkg. (Electric Space & Cooling) 131,432,745
6	Radiant Barriers (Electric Space & Cooling) 207,215,057	6	Low Flow Showerhead/Faucets 127,404,749	6	Low Flow Showerhead/Faucets 127,404,749
7	Insulation & Weath. Pkg. (Electric Space & Cooling) 204,126,442	7	HVAC Tune-Up 126,967,500	7	HVAC Tune-Up 126,967,500
8	Low Flow Showerhead/Faucets 163,807,900	8	Water Heater Blanket 126,393,600	8	Water Heater Blanket 126,393,600
9	HVAC Tune-Up 163,241,391	9	Heat Pump Water Heater 112,206,641	9	ES Windows (Electric Space & Cooling) 105,607,850
10	Water Heater Blanket 162,507,837	10	ES Windows (Electric Space & Cooling) 105,607,850	10	New Construction (Electric) 102,522,403
<b>Total</b> 2,709,666,679		<b>Total</b> 1,810,554,803		<b>Total</b> 1,800,870,565	



# Top Ten Single Family Measures

(based on 50% Market Penetration Scenario)

Technical Potential (kWh)		Achievable Potential (kWh)		Achievable Cost Effective Potential (kWh)	
1	CFL Bulbs (Homes w/ no CFL bulbs installed) 759,662,708	1	CFL Bulbs (Homes w/ no CFL bulbs installed) 379,838,226	1	CFL Bulbs (Homes w/ no CFL bulbs installed) 379,838,226
2	Solar Water Heating 335,024,629	2	Radiant Barriers (Electric Space & Cooling) 116,661,002	2	Radiant Barriers (Electric Space & Cooling) 116,661,002
3	Second Refrigerator Turn In 266,102,213	3	CFL Bulbs (Homes w/ partial CFL installation) 100,857,515	3	CFL Bulbs (Homes w/ partial CFL installation) 100,857,515
4	New Construction (Electric) 231,517,205	4	Second Refrigerator Turn In 84,723,002	4	Second Refrigerator Turn In 84,723,002
5	CFL Bulbs (Homes w/ partial CFL installation) 216,461,297	5	Solar Water Heating 79,924,644	5	Low Flow Showerhead/Faucets 72,805,219
6	Radiant Barriers (Electric Space & Cooling) 207,215,057	6	Low Flow Showerhead/Faucets 72,805,219	6	HVAC Tune-Up 72,553,500
7	Insulation & Weath Pkg (Electric Space & Cooling) 204,126,442	7	HVAC Tune-Up 72,553,500	7	Water Heater Blanket 72,227,400
8	Low Flow Showerhead/Faucets 163,807,900	8	Water Heater Blanket 72,227,400	8	New Construction (Electric) 63,974,543
9	HVAC Tune-Up 163,241,391	9	New Construction (Electric) 63,974,543	9	Prog. Thermostats (Electric Space & Cooling) 52,512,124
10	Water Heater Blanket 162,507,837	10	Prog. Thermostats (Electric Space & Cooling) 52,512,124	10	Standby Power 39,715,550
<b>Total</b> 2,709,666,679		<b>Total</b> 1,096,077,175		<b>Total</b> 1,055,868,080	

# Top Ten Single Family Measures

(based on 20% Market Penetration Scenario)

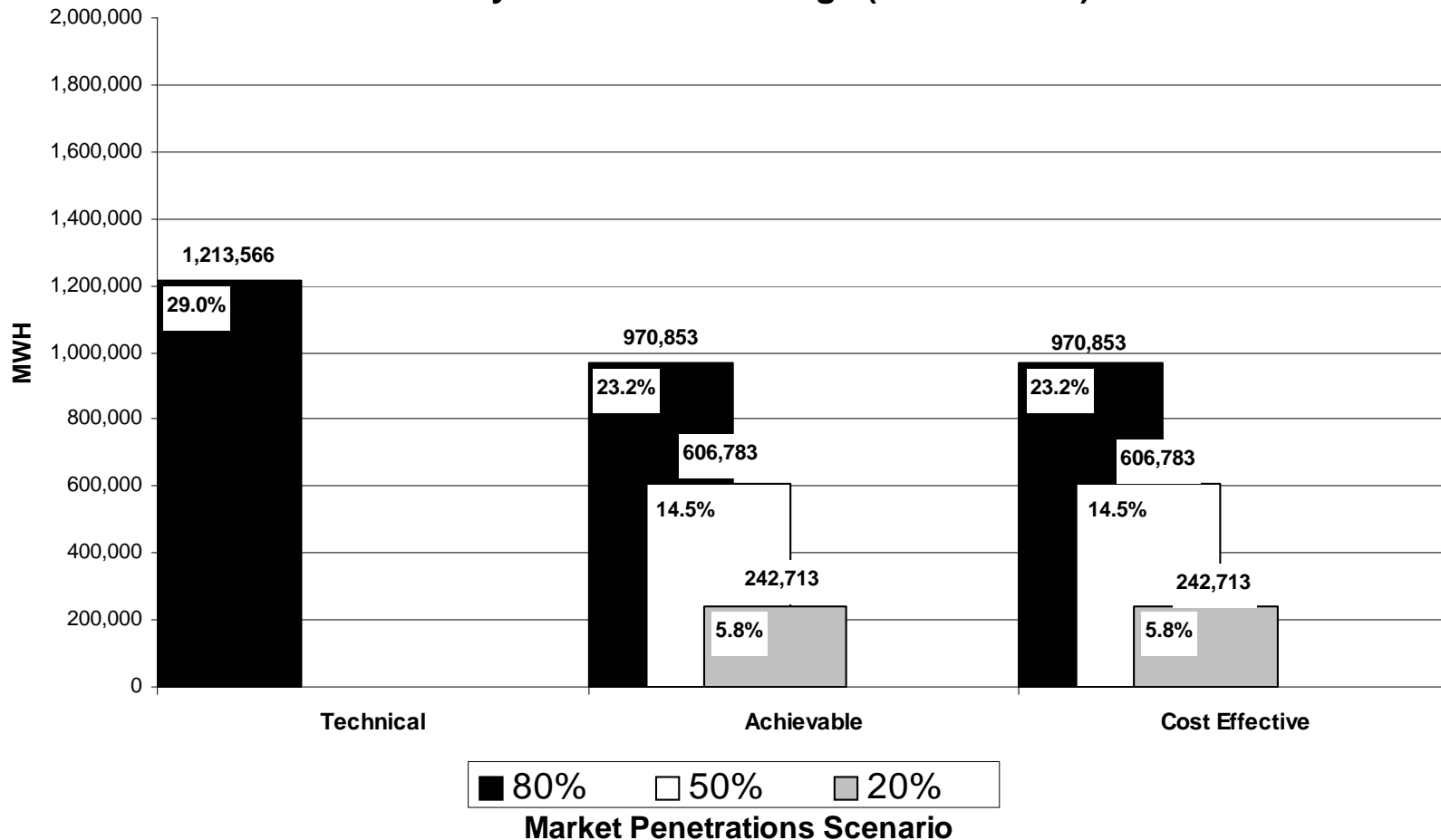
Technical Potential (kWh)		Achievable Potential (kWh)		Achievable Cost Effective Potential (kWh)	
1	CFL Bulbs (Homes w/ no CFL bulbs installed) 759,662,708	1	CFL Bulbs (Homes w/ no CFL bulbs installed) 151,935,290	1	CFL Bulbs (Homes w/ no CFL bulbs installed) 151,935,290
2	Solar Water Heating 335,024,629	2	Solar Water Heating 79,924,644	2	Radiant Barriers (Electric Space & Cooling) 49,153,687
3	Second Refrigerator Turn In 266,102,213	3	Radiant Barriers (Electric Space & Cooling) 49,153,687	3	Second Refrigerator Turn In 31,774,288
4	New Construction (Electric) 231,517,205	4	Second Refrigerator Turn In 48,883,520	4	CFL Bulbs (Homes w/ partial CFL installation) 31,492,460
5	CFL Bulbs (Homes w/ partial CFL installation) 216,461,297	5	CFL Bulbs (Homes w/ partial CFL installation) 31,492,460	5	New Construction (Electric) 25,424,255
6	Radiant Barriers (Electric Space & Cooling) 207,215,057	6	New Construction (Electric) 25,424,255	6	Programmable Thermostats (Electric Cooling Only) 21,119,491
7	Insulation & Weath Pkg (Electric Space & Cooling) 204,126,442	7	Programmable Thermostats (Electric Cooling Only) 21,119,491	7	Low Flow Showerhead/Faucets 18,202,182
8	Low Flow Showerhead/Faucets 163,807,900	8	Low Flow Showerhead/Faucets 18,202,182	8	HVAC Tune-Up 18,139,500
9	HVAC Tune-Up 163,241,391	9	HVAC Tune-Up 18,139,500	9	Water Heater Blanket 18,057,720
10	Water Heater Blanket 162,507,837	10	Water Heater Blanket 18,057,720	10	Radiant Barriers (Electric Cooling Only) 10,309,797
<b>Total</b> 2,709,666,679		<b>Total</b> 462,332,750		<b>Total</b> 375,608,671	



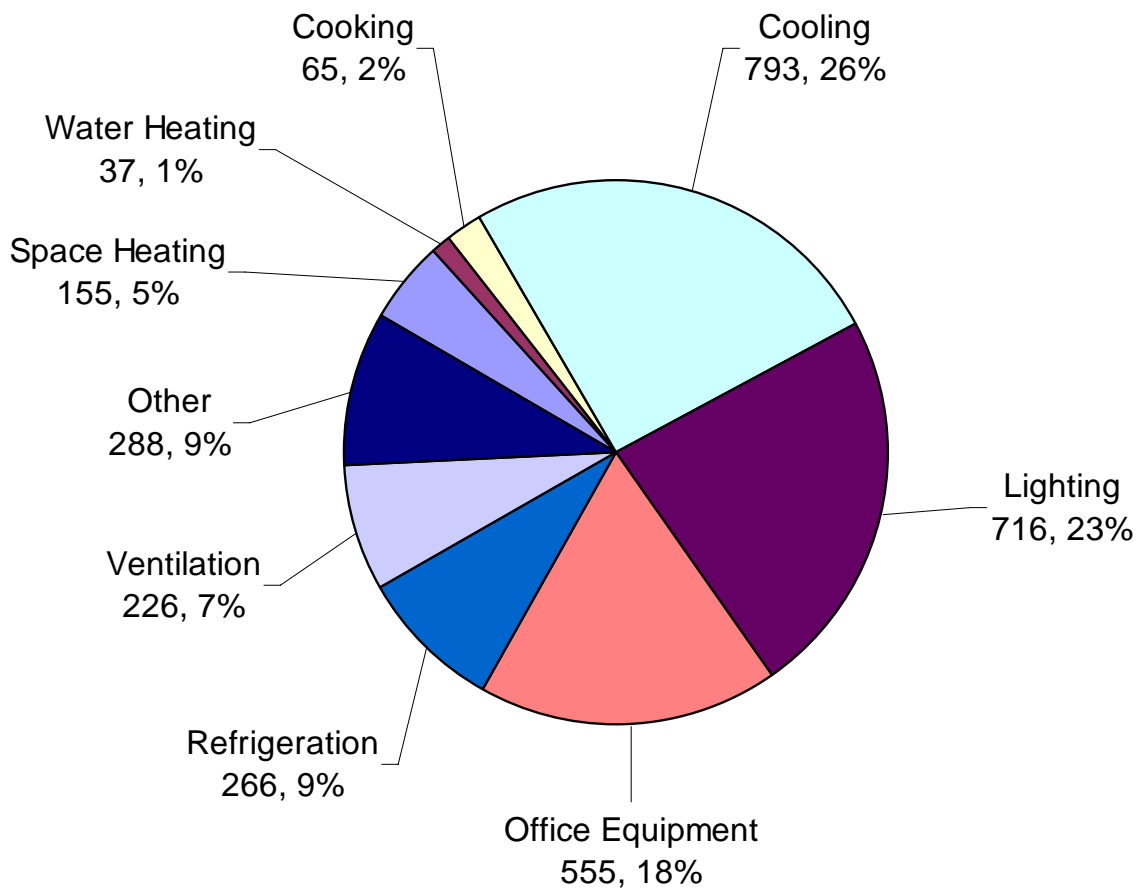
# Commercial Sector Findings

GDS Associates, Inc.  
Engineers and Consultants

## Summary of Potential Savings (Commercial)



## National End-Use Consumption for Electricity in Trillion Btu (CBECS 1999)



# Commercial Sector Buildings

## **Large Office**

Floor area: 90,000 square feet on average

Number of Floors: 6

Floor types: First floor, interior floors, top floor

Zones: Each floor has 4 perimeter zones and one core zone

## **Small Office**

Floor area: 6,600 square feet on average

Number of Floors: 1

Zones: Each floor has two zones

## **Large Retail Stores**

Floor area: 79,000 square feet on average

Number of Floors: 2

Floor types: First floor and top floor

Zones: Each floor has a single zone

## **Small Retail Store**

Floor area: 6,400 square feet on average

Number of Floors: 1

Zones: Single zone

## **School**

Floor area: 16,000 square feet on average

Number of Floors: 2 for classrooms

Floor types: First floor and top floor

Zones: Each floor has a multiplier for each class room.

# Commercial Sector Buildings Continued

## **Hospital**

Floor area: 155,800 square feet on average

Number of Floors: 12

Floor types: First floor, interior floors, and top floor

Zones: Each floor has patient rooms, core and public areas, kitchen, hallway, and clinic. The percentages of each zone compared to the total floor area are listed below:

Patient rooms – 15%

Core and public: 35%

Kitchen – 5%

Hallway – 20%

Clinic – 25%

## **Large Hotel**

Floor area: 25,000 square feet on average

Number of Floors: 10

Floor types: First floor, interior floor, and top floor

Zones: Each floor has hotel rooms. Kitchen and laundry and conference room are located in the first floor. The percentages of each zone compared to the total floor area are the following:

Hotel rooms – 70%

Lobby/conference rooms – 25%

Kitchen/Laundry – 5%

## **Sit-down restaurant**

Floor area: 5,250 square feet on average

Number of Floors: 1

Zones: Consists of dining area and kitchen. The percentages of each zone compared to the total floor area are the following:

Dining – 80%

Kitchen – 20%

# Energy Efficiency Measures Applied to Commercial Buildings

**Window Glazing  
Daylighting  
Energy Efficient Lights  
Insulation  
High Efficiency HVAC  
HVAC Controls**





# Estimated Savings by Building Type

	Small Office	Large Office	Hotel	Small Retail	Large Retail
Percent Savings	43.50%	31.12%	14.58%	34.21%	26.68%
Annual kWh Savings for CEPCI Service Territory	331,892,326	123,288,551	15,257,426	216,329,869	189,967,841
Number of Buildings in CEPCI Service Territory	64,651	6,532	209	19,033	1,108

	Restaurant	School	Hospital	Other
Percent Savings	21.35%	37.95%	24.05%	29.18%
Annual kWh Savings for CEPCI Service Territory	69,150,858	180,534,931	25,168,678	196,816,033
Number of Buildings in CEPCI Service Territory	5,056	618	161	N/A



# Industrial Sector Findings

GDS Associates, Inc.  
Engineers and Consultants

# Industrial Sector

- GDS contacted the South Carolina Manufacturing Extension Partnership
  - Non-profit organization that helps manufacturers address business and supply chain process problems
  - Also provides onsite consultations and energy audits for manufacturing facilities
  - Spoke with Charles Rampey, who has worked with some of the member distribution co-ops in Central's service area as well as Santee Cooper distribution.

# Industrial Sector Electric Energy Savings

- SCMEP has conducted over 75 energy audits of industrial sites in the past 5 years.
- They address all types of energy (electric, gas etc) and recommend measures for changing both process and productivity.
- On average, they estimate a 10-20% energy savings per facility
- GDS has used this information to estimate a 15% achievable potential savings for the Industrial Sector
- Achievable cost effective potential savings of 11% are based on an average of savings from 15 studies listed on page 20.

# Recommendations for Future Research (Residential)

- Conduct new Appliance Saturation Survey in 2008
- Conduct in-home survey for a random sample of at least 100 homes in order to get baseline levels of efficient lighting and high efficiency ENERGY STAR appliances
- Conduct end-use consumption/load shape research for residential heating, cooling and water heating
- Conduct a residential new construction baseline study

# Recommendations for Future Research (Commercial)

- Conduct commercial equipment saturation survey
- Collect data on numbers of commercial buildings by type
- Collect and report data on kWh sales by NAICS code
- Collect commercial end-use load shape and intensity data (kWh/sq ft by end-use)
- Collect data on percent of equipment that is already high efficiency

# Recommendations for Future Research (Industrial)

- Conduct in-depth interviews with industrial customers to assess remaining opportunities for energy efficiency measures

