NSW GOVERNMENT | Planning & Environment

Energy Savings Scheme

Rule Change 17-18

Appendix A: Updates to the commercial lighting sub-method

December 2017

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Appendix A: Updates to the commercial lighting sub-method

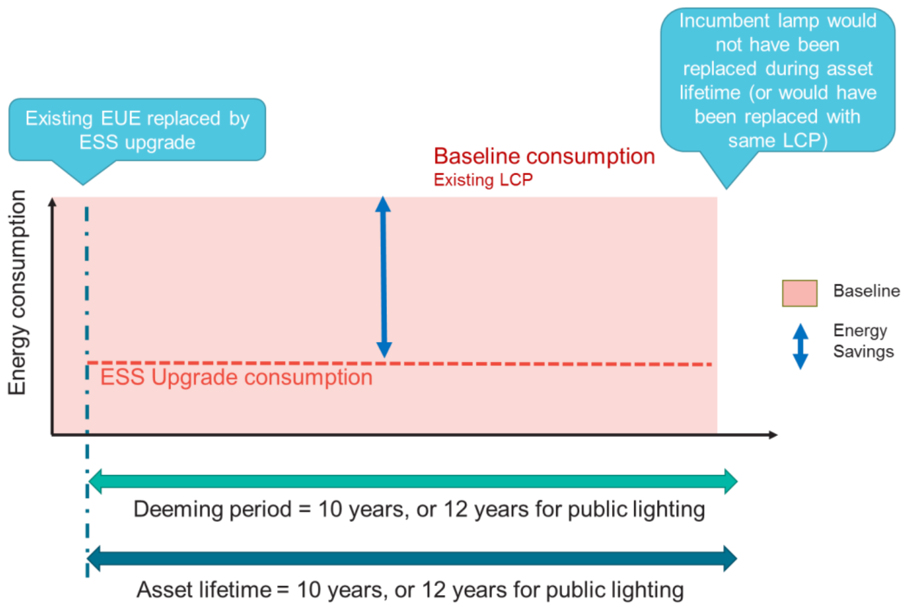
A.1 The current commercial lighting sub-method

The commercial lighting sub-method calculates Energy Savings based on the difference between the Baseline Energy Consumption and the energy consumption of the upgraded lights. There are two equations to calculate Baseline Energy Consumption under this sub-method.

Building Code of Australia (BCA) Part J6 sets out artificial lighting and power requirements as part of a Development Application (DA) approval. Where BCA Part J6 applies to a Lighting Upgrade, the new lights must be equal to or below the maximum Illumination Power Density (IPD) requirements in Watts per square meter (W/m^2).

Equation 7 of the Rule is used when Part J6 of BCA does not apply to the Lighting Upgrade, or where BCA Part J6 applies to the Lighting Upgrade and the existing lighting meets or is below the maximum IPD requirements. The Baseline Energy Consumption is the rated Lamp Circuit Power (LCP) of the removed lamp or luminaire (see Figure A1).

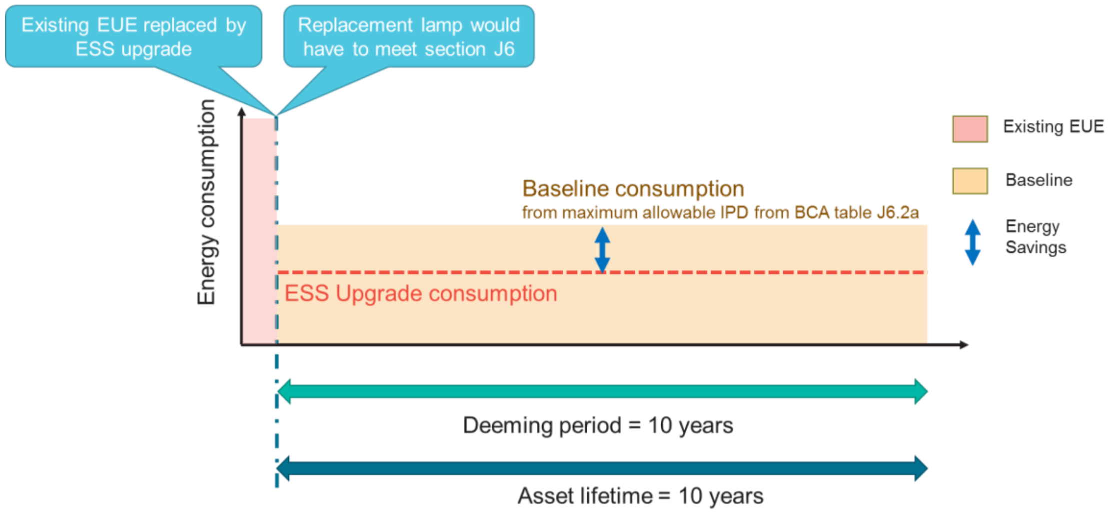
Figure A1 Commercial Lighting Energy Savings Formula (concept illustration for Equation 7)



EUE: End-User Equipment

Otherwise, if BCA Part J6 applies and the existing lighting does not meet the IPD requirements, Equation 8 of the Rule is used to calculate Baseline Energy Consumption (see Figure A2).

Figure A2 Commercial Lighting Energy Savings Formula (concept illustration for Equation 8)



EUE: End-User Equipment

A.2 The Lighting Market Impact Evaluation (LMIE) research

Recently, the NSW Government commissioned consultants Common Capital and Beletich Associates to undertake a Lighting Market Impact Evaluation (LMIE). Its purpose was to help understand the impact of the ESS and other NSW Government programs on the NSW lighting market since 2009, and to identify the policy, operational and evaluation implications of these findings. The study involved qualitative and quantitative research that examined the structure, dynamics and performance of the lighting market.

Common Capital developed an integrated theory of change and program logic to formulate a series of hypotheses and research questions relating to how NSW Government programs influence the lighting market. To answer these research questions, they conducted interviews with 30 stakeholders across a diverse range of roles within the lighting supply chain. The interview results were used to refine the consultants' understanding of baseline market trends and program impacts, as well as to refine the assumptions and update the model for the quantitative analysis.

Beletich Associates developed a model to estimate the market average energy consumption of lighting products by technology type and end-use sector over time. This model was informed by an analysis of the stock and sales of lighting products over the last ten years in the national and NSW commercial, residential, industrial and public lighting sectors. This research is presented in Appendix C.

Based on the modelling undertaken by Beletich Associates, and interviews undertaken with stakeholders, the LMIE used an alternative model to estimate Energy Savings under the lighting sub-methods (for a more detailed explanation see Appendix B).

A.3 The case for ESS Rule changes

The LMIE study indicates that the lighting market has transformed and that, in some sectors, the commercial lighting sub-method may begin to over-reward the Energy Savings from Lighting Upgrades. This would lead to less energy being saved in NSW.

If the ESS leads to less energy being saved, it would be less effective in meeting its legislated objectives and would deliver a reduced net economic benefit for NSW. The ESS Review Options Paper from April 2015[1] found that if the ESS supported five per cent of activity that would have occurred anyway it would reduce the net economic benefit of the Scheme by around $51 million.

There is a risk that without changes to the commercial lighting sub-method, the effectiveness of the ESS and its net economic benefit would reduce.

If an activity would happen without a financial incentive from an Energy Savings Certificate (ESC), the ESC price is not material to whether the activity goes ahead. An ACP may be willing to accept a lower price for the ESC they created.

This could lead to more ESCs being created than required to meet the ESS targets, which could result in low ESC prices for all ACPs. Low ESC prices may reduce the financial viability of other activities that need an incentive to go ahead.

There is a risk that without changes to the commercial lighting sub-method, ESC prices may reach sustained low levels and ACPs may not be able to use the ESS to drive other types of Energy Savings activities.

A.4 Proposed conceptual framework to calculate Energy Savings

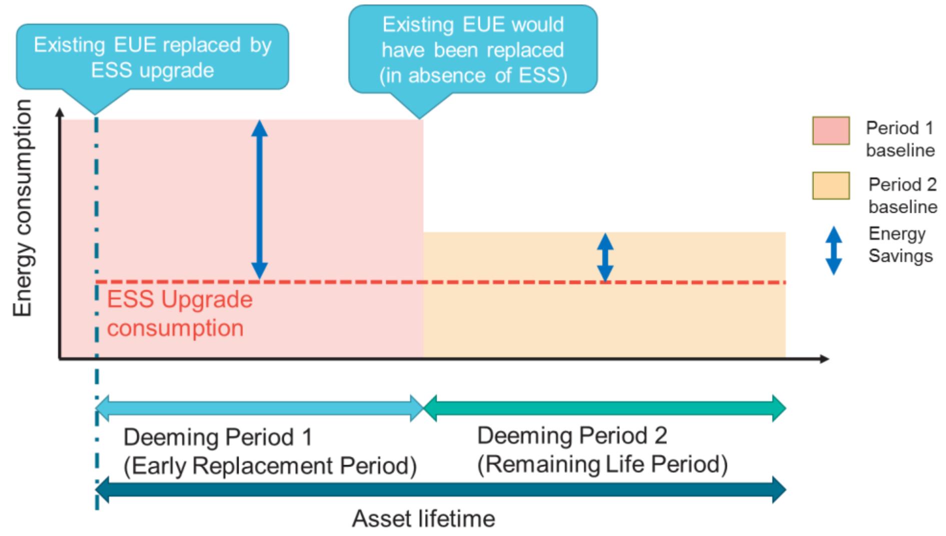
Figure A4 below illustrates a proposed conceptual framework to calculate Energy Savings based on the outcomes of the LMIE research. This framework differs from Energy Savings calculated using Equation 7 in two main ways:

- the timing and efficiency of a future upgrade are now considered
- the deeming period depends on the technology type and end-use sector

Baseline energy consumption is calculated separately for period 1 (Early Replacement Period), and period 2 (Remaining Life Period).

Figure A3 Proposed conceptual framework

[1] http://www.resourcesandenergy.nsw.gov.au/energy-consumers/sustainable-energy/efficiency/scheme?a=558865.



In Figure A3, the Early Replacement Period is the timeframe during which the existing lighting would have been in place without the ESS. It's the period between ESS installation and the counterfactual installation.

The Energy Savings in the Early Replacement Period are calculated based on the difference between the energy consumption of the existing lights and the ESS Lighting Upgrade.

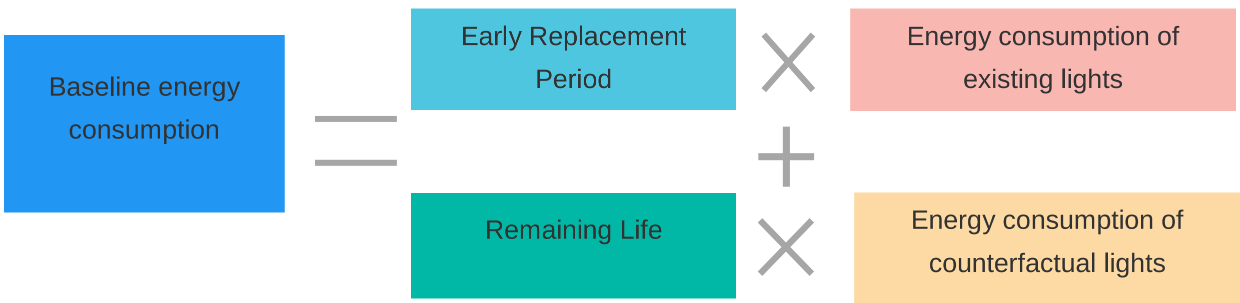
The Remaining Life Period is the time period between the point when the existing lights would have been replaced without the ESS (the counterfactual installation), and the end of the life of the ESS Lighting Upgrade.

The Energy Savings in the Remaining Life Period are calculated based on the difference between the energy consumption of the counterfactual installation and the ESS Lighting Upgrade.

Note that the counterfactual installation is likely to be less energy efficient than the ESS Lighting Upgrade. However, in theory it could be the same or more efficient.

Figure A4 illustrates this new approach followed by an explanation of the components (for a more detailed explanation see Appendix B) used to calculate Energy Savings.

Figure A4 Proposed approach to calculating baseline energy consumption



Component 1 Early Replacement Period

Early Replacement Period

The Early Replacement Period is the timeframe during which the existing lighting would have been in place without the ESS.

The LMIE identified estimates for the length of typical refurbishment cycles based on interviews conducted with lighting industry experts (presented in Appendix B). These figures were presented to the lighting industry through a targeted consultation forum. The NSW Government proposes the Early Replacement Period figures shown in Table A1, based on the LMIE research and feedback from the targeted consultation forum.

Table A1 Proposed Early Replacement Period values

Equipment Group	Building/Space Group	Early Replacement Period (in years)
I - Linear – T5 or T8/T12 to LED	A (Others)	5
	B (Office)	5
	C (Industrial)	10
	D (Retail)	5
II - Downlight - halogen/CFLn to LED	A (Others)	5
	B (Office)	5
	C (Industrial)	10
	D (Retail)	5
III - Bay/road - HID to LED	A (Others)	5
	B (Office)	5
	C (Industrial)	10
	D (Retail)	5

Component 2 Energy consumption of existing lights

Energy consumption of existing lights

This component is the same with the current approach used to calculate baseline energy consumption under Equation 7. It uses the Lamp Circuit Power (LCP) of existing lights. For example, if the existing light is a T8 36W fluorescent tube with a B2 ballast (8W in the ESS Rule), the total energy consumption is 44W.

Component 3 Remaining Life Period

Remaining Life Period

The Remaining Life Period is the time period between the point when the existing lights would have been replaced without the ESS (the counterfactual installation), and the end of the life of the ESS Lighting Upgrade, which is determined by the Asset Lifetime.

Currently the Asset Lifetime is 10 years under the commercial lighting sub-method, except for public lighting upgrades, which have a 12-year base Asset Lifetime.

Based on the LMIE research, the NSW Government proposes to extend the Asset Lifetime in industrial space to 15 years.

For example, if the existing light is a T8 36W fluorescent tube, and the end-use sector is industrial, the LMIE study estimates that the Asset Lifetime would be 15 years - the length of Early Replacement Period would be 10 years and so the Remaining Lifetime would be 5 years.

The NSW Government proposes the Remaining Life Period figures shown in Table A2, based on the LMIE research and feedback from the targeted consultation.

Table A2 Proposed Remaining Life Period values

Equipment Group	Building/Space Group	Remaining Life Period (in years)
I - Linear – T5 or T8/T12 to LED	A (Others)	5
	B (Office)	5
	C (Industrial)	5
	D (Retail)	5
II - Downlight - halogen/CFLn to LED	A (Others)	5
	B (Office)	5
	C (Industrial)	5
	D (Retail)	5
III - Bay/road - HID to LED	A (Others)	5
	B (Office)	5
	C (Industrial)	5
	D (Retail)	5

Component 4 Energy consumption of counterfactual lights

Energy consumption of counterfactual lights

The energy consumption (LCP) of counterfactual lights have been estimated based on the following:

- The estimated LCP of the energy efficient light
- The estimated LCP of the energy inefficient light
- The percentage of total counterfactual lights that are energy efficient lights
- The percentage of total counterfactual lights that are energy inefficient lights

The LMIE research estimated the energy consumption of counterfactual lights, detailed in Appendix B. These estimates were released by the NSW Government in the targeted consultation with the lighting industry.

Based on the targeted consultation feedback, the NSW Government proposes the counterfactual LCPs presented in Table A3. These LCPs have been estimated using historical Lighting Upgrades data in the ESS, grouped by technology type and end-use sector.

Table A3 Counterfactual LCP values

Equipment Group	Counterfactual LCP (watts)
I	51.1
II	21.0
III	218.8

A.5 Proposed changes to the Asset Lifetimes

The proposed conceptual framework has been used to calculate the baseline energy consumption and compare changes to the estimated Energy Savings generated in the current ESS Rule.

To ensure simplicity, the NSW Government proposes to update the Asset Lifetime, based on the changes to the estimated Energy Savings in each end-use sector and technology type.

To calculate these changes, the conceptual framework has been applied to a set of installation data that the NSW Government acquired from several ACPs. These installations represent more than 10 per cent of total installations under the commercial lighting sub-method in the ESS.

The proposed Asset Lifetimes, shown under the Effective Asset Lifetime column in Table A4, are based on the average change to the estimated Energy Savings in each end-use sector and technology type, and consider the conceptual framework, the recommendations detailed in the LMIE report and industry feedback.

Table A4 Derivation of Asset Lifetimes

Equipment Group	Building/Space Group	Early Replacement Period (in years)	Remaining Life Period (in years)	Base Asset Lifetime (in years)[2]	Effective Asset Lifetime (in years)[3]
I - Linear – T5 or T8/T12 to LED	A (Others)	5	5	10	6.7
	B (Office)	5	5	10	7.2
	C (Industrial)	10	5	15	11.6
	D (Retail)	5	5	10	7.3
II - Downlight - halogen/CFLn to LED	A (Others)	5	5	10	7.2
	B (Office)	5	5	10	7.2
	C (Industrial)	10	5	15	12.2
	D (Retail)	5	5	10	7.1
III - Bay/road - HID to LED	A (Others)	5	5	10	7.8
	B (Office)	5	5	10	7.8
	C (Industrial)	10	5	15	11.6
	D (Retail)	5	5	10	7.8

[2] Base Asset Lifetime is the period over which Energy Savings have been calculated.

[3] Effective Asset Lifetime is the proposed adjustment based on average change to the estimated Energy Savings.