
Appendix M

Guidelines for Early Replacement Conditions

Contents

1. Getting Started	4
2. Introduction.....	5
3. Early Replacement vs. Normal Replacement	5
4. The Ratio Approach to the Dual Baseline with the Lookup Tables	8
4.1. DEER-Based Look-Up Tables.....	9
4.1.1 Table Organization.....	12
4.1.2 Example	13
4.1.3 Trends on the Lookup Tables and Calculation of Ratios.....	13
4.2. PA-Based Look-Up Tables	14
5. Program-Tracking Database Requirements	15

Tables

Table M-1. Early Replacement Measures, EULs, and Baselines	11
Table M-2. Inflated Lifecycle Benefit Adjustment Factors: Residential Boilers	17
Table M-3. Inflated Lifecycle Benefit Adjustment Factors: Chillers, Furnaces, Non-Res Boilers, and High Performance Windows	18
Table M-4. Inflated Lifecycle Benefit Adjustment Factors: Residential Refrigerators.....	18
Table M-5. Inflated Lifecycle Benefit Adjustment Factors: Central Air Conditioners, Air Source Heat Pumps, Non-Res Water Heaters, Indirect Water Heaters, and Air Compressor Upgrades	19
Table M-6. Inflated Lifecycle Benefit Adjustment Factors: Multi-Family Clothes Washers	19
Table M-7. Inflated Lifecycle Benefit Adjustment Factors: Residential Electric and Indirect Water Heaters.....	20
Table M-8. Inflated Lifecycle Benefit Adjustment Factors: Non-Res Refrigerators	20
Table M-9. Inflated Lifecycle Benefit Adjustment Factors: Clothes Washers, Dishwashers, and Residential Gas Water Heaters.....	21
Table M-10. Inflated Lifecycle Benefit Adjustment Factors: Heat Pump Water Heaters and Room A/C	21
Table M-11. Full-Cost Adjustment Factors: Residential Boilers	22
Table M-12. Full-Cost Adjustment Factors: Chillers, Furnaces, Non-Res Boilers, and High Performance Windows.....	23
Table M-13. Full-Cost Adjustment Factors: Residential Refrigerators.....	23
Table M-14. Full-Cost Adjustment Factors: Central Air Conditioners, Air Source Heat Pumps, Non-Res Water Heaters, Indirect Water Heaters, and Air Compressor Upgrades	24
Table M-15. Full-Cost Adjustment Factors: Multi-Family Clothes Washers	24
Table M-16. Full-Cost Adjustment Factors: Residential Electric and Indirect Water Heaters	25
Table M-17. Full-Cost Adjustment Factors: Non-Residential Refrigerators.....	25
Table M-18. Full-Cost Adjustment Factors: Clothes Washers, Dishwashers, and Residential Gas Water Heaters	26

Table M-19. Full-Cost Adjustment Factors: Heat Pump Water Heaters and Room A/C.....	26
Table M-20. Adjusted EULs: Residential Boilers	27
Table M -21. Adjusted EULs: Chillers, Furnaces, Non-Residential Boilers, and High Performance Windows.....	28
Table M-22. Adjusted EULs: Residential Refrigerators.....	28
Table M-23. Adjusted EULs: Central Air Conditioners, Air Source Heat Pumps, Non-Res Water Heaters, Indirect Water Heaters, and Air Compressor Upgrades	29
Table M-24. Adjusted EULs: Multi-Family Clothes Washers	29
Table M-25. Adjusted EULs: Residential Electric and Gas Indirect Water Heaters.....	30
Table M-26. Adjusted EULs: Non-Residential Refrigerators	30
Table M-27. Adjusted EULs: Clothes Washers, Dishwashers, and Residential Gas Water Heaters	31
Table M-28. Adjusted EULs: Heat Pump Water Heaters and Room A/C.....	31
Table M-29. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for a 25 Year EUL.....	32
Table M-30. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for a 20 Year EUL.....	33
Table M-31. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for a 17 Year EUL.....	34
Table M-32. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for a 15 Year EUL.....	35
Table M-33. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for a 14 Year EUL.....	35
Table M-34. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for a 13 Year EUL.....	36
Table M-35. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for a 12 Year EUL.....	36
Table M-36. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for an 11 Year EUL.....	37
Table M-37. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for a 10 Year EUL.....	37
Table M-38. Full Cost Adjustment Factors	38
Table M-39. Adjusted EULs for a 25 Year EUL.....	39
Table M-40. Adjusted EULs for a 20 Year EUL.....	40
Table M-41. Adjusted EULs for a 17 Year EUL.....	41
Table M-42. Adjusted EULs for a 15 Year EUL.....	41
Table M-43. Adjusted EULs for a 14 Year EUL.....	42
Table M-44. Adjusted EULs for a 13 Year EUL.....	42
Table M-45. Adjusted EULs for a 12 Year EUL.....	43
Table M-46. Adjusted EULs for a 11 Year EUL.....	43
Table M-47. Adjusted EULs for a 10 Year EUL.....	44

1. Getting Started

The full manual, beginning in Section 2, explains the concepts of the tables and their use, and the choices offered to PAs. It also contains various instructions on such matters as data retention and the tracking database. This first section contains the immediate directions to get a quick start on the simplest case. These tables can only be used regarding the proposed replacement of equipment which has not reached its prescribed Effective Useful Life (EUL). Two other conditions are pertinent to use of this page:

- (1) The PA accepts agrees to use the assumptions for each measure regarding the typical relationship between incremental costs and savings and the full costs and savings of replacing the older (but pre-EUL) equipment with the high efficiency equipment promoted by the program.
- (2) The measures in question are listed in Table M-1 *without* an “a” or a “b” superscript.

If these conditions are met, the fundamental steps for calculation would be as follows:

1. Calculate the full costs of replacing the old equipment with the program measure, including labor.
2. Calculate the full first year savings of the program measure using the existing equipment as the baseline, assume such savings through the EUL of the new equipment, monetize the savings per the prescribed annual Long Run Avoided Costs (LRACs) estimates, and calculate the present value of this stream of monetized savings using Staff’s discount rate. This present value is referred to herein as the Inflated Benefits.¹
3. Estimate the remaining useful life (RUL) of the old equipment in place.
4. Turn to the measure-specific costs and savings tables of the measure in question (the measures are grouped by the EUL on Table M-1).
5. Go down each table to the row for the estimated RUL and find the percentage adjustment factor in the column for the measure.
6. Multiply the Inflated Benefits by the benefits factor.
7. Multiply the full costs by the costs factor.
8. For Total Resources Cost (TRC) analysis, use the two products from steps 6 and 7.
9. For first year savings to report against approved program goals, use the full savings.

¹ “Inflated Benefits” is simply a concept designed to be an intermediate step in the computation of estimated dual baseline benefits, using the tables in this Appendix. It does not imply an assumption that the old equipment, absent the program, would have continued in use through the life of the new equipment.

2. Introduction

In the EEPS Order issued on October 18, 2010 (p.9),² the Commission stated, regarding TRC analysis of early replacements in individual projects, that it was “. . . directing Staff to develop a new approach, based on the dual baseline approach, which provides consistency between the treatment of savings and costs. The Director of the Office of Energy Efficiency and Environment is directed to compile and provide simplifying lookup tables, which provide early replacement method energy savings consistent with the dual baseline concept as an attachment to the consolidated Technical Manual (TM).” Staff was also directed “to develop a consistent cost estimation approach which reflects the concept that the costs of making a high efficiency early replacement will avoid an end-of useful-life replacement with minimally code compliant equipment.”

3. Early Replacement vs. Normal Replacement

Early replacement is defined in the Order as the replacement of equipment before it reaches its Effective Useful Life (EUL), whereas end-of-life or normal replacement refers to the replacement of equipment which has reached or passed the end of its measure-prescribed EUL. The crucial difference between end-of-life replacement and early replacement is that end-of-life/normal uses “incremental” costs and savings while early replacement uses “full” values:

- *Incremental savings* is defined as the annual energy use of the currently-on-the-market standard, minimally-compliant equipment minus the annual energy use of the high efficiency equipment subsidized by the program.
- *Full savings* is defined as the annual energy use of the old equipment in place minus the annual energy use of the high efficiency equipment subsidized by the program.
- *Incremental cost* is defined as the full cost of new efficient equipment minus the cost of the currently-on-the-market standard, minimally-compliant equipment, plus the time value penalty (the present value cost of a dollar amount increases with earlier spending, see below) .
- *Full cost* is simply the cost (including installation) of the new efficient equipment.

Early replacement not only accelerates savings to the electric grid but also allows PAs to claim greater first-year annual savings toward their annual energy goals because full savings are reported as the first-year savings. *If a PA cannot substantiate that the age of the equipment in place is less than its EUL and therefore a case of early replacement, the replacement must be screened as normal (end of life) replacement, with the incremental savings reported as the first-year savings toward approved program goals.*

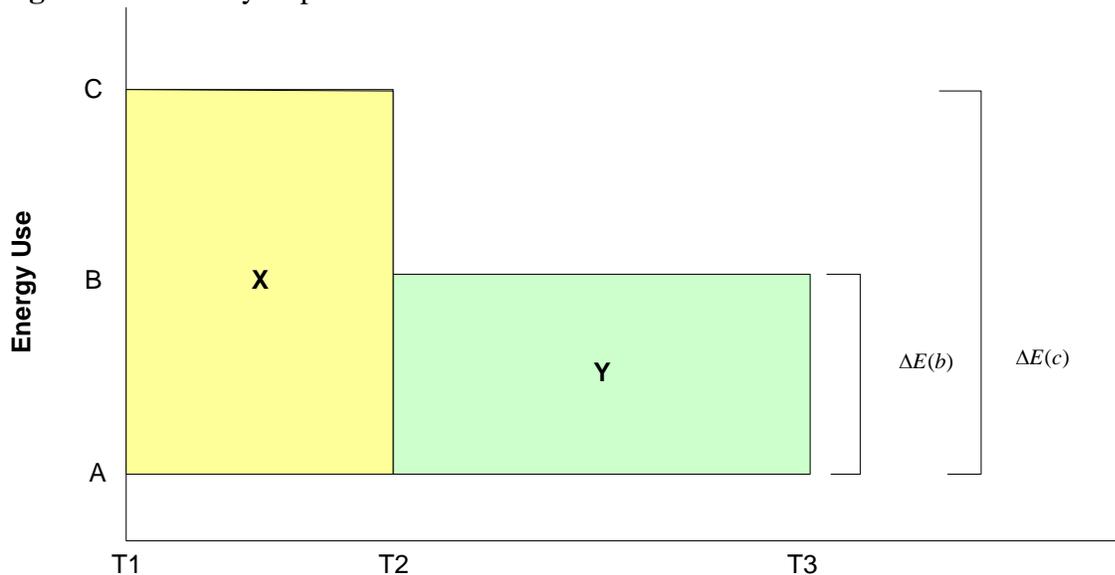
In both normal and early replacement conditions, the establishment of the correct baseline is critical in accurately estimating gross energy and demand impacts. However, while the TM addresses the establishment of the baseline for normal replacement conditions, it rarely addresses

² Case 07-M-0548, Energy Efficiency Portfolio Standard (EEPS), Order Approving Consolidation and Revision of Technical Manuals (issued October 18, 2010).

the establishment of baselines for early replacement conditions. This Appendix M provides two sets of lookup tables and guidance designed to simplify the complex mathematical analysis of dual-baseline cases and reduce PA data needs. The first set of tables, for *typical* early replacement measure conditions as developed by TecMarket Works, reflects data, discussed below, that PAs might find it difficult to obtain. The second set of tables requires PAs to provide these data but still simplifies the calculations.

The standard early replacement condition, illustrated in Figure 1, involves a customer who replaces equipment before it reaches the end of its EUL. That is, the equipment is fully functioning and would continue to function for some period of time, referred to as the remaining useful life (RUL). However, the customer is induced by the program to replace this existing equipment with more efficient equipment. It is assumed that at the end of the RUL, absent the program, the customer would have installed equipment that would meet the existing efficiency code or appliance standard, i.e., equipment that represents the market average efficiency or the efficiency that had become the industry standard (referred to as the *code/standard equipment*).

Figure 1. The Early Replacement Condition



- C = Energy use of pre-existing measure
- B = Energy use of code/standard measure
- A = Energy use of the new efficient measure
- T1 = Date on which new efficient measure is installed
- T2 = Date on which existing measure was expected to have failed
- T3 = Date on which the new efficient measure is expected to fail
- T3 – T1 = Expected effective useful life (EUL) of the new efficient measure
- T2 – T1 = Expected remaining useful life (RUL) of the pre-existing measure
- T3 – T2 = Expected remaining EUL of the new efficient measure
- $\Delta E(c)$ = The full savings defined as C - A
- $\Delta E(b)$ = The incremental savings defined as B - A

Energy savings in this example would consist of two portions. The customer would have experienced the full savings defined by Area X (energy use C-A for the RUL period T2-T1). At the end of the RUL, the savings for the period T3-T2 would be reduced to incremental savings defined by area Y. To carry out these calculations, information on two (dual) baselines is

required, the energy use of the pre-existing equipment and the energy use of code/standard equipment. Information on energy use for the high efficiency equipment provided through the program will also be required.

The cost would also have to be calculated in a manner consistent with early replacement. In normal replacement situations, one would use the incremental cost that is defined as the cost of the new efficient equipment minus the cost of the code/standard equipment. In the early replacement case, the incremental cost is calculated in a slightly different manner. This calculation recognizes that, while the customer purchased efficient equipment with the assistance of the program, it would have purchased code/standard equipment at some time in the future, i.e., at the end of the RUL, had the program not existed.

Thus, one would first have to determine the full cost of the new efficient equipment (including the installation labor) at T1 *and* the full cost of the code/standard equipment (including the installation labor) at T2. The incremental costs would then be calculated as the cost of the new efficient equipment minus the present value (PV) of the cost that is avoided in the future for the code/standard equipment. Figure 2 presents a case in which the RUL is 4 years and, absent the program, the code/standard equipment would have been installed in the fifth year. This calculation differs from the normal/end of life replacement incremental cost in adding the time value of money for spending earlier.

Figure 2. Incremental Cost Calculation for an Early Replacement of Equipment with an RUL of Four Years

Year	PV With Program	PV Without Program
1	Full Cost of High Efficient Equipment	0
2	0	0
3	0	0
4	0	0
5	0	Full Cost of Code/Standard Equipment

The two key inputs necessary for these calculations, the energy use and the cost of the code/standard equipment, may not be readily available to PA field staff and are subject to change before the end of the equipment’s RUL in the absence of a program. Note that the first set of tables in this Appendix M is based on current codes and standards. If a PA can document the needed energy use and cost data, it can choose to use the second set of tables. Both sets of tables are based on a “ratio approach”.

4. The Ratio Approach to the Dual Baseline with the Lookup Tables

This approach focuses on the ratio of incremental savings to full savings³ and the ratio of incremental costs to full costs. These ratios, shown at the top of the attached tables, determine the factors that PAs can use to adjust the savings and cost data they do have. The first set of tables, the measure-specific set, allows the early replacement calculations to be performed in a manner that only requires the program administrator to have the Remaining Useful Life (RUL) of the equipment in place and the full savings and costs of the project. The ratios in the first set of tables (M-2 through M-19) were developed by TecMarket Works. The second set of tables (M-29 through M-38), the non-measure-specific set, requires the program administrators to provide their own incremental costs and savings ratios (based on the code/standard equipment). To use the second set of tables, PAs must match ratios that they have calculated to corresponding ratios in the tables.

The source of these two ratios for the first set of tables is the Database for Energy Efficient Resources (DEER), most recently updated by Itron for the California Public Utility Commission in 2009. Among other things, DEER contains energy use and costs for selected energy-efficient technologies and equipment in the residential and nonresidential sectors. DEER also contains the same information for typical equipment, those commonly installed in the marketplace.

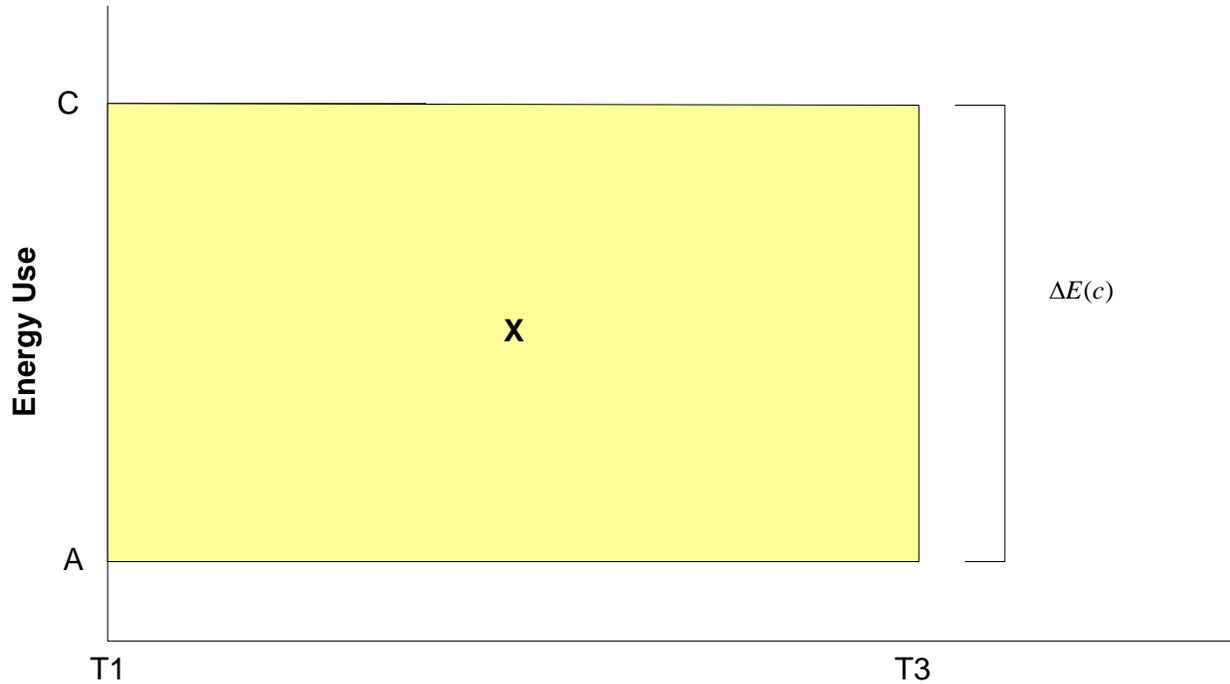
To use either set of tables PAs will need to calculate the first-year annual savings as the annual energy use of the old equipment in place minus the annual energy use of the high efficiency equipment (the full savings). These full savings are then counted for each year of the EUL as is represented as area *X* in Figure 3. For each year of the EUL ($T_3 - T_1$) of the new equipment, the full kWh or therm savings are converted to dollar benefits by multiplying them by the Commission's avoided costs estimates for that year. As a preliminary step in using the tables, the PAs will calculate this "inflated lifecycle benefits" as the present value of the stream of full savings benefits for the EUL of the new equipment.

In cases of early replacement under the ratio approach, it is these inflated lifecycle benefits that must be adjusted using the appropriate *inflated lifecycle benefits adjustment factor*. For a given measure with a given EUL, RUL and ratio of incremental savings to full savings, the inflated lifecycle benefits adjustment factor is the ratio (presented as a percentage) of the present value of the dual baseline lifecycle benefits ($X+Y$) illustrated in Figure 1 to the present value of the inflated lifecycle benefits illustrated in Figure 3.

PAs can obtain these factors from either the set of DEER-based tables or from the set of PA-based tables if a PA can calculate its own incremental savings to full savings ratios.

³ The savings values ratios are not lifecycle present values but are rather the line segments in Figure 1 on the vertical axis: $(B - A)$ divided by $(C - A)$.

Figure 3. Inflated Lifecycle Benefits



$$\Delta E(c) = C - A$$

C = Energy use of pre-existing equipment

A = Energy use of the efficient equipment rebated through program

T1 = Date on which new efficient equipment is installed

T3 = Date on which the new efficient equipment is expected to fail

T3 – T1 = EUL of new efficient equipment

Under the Commission requirement of consistent treatment of savings and costs, the full costs⁴ must also be adjusted downward. PAs can obtain the *full cost adjustment factors* from either the DEER-based Tables based on typical ratios of incremental cost to full cost or from the PA-based Tables if a PA can calculate its own incremental cost to full cost ratios. The DEER-based set of lookup tables runs from M-2 through M-28. Of these, M-2 through M-10 cover benefits, M-11 through M-19 costs, and M-20 through M-28 adjusted EULs. The PA-based set of lookup tables runs from M-29 through M-47. Of these, M-29 through M-37 cover benefits, M-38 all costs (only the RUL matters, not the EUL), and M-39 through M-47 adjusted EULs.

4.1. DEER-Based Look-Up Tables

The first set of tables includes look-up tables M-2 through M-10, which present the *Inflated Lifecycle Benefit Adjustment Factors*. The tables are based primarily on data contained in the California 2009 DEER. For each qualified equipment type, the median ratio of incremental savings to the full savings was calculated. These ratios along with the RULs, ranging from 1

⁴ Full costs include the capital cost of the new efficient equipment plus installation cost.

year to the EUL minus 1 year, are shown in the look-up tables and are used to derive the factors needed to adjust the inflated lifecycle benefits.

Tables M-11 through M-19 present the *full cost adjustment factors*, for the same equipment addressed in Tables M-2 through M-10, for the same RUL ranges. For each qualified equipment type, the median ratio of incremental costs to the full costs was calculated.

To use these tables of typical ratios, a PA must have gathered the following four pieces of information:

- 1) the EUL of the new efficient equipment,
- 2) the RUL of the old equipment in place,
- 3) the full savings of the equipment (annual energy use of the old equipment in place minus the annual energy of the high efficiency equipment supported by the program), and
- 4) the full costs (including installation)

The EUL for a given measure is obtained from Table M-1, which is a compilation of the EULs for all the relevant measures in the consolidated Technical Manual effective January 1, 2011 that could qualify for early replacement⁵. The RUL⁶, the full savings, and the full costs are provided by the program implementer. Note that documentation for PA estimates of these data must be retained for possible Staff review. Table M-1 also presents the normal replacement baseline equipment against which each of the 29 measures covered in this table is compared. Note that the lookup tables apply only to the 23 measures without an *a* or *b* designation in Table M-1.

⁵ Early replacement is inappropriate for such equipment as wall insulation, right sizing, setback thermostats, and sub-metering since nothing is being replaced. Lighting equipment has also been excluded since it is expected to be treated as pre-qualified.

⁶ Upon request, Staff will provide a suggested questionnaire to assist in the determination of the RUL.

Table M-1. Early Replacement Measures, EULs, and Baselines

Measures	EUL	Normal Replacement Baseline
Heat Pump Water Heater: Residential	10	Code Electric Storage Water Heater
Room Air Conditioner: Residential	10	EPACT Room Air Conditioner
Clothes Washer: Single Family: Residential	11	EPACT Clothes Washer
ENERGY STAR Dishwashers: Residential	11	EPACT Dishwasher
Water Heater: Gas: Residential	11	Code Gas Storage Water Heater
Energy Star Dehumidifier: Residential ^a	12	Standard Efficiency Dehumidifier
Refrigerators: Nonresidential	12	EPACT Refrigerator
Indirect Water Heaters: Residential	13	Code Gas Storage Water Heater
Water Heater: Electric: Residential	13	Code Electric Storage Water Heater
Clothes Washer: Multi-Family Residential	14	EPACT Clothes Washer
Air Compressor Upgrade: Nonresidential	15	Standard Efficiency Rotary Screw Compressor
Central Air Conditioning: Residential	15	Code Central AC with gas heat
Central Air Source Heat Pumps: Residential	15	Code Central Air Source Heat Pump
Cool Roof: Nonresidential ^a	15	Standard Roof
Cooling Tower: Nonresidential ^a	15	Standard Efficiency Cooling Tower
Efficient Air-Cooled Refrigeration Condenser: Nonresidential ^a	15	Standard Efficiency Refrigeration Condenser
Indirect Water Heaters: Nonresidential	15	Code Gas Storage Water Heater
Motors: Nonresidential ^b	15	EISA Minimum Efficiency Motor
Packaged Air Conditioners (Central AC): Nonresidential	15	Code Packaged Air Conditioner
Packaged Air Source Heat Pumps (CAC Cooling Only): Nonresidential	15	Code Packaged Air Source Heat Pump
Water Heaters: Nonresidential (Gas & Electric)	15	Code Storage Water Heater
Refrigerators: Residential	17	EPACT Refrigerator
Chillers: Nonresidential	20	Code Chiller
Gas Furnaces and Boilers: Nonresidential	20	Code Furnace and Boiler
High Efficiency Gas Furnaces: Residential	20	Code Furnace
High Performance Glazing: Nonresidential ^b	20	Code Glazing
High Performance Windows (Gas Heating Only): Residential	20	Code Window
Instantaneous Water Heater: Residential	20	Code Storage Water Heater
Gas Boilers: Residential	25	Code Boiler

Notes: **EPACT** refers to efficiency standards promulgated by the Energy Policy and Conservation Act of 2005
EISA refers to efficiency standards promulgated by the Energy Independence and Security Act of 2007
Code refers to New York State Construction codes, which reference ASHRAE standards.

For measures assigned an **a**, the efficiency of the old in place unit is still the common practice or no new standards have been adopted, i.e., the baseline for the full savings and the incremental savings are the same. As a result, the ratio of incremental to full savings is near 1.0, meaning that a PA can claim the full savings for the entire EUL of the new equipment (areas X and Y in Figure 4). Therefore, the lookup tables do not apply.

For these measures assigned a **b**, the high efficiency equipment subsidized by the program is consistent with current code or standards. For these measures, the incremental savings are zero and thus the ratio of incremental to full savings is 0.0. This means that a PA can claim full savings for only the RUL (area X in Figure 5), after which the high-efficiency replacement would have occurred anyway. Therefore, the lookup tables do not apply.

Figure 4. Efficiency of the Old In Place Unit Is Still the Common Practice Or No New Standards

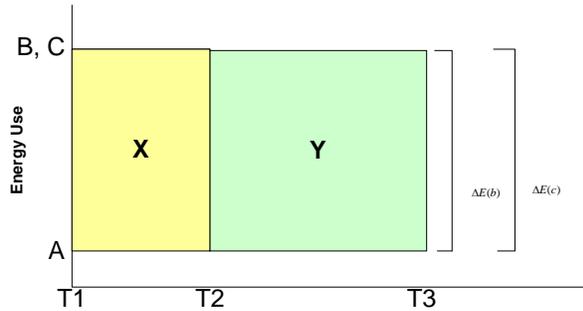
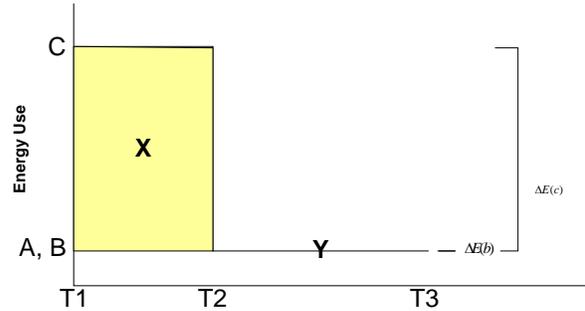


Figure 5. High Efficiency Equipment Subsidized by the Program Is Consistent with Current Code Or Standards



$$\Delta E(c) = C - A$$

$$\Delta E(b) = B - A$$

C = Energy use of pre-existing equipment

B = Energy use of equipment that meets code

A = Energy use of the efficient equipment rebated through program

T1 = Date on which new efficient equipment is installed

T2 = Date on which existing equipment was expected to have failed

T3 = Date on which the new efficient equipment is expected to fail

T3 - T1 = Expected effective useful life (EUL) of the new efficient equipment

T2 - T1 = Expected remaining useful life (RUL) of the pre-existing equipment

T3 - T2 = Expected remaining EUL of the new efficient equipment

After obtaining the four pieces of information listed above, the program implementer can determine the appropriate inflated lifecycle benefits adjustment factor by which to multiply the inflated lifecycle benefits and the full cost adjustment factor by which to multiply the full costs. These adjusted inflated lifecycle benefits and adjusted full costs are to be used in the TRC ratio in the screening of measures in specific projects.

4.1.1 Table Organization

The DEER-Based Tables are divided into two groups:

- Inflated Lifecycle Benefit Adjustment Factors (Tables M-2 through M-10)
- Full-Cost Adjustment Factor (Tables M-11 through M-19)

Each set of tables addresses the same 23 measures or varieties of measures grouped by the EUL.

In each table, the left *column* contains the RULs from 1 year through the EUL minus 1 year. For example, Table M-5 presents Inflated Lifecycle Benefit Adjustment Factors for measures with an EUL of 15 years. So, Table M-5 contains RULs from 1 through 14.

The *first row* of each table contains the names of each measure addressed in the table.

The *second row* of each table indicates whether the measure is residential, non-residential or both.

The *third row* of each table lists the median ratio associated with each measure. For Tables M-2 through M-10 and Tables M-20 through M-28, the ratio is the ratio of the incremental savings to

the full savings for each measure. For Tables M-11 through M-19, the ratio is the ratio of the incremental costs to the full costs for each measure.

The remaining *cells* in the matrix contain:

- For Tables M-2 through M-10, the cells contain the Inflated Lifecycle Benefit Adjustment Factors
- For Tables M-11 through M-19, the cells contain the Full-Cost Adjustment Factors

4.1.2 Example

Consider the following example for a group of five measures, each with an EUL of 15 years:

1. residential and non-residential air conditioners (central ACs/package units) covering four levels of efficiency,
2. non-residential domestic electric water heaters (service hot water),
3. non-residential domestic gas water heaters,
4. non-residential indirect water heaters, and
5. non-residential air compressors.

Table M-5 presents the inflated lifecycle benefits adjustment factors for these five measures. For central air conditioners, the program implementer must determine the SEER of the new efficient unit and estimate the RUL for the old unit in place and select the appropriate lifecycle benefits adjustment factor. For example, if the SEER of the new efficient unit is 17 and the estimated RUL is 4 years, Table M-5 shows that the *inflated lifecycle benefits adjustment factor* is 0.63. Thus, the inflated lifecycle benefits should be multiplied by 0.63.

For a central air conditioner with a SEER of 17 and an estimated RUL of 4 years, Table M-14 shows that the *full-cost adjustment factor* is 0.44. Thus, the full cost of the new efficient central air conditioner should be multiplied by the full-cost adjustment factor of 0.44.

4.1.3 Trends on the Lookup Tables and Calculation of Ratios

This section discusses the directions in which RULs and the savings and costs ratios affect the adjustment factors, and illustrates how the ratios are calculated.

- *Tables M-2 through M-10:* The longer the RUL is, the larger the share of the inflated lifecycle benefits that a PA can claim. Also, the greater the ratio of incremental savings to full savings is, the larger the share of the inflated lifecycle benefits that a PA can claim. Consider the following example of equipment with an EUL of 10 years and annual kWh use of 2,000 kWh that is removed in its 6th year (RUL=4 years) and replaced with an energy efficient version of the equipment with an annual kWh use of 1,400 kWh. The full savings are 600 kWh (2,000 - 1,400). It is assumed that in four years the customer would have installed equipment that, at a minimum, met the current efficiency code of annual energy use. The ratio will change depending on the efficiency of the code/standard equipment:

-
- If the kWh use associated with code/standard is 1,600 kWh, then the incremental savings = $(1,600 - 1,400)$ or 200 and the ratio = $(200/600)$ or 0.33.
 - If the kWh use associated with code/standard is 1800 kWh, then the incremental savings = $(1,800 - 1,400)$ or 400 and the ratio = $(400/600)$ or 0.67.

A less strict code (one that allows higher consumption) allows a PA to claim a larger share of the inflated lifecycle benefits. In other words, the higher the kWh use associated with the code/standard equipment, the more the program is accomplishing in avoiding standard equipment.

- *Tables M-11 through M-19:* The longer the RUL is, the larger the share of the unadjusted costs for a PA to include (larger time value penalty). Also, the greater the ratio of incremental costs to full costs is, the larger the share of the unadjusted costs for a PA to include. Continuing with the above example, assume that the full cost of the energy efficient equipment is \$2,000. It is assumed that in four years the customer would have installed code/standard equipment. The ratio will change depending on the cost of the code/standard equipment:
 - If the full cost of the code/standard equipment is \$1,400, then the incremental cost = \$600 and the ratio = $(\$600/\$2,000)$ or 0.30.
 - If the full cost of the code/standard equipment is \$1,800, then the incremental cost = \$200 and the ratio = $(\$200/\$2,000)$ or 0.10.

The higher cost of the standard/code equipment, which lowers the incremental cost, allows a PA to take into account a smaller portion of the full cost of the efficient measure when calculating a TRC. In other words, the higher the cost of the code/standard equipment that the customer would have incurred without the program, the lower the cost of the program.

4.2. PA-Based Look-Up Tables

If a PA is able to calculate its own ratio of the incremental savings to full savings and/or the ratio of incremental costs to full cost, then they may choose to use the second set of tables. If a PA chooses to use its own savings ratio and/or cost ratio, it should identify the ratio in the appropriate tables (M-29 through M-47) that is closest to the one(s) it developed. These 19 tables are for the most part organized and interpreted in the same manner as Tables M-2 through M-28. The only exceptions are that the ratios range⁷ from 0.95 to .05 in increments of 0.05, and there are no measure designations. To use these tables, a PA will still need to gather the same four pieces of information needed to use the first set of tables:

1. the EUL of the new efficient equipment,
2. the RUL of the old equipment in place,

⁷ The lookup tables do not apply to measures that have a ratio of *incremental savings to full savings* or a ratio of *incremental costs to full costs* of 1.0 or 0.0 for the same reasons provided earlier in Section 2.1.

-
3. the full savings of the equipment (annual energy use of the old equipment in place minus the annual energy of the high efficiency equipment supported by the program), and
 4. the full costs (including installation)

Additionally, the PA will need documented estimates of incremental costs and savings in order to calculate:

1. The ratio of incremental savings to full savings, and/or
2. The ratio of incremental costs to full cost

Note that all documentation for PA estimates of these data must be retained for possible Staff review.

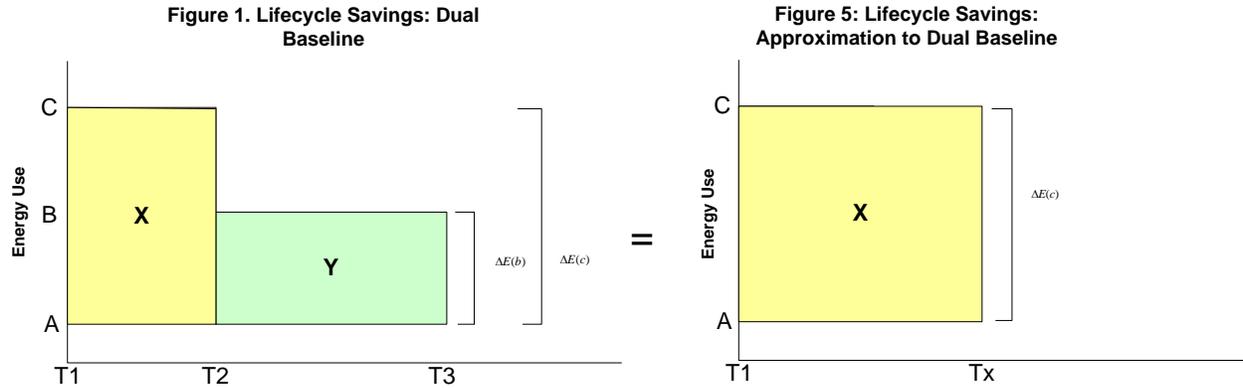
5. Program-Tracking Database Requirements

The program tracking databases are databases by measure installation which the PAs are required to maintain for the purposes of current reporting and future impact evaluation, the latter requiring many fields not used for current reporting. The Department of Public Service hereby adds, for cases of early replacement, six additional required variables.

1. Type of Installation (TRC Approach)⁸,
2. The *Adjusted Full Savings* (full savings multiplied by the full-savings adjustment factor),
3. The *Adjusted Full Cost* (full cost multiplied by the full-cost adjustment factor),
4. The *Ratio of Incremental Savings to Full Savings*,
5. The *Ratio of Incremental Costs to Full Costs*, and
6. The *Adjusted EUL* (discussed below)

The Adjusted EUL is defined as that period of years over which the full savings would be claimed such that it matches the present value dollar benefits of the underlying dual baseline. That is, the EUL of the new equipment in Figure 6 below, represented by **Tx – T1**, is adjusted so that the present value of lifecycle benefits represented by area **X** in Figure 6 is equivalent to the present value of the lifecycle benefits represented by the sum of areas **X** and **Y** in Figure 1.

⁸ ER=Early Replacement; NR=Normal Replacement; SC=Special Circumstance; AO=Add On. Add on refers to adding something which replaces nothing. Examples include adding controls to a boiler which had none, or adding insulation where there was none or some. Add-on measures are modeled at full costs and full savings for the length of their EULs. The full savings are reported toward first-year goals.



The longer the RUL is, the larger the adjusted EUL. This follows the same logic as the case of the *inflated lifecycle benefit adjustment factors* except that the result is an adjusted EUL (that portion of the EUL for which the PV of using the full savings would equal the PV of the dual baseline savings).

PAs can obtain the adjusted EULs from the DEER-Based Tables based on typical ratios of incremental savings to full savings or from the PA-Based Tables if a PA can calculate its own savings ratios. The adjusted EUL is not used for TRC screening, but for the program's tracking data base. The tables are organized in the same way as the earlier tables. The only difference is that the cells in the matrix contain adjusted EULs in years. Tables M-20 through M-28 contain DEER-Based adjusted EULs while Tables M-39 through M-47 contain PA-Based adjusted EULs.

Table M-2. Inflated Lifecycle Benefit Adjustment Factors: Residential Boilers

RUL	Boiler-G
	Res
	Median Ratio of Incremental Savings to Full Savings
	0.15
	Artificial Lifecycle Benefit Adjustment Factors
1	20%
2	26%
3	32%
4	37%
5	42%
6	47%
7	52%
8	56%
9	60%
10	64%
11	68%
12	68%
13	71%
14	75%
15	78%
16	81%
17	84%
18	86%
19	89%
20	91%
21	94%
22	94%
23	96%
24	98%
EUL =	25

Table M-3. Inflated Lifecycle Benefit Adjustment Factors: Chillers, Furnaces, Non-Res Boilers, and High Performance Windows

RUL	Chiller: Air Cooled Recip and Screw	Chiller: Water Cooled Recip	Chiller: Water Cooled Screw < 150 ton	Chiller: Water Cooled Screw 150-300 ton	Chiller: Water Cooled Screw > 300 ton	Chiller: Water Cooled Centrifugal < 150 ton	Chiller: Water Cooled Centrifugal 150-300 ton	Chiller: Water Cooled Centrifugal > 300 ton	Boiler-G	Furnace-G (AFUE 90)	Furnace-G (AFUE 92)	Furnace-G (AFUE 94)	Furnace-G (AFUE 96)	High Performance Windows-G
	Non-Res	Non-Res	Non-Res	Non-Res	Non-Res	Non-Res	Non-Res	Non-Res	Non-Res	Res/Non-Res	Res/Non-Res	Res/Non-Res	Res/Non-Res	Res
	Median Ratio of Incremental Savings to Full Savings													
	0.50	0.15	0.37	0.31	0.69	0.58	0.38	0.31	0.27	0.44	0.48	0.51	0.54	0.63
	Artificial Lifecycle Benefit Adjustment Factors													
1	53%	23%	42%	36%	72%	63%	42%	36%	35%	47%	53%	53%	58%	68%
2	58%	29%	47%	42%	72%	63%	47%	42%	35%	53%	58%	58%	63%	68%
3	63%	36%	53%	47%	76%	67%	53%	47%	41%	58%	58%	63%	63%	72%
4	63%	42%	58%	53%	76%	72%	58%	53%	47%	63%	63%	68%	68%	72%
5	67%	47%	58%	58%	80%	72%	58%	58%	53%	63%	68%	68%	72%	76%
6	72%	53%	63%	58%	80%	76%	63%	58%	58%	68%	68%	72%	72%	80%
7	72%	53%	67%	63%	84%	76%	67%	63%	63%	72%	72%	76%	76%	80%
8	76%	58%	72%	67%	84%	80%	72%	67%	68%	72%	76%	76%	80%	84%
9	80%	63%	72%	72%	87%	84%	72%	72%	68%	76%	76%	80%	80%	84%
10	80%	67%	76%	76%	87%	84%	76%	76%	72%	80%	80%	80%	84%	87%
11	84%	72%	80%	76%	91%	87%	80%	76%	76%	80%	84%	84%	84%	87%
12	87%	76%	84%	80%	91%	87%	84%	80%	80%	84%	84%	84%	87%	91%
13	87%	80%	84%	84%	94%	91%	84%	84%	84%	87%	87%	87%	87%	91%
14	91%	84%	87%	87%	94%	91%	87%	87%	84%	87%	91%	91%	91%	94%
15	91%	87%	91%	87%	94%	94%	91%	87%	87%	91%	91%	91%	94%	94%
16	94%	91%	91%	91%	97%	94%	91%	91%	91%	94%	94%	94%	94%	94%
17	94%	91%	94%	94%	97%	97%	94%	94%	94%	94%	94%	94%	97%	97%
18	97%	94%	97%	97%	97%	97%	97%	97%	97%	97%	97%	97%	97%	97%
19	100%	97%	97%	97%	100%	100%	97%	97%	97%	97%	97%	100%	100%	100%
EUL =	20													

Table M-4. Inflated Lifecycle Benefit Adjustment Factors: Residential Refrigerators

RUL	Refrigerator-E	
	Res	
	Median Ratio of Incremental Savings to Full Savings	
	0.11	
	Artificial Lifecycle Benefit Adjustment Factors	
1	17%	
2	25%	
3	32%	
4	39%	
5	46%	
6	52%	
7	58%	
8	64%	
9	69%	
10	74%	
11	79%	
12	79%	
13	84%	
14	88%	
15	92%	
16	96%	
EUL =	17	

Table M-5. Inflated Lifecycle Benefit Adjustment Factors: Central Air Conditioners, Air Source Heat Pumps, Non-Res Water Heaters, Indirect Water Heaters, and Air Compressor Upgrades

RUL	Central Air conditioner (SEER 14)	Central Air conditioner (SEER 15)	Central Air conditioner (SEER 16)	Central Air conditioner (SEER 17)	Central Air conditioner (SEER 18)	DHW-E	DHW-G	Indirect Water Heater-G	Air Compressor Upgrade-E
	Res/Non-Res	Res/Non-Res	Res/Non-Res	Res/Non-Res	Res/Non-Res	Non-Res	Non-Res	Non-Res	Non-Res
	Median Ratio of Incremental Savings to Full Savings								
	0.19	0.31	0.38	0.44	0.48	0.60	0.21	0.34	0.48
Artificial Lifecycle Benefit Adjustment Factors									
1	27%	35%	50%	50%	56%	63%	35%	42%	50%
2	35%	43%	50%	56%	56%	69%	35%	49%	56%
3	43%	50%	56%	56%	63%	69%	42%	49%	63%
4	50%	56%	56%	63%	69%	75%	49%	56%	69%
5	56%	63%	63%	69%	69%	75%	56%	63%	69%
6	56%	63%	69%	69%	75%	80%	63%	69%	75%
7	63%	69%	75%	75%	75%	80%	63%	69%	75%
8	69%	75%	75%	80%	80%	86%	69%	75%	80%
9	75%	80%	80%	80%	86%	86%	75%	80%	86%
10	80%	80%	86%	86%	86%	91%	80%	86%	86%
11	86%	86%	86%	91%	91%	91%	86%	86%	91%
12	91%	91%	91%	91%	91%	95%	91%	91%	91%
13	91%	95%	95%	95%	95%	95%	91%	96%	95%
14	95%	95%	95%	95%	95%	100%	96%	96%	95%
EUL =	15								

Table M-6. Inflated Lifecycle Benefit Adjustment Factors: Multi-Family Clothes Washers

RUL	Clothes Washer-G
	MF Res
	Median Ratio of Incremental Savings to Full Savings
	0.39
	Artificial Lifecycle Benefit Adjustment Factors
1	45%
2	52%
3	59%
4	59%
5	66%
6	72%
7	72%
8	78%
9	84%
10	84%
11	90%
12	95%
13	95%
EUL =	14

Table M-7. Inflated Lifecycle Benefit Adjustment Factors: Residential Electric and Indirect Water Heaters

RUL	DHW-E	Indirect Water Heater-G
	Res	Res
	Median Ratio of Incremental Savings to Full Savings	
	0.60	0.34
	Artificial Lifecycle Benefit Adjustment Factors	
1	69%	46%
2	69%	46%
3	69%	54%
4	76%	62%
5	76%	62%
6	83%	69%
7	83%	76%
8	89%	82%
9	89%	82%
10	94%	89%
11	94%	94%
12	100%	94%
EUL =	13	

Table M-8. Inflated Lifecycle Benefit Adjustment Factors: Non-Res Refrigerators

RUL	Refrigerator-E
	Non-Res
	Median Ratio of Incremental Savings to Full Savings
	0.34
	Artificial Lifecycle Benefit Adjustment Factors
1	41%
2	50%
3	58%
4	58%
5	66%
6	73%
7	81%
8	81%
9	87%
10	94%
11	94%
EUL =	12

Table M-9. Inflated Lifecycle Benefit Adjustment Factors: Clothes Washers, Dishwashers, and Residential Gas Water Heaters

RUL	Clothes Washer-E	Dishwasher-E	DHW-G
	Res	Res	Res
	Median Ratio of Incremental Savings to Full Savings		
	0.39	0.33	0.21
	Artificial Lifecycle Benefit Adjustment Factors		
1	43%	43%	33%
2	53%	53%	43%
3	62%	53%	43%
4	62%	62%	52%
5	70%	70%	61%
6	78%	78%	70%
7	78%	78%	78%
8	86%	86%	86%
9	93%	93%	86%
10	93%	93%	93%
EUL =	11		

Table M-10. Inflated Lifecycle Benefit Adjustment Factors: Heat Pump Water Heaters and Room A/C

RUL	Heat Pump Water Heater-E	Room Air Conditioner-E
	Res	Res
	Median Ratio of Incremental Savings to Full Savings	
	0.87	0.25
	Artificial Lifecycle Benefit Adjustment Factors	
1	92%	36%
2	92%	47%
3	92%	57%
4	92%	57%
5	92%	66%
6	92%	75%
7	100%	84%
8	100%	84%
9	100%	92%
EUL =	10	

Table M-11. Full-Cost Adjustment Factors: Residential Boilers

RUL	Boiler-G
	Res
	Median Ratio of Incremental Cost to Full Cost
	0.16
	Full Cost Adjustment Factors
1	20%
2	25%
3	28%
4	32%
5	36%
6	39%
7	42%
8	45%
9	48%
10	51%
11	53%
12	56%
13	58%
14	60%
15	62%
16	64%
17	66%
18	68%
19	70%
20	71%
21	73%
22	74%
23	75%
24	77%
EUL =	25

Table M-12. Full-Cost Adjustment Factors: Chillers, Furnaces, Non-Res Boilers, and High Performance Windows

RUL	Chiller: Air Cooled Recip and Screw	Chiller: Water Cooled Recip	Chiller: Water Cooled Screw < 150 ton	Chiller: Water Cooled Screw 150-300 ton	Chiller: Water Cooled Screw > 300 ton	Chiller: Water Cooled Centrifugal < 150 ton	Chiller: Water Cooled Centrifugal 150-300 ton	Chiller: Water Cooled Centrifugal > 300 ton	Boiler-G	Furnace-G (AFUE 90)	Furnace-G (AFUE 92)	Furnace-G (AFUE 94)	Furnace-G (AFUE 96)	High Performance Windows-G
	Non-Res	Non-Res	Non-Res	Non-Res	Non-Res	Non-Res	Non-Res	Non-Res	Non-Res	Res/Non-Res	Res/Non-Res	Res/Non-Res	Res/Non-Res	Res
Median Ratio of Incremental Cost to Full Cost														
	0.18	0.03	0.16	0.13	0.12	0.21	0.24	0.33	0.48	0.28	0.31	0.34	0.36	0.10
Full Cost Adjustment Factors														
1	22%	8%	20%	18%	17%	25%	28%	36%	51%	32%	35%	37%	39%	15%
2	26%	13%	25%	22%	21%	29%	32%	40%	53%	35%	38%	41%	42%	19%
3	30%	17%	28%	26%	25%	33%	35%	43%	56%	39%	41%	44%	45%	23%
4	34%	22%	32%	30%	29%	36%	39%	46%	58%	42%	44%	47%	48%	27%
5	37%	26%	36%	33%	33%	40%	42%	49%	60%	45%	47%	50%	51%	31%
6	41%	30%	39%	37%	36%	43%	45%	51%	62%	48%	50%	52%	54%	35%
7	44%	33%	42%	40%	40%	46%	48%	54%	64%	51%	53%	55%	56%	38%
8	47%	37%	45%	43%	43%	49%	50%	56%	66%	53%	55%	57%	58%	41%
9	49%	40%	48%	46%	46%	51%	53%	59%	68%	56%	57%	59%	60%	44%
10	52%	43%	51%	49%	48%	54%	56%	61%	70%	58%	60%	61%	63%	47%
11	54%	46%	53%	52%	51%	56%	58%	63%	71%	60%	62%	63%	64%	50%
12	57%	49%	56%	54%	54%	58%	60%	65%	73%	62%	64%	65%	66%	53%
13	59%	52%	58%	57%	56%	61%	62%	67%	74%	64%	66%	67%	68%	55%
14	61%	54%	60%	59%	58%	63%	64%	68%	75%	66%	67%	69%	70%	57%
15	63%	57%	62%	61%	61%	65%	66%	70%	77%	68%	69%	70%	71%	60%
16	65%	59%	64%	63%	63%	66%	68%	72%	78%	69%	71%	72%	73%	62%
17	67%	61%	66%	65%	65%	68%	69%	73%	79%	71%	72%	73%	74%	64%
18	69%	63%	68%	67%	66%	70%	71%	74%	80%	73%	74%	75%	76%	66%
19	70%	65%	70%	69%	68%	71%	73%	76%	81%	74%	75%	76%	77%	67%
EUL =	20													

Table M-13. Full-Cost Adjustment Factors: Residential Refrigerators

RUL	Refrigerator-E	
	Res	
	Median Ratio of Incremental Cost to Full Cost	
	0.12	
Full Cost Adjustment Factors		
1	17%	
2	21%	
3	25%	
4	29%	
5	33%	
6	36%	
7	40%	
8	43%	
9	46%	
10	48%	
11	51%	
12	54%	
13	56%	
14	58%	
15	61%	
16	63%	
EUL =	17	

Table M-14. Full-Cost Adjustment Factors: Central Air Conditioners, Air Source Heat Pumps, Non-Res Water Heaters, Indirect Water Heaters, and Air Compressor Upgrades

	Central Air Conditioner/Air Source Heat Pumps (SEER 14)	Central Air Conditioner/Air Source Heat Pumps (SEER 15)	Central Air Conditioner/Air Source Heat Pumps (SEER 16)	Central Air Conditioner/Air Source Heat Pumps (SEER 17)	Central Air Conditioner/Air Source Heat Pumps (SEER 18)	DHW-E	DHW-G	Indirect Water Heater-G	Air Compressor Upgrade-E
	Res/Non-Res	Res/Non-Res	Res/Non-Res	Res/Non-Res	Res/Non-Res	Non-Res	Non-Res	Non-Res	Non-Res
	Median Ratio of Incremental Cost to Full Cost								
	0.10	0.20	0.26	0.31	0.37	0.25	0.22	0.93	0.46
	Full Cost Adjustment Factors								
RUL									
1	15%	24%	30%	35%	40%	29%	26%	93%	49%
2	19%	28%	34%	38%	43%	33%	30%	94%	51%
3	23%	32%	37%	41%	46%	36%	34%	94%	54%
4	27%	35%	40%	44%	49%	39%	37%	94%	56%
5	31%	39%	43%	47%	52%	43%	40%	95%	59%
6	35%	42%	46%	50%	54%	46%	43%	95%	61%
7	38%	45%	49%	53%	57%	48%	46%	95%	63%
8	41%	48%	52%	55%	59%	51%	49%	95%	65%
9	44%	51%	54%	57%	61%	54%	52%	96%	67%
10	47%	53%	57%	60%	63%	56%	54%	96%	68%
11	50%	56%	59%	62%	65%	58%	57%	96%	70%
12	53%	58%	61%	64%	67%	61%	59%	96%	72%
13	55%	60%	63%	66%	69%	63%	61%	97%	73%
14	57%	62%	65%	67%	70%	65%	63%	97%	74%
EUL =	15								

Table M-15. Full-Cost Adjustment Factors: Multi-Family Clothes Washers

RUL	Clothes Washer-G
	MF Res
	Median Ratio of Incremental Cost to Full Cost
	0.24
	Full Cost Adjustment Factors
1	28%
2	32%
3	35%
4	39%
5	42%
6	45%
7	48%
8	50%
9	53%
10	56%
11	58%
12	60%
13	62%
EUL =	14

Table M-16. Full-Cost Adjustment Factors: Residential Electric and Indirect Water Heaters

RUL	DHW-E	Indirect Water Heater-G
	Res	Res
	Median Ratio of Incremental Cost to Full Cost	
	0.25	0.93
	Full Cost Adjustment Factors	
1	29%	93%
2	33%	94%
3	36%	94%
4	39%	94%
5	43%	95%
6	46%	95%
7	48%	95%
8	51%	95%
9	54%	96%
10	56%	96%
11	58%	96%
12	61%	96%
EUL =	13	

Table M-17. Full-Cost Adjustment Factors: Non-Residential Refrigerators

RUL	Refrigerator-E
	Non-Res
	Median Ratio of Incremental Cost to Full Cost
	0.05
	Full Cost Adjustment Factors
1	10%
2	15%
3	19%
4	23%
5	27%
6	31%
7	35%
8	38%
9	41%
10	44%
11	47%
EUL =	12

Table M-18. Full-Cost Adjustment Factors: Clothes Washers, Dishwashers, and Residential Gas Water Heaters

	Clothes Washer-E	Dishwasher-E	DHW-G	
	Res	Res	Res	
RUL	Median Ratio of Incremental Cost to Full Cost			
	0.24	0.06	0.22	
RUL	Full Cost Adjustment Factors			
	1	28%	11%	26%
	2	32%	16%	30%
	3	35%	20%	34%
	4	39%	24%	37%
	5	42%	28%	40%
	6	45%	32%	43%
	7	48%	35%	46%
	8	50%	39%	49%
	9	53%	42%	52%
	10	56%	45%	54%
EUL =	11			

Table M-19. Full-Cost Adjustment Factors: Heat Pump Water Heaters and Room A/C

	Heat Pump Water Heater-E	Room Air Conditioner-E	
	Res	Res	
RUL	Median Ratio of Incremental Cost to Full Cost		
	0.77	0.23	
RUL	Full Cost Adjustment Factors		
	1	78%	27%
	2	79%	31%
	3	80%	34%
	4	81%	38%
	5	82%	41%
	6	83%	44%
	7	84%	47%
	8	85%	50%
9	86%	52%	
EUL =	10		

Table M-20. Adjusted EULs: Residential Boilers

RUL	Boiler-G
	Res
	Median Ratio of Incremental Savings to Full Savings
	0.15
	Adjusted EULs in Years
1	3
2	4
3	5
4	6
5	7
6	8
7	9
8	10
9	11
10	12
11	13
12	13
13	14
14	15
15	16
16	17
17	18
18	19
19	20
20	21
21	22
22	22
23	23
24	24
EUL =	25

Table M -21. Adjusted EULs: Chillers, Furnaces, Non-Residential Boilers, and High Performance Windows

	Chiller: Air Cooled Recip and Screw	Chiller: Water Cooled Recip	Chiller: Water Cooled Screw < 150 ton	Chiller: Water Cooled Screw 150-300 ton	Chiller: Water Cooled Screw > 300 ton	Chiller: Water Cooled Centrifugal < 150 ton	Chiller: Water Cooled Centrifugal 150 - 300 ton	Chiller: Water Cooled Centrifugal > 300 ton	Boiler-G	Furnace-G (AFUE 90)	Furnace-G (AFUE 92)	Furnace-G (AFUE 94)	Furnace-G (AFUE 96)	High Performance Windows-G
	Non-Res	Non-Res	Non-Res	Non-Res	Non-Res	Non-Res	Non-Res	Non-Res	Non-Res	Res/Non-Res	Res/Non-Res	Res/Non-Res	Res/Non-Res	Res
	Median Ratio of Incremental Savings to Full Savings													
	0.50	0.45	0.37	0.31	0.69	0.58	0.38	0.31	0.27	0.44	0.48	0.51	0.54	0.63
	Adjusted EULs in Years													
RUL	8	3	6	5	12	10	6	5	5	7	8	8	9	11
1	8	3	6	5	12	10	6	5	5	7	8	8	9	11
2	9	4	7	6	12	10	7	6	5	8	9	9	10	11
3	10	5	8	7	13	11	8	7	6	9	9	10	10	12
4	10	6	9	8	13	12	9	8	7	10	10	11	11	12
5	11	7	9	9	14	12	9	9	8	10	11	11	12	13
6	12	8	10	9	14	13	10	9	9	11	11	12	12	14
7	12	8	11	10	15	13	11	10	10	12	12	13	13	14
8	13	9	12	11	15	14	12	11	11	12	13	13	14	15
9	14	10	12	12	16	15	12	12	11	13	13	14	14	15
10	14	11	13	13	16	15	13	13	12	14	14	14	15	16
11	15	12	14	13	17	16	14	13	13	14	15	15	15	16
12	16	13	15	14	17	16	15	14	14	15	15	16	16	17
13	16	14	15	15	18	17	15	15	15	16	16	16	16	17
14	17	15	16	16	18	17	16	16	15	16	17	17	17	18
15	17	16	17	16	18	18	17	16	16	17	17	17	18	18
16	18	17	17	17	19	18	17	17	17	18	18	18	18	18
17	18	17	18	18	19	19	18	18	18	18	18	18	19	19
18	19	18	19	19	19	19	19	19	19	19	19	19	19	19
19	20	19	19	19	20	20	19	19	19	19	19	20	20	20
EUL =	20													

Table M-22. Adjusted EULs: Residential Refrigerators

RUL	Refrigerator-E
	Res
	Median Ratio of Incremental Savings to Full Savings
	0.11
	Adjusted EULs in Years
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10
10	11
11	12
12	12
13	13
14	14
15	15
16	16
EUL =	17

Table M-23. Adjusted EULs: Central Air Conditioners, Air Source Heat Pumps, Non-Res Water Heaters, Indirect Water Heaters, and Air Compressor Upgrades

	Central Air Conditioner/Air Source Heat Pumps (SEER 14)	Central Air Conditioner/Air Source Heat Pumps (SEER 15)	Central Air Conditioner/Air Source Heat Pumps (SEER 16)	Central Air Conditioner/Air Source Heat Pumps (SEER 17)	Central Air Conditioner/Air Source Heat Pumps (SEER 18)	DHW-E	DHW-G	Indirect Water Heater-G	Air Compressor Upgrade-E
	Res/Non-Res	Res/Non-Res	Res/Non-Res	Res/Non-Res	Res/Non-Res	Non-Res	Non-Res	Non-Res	Non-Res
	Median Ratio of Incremental Savings to Full Savings								
	0.19	0.31	0.38	0.44	0.48	0.60	0.21	0.34	0.48
	Adjusted EULs in Years								
RUL									
1	3	4	6	6	7	8	4	5	6
2	4	5	6	7	7	9	4	6	7
3	5	6	7	7	8	9	5	6	8
4	6	7	7	8	9	10	6	7	9
5	7	8	8	9	9	10	7	8	9
6	7	8	9	9	10	11	8	9	10
7	8	9	10	10	10	11	8	9	10
8	9	10	10	11	11	12	9	10	11
9	10	11	11	11	12	12	10	11	12
10	11	11	12	12	12	13	11	12	12
11	12	12	12	13	13	13	12	12	13
12	13	13	13	13	13	14	13	13	13
13	13	14	14	14	14	14	13	14	14
14	14	14	14	14	14	15	14	14	14
EUL =	15								

Table M-24. Adjusted EULs: Multi-Family Clothes Washers

	Clothes Washer-G
	MF Res
	Median Ratio of Incremental Savings to Full Savings
	0.39
	Adjusted EULs in Years
RUL	
1	5
2	6
3	7
4	7
5	8
6	9
7	9
8	10
9	11
10	11
11	12
12	13
13	13
EUL =	14

Table M-25. Adjusted EULs: Residential Electric and Gas Indirect Water Heaters

RUL	DHW-E	Indirect Water Heater-G
	Res	Res
	Median Ratio of Incremental Savings to Full Savings	
	0.60	0.34
	Adjusted EULs in Years	
1	8	5
2	8	5
3	8	6
4	9	7
5	9	7
6	10	8
7	10	9
8	11	10
9	11	10
10	12	11
11	12	12
12	13	12
EUL =	13	

Table M-26. Adjusted EULs: Non-Residential Refrigerators

RUL	Refrigerator-E
	Non-Res
	Median Ratio of Incremental Savings to Full Savings
	0.34
	Adjusted EULs in Years
1	4
2	5
3	6
4	6
5	7
6	8
7	9
8	9
9	10
10	11
11	11
EUL =	12

Table M-27. Adjusted EULs: Clothes Washers, Dishwashers, and Residential Gas Water Heaters

RUL	Clothes Washer-E	Dishwasher-E	DHW-G
	Res	Res	Res
	Median Ratio of Incremental Savings to Full Savings		
	0.39	0.33	0.21
	Adjusted EULs in Years		
1	4	4	3
2	5	5	4
3	6	5	4
4	6	6	5
5	7	7	6
6	8	8	7
7	8	8	8
8	9	9	9
9	10	10	9
10	10	10	10
EUL =	11		

Table M-28. Adjusted EULs: Heat Pump Water Heaters and Room A/C

RUL	Heat Pump Water Heater-E	Room Air Conditioner-E
	Res	Res
	Median Ratio of Incremental Savings to Full Savings	
	0.87	0.25
	Adjusted EULs in Years	
1	9	3
2	9	4
3	9	5
4	9	5
5	9	6
6	9	7
7	10	8
8	10	8
9	10	9
EUL =	10	

Table M-29. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for a 25 Year EUL

RUL	Savings Ratio																		
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
1	14%	14%	20%	26%	32%	37%	42%	42%	47%	52%	60%	64%	68%	71%	78%	81%	86%	91%	96%
2	20%	20%	26%	32%	37%	42%	42%	47%	52%	56%	60%	64%	71%	75%	78%	84%	86%	91%	96%
3	26%	26%	32%	37%	42%	42%	47%	52%	56%	60%	64%	68%	71%	75%	81%	84%	89%	91%	96%
4	32%	32%	37%	42%	47%	47%	52%	56%	60%	64%	68%	71%	75%	78%	81%	86%	89%	94%	96%
5	37%	37%	42%	47%	47%	52%	56%	60%	64%	68%	68%	71%	75%	81%	84%	86%	89%	94%	96%
6	42%	42%	47%	52%	52%	56%	60%	64%	64%	68%	71%	75%	78%	81%	84%	86%	91%	94%	96%
7	47%	47%	52%	52%	56%	60%	64%	64%	68%	71%	75%	78%	81%	84%	86%	89%	91%	94%	98%
8	52%	52%	56%	56%	60%	64%	64%	68%	71%	75%	75%	78%	81%	84%	86%	89%	91%	94%	98%
9	56%	56%	60%	60%	64%	68%	68%	71%	75%	75%	78%	81%	84%	86%	89%	91%	94%	96%	98%
10	60%	60%	64%	64%	68%	68%	71%	75%	75%	78%	81%	84%	84%	86%	89%	91%	94%	96%	98%
11	64%	64%	68%	68%	71%	71%	75%	75%	78%	81%	81%	84%	86%	89%	89%	91%	94%	96%	98%
12	64%	68%	68%	71%	75%	75%	78%	78%	81%	81%	84%	86%	86%	89%	91%	94%	94%	96%	98%
13	68%	71%	71%	75%	75%	78%	78%	81%	81%	84%	86%	86%	89%	91%	91%	94%	96%	96%	98%
14	71%	75%	75%	78%	78%	81%	81%	84%	84%	86%	86%	89%	89%	91%	94%	94%	96%	98%	98%
15	75%	78%	78%	81%	81%	81%	84%	84%	86%	86%	89%	89%	91%	91%	94%	96%	96%	98%	98%
16	78%	81%	81%	81%	84%	84%	86%	86%	89%	89%	89%	91%	91%	94%	94%	96%	96%	98%	98%
17	81%	84%	84%	84%	86%	86%	86%	89%	89%	91%	91%	91%	94%	94%	96%	96%	98%	98%	100%
18	84%	86%	86%	86%	89%	89%	89%	91%	91%	91%	94%	94%	94%	96%	96%	96%	98%	98%	100%
19	86%	89%	89%	89%	89%	91%	91%	91%	91%	94%	94%	94%	96%	96%	96%	98%	98%	98%	100%
20	89%	89%	91%	91%	91%	91%	94%	94%	94%	94%	96%	96%	96%	96%	98%	98%	98%	98%	100%
21	91%	91%	94%	94%	94%	94%	94%	96%	96%	96%	96%	96%	98%	98%	98%	98%	98%	100%	100%
22	94%	94%	94%	96%	96%	96%	96%	96%	96%	96%	98%	98%	98%	98%	98%	98%	100%	100%	100%
23	96%	96%	96%	96%	96%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	100%	100%	100%	100%
24	98%	98%	98%	98%	98%	98%	98%	98%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
EUL =	25																		

Table M-30. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for a 20 Year EUL

RUL	Savings Ratio																		
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
1	16%	16%	23%	29%	29%	36%	42%	47%	47%	53%	58%	63%	67%	72%	76%	80%	87%	91%	94%
2	23%	23%	29%	29%	36%	42%	47%	47%	53%	58%	63%	67%	72%	76%	80%	84%	87%	91%	97%
3	29%	29%	36%	36%	42%	47%	47%	53%	58%	63%	67%	67%	72%	76%	80%	84%	87%	91%	97%
4	36%	36%	42%	42%	47%	53%	53%	58%	63%	63%	67%	72%	76%	80%	84%	87%	91%	94%	97%
5	42%	42%	47%	47%	53%	53%	58%	63%	63%	67%	72%	76%	76%	80%	84%	87%	91%	94%	97%
6	47%	47%	53%	53%	58%	58%	63%	63%	67%	72%	72%	76%	80%	84%	84%	87%	91%	94%	97%
7	47%	53%	53%	58%	63%	63%	67%	67%	72%	72%	76%	80%	80%	84%	87%	91%	91%	94%	97%
8	53%	58%	58%	63%	63%	67%	67%	72%	76%	76%	80%	80%	84%	87%	87%	91%	94%	94%	97%
9	58%	63%	63%	67%	67%	72%	72%	76%	76%	80%	80%	84%	84%	87%	91%	91%	94%	97%	97%
10	63%	67%	67%	72%	72%	72%	76%	76%	80%	80%	84%	84%	87%	87%	91%	94%	94%	97%	97%
11	67%	72%	72%	72%	76%	76%	80%	80%	84%	84%	84%	87%	87%	91%	91%	94%	94%	97%	97%
12	72%	76%	76%	76%	80%	80%	80%	84%	84%	87%	87%	87%	91%	91%	94%	94%	97%	97%	100%
13	76%	80%	80%	80%	84%	84%	84%	87%	87%	87%	91%	91%	91%	94%	94%	94%	97%	97%	100%
14	80%	84%	84%	84%	84%	87%	87%	87%	87%	91%	91%	91%	94%	94%	94%	97%	97%	97%	100%
15	84%	84%	87%	87%	87%	87%	91%	91%	91%	91%	94%	94%	94%	94%	97%	97%	97%	97%	100%
16	87%	87%	91%	91%	91%	91%	91%	94%	94%	94%	94%	94%	97%	97%	97%	97%	97%	100%	100%
17	91%	91%	91%	94%	94%	94%	94%	94%	94%	94%	97%	97%	97%	97%	97%	97%	100%	100%	100%
18	94%	94%	94%	94%	94%	97%	97%	97%	97%	97%	97%	97%	97%	97%	97%	100%	100%	100%	100%
19	97%	97%	97%	97%	97%	97%	97%	97%	97%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%
EUL =	20																		

Table M-31. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for a 17 Year EUL

RUL	Savings Ratio																		
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
1	17%	17%	25%	25%	32%	39%	39%	46%	52%	52%	58%	64%	69%	74%	79%	84%	88%	92%	96%
2	25%	25%	32%	32%	39%	39%	46%	52%	52%	58%	64%	69%	69%	74%	79%	84%	88%	92%	96%
3	32%	32%	39%	39%	46%	46%	52%	52%	58%	64%	64%	69%	74%	79%	79%	84%	88%	92%	96%
4	32%	39%	39%	46%	52%	52%	58%	58%	64%	64%	69%	74%	74%	79%	84%	88%	88%	92%	96%
5	39%	46%	46%	52%	52%	58%	58%	64%	69%	69%	74%	74%	79%	84%	84%	88%	92%	92%	96%
6	46%	52%	52%	58%	58%	64%	64%	69%	69%	74%	74%	79%	79%	84%	88%	88%	92%	96%	96%
7	52%	58%	58%	64%	64%	69%	69%	69%	74%	74%	79%	79%	84%	84%	88%	92%	92%	96%	96%
8	58%	64%	64%	69%	69%	69%	74%	74%	79%	79%	79%	84%	84%	88%	88%	92%	92%	96%	96%
9	64%	69%	69%	69%	74%	74%	74%	79%	79%	84%	84%	84%	88%	88%	92%	92%	96%	96%	100%
10	69%	74%	74%	74%	79%	79%	79%	84%	84%	84%	88%	88%	88%	92%	92%	92%	96%	96%	100%
11	74%	79%	79%	79%	79%	84%	84%	84%	84%	88%	88%	88%	92%	92%	92%	96%	96%	96%	100%
12	79%	79%	84%	84%	84%	84%	88%	88%	88%	88%	92%	92%	92%	92%	96%	96%	96%	96%	100%
13	84%	84%	88%	88%	88%	88%	88%	92%	92%	92%	92%	96%	96%	96%	96%	96%	96%	100%	100%
14	88%	88%	88%	92%	92%	92%	92%	92%	92%	96%	96%	96%	96%	96%	96%	96%	100%	100%	100%
15	92%	92%	92%	92%	92%	96%	96%	96%	96%	96%	96%	96%	96%	96%	96%	100%	100%	100%	100%
16	96%	96%	96%	96%	96%	96%	96%	96%	96%	96%	100%	100%	100%	100%	100%	100%	100%	100%	100%
EUL =	17																		

Table M-32. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for a 15 Year EUL

RUL	Savings Ratio																		
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
1	19%	19%	27%	27%	35%	35%	43%	43%	50%	56%	56%	63%	69%	75%	75%	80%	86%	91%	95%
2	19%	27%	27%	35%	43%	43%	50%	50%	56%	56%	63%	69%	69%	75%	80%	86%	86%	91%	95%
3	27%	35%	35%	43%	43%	50%	50%	56%	63%	63%	69%	69%	75%	80%	80%	86%	91%	91%	95%
4	35%	43%	43%	50%	50%	56%	56%	63%	63%	69%	69%	75%	75%	80%	86%	86%	91%	95%	95%
5	43%	50%	50%	56%	56%	63%	63%	63%	69%	69%	75%	75%	80%	80%	86%	91%	91%	95%	95%
6	50%	56%	56%	63%	63%	63%	69%	69%	75%	75%	80%	80%	80%	86%	86%	91%	91%	95%	95%
7	56%	63%	63%	63%	69%	69%	69%	75%	75%	80%	80%	80%	86%	86%	91%	91%	95%	95%	100%
8	63%	69%	69%	69%	75%	75%	75%	80%	80%	80%	86%	86%	86%	91%	91%	91%	95%	95%	100%
9	69%	75%	75%	75%	75%	80%	80%	80%	80%	86%	86%	86%	91%	91%	91%	95%	95%	95%	100%
10	75%	75%	80%	80%	80%	80%	86%	86%	86%	86%	91%	91%	91%	91%	95%	95%	95%	95%	100%
11	80%	80%	86%	86%	86%	86%	86%	91%	91%	91%	91%	91%	95%	95%	95%	95%	95%	100%	100%
12	86%	86%	86%	91%	91%	91%	91%	91%	91%	91%	95%	95%	95%	95%	95%	95%	100%	100%	100%
13	91%	91%	91%	91%	91%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	100%	100%	100%	100%
14	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%
EUL =	15																		

Table M-33. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for a 14 Year EUL

RUL	Savings Ratio																		
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
1	10%	19%	19%	28%	37%	37%	45%	45%	52%	52%	59%	66%	66%	72%	78%	84%	84%	90%	95%
2	19%	28%	28%	37%	37%	45%	45%	52%	59%	59%	66%	66%	72%	78%	78%	84%	90%	90%	95%
3	28%	37%	37%	45%	45%	52%	52%	59%	59%	66%	66%	72%	72%	78%	84%	84%	90%	95%	95%
4	37%	45%	45%	52%	52%	59%	59%	59%	66%	66%	72%	72%	78%	78%	84%	90%	90%	95%	95%
5	45%	52%	52%	59%	59%	59%	66%	66%	72%	72%	78%	78%	78%	84%	84%	90%	90%	95%	95%
6	52%	59%	59%	59%	66%	66%	66%	72%	72%	78%	78%	84%	84%	90%	90%	90%	95%	95%	100%
7	59%	66%	66%	66%	72%	72%	72%	78%	78%	78%	84%	84%	84%	90%	90%	90%	95%	95%	100%
8	66%	72%	72%	72%	72%	78%	78%	78%	78%	84%	84%	84%	90%	90%	90%	95%	95%	95%	100%
9	72%	72%	78%	78%	78%	78%	84%	84%	84%	84%	90%	90%	90%	90%	95%	95%	95%	95%	100%
10	78%	78%	84%	84%	84%	84%	84%	90%	90%	90%	90%	90%	95%	95%	95%	95%	95%	100%	100%
11	84%	84%	84%	90%	90%	90%	90%	90%	90%	90%	95%	95%	95%	95%	95%	95%	100%	100%	100%
12	90%	90%	90%	90%	90%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	100%	100%	100%	100%
13	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%
EUL =	14																		

Table M-34. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for a 13 Year EUL

RUL	Savings Ratio																		
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
1	11%	20%	20%	30%	30%	39%	39%	47%	55%	55%	62%	62%	69%	76%	76%	83%	89%	89%	94%
2	20%	30%	30%	39%	39%	47%	47%	55%	55%	62%	62%	69%	69%	76%	76%	83%	89%	89%	94%
3	30%	39%	39%	47%	47%	55%	55%	55%	62%	62%	69%	69%	76%	76%	83%	89%	89%	94%	94%
4	39%	47%	47%	55%	55%	55%	62%	62%	69%	69%	69%	76%	76%	83%	83%	89%	89%	94%	94%
5	47%	55%	55%	55%	62%	62%	62%	69%	69%	76%	76%	76%	83%	83%	89%	89%	94%	94%	100%
6	55%	62%	62%	62%	69%	69%	69%	76%	76%	76%	83%	83%	83%	89%	89%	89%	94%	94%	100%
7	62%	69%	69%	69%	69%	76%	76%	76%	76%	83%	83%	83%	89%	89%	89%	94%	94%	94%	100%
8	69%	69%	76%	76%	76%	76%	83%	83%	83%	83%	89%	89%	89%	94%	94%	94%	94%	94%	100%
9	76%	76%	83%	83%	83%	83%	83%	89%	89%	89%	89%	94%	94%	94%	94%	94%	94%	100%	100%
10	83%	83%	83%	89%	89%	89%	89%	89%	89%	89%	94%	94%	94%	94%	94%	94%	100%	100%	100%
11	89%	89%	89%	89%	89%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	100%	100%	100%	100%
12	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	100%	100%	100%	100%	100%	100%	100%	100%	100%
EUL =	13																		

Table M-35. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for a 12 Year EUL

RUL	Savings Ratio																		
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
1	11%	22%	22%	32%	32%	41%	41%	50%	50%	58%	58%	66%	66%	73%	81%	81%	87%	94%	94%
2	22%	32%	32%	41%	41%	41%	50%	50%	58%	58%	66%	66%	73%	73%	81%	87%	87%	94%	94%
3	32%	41%	41%	41%	50%	50%	58%	58%	66%	66%	66%	73%	73%	81%	81%	87%	87%	94%	94%
4	41%	50%	50%	50%	58%	58%	58%	66%	66%	73%	73%	73%	81%	81%	87%	87%	94%	94%	100%
5	50%	58%	58%	58%	66%	66%	66%	73%	73%	73%	81%	81%	81%	87%	87%	87%	94%	94%	100%
6	58%	66%	66%	66%	66%	73%	73%	73%	73%	81%	81%	81%	87%	87%	87%	94%	94%	94%	100%
7	66%	66%	73%	73%	73%	73%	81%	81%	81%	81%	87%	87%	87%	94%	94%	94%	94%	94%	100%
8	73%	73%	81%	81%	81%	81%	81%	87%	87%	87%	87%	87%	94%	94%	94%	94%	94%	100%	100%
9	81%	81%	81%	87%	87%	87%	87%	87%	87%	87%	94%	94%	94%	94%	94%	94%	100%	100%	100%
10	87%	87%	87%	87%	87%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	100%	100%	100%	100%
11	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	100%	100%	100%	100%	100%	100%	100%	100%	100%
EUL =	12																		

Table M-36. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for an 11 Year EUL

RUL	Savings Ratio																			
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	
1	12%	23%	23%	34%	34%	34%	43%	43%	53%	53%	62%	62%	70%	70%	78%	86%	86%	93%	93%	
2	23%	34%	34%	34%	43%	43%	53%	53%	62%	62%	70%	70%	70%	78%	78%	86%	86%	93%	93%	
3	34%	43%	43%	43%	53%	53%	53%	62%	62%	70%	70%	70%	78%	78%	86%	86%	93%	93%	100%	
4	43%	53%	53%	53%	62%	62%	62%	70%	70%	70%	78%	78%	78%	86%	86%	86%	93%	93%	100%	
5	53%	62%	62%	62%	62%	70%	70%	70%	70%	78%	78%	78%	86%	86%	86%	93%	93%	93%	100%	
6	62%	62%	70%	70%	70%	70%	78%	78%	78%	78%	86%	86%	86%	86%	93%	93%	93%	93%	100%	
7	70%	70%	78%	78%	78%	78%	86%	86%	86%	86%	86%	86%	93%	93%	93%	93%	93%	100%	100%	
8	78%	78%	78%	86%	86%	86%	86%	86%	86%	86%	93%	93%	93%	93%	93%	93%	100%	100%	100%	
9	86%	86%	86%	86%	86%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	100%	100%	100%	100%	
10	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
EUL =	11																			

Table M-37. Inflated Lifecycle Benefit Adjustment Factors for PA-Supplied Ratios of Incremental Savings to Full Savings for a 10 Year EUL

RUL	Savings Ratio																			
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	
1	13%	25%	25%	25%	36%	36%	47%	47%	57%	57%	57%	66%	66%	75%	75%	84%	84%	92%	92%	
2	25%	36%	36%	36%	47%	47%	47%	57%	57%	66%	66%	66%	75%	75%	84%	84%	92%	92%	100%	
3	36%	47%	47%	47%	57%	57%	57%	66%	66%	66%	75%	75%	75%	84%	84%	84%	92%	92%	100%	
4	47%	57%	57%	57%	57%	66%	66%	66%	66%	75%	75%	75%	84%	84%	84%	92%	92%	92%	100%	
5	57%	57%	66%	66%	66%	66%	75%	75%	75%	75%	84%	84%	84%	84%	92%	92%	92%	92%	100%	
6	66%	66%	75%	75%	75%	75%	75%	84%	84%	84%	84%	84%	92%	92%	92%	92%	92%	100%	100%	
7	75%	75%	75%	84%	84%	84%	84%	84%	84%	84%	92%	92%	92%	92%	92%	92%	100%	100%	100%	
8	84%	84%	84%	84%	84%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	100%	100%	100%	100%	
9	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
EUL =	10																			

Table M-38. Full Cost Adjustment Factors

RUL	Cost Ratio																		
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
1	10%	15%	19%	24%	29%	34%	38%	43%	48%	53%	57%	62%	67%	72%	76%	81%	86%	91%	95%
2	15%	19%	24%	28%	33%	37%	42%	46%	51%	55%	60%	64%	69%	73%	78%	82%	87%	91%	96%
3	19%	23%	28%	32%	36%	40%	45%	49%	53%	57%	62%	66%	70%	74%	79%	83%	87%	91%	96%
4	23%	27%	31%	35%	39%	43%	48%	52%	56%	60%	64%	68%	72%	76%	80%	84%	88%	92%	96%
5	27%	31%	35%	39%	43%	46%	50%	54%	58%	62%	66%	69%	73%	77%	81%	85%	89%	92%	96%
6	31%	35%	38%	42%	46%	49%	53%	56%	60%	64%	67%	71%	75%	78%	82%	85%	89%	93%	96%
7	35%	38%	42%	45%	48%	52%	55%	59%	62%	66%	69%	73%	76%	79%	83%	86%	90%	93%	97%
8	38%	41%	45%	48%	51%	54%	58%	61%	64%	67%	71%	74%	77%	80%	84%	87%	90%	93%	97%
9	41%	44%	48%	51%	54%	57%	60%	63%	66%	69%	72%	75%	78%	81%	85%	88%	91%	94%	97%
10	44%	47%	50%	53%	56%	59%	62%	65%	68%	71%	74%	77%	80%	82%	85%	88%	91%	94%	97%
11	47%	50%	53%	56%	58%	61%	64%	67%	69%	72%	75%	78%	81%	83%	86%	89%	92%	94%	97%
12	50%	53%	55%	58%	61%	63%	66%	68%	71%	74%	76%	79%	82%	84%	87%	89%	92%	95%	97%
13	53%	55%	58%	60%	63%	65%	68%	70%	73%	75%	78%	80%	83%	85%	88%	90%	93%	95%	98%
14	55%	57%	60%	62%	65%	67%	69%	72%	74%	76%	79%	81%	83%	86%	88%	91%	93%	95%	98%
15	57%	60%	62%	64%	66%	69%	71%	73%	75%	78%	80%	82%	84%	87%	89%	91%	93%	96%	98%
16	60%	62%	64%	66%	68%	70%	72%	75%	77%	79%	81%	83%	85%	87%	89%	92%	94%	96%	98%
17	62%	64%	66%	68%	70%	72%	74%	76%	78%	80%	82%	84%	86%	88%	90%	92%	94%	96%	98%
18	64%	66%	68%	69%	71%	73%	75%	77%	79%	81%	83%	85%	87%	89%	90%	92%	94%	96%	98%
19	66%	67%	69%	71%	73%	75%	76%	78%	80%	82%	84%	86%	87%	89%	91%	93%	95%	96%	98%
20	67%	69%	71%	73%	74%	76%	78%	79%	81%	83%	85%	86%	88%	90%	91%	93%	95%	97%	98%
21	69%	71%	72%	74%	76%	77%	79%	81%	82%	84%	85%	87%	89%	90%	92%	94%	95%	97%	98%
22	71%	72%	74%	75%	77%	78%	80%	82%	83%	85%	86%	88%	89%	91%	92%	94%	95%	97%	98%
23	72%	74%	75%	77%	78%	80%	81%	82%	84%	85%	87%	88%	90%	91%	93%	94%	96%	97%	99%
24	74%	75%	76%	78%	79%	81%	82%	83%	85%	86%	88%	89%	90%	92%	93%	94%	96%	97%	99%
EUL =	25																		

Table M-39. Adjusted EULs for a 25 Year EUL

RUL	Savings Ratio																			
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	
1	2	2	3	4	5	6	7	7	8	9	10	11	12	13	14	16	17	19	21	23
2	3	3	4	5	6	7	7	8	9	10	11	12	14	15	16	18	19	21	23	23
3	4	4	5	6	7	7	8	9	10	11	12	13	14	15	17	18	20	21	23	23
4	5	5	6	7	8	8	9	10	11	12	13	14	15	16	17	19	20	22	23	23
5	6	6	7	8	8	9	10	11	12	13	13	14	15	17	18	19	20	22	23	23
6	7	7	8	9	9	10	11	12	12	13	14	15	16	17	18	19	21	22	23	23
7	8	8	9	9	10	11	12	12	13	14	15	16	17	18	19	20	21	22	24	24
8	9	9	10	10	11	12	12	13	14	15	15	16	17	18	19	20	21	22	24	24
9	10	10	11	11	12	13	13	14	15	15	16	17	18	19	20	21	22	23	24	24
10	11	11	12	12	13	13	14	15	15	16	17	18	18	19	20	21	22	23	24	24
11	12	12	13	13	14	14	15	15	16	17	17	18	19	20	20	21	22	23	24	24
12	12	13	13	14	15	15	16	16	17	17	18	19	19	20	21	22	22	23	24	24
13	13	14	14	15	15	16	16	17	17	18	19	19	20	21	21	22	23	23	24	24
14	14	15	15	16	16	17	17	18	18	19	19	20	20	21	22	22	23	24	24	24
15	15	16	16	17	17	17	18	18	19	19	20	20	21	21	22	23	23	24	24	24
16	16	17	17	17	18	18	19	19	20	20	20	21	21	22	22	23	23	24	24	24
17	17	18	18	18	19	19	19	20	20	21	21	21	22	22	23	23	24	24	25	25
18	18	19	19	19	20	20	20	21	21	21	22	22	22	23	23	23	24	24	25	25
19	19	20	20	20	20	21	21	21	21	22	22	22	23	23	23	24	24	24	25	25
20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25
21	21	21	22	22	22	22	22	23	23	23	23	23	24	24	24	24	24	25	25	25
22	22	22	22	23	23	23	23	23	23	23	24	24	24	24	24	24	25	25	25	25
23	23	23	23	23	23	24	24	24	24	24	24	24	24	24	24	25	25	25	25	25
24	24	24	24	24	24	24	24	24	24	25	25	25	25	25	25	25	25	25	25	25
EUL =	25																			

Table M-40. Adjusted EULs for a 20 Year EUL

RUL	Savings Ratio																		
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
1	2	2	3	4	4	5	6	7	7	8	9	10	11	12	13	14	16	17	18
2	3	3	4	4	5	6	7	7	8	9	10	11	12	13	14	15	16	17	19
3	4	4	5	5	6	7	7	8	9	10	11	11	12	13	14	15	16	17	19
4	5	5	6	6	7	8	8	9	10	10	11	12	13	14	15	16	17	18	19
5	6	6	7	7	8	8	9	10	10	11	12	13	13	14	15	16	17	18	19
6	7	7	8	8	9	9	10	10	11	12	12	13	14	15	15	16	17	18	19
7	7	8	8	9	10	10	11	11	12	12	13	14	14	15	16	17	17	18	19
8	8	9	9	10	10	11	11	12	13	13	14	14	15	16	16	17	18	18	19
9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	17	17	18	19	19
10	10	11	11	12	12	12	13	13	14	14	15	15	16	16	17	18	18	19	19
11	11	12	12	12	13	13	14	14	15	15	15	16	16	17	17	18	18	19	19
12	12	13	13	13	14	14	14	15	15	16	16	16	17	17	18	18	19	19	20
13	13	14	14	14	15	15	15	16	16	16	17	17	17	18	18	19	19	19	20
14	14	15	15	15	15	16	16	16	16	17	17	17	18	18	18	19	19	19	20
15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20
16	16	16	17	17	17	17	17	17	18	18	18	18	19	19	19	19	19	20	20
17	17	17	17	18	18	18	18	18	18	18	19	19	19	19	19	19	20	20	20
18	18	18	18	18	18	19	19	19	19	19	19	19	19	19	19	20	20	20	20
19	19	19	19	19	19	19	19	19	19	19	20	20	20	20	20	20	20	20	20
EUL =	20																		

Table M-41. Adjusted EULs for a 17 Year EUL

RUL	Savings Ratio																		
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
1	2	2	3	3	4	5	5	6	7	7	8	9	10	11	12	13	14	15	16
2	3	3	4	4	5	5	6	7	7	8	9	10	10	11	12	13	14	15	16
3	4	4	5	5	6	6	7	7	8	9	9	10	11	12	12	13	14	15	16
4	4	5	5	6	7	7	8	8	9	9	10	11	11	12	13	14	14	15	16
5	5	6	6	7	7	8	8	9	10	10	11	11	12	13	13	14	15	15	16
6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	14	14	15	16	16
7	7	8	8	9	9	10	10	10	11	11	12	12	13	13	14	15	15	16	16
8	8	9	9	10	10	10	11	11	12	12	12	13	13	14	14	15	15	16	16
9	9	10	10	10	11	11	11	12	12	13	13	13	14	14	15	15	16	16	17
10	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15	16	16	17	17
11	11	12	12	12	12	13	13	13	13	14	14	14	15	15	15	16	16	17	17
12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	17	17
13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	17	17	17
14	14	14	14	15	15	15	15	15	15	15	16	16	16	16	16	17	17	17	17
15	15	15	15	15	15	16	16	16	16	16	16	16	16	16	16	17	17	17	17
16	16	16	16	16	16	16	16	16	16	16	17	17	17	17	17	17	17	17	17
EUL =	17																		

Table M-42. Adjusted EULs for a 15 Year EUL

RUL	Savings Ratio																		
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
1	2	2	3	3	4	4	5	5	6	7	7	8	9	10	10	11	12	13	14
2	2	3	3	4	5	5	6	6	7	7	8	9	9	10	11	12	12	13	14
3	3	4	4	5	5	6	6	7	8	8	9	9	10	11	11	12	13	13	14
4	4	5	5	6	6	7	7	8	8	9	9	10	10	11	12	12	13	14	14
5	5	6	6	7	7	8	8	8	9	9	10	10	11	11	12	13	13	14	14
6	6	7	7	8	8	8	9	9	10	10	10	11	11	12	12	13	13	14	14
7	7	8	8	8	9	9	9	10	10	11	11	11	12	12	13	13	14	14	15
8	8	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14	14	15
9	9	10	10	10	10	11	11	11	11	12	12	12	13	13	13	14	14	14	15
10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15
11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15
12	12	12	12	13	13	13	13	13	13	13	14	14	14	14	14	14	15	15	15
13	13	13	13	13	13	14	14	14	14	14	14	14	14	14	14	15	15	15	15
14	14	14	14	14	14	14	14	14	14	14	15	15	15	15	15	15	15	15	15
EUL =	15																		

Table M-43. Adjusted EULs for a 14 Year EUL

RUL	Savings Ratio																		
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
1	1	2	2	3	4	4	5	5	6	6	7	8	8	9	10	11	11	12	13
2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	10	10	11	12	13
3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	11	11	12	13	13
4	4	5	5	6	6	7	7	7	8	8	9	9	10	10	11	12	12	13	13
5	5	6	6	7	7	7	8	8	9	9	9	10	10	11	11	12	12	13	13
6	6	7	7	7	8	8	8	9	9	10	10	10	11	11	12	12	13	13	14
7	7	8	8	8	9	9	9	10	10	10	11	11	11	12	12	12	13	13	14
8	8	9	9	9	9	10	10	10	10	11	11	11	12	12	12	13	13	13	14
9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14
10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14
11	11	11	11	12	12	12	12	12	12	12	13	13	13	13	13	13	14	14	14
12	12	12	12	12	12	13	13	13	13	13	13	13	13	13	13	14	14	14	14
13	13	13	13	13	13	13	13	13	13	13	14	14	14	14	14	14	14	14	14
EUL =	14																		

Table M-44. Adjusted EULs for a 13 Year EUL

RUL	Savings Ratio																		
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
1	1	2	2	3	3	4	4	5	6	6	7	7	8	9	9	10	11	11	12
2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	10	10	11	12	12
3	3	4	4	5	5	6	6	6	7	7	8	8	9	9	10	11	11	12	12
4	4	5	5	6	6	6	7	7	8	8	8	9	9	10	10	11	11	12	12
5	5	6	6	6	7	7	7	8	8	9	9	9	10	10	11	11	12	12	13
6	6	7	7	7	8	8	8	9	9	9	10	10	10	11	11	11	12	12	13
7	7	8	8	8	8	9	9	9	9	10	10	10	11	11	11	12	12	12	13
8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13
9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13
10	10	10	10	11	11	11	11	11	11	11	12	12	12	12	12	12	13	13	13
11	11	11	11	11	11	12	12	12	12	12	12	12	12	12	12	13	13	13	13
12	12	12	12	12	12	12	12	12	12	12	13	13	13	13	13	13	13	13	13
EUL =	13																		

Table M-45. Adjusted EULs for a 12 Year EUL

RUL	Savings Ratio																		
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	9	9	10	11	11
2	2	3	3	4	4	4	5	5	6	6	7	7	8	8	9	10	10	11	11
3	3	4	4	4	5	5	6	6	7	7	7	8	8	9	9	10	10	11	11
4	4	5	5	5	6	6	6	7	7	8	8	8	9	9	10	10	11	11	12
5	5	6	6	6	7	7	7	8	8	8	9	9	9	10	10	10	11	11	12
6	6	7	7	7	7	8	8	8	8	9	9	9	10	10	10	11	11	11	12
7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12
8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12
9	9	9	9	10	10	10	10	10	10	10	11	11	11	11	11	11	12	12	12
10	10	10	10	10	10	11	11	11	11	11	11	11	11	11	11	12	12	12	12
11	11	11	11	11	11	11	11	11	11	11	12	12	12	12	12	12	12	12	12
EUL =	12																		

Table M-46. Adjusted EULs for a 11 Year EUL

RUL	Savings Ratio																		
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
1	1	2	2	3	3	3	4	4	5	5	6	6	7	7	8	9	9	10	10
2	2	3	3	3	4	4	5	5	6	6	6	7	7	8	8	9	9	10	10
3	3	4	4	4	5	5	5	6	6	7	7	7	8	8	9	9	10	10	11
4	4	5	5	5	6	6	6	7	7	7	8	8	8	9	9	9	10	10	11
5	5	6	6	6	6	7	7	7	7	8	8	8	9	9	9	10	10	10	11
6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11
7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11
8	8	8	8	9	9	9	9	9	9	9	10	10	10	10	10	10	11	11	11
9	9	9	9	9	9	10	10	10	10	10	10	10	10	10	10	11	11	11	11
10	10	10	10	10	10	10	10	10	10	10	11	11	11	11	11	11	11	11	11
EUL =	11																		

Table M-47. Adjusted EULs for a 10 Year EUL

RUL	Savings Ratio																		
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
1	1	2	2	2	3	3	4	4	5	5	5	6	6	7	7	8	8	9	9
2	2	3	3	3	4	4	4	5	5	6	6	6	7	7	8	8	9	9	10
3	3	4	4	4	5	5	5	6	6	6	7	7	7	8	8	8	9	9	10
4	4	5	5	5	5	6	6	6	6	7	7	7	8	8	8	9	9	9	10
5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10
6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10
7	7	7	7	8	8	8	8	8	8	8	9	9	9	9	9	9	10	10	10
8	8	8	8	8	8	9	9	9	9	9	9	9	9	9	9	10	10	10	10
9	9	9	9	9	9	9	9	9	9	9	10	10	10	10	10	10	10	10	10
EUL =	10																		