201-3NP

MISSOURI PUBLIC SERVICE COMMISSION

STAFF REPORT

COST OF SERVICE

APPENDIX 3

Alphabetical Listing of Testimony Schedules

UNION ELECTRIC COMPANY

D/B/A Ameren Missouri

FILE NO. ER-2011-0028

Jefferson City, Missouri
February2011

Staff Exhibit No. 201-3 NP
Date 4/26/11 Reporter LMB
File No. ER-2011-0028

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SCHEDULE HEW - 1

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SCHEDULE JAR-1

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AmerenUE Demand-Side Resources Performance Summary Report

Date of Report: December 31, 2010

Year 1: Feb. 11, 2009 to Sept. 30, 2009 (BUSINESS) and Apr. 24, 2009 to Sept. 30, 2009 (RES DENTIAL) Year 2: Oct. 1, 2009 to Sept. 30, 2010
Year 3: Oct. 1, 2010 to Sept. 30, 2011

Implementation	Date	Program		Cumulative MWh Year 1	Cumulative MWh Year 2	Cumulative MWh Year 3	Cumulative MW Year 1	Cumulative MW Year 2	Cumulative MW Year 3	Cumulative Program Costs ($000) Year 1	Cumulative Program Costs ($000) Year 2	Cumulative Program Costs ($000) Year 3	Cost Effectiveness TRC	Cost Effectiveness UCT
IRP	3/2/09	ENERGY STAR Homes Program	IRP	0	0	154	0.0	0.0	0.1	$ -	$ 129	$ 304	1.00	1.18
Expected			Actual	0	0	0	0.0	0.0	0.0	$ -	$ -	$ -		
Actual			Variance	0	0	(154)	0	0	(0)	$ -	$ (129)	$ (304)	(1.00)	(1.18)
IRP	10/31/08	Home Energy Performance	IRP	3,480	8,195	14,463	0.5	1.2	2.0	$ 762	$ 1,820	$ 3,262	2.39	3.19
Expected			Actual	0	0	0	0.0	0.0	0.0	$ 371	$ 371	$ 371		
Actual			Variance	(3,480)	(8,195)	(14,463)	(1)	(1)	(2)	$ (391)	$ (1,449)	$ (2,891)	(2.39)	(3.19)
IRP	3/2/09	Res. DR-CPP w/ Smart Thermostat	IRP	0	0	159	0.0	0.0	1.8	$ -	$ -	$ 506	1.37	1.30
Expected			Actual	0	0	0	0.0	0.0	0.0	$ 300	$ 300	$ 300		
Actual			Variance	0	0	(159)	0	0	(2)	$ 300	$ 300	$ (206)	(1.37)	(1.30)
IRP	10/31/08	Res. DR - Direct Load Control	IRP	495	1,013	1,554	5.5	11.3	17.3	$ 1,144	$ 2,458	$ 3,955	1.93	1.78
Expected			Actual	0	0	0	0.0	0.0	0.0	$ -	$ -	$ -		
Actual			Variance	(495)	(1,013)	(1,554)	(6)	(11)	(17)	$ (1,144)	$ (2,458)	$ (3,955)	(1.93)	(1.78)
IRP	1/1/09	HVAC CheckMe!	IRP	0	7,368	17,086	0.0	1.5	3.5	$ 520	$ 3,275	$ 7,273	1.55	1.92
Expected	7/28/10		Actual	0	1,036	4,956	0.0	0.3	1.4	$ 622	$ 900	$ 1,754		
Actual			Variance	0	(6,332)	(12,130)	0	(1)	(2)	$ 102	$ (2,375)	$ (5,519)	(1.55)	(1.92)
IRP	11/28/08	Res Lighting & Appliance (includes Social Marketing Distribution)	IRP	28,749	65,928	112,670	2.4	5.6	9.6	$ 3,075	$ 7,151	$ 12,403	2.29	3.99
Expected	5/22/09		Actual	3,838	69,946	86,978	0.3	6.5	8.0	$ 2,424	$ 7,044	$ 8,637		
Actual			Variance	(24,911)	4,018	(25,692)	(2)	1	(2)	$ (651)	$ (107)	$ (3,766)	(2.29)	(3.99)
IRP	9/1/08	Res. Low Income	IRP	4,581	9,162	13,742	0.3	0.5	0.8	$ 2,954	$ 5,982	$ 9,085	0.88	1.00
Expected	7/30/09		Actual	0	5,201	7,963	0.0	0.6	0.9	$ 1,169	$ 3,810	$ 5,020		
Actual			Variance	(4,581)	(3,961)	(5,779)	(0)	0	0	$ (1,785)	$ (2,172)	$ (4,066)	(0.88)	(1.00)
IRP	11/28/08	Res. Multi-Family	IRP	10,012	24,136	34,026	1.8	4.3	6.2	$ 656	$ 1,685	$ 3,047	2.63	3.26
Expected	6/6/09		Actual	0	29	29	0.0	0.0	0.0	$ 860	$ 1,240	$ 1,240		
Actual			Variance	(10,012)	(24,107)	(33,997)	(2)	(4)	(6)	$ 204	$ (445)	$ (1,806)	(2.63)	(3.26)
IRP	N/A	Appliance Recycling	IRP	0	0	0	0.0	0.0	0.0	$ -	$ -	$ -	1.71	2.13
Expected	7/28/10		Actual	0	908	5,249	0.0	0.1	0.8	$ -	$ 58	$ 440		
Actual			Variance	0	908	5,249	0	0	1	$ -	$ 58	$ 440	(1.71)	(2.13)
		Total Residential Portfolio	IRP	**47,317**	**115,802**	**193,854**	**10.6**	**24.4**	**41.3**	**$ 9,111**	**$ 22,600**	**$ 39,834**		
			Actual	**3,838**	**77,120**	**105,175**	**0.3**	**7.6**	**11.1**	**$ 5,745**	**$ 13,723**	**$ 17,762**		
			Variance	(43,479)	(38,682)	(88,679)	(10)	(17)	(30)	$ (3,365)	$ (8,777)	$ (22,072)		

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AmerenUE Demand-Side Resources Performance Summary Report

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Year 3: Oct. 1, 2010 to Sept. 30, 2011

Implementation Date	Program		Cumulative MWh			Cumulative MW			Cumulative Program Costs ($000)			Cost Effectiveness	
			Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	TRC	UCT
IRP 9/1/08	C&I Custom	IRP	27,099	54,198	81,297	3.5	7.0	10.6	$ 4,203	$ 8,510	$ 12,925	2.23	2.94
Expected 2/11/09		Actual	5,018	57,365	74,942	1.0	8.8	11.3	$ 1,882	$ 8,159	$ 9,569		
Actual		Variance	(22,081)	3,167	(6,355)	(2.5)	1.8	0.7	$ (2,321)	$ (351)	$ (3,356)	(2.23)	(2.94)
IRP 11/28/09	C&I Prescriptive	IRP	32,470	68,985	109,738	4.8	10.5	16.6	$ 4,871	$ 11,327	$ 19,647	1.89	2.44
Expected		Actual	10,466	23,359	30,212	1.9	4.0	5.2	$ 1,524	$ 3,007	$ 3,685		
Actual		Variance	(22,004)	(45,626)	(79,526)	(2.9)	(6.5)	(11.4)	$ (3,346)	$ (8,320)	$ (15,962)	(1.89)	(2.44)
IRP 9/1/08	C&I Retro-Commissioning	IRP	11,573	24,007	37,357	1.4	2.8	4.4	$ 562	$ 1,182	$ 1,863	3.17	6.78
Expected 7/25/09		Actual	0	1,558	3,581	0.0	0.2	0.5	$ 74	$ 314	$ 632		
Actual		Variance	(11,573)	(22,449)	(33,776)	(1.4)	(2.6)	(3.9)	$ (489)	$ (868)	$ (1,231)	(3.17)	(6.78)
IRP 9/1/08	Commercial Demand Credit	IRP	760	760	760	38.0	38.0	38.0	$ 410	$ 830	$ 1,261	1.56	1.08
Expected 7/1/09		Actual	156	156	156	7.5	7.5	7.5	$ 40	$ 40	$ 40		
Actual		Variance	(604)	(604)	(604)	(30.5)	(30.5)	(30.5)	$ (370)	$ (790)	$ (1,221)	(1.56)	(1.08)
IRP 3/2/09	Commercial DR - CPP w/ Smart Therm.	IRP	0	0	178	0.0	0.0	2.0	$ -	$ -	$ 488	1.60	1.51
Expected		Actual	0	0	0	0.0	0.0	0.0	$ -	$ -	$ -		
Actual		Variance	0	0	(178)	0.0	0.0	(2.0)	$ -	$ -	$ (488)	(1.60)	(1.51)
IRP 2/2/09	Commercial New Construction	IRP	817	1,634	2,451	0.3	0.5	0.8	$ 666	$ 1,348	$ 2,047	1.14	1.35
Expected 5/3/09		Actual	0	4,809	7,179	0.0	0.7	1.4	$ 95	$ 841	$ 1,274		
Actual		Variance	(817)	3,175	4,728	(0.3)	0.2	0.6	$ (571)	$ (507)	$ (773)	(1.14)	(1.35)
IRP 7/18/08	Industrial Interruptible Tariff	IRP	3,800	3,800	3,800	47.5	47.5	47.5	$ 1,999	$ 4,047	$ 6,147	1.59	0.36
Expected		Actual	0	0	0	0.0	0.0	0.0	$ -	$ -	$ -		
Actual		Variance	(3,800)	(3,800)	(3,800)	(47.5)	(47.5)	(47.5)	$ (1,999)	$ (4,047)	$ (6,147)	(1.59)	(0.36)
	Total C&I Portfolio	IRP	76,519	153,384	235,581	96	106	120	$ 12,710	$ 27,246	$ 44,379		
		Actual	15,640	87,247	116,070	10	21	26	$ 3,616	$ 12,361	$ 15,200		
		Variance	(60,879)	(66,137)	(119,511)	(85)	(85)	(94)	$ (9,096)	$ (14,884)	$ (29,179)		

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Year 3: Oct. 1, 2010 to Sept. 30, 2011

Implementation Date		Cumulative MWh			Cumulative MW			Cumulative Program Costs ($000)			Cost Effectiveness	
		Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	TRC	UCT
Education Program	IRP							$ 500	$ 1,200	$ 2,100		
	Actual											
	Variance							$ (500)	$ (1,200)	$ (2,100)		
Information Program	IRP							$ 500	$ 1,200	$ 2,100		
	Actual							$ 484	$ 1,230	$ 1,232		
	Variance							$ (16)	$ 30	$ (868)		
Total Education and Information Programs	IRP							$ 1,000	$ 2,400	$ 4,200		
	Actual							$ 484	$ 1,230	$ 1,252		
	Variance							$ (516)	$ (1,170)	$ (2,948)		
Total Portfolio (Without Indirect Costs)	IRP	123,836	269,186	429,436	106	131	161	$ 22,821	$ 52,144	$ 88,414	1.71	2.04
	Actual	19,478	164,367	221,246	11	29	37	$ 9,844	$ 27,314	$ 34,214		
	Variance	(104,358)	(104,819)	(208,190)	(95)	(102)	(124)	$ (12,977)	$ (24,831)	$ (54,200)		
Portfolio Administration - Contractor	IRP							$ -	$ -	$ -		
	Actual							$ -	$ -	$ -		
	Variance							$ -	$ -	$ -		
Portfolio Administration - AmerenUE	IRP							$ 1,100	$ 2,500	$ 4,200		
	Actual							$ 736	$ 1,717	$ 1,799.16		
	Variance							$ (364)	$ (783)	$ (2,401)		
EM&V - Contractor	IRP							$ 1,100	$ 2,500	$ 4,200		
	Actual							$ 304	$ 1,351	$ 1,748		
	Variance							$ (796)	$ (1,149)	$ (2,452)		
Total Portfolio Indirect Costs	IRP							$ 2,200	$ 5,000	$ 8,400		
	Actual							$ 1,040	$ 3,068	$ 3,647		
	Variance							$ (1,160)	$ (1,932)	$ (4,853)		
Total AmerenUE DSM Portfolio	IRP	123,836	269,186	429,436	106	131	161	$ 25,021	$ 57,144	$ 96,814	1.71	2.04
	Actual	19,478	164,367	221,245	11	29	37	$ 10,884	$ 30,382	$ 37,761		
	Variance	(104,358)	(104,819)	(208,190)	(95)	(102)	(124)	$ (14,137)	$ (26,763)	$ (59,053)		

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AmerenUE Demand Side Management (DSM) Market Potential Study Volume 1: Executive Summary

Global Report Number 1287-1

January 2010

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An Employee-Owned Company

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AmerenUE Demand Side Management (DSM) Market Potential Study Volume 1: Executive Summary, Global Energy Partners, LLC. Walnut Creek, CA. 2010. 1287-1.

EXECUTIVE SUMMARY

AmerenUE engaged a team led by Global Energy Partners, LLC (Global) to perform a Demand Side Management (DSM) Market Potential Study to assess the various categories of electrical energy efficiency and demand response potential in the residential, commercial, and industrial sectors for the AmerenUE service area from 2009 to 2030. The study used updated forecasts of baseline energy use estimates based on the latest information on federal, state, and local codes and standards for improving energy efficiency.

AmerenUE will use the results of this study in its integrated resource planning process to analyze various levels of energy savings and peak demand reductions attributable to both energy efficiency and demand response initiatives at various levels of implementation cost.

This executive summary presents high-level results from this study as well as a preview of selected results from the four-volume report.

Background

The Missouri Rules of the Department of Economic Development (4 CSR 240-22) require that electric utilities in Missouri prepare an Integrated Resource Plan (IRP) that "[c]onsider[s] and analyze[s] demand-side efficiency and energy management measures on an equivalent basis with supply-side alternatives in the resource planning process." (4 CSR 240-22.010(2)(A)) Section 4 CSR 240-22.050 prescribes the elements of the demand-side analysis, including reporting requirements. A copy of the Missouri rules governing electric utility resource planning is available on the Missouri Secretary of State's website[1].

In 2009, AmerenUE launched a portfolio of such DSM programs on a substantially larger scale than any related efforts the company has initiated in the past. These programs were analyzed and developed in 2008 drawing upon best available secondary data sources. This DSM Market Potential Study updates the previous analysis using primary market data and more detailed and comprehensive analyses.

The key objectives for this study were to:

- Assess and understand technical, economic, achievable and naturally occurring potential for all customer segments in the AmerenUE service area from 2009 to 2030.
- Analyze savings at various levels of cost.
- Conduct primary market research to collect electricity end-use data, customer demographics and psychographics.
- Understand how customers in the AmerenUE service territory make decisions related to their electricity use and energy efficiency investment decisions.
- Develop several scenarios for assessing DSM potential.
- Clearly communicate the DSM Potential in an objective way that is useful for AmerenUE senior management, AmerenUE stakeholders and AmerenUE DSM and IRP staff.

[1] Rules of Department of Economic Development Division 240—Public Service Commission Chapter 22—Electric Utility Resource Planning (4 CSR 240-22.010) – http://sos.mo.gov/adrules/csr/current/4csr/4c240-22.pdf

OVERALL CONCLUSIONS

This study has enlightened AmerenUE about its customer base and the potential for energy savings and peak demand reductions that are possible through energy-efficiency (EE) and demand response (DR) programs. The key highlights are as follow:

- There is more opportunity for program savings than was estimated using secondary data. Achievable potential is higher than what was concluded in the AmerenUE 2008 IRP.
- Concurrent with higher opportunities, budgets to harvest those opportunities reach an annual spend range of $100 million to $200 million by 2015. This range corresponds to 4% and 8% of AmerenUE revenues, a spending level which exceeds nearly all electric utilities in the nation.
- A comprehensive view of measures yielded higher economic potential. The study considered hundreds of measures and there are considerable savings to be had.
- AmerenUE customers are different. They express less interest in DSM investments and they do not all consider AmerenUE to be their "trusted energy advisor" at this time.

DEFINITIONS

Before launching into the discussion of results, a few key terms are defined:

- **Technical potential** is a theoretical construct that assumes all feasible measures are adopted by customers, regardless of cost or customer preferences.
- **Economic potential** is also a theoretical construct that assumes all ***cost-effective*** measures are adopted by customers, regardless of customer preferences.
- **Maximum achievable potential (MAP)** takes into account expected program participation, based on customer preferences resulting from ideal implementation conditions. MAP establishes a maximum target for the EE and DR savings that a utility can hope to achieve through its EE and DR programs and involves incentives that represent a substantial portion of the incremental cost combined with high administrative and marketing costs. It is commonly-accepted in the industry that MAP is considered the hypothetical upper-boundary of achievable savings potential simply because it presumes conditions that are ideal and not typically observed in real-world experience.
- **Realistic achievable potential (RAP)** represents what is considered to be realistic estimates of EE and DR potential based on realistic parameters associated with DR and EE program implementation (i.e., limited budgets, customer acceptance barriers, etc.). RAP is of most interest for this study since it represents the mid-point of achievable potential and corresponds to best practices that are attainable since the estimates are tied to known program experience from around the country.
- **Business as usual (BAU)** represents the existing AmerenUE DSM plan from the 2008 IRP and the associated impacts and costs projected into the future. For this analysis, impacts without alteration were included in the savings and cost-effectiveness assessments to represent a benchmark of what is anticipated under current practices.[2]
- **Baseline forecast** is a reference end-use forecast developed specifically for this study. This estimates what would happen in the absence of any DSM programs, and includes naturally occurring energy efficiency and any codes and standards that were in place as of June 30, 2009. It is the metric against which savings are measured.

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[2] Note that it was necessary in this assessment to project savings and costs for the BAU for three additional years (2028-2030) since the IRP assessment only went as far as 2027. Savings for those three years were extended without additional growth. Costs for those three years were extended reflecting growth only due to inflation.

KEY FINDINGS

The key findings from this study encompass the potential savings from EE and DR programs, supply curves for EE and DR programs, and scenario analyses for EE and DR programs. Each set of results is summarized below. Details are presented in Volumes 3 and 4.

Energy Efficiency Potential

Realistic achievable potential in 2030 is 3,165 GWh, which represents 7.3% of total forecasted baseline usage for that year. This represents 25% of technical potential and 44% of economic potential.

- MAP in 2030 is 4,758 GWh, about 11% of the total forecasted sales in 2030. This represents more than a third of technical potential and nearly two-thirds of economic potential.
- BAU in 2030 is 2,740 GWh, 6.3% of total forecasted usage in 2030.

Table 1 and Figure 1 present estimates for all five types of potential for selected years.

Figure 2 presents forecasts of electricity use for each of the five types of potential, as well as the baseline forecast and recent historical sales. By 2030:

- Electricity use in the baseline forecast has increased by 4,432 GWh, an increase of 11.2%.
- RAP offsets growth in the baseline forecast by almost three-fourths.
- MAP more than offsets growth in the baseline forecast.
- Economic potential brings usage down to the level it was in 2005.

Table 1 Summary of Energy Efficiency Potential

	2009	2015	2020	2025	2030
Baseline Electricity Forecast (GWh)	38,839	39,057	40,248	41,899	43,181
Energy Savings (GWh)					
Technical Potential	3,434	9,115	11,098	12,296	12,696
Economic Potential	1,895	4,392	5,475	6,657	7,181
Maximum Achievable Potential	13	1,950	3,943	4,655	4,758
Realistic Achievable Potential	12	1,316	2,627	3,098	3,165
Business as Usual	264	1,399	2,184	2,596	2,740
Energy Savings as % of Baseline					
Technical Potential	8.8%	23.3%	27.6%	29.3%	29.4%
Economic Potential	4.9%	11.2%	13.6%	15.9%	16.6%
Maximum Achievable Potential	0.0%	5.0%	9.8%	11.1%	11.0%
Realistic Achievable Potential	0.0%	3.4%	6.5%	7.4%	7.3%
Business as Usual	0.7%	3.6%	5.4%	6.2%	6.3%

Figure 1 *Summary of Energy Efficiency Potential (Savings as % of Baseline)*

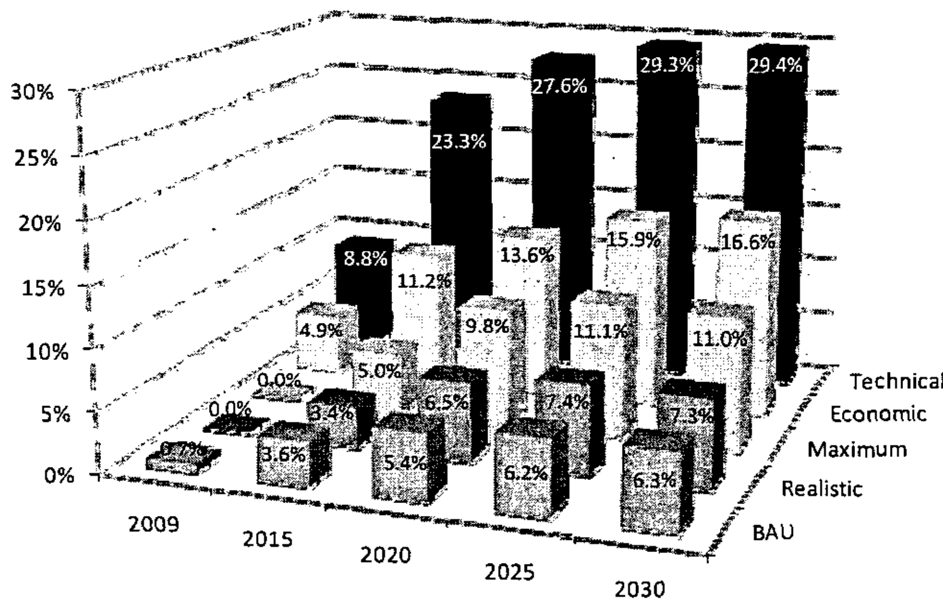
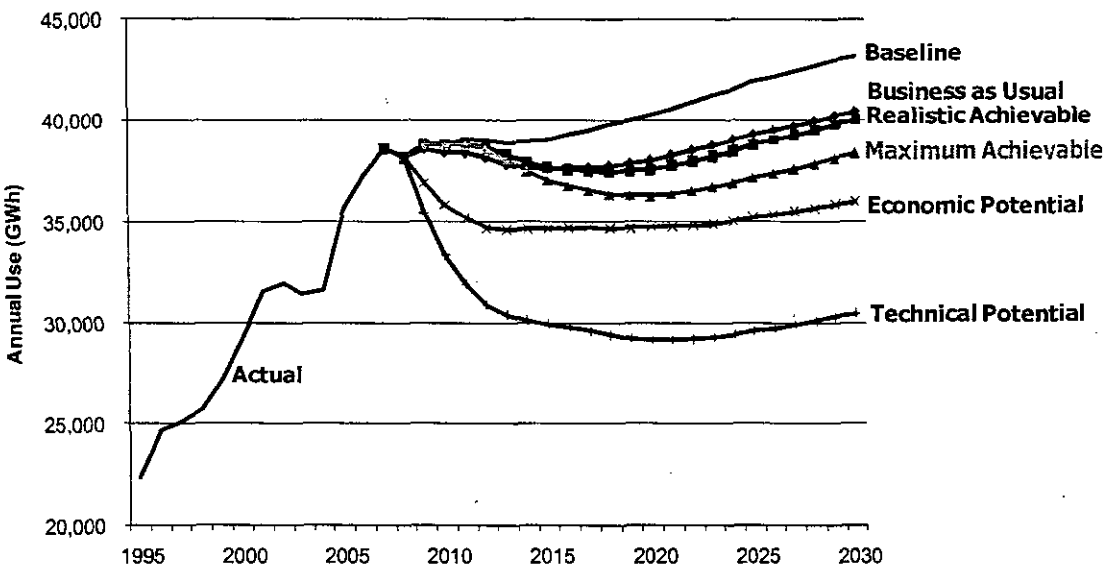


Figure 2 *Forecast Summary of Energy Efficiency Potential*



In addition to energy savings (GWh), energy efficiency programs also create savings in coincident peak demand (MW). Table 3 presents peak demand savings from EE programs for all five types of potential. The savings are substantial because many of the EE savings result from measures related to air conditioning across all sectors, C&I lighting and motors, all of which have high usage during peak periods. These EE peak demand savings are combined with DR peak demand savings in the following discussion.

Table 2 ***Summary of Peak Demand Savings from Energy Efficiency Programs***

	2009	2015	2020	2025	2030
Baseline Peak Demand Forecast (MW)	**7,642**	**8,003**	**8,356**	**8,752**	**9,127**
Peak Demand Savings (MW)					
Technical Potential	837	2,342	2,932	3,377	3,511
Economic Potential	454	1,166	1,444	1,715	1,846
Maximum Achievable Potential	4	563	1,072	1,269	1,253
Realistic Achievable Potential	4	381	716	846	834
Business as Usual	34	173	271	331	352
Peak Demand Savings as % of Baseline					
Technical Potential	11.0%	29.3%	35.1%	38.6%	38.5%
Economic Potential	5.9%	14.6%	17.3%	19.6%	20.2%
Maximum Achievable Potential	0.1%	7.0%	12.8%	14.5%	13.7%
Realistic Achievable Potential	0.0%	4.8%	8.6%	9.7%	9.1%
Business as Usual	0.4%	2.2%	3.2%	3.8%	3.9%

Demand Response Potential

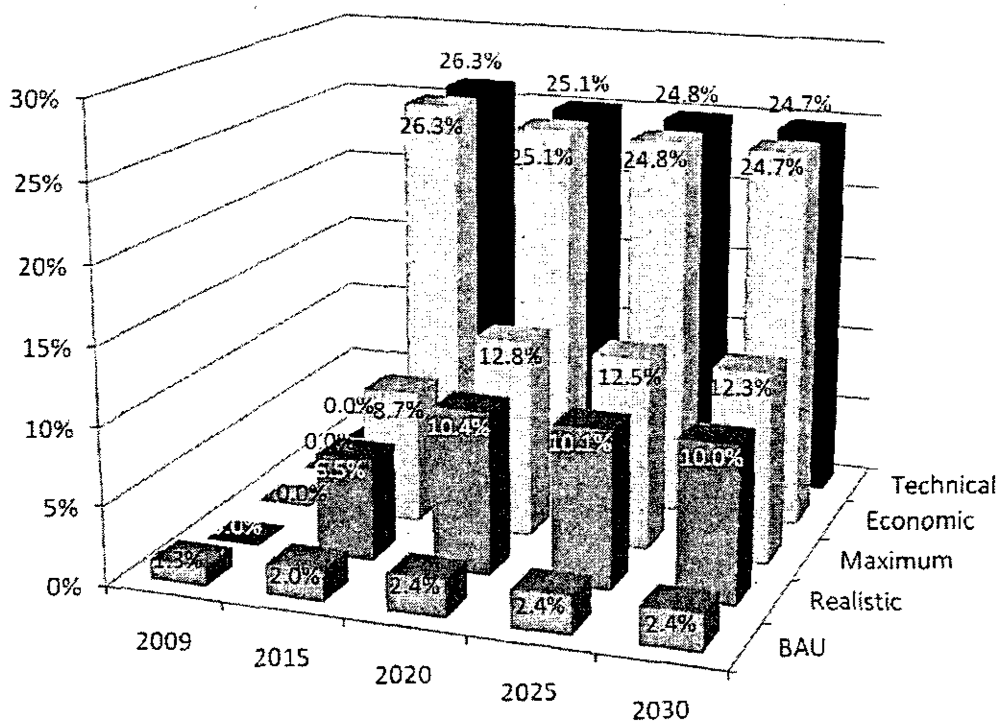
By 2030, achievable savings from demand-response programs are in the range of 914 to 1,126 MW. This represents between 10 and 12% of peak demand in 2030.

Table 3 displays the different levels of potential both as MW/year and as a percentage of baseline forecast. Figure 3 presents the savings as a percentage of coincident peak demand in selected years.

Table 3 ***Summary of Demand Response Potential***

	2009	2015	2020	2025	2030
Baseline Peak Demand Forecast (MW)	**7,642**	**8,003**	**8,356**	**8,752**	**9,127**
Peak Demand Savings (MW)					
Technical Potential	2	2,102	2,098	2,173	2,254
Economic Potential	2	2,102	2,098	2,173	2,254
Maximum Achievable Potential	2	694	1,072	1,090	1,126
Realistic Achievable Potential	2	520	870	885	914
Business as Usual	97	160	199	213	219
Peak Savings as % of Baseline					
Technical Potential	0.0%	26.3%	25.1%	24.8%	24.7%
Economic Potential	0.0%	26.3%	25.1%	24.8%	24.7%
Maximum Achievable Potential	0.0%	8.7%	12.8%	12.5%	12.3%
Realistic Achievable Potential	0.0%	6.5%	10.4%	10.1%	10.0%
Business as Usual	1.3%	2.0%	2.4%	2.4%	2.4%

Figure 3 ***Summary of Demand Response Potential (Savings as % of Baseline)***



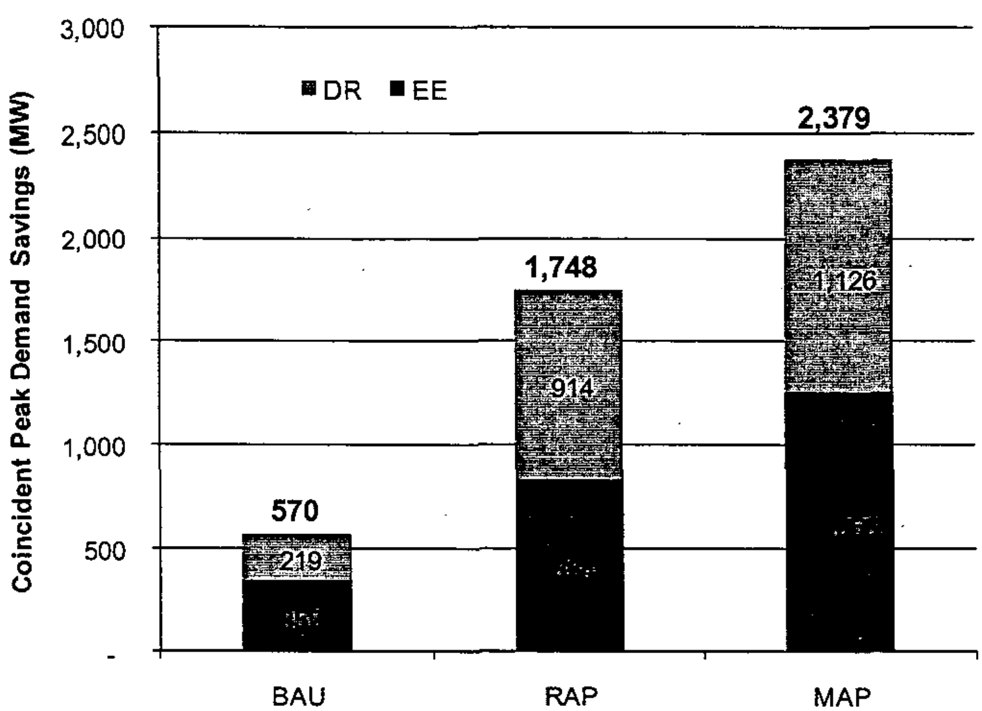
Combined Peak Demand Savings

In addition to peak-demand savings from demand response programs, the energy efficiency programs also yield savings. Throughout the forecast period, peak demand savings from EE programs for RAP and MAP are about the same as the savings from DR programs. However, in contrast to DR programs, the peak-demand savings from EE programs are permanent and non-dispatchable. Together, these savings are substantial and could potentially eliminate the need for new capacity over the next 20 years. Table 4 and Figure 4 present these results.

Table 4 Summary of Peak Demand Savings from EE and DR

	2009	2015	2020	2025	2030
Baseline Peak Demand Forecast (MW)	**7,642**	**8,003**	**8,356**	**8,752**	**9,127**
EE Peak Demand Savings (MW)					
Maximum Achievable Potential	4	563	1,072	1,269	1,253
Realistic Achievable Potential	4	381	716	846	834
Business as Usual	34	173	271	331	352
DR Peak Demand Savings (MW)					
Maximum Achievable Potential	2	694	1,072	1,090	1,126
Realistic Achievable Potential	2	520	870	885	914
Business as Usual	97	160	199	213	219
Total Peak Demand Savings (MW)					
Maximum Achievable Potential	5	1,257	2,144	2,359	2,379
Realistic Achievable Potential	5	901	1,586	1,731	1,748
Business as Usual	131	333	470	544	570
Peak Savings as % of Baseline					
Maximum Achievable Potential	0.1%	15.7%	25.7%	27.0%	26.1%
Realistic Achievable Potential	0.1%	11.3%	19.0%	19.8%	19.2%
Business as Usual	1.7%	4.2%	5.6%	6.2%	6.2%

Figure 4 Combined Peak Demand Savings from DR and EE Programs in 2030



Cost-Effectiveness Analysis

The EE and DR programs were assessed for cost-effectiveness drawing upon the California Standard Practice protocol for DSM economic assessment. For the purposes of this study, four economic test perspectives from the protocol were applied. Each is briefly defined below:

- **The Total Resource Cost (TRC)** test measures benefits and costs from the perspective of the utility and society as a whole.
- **The Utility Cost (UC)** test measures the costs and benefits from the perspective of the utility administering the program.
- **The Ratepayer Impact Measure (RIM)** test measures the difference between the change in total revenues paid to a utility and the change in total costs to a utility resulting from the EE and DR programs.
- The **Participant (Part)** test measures the benefits and costs from the perspective of program participants as a whole.

The cost-effectiveness analysis was performed at an aggregate level, representing the potential effects of each individual EE and DR program in the portfolio.

A spreadsheet model was used as the primary tool for conducting AmerenUE's cost-effectiveness assessment.[3] Table 5 presents the results of the cost-effectiveness analysis.

Table 5 TRC Cost-Effectiveness Results

Program	Total Resource Cost (TRC)			
	Lifetime Benefits (Million$)	Lifetime Costs (Million $)	Net Benefits (Million $)	B/C Ratio
Energy Efficiency Programs				
Maximum Achievable Potential (MAP)	$4,599	$2,921	$1,678	1.57
Realistic Achievable Potential (RAP)	$3,072	$1,856	$1,217	1.66
Business as Usual (BAU)				1.95
Demand Response Programs				
Maximum Achievable Potential (MAP)	$1,124	$514	$610	2.19
Realistic Achievable Potential (RAP)	$898	$406	$492	2.21
Business as Usual (BAU)				1.68

Important insights can also be drawn by looking at the levelized cost of achieving the projected savings. Table 6 presents the estimated levelized costs for the various EE and DR program portfolios.

[3] Global uses its own in-house cost-effectiveness assessment tool.

Table 6 *Levelized Cost (Utility Cost perspective)*

Type of Potential	Levelized Cost	
	Energy Efficiency Programs ($/kWh)	Demand Response Programs ($/kW-yr)
Maximum Achievable Potential (MAP)	$0.024	$37.45
Realistic Achievable Potential (RAP)	$0.017	$39.69
Business as Usual (BAU)	$0.021	$27.50

As the table indicates, by all measures the EE program portfolio is cost-effective from a levelized cost perspective. Industry average levelized cost tends to range from $0.03 to $0.05 per kWh saved. With the BAU portfolio, the levelized cost is well under that average. Looking at either the MAP or RAP, it is fair to conclude that the portfolio levelized costs are well within industry expectations. For the DR programs, the portfolio is cost-effective from a levelized cost perspective since the levelized cost of new capacity is typically well over $75/kW-year.[4] With any of the three portfolios, the levelized cost is well under half of that average.

Supply Curves

Two key results from this study are two sets of supply curves – one for energy-efficiency programs and the other for demand response programs – that represent MAP, RAP, and BAU.

Figure 5 shows the reference supply curve for energy-efficiency programs for 2030. Key observations include:

- Overall, the 20-year analysis shows a majority of the EE program savings fall under $0.04/kWh. For the BAU portfolio, a total savings of over 5% falls under a very attractive cost-effective cut-off of $0.03/kWh.
- For the RAP portfolio, close to 7% total savings falls under a $0.03/kWh levelized cost.
- The MAP portfolio becomes very costly when reaching beyond the 10% savings level, as the levelized cost to add additional savings beyond a cumulative savings of 10% reaches well over $0.05/kWh.
- Another interesting observation is that RAP holds steady at a levelized cost under $0.02/kWh, going from a cumulative savings of just over 2% to over 5%. Program costs do not appear to substantially increase under RAP until the portfolio reaches over 7% savings.
- While most of the programs are considered cost-effective, there are some higher cost programs which include: HVAC, Lighting and Appliance, and Residential New Construction. Residential New Construction costs are significantly higher than the second most expensive program.
- When comparing the three different curves (BAU, RAP and MAP), it is worth noting that there is a clustering of programs that cost roughly the same (on a levelized $/kWh basis), yet these programs bring about substantial increases in the energy savings potential. For MAP, bringing on the last two most expensive programs brings about measureable increases in savings potential. Thus the slope of the supply curve does not turn in a vertical direction, as is clearly demonstrated in the BAU and to some extent in the RAP cases. This suggests that while MAP is the most expensive portfolio, a bump-up in the expenditures even for the high cost programs yields significantly greater returns in terms of energy savings.

[4] This was the figure used as a proxy avoided capacity cost for the FERC National DR Potential study.

Figure 5 ***Energy Efficiency Program Supply Curve – Potential by 2030***

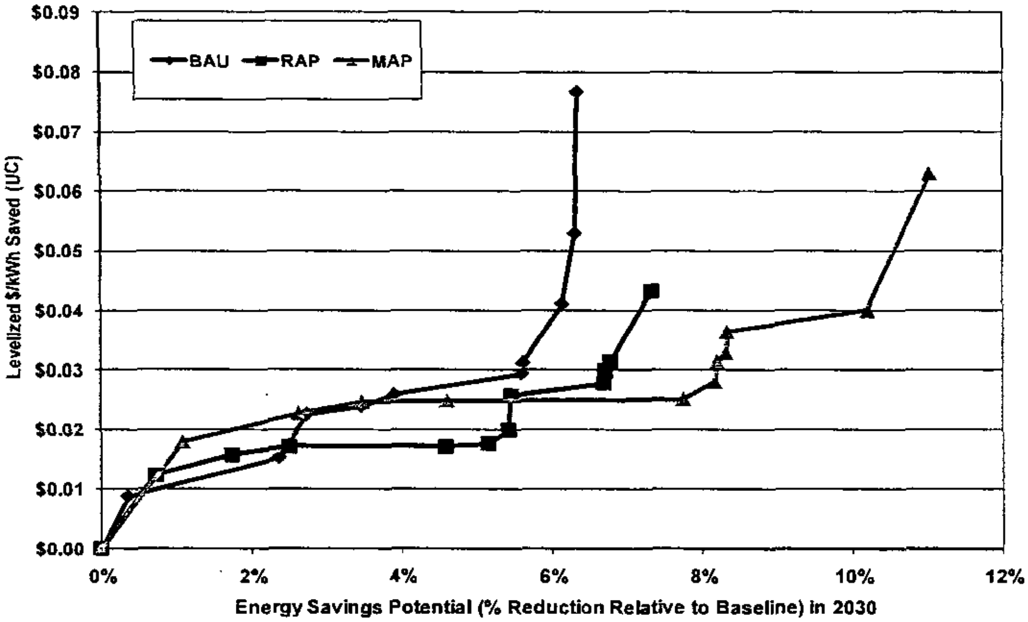
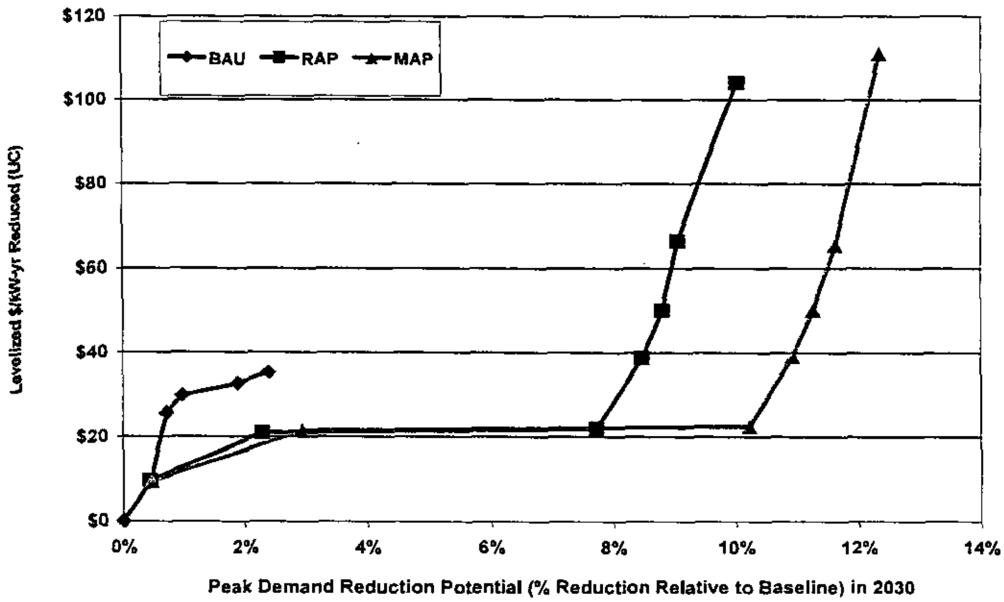


Figure 6 shows the reference supply curve for demand-response programs for 2030. Key observations include:

- In RAP and MAP, the programs as a whole appear to deliver significant peak demand reductions at a cost that is well below $30/kW-year. By any measure, this would also be judged very cost effective when compared to supply-side resources and their associated costs.
- For the BAU portfolio, savings do not go much above the 2% mark, with associated costs jumping up to above $30/kW-year.
- The RAP portfolio brings about savings at over 7% for a cost that is well under $30/kW-year.
- The MAP portfolio yields a higher savings of over 10% for essentially the same cost that is experienced in the RAP case. The reason these costs are comparable relates to the fact that the main differences between RAP and MAP relate to scale-up of DR programs under scenarios of higher incentives and assumptions about greater levels of opt-out pricing in the MAP case, which bring about significantly greater savings for very little extra cost.
- Again, most of the DR programs in each portfolio have a lower levelized cost than the projected avoided capacity costs used in the FERC National Assessment of Demand Response of approximately $75/kW-year in year 2030 indicating that all three portfolios are cost-effective as a whole.

Figure 6 ***Demand Response Program Supply Curve – Potential by 2030***



Program Costs

An important result from this study is an estimation of program spending, both from an annual perspective and cumulative. Figure 7 illustrates the year-by-year EE program spending over the entire 22-year time horizon (2009-2030). The figure illustrates that for BAU and RAP, the annual spend is roughly equivalent (yet the RAP savings are significantly higher than BAU in each year after about 2013). The figure also illustrates the fact that the MAP spend is significantly higher than RAP and BAU. Of course, MAP savings are substantially higher than BAU and RAP. The results lead to the obvious conclusion that it will cost significantly more to get additional savings.

Figure 7 *Annual Energy Efficiency Program Spending*[5]

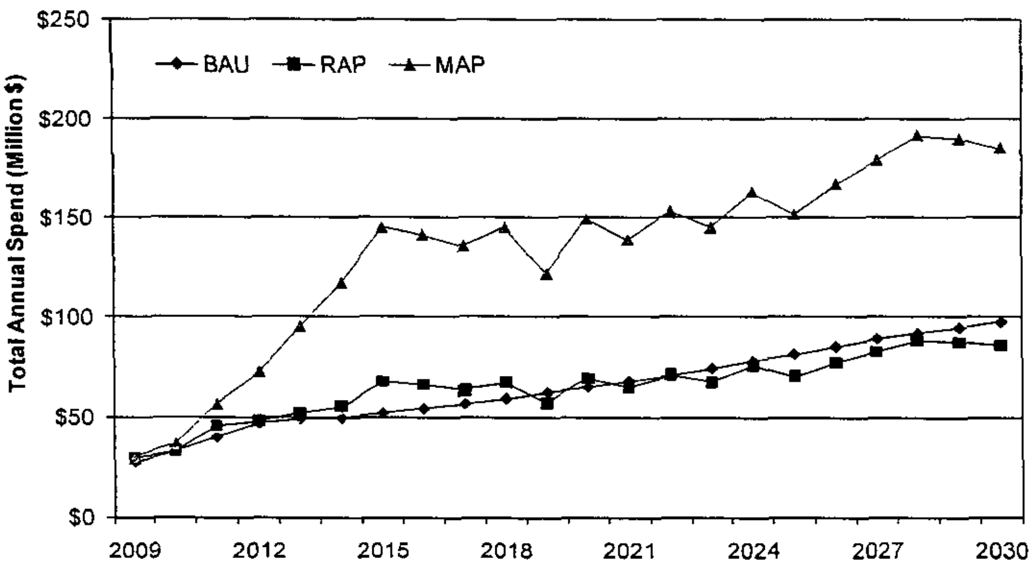


Figure 8 illustrates the year-by-year DR program spending over the entire 22-year time horizon (2009-2030). The figure illustrates significant fluctuations in the annual spending for all three cases. In the RAP case, it is assumed that AMI comes in around 2015 and that opt-in dynamic pricing is implemented afterwards. Since opt-in pricing assumes that participants are voluntary, the rates of growth in spending are what would typically be expected in a DR program.

However, for the MAP case, the spending grows dramatically in the first 5 years (2009-2013), reflecting a significant ramp-up of participation in traditional DR programs such as Direct Load Control and Curtailable as well as newer DR programs such as opt-in dynamic pricing tariffs. Beginning in 2014 the spending drops down for the one year, and then again rises dramatically until about 2020. This is occurring because it is assumed that customers are participating in the dynamic pricing programs on an opt-in or voluntary basis through 2013. In 2014, there is a transition in the pricing program designs from the opt-in style to a more mandatory opt-out style. That means that all customers not currently on a time-based pricing tariff would be defaulted to such a tariff. This transition occurs based on the assumption that the AMI meters begin to become deployed starting in 2015. As AMI deployment is initiated, pricing program expenditures rise to bring on the new participants until 2020 when it is assumed that all available participants are transitioned to the various dynamic pricing programs. While it is merely speculation as to whether opt-out dynamic pricing tariffs would actually be implemented in the AmerenUE service territory during this time, the differences in annual spend between MAP and RAP reveal some important insights about the tradeoffs between opt-out dynamic pricing vs. opt-in dynamic pricing. First, it is clear that there would be significant fluctuations in spending in the dynamic pricing case. Such fluctuations may not be feasible from an AmerenUE operational perspective. Second, as mandatory dynamic pricing tariffs take hold, there is a negative impact on program participation for other non-pricing programs. This situation is clearly revealed in the annual spend, where RAP spending in the last 10 years of the plan is actually higher than MAP spending.

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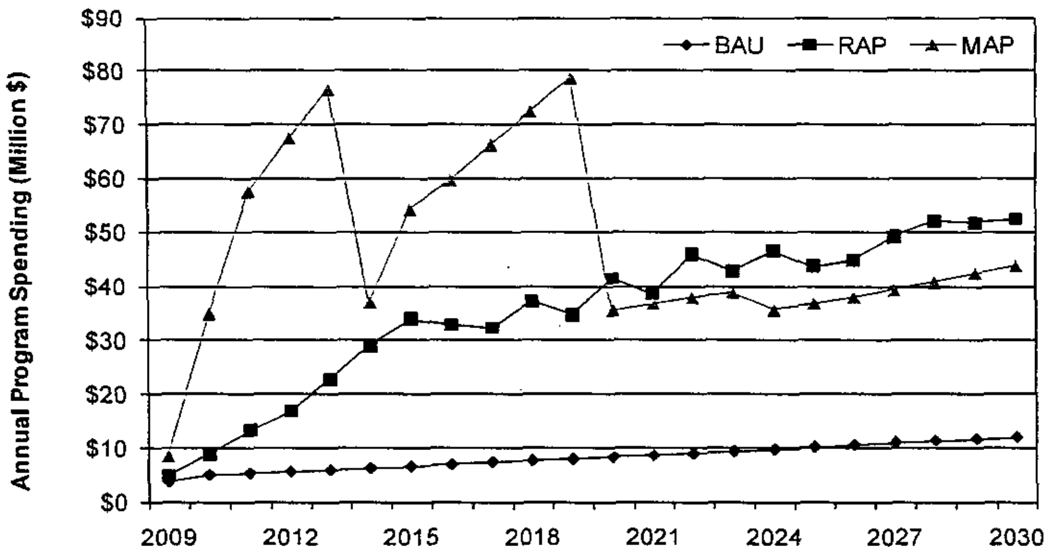
[5] Note that annual spending for MAP and RAP was calibrated to the BAU for the purposes of creating this illustration. The calibration was done such that spending amounts in the first two years of the programs would be roughly comparable across the three levels (MAP, RAP and BAU). The actual analyses of MAP and RAP (in terms of savings and cost-effectiveness) were conducted independently of BAU.

Figure 8 ***Annual Demand Response Program Spending***



Scenario Analysis

Scenario development is a critical part of any planning exercise. While the "reference" case for EE and DR program potential represents the best or most-likely estimate of what the future will look like, it is important to understand the sensitivity of the reference case estimate to key assumptions and to evaluate alternative worlds or scenarios. Based on the results of the potential analysis, it was determined that the realistic achievable potential (RAP) would serve as the representative reference case for conducting the scenarios analysis.

During the various stakeholder meetings convened over the course of this project, several potential future scenarios were outlined and reviewed. In those discussions, it was clear that a whole host of external factors might occur in the future, all potentially influencing the outcome of AmerenUE's EE and DR programs. As a result, the following three scenarios were considered for the analysis:

- **Scenario 1 – Aggressive Codes and Standards**: This scenario represents the implementation of aggressive state building codes which will capture lost opportunities in new construction that might currently be captured (at least in part) in the various DSM new construction programs. Further, the scenario represents aggressive appliance standards that are currently being contemplated at the federal level. As recent increased national attention is being given to role of energy efficiency in the economic recovery and the Smart Grid, it is conceivable that this attention will lead policymakers to increase laws and regulations governing codes and standards beyond existing and planned levels.
- **Scenario 2 – High Infrastructure Costs**: This scenario anticipates greater levels of utility spending due to higher than anticipated costs associated with new generation, compliance with environmental regulations and carbon legislation[6], widespread implementation of the Smart Grid, adoption of distributed generation and solar, and the like.
- **Scenario 3 – Prolonged Recession Beyond 2 Years**: This scenario assumes that the economy does not recover in the next two years, but rather that the recession lasts up to

[6] The Reference scenario assumes passage of legislation similar to the 2009 proposed Waxman-Markey Bill. A carbon cost is included in the forecasts beginning in 2014 that reflects the targets and assumptions therein. These carbon costs are thus included in each scenario unless modified as noted.

five years. As a result, there would be a delayed and weakened carbon legislation passed by the Congress and rate hikes would be kept to a minimum.

Table 7 highlights the key findings of the scenario analysis. The table provides key indicators of the EE and DR programs, including total cumulative expenditure over the entire study time horizon (2009-2030), the levelized cost of saved energy and peak demand, and the percentage reduction relative to the baseline forecast.

Table 7 Scenario Impacts on EE and DR Potential

Parameter	Reference Case (RAP)	Scenario 1: Aggressive Codes and Standards		Scenario 2: High Infrastructure Costs		Scenario 3: Prolonged Recession	
		Value	Percent Change	Value	Percent Change	Value	Percent Change
EE Program Total Expenditure (Million $)	$1,856	$1,555	-16%	$2,394	29%	$1,522	-18%
EE Portfolio Levelized Cost ($/kWh-saved)	$0.017	$0.018	8%	$0.021	23%	$0.018	4%
EE Portfolio % Reduction Relative to Baseline	7.33%	5.18%	-29%	9.12%	24%	5.88%	-20%
DR Program Total Expenditure (Million $)	$406	$370	-9%	$657	62%	$406	0%
DR Portfolio Levelized Cost ($/kW-yr saved)	$39.69	$39.923	1%	$38.87	-2%	$38.88	-2%
DR Portfolio % Reduction Relative to Baseline	10.01%	9.32%	-7%	15.21%	52%	9.94%	-1%

Several observations can be made from the results of the scenario analysis:

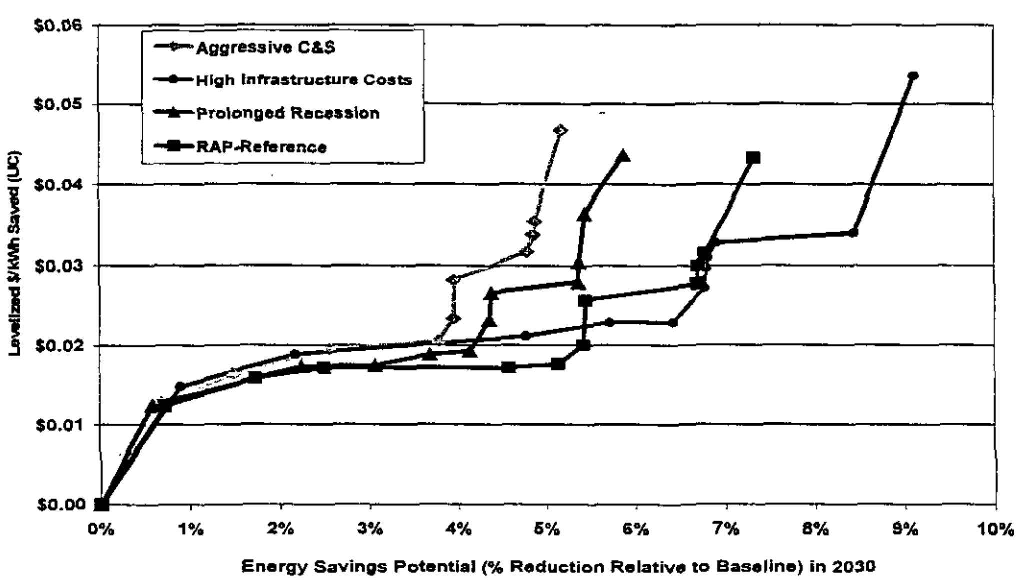
- As we move from the reference case (RAP) to the various scenarios, most of the typical parameters are moving in the direction that is expected. Aggressive codes and standards and a prolonged recession bring about lower expenditure for programs, lower savings relative to the baseline and higher levelized costs. High infrastructure costs bring about higher expenditure for programs, higher savings relative to the baseline and higher levelized cost.
- For Scenario 1 (Aggressive Codes and Standards), total EE expenditures are reduced by 16% and DR expenditures reduced by 9% due mainly to the fact that lower impacts mean that less is being expended for program administration and incentives. Levelized costs for the EE portfolio increase by 8% and for the DR portfolio by 1% indicating that the reduction in expenditures is not leading to a proportional reduction in impacts. Finally, the EE portfolio percentage reduction drops by 29% and the DR reduction drops by 7%, which is largely a function of the aggressive codes and standards taking over nearly a third of the savings projected in the reference case.
- For Scenario 2 (High Infrastructure Costs), total EE expenditures increase by 29% and DR expenditures increased by 62% due mainly to the fact more programmatic activities due to lower avoided costs, more aggressive marketing of programs, and the like. Levelized costs for the EE portfolio increase by 23% and for the DR portfolio drops by a slight 2% indicating that the increase in expenditures is bringing about a proportional increase in impacts (at least for the EE programs) . Finally, the EE portfolio percentage reduction increases by 24% and the DR reduction drops by 52%, This again is mainly driven by the fact that the EE and DR programs are operated at higher budget levels thus bringing about a larger number of participants relative to the Reference Case which in turn leads to greater impacts.

- For Scenario 3 (Prolonged Recession), total EE expenditures decrease by 18% and DR expenditures remaining relatively unchanged. The decrease in EE expenditures is due mainly to the fact few program participants is leading to less in incentives being paid out. DR appears to be relatively unchanged by these exogenous factors. Levelized costs for the EE portfolio increase by 4% and for the DR portfolio decrease by 2% indicating that (like Scenario 1) the reduction in EE expenditures is leading to a proportional reduction in impacts which has very little impact on the levelized cost. Finally, the EE portfolio percentage reduction decreases by 20% and the DR reduction increases drops by less than 1%. This again is mainly driven by the fact that the EE programs are not attracting as many participants because the economic situation is inhibiting the ability of participants to make capital investments. Thus, the resulting impacts are depressed relative to the Reference Case. This situation was not as affected in the DR case.

In addition to estimates of potential for each scenario, EE and DR program supply curves were also developed. The reference case (RAP) and each of the three scenarios are represented as separate supply curves on the same graph, in much the same manner as was presented for the various program implementation levels reported in the previous chapter.

Figure 9 shows the supply curve for AmerenUE's potential EE programs, as reflected by each of the three scenarios for the year 2030. The supply curve from the reference case is provided for comparison purposes.

Figure 9 EE Program Supply Curve – by Scenario, Year 2030



Several observations can be made from the results of the 20-year supply curve analysis for the various scenario assessments of the EE programs:

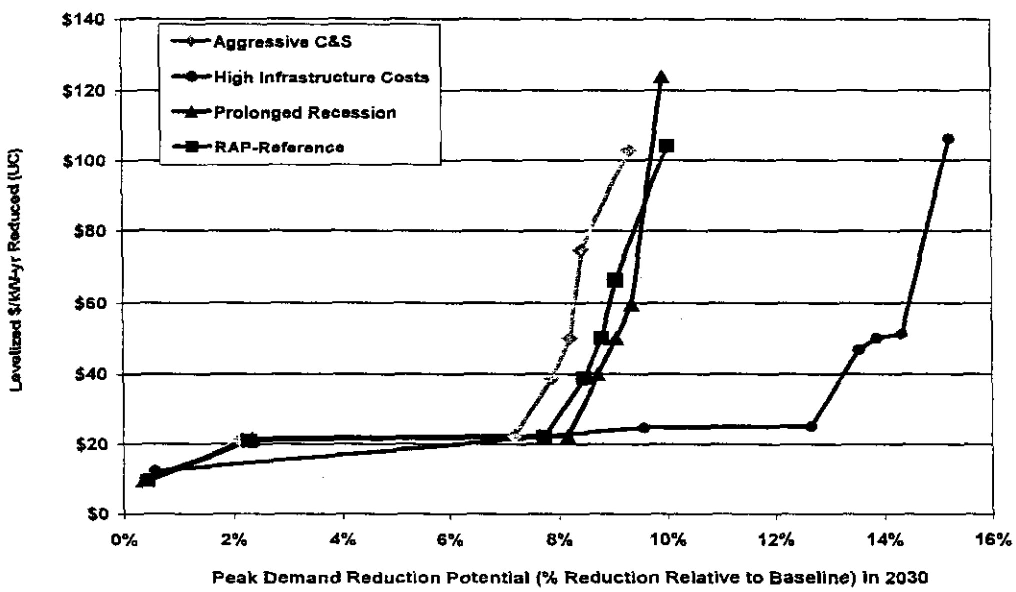
- Up to about 4% energy savings potential, all of the scenarios deliver about the same level of savings at the same level of cost (around $0.02/kWh or less). However, going above that levelized cost threshold, significant variances occur.

- Neither Scenario 1 (Aggressive C&S) nor Scenario 3 (Prolonged Recession) would be favorable from the perspective of an AmerenUE EE program portfolio. Both cases show significantly higher costs for a relatively minimal increase in savings potential.
- Scenario 2 (High Infrastructure Costs) appears to be most favorable from the perspective of bringing about 6.5% in energy savings potential at the lowest level of cost. However, for every extra kWh saved beyond that level, the costs rise dramatically.

Figure 10 shows the supply curve for AmerenUE's potential DR programs, as reflected by each of the three scenarios for the year 2030. Several observations can be made from the results of the 20-year supply curve analysis for the various scenario assessments of the DR programs:

- There is very little difference between the Reference Case and Scenario 1 (Aggressive Codes and Standards) and Scenario 3 (Prolonged Recession). This has mainly to do with the fact that in both instances these external factors have very little influence on the DR program portfolios.
- For Scenario 2 (High Infrastructure Costs) there is a pronounced improvement in the cost of delivered demand relative to the Reference Case. In other words, it does not appear to cost much more on a $/kW-year basis but the savings are significantly greater.

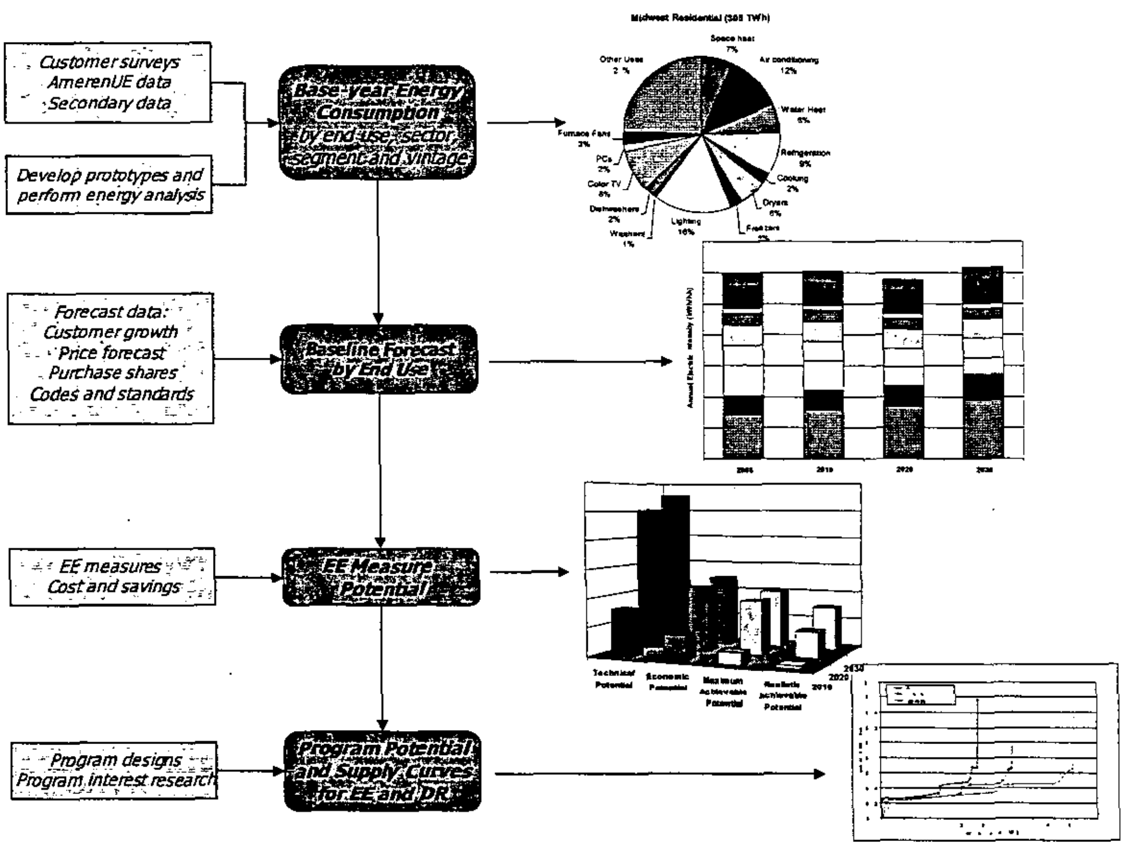
Figure 10 DR Program Supply Curve – by Scenario, Year 2030



STUDY APPROACH

This study represents industry best-practices in assessment of DSM potential. It began with comprehensive market research of AmerenUE customers that covered their current energy-using equipment, behavior and attitudes. The market research results were used to develop base-year usage profiles and the baseline forecast. These, in turn, were used to support the analysis of EE and DR potential at the measure and program levels. Finally, program analysis was used to develop supply curves. Figure 11 depicts this approach.

Figure 11 Overview of Study Approach



The remainder of this Executive Summary provides an overview of the market research and each of the analysis steps.

MARKET RESEARCH

Comprehensive market research about AmerenUE customers was conducted for this project. This research provides a solid foundation for the analyses performed in this study and it also provides a wealth of information for future analyses across many departments at AmerenUE. The market research included:

- Residential customers – online saturation surveys with 1,284 customers and online program interest surveys with 1,126 customers
- Small and medium C&I customers – online saturation surveys with 800 customers and online program interest surveys with 750 customers

- Large C&I customers – online energy-use surveys with 221 customers and online program-interest surveys with 273 customers
- Complex C&I customers – 145 site visits distributed strategically among campuses/locations of AmerenUE's "top customers"
- Trade Allies – 40 telephone interviews

Volume 2 of the report series presents the detailed results of the market research.

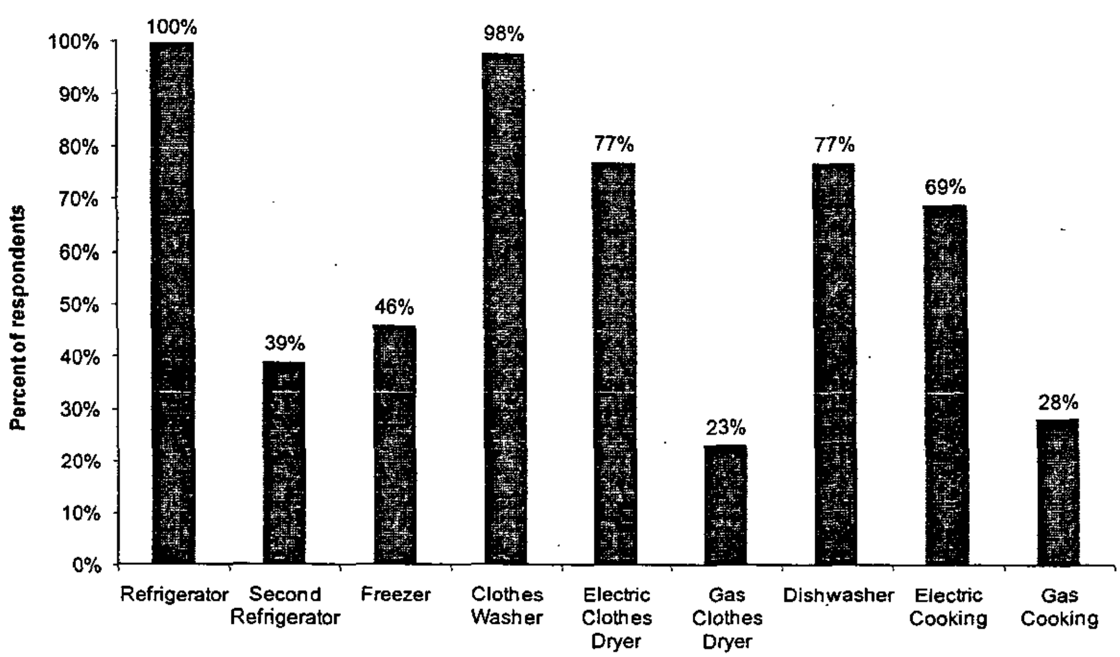
Energy-use Surveys

Energy-use (or saturation) surveys were conducted across all customer classes. Topics included:

- Characteristics of households/homes and businesses/buildings and their occupants
- Heating, cooling and water heating equipment
- Lighting, refrigeration and food service equipment
- Office equipment, electronics and miscellaneous plug loads
- Motors and process uses
- Energy-efficiency measures taken and planned

Figure 12 presents one example of the results from the residential saturation survey.

Figure 12 Saturation Survey Results – Percent of Single-family Homes with Appliances



Program-Interest Research

A hallmark of the AmerenUE study is the research of customer attitudes and behaviors toward energy efficiency and demand response measures and programs. The objectives of this research were to:

1. Help AmerenUE estimate achievable potential

a. How likely are customers within each sector to participate in various energy efficiency programs AmerenUE is considering offering?

b. Which of these energy efficiency measures offer the highest likely participation rates?

c. How does likelihood to participate differ by payback period for the customer?

2. Help AmerenUE understand unique customer segments to support customer marketing and outreach

The topics covered by the program-interest research included:

- Attitudinal questions, which included general attitudes about energy use, energy efficiency, environmental concerns, saving money, comfort, etc.; purchasing attitudes, preferences, practices; and attitudes toward electric utility providers in general and attitudes toward AmerenUE
- Assessment of energy efficiency measures already implemented
- Interest in potential energy efficiency and demand response measures offered by AmerenUE that cover appliance and equipment upgrades to high-efficiency models, improvements in processes that would save energy, and likelihood of undertaking certain energy conservation measures.

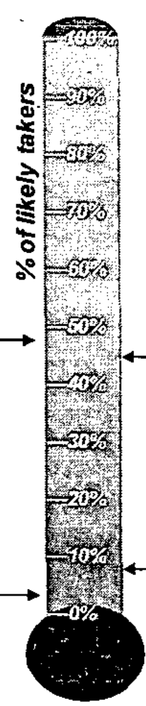
Key results from the program interest research included "take rates" for various program concepts. Take-rates represent the likelihood that customers will participate in specific programs and they reflect a snapshot of current behavior and circumstances. They have been adjusted for response bias using industry standard techniques to reflect what customers *actually* do rather than what they *say* they will do.

Figure 13 illustrates the range of take rates for the residential and business sectors. Figure 14 and Figure 15 present likely take rates for specific appliances/equipment.

Figure 13 Range of Take Rates

C & I Takers

Residential Takers



Maximum take rate for a single program: 47%
(Purchase higher than standard efficiency light bulbs; at a 1 year payback period)

Maximum take rate for a single program: 45%
(Purchase a higher than standard efficiency refrigerator; at a 1 year payback period)

Minimum take rate for a single program: 3%
(Install diesel generators to offset electricity used; at a 5 year payback period)

Minimum take rate for a single program: 8%
(Install solar panels to generate electricity for your home to offset all or a portion of the electric energy provided by a utility; at a 5 year payback period)

Figure 14 Likely Residential Take Rates for Purchasing High-efficiency Equipment

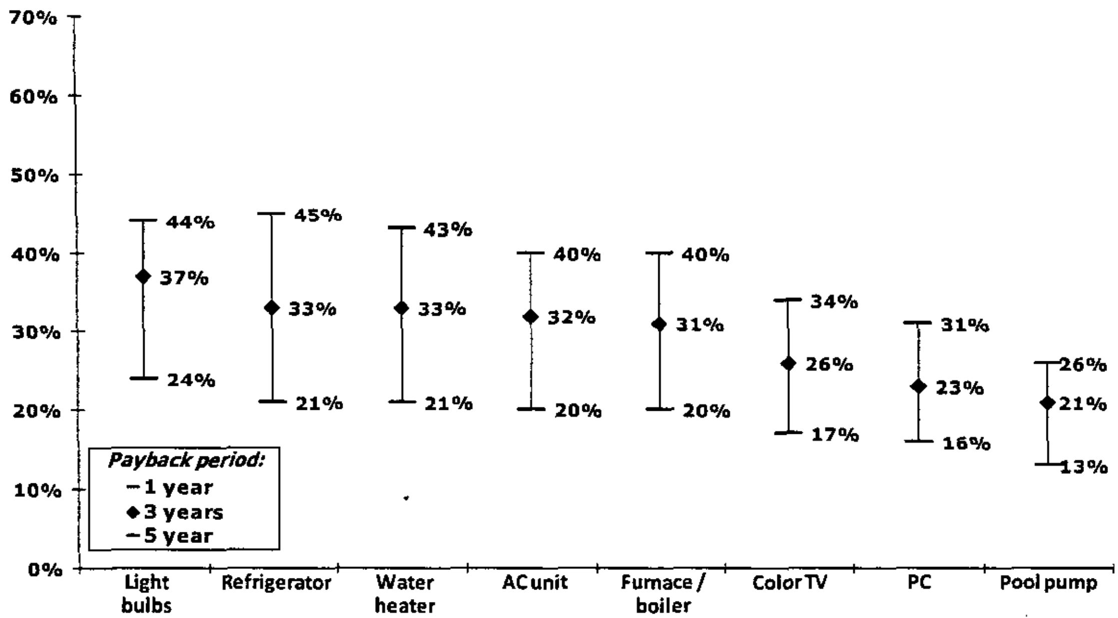
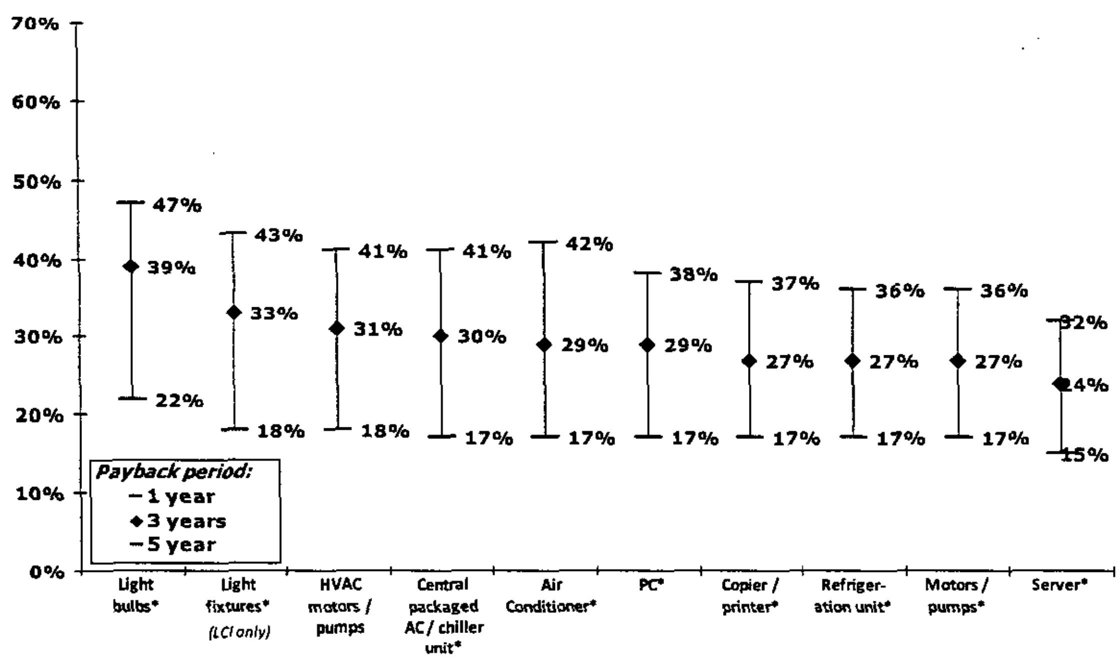


Figure 15 Likely C&I Take Rates for Purchasing High-efficiency Equipment



These take rates are used directly to estimate the various levels of achievable potential for this study – MAP and RAP. Take-rate estimates at a one-year payback were used to estimate MAP. Take-rates at a three-year payback were used to estimate RAP and were ramped up over the 20-year forecast horizon to reflect increased awareness of utility programs.

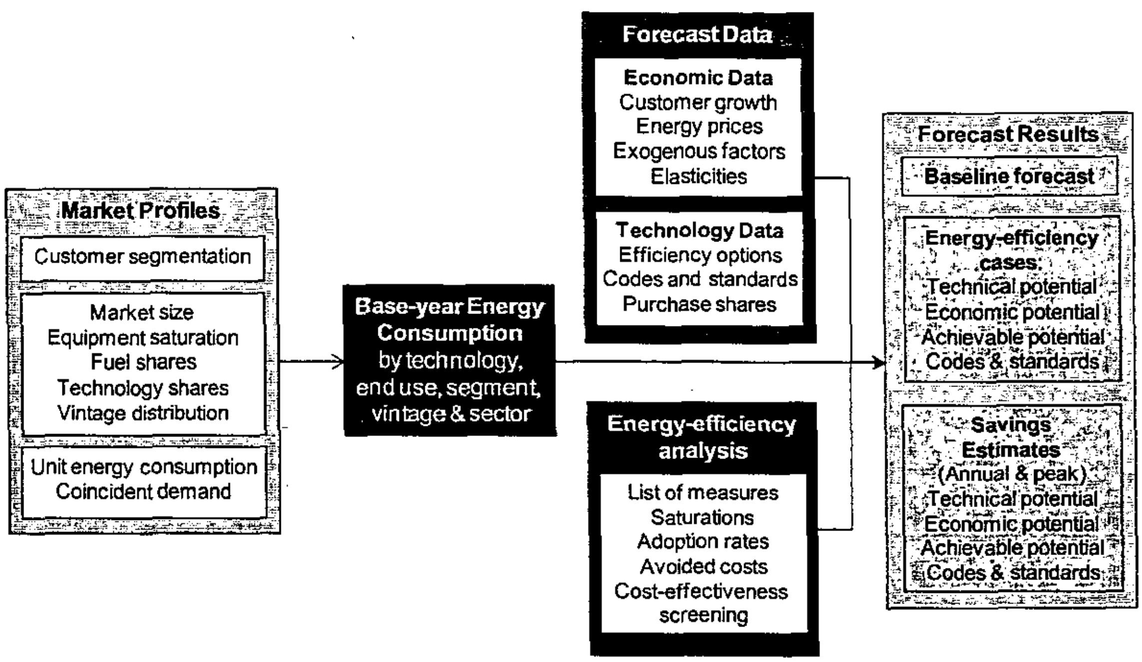
The majority of the AmerenUE take rates under a three-year payback are in the range of 20-40%. Based on observation and expert judgment, these are lower than comparable studies conducted for West Coast and Northeast utilities, which typically show 30-50%. By comparison, a recent similar study conducted by the Electric Power Research Institute identified take rates of 50% or higher, reflecting a mix of states with high and low DSM activity and history.[7] The result of lower take rates is that MAP and RAP for AmerenUE represent a smaller portion of economic potential than what is projected in some other studies.

In addition to the program take rates, the market research results were used to perform a segmentation analysis. These results are also presented in Volume 2.

DEVELOP BASELINE FORECAST

The market research was a primary source of information for the development of energy market profiles, base-year electricity use by end use and the baseline forecast as illustrated in Figure 16. For this study, 2008 was defined as the base-year because it was the most recent year for which complete billing data were available.

Figure 16 Analysis Framework for Baseline and EE Potentials Forecasts



Base-year Energy Use

In 2008, AmerenUE provided 38,165 GWh of electricity to its residential, commercial and industrial customers. The residential and commercial sectors are roughly equal, each accounting for more than one third of total use. The industrial sector accounts for the remaining 28%.

Residential Electricity Use in 2008

In 2008, AmerenUE provided electricity service to 1.04 million households who used 13,993 GWh. Overall, residential customers used 13,498 kWh/household. The market is dominated by

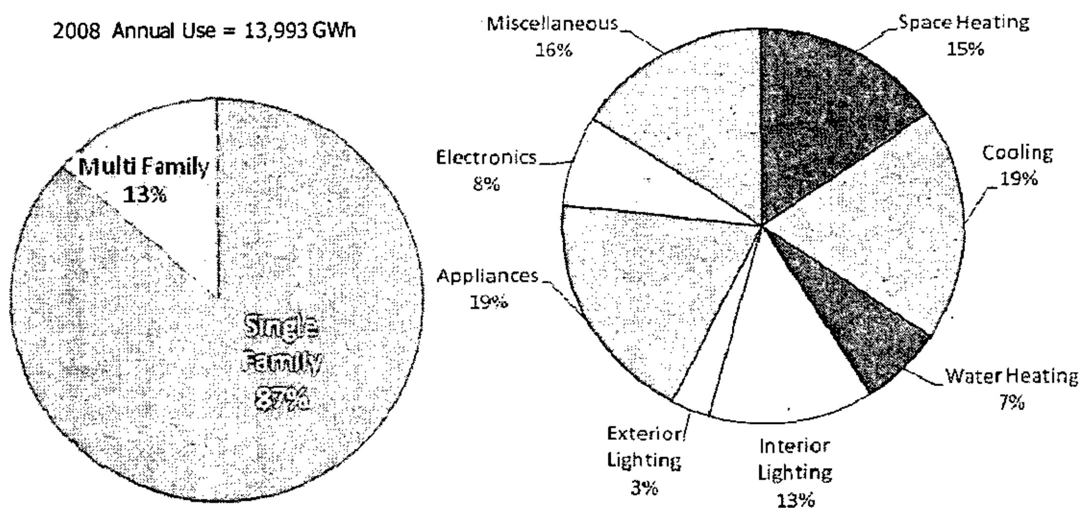
[7] Assessment of Achievable Potential from Energy Efficiency and Demand Response Programs in the U.S. (2010-2030), EPRI, TR 1016987, January 2009, available at www.epri.com.

single-family homes (see Figure 17), which used 14,682 kWh/household on average, compared to multi-family homes which used 8,883 kWh/household.

Appliance information and dwelling characteristics from the market research were combined to develop descriptions of prototypical houses in the AmerenUE service area. These prototypes were analyzed using an engineering simulation model to estimate end-use consumption.[8] Comprehensive energy market profiles that characterize electricity usage by end use and segment are presented in Volume 3.

Figure 17 presents a breakdown of 2008 usage by end use. Air conditioning and white-goods appliances are the largest uses, followed by space heating and interior lighting.

Figure 17 Residential Electricity Usage by Segment and End Use



Commercial Sector Electricity Use in 2008

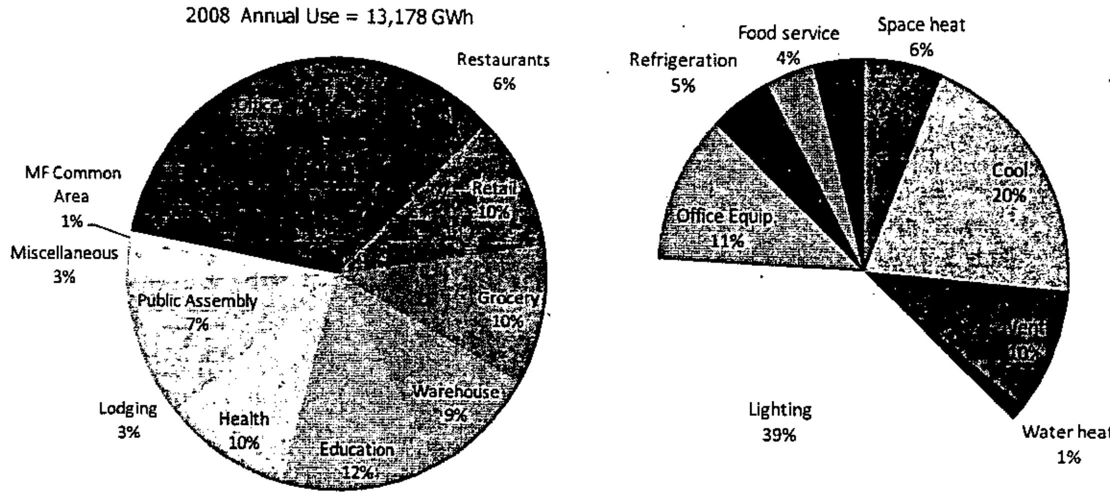
In 2008, AmerenUE provided 13,178 GWh to commercial-sector customers. These businesses occupied 964 million square feet, implying an intensity of 13.7 kWh per square foot per year. The largest segment in the commercial sector is offices, which accounts for 29% of total usage in 2008. All other segments account for 12% or less of total use (see Figure 18).

Information about equipment inventories, business operations and building characteristics from the survey were combined to develop descriptions of prototypical building types in the AmerenUE service area. These prototypes were analyzed in BEST to estimate end-use consumption. Comprehensive energy market profiles that characterize electricity usage by end use and segment are presented in Volume 3.

Figure 18 presents a breakdown of 2008 usage end use. Lighting is the dominant use in the commercial sector, followed by space cooling.

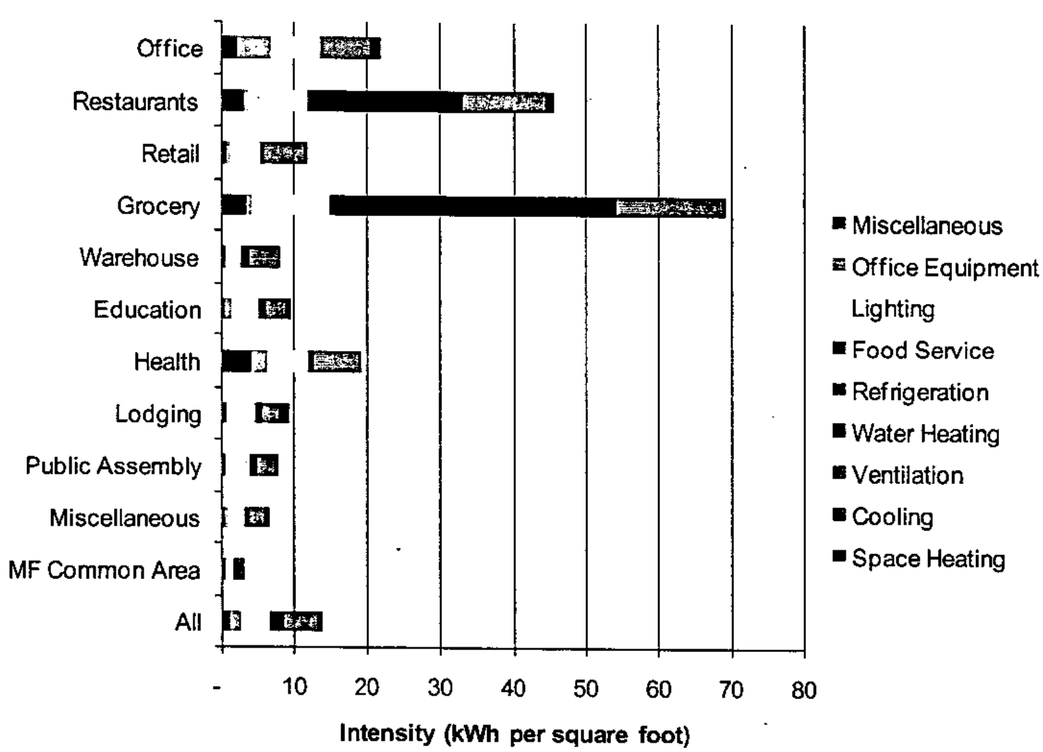
[8] The model used for this purpose is Global's Building Energy Simulation Tool (BEST), which is a user-friendly front-end to the powerful DOE-2 energy simulation model.

Figure 18 ***2008 Commercial Sector Electricity Usage by Segment and End Use***



Electricity use varies considerably by building type and end use. Figure 19 presents the overall intensity in kWh per square foot per year, as well as the end-use breakdown. The grocery and restaurant segments are the most intensive as a result of high refrigeration and food service usage, in addition to lighting and cooling. Lighting and cooling are significant uses across all segments. Office is the largest segment, in terms of absolute kWh usage, and uses about 22 kWh per square foot on average.

Figure 19 ***Electricity Use by Building Type and End Use***

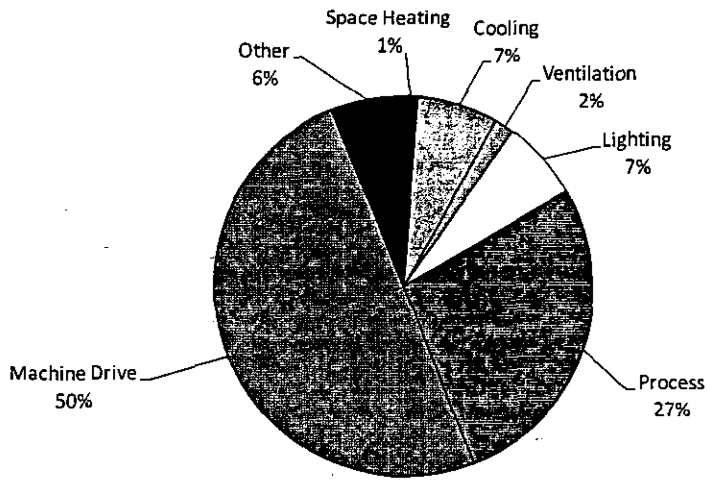


Industrial Sector Electricity Use in 2008

In 2008, AmerenUE provided 10,994 GWh to the industrial sector. Throughout this study, this sector is treated as a whole to protect the confidentiality of AmerenUE's largest customers who might otherwise be identified.

Figure 20 presents a breakdown of 2008 usage by end use for the industrial sector. Machine drives, primarily motors and air compressors, account for 50% of usage in 2008. Electric processes account for just over one fourth of usage. Lighting, cooling, and other uses account for the remaining 23%.

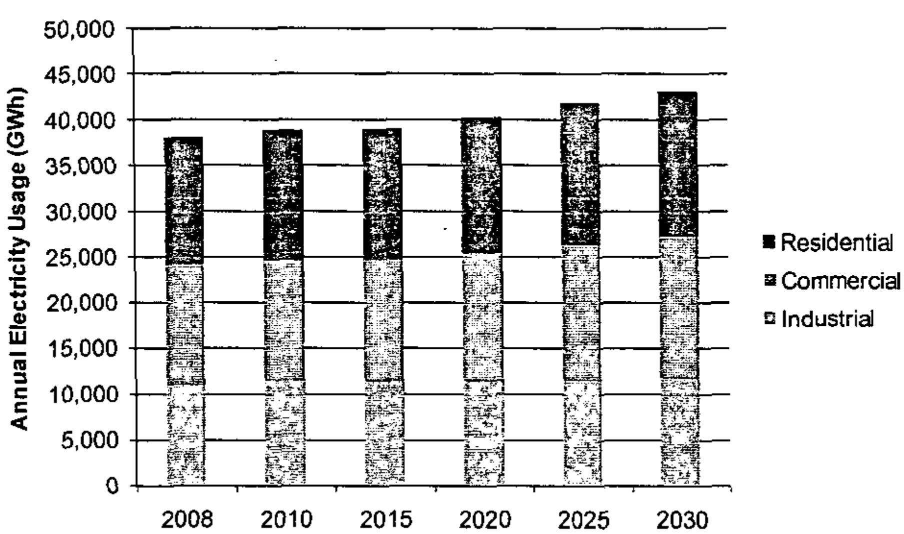
Figure 20 2008 Industrial Electricity Usage by End Use



Baseline End-Use Forecast Results

Using the base-year profiles as a starting point, a baseline end-use forecast was developed for 2009 through 2030 using Global's LoadMAP model. This forecast embodies assumptions about customer growth, electricity prices, technology trends and the impacts of codes and standards. This forecast provides the springboard for the estimation of energy-efficiency potential and is the metric against which EE savings are measured. The total forecast is presented in Figure 21.

Figure 21 Baseline Forecast Summary



Residential Baseline End-use Forecast

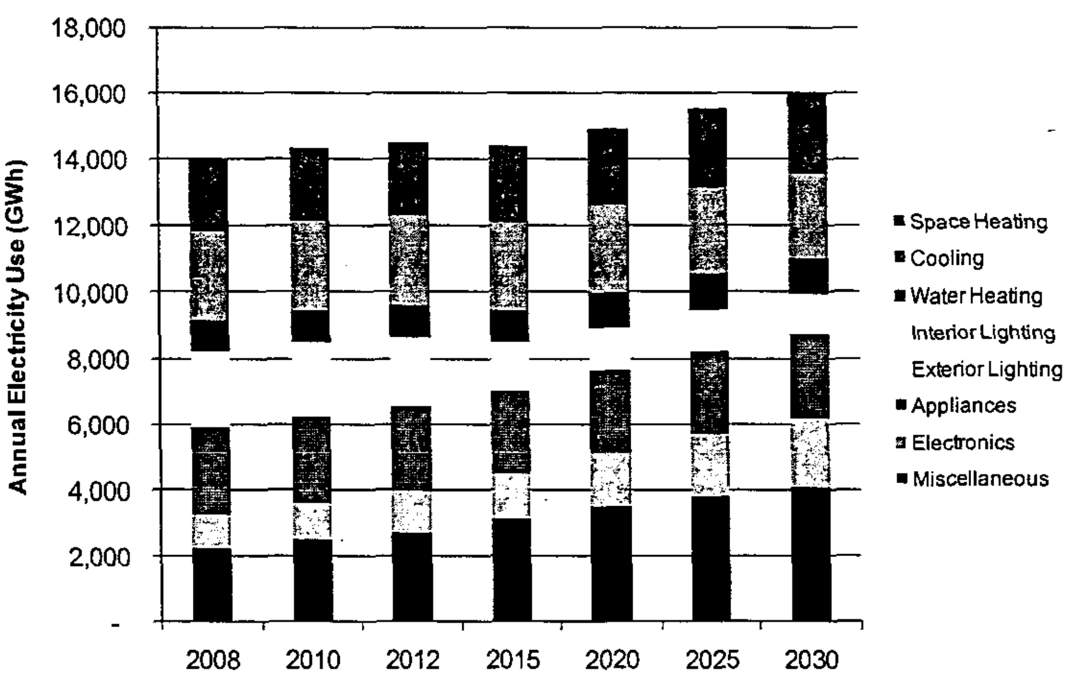
Electricity use is forecast to grow from 13,993 GWh in 2008 to 15,986 GWh in 2030. This is a 14% increase over the 22 years, implying an average growth rate of 0.61%.

Key observations about this forecast include the following:

- Residential lighting is affected by the passage of the Energy Independence and Security Act (EISA) in 2007, which mandates higher efficacies for lighting technologies starting in 2012. Several lighting technologies are anticipated to meet this standard when it goes into effect, including compact fluorescent lamps (CFL), white light-emitting diodes (LED), and advanced incandescents currently under development. Old stock is phased out over time beginning in 2012. The effect of this standard is a decline in electricity for lighting use by 43% over the forecast period, reflecting a low penetration of CFLs in the AmerenUE service area in 2008.
- Growth in electricity use in electronics is strong and reflects an increase in the saturation of electronics and the trend toward higher-powered computers and larger televisions.
- Growth in miscellaneous use is also substantial. This has been a long-term trend and assumptions have been made about growth in this end use that are consistent with the Annual Energy Outlook.

Figure 22 presents the residential end-use forecast.

Figure 22 Residential Baseline End-use Forecast

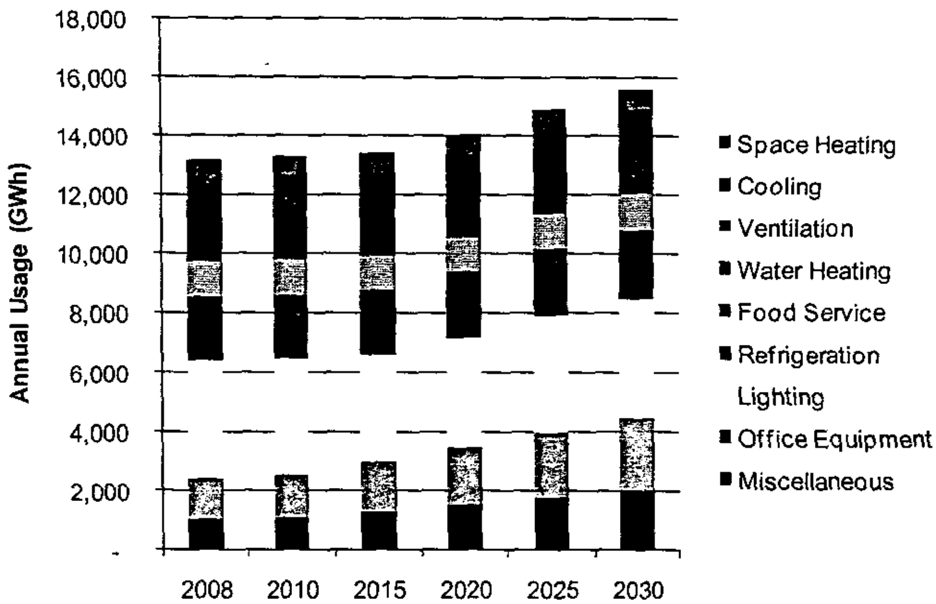


Commercial Baseline End-use Forecast

In the commercial sector, electricity use is forecast to grow from 13,178 GWh in 2008 to 15,615 GWh in 2030. This is an 18% increase over the 22 years, implying an average growth rate of 0.8%.

Figure 23 presents the forecast which shows considerable variation across the end uses. Major uses – cooling, lighting and refrigeration – are relatively flat, while significant growth takes place in office equipment and miscellaneous uses.

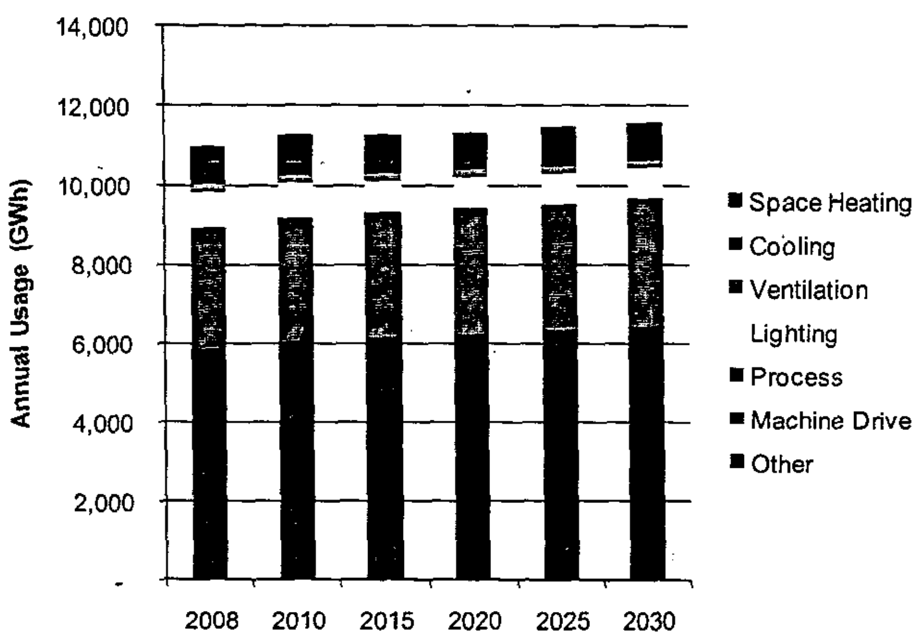
Figure 23 Commercial Baseline End-use Forecast



Industrial Baseline End-use Forecast

Industrial electricity use is projected to stay fairly flat over the next 22 years. Of course, this assumes the continued viability of AmerenUE's largest industrial customers. Electricity use is forecast to grow from 10,994 GWh in 2008 to 11,580 GWh in 2030, an increase of 5%. As in the other sectors, lighting use declines as the result of standards. The primary source of growth is in the other uses. The forecast is depicted in Figure 24.

Figure 24 Industrial Baseline End-use Forecast



POTENTIAL SAVINGS FROM ENERGY EFFICIENCY MEASURES

Once the baseline forecast was developed, analysis of energy-efficiency potential proceeded. This activity began with the identification and screening of energy-efficiency measures. A total of 299 individual measures were considered across all three sectors. The residential analysis included 118 measures, the commercial sector included 120 measures and the industrial sector considered 43 measures. The primary sources for EE measure information include:

- Global's Database of Energy Efficiency Measures (DEEM)
- California's Database of Energy Efficiency Resources (DEER database)
- AmerenUE stakeholder input

The analysis of energy-efficiency measures yielded estimates of energy efficiency for Technical and Economic potential, which were the building blocks of the subsequent program analysis and achievable potentials (see Table 1):

- **Technical potential** is the theoretical upper bound of energy-efficiency savings regardless of cost.
    1. In 2020, technical potential is 11,098 GWh, which represents 27.6% of total usage in that year.
    2. In 2030, technical potential is 12,696 GWh, 29.4% of total usage.
- **Economic potential** is an estimate of all cost-effective energy efficiency savings.
    1. In 2020, economic potential is 5,475 GWh, which represents 13.6% of total usage in that year.
    2. In 2030, economic potential is 7,181 GWh, 16.6% of total usage.

Figure 25 presents the savings as a percent of baseline energy usage in each of selected years.

Figure 25 Summary of Energy-efficiency Measure Potential

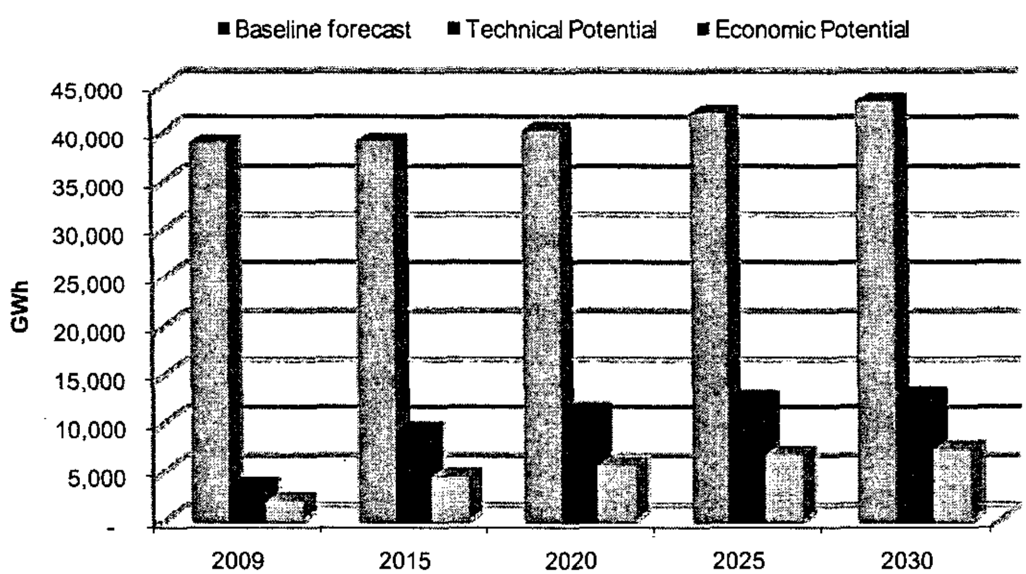
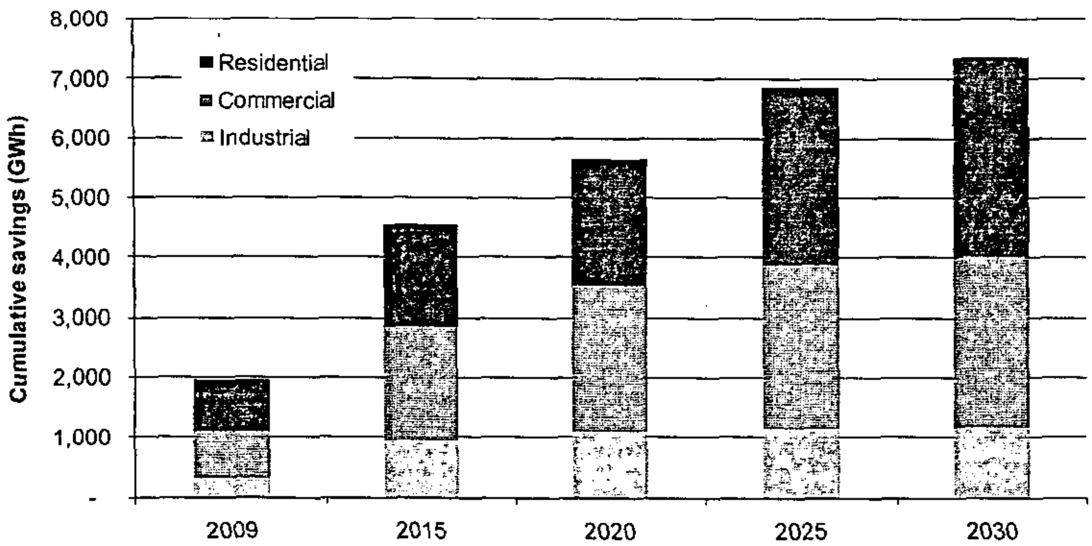


Figure 26 summarizes economic potential by sector. The contributions to savings from the residential and commercial sectors are roughly equal, while the industrial sector is the smallest of the three.

Figure 26   ***Summary of Economic Potential by Sector***



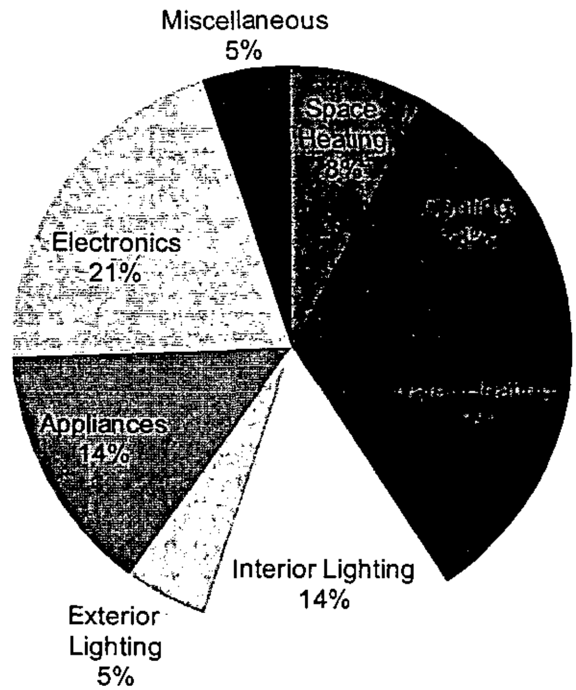
Residential EE Measure Potential

Economic potential in the residential sector in 2030 is 3,348 GWh or 21% of baseline residential usage in that year. The breakdown by end use for selected years is presented in Table 8. Figure 27, which illustrates the end-use breakdown in 2030, shows that there are substantial savings across all end uses in the residential sector, even after the effects of appliance standards.

Table 8   ***Residential Economic Potential by End Use***

	2009	2015	2020	2030
Space Heating	66	191	214	264
Cooling	95	275	328	436
Water Heating	107	338	446	664
Interior Lighting	354	269	291	484
Exterior Lighting	135	195	164	161
Appliances	14	97	196	482
Electronics	19	205	339	688
Miscellaneous	43	123	152	170
Total	**834**	**1,692**	**2,130**	**3,348**

Figure 27 End-use Breakdown of Residential Economic Potential in 2030



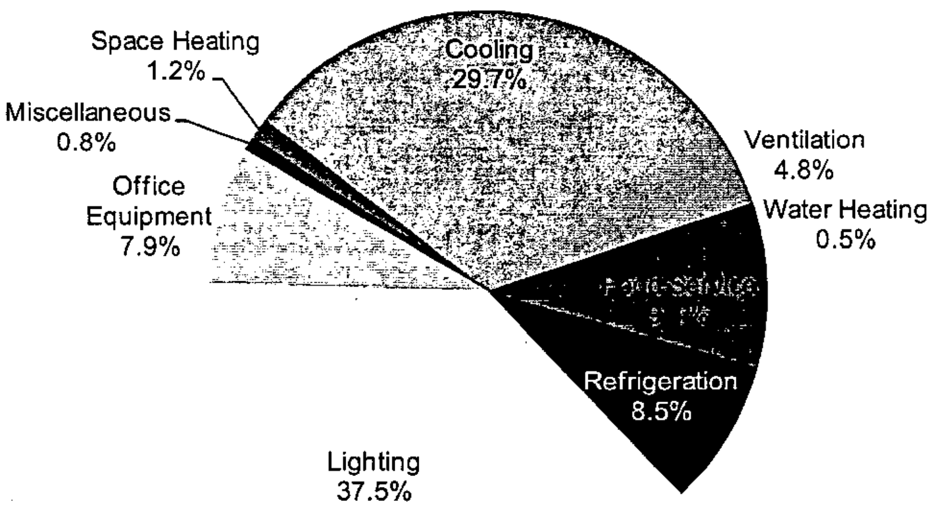
Commercial EE Measure Potential

In 2030, economic potential in the commercial sector is 2,847 GWh or 18% of baseline commercial usage in 2030. The breakdown by end use for selected years is presented in Table 9. Figure 28, which illustrates the end-use breakdown in 2030, shows that lighting and cooling account for the majority of potential savings.

Table 9 Commercial Economic Potential by End Use

	2009	2015	2020	2030
Space Heating	13	32	34	35
Cooling	196	542	679	846
Ventilation	14	95	132	136
Water Heating	2	7	10	13
Food Service	13	118	214	258
Refrigeration	14	90	152	242
Lighting	481	852	1,020	1,066
Office Equipment	42	156	178	226
Miscellaneous	2	12	20	24
Total	**777**	**1,903**	**2,441**	**2,847**

Figure 28 End-use Breakdown of Commercial Economic Potential in 2030



Industrial EE Measure Potential

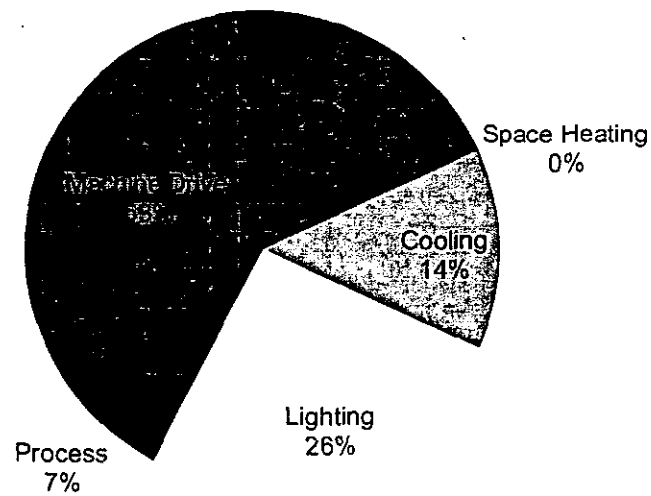
In 2030, economic potential in the industrial sector is 986 GWh or 8.5% of baseline industrial usage in 2030. The breakdown by end use for selected years is presented in Table 10.

Figure 29, which illustrates the end-use breakdown in 2030, shows that machine drives – motors and air compressors account for more than half the potential savings. However, the absolute savings from motors is relatively small for two reasons. First, there are significant savings already embodied in the baseline forecast as a result of the NEMA standards that have been in place for many years and which will begin to require that premium-grade motors be installed in December 2010. Second, industrial customers are savvy and have been able to successfully postpone motor replacement by rewinding existing motors. In addition to motors, there are significant savings opportunities in cooling, lighting and, to a lesser degree, electric processes.

Table 10 Industrial Economic Potential by End Use

	2009	2015	2020	2030
Space Heating	1	1	2	2
Cooling	26	63	75	134
Ventilation	-	-	-	-
Lighting	117	252	251	255
Process	25	65	67	67
Machine Drive	114	416	509	528
Total	**284**	**797**	**904**	**986**

Figure 29 End-use Breakdown of Industrial Economic Potential in 2030



DSM PROGRAM ANALYSIS

The process of developing the EE and DR programs for this study involved an assessment process that is illustrated in Figure 30. This figure depicts the sources of information that were used to guide the development of a portfolio of representative EE and DR programs that could then serve as the basis for detailed analyses, including cost-effectiveness analysis, supply curve assessment and scenario analysis. The results of these various analytics will serve as the inputs necessary for AmerenUE to conduct its current IRP assessment, work through the Missouri regulatory process and support the process of implementation.

Figure 30 Process for Developing Energy Efficiency and Demand Response Programs

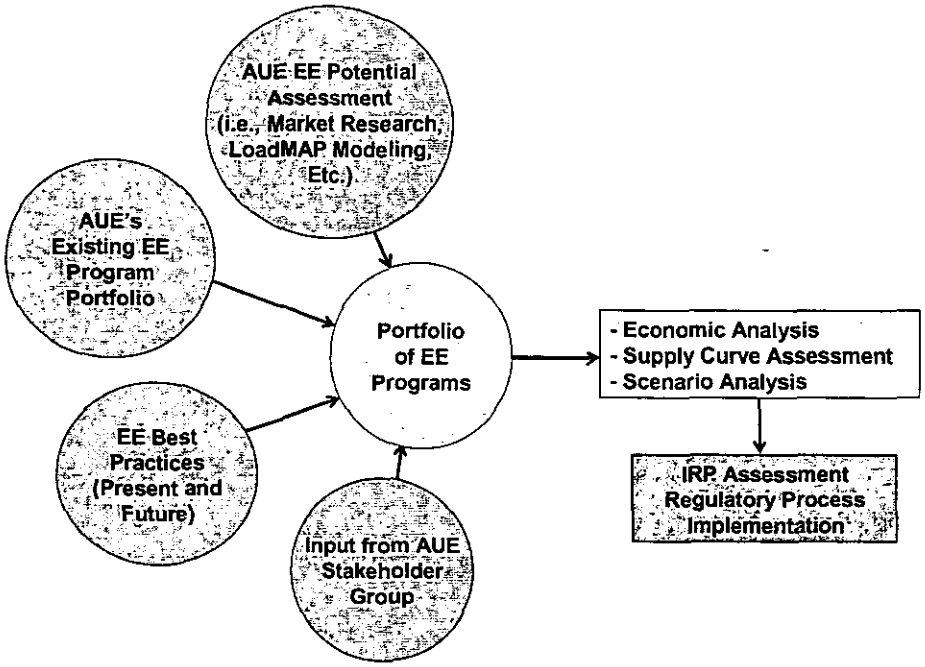


Table 11 identifies the portfolio of energy-efficiency programs considered in the analysis as well as target market segments for each. These programs reflect current industry best practices, but also provide a structure that allows the programs to adapt to meet future needs.

Figure 31 presents realistic achievable potential from energy-efficiency programs in selected years. The largest savings are found in three programs: C&I Standard Incentives, C&I Custom Incentives and Residential Lighting and Appliances

Table 11 Energy Efficiency Programs

Energy Efficiency Program	Target Market Segment(s)
1. Residential Lighting and Appliances	All residential customers
2. Multi-Family Common Area	Owners and property managers of multi-family buildings
3. Residential New Construction	Single-family new constructions
4. Residential HVAC Equipment & Diagnostics	Single-family home customers
5. Residential Energy Performance	Single-family home customers
6. Residential Low Income	Low-income residential customers
7. Residential Appliance Recycling	All residential customers
8. Residential Information/Feedback	All residential customers
9. C&I Standard Incentives	All C&I customers
10. C&I Custom Incentives	All C&I customers
11. C&I New Construction	C&I new constructions
12. C&I Retro-Commissioning	All C&I customers
13. C&I Information/Feedback	All C&I customers

Figure 31 Realistic Achievable Potential from Energy Efficiency Programs

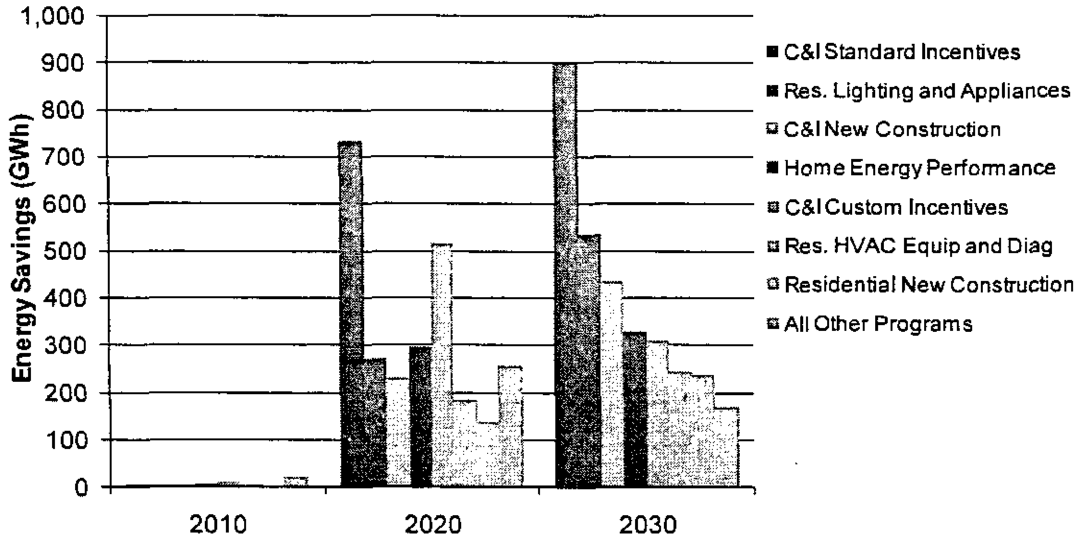
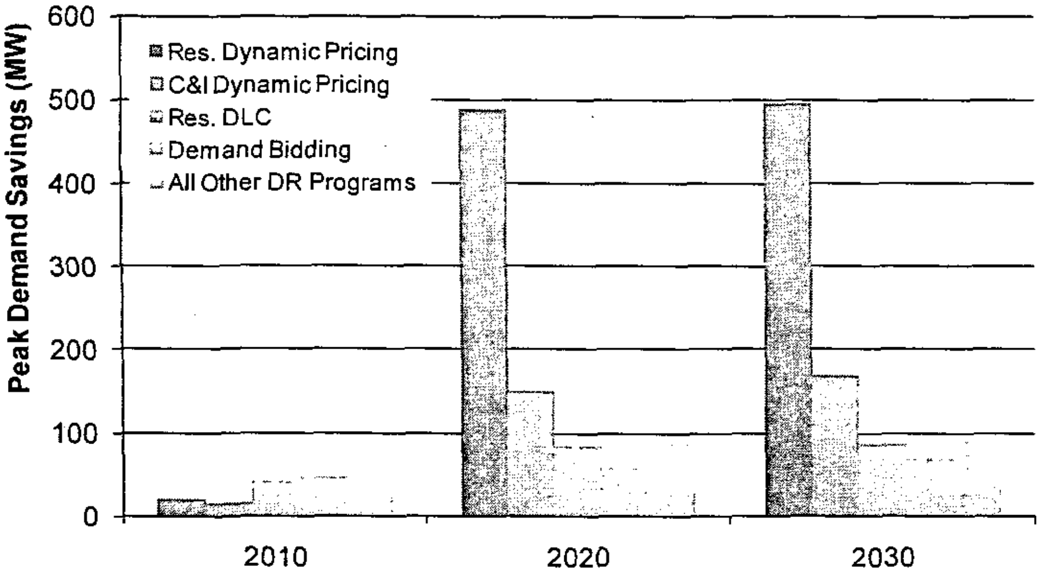


Table 12 identifies the list of demand-response programs included in the analysis together with the target segments for each. Figure 32 presents realistic achievable potential for selected years. In 2010, the majority of savings come from non-pricing programs, but by 2020 the trend is reversed and savings from dynamic pricing programs dominate.

Table 12 Demand Response Programs

Demand Response Program	Target Market Segment(s)
1. Residential Direct Load Control	All residential customers with air conditioning and electric water heating
2. Residential Dynamic Pricing	All residential customers
3. C&I Direct Load Control	All small-sized C&I customers (Rate 2M)
4. C&I Dynamic Pricing	All C&I customers (Rates 2M, 3M, 4M and 11M)
5. Demand Bidding	All medium- and large-sized C&I customers (Rates 3M, 4M and 11M)
6. Curtailable	All large-sized C&I customers (Rates 4M and 11M)
7. DR Aggregator Contracts	All C&I customers (Rates 2M, 3M, 4M and 11M)

Figure 32 Realistic Achievable Potential from Demand Response Programs



COMPARISON WITH OTHER STUDIES

The results of this AmerenUE study have been compared with three recent and relevant studies:

- The EPRI National Potential Study: ***Assessment of Achievable Potential from Energy Efficiency and Demand Response in the U.S. (2010-2030)***, TR 1016987, January 2009
- The Wisconsin Study: ***Energy Efficiency and Customer-Sited Renewable Resource Potential in Wisconsin, For the years 2012 and 2018***, ECW Report Number 244-1, April 2009
- The FERC Study: ***A National Assessment of Demand Response Potential***, Staff Report, June 2009

The EPRI Study

The EPRI Study assessed EE and DR potential for the U.S. and for four Census regions. AmerenUE is part of the Midwest Census region. The EPRI study has a 20-year time horizon and used a bottom-up analysis approach for the residential and commercial sectors, and a top-down approach for the industrial sector. (The AmerenUE study used a bottom-up analysis approach for all three sectors.) The base-year market characterization and the baseline end-use forecast were based on 2008 Annual Energy Outlook prepared by the Energy Information Administration. Energy-efficiency measures were comprehensive but not as extensive as the AmerenUE measure list. Market acceptance rates and program implementation factors were based on a Delphi approach with industry experts. The estimates of realistic achievable potential from this study represent a forecast of what is likely to occur and do not represent what might occur under "aggressive" utility programs. The AmerenUE parameters are based on primary market research with AmerenUE customers.

The Midwest regional results from the EPRI National Potential Study compare with AmerenUE as follows for the year 2030:

- EPRI economic potential in 2030 is 12.3%. AmerenUE economic potential is 16.6% and reflects the more extensive list of energy-efficiency measures.
- EPRI maximum achievable potential in 2030 is 10.1%, compared to the AmerenUE value of 11.0%. This reflects the lower market acceptance rates for AmerenUE based on market research.

- EPRI realistic achievable is 7.5%, compared with 7.3% for AmerenUE.

Even though the AmerenUE economic potential is higher than the EPRI study, the achievable potential estimates are in close alignment reflecting the results of the market research performed for the AmerenUE study.

The Wisconsin Study

The State of Wisconsin Study was conducted by Energy Center of Wisconsin (ECW), with subcontractors ACEEE, GDS Associates and L&S Technical Associates. It defines achievable potential not as a "middle-of-the-road" case, but rather as an upper-bound estimate of what could be achieved with aggressive utility programs. This study used a bottom-up analysis framework for the residential sector and a top-down approach for the C&I sectors. As mentioned above, market and program acceptance rates for AmerenUE are based on primary market research. The Wisconsin study used a Delphi approach to explore an aggressive energy-efficiency future in Wisconsin.

This study is regarded to be aggressive in its findings of energy-efficiency savings. Therefore, the results are compared with the RAP and MAP estimates from AmerenUE. Specifically, over a ten-year horizon, the ECW study concludes:

- Wisconsin economic potential is 18%, compared to 14% for AmerenUE.
- Wisconsin achievable potential is 13%, compared to 7% for AmerenUE RAP and 10% for AmerenUE MAP.

Given the definition of achievable potential used for the Wisconsin study and the approach for developing market acceptance rates, it is not surprising that the Wisconsin estimates of achievable potential are higher than the AmerenUE estimates.

The FERC Study

In 2008-2009, FERC conducted its first assessment of demand-response potential. The analysis was performed for each of the 50 states and the District of Columbia and aggregated to regional and national totals. The results reflect a bottom-up analysis approach that relies on secondary data from a variety of resources.

The definition of achievable potential for the FERC study is similar to that used for the Wisconsin EE study in that it is an aggressive perspective. Specifically, achievable potential is defined as what could be achieved over a ten-year horizon if advanced metering infrastructure (AMI) were deployed universally, dynamic pricing were the default tariff, and other DR programs, such as direct load control, were available to those who opted out of dynamic pricing. The FERC study also estimated an "expanded business as usual" scenario which represents expansion of current programs to all states and with higher participation rates, partial AMI deployment, and optional dynamic pricing tariffs. Participation rates are based on secondary data and expert judgment, whereas the AmerenUE rates are based on primary market research and expert judgment.

The FERC study provides the following estimates for the state of Missouri:

- FERC achievable potential is 19.2%, compared with 11.9% for maximum achievable for AmerenUE
- FERC expanded BAU is 14.1%, compared with 9.6% for realistic achievable potential for AmerenUE.

Since the definition of achievable potential in the FERC study is more aggressive (or optimistic) than that used for the AmerenUE study, it is not surprising that estimates of achievable potential are higher than the AmerenUE estimates.

ABOUT GLOBAL

Established in 1998, Global Energy Partners, LLC is a premier provider of energy and environmental engineering and technical services to utilities, energy companies, research organizations, government/regulatory agencies and private industry.

Global's offerings range from strategic planning to turn-key program design and implementation and technology applications.

Global is an employee-owned consulting organization committed to helping its clients achieve strategic business objectives with a staff of world-class experts, state of the art tools, and proven methodologies.

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Union Electric Company d/b/a Ameren Missouri
File No. ER-2011-0028

Pension Plan Costs Allowed in Rates/Payments

2007	Allowed in Rates	Expensed	Funded / Payment [1]	Tracker Balance
Qualified	$ 21,872,515	$ 20,705,950	$ 23,894,849	$ 2,022,334
Non-qualified	$ 539,216	$ 631,487	$ -	$ (539,216)
Total	$ 22,411,731	$ 21,337,437	$ 23,894,849	$ 1,483,118

2008	Allowed in Rates	Expensed	Funded / Payment [1]	Tracker Balance
Qualified	$ 37,495,740	$ 23,398,623	$ 33,791,082	$ (3,704,658)
Non-qualified	$ 924,369	$ 711,165	$ -	$ (924,369)
Total	$ 38,420,109	$ 24,109,788	$ 33,791,082	$ (4,629,027)

2009	Allowed in Rates	Expensed	Funded / Payment [1]	Tracker Balance
Qualified	$ 29,171,740	$ 36,235,694	$ 46,963,764	$ 17,792,024
Non-qualified	$ 909,033	$ 928,439	$ -	$ (909,033)
Total	$ 30,080,773	$ 37,164,133	$ 46,963,764	$ 16,882,991

2010	Allowed in Rates	Expensed	Funded / Payment [1]	Tracker Balance
Qualified	$ 26,583,318	$ 31,882,893	$ 38,658,855	$ 12,075,537
Non-qualified	$ 1,588,454	$ 1,138,900	$ 861,097	$ (727,357)
Total	$ 28,171,772	$ 33,021,793	$ 39,519,952	$ 11,348,180

Total	Allowed in Rates	Expensed	Funded / Payment [1]	Tracker Balance
Qualified	$ 115,123,313	$ 112,223,160	$ 143,308,549	$ 28,185,236
Non-qualified	$ 3,961,072	$ 3,409,991	$ 861,097	$ (3,099,975)
Total	$ 119,084,385	$ 115,633,151	$ 144,169,646	$ 25,085,261
			Adjustment to Pension Tracker	**$ (3,099,975)**

1 Source: Ameren Missouri's Response to Staff's Data Request No. 0354

Tracker for Pension and Other Post-Retirement Benefits

Intent:

1. These provisions are intended to accomplish the following:

a. To ensure that the amount collected in rates for pension and other postretirement benefit (OPEB) costs is based on the pension and OPEB trusts funding amounts for Accounting Standards Codification (ASC) 715-30 and ASC 715-60 (formerly FAS 87 and FAS106) costs Ameren Missouri recognizes for financial reporting purposes; and

b. To ensure Ameren Missouri recovers in rates certain contributions it makes to its pension and OPEB trusts; and

Procedure:

2. The ASC 715-30 and ASC 715-60 costs Ameren Missouri recognizes for financial reporting purposes shall be recognized in rates for all funded plans. The calculation of these costs shall be, unless specifically changed by the issuance of new FASB codifications, based on the Market Related Value of Assets that reflects asset gains and losses over a 4 year period. Unrecognized gains and losses shall be, unless specifically changed by the issuance of new FASB codifications, amortized over a 10-year period. This calculation does not employ the corridor approach. Ameren Missouri will inform the Staff of the Missouri Public Service Commission and the Office of Public Counsel as soon as it becomes aware of a new FASB codification that would affect the calculation parameters discussed above.

3. Each year Ameren Missouri shall contribute to its pensions and VEBA trusts the amount of its ASC 715-30 and ASC 715-60 costs for that year, excluding any cost or credit triggered due to any special events as described in paragraph 9.

4. Ameren Missouri shall be allowed rate recovery for contributions it makes to its pension trust that exceed its ASC 715-30 cost for any of the following reasons: the minimum required contribution is greater than the ASC 715-30 cost, and avoidance or reduction of Pension Benefit Guaranty Corporation (PBGC) variable premiums. To track

any such excess contributions, a regulatory asset will be established and will be included in rate base.

5. Due to the Pension Protection Act of 2006 (PPA), Ameren Missouri may be required to make necessary contributions in excess of ASC 715-30 level in order to avoid or lessen benefit restrictions under the PPA. Such contributions will be examined in the context of future rate cases and a determination will be made at that time as to the appropriate and proper level to be included in rate base through the pension and OPEBs tracker mechanism.

6. The difference between the level of pension (ASC 715-30) or OPEB (ASC 715-60) costs Ameren Missouri incurs and the level of those costs built into rates shall be tracked by means of regulatory assets and/or liabilities described in the following paragraphs.

7. Regulatory assets or liabilities shall be established on Ameren Missouri's books to track the difference between the level of ASC 715-30 and ASC 715-60 costs Ameren Missouri incurs during the period between general electric rate cases and the level of ASC 715-30 and ASC 715-60 costs built into rates for that period. If the ASC 715-30 or ASC 715-60 cost during the period is more than the ASC 715-30 or ASC 715-60 cost built into rates for the period, Ameren Missouri shall establish a regulatory asset which has been reduced by any existing regulatory liability for pensions, or OPEBs, maintained pursuant to the following paragraph. If the ASC 715-30 or ASC 715-60 cost during the period, adjusted for any amount of such expense used to reduce a regulatory liability maintained pursuant to the following paragraph, is less than the cost built into rates for the period, Ameren Missouri shall establish a regulatory liability. Since this is a cash item, the regulatory asset or liability will be included in rate base for purposes of setting new rates in the next rate case, and amortized over 5 years beginning with the effective date of the new rates.

8. If Ameren Missouri incurs negative ASC 715-30 or ASC 715-60 cost, Ameren Missouri shall set up a regulatory liability to offset the negative cost. The regulatory liability will increase by the amount of negative cost, or decrease by the amount of positive cost, in each subsequent year. Positive cost in such subsequent year will be used to reduce this regulatory liability before being used to establish a regulatory asset pursuant to the preceding paragraph. Any existing regulatory liability related to prior negative ASC 715-30 or ASC 715-60 cost will reduce the ASC 715-30 or ASC 715-60 cost included in cost of service in Ameren Missouri's next rate case. This regulatory liability is a noncash item that Ameren Missouri shall exclude from its rate base in future rate cases.

9. The parties have designed this agreement so that Ameren Missouri will receive through rates reimbursement of its ASC 715-30 and ASC 715-60 costs. Therefore, Ameren Missouri shall set up a regulatory asset to offset any charges that would otherwise be recorded against equity (e.g., decreases to other comprehensive income) caused by applying the provisions of ASC 715-20 or any other FASB codification that requires accounting adjustments due to the funded status or other attributes of Ameren Missouri's Pension or OPEB plans. This regulatory asset shall not be amortized into rates or included in rate base because Ameren Missouri will recover for the amounts in this regulatory asset in rates through Ameren Missouri's ASC 715-30 or ASC 715-60 costs in future years. This regulatory asset will increase or decrease each year by the same amount that the equity charge increases or decreases.

10. If Ameren Missouri has a curtailment, settlement, or special termination cost or credit due to requirements of applicable accounting rules according to ASC 715-30 (formerly FAS 88) and ASC 715-60 (formerly FAS 106), the following procedure will be used to address such a cost or credit.

a. If the special event triggers a charge, then Ameren Missouri will establish an offsetting regulatory asset. This regulatory asset will not be added to rate base (since it is not a cash item), and it will be amortized over 5 years beginning when new rates are implemented in Ameren Missouri's next general electric rate increase or decrease proceeding before the Missouri Public Service Commission. Ameren Missouri shall make additional contributions to the applicable pension or OPEB trust equal to the amount of the amortization.

b. If the special event triggers a credit, then Ameren Missouri shall establish an offsetting regulatory liability. This regulatory liability will not be added to rate base (since it is not a cash item), and it will be amortized over 5 years beginning when new rates are implemented in Ameren Missouri's next general electric rate increase or decrease proceeding before the Missouri Public Service Commission. Generally, Ameren Missouri will contribute to the applicable pension or OPEB trust an amount equivalent to its ASC 715-30/715-60 costs for the year less the amortization amount, subject to the following condition:

> If pension or OPEB cost becomes negative as a result of an ASC 715-30 or ASC 715-60 credit, the Parties agree Ameren Missouri shall set up an offsetting regulatory liability. This regulatory liability is a non-cash item which will not require rate base treatment. When ASC 715-30 or ASC 715-60 cost becomes positive again, the regulatory liability will be amortized over 5 years, or longer, if necessary to avoid the net of the ASC 715-30 or ASC 715-60 cost and the offsetting amortized regulatory liability yielding a result which is less than $0 in any year.

SCHEDULE LMF - 1

HAS BEEN DEEMED

HIGHLY CONFIDENTIAL

IN ITS ENTIRETY

Union Electric Company d/b/a Ameren Missouri
File No. ER-2011-0028

Ameren Missouri's Fuel Adjustment Clause Time Line

	MM/YY	
FAC allowed by Commission effective 3/23/09 (ER-2008-0318)	03/09	AP1 begins
	04/09	
	05/09	
	06/09	AP2 begins / AP1 ends
Ameren Missouri files to change FPA 7/31/09 (ER-2010-0044)	07/09	
	08/09	
	09/09	
	10/09	AP3 begins / AP2 ends / RP1 begins
Ameren Missouri files to change FPA 11/25/09 (ER-2010-0165)	11/09	
	12/09	
	01/10	
	02/10	AP4 begins/ AP3 ends / RP2 begins
Ameren Missouri files to change FPA 3/25/10 (ER-2010-0264)	03/10	
	04/10	
	05/10	
FAC Modified, NBFC re-based effective 6/23/10 (ER-2010-0036)	06/10	AP5 begins / AP4 ends / RP3 begins
Ameren Missouri files to change FPA 7/23/10 (ER-2011-0018)	07/10	
Staff Prudence Audit filed 8/31/10 (EO-2010-0255)	08/10	
	09/10	
	10/10	AP6 begins / AP5 ends / RP3 begins / RP1 ends
Ameren Missouri files to change FPA 11/24/10 (ER-2011-0153)	11/10	
Ameren Missouri files first true-up 12/1/10 (ER-2010-0274)	12/10	
	01/11	

FPA: Fuel and Puchased Power Adjustment

AP: Accumulation Period
RP: Recovery Period

In-Service Criteria for Sioux Plant (Unit 1)--SO_2 Control Equipment

1. All major construction work is complete.

   Based on personal observations of the facility on the following dates, all major construction is complete: May 1, 2008; July 9, 2009; and January 7, 2011.

2. All preoperational tests have been successfully completed.

   Preoperational tests were completed to support operational testing that was conducted in November 2010.

3. Equipment successfully meets the operational contract guarantees necessary to achieve the emission levels described in items (4) and (5) below.

   Applicable operational contract guarantees have been satisfied.

4. The equipment shall be operational and demonstrate its ability to operate at a SO_2 reduction efficiency equal to or greater than 92% over a continuous four (4) hour period or at an SO_2 emission rate equal to or less than 0.043 lb/mmBtu over a continuous four (4) hour period while the generating unit is operating at or above 95% of its design generation (532 MWgross).

   Based on operation from 2:00 p.m., November 23, 2010 through 6:00 p.m., November 23, 2010, the scrubber reduced SO_2 emissions by greater than 99.5%. The generating unit operated above 507 MWgross during this period. Based on a 532 MWgross rating for the unit, this is greater than 95% of its design generation.

5. The equipment shall also demonstrate its ability to operate at a SO2 reduction efficiency equal to or greater than 87% over a continuous 120-hour period or at an SO_2 emission rate equal to or less than 0.045 lb/mmBtu over a continuous 120-hour period while the generating unit is operating at or above 80% of its design generation (532 MWgross).

   Based on operation from 11:00 a.m., November 18, 2010 through 11:00 a.m., November 23, 2010, the scrubber reduced SO_2 emissions by greater than 98.2%. The generating unit operated above 451 MWgross during this period. Based on a 532 MWgross rating for the unit, this is greater than 84% of its design generation.

6. Continuous emission monitoring systems (CEMS) are operational and demonstrate the capability of monitoring the SO_2 emissions to satisfy the parameters in items (4) and (5) above.

   Based on review of the operational data for the scrubber testing conducted in November 2010 and personal observation on January 7, 2011, the CEMS were operational and capable of monitoring the parameters necessary for the testing in progress.

In-Service Criteria for Sioux Plant (Unit 2)--SO_2 Control Equipment

7. All major construction work is complete.

   Based on personal observations of the facility on the following dates, all major construction is complete: May 1, 2008; July 9, 2009; and January 7, 2011.

8. All preoperational tests have been successfully completed.

   Preoperational tests were completed to support operational testing that was conducted in November 2010.

9. Equipment successfully meets the operational contract guarantees necessary to achieve the emission levels described in items (4) and (5) below.

   Applicable operational contract guarantees have been satisfied.

10. The equipment shall be operational and demonstrate its ability to operate at a SO_2 reduction efficiency equal to or greater than 92% over a continuous four (4) hour period or at an SO_2 emission rate equal to or less than 0.043 lb/mmBtu over a continuous four (4) hour period while the generating unit is operating at or above 95% of its design generation (505 MWgross).

    Based on operation from 2:00 p.m., November 23, 2010 through 6:00 p.m., November 23, 2010, the scrubber reduced SO_2 emissions by greater than 98.9%. The generating unit operated above 488 MWgross during this period. Based on a 505 MWgross rating for the unit, this is greater than 96% of its design generation.

11. The equipment shall also demonstrate its ability to operate at a SO2 reduction efficiency equal to or greater than 87% over a continuous 120-hour period or at an SO_2 emission rate equal to or less than 0.045 lb/mmBtu over a continuous 120-hour period while the generating unit is operating at or above 80% of its design generation (505 MWgross).

    Based on operation from 11:00 a.m., November 18, 2010 through 11:00 a.m., November 23, 2010, the scrubber reduced SO_2 emissions by greater than 98.2%. The generating unit operated above 415 MWgross during this period. Based on a 505 MWgross rating for the unit, this is greater than 82% of its design generation.

12. Continuous emission monitoring systems (CEMS) are operational and demonstrate the capability of monitoring the SO_2 emissions to satisfy the parameters in items (4) and (5) above.

    Based on review of the operational data for the scrubber testing conducted in November 2010, the CEMS were operational and capable of monitoring the parameters necessary for the testing in progress.