

**APPENDIX R. LIFE-CYCLE-COST AND NATIONAL ENERGY SAVINGS USING
THE MOST CURRENT RECS 1997 AND AEO 2000 DATA**

R.1	INTRODUCTION	R-1
R.1.1	How Updating RECS and AEO Data Affects the Analysis	R-1
R.1.1.1	Input Parameter Changes to LCC / Payback Spreadsheet	R-1
R.1.1.2	Input Parameter Changes to NES / Shipment Spreadsheet	R-2
R.2	LIFE-CYCLE-COST & PAYBACK PERIOD	R-2
R.2.1	Life-Cycle-Cost Results	R-3
R.2.2	Distribution Payback Results	R-4
R.2.3	Rebuttable Payback Period Results	R-4
R.2.4	Comparison of LCC & Payback Period Results	R-5
R.3	NATIONAL ENERGY SAVINGS (NES)	R-6
R.3.1	National Energy and Water Savings Results	R-6
R.3.2	Comparison of NES Results for AEO99/RECS93 and AEO2000/RECS97 Input Data	R-8

LIST OF TABLES

Table R.1	Summary of LCC Results	R-3
Table R.2	Summary of Payback Period Results	R-4
Table R.3	Rebuttable Presumption Payback in Years	R-4
Table R.4	LCC for Trial Standard Level 3	R-5
Table R.5	Distribution Payback Periods for Trial Standard Level 3	R-5
Table R.6	Rebuttable Presumption Payback Periods for Trial Standard Level 3	R-5
Table R.7	Reference Case - All Parameters Set to Medium or Average	R-6
Table R.8	NES Results: Proposed Rule (MEF=1.04 in 2004 & MEF = 1.26 in 2007) ...	R-6
Table R.9	Efficiency Level: Energy and Water Savings (proposed rule, TSL 3)	R-7
Table R.10	NES Results: Proposed rule (MEF = 1.04 in 2004 & MEF = 1.26 in 2007) ...	R-8

LIST OF FIGURES

Figure R.1	Distribution of Life-Cycle-Costs Savings for an MEF of 1.26	R-3
Figure R.2	Distribution of Payback Periods for a MEF of 1.26	R-4

APPENDIX R. LIFE-CYCLE-COST AND NATIONAL ENERGY SAVINGS USING THE MOST CURRENT RECS 1997 AND AEO 2000 DATA

R.1 INTRODUCTION

Since the TSD was written for the NOPR, more updated data has become available from EIA, for both the Residential Energy Consumption Survey (RECS97) and for the Annual Energy Outlook (AEO2000). This appendix will show that the results and conclusions in the NOPR TSD are not affected significantly by the new data.

R.1.1 How Updating RECS and AEO Data Affects the Analysis

Updating analysis with more current RECS data and AEO fuel forecasts affects the inputs to the LCC and NES analysis.

R.1.1.1 Input Parameter Changes to LCC / Payback Spreadsheet

Changes due to RECS

The 1993 version of RECS sampled more households than the 1997 version. After culling out the households that did not have a clothes washer and a clothes dryer. The 1993 RECS gave a sample size of 4396 households. When the same criteria was used to determine a sample set from the 1997 RECS, 2833 households were included in the sample. Data from the RECS database used in the LCC analysis are:

- marginal energy prices (both a distribution and average prices are used in the LCC spreadsheet),
- cycles per year (based on the number of household occupants and then normalized to an average of 392 cycles per year to agree with the test procedure),
- to separate households into having rural versus urban for purposes of determining water and wastewater removal expenses,
- differences in the percentages of households using the various fuel types.

Changes due to AEO

The AEO data generated by a variation of the EIA's NEMS program, called NEMS-BRS provides a year by year forecast of fuel prices. This average fuel price forecast is used to escalate the marginal price as determined for the year of the RECS data. In other words, to determine a fuel price escalation rate.

R.1.1.2 Input Parameter Changes to NES/Shipment Spreadsheet

Changes due to RECS

The NES spreadsheet does not use a distribution of fuel prices but does use an average marginal rate for each fuel type and this is determined from the RECS database of households having a washer and a dryer.

Changes due to AEO

For the NES, updating to the AEO2000 data has an effect on the forecasted escalation of fuel prices including: electricity, natural gas, LPG and oil. This in turn affects shipments and the national energy savings. A change in forecasted shipments also effects the forecasted energy savings. As in the LCC analysis the fuel price escalation rate is determined from yearly AEO fuel price forecasts.

NEMS-BRS forecasting model is updated every year and is used to determine the fuel price forecasts. Other internal changes to the latest version of NEMS-BRS also have an effect on the NES analysis. Among these is the heat rate (or source conversion factor) used to determine the source energy consumption. The heat rate varies from appliance to appliance as the average annual heat rate used depends on the daily and seasonal load profile for a particular appliance. The clothes washer load profile, uses the same load profile as specified for water heaters. This is due to water heating being the major load for a clothes washer. The NEMS-BRS heat rate includes the transmission and distribution losses. Heat rate projections differed significantly from the AEO 1999 projections.

To be consistent with an updated NEMS-BRS model, the housing completions and housing stock are also updated with the latest data. There was no significant change in housing completions.

R.2 LIFE-CYCLE-COST & PAYBACK PERIOD

Rather than redo the entire analysis with the updated RECS97 and AEO2000 data, the tables below show updated LCC results for only the standard level proposed in the NOPR (TSL 3). These results are compared to the results in the main body of the TSD which are based on RECS93 and AEO1999.. (Each table is referenced to the equivalent table in chapter 7 of the TSD). All results shown here are for the reference AEO scenario, i.e., not high or low economic growth assumptions.

R.2.1 Life-Cycle-Cost Results

Figure R.1 shows the distribution of life-cycle-costs using input data from RECS97 and AEO2000. The life-cycle-cost is for the second tier of the proposed standard (TSL 3) which takes effect in 2007.

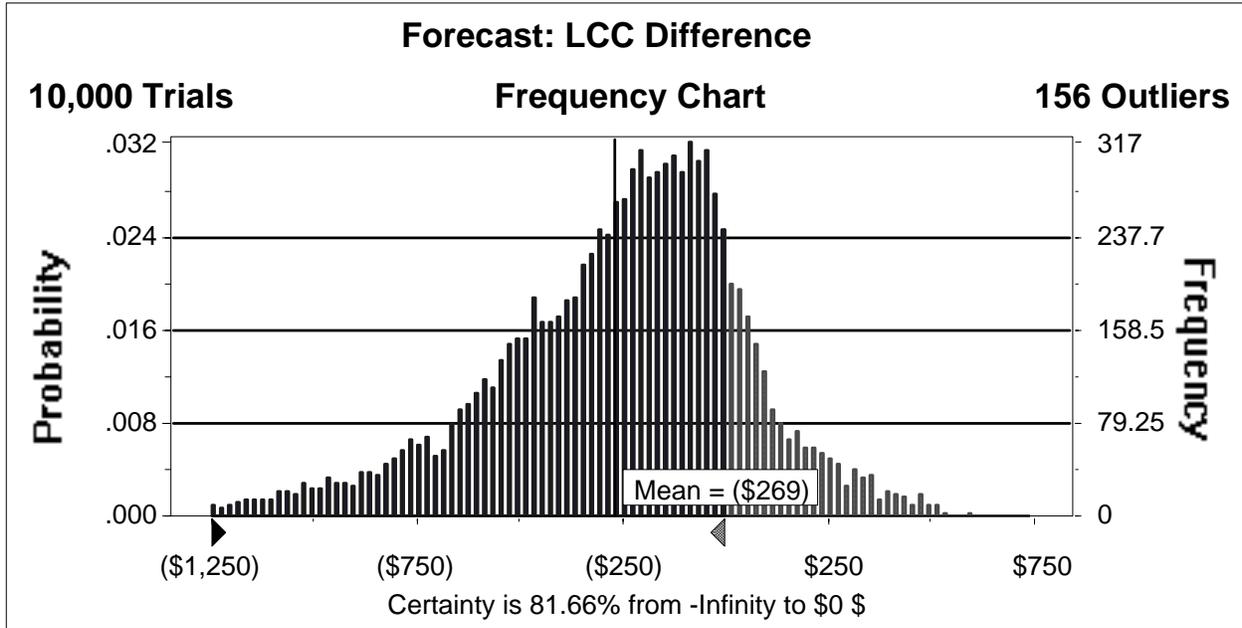


Figure R.1 Distribution of Life-Cycle-Cost Savings for an MEF of 1.26

Table R.1 Summary of LCC Results

Trial Std. Level	MEF	Change in LCC from Baseline Shown by Percentiles of the Distribution of Results (values in \$)								Percent with LCC Less than Baseline
		0	10	25	50	75	90	100	Mean	
3	1.04 MEF in 2004	(\$1,011)	(\$233)	(\$153)	(\$86)	(\$37)	(\$1)	\$116	(\$105)	90
	1.26 MEF in 2007	(\$2,784)	(\$701)	(\$444)	(\$216)	(\$49)	\$85	\$620	(\$269)	82

See Table 7.6 for RECS 93 / AEO 99 version

R.2.2 Distribution Payback Period Results

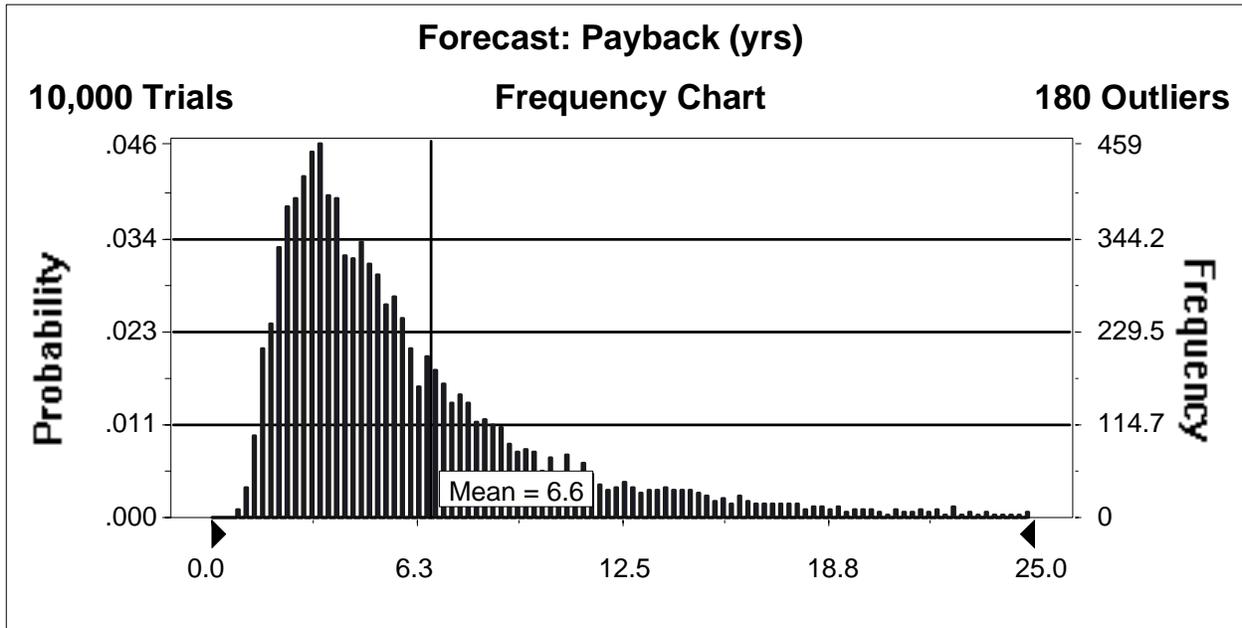


Figure R.2 Distribution of Payback Periods for a MEF of 1.26

Table R.2 Summary of Payback Period Results

Trial Standard Level	MEF	Payback Period in Years Shown by Percentiles of the Distribution of Results							
		0%	10%	25%	50%	75%	90%	100%	Mean
3	1.04 MEF in 2004	0.0	0.9	1.9	3.5	5.8	9.2	182.7	4.6
	1.26 MEF in 2007	0.8	2.3	3.2	4.9	7.9	12.9	194.2	6.6

See Table 7.9 for RECS 93 / AEO 99 version

R.2.3 Rebuttable Payback Period Results

Table R.3 Rebuttable Presumption Payback in Years

Market Share	91%	9%	
Standard Level	0% (MEF=0.860) to new Standard Level	35% (MEF= 1.257) to New Standard Level	Weighted Payback
MEF = 1.04 (in 2004)	2.7	NA	2.7
MEF = 1.26 (in 2007)	4.3	20.4	5.7

Note: NA = not applicable

See Table 7.12 for RECS 93 / AEO 99 version

R.2.4 Comparison of LCC & Payback Period Results

Table R.4 below shows that there are no significant differences between the RECS93/AEO99 and RECS97/AEO2000 values. The difference is within the variation in results from successive Monte Carlo simulations. Distribution payback period results, have a maximum difference in the mean payback period of 3%

Table R.4 LCC for Trial Standard Level 3

Level	RECS93/AEO99		RECS97/AEO2000	
	Mean	Percent with LCC Less than Baseline	Mean	Percent with LCC Less than Baseline
1.04 MEF in 2004	\$ (103)	90	\$ (105)	90
1.26 MEF in 2007	\$ (260)	81	\$ (269)	82

Table R.5 Distribution Payback Periods for Trial Standard Level 3

Level	RECS93/AEO99		RECS97/AEO2000	
	Median	Mean	Median	Mean
1.04 MEF in 2004	3.5	4.6	3.5	4.6
1.26 MEF in 2007	5.0	6.8	4.9	6.6

Table R.6 Rebuttable Presumption Payback Periods for Trial Standard Level 3

Level	Weighted Payback	
	RECS93/AEO99	RECS97/AEO2000
1.04 MEF in 2004	2.5	2.7
1.26 MEF in 2007	5.5	5.7

R.3 NATIONAL ENERGY SAVINGS (NES)

R.3.1 National Energy and Water Savings Results

Shown below are tables that reproduce the results in Chapter 10 of the TSD, except that they use RECS97 and AEO2000 as inputs to the NES/Shipment spreadsheet. Each table is referenced to its equivalent in Chapter 10. Results are provided for each of the six trial standard levels considered. All results in the tables below are for the AEO reference case economic growth assumptions. All other parameters are set to medium or average. In other words, the main scenario is shown, not the sensitivity cases.

Table R.7 Reference Case – All Parameters Set to Medium or Average

Trial Standard Level	MEF	Efficiency Improvement over the Base Case	Energy Savings Quads	Water Savings trillion gallons	Net Present Value (NPV) (billion 1997\$)
1	1.021	20%	2.09	0.52	3.76
2	1.089	25%	3.98	8.93	14.30
4	1.257	35%	5.92	12.71	16.89
5	1.362	40%	5.95	12.71	16.75
6	1.634	50%	7.44	10.66	10.94
3	1.04 in 2004 1.26 in 2007	22% 35%	5.42	11.36	15.33

See Table 10.7 for RECS 93 / AEO 99 version

Table R.8 NES Results: Proposed rule (MEF = 1.04 in 2004 & MEF=1.26 in 2007)

Cost and Net Present Values Discounted from 2004 at 7% real to 1997 (in billion 1997\$)	
Total Energy & Water Savings	27.09
Net equipment Cost	11.77
Net Present Benefit	15.33
Benefit/Cost Ratio	2.3

See Table 10.8 for RECS 93 / AEO 99 version

Table R.9 Efficiency Level: Energy and Water Savings (proposed rule, TSL 3)

	Energy Saving in Quads					Water Saving (Trillion gals)
	Total	Elec	Gas	Oil	LPG	
From 2004 to 2010	0.41	0.26	0.14	0.01	0.01	0.60
to 2020	2.52	1.51	0.90	0.06	0.04	4.91
to 2030	5.42	3.21	1.98	0.13	0.10	11.36

See Table 10.9 for RECS 93 / AEO 99 version

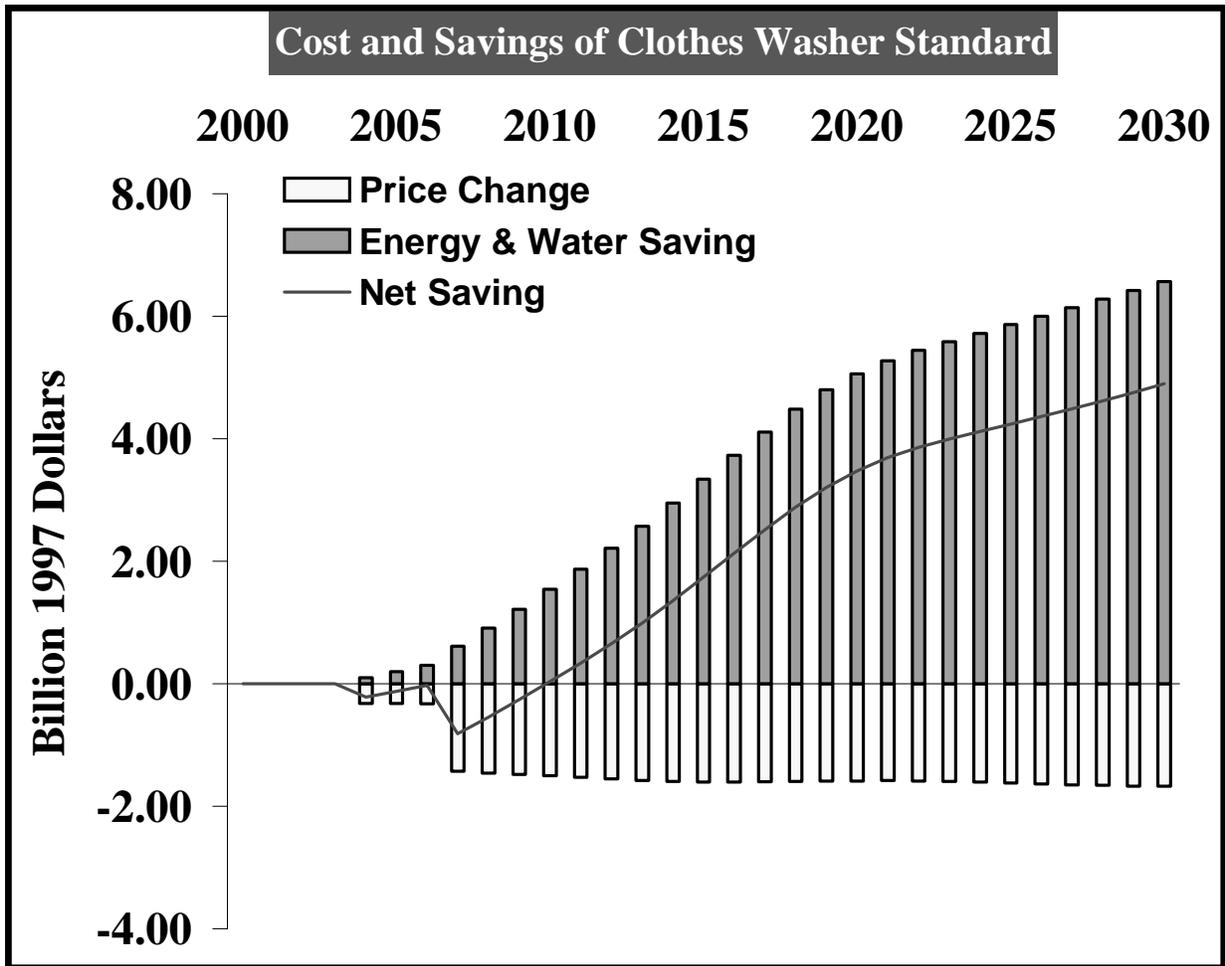


Figure R.3 Annual Cost and Savings for the Proposed Clothes Washer Rule (TSL 3)

R.3.2 Comparison of NES Results for AEO99 and AEO2000 Input Data

Table R.10 NES Results: Proposed rule (MEF = 1.04 in 2004 & MEF=1.26 in 2007)

Cost and Net Present Values Discounted from 2004 at 7% real to 1997 (in billion 1997\$)			
	AEO99, RECS93	AEO2000, RECS97	% change
Total Energy & Water Savings	27.16	27.09	-0.26%
Net equipment Cost	11.86	11.77	-0.76%
Net Present Benefit	15.30	15.33	0.20%
Benefit/Cost Ratio	2.3	2.3	0.0%

As shown in Table R.10 above for the proposed trial standard (TSL 3), differences in the results are less than 1%, and therefore, not significant.