### ENERGY STAR Specialty Compact Fluorescent Lamp (CFL)

###### Description

An ENERGY STAR qualified specialty compact fluorescent bulb is installed in place of an incandescent specialty bulb.

This characterization assumes that the specialty CFL is installed in a residential location. If the implementation strategy does not allow for the installation location to be known (e.g. an upstream retail program) a deemed split of 96% Residential and 4% Commercial assumptions should be used[[1]](#footnote-1).

This measure was developed to be applicable to the following program types:  TOS, NC, DI, KITS.

If applied to other program types, the measure savings should be verified.

###### Definition of Efficient Equipment

Energy Star qualified specialty CFL bulb based upon the draft ENERGY STAR specification for lamps (<http://energystar.gov/products/specs/sites/products/files/ENERGY_STAR_Lamps_V1_0_Draft%203.pdf>).

###### Definition of Baseline Equipment

The baseline is a specialty incandescent light bulb including those exempt of the EISA 2007 standard: three-way, plant light, daylight bulb, bug light, post light, globes G40 (<40W), candelabra base (<60W), vibration service bulb, decorative candle with medium or intermediate base (<40W), shatter resistant and reflector bulbs and standard bulbs greater than 2601 lumens, and those non-exempt from EISA 2007: dimmable, globes (less than 5” diameter and >40W), candle (shapes B, BA, CA >40W, candelabra base lamps (>60W) and intermediate base lamps (>40W).

###### Deemed Lifetime of Efficient Equipment

The expected measure life is assumed to be 6.8 year[[2]](#footnote-2).

Exterior bulbs: The expected measure life is 3.2 years[[3]](#footnote-3) for bulbs installed June 2012 – May 2017. For bulbs installed June 2017-May 2018 this would be reduced to 3 years.

###### Deemed Measure Cost

For the Retail (Time of Sale) measure, the incremental capital cost for this measure is $5[[4]](#footnote-4).

For the Direct Install measure, the full cost of $8.50 should be used plus $5 labor[[5]](#footnote-5) for a total of $13.50. However actual program delivery costs should be utilized if available.

For bulbs provided in Efficiency Kits, the actual program delivery costs should be utilized..

###### Loadshape

|  |
| --- |
| Loadshape R06 - Residential Indoor Lighting |
| Loadshape R07 - Residential Outdoor Lighting |

###### Coincidence Factor

Unlike standard CFLs that could be installed in any room, certain types of specialty CFLs are more likely to be found in specific rooms, which affects the coincident peak factor. Coincidence factors by bulb types are presented below[[6]](#footnote-6)

|  |  |
| --- | --- |
| **Bulb Type** | **Peak CF** |
| Three-way | 0.078[[7]](#footnote-7) |
| Dimmable | 0.078[[8]](#footnote-8) |
| Interior reflector (incl. dimmable) | 0.091 |
| Exterior reflector | 0.273 |
| Candelabra base and candle medium and intermediate base | 0.121 |
| Bug light | 0.273 |
| Post light (>100W) | 0.273 |
| Daylight | 0.081 |
| Plant light | 0.081 |
| Globe | 0.075 |
| Vibration or shatterproof | 0.081 |
| Standard spirals >= 2601 lumens, Residential, Multi-family in unit | 0.071 |
| Standard spirals >= 2601 lumens, unknown | 0.081 |
| Standard spirals >= 2601 lumens, exterior | 0.273 |
| Specialty - Generic | 0.081 |

Algorithm

###### Calculation of Savings

###### Electric Energy Savings

∆kWh = ((WattsBase - WattsEE) / 1000) \* ISR \* (1-Leakage) \* Hours \* WHFe

Where:

WattsBase = Actual wattage equivalent of incandescent specialty bulb, use the tables below to obtain the incandescent bulb equivalent wattage[[9]](#footnote-9); use 60W if unknown[[10]](#footnote-10)

EISA exempt bulb types:

| **Bulb Type** | **Lower Lumen Range** | **Upper Lumen Range** | **WattsBase** |
| --- | --- | --- | --- |
| **Standard Spirals >=2601** | 2601 | 2999 | 150 |
| 3000 | 5279 | 200 |
| 5280 | 6209 | 300 |
| **3-Way** | 250 | 449 | 25 |
| 450 | 799 | 40 |
| 800 | 1099 | 60 |
| 1100 | 1599 | 75 |
| 1600 | 1999 | 100 |
| 2000 | 2549 | 125 |
| 2550 | 2999 | 150 |
| **Globe**  **(medium and intermediate bases less than 750 lumens)** | 90 | 179 | 10 |
| 180 | 249 | 15 |
| 250 | 349 | 25 |
| 350 | 749 | 40 |
| **Decorative**  **(Shapes B, BA, C, CA, DC, F, G, medium and intermediate bases less than 750 lumens)** | 70 | 89 | 10 |
| 90 | 149 | 15 |
| 150 | 299 | 25 |
| 300 | 749 | 40 |
| **Globe**  **(candelabra bases less than 1050 lumens)** | 90 | 179 | 10 |
| 180 | 249 | 15 |
| 250 | 349 | 25 |
| 350 | 499 | 40 |
| 500 | 1049 | 60 |
| **Decorative**  **(Shapes B, BA, C, CA, DC, F, G, candelabra bases less than 1050 lumens)** | 70 | 89 | 10 |
| 90 | 149 | 15 |
| 150 | 299 | 25 |
| 300 | 499 | 40 |
| 500 | 1049 | 60 |

**Directional Lamps -** ENERGY STAR Minimum Luminous Efficacy = 40Lm/W for lamps with rated wattages less than 20Wand 50 Lm/W for lamps with rated wattages >= 20 watts[[11]](#footnote-11).

For Directional R, BR, and ER lamp types[[12]](#footnote-12):

| **Bulb Type** | **Lower Lumen Range** | **Upper Lumen Range** | **WattsBase** |
| --- | --- | --- | --- |
| **R, ER, BR with medium screw bases w/ diameter >2.25" (\*see exceptions below)** | 420 | 472 | 40 |
| 473 | 524 | 45 |
| 525 | 714 | 50 |
| 715 | 937 | 65 |
| 938 | 1259 | 75 |
| 1260 | 1399 | 90 |
| 1400 | 1739 | 100 |
| 1740 | 2174 | 120 |
| 2175 | 2624 | 150 |
| 2625 | 2999 | 175 |
| 3000 | 4500 | 200 |
| **\*R, BR, and ER with medium screw bases w/ diameter <=2.25"** | 400 | 449 | 40 |
| 450 | 499 | 45 |
| 500 | 649 | 50 |
| 650 | 1199 | 65 |
| **\*ER30, BR30, BR40, or ER40** | 400 | 449 | 40 |
| 450 | 499 | 45 |
| 500 | 649 | 50 |
| **\*BR30, BR40, or ER40** | 650 | 1419 | 65 |
| **\*R20** | 400 | 449 | 40 |
| 450 | 719 | 45 |
| **\*All reflector lamps below lumen ranges specified above** | 200 | 299 | 20 |
| 300 | [[13]](#footnote-13)399 | 30 |

Directional lamps are exempt from EISA regulations.

For PAR, MR, and MRX Lamps Types:

For these highly focused directional lamp types, it is necessary to have Center Beam Candle Power (CBCP) and beam angle measurements to accurately estimate the equivalent baseline wattage. The formula below is based on the Energy Star Center Beam Candle Power tool.[[14]](#footnote-14) If CBCP and beam angle information are not available, or if the equation below returns a negative value (or undefined), use the manufacturer’s recommended baseline wattage equivalent.[[15]](#footnote-15)

Where:

D = Bulb diameter (e.g. for PAR20 D = 20)

BA = Beam angle

CBCP = Center beam candle power

The result of the equation above should be rounded DOWN to the nearest wattage established by Energy Star:

| **Diameter** | **Permitted Wattages** |
| --- | --- |
| 16 | 20, 35, 40, 45, 50, 60, 75 |
| 20 | 50 |
| 30S | 40, 45, 50, 60, 75 |
| 30L | 50, 75 |
| 38 | 40, 45, 50, 55, 60, 65, 75, 85, 90, 100, 120, 150, 250 |

EISA non-exempt bulb types:

| **Bulb Type** | **Lower Lumen Range** | **Upper Lumen Range** | **Incandescent Equivalent**  **Post-EISA 2007**  **(WattsBase)** |
| --- | --- | --- | --- |
| **Dimmable Twist, Globe (less than 5" in diameter and > 749 lumens), candle (shapes B, BA, CA > 749 lumens), Candelabra Base Lamps (>1049 lumens), Intermediate Base Lamps (>749 lumens)** | 310 | 749 | 29 |
| 750 | 1049 | 43 |
| 1050 | 1489 | 53 |
| 1490 | 2600 | 72 |

WattsEE = Actual wattage of energy efficient specialty bulb purchased, use 15W if unknown[[16]](#footnote-16)

ISR = In Service Rate, the percentage of units rebated that are actually in service.

| **Program** | | **Weighted Average 1st year In Service Rate (ISR)** | **2nd year Installations** | **3rd year Installations** | **Final Lifetime In Service Rate** |
| --- | --- | --- | --- | --- | --- |
| Retail (Time of Sale) | | 88.0%[[17]](#footnote-17) | 5.4% | 4.6% | 98.0%[[18]](#footnote-18) |
| Direct Install | | 96.9%[[19]](#footnote-19) |  |  |  |
| Efficiency Kits[[20]](#footnote-20) | CFL Distribution[[21]](#footnote-21) | 59% | 13% | 11% | 83% |
| School Kits[[22]](#footnote-22) | 61% | 13% | 11% | 86% |
| Direct Mail Kits[[23]](#footnote-23) | 66% | 14% | 12% | 93% |

Leakage = Adjustment to account for the percentage of bulbs purchased that move out (and in if deemed appropriate) of the Utility Jurisdiction.

Upstream (TOS) Lighting programs = Determined through evaluation[[24]](#footnote-24).

All other programs = 0

Hours = Average hours of use per year, varies by bulb type as presented below:[[25]](#footnote-25)

| **Bulb Type** | **Annual hours of use (HOU)** |
| --- | --- |
| Three-way | 850 |
| Dimmable | 850 |
| Interior reflector (incl. dimmable) | 861 |
| Exterior reflector | 2475 |
| Candelabra base and candle medium and intermediate base | 1190 |
| Bug light | 2475 |
| Post light (>100W) | 2475 |
| Daylight | 847 |
| Plant light | 847 |
| Globe | 639 |
| Vibration or shatterproof | 847 |
| Standard Spiral >2601 lumens, Residential, Multi Family in-unit | 759 |
| Standard Spiral >2601 lumens, unknown | 847 |
| Standard Spiral >2601 lumens, Exterior | 2475 |
| Specialty - Generic | 847 |

WHFe = Waste heat factor for energy to account for cooling savings from efficient lighting

| **Bulb Location** | **WHFe** |
| --- | --- |
| Interior single family or unknown location | 1.06 [[26]](#footnote-26) |
| Multi family in unit | 1.04 [[27]](#footnote-27) |
| Exterior or uncooled location | 1.0 |

###### Deferred Installs

As presented above, the characterization assumes that a percentage of bulbs purchased are not installed until Year 2 and Year 3 (see ISR assumption above). The Illinois Technical Advisory Committee has determined the following methodology for calculating the savings of these future installs.

Year 1 (Purchase Year) installs: Characterized using assumptions provided above or evaluated assumptions if available.

Year 2 and 3 installs: Characterized using delta watts assumption and hours of use from the Install Year i.e. the actual deemed (or evaluated if available) assumptions active in Year 2 and 3 should be applied.

The NTG factor for the Purchase Year should be applied.

For example, for a 13W dimmable CFL impacted by EISA 2007 (60W standard incandescent and 43W EISA qualified incandescent/halogen) purchased in 2013.

ΔkWH1st year installs = ((60 - 13) / 1000) \* 0.823 \* 850 \* 1.06

= 34.9 kWh

ΔkWH2nd year installs = ((43 - 13) / 1000) \* 0.085 \* 850 \* 1.06

= 2.3 kWh

Note: Here we assume no change in hours assumption. NTG value from Purchase year applied.

ΔkWH3rd year installs = ((43 - 13) / 1000) \* 0.072 \* 850 \* 1.06

= 1.9 kWh

Note: delta watts is equivalent to install year. Here we assume no change in hours assumption.

###### Heating Penalty

If electric heated home (if heating fuel is unknown assume gas, see Natural Gas section):

∆kWh[[28]](#footnote-28)  = - (((WattsBase - WattsEE) / 1000) \* ISR \* Hours \* HF) / ηHeat

Where:

HF = Heating Factor or percentage of light savings that must be heated

= 49%[[29]](#footnote-29) for interior or unknown location

= 0% for exterior location

ηHeat = Efficiency in COP of Heating equipment

= actual. If not available use[[30]](#footnote-30):

|  |  |  |  |
| --- | --- | --- | --- |
| **System Type** | **Age of Equipment** | **HSPF Estimate** | **ηHeat**  **(COP Estimate)** |
| Heat Pump | Before 2006 | 6.8 | 2.00 |
| 2006 - 2014 | 7.7 | 2.26 |
| 2015 on | 8.2 | 2.40 |
| Resistance | N/A | N/A | 1.00 |

For example, a 15W globe CFL replacing a 60W incandescent specialty bulb installed in home with 2.0 COP Heat Pump:

∆kWh1st year    = - (((60 - 15) / 1000) \* 0.823 \* 639 \* 0.49) / 2.0

= - 5.8 kWh

Second and third year savings should be calculated using the appropriate ISR.

###### Summer Coincident Peak Demand Savings

∆kW =((WattsBase - WattsEE) / 1000) \* ISR \* WHFd \* CF

Where:

WHFd = Waste heat factor for demand to account for cooling savings from efficient lighting.

| **Bulb Location** | **WHFd** |
| --- | --- |
| Interior single family or unknown location | 1.11[[31]](#footnote-31) |
| Multi family in unit | 1.07[[32]](#footnote-32) |
| Exterior or uncooled location | 1.0 |

CF = Summer Peak Coincidence Factor for measure. Coincidence factors by bulb types are presented below[[33]](#footnote-33)

| **Bulb Type** | **Peak CF** |
| --- | --- |
| Three-way | 0.078[[34]](#footnote-34) |
| Dimmable | 0.078[[35]](#footnote-35) |
| Interior reflector (incl. dimmable) | 0.091 |
| Exterior reflector | 0.273 |
| Candelabra base and candle medium and intermediate base | 0.121 |
| Bug light | 0.273 |
| Post light (>100W) | 0.273 |
| Daylight | 0.081 |
| Plant light | 0.081 |
| Globe | 0.075 |
| Vibration or shatterproof | 0.081 |
| Standard Spiral >=2601 lumens, Residential, Multi-family in unit | 0.071 |
| Standard spirals >= 2601 lumens, unknown | 0.081 |
| Standard spirals >= 2601 lumens, exterior | 0.273 |
| Specialty - Generic | 0.081 |

Other factors as defined above

For example, a 15W specialty CFL replacing a 60W incandescent specialty bulb:

ΔkW1st year = ((60 - 15) / 1000) \* 0.823 \* 1.11 \* 0.081

= 0.003 kW

Second and third year savings should be calculated using the appropriate ISR.

###### Natural Gas Savings

Heating Penalty if Natural Gas heated home (or if heating fuel is unknown):

∆Therms[[36]](#footnote-36) = - (((WattsBase - WattsEE) / 1000) \* ISR \* Hours \* HF \* 0.03412) / ηHeat

Where:

HF = Heating Factor or percentage of light savings that must be heated

= 49%[[37]](#footnote-37) for interior or unknown location

= 0% for exterior location

0.03412 =Converts kWh to Therms

ηHeat = Efficiency of heating system

=70%[[38]](#footnote-38)

For example, a 15W Globe specialty CFL replacing a 60W incandescent specialty bulb:

∆Therms = - (((60 - 15) / 1000) \* 0. 823 \* 639 \* 0.49 \* 0.03412) / 0.7

= - 0.57 Therms

Second and third year savings should be calculated using the appropriate ISR.

###### Water Impact Descriptions and Calculation

N/A

###### Deemed O&M Cost Adjustment Calculation

For those bulbs types exempt from EISA the following O&M assumptions should be used: Life of the baseline bulb is assumed to be 1.32 year[[39]](#footnote-39); baseline replacement cost is assumed to be $3.5[[40]](#footnote-40).

For non-exempt EISA bulb types defined above, the following O&M assumptions should be used: Life of the baseline bulb is assumed to be 1.32 year[[41]](#footnote-41); baseline replacement cost is assumed to be $5[[42]](#footnote-42).

###### Measure Code: RS-LTG-ESCC-V04-160601

1. RES v C&I split is based on a weighted (by sales volume) average of ComEd PY4, PY5 and PY6 and Ameren PY5 and PY6 in store intercept survey results. See ‘RESvCI Split\_122014.xls’. [↑](#footnote-ref-1)
2. The assumed measure life for the specialty bulb measure characterization was reported in "Residential Lighting Measure Life Study", Nexus Market Research, June 4, 2008 (measure life for markdown bulbs). Measure life estimate does not distinguish between equipment life and measure persistence. Measure life includes products that were installed and operated until failure (i.e., equipment life) as well as those that were retired early and permanently removed from service for any reason, be it early failure, breakage, or the respondent not liking the product (i.e., measure persistence). [↑](#footnote-ref-2)
3. Based on using 8,000 hour rated life assumption since more switching and use ourdoors. 8,000/2475 = 3.2years [↑](#footnote-ref-3)
4. NEEP Residential Lighting Survey, 2011 [↑](#footnote-ref-4)
5. Based on 15 minutes at $20 per hour. [↑](#footnote-ref-5)
6. Based on lighting logger study conducted as part of the PY5/6 ComEd Residential Lighting Program evaluation. [↑](#footnote-ref-6)
7. Based on average of bedroom, dining room, office and living room results from the lighting logger study conducted as part of the PY5/6 ComEd Residential Lighting Program evaluation. [↑](#footnote-ref-7)
8. Ibid [↑](#footnote-ref-8)
9. Based upon the draft ENERGY STAR specification for lamps (<http://energystar.gov/products/specs/sites/products/files/ENERGY_STAR_Lamps_V1_0_Draft%203.pdf>) and the Energy Policy and Conservation Act of 2012. [↑](#footnote-ref-9)
10. A 2006-2008 California Upstream Lighting Evaluation found an average incandescent wattage of 61.7 Watts (KEMA, Inc, The Cadmus Group, Itron, Inc, PA Consulting Group, Jai J. Mitchell Analytics, Draft Evaluation Report: Upstream Lighting Program. Prepared for the California Public Utilities Commission, Energy Division. December 10, 2009) [↑](#footnote-ref-10)
11. From pg 10 of the Energy Star Specification for lamps v1.1 [↑](#footnote-ref-11)
12. From pg 11 of the Energy Star Specification for lamps v1.1 [↑](#footnote-ref-12)
13. [↑](#footnote-ref-13)
14. http://energystar.supportportal.com/link/portal/23002/23018/Article/32655/ [↑](#footnote-ref-14)
15. The Energy Star Center Beam Candle Power tool does not accurately model baseline wattages for lamps with certain bulb characteristic combinations – specifically for lamps with very high CBCP. [↑](#footnote-ref-15)
16. An evaluation (Energy Efficiency / Demand Response Plan: Plan Year 2 (6/1/2009-5/31/2010) Evaluation Report: Residential Energy Star ® Lighting

    <http://ilsag.org/yahoo_site_admin/assets/docs/ComEd_Res_Lighting_PY2_Evaluation_Report_2010-12-21_Final.12113928.pdf> ) reported 13-17W as the most common specialty CFL wattage (69% of program bulbs). 2009 California data also reported an average CFL wattage of 15.5 Watts (KEMA, Inc, The Cadmus Group, Itron, Inc, PA Consulting Group, Jai J. Mitchell Analytics, Draft Evaluation Report: Upstream Lighting Program, Prepared for the California Public Utilities Commission, Energy Division. December 10, 2009). [↑](#footnote-ref-16)
17. 1st year in service rate is based upon review of PY4-6 evaluations from ComEd and PY5-6 from Ameren (see ‘IL RES Lighting ISR\_122014.xls’ for more information. The average first year ISR was calculated weighted by the number of bulbs in the each year’s survey. [↑](#footnote-ref-17)
18. The 98% Lifetime ISR assumption is consistent with the assumption for standard CFLs (in the absence of evidence that it should be different for this bulb type) based upon review of two evaluations:

    ‘Nexus Market Research, RLW Analytics and GDS Associates study; “New England Residential Lighting Markdown Impact Evaluation, January 20, 2009’ and ‘KEMA Inc, Feb 2010, Final Evaluation Report:, Upstream Lighting Program, Volume 1.’ This implies that only 2% of bulbs purchased are never installed. The second and third year installations are based upon Ameren analysis of the Californian KEMA study showing that 54% of future installs occur in year 2 and 46% in year 3. The 2nd and 3rd year installations should be counted as part of those future program year savings. [↑](#footnote-ref-18)
19. Consistent with assumption for standard CFLs (in the absence of evidence that it should be different for this bulb type). Based upon review of the PY2 and PY3 ComEd Direct Install program surveys. This value includes bulb failures in the 1st year to be consistent with the Commission approval of annualization of savings for first year savings claims. ComEd PY2 All Electric Single Family Home Energy Performance Tune-Up Program Evaluation, Navigant Consulting, December 21, 2010. <http://www.icc.illinois.gov/downloads/public/edocket/287090.pdf>. [↑](#footnote-ref-19)
20. In Service Rates provided are for the bulb within a kit only. Given the significant differences in program design and the level of education provided through Efficiency Kits programs, the evaluators should apply the ISR estimated through evaluations (either past evaluations or the current program year evaluation) of the specific Efficiency Kits program.  In cases where program-specific evaluation results for an ISR are unavailable, the default ISR values for Efficiency Kits provide may be used. [↑](#footnote-ref-20)
21. Free bulbs provided without request, with little or no education. Consistent with Standard CFL assumptions. [↑](#footnote-ref-21)
22. Kits provided free to students through school, with education program. Consistent with Standard CFL assumptions. [↑](#footnote-ref-22)
23. Opt-in program to receive kits via mail, with little or no education. Consistent with Standard CFL assumptions. [↑](#footnote-ref-23)
24. Using a leakage estimate from the current program year evaluation, from past evaluation results, or a rolling average of leakage estimates from previous years. [↑](#footnote-ref-24)
25. Hours of use by specialty bulb type calculated using the average hours of use in locations or rooms where each type of specialty bulb is most commonly found. Values for Reflector, Decorative and Globe are taken directly from the lighting logger study conducted as part of the PY5/6 ComEd Residential Lighting Program evaluation. All other hours have been updated based on the room specific hours of use from the PY5/PY6 logger study. [↑](#footnote-ref-25)
26. The value is estimated at 1.06 (calculated as 1 + (0.66\*(0.27 / 2.8)). Based on cooling loads decreasing by 27% of the lighting savings (average result from REMRate modeling of several different configurations and IL locations of homes), assuming typical cooling system operating efficiency of 2.8 COP (starting from standard assumption of SEER 10.5 central AC unit, converted to 9.5 EER using algorithm (-0.02 \* SEER2) + (1.12 \* SEER) (from Wassmer, M. (2003). A Component-Based Model for Residential Air Conditioner and Heat Pump Energy Calculations. Masters Thesis, University of Colorado at Boulder), converted to COP = EER/3.412 = 2.8COP) and 66% of homes in Illinois having central cooling ("Table HC7.9 Air Conditioning in Homes in Midwest Region, Divisions, and States, 2009 from Energy Information Administration", 2009 Residential Energy Consumption Survey; <http://www.eia.gov/consumption/residential/data/2009/xls/HC7.9%20Air%20Conditioning%20in%20Midwest%20Region.xls> ) [↑](#footnote-ref-26)
27. As above but using estimate of 45% of multi family buildings in Illinois having central cooling (based on data from “Table HC7.1 Air Conditioning in U.S. Homes, By Housing Unit Type, 2009” which is for the whole of the US, scaled to IL air conditioning prevalence compared to US average); <http://205.254.135.7/consumption/residential/data/2009/xls/HC7.1%20Air%20Conditioning%20by%20Housing%20Unit%20Type.xls> [↑](#footnote-ref-27)
28. Negative value because this is an increase in heating consumption due to the efficient lighting. [↑](#footnote-ref-28)
29. This means that heating loads increase by 49% of the lighting savings. This is based on the average result from REMRate modeling of several different configurations and IL locations of homes. [↑](#footnote-ref-29)
30. These default system efficiencies are based on the applicable minimum Federal Standards. In 2006 the Federal Standard for Heat Pumps was adjusted. While one would expect the average system efficiency to be higher than this minimum, the likely degradation of efficiencies over time mean that using the minimum standard is appropriate. [↑](#footnote-ref-30)
31. The value is estimated at 1.11 (calculated as 1 + (0.66 \* 0.466 / 2.8)). See footnote relating to WHFe for details. Note the 46.6% factor represents the average Residential cooling coincidence factor calculated by dividing average load during the peak hours divided by the maximum cooling load. [↑](#footnote-ref-31)
32. As above but using estimate of 45% of multifamily buildings in Illinois having central cooling (based on data from “Table HC7.1 Air Conditioning in U.S. Homes, By Housing Unit Type, 2009” which is for the whole of the US, scaled to IL air conditioning prevalence compared to US average); <http://205.254.135.7/consumption/residential/data/2009/xls/HC7.1%20Air%20Conditioning%20by%20Housing%20Unit%20Type.xls>. [↑](#footnote-ref-32)
33. Based on lighting logger study conducted as part of the PY5/6 ComEd Residential Lighting Program evaluation. [↑](#footnote-ref-33)
34. Based on average of bedroom, dining room, office and living room results from the lighting logger study conducted as part of the PY5/6 ComEd Residential Lighting Program evaluation. [↑](#footnote-ref-34)
35. Ibid [↑](#footnote-ref-35)
36. Negative value because this is an increase in heating consumption due to the efficient lighting. [↑](#footnote-ref-36)
37. This means that heating loads increase by 49% of the lighting savings. This is based on the average result from REMRate modeling of several different configurations and IL locations of homes. [↑](#footnote-ref-37)
38. This has been estimated assuming that natural gas central furnace heating is typical for Illinois residences (66% of Illinois homes have a Natural Gas Furnace (based on EIA Residential Energy Consumption Survey (RECS) 2009 for Midwest Region, data for the state of IL. If utilities have specific evaluation results providing a more appropriate assumption for homes in a particular market or geographical area then that should be used.)

    In 2000, 24% of furnaces purchased in Illinois were condensing (based on data from GAMA, provided to Department of Energy during the federal standard setting process for residential heating equipment - see Furnace Penetration.xls). Furnaces tend to last up to 20 years and so units purchased 10 years ago provide a reasonable proxy for the current mix of furnaces in the State. Assuming typical efficiencies for condensing and non-condensing furnaces and duct losses, the average heating system efficiency is estimated as follows:

    (0.24\*0.92) + (0.76\*0.8) \* (1-0.15) = 0.70 [↑](#footnote-ref-38)
39. Assuming 1000 hour rated life for incandescent bulb: 1000/759 = 1.32 [↑](#footnote-ref-39)
40. NEEP Residential Lighting Survey, 2011 [↑](#footnote-ref-40)
41. Assuming 1000 hour rated life for halogen bulb: 1000/759 = 1.32 [↑](#footnote-ref-41)
42. NEEP Residential Lighting Survey, 2011 [↑](#footnote-ref-42)