

APPENDIX 8-J. LIFE-CYCLE COST ANALYSIS USING ALTERNATIVE ECONOMIC GROWTH SCENARIOS

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APPENDIX 8-J. LIFE-CYCLE COST ANALYSIS RESULTS USING ALTERNATIVE ECONOMIC GROWTH SCENARIOS

8-J.1 INTRODUCTION

This appendix presents LCC results using energy price forecasts from alternative economic growth scenarios. The scenarios are based on the High Economic Growth case and the Low Economic Growth case from the March 2009 release of *AEO2009*¹ and the Early Release (December 2009) of the *AEO2010*.² The *AEO 2010* Early Release only provides forecasts for the Reference Case. Therefore, DOE based the low-growth and high-growth forecasts on the ratio between the *AEO 2009* March Release low- or high-growth forecasts and the *AEO 2009* March Release reference case. DOE then applied these ratios to the *AEO 2010* Early Release Reference case to construct its high- growth and low- growth forecasts. For energy prices from 2031 to 2035 in the high and low scenarios, DOE used the moving average. For energy prices after 2035 in the high and low scenarios, DOE assumed the same growth rate as was provided in *AEO2010* for the Reference Case.

The forecasts in these cases are shown in Appendix 10-B. Energy prices are higher in the High Economic Growth case and lower in the Low Economic Growth case. The energy price forecasts affect the energy savings at different efficiency levels.

8-J.2 HIGH ECONOMIC GROWTH RESULTS

8-J.2.1 Water Heaters

Table 8-J.2.1 Gas-Fired Storage Water Heaters: LCC and PBP Results (High Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	0.59	\$1,079	\$2,554	\$3,633						
1	0.62	\$1,171	\$2,434	\$3,605	\$18	25%	36%	39%	1.9	16.5
2	0.63	\$1,244	\$2,368	\$3,612	\$11	32%	22%	46%	4.4	17.9
3	0.64	\$1,559	\$2,361	\$3,920	-\$263	72%	12%	16%	34.0	55.6
4	0.65	\$1,591	\$2,293	\$3,884	-\$229	70%	6%	23%	25.1	38.1
5	0.67	\$1,656	\$2,208	\$3,864	-\$209	70%	6%	24%	20.7	26.0
6	0.77	\$1,893	\$1,939	\$3,832	-\$178	69%	1%	30%	15.0	16.2

Table 8-J.2.2 Electric Storage Water Heaters: LCC and PBP Results (High Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	0.90	\$569	\$2,824	\$3,393						
1	0.91	\$602	\$2,786	\$3,388	\$0	7%	68%	25%	3.7	11.5
2	0.92	\$623	\$2,750	\$3,373	\$7	11%	44%	45%	3.9	9.9
3	0.93	\$634	\$2,728	\$3,362	\$13	12%	39%	49%	3.9	9.7
4	0.94	\$674	\$2,676	\$3,350	\$22	21%	17%	63%	4.9	9.0
5	0.95	\$711	\$2,638	\$3,349	\$23	30%	10%	60%	6.5	9.6
6	2.00	\$1,575	\$1,630	\$3,204	\$159	48%	5%	47%	9.1	25.6
7	2.35	\$1,703	\$1,433	\$3,136	\$227	47%	1%	52%	8.8	19.9

Table 8-J.2.3 Oil-Fired Storage Water Heaters: LCC and PBP Results (High Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	0.53	\$1,948	\$6,670	\$8,618						
1	0.54	\$1,962	\$6,545	\$8,507	\$0	0%	100%	0%	NA	NA
2	0.56	\$1,975	\$6,309	\$8,284	\$49	0%	78%	22%	0.6	0.6
3	0.58	\$2,002	\$6,089	\$8,091	\$91	0%	78%	22%	1.0	1.0
4	0.60	\$1,987	\$5,884	\$7,871	\$163	0%	68%	32%	0.4	0.3
5	0.62	\$2,016	\$5,693	\$7,708	\$232	0%	59%	41%	0.7	0.9
6	0.66	\$2,156	\$5,421	\$7,577	\$312	2%	42%	56%	2.6	3.7
7	0.68	\$2,154	\$5,297	\$7,452	\$411	0%	21%	79%	1.9	2.1

Table 8-J.2.4 Gas-Fired Instantaneous Water Heaters: LCC and PBP Results (High Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	0.62	\$1,778	\$4,414	\$6,191						
1	0.69	\$1,807	\$4,000	\$5,806	\$4	0%	99%	1%	1.1	1.0
2	0.78	\$2,090	\$3,325	\$5,414	\$19	0%	96%	4%	5.7	5.8
3	0.80	\$2,303	\$3,266	\$5,569	\$12	2%	95%	3%	10.3	25.5
4	0.82	\$2,378	\$3,208	\$5,586	\$10	5%	91%	4%	14.7	24.2
5	0.84	\$2,950	\$3,153	\$6,102	-\$305	60%	39%	1%	142.5	199.0
6	0.85	\$3,051	\$3,126	\$6,176	-\$352	62%	37%	1%	123.5	168.2
7	0.92	\$2,894	\$2,954	\$5,848	-\$132	54%	33%	13%	29.8	43.3
8	0.95	\$3,096	\$2,889	\$5,984	-\$251	77%	12%	11%	37.5	53.1

8-J.2.2 Direct Heating Equipment

Table 8-J.2.5 Gas Wall Fan DHE: LCC and PBP Results (High Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	74%	\$1,832	\$5,679	\$7,510						
1	75%	\$1,888	\$5,409	\$7,297	\$86	0%	60%	40%	2.7	2.6
2	76%	\$1,912	\$5,344	\$7,256	\$105	3%	53%	44%	3.2	3.9
3	77%	\$1,957	\$5,280	\$7,237	\$119	19%	26%	55%	5.0	9.9
4	80%	\$2,200	\$5,108	\$7,309	\$52	52%	7%	41%	11.9	33.5

Table 8-J.2.6 Gas Wall Gravity DHE: LCC and PBP Results (High Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	64%	\$1,433	\$5,632	\$7,065						
1	66%	\$1,494	\$5,483	\$6,977	\$22	10%	75%	15%	7.5	13.6
2	68%	\$1,530	\$5,342	\$6,872	\$75	15%	50%	36%	5.2	10.9
3	69%	\$1,609	\$5,275	\$6,883	\$68	32%	37%	31%	10.9	22.2
4	70%	\$1,924	\$5,074	\$6,998	-\$47	69%	0%	31%	16.5	18.4

Table 8-J.2.7 Gas Floor DHE: LCC and PBP Results (High Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	57%	\$2,209	\$5,714	\$7,923						
1	58%	\$2,263	\$5,628	\$7,891	\$14	22%	58%	20%	10.7	16.5

Table 8-J.2.8 Gas Room DHE: LCC and PBP Results (High Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	64%	\$1,208	\$6,340	\$7,548						
1	65%	\$1,242	\$6,253	\$7,495	\$14	9%	74%	16%	6.6	9.9
2	66%	\$1,275	\$6,169	\$7,444	\$27	9%	74%	16%	6.7	11.8
3	67%	\$1,291	\$6,087	\$7,378	\$61	12%	50%	38%	4.5	8.3
4	68%	\$1,311	\$6,007	\$7,318	\$106	18%	25%	57%	4.6	8.2
5	83%	\$1,849	\$4,854	\$6,703	\$721	31%	0%	69%	7.0	8.7

Table 8-J.2.9 Gas Hearth DHE: LCC and PBP Results (High Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	64%	\$1,603	\$3,884	\$5,486						
1	67%	\$1,685	\$3,516	\$5,201	\$115	2%	61%	37%	0.0	3.1
2	72%	\$2,074	\$3,302	\$5,376	-\$23	55%	23%	22%	16.9	46.6
3	93%	\$2,867	\$2,649	\$5,516	-\$162	77%	1%	22%	26.5	59.7

8-J.2.3 Pool Heaters**Table 8-J.2.10 Gas-Fired Pool Heaters: LCC and PBP Results (High Growth)**

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	78%	\$3,240	\$5,193	\$8,433						
1	79%	\$3,283	\$5,133	\$8,416	\$0	1%	98%	1%	5.0	9.9
2	81%	\$3,308	\$5,016	\$8,325	\$26	5%	72%	23%	2.5	5.2
3	82%	\$3,367	\$4,960	\$8,327	\$24	26%	51%	23%	8.5	14.7
4	83%	\$3,484	\$4,911	\$8,395	-\$31	59%	23%	18%	17.2	33.2
5	84%	\$3,594	\$4,858	\$8,452	-\$76	66%	21%	13%	20.2	40.7
6	86%	\$4,146	\$4,940	\$9,086	-\$652	88%	9%	3%	40.9	90.3
7	90%	\$5,032	\$4,747	\$9,779	-\$1,337	96%	1%	2%	46.6	103.7
8	95%	\$5,283	\$4,529	\$9,812	-\$1,370	95%	1%	4%	34.8	76.6

8-J.3 LOW ECONOMIC GROWTH RESULTS

8-J.3.1 Water Heaters

Table 8-J.3.1 Gas-Fired Storage Water Heaters: LCC and PBP Results (Low Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	0.59	\$1,079	\$2,373	\$3,452						
1	0.62	\$1,171	\$2,262	\$3,433	\$12	25%	36%	39%	2.0	17.5
2	0.63	\$1,244	\$2,200	\$3,445	\$1	33%	22%	45%	4.6	19.2
3	0.64	\$1,559	\$2,194	\$3,753	-\$272	72%	12%	16%	36.4	58.8
4	0.65	\$1,591	\$2,131	\$3,722	-\$243	71%	6%	23%	26.9	40.7
5	0.67	\$1,656	\$2,051	\$3,707	-\$229	71%	6%	23%	22.2	28.0
6	0.77	\$1,893	\$1,803	\$3,696	-\$217	72%	1%	27%	16.1	17.3

Table 8-J.3.2 Electric Storage Water Heaters: LCC and PBP Results (Low Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	0.90	\$569	\$2,596	\$3,165						
1	0.91	\$602	\$2,561	\$3,162	-\$2	7%	68%	25%	3.8	12.2
2	0.92	\$623	\$2,535	\$3,158	\$4	11%	45%	44%	4.0	10.4
3	0.93	\$635	\$2,514	\$3,149	\$9	13%	40%	48%	4.0	10.3
4	0.94	\$674	\$2,459	\$3,133	\$15	21%	17%	62%	5.2	9.4
5	0.95	\$711	\$2,424	\$3,135	\$13	33%	10%	58%	6.9	10.1
6	2.00	\$1,574	\$1,498	\$3,071	\$76	51%	5%	44%	9.5	25.6
7	2.35	\$1,702	\$1,318	\$3,019	\$129	51%	1%	48%	9.2	19.9

Table 8-J.3.3 Oil-Fired Storage Water Heaters: LCC and PBP Results (Low Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	0.53	\$1,948	\$6,375	\$8,323						
1	0.54	\$1,962	\$6,258	\$8,219	\$0	0%	100%	0%	NA	NA
2	0.56	\$1,975	\$6,035	\$8,010	\$46	0%	78%	22%	0.6	0.6
3	0.58	\$2,002	\$5,828	\$7,830	\$85	0%	78%	22%	1.0	1.0
4	0.60	\$1,987	\$5,635	\$7,621	\$153	0%	68%	32%	0.4	0.3
5	0.62	\$2,016	\$5,454	\$7,470	\$218	0%	59%	41%	0.7	0.9
6	0.66	\$2,156	\$5,197	\$7,353	\$288	3%	42%	55%	2.7	3.8
7	0.68	\$2,154	\$5,081	\$7,235	\$382	0%	21%	79%	1.9	2.1

Table 8-J.3.4 Gas-Fired Instantaneous Water Heaters: LCC and PBP Results (Low Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	0.62	\$1,778	\$4,140	\$5,919						
1	0.69	\$1,807	\$3,758	\$5,565	\$4	0%	99%	1%	1.2	1.1
2	0.78	\$2,090	\$3,135	\$5,225	\$17	0%	96%	3%	6.2	6.2
3	0.80	\$2,303	\$3,081	\$5,384	\$9	2%	95%	3%	11.2	26.6
4	0.82	\$2,379	\$3,027	\$5,406	\$7	6%	91%	4%	15.2	25.0
5	0.84	\$2,950	\$2,976	\$5,926	-\$311	60%	39%	1%	164.5	208.9
6	0.85	\$3,051	\$2,951	\$6,002	-\$360	63%	36%	1%	131.2	176.8
7	0.92	\$2,894	\$2,793	\$5,686	-\$146	56%	32%	12%	31.7	46.0
8	0.95	\$3,096	\$2,732	\$5,827	-\$270	78%	12%	10%	39.5	56.3

8-J.3.2 Direct Heating Equipment

Table 8-J.3.5 Gas Wall Fan DHE: LCC and PBP Results (Low Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	74%	\$1,832	\$5,353	\$7,185						
1	75%	\$1,888	\$5,101	\$6,989	\$79	0%	60%	40%	2.7	2.7
2	76%	\$1,912	\$5,040	\$6,952	\$96	3%	53%	44%	3.3	3.9
3	77%	\$1,957	\$4,980	\$6,937	\$107	20%	26%	54%	5.2	10.0
4	80%	\$2,200	\$4,818	\$7,019	\$31	55%	7%	38%	12.3	34.2

Table 8-J.3.6 Gas Wall Gravity DHE: LCC and PBP Results (Low Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	64%	\$1,433	\$5,310	\$6,744						
1	66%	\$1,494	\$5,170	\$6,664	\$19	10%	75%	15%	7.5	14.1
2	68%	\$1,530	\$5,038	\$6,568	\$68	16%	50%	35%	5.5	11.4
3	69%	\$1,609	\$4,975	\$6,583	\$58	34%	37%	29%	11.3	22.8
4	70%	\$1,924	\$4,787	\$6,711	-\$69	72%	0%	28%	16.9	19.2

Table 8-J.3.7 Gas Floor DHE: LCC and PBP Results (Low Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	57%	\$2,209	\$5,382	\$7,591						
1	58%	\$2,263	\$5,301	\$7,564	\$11	23%	58%	19%	10.7	17.0

Table 8-J.3.8 Gas Room DHE: LCC and PBP Results (Low Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	64%	\$1,208	\$6,059	\$7,267						
1	65%	\$1,242	\$5,976	\$7,218	\$13	10%	74%	16%	6.6	10.1
2	66%	\$1,275	\$5,896	\$7,171	\$25	10%	74%	16%	6.7	12.0
3	67%	\$1,291	\$5,817	\$7,108	\$57	13%	50%	38%	4.5	8.4
4	68%	\$1,311	\$5,742	\$7,053	\$99	20%	25%	56%	4.9	8.4
5	83%	\$1,849	\$4,640	\$6,489	\$662	34%	0%	66%	7.1	9.0

Table 8-J.3.9 Gas Hearth DHE: LCC and PBP Results (Low Growth)

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	64%	\$1,603	\$3,709	\$5,311						
1	67%	\$1,685	\$3,361	\$5,046	\$107	3%	61%	36%	0.0	3.2
2	72%	\$2,074	\$3,156	\$5,230	-\$38	57%	23%	20%	17.4	47.1
3	93%	\$2,867	\$2,536	\$5,402	-\$209	78%	1%	21%	27.5	61.2

8-J.3.3 Pool Heaters**Table 8-J.3.10 Gas-Fired Pool Heaters: LCC and PBP Results (Low Growth)**

Efficiency Level ID	Energy Factor	Life-Cycle Cost (2009\$)			Life-Cycle Cost Savings				Payback Period (years)	
		Average Installed Price	Average Lifetime Operating Cost	Average LCC	Average Savings (2009\$)	Households with			Median	Average
						Net Cost	No Impact	Net Benefit		
Baseline	78%	\$3,240	\$4,942	\$8,182						
1	79%	\$3,283	\$4,884	\$8,168	\$0	1%	98%	1%	6.2	10.3
2	81%	\$3,308	\$4,774	\$8,082	\$24	5%	72%	23%	2.6	5.4
3	82%	\$3,367	\$4,721	\$8,088	\$21	27%	51%	22%	8.6	15.0
4	83%	\$3,484	\$4,675	\$8,158	-\$36	61%	23%	16%	18.4	33.9
5	84%	\$3,594	\$4,624	\$8,218	-\$83	68%	21%	12%	20.4	41.9
6	86%	\$4,146	\$4,712	\$8,857	-\$665	89%	9%	2%	42.4	92.4
7	90%	\$5,032	\$4,529	\$9,561	-\$1,359	97%	1%	2%	48.4	107.9
8	95%	\$5,283	\$4,322	\$9,605	-\$1,404	95%	1%	4%	36.0	79.7

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