APPENDIX S. NATIONAL EQUIPMENT AND OPERATING COSTS

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APPENDIX S. NATIONAL EQUIPMENT AND OPERATING COSTS

S.1 INTRODUCTION

In this appendix, the Department presents the components of the net present value (NPV), namely, the present value of the equipment (or total installed costs) and the present value of the operating costs. The present value of equipment costs is also termed the cumulative national equipment costs while the present value of operating costs is also termed the cumulative national operating costs.

As presented in Chapter 10, National Energy Savings and Consumer Impacts, the NPV is described by the equation:

$$NPV = PVS - PVC$$

where *PVS* is the present value of operating cost savings (including electricity, repair, and maintenance costs) and *PVC* is the present value of increased total installed costs (including equipment and installation). *PVS* and *PVC* are determined according to the following expressions:

$$PVS = \sum OCS_y \cdot DF_y$$

$$PVC = \sum TIC_y \cdot DF_y$$

where *OCS* are the total annual operating cost savings, *TIC* are the total annual installed cost increases, *DF* is the discount factor, and *y* is the year for which *PVS* and *PVC* are determined. *PVS* and *PVC* are determined for each year from the effective date of the standard to the year when units purchased in 2035 retire.

The present value of operating costs and the present value of equipment costs (or total installed costs) are the components comprising the *PVS* and *PVC*, respectively. The *PVS* is determined by taking the difference between the present value of operating costs for the base case and the present value of operating costs for the standards case. The *PVC* is determined by taking the difference between the present value of equipment costs for the base case and the present value of equipment costs for the standards case.

S.2 RESULTS

Tables S.2.1 and S.2.2 provide the present value of operating costs (also known as the cumulative national operating costs) and the present value of equipment costs (also known as the cumulative national equipment costs) for the ≥65,000 Btu/h to <135,000 Btu/h equipment class. Tables S.2.1 and S.2.2 present the results based upon a 7 percent discount rate and a 3 percent discount rate, respectively. Tables S.2.3 and S.2.4 provide the same information but for the ≥135,000 Btu/h to <240,000 Btu/h equipment class.

In the following tables, the national operating and equipment costs are presented for the base case (i.e., without standards) and each standards case analyzed for the equipment class. For the ≥65,000 Btu/h to <135,000 Btu/h equipment class, the following standards cases were analyzed: ASHRAE/IESNA 90.1-1999, 10.5 EER, 11.0 EER, 11.5 EER, and 12.0 EER. For the ≥135,000 Btu/h and <240,000 Btu/h equipment class, the following standards cases were analyzed: ASHRAE/IESNA 90.1-1999, 10.0 EER, 10.5 EER, 11.0 EER, 11.5 EER, and 12.0 EER. Differences between the base case and standards cases are also presented. The difference in the national equipment costs represents the *PVC* or present value of equipment cost increases while the difference in the national operating costs represents the *PVS* or present value of operating cost savings. The difference between the base case and standards case total national equipment and operating costs represents the *NPV*.

All base case values were determined with shipments projections established under the standards case. As detailed in Chapter 9, shipments projections under the standards cases were determined to be lower than those in the base case projection due to the higher installed cost of the more efficient equipment. As a result, the standards case shipments projection and, in turn, the standards case equipment stock, were used to determine the NPV to avoid the inclusion of savings due to displaced shipments. Thus, the base case values shown in Tables S.2.1–S.2.4 vary with the standards case. For the ≥65,000 Btu/h to <135,000 Btu/h equipment class, 7 percent discount rate, the total base case national equipment and operating costs range from $58.1 to $57.7 billion. When a 3 percent discount rate is used, the total base case national equipment and operating costs range from $124.7 to $124.1 billion. For the ≥135,000 Btu/h to <240,000 Btu/h equipment class the total base case national equipment and operating costs range from $46.4 to $47 billion for the 7 percent discount case and $100.2 to $101.4 billion for the 3 percent discount case.[a]

[a] The range of values for the total base case national equipment and operating costs for both the ≥65,000 Btu/h to <135,000 Btu/h and the ≥135,000 Btu/h to <240,000 Btu/h equipment classes are based on a time period of 2008-2035. Because the assumed effective date of the ASHRAE/IESNA 90.1-1999 standards case is 2004, the total base case national costs under this standards case are greater than those for all other standards cases. The total base case national costs for all standards cases are provided in Tables S.2.1-S.2.4.

Table S.2.1 ≥65,000 Btu/h to <135,000 Btu/h: Cumulative National Equipment and Operating Costs with NPV, 7% Discount Rate (billion 2001$)

Standards Case	**Equipment**[1]	**Operating***	**Total**[1]
Base Case	$19.01	$54.99	$74.00
ASHRAE 90.1-1999 Case	$19.25	$54.23	$73.48
Difference†	-$0.23	$0.75	***$0.52***
Base Case	$14.78	$43.29	$58.07
10.5 EER Case	$15.05	$42.45	$57.50
Difference†	-$0.27	$0.84	***$0.57***
Base Case	$14.71	$43.29	$58.00
11.0 EER Case	$15.28	$41.80	$57.07
Difference†	-$0.57	$1.50	***$0.93***
Base Case	$14.56	$43.27	$57.83
11.5 EER Case	$15.54	$41.21	$56.75
Difference†	-$0.99	$2.06	***$1.08***
Base Case	$14.41	$43.25	$57.66
12.0 EER Case	$15.67	$40.97	$56.64
Difference†	-$1.26	$2.48	***$1.02***

* Cumulative values for the ASHRAE/IESNA 90.1-1999 standards cases are based on a time period of 2004-2035. All other standards cases are based on a time period of 2008-2035.

† Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

Table S.2.2 ≥65,000 Btu/h to <135,000 Btu/h: Cumulative National Equipment and Operating Costs with NPV, 3% Discount Rate (billion 2001$)

Standards Case	Equipment*	Operating*	Total*
Base Case	$34.78	$108.82	$143.61
ASHRAE 90.1-1999 Case	$35.21	$107.15	$142.35
Difference†	-$0.42	$1.68	***$1.25***
Base Case	$29.75	$94.98	$124.74
10.5 Case	$30.30	$92.92	$123.22
Difference†	-$0.55	$2.07	***$1.52***
Base Case	$29.60	$95.04	$124.65
11.0 Case	$30.75	$91.37	$122.12
Difference†	-$1.15	$3.67	***$2.53***
Base Case	$29.34	$95.00	$124.33
11.5 Case	$31.26	$90.01	$121.27
Difference†	-$1.92	$4.99	***$3.06***
Base Case	$29.13	$94.94	$124.06
12.0 Case	$31.46	$89.55	$121.01
Difference†	-$2.34	$5.39	***$3.05***

* Cumulative values for the ASHRAE/IESNA 90.1-1999 standards cases are based on a time period of 2004-2035. All other standards cases are based on a time period of 2008-2035.

† Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

Table S.2.3 ≥135,000 Btu/h to <240,000 Btu/h: Cumulative National Equipment and Operating Costs with NPV, 7% Discount Rate (billion 2001$)

Standards Case	Equipment*	Operating*	Total*
Base Case	$13.30	$41.27	$54.58
ASHRAE 90.1-1999 Case	$13.42	$40.78	$54.20
Difference†	-$0.12	$0.50	***$0.38***
Base Case	$10.42	$32.81	$43.23
10.0 Case	$10.59	$32.13	$42.72
Difference†	-$0.17	$0.68	***$0.51***
Base Case	$10.40	$32.80	$43.20
10.5 Case	$10.72	$31.66	$42.37
Difference†	-$0.32	$1.15	***$0.83***
Base Case	$10.34	$32.80	$43.14
11.0 Case	$10.91	$31.11	$42.02
Difference†	-$0.57	$1.69	***$1.12***
Base Case	$10.24	$32.77	$43.00
11.5 Case	$11.14	$30.63	$41.77
Difference†	-$0.90	$2.14	***$1.24***
Base Case	$10.14	$32.74	$42.88
12.0 Case	$11.26	$30.43	$41.68
Difference†	-$1.11	$2.31	***$1.20***

* Cumulative values for the ASHRAE/IESNA 90.1-1999 standards cases are based on a time period of 2004-2035. All other standards cases are based on a time period of 2008-2035.

† Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

Table S.2.4 ≥135,000 Btu/h to <240,000 Btu/h: Cumulative National Equipment and Operating Costs with NPV, 3% Discount Rate (billion 2001$)

Standards Case	Equipment*	Operating*	Total*
Base Case	$24.49	$82.55	$107.04
ASHRAE 90.1-1999 Case	$24.70	$81.44	$106.14
Difference†	-$0.22	$1.11	***$0.90***
Base Case	$21.06	$72.52	$93.59
10.0 Case	$21.40	$70.85	$92.26
Difference†	-$0.34	$1.67	***$1.33***
Base Case	$21.02	$72.53	$93.55
10.5 Case	$21.66	$69.70	$91.37
Difference†	-$0.64	$2.83	***$2.19***
Base Case	$20.90	$72.56	$93.46
11.0 Case	$22.05	$68.40	$90.45
Difference†	-$1.15	$4.16	***$3.02***
Base Case	$20.71	$72.49	$93.20
11.5 Case	$22.49	$67.27	$89.76
Difference†	-$1.78	$5.22	***$3.44***
Base Case	$20.58	$72.42	$92.99
12.0 Case	$22.67	$66.88	$89.55
Difference†	-$2.10	$5.53	***$3.44***

* Cumulative values for the ASHRAE/IESNA 90.1-1999 standards cases are based on a time period of 2004-2035. All other standards cases are based on a time period of 2008-2035.

† Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.